SUMMARY OF OPERABLE UNIT 5 (OU5) HUMAN HEALTH RISK-BASED PRELIMINARY REMEDIATION GOALS (PRGs)

TAR CREEK SUPERFUND SITE
MARCH 23, 2021
AGENDA

- Technical Assistance Services for Communities (TASC) program
- Site Background
- OU5 Human Health Risk Assessment (HHRA) Report
- Advanced Screening-Level Ecological Risk Assessment (SLERA) for the Tri-State Mining District (TSMD) Report (2010)
- OU5 Human Health Risk-Based Sediment Preliminary Remediation Goals (PRGs)
- TASC Comments
- Discussion

This presentation is funded by EPA’s TASC program – its contents do not necessarily reflect the policies, actions or positions of EPA
TECHNICAL ASSISTANCE SERVICES FOR COMMUNITIES (TASC) PROGRAM

- One of several EPA-sponsored technical assistance programs
- Independent services provided under contract with Skeo
OPERABLE UNITS

- Site placed on the National Priorities List in 1983

- Five operable units (OUs)
  - OU1 – Surface water/groundwater
  - OU2 – Residential areas
  - OU3 – Eagle-Picher Office Complex (abandoned mining chemicals)
  - OU4 – Mine and mill waste and smelter waste (about a 40-square-mile area)
  - OU5 – Sediments and surface water in continuously flowing creeks, streams and rivers
OU5 STUDY AREA
OU5 WATERSHEDS

- Fourmile Creek
- Elm Creek
- Tar Creek (including Lytle Creek)
- Neosho River
- Beaver Creek
- Lost Creek
- Lower Spring River (portion of Spring River downstream of Empire Lake in Kansas and ending at headwaters of Grand Lake O’ the Cherokees)
OU5 WATERSHEDS

- Fourmile Creek (background area)
- Beaver Creek
- Elm Creek
- Tar Creek (including Lytle Creek)
- Lost Creek
- Neosho River
- Lower Spring River
WHERE IS OU5 IN THE SUPERFUND PROCESS?

THE SUPERFUND REMEDIAL PROCESS

Assessment
- Discovery of Contamination
- Preliminary Assessment
- Site Inspection
- National Priorities List (NPL) Site Listing

Characterization
- Remedial Investigation
- Feasibility Study & Proposed Plan

Selection of Remedy
- Record of Decision

Cleanup
- Remedial Design
- Remedial Action

Post-Construction
- Operation and Maintenance
- NPL Deletion

Five-Year Reviews

Community involvement and planning for a site’s redevelopment are integral to the entire process.
PREVIOUS TASC REVIEW OF OU5 HHRA REPORT (VERSION 1.1)

1. Introduction
2. Site Characteristics and Potential Receptors
3. Data Evaluation
4. Exposure Assessment
5. Toxicity Assessment
6. Risk Characterization
7. References

EPA’S OU5 EXPOSURE SCENARIOS

▪ Tribal members (adults, including aquatic workers who practice traditional lifeway, and children)
  ▪ Hunting/fishing/gathering and swimming/wading
  ▪ Using river and creek water for drinking and bathing
  ▪ Using river and creek water in sweat lodges
  ▪ Eating aquatic plants and animals, including whole fish
  ▪ Using salve made from aquatic plants

▪ Aquatic workers (fish hatchery and environmental workers who do not practice traditional lifeway)
  ▪ Work activities

▪ The general public (adults and children)
  ▪ Swimming/wading/fishing/hunting
  ▪ Using river and creek water for drinking and bathing
  ▪ Eating fish fillets and waterfowl
## Summary of HHRA Results, by Watershed

<table>
<thead>
<tr>
<th>Watershed</th>
<th>Tribal Lifeway</th>
<th>Aquatic Worker</th>
<th>General Public</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elm Creek</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Tar Creek</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Neosho River</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Beaver Creek</td>
<td>+</td>
<td>-</td>
<td>+(^a)</td>
</tr>
<tr>
<td>Lost Creek</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Lower Spring River</td>
<td>+(^a)</td>
<td>-</td>
<td>+(^a)</td>
</tr>
<tr>
<td>Sitewide(^b)</td>
<td>+</td>
<td>n/a</td>
<td>+(^a)</td>
</tr>
</tbody>
</table>

\(^a\) Risk of high blood lead level only  
\(^b\) Risk from eating OU5 area plants and aquatic animals  
+ = increased health risk  
- = no increased health risk
COMPARISON OF HHRA VERSION 1.1 AND VERSION 1.3 REPORTS

- Same exposure scenarios
- Same chemicals of concern
- Same calculated cancer and noncancer risks
- Additional text and clarifications
- Additional documentation of childhood lead blood levels (Tables 6-20 through 6-25)
- Appendix A in Version 1.3 contains responses to comments on Version 1.1
- Appendix E in Version 1.3 contains additional text, content organization and clarification.
ADVANCED SLERA FOR THE TSMD REPORT (2010)

1. Background
2. Geographic Scope of Study Area
3. Screening-Level Problem Formulation and Ecological Effects
4. Screening-Level Exposure Estimate and Risk Calculation
5. Development of Ecosystem Goals and Objectives for the Tri-State Mining District Risk Characterization
6. Overview of Problem Formulation for the Detailed Assessment of Risks to the Benthic Invertebrate Community
7. Approach to the Assessment of Risks to the Benthic Invertebrate Community
8. Detailed Assessment of Risks to the Benthic Invertebrate Community
9. Uncertainty Analysis
10. Development of Preliminary Remedial Action Objectives for the Tri-State Mining District
11. Summary and Conclusions
12. References
EPA’S APPROACH TO THE ADVANCED SLERA

▪ Goal: Assess risks to plants and animals exposed to sediment and surface water within the Tri-State Mining District

▪ EPA used a step-wise approach to evaluate risks:
  ▪ Identified risks were used to inform development of remedial action objectives and guide remedial activities
  ▪ EPA identified cadmium, lead and zinc as the primary contaminants of concern
  ▪ EPA identified chromium, copper, mercury, nickel, and/or silver likely contributing to adverse effects on animals without backbones living in sediment
RESULTS AND NEXT STEPS DEVELOPED FROM THE ADVANCED SLERA

- SLERA results indicated potential risks to aquatic plants and animals using aquatic habitats in the TSMD.
- EPA then conducted a detailed ecological risk assessment
- The advanced SLERA focuses on the remedial action objectives for surface water, sediment and pore water
  - Develops site-specific cleanup levels for the organisms that use aquatic sedimentary habitat.
PRELIMINARY REMEDIAL ACTION OBJECTIVES

▪ The advanced SLERA focused on evaluating risks to benthic invertebrates (animals without backbones living at the bottom of creeks and rivers) exposed to surface water, sediment and porewater.

▪ Preliminary remedial action objectives:
  ▪ Minimize exposure to contaminated sediment and/or porewater for microbes, aquatic plants, invertebrates and fish
  ▪ Minimize or prevent exposure to contaminated sediment for aquatic dependent wildlife (probing birds, omnivorous mammals, etc.)
ECOLOGICAL PRGs

- Described in Appendix H of the Remedial Investigation Report
- Based on reducing toxicity to plants and animals to T10 (10% reduction of animal survival or 10% reduction in plant biomass)
  - Cadmium (Cd) – 11.1 mg/kg
  - Lead (Pb) – 150 mg/kg
  - Zinc (Zn) – 2,083 mg/kg
  - $\Sigma$PEC-Q$_{Cd, Pb, Zn}$ – <6.47
    - Sum of probable effect concentration quotients (PEC-Qs) for each of the three metals
    - PEC-Q is the ratio of chemical level in sediment over the level that would probably cause harm to organisms in sediment

mg/kg = milligrams per kilogram of dry weight sediment
OU5 HUMAN HEALTH RISK-BASED SEDIMENT PRGS
TECHNICAL MEMORANDUM: HUMAN HEALTH RISK-BASED PRGs

1. Site Background
2. Remedial Action Objectives
3. Overview of the Basis for Preliminary Remediation Goals
4. Summary of Ecological Preliminary Remediation Goals
5. Summary of Human Health Risk Assessment
6. Human Health Risk-Based PRG Development Approach
7. Uncertainties
8. Conclusions
9. References

Review of Tar Creek Superfund Site Operable Unit 5 Human Health Preliminary Remediation Goals (PRGs)

The community group Local Environmental Action Demanded (L.E.A.D) Agency asked for assistance from EPA’s Technical Assistance Services for Communities (TASC) program. The request was for TASC review and comment on Version 1.1 of the Technical Memorandum: Development of Human Health Risk-Based Preliminary Remediation Goals for Operable Unit 5.

The Technical Memorandum discusses human health risk-based preliminary remediation goals (PRGs) and ecological PRGs. It has nine sections and two appendices. The sections are:

1. Site Background
2. Remedial Action Objectives
3. Overview of the Basis for Preliminary Remediation Goals
4. Summary of Ecological Preliminary Remediation Goals
5. Summary of Human Health Risk Assessment
6. Human Health Risk-Based PRG Development Approach
7. Uncertainties
8. Conclusions
9. References

The appendices are:
A. Detailed Lead PRG Methodology
B. Sediment and Aquatic Plant Expression Analysis

This fact sheet summarizes the nine chapters. TASC comments follow the summary.

EPA asked for comments by April 16, 2021. Please email comments to EPA community involvement coordinator, Janet Cost at ecast.janetcost@epa.gov.

The U.S. Environmental Protection Agency’s (EPA) TASC program funded this fact sheet. Its contents do not necessarily reflect the policies, actions, or positions of EPA.
PRELIMINARY OU5 REMEDIAL ACTION OBJECTIVES

▪ Human Health
  ▪ Minimize or prevent human contact with elevated metals in OU5 sediment and surface water that may pose an unacceptable risk
  ▪ Minimize or prevent human exposures to elevated metals found in OU5 aquatic (water) plants and animals that may pose an unacceptable risk
CONSIDERATIONS IN DEVELOPING PRGs

▪ Chemical levels associated with a noncancer hazard index of 1.
  ▪ A hazard index of 1 means there is little or no risk of a noncancer health effect

▪ A 5% chance of exceeding a target blood lead level of 5, 8 and 10 micrograms per deciliter
  ▪ PRGs developed to a target of 5 micrograms per deciliter

▪ Toxicity thresholds indicating a significant ecological risk
  ▪ PRGs developed to a target of T10 (10% reduction of animal survival or 10% reduction in plant biomass)

▪ Background concentrations
CALCULATED SEDIMENT PRGs

PRG Ranges

- Cadmium – 13.2 to 41.2 mg/kg (tribal lifeway child); 214 mg/kg (aquatic worker)
- Lead – up to 3,224 mg/kg
  - Depends on exposure assumptions and 5, 8 or 10 micrograms per deciliter target blood lead level
- Zinc – 2,095 to 13,161 mg/kg (tribal lifeway child)

mg/kg = milligrams per kilogram of dry weight sediment

Highlighted PRGs

- Cadmium – 13.2 mg/kg
- Lead – 414 mg/kg
  - hybrid method - assumes different exposures for children under 3 years old and children 3 to 6 years old.
  - 5% chance of exceeding a target blood lead level of 5 micrograms per deciliter
- Zinc – 2,095 mg/kg
PROPOSED SEDIMENT PRGs VERSUS OTHER VALUES

- Proposed PRGs (ecological)
  - Cadmium – 11.1 mg/kg
  - Lead – 150 mg/kg
  - Zinc – 2,083 mg/kg
  - $\Sigma$PEC-Q$_{\text{Cd}, \text{Pb}, \text{Zn}}$ – <6.47

- Background Levels
  - Cadmium – 0.70 mg/kg
  - Lead – 59 mg/kg
  - Zinc – 534 mg/kg

- Final OU4 Soil Remediation Goals
  - Cadmium – 10 mg/kg
  - Lead – 500 mg/kg
    - 5% chance of exceeding a target blood lead level of 10 micrograms per deciliter
    - Also soil remediation goal for OU2
  - Zinc – 1,100 mg/kg

- Highlighted Human Health PRGs
  - Cadmium – 13.2 mg/kg
  - Lead – 414 mg/kg
  - Zinc – 2,095 mg/kg

mg/kg = milligrams per kilogram of dry weight sediment
TASC COMMENTS

1. Neosho River and Lost Creek have no sediment chemicals of concern and Lower Spring River has only lead
   ▪ Community members may want to follow EPA’s progress on final remediation goals and comment during the Proposed Plan public comment period

2. Considering runoff and acid mine drainage, how will sediment PRG levels be maintained after cleanup?

3. Is flood scour a concern and should stream-specific or reach-specific PRGs be set for susceptible areas?

4. Are sediment PRGs protective enough considering:
   ▪ Additional contaminants in sediment besides cadmium, lead and zinc
   ▪ Possible increased bioavailability due to runoff and acid mine drainage
TASC COMMENTS

5. Cadmium and zinc PRGs excluded the pathway of surface water ingestion. Are these sediment PRGs protective enough to address the surface water pathway?

6. Are the site-specific PRGs comparable to those at other sites with similar characteristics?

7. How will the ΣPEC-Q PRG be used, considering that each of the three chemicals of concern has its own PRG?

8. In an EPA webinar and discussion about the PRGs on February 23, 2021, it appeared that Quapaw tribal leaders may prefer the sediment PRGs to be the same as background levels
   - Community members may want to provide their opinions about this issue to EPA
DISCUSSION
COMMENTS ON OU5 HUMAN HEALTH RISK-BASED PRGS ARE DUE ON APRIL 16, 2021

Please email comments to:

- Janetta Coats
  EPA Community Involvement Coordinator
  214-665-7308
  coats.janetta@epa.gov
Terrie Boguski  
Harmony Environmental  
913-780-3328  
tboguski@harmonyenviro.com

Karmen King  
Skeo  
970-852-0036  
kking@skeo.com