



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 7**

11201 Renner Boulevard  
Lenexa, Kansas 66219

**ACTION MEMORANDUM**

**SUBJECT:** Approval and Funding for a Time-Critical Removal Action at the Berry Wood Products Site, Fredericktown (Cherokee Pass), Madison County, Missouri

**FROM:** Andrew Gieseke, On-Scene Coordinator  
Response, Removal and Emergency Preparedness Section

**THRU:** J. Heath Smith, Supervisor  
Response, Removal and Emergency Preparedness Section

Adam Ruiz, Manager  
Assessment, Emergency Response and Removal Branch

**TO:** Robert D. Jurgens, Director  
Superfund and Emergency Management Division

**I. PURPOSE**

The purpose of this Action Memorandum is to document the decision to initiate a response action for the Berry Wood Products Site (site), located near Fredericktown in unincorporated Cherokee Pass, Madison County, Missouri. The site is a former wood preserving facility that operated from 1969 to the early 2000s. The primary contaminant of concern is pentachlorophenol (PCP) that exists in process vessels and soil at concentrations at or above the site-specific removal management levels (RML). The proposed removal action will address the immediate threat to human health and the environment, which includes the removal and disposal of all PCP-contaminated wastes identified at concentrations exceeding RMLs (soils, liquids, and process sludges/residuals); wood treatment containers and tanks; or instituting Post-Removal Site Controls as needed.

**II. SITE CONDITIONS AND BACKGROUND**

CERCLIS/EPA ID#:	MOD143540375
SSID#:	B7N9
REMOVAL CATEGORY:	Time-Critical
NATIONALLY SIGNIFICANT:	No

**A. Site Description**

**1. Removal site evaluation**

The EPA referred this site to the Missouri Department of Natural Resources (MoDNR), in 2008 with a decision of no further remedial action planned (NFRAP),

following a Resource Conservation Recovery Act (RCRA) closure investigation. The MoDNR Environmental Remediation Program was made aware of the potential threat to health in children and adults occupying the site in August of 2022, and immediately requested EPA's assistance in assessing the site for a Removal Action. Because this site is located in Madison County where there is widespread lead contamination, the MoDNR screened the surface soil with an X-Ray Fluorescence analyzer (XRF) during the initial site visit on August 22, 2022, and did not detect lead.

The EPA conducted the Removal Site Evaluation field sampling activities in November 2022. The EPA collected surface soils in proximity of former wood treating operations and representative samples of a sawdust and wood shavings waste pile. Liquid samples were taken from a storage tank found on the property. Water and sediment samples were taken from standing water found on the site, an adjacent spring, and a neighboring creek that flows to the east of the site.

The EPA selected sampling locations based on professional judgement and by observing erosion patterns connected to the topography of the site. The residential health-based RML for PCP is 100 parts per million (ppm). The results of the surface and sub-surface soil samples analysis revealed elevated levels of PCP above the RML. Based on the results of the Removal Site Evaluation, the following wastes are expected to be addressed during this Removal Action:

- 2,500 gallons of liquid containing roughly 3.3% PCP, 74% diesel fuel, and 22.7% water, and
- 7,000 tons of PCP-contaminated soil.

## **2. Physical location**

The Berry Wood Products site is located just south of Cherokee Pass, Madison County, Missouri, approximately five miles south of Fredericktown on the east side of U.S. Highway 67. It is in the Southeast Quarter (SE 1/4) of the Southeast Quarter (SE 1/4) of the Northwest Quarter (NW 1/4) of Section 8, Township 32 North, Range 7 East (See Figure 1). The approximate geographic coordinates of the site are 37.473889, -90.299722. The site boundary is within parcel ID 103008000000017000, which was subdivided out from the original facility's footprint.

The EPA has conducted an environmental justice (EJ) review of the community where the site is located using EJScreen, the EPA's EJ mapping and screening tool. EJScreen provides a nationally consistent dataset and approach for combining environmental and demographic indicators. The EPA uses EJScreen to evaluate communities where Superfund sites are located to determine whether additional consideration, analysis, or actions are needed, as determined by the EPA, as it plans for and conducts response actions in the community.

There are no Environmental Justice Indexes above the 80<sup>th</sup> percentile. The EJScreen reports are included in the Administrative Record for the site.

### **3. Site characteristics**

The Berry Wood Products site was a formerly operated wood treating/sawmill facility. The facility began operation in 1969. According to a Resource Conservation and Recovery Act (RCRA) report from 2000, the facility stopped pressure-treating lumber sometime in 1998. During operations, the facility purchased and blended its own 5% PCP formulations on the site by combining 40% PCP solution with diesel fuel. The treatment solution was stored in a 15,000-gallon tank. This tank was partially buried at the time of operation and continues to reside in that same location at the site.

### **4. Release or threatened release into the environment of a hazardous substance, or pollutant, or contaminant**

Hazardous substances, as defined in section 101(14) of CERCLA, 42 U.S.C. § 9601(14), have been released to the environment, and there remains a threat of additional releases due to the continued presence of PCP solution stored in tanks on the site. The age of the tanks and the effects of weathering have impacted the integrity of the storage tanks, which constitutes a significant source of contamination with the potential for exposure to humans and environmental receptors.

Multiple surface soil samples detected concentrations of PCP that exceeded the EPA RML of 100 ppm.

### **5. National Priority List (NPL) status**

The site is not listed on, nor is it proposed for inclusion on, the National Priorities List.

### **6. Maps, pictures and other graphic representations**

Maps of the site are included as Attachment 2.

1. Site Location Map
2. Site-Related Properties/Parcels
3. Sample Location Map
4. Hot Zone Map

## **B. Other Actions to Date**

### **1. Previous actions**

In 1997, MoDNR conducted an Integrated Site Inspection and Removal Site Evaluation. The purpose of this investigation was to collect sufficient information concerning conditions at the site to assess the threat posed to human health and the environment, and to determine the need for additional investigation under CERCLA or other authority. Sampling found soils surrounding the treatment tanks with surface PCP concentrations as high as 6,000 ppm. The MoDNR noted the possibility of PCP

migration from the high concentration areas into the sawdust pile that resides downgradient to the east.

In 2000, the EPA Region 7 RCRA program conducted a compliance evaluation inspection and sampling at the site. Activities included interviewing owners and operators for the facility. The EPA documented visual staining of PCP contamination in the soils at the site. In 2003, Berry Wood Products entered into an Expedited Settlement Agreement to immediately cease all releases of PCP and pay a civil penalty of \$25,163. The company only paid a small portion of the penalty, however, before it was administratively dissolved in 2004.

## **2. Current actions**

There are no current actions regarding the site other than this proposal to take a fund-lead Removal Action to characterize and dispose of wastes and contaminated soil remaining on the site.

### **C. State and Local Authorities' Roles**

#### **1. State and local actions to date**

On August 9th, 2022, the MoDNR referred the site to the Region 7 EPA Superfund and Emergency Management Division. The site is not listed on the National Priorities List.

#### **2. Potential for continued state/local response**

State authorities continue to have a role in providing EPA assistance with ARARs. Post-Removal Site Controls will be coordinated with the state.

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

Section 300.415(b) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) provides that the EPA may conduct a Removal Action when it determines that there is a threat to human health, or welfare, or the environment based on one or more of the eight factors listed in 40 CFR § 300.415(b)(2). The factors that justify a Removal Action at the site are:

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

Abandoned waste remaining at the site poses a risk to nearby residents. The current property owners intend to use the site for residential purposes such as building a home, having children visit, and residing at the property for greater than 8-hour periods.

An above-ground storage tank containing liquid waste of 3.3% PCP mixed with diesel is not secure and poses the threat of release with direct exposure to nearby populations and the environment.

PCP, once one of the most widely used biocides in the United States, is now a restricted-use pesticide and is no longer available to the general public. It was primarily used as a wood preservative. PCP is extremely toxic to humans from acute (short-term) ingestion and inhalation exposure. Acute inhalation exposures in humans have resulted in neurological, blood, and liver effects, and eye irritation. Chronic (long-term) exposure to PCP by inhalation in humans has resulted in effects on the respiratory tract, blood, kidney, liver, immune system, eyes, nose, and skin. Human studies are inconclusive regarding PCP exposure on reproduction. Human studies suggest an association between exposure to PCP and cancer. Oral animal studies have reported increases in liver tumors and two uncommon tumor types. The EPA has classified PCP as a Group B2, probable human carcinogen.

**300.415(b)(2)(iii) – Hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers, that may pose a threat of release.**

PCP mixed with diesel is currently stored in a large tank on the property. The storage tank is heavily weathered, oxidized, and there is no secondary containment. Due to these conditions, action must be taken to prevent the high likelihood of release if the structural integrity is further compromised.

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

The highest concentrations of PCP were found in the surface soils, but the contaminants were also found at depth in lower concentrations, indicating that migration down the soil column is occurring. Overland flow from weather events and vehicular traffic through the site could also cause the surface soil contamination to spread further. Migration of PCP contamination may have flowed into a sawdust pile that resides downgradient from where pressure treating activities occurred.

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

There is no protection from the elements for the storage tank on the site. Wind and rain will further degrade the condition of the tank over time, as well as increase the chances of off-site migration of the contaminants.

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

The MoDNR does not have the resources to respond to this release. On August 9, 2022, as part of a Request for Federal Action, the MoDNR requested that the EPA take the lead on “evaluation of site conditions and/or the performance of a response action”.

#### **IV. ENDANGERMENT DETERMINATION**

Actual or threatened releases of hazardous substances from the site, if not addressed by implementing the response action selected in this Action Memorandum, may present an imminent and substantial endangerment to public health, or welfare, or the environment.

## **V. EXEMPTION FROM STATUTORY LIMITS**

No exemptions from statutory limits are requested at this time.

## **VI. PROPOSED ACTIONS AND ESTIMATED COSTS**

### **A. Proposed Actions**

#### **1. Proposed Action Description**

This proposed Removal Action will address the immediate threat to human health and the environment. Actions include the removal and disposal of all PCP-contaminated wastes identified at concentrations exceeding RMLs (soils, liquids, and process sludges/residuals); wood treatment containers and tanks; and/or institution of Post-Removal Site Controls, as needed.

##### **a. Removal and disposal of all PCP-contaminated wastes and their containers**

An estimated 2,500 gallons of 3.3% PCP, 74% diesel, and 22.7% water solution will be pumped from holding tanks and consolidated for off-site disposal. Any contaminated solid wastes found in the treatment cylinder will be removed for off-site disposal. All empty steel vessels, including the treatment cylinder, will be dismantled, and disposed off of the site to prevent further use.

An estimated 7,000 tons of PCP-contaminated soils exceeding the RML of 100 ppm will be excavated. Areas that have been determined to exceed 100 ppm will be initially excavated to the known or inferred depth of contamination and then resampled to determine the residual PCP concentration. If the concentration is still 100 ppm or greater, excavation will continue in 6-inch intervals, with samples collected at each interval. This will continue until concentrations are lower than 100 ppm, or 36 inches, or refusal is reached. If refusal is reached before 36 inches and concentrations are above 100 ppm, a high-visibility physical barrier (such as construction fencing) will be placed. If concentrations at 36 inches are 300 ppm or higher, EPA will evaluate options and either continue excavation until concentrations are below 300 ppm or place a barrier. If a barrier is placed, the grid/cell will be surveyed and an environmental covenant will be developed to institutionalize the control.

Excavated areas will be backfilled with clean fill matching the pre-removal grade, following 1) and the achievement of the health-based action level for PCP-contaminated soils, or 2) excavation to 36 inches or refusal, and the health-based action level for PCP-contaminated soils is not attained, and a high-visibility physical barrier is put in place.

Further assessment of the sawdust pile, directly east of the former wood treating operations, will be conducted to ensure no PCP contamination has collected below the sawdust pile. Excavation and disposal will occur for any additional soils or sawdust that are found to be contaminated by PCP above RML.

## **b. Institutional controls**

It is anticipated that all contaminated liquid and contaminated solid wastes above removal management levels established in this Action Memorandum will be removed. Institutional controls for the site are under consideration in the event contaminated soils are not removable beyond the 36-inch depth or because of refusal at shallower depths. A physical high-visibility barrier will be put in place at the bottom of the excavation. Additional site controls could possibly take the form of an environmental covenant on the property, with the current property owners' consent, or institution of a deed notice on the property.

## **2. Contribution to Remedial Performance**

The proposed actions will, to the extent practicable, contribute to the efficient performance of any long-term remedial action at the site by removing any immediate threats.

## **3. Applicable or Relevant and Appropriate Requirements (ARARs)**

### **Federal**

Section 300.415(j) of the NCP, 40 C.F.R. § 300.415(j), provides that Removal Actions shall, to the extent practicable considering the exigencies of the situation, comply with ARARs under federal environmental or state environmental facility siting laws. In determining whether compliance with ARARs is practicable, the OSC may consider appropriate factors, including the urgency of the situation and the scope of the Removal Action to be conducted.

- The CERCLA off-site rule promulgated pursuant to CERCLA section 121(d)(3), 42 U.S.C. § 9621(d)(3), and formally entitled “Amendment to the National Oil and Hazardous Substances Pollution Contingency Plan; Procedures for Planning and Implementing Off-Site Response Action: Final Rule,” 58 Fed. Reg. 49200 (Sept. 22, 1993), codified at 40 CFR § 300.440, will be applicable for wastes disposed off-site.

### **State**

In a letter dated July 14, 2023, a written request for state ARARs was sent to the MoDNR. Potential ARARs received by the EPA from MoDNR will be considered in accordance with 40 C.F.R. § 300.400(g).

## **4. Project schedule**

The Removal Action described in this Action Memorandum are expected to begin within two to three weeks of the signing of the Action Memorandum and completed within the next six to twelve months dependent upon the weather, availability of subcontractors, and other factors. The project will consist of the immediate removal of all liquid wastes, contaminated solid wastes, their containers, and off-site disposal.

## **B. Estimated Costs**

The estimated costs associated with this Removal Action include the removal of liquid wastes and contaminated soils. Assumptions on cost for transportation and disposal are based on previous work on similar sites in Region 7 and the remote location of this site. Disposal costs for PCP-contaminated soils are estimated to be \$85.00 per ton for transportation and disposal to a landfill. The liquid wastes are to be disposed of as hazardous waste and estimated to cost \$5,000.00 per 250 gallons for transportation and disposal.

Extramural Costs	\$ 1,475,000
Contingency	\$ <u>295,000</u>
Removal Ceiling	\$ 1,770,000

EPA direct and indirect costs, although cost recoverable, do not count toward the Removal Ceiling for this Removal Action. Refer to the enforcement section for a breakout of these costs.

## **VII. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN**

Delayed action will result in a continued and increasing threat to public health, or welfare, or the environment.

## **VIII. OUTSTANDING POLICY ISSUES**

None.

## **IX. ENFORCEMENT**

See the Confidential Enforcement Addendum for this site. For NCP consistency purposes, it is not a part of this Action Memorandum.

The total EPA costs for this Removal Action based on full-cost accounting practices are estimated to be:

Direct Extramural Costs	\$ 1,770,000
Direct Intramural Costs	\$ 40,000
EPA Indirect (38.1 percent)	\$ <u>765,811</u>
Total Costs	\$ 2,499,610

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



## **X. RECOMMENDATION**

This decision document represents the selected Removal Action for addressing the hazardous substances, pollutants or contaminants present at the site. The Removal Action was developed in accordance with CERCLA, as amended, and is not inconsistent with the NCP. This decision is based on the Administrative Record for the site.

The conditions at the site meet NCP Section 300.415(b) criteria for a Removal Action. I recommend your approval of the proposed Removal Action. The Removal Action ceiling will be \$1,770,000. These funds will come from the regional Removal Allowance.

Approved:

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Robert D. Jurgens, Director  
Superfund and Emergency Management Division

Attachments: Attachment 1 – Request for Federal Action  
Attachment 2 – Removal Assessment Maps  
Attachment 3 – Risk Assessment Memorandum (Removal Management Level)

## REQUEST FOR FEDERAL ACTION

The Missouri Department of Natural Resources requests, pursuant to Section 128(b)(1)(B)(i) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9608(b)(1)(B)(i), the assistance of the United States Environmental Protection Agency, Region 7 (EPA) in the evaluation of site conditions and/or the performance of a response action, for the following site:

Berry Wood Products - MOD143540375

Site Name

East Side of US Hwy 67, South of Cherokee Pass

Street Address/Property Description

Fredericktown

City

Madison

County

Missouri 63645

State

By making this request, the Requesting Agency recognizes that the EPA, or any other entity acting on behalf of the EPA, may use its authorities under CERCLA, the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300, or any other federal statute, regulation or response program, to respond to and recover costs incurred in response to releases or threats of releases of hazardous substances, pollutants and/or contaminants at or from the site. By making this request, the Requesting Agency waives notice as otherwise required by Section 128(b)(1)(D) of CERCLA, 42 U.S.C. § 9628(b)(1)(D). The signatory of this request is authorized to make this request on behalf of the Requesting Agency.

Date 8/9/2022

Valerie Wilder

Name

*Valerie Wilder*

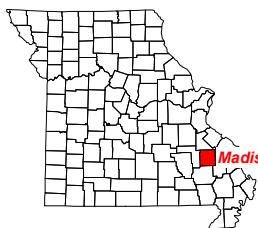
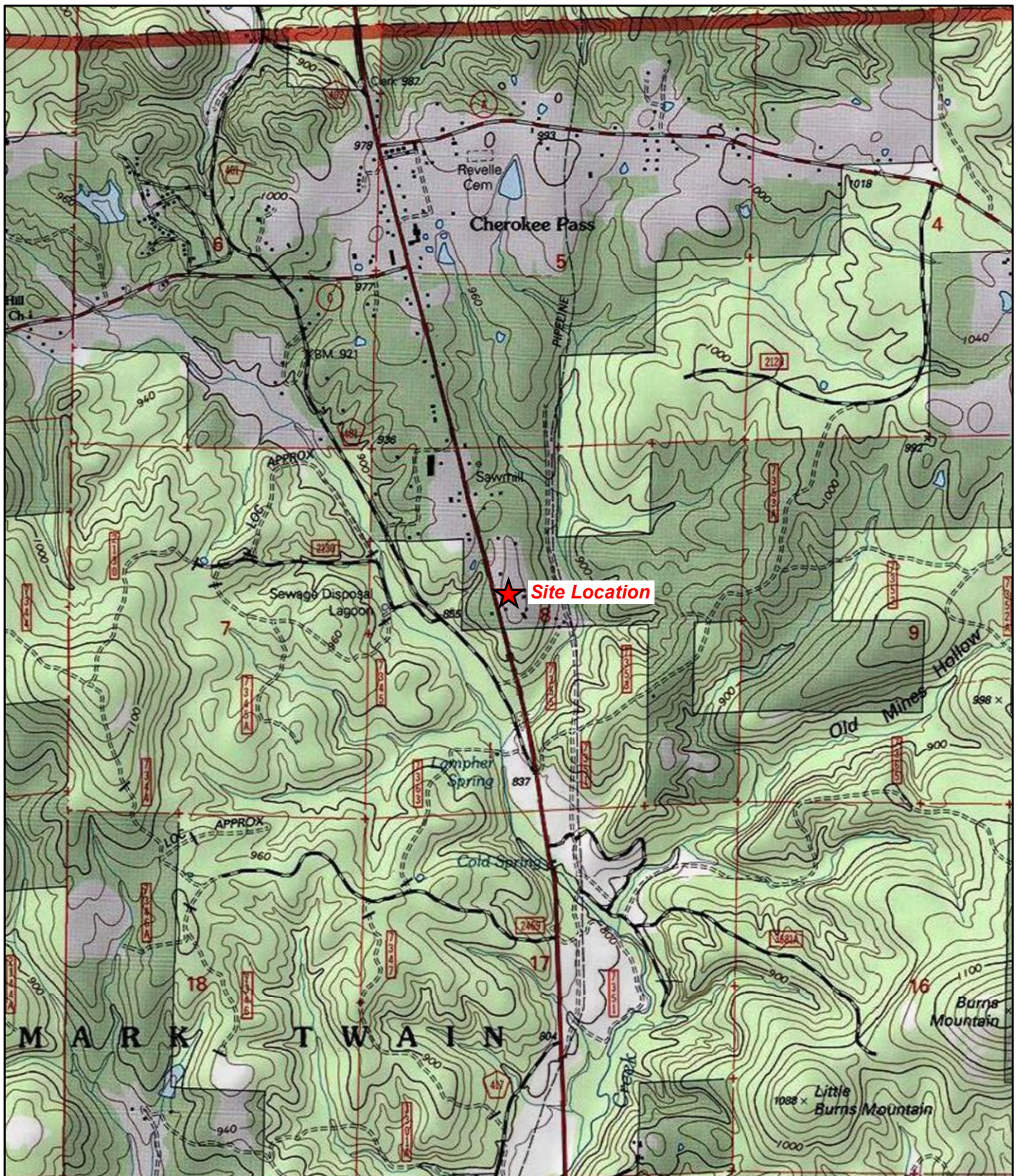
Chief, Superfund Section, Environmental Remediation Program

Title

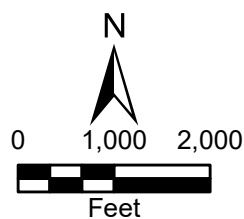
Missouri Department of Natural Resources

Requesting Agency





Madison County



Berry Wood Products  
7307 Business Highway 67  
Fredericktown, Missouri

**Figure 1**  
Site Location Map

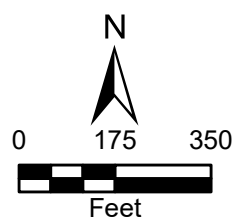






Legend

Approximate parcel boundary



Berry Wood Products  
7307 Business Highway 67  
Fredericktown, Missouri

**Figure 2**  
Site Related Properties/Parcels



Source: Esri, ArcGIS Online, World Imagery (Clarity); Madison Assessment Map, 2017

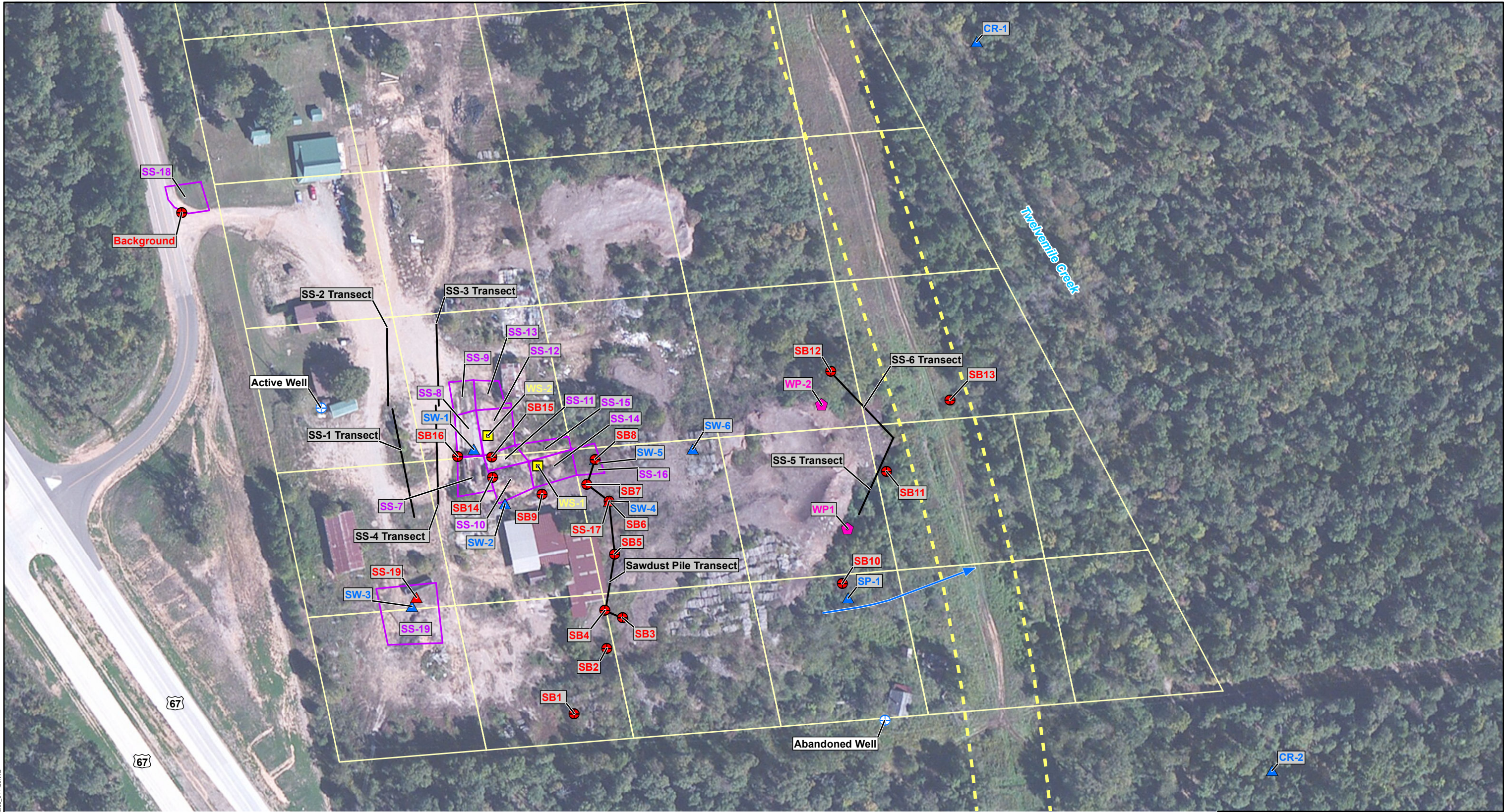
Date: 10/18/2022

Drawn By: Nick Wiederholt












Project No: X903022F0152.000

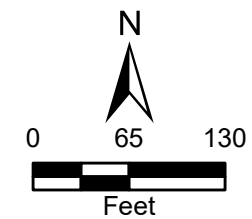
X:\G\03022F0152\000\Projects\mxd\Figure2.mxd





Legend

- |  |   |  |
|--|---|--|
|  Private well                       |  Surface soil sample location                        |  Natural spring discharge pathway     |
|  Sawdust waste pile sample location |  Surface water sample location                       |  Pipeline easement                    |
|  Subsurface soil boring location    |  Waste stream material / tank sample location        |  Composite surface soil sampling area |
|  |  Linear composite/transect line soil sample location |  Grid cell                            |



Berry Wood Products  
7307 Business Highway 67  
Fredericktown, Missouri

**Figure 3**  
Sample Location Map







**Legend**

	Private well		Subsurface soil boring location (PCP concentration exceeding the EPA RML of 100 ppm)
	Subsurface soil boring location		Linear composite/transect line soil sample location
	Surface soil sample location		Composite surface soil sampling area
	Waste stream material / tank sample location		Soil sampling area exceeding the EPA RML for PCP of 100 ppm

EPA U.S. Environmental Protection Agency  
PCP Pentachlorophenol  
ppm Parts per million  
RML Removal management level

0 20 40  
Feet

Berry Wood Products  
7307 Business Highway 67  
Fredericktown, Missouri

**Figure 4**  
Hot Zone Map

**TETRA TECH**

Date: 2/7/2023 Drawn By: Nick Wiederholt Project No: X903022F0152.000

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**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 7**

11201 Renner Boulevard  
Lenexa, Kansas 66219

Jun 28, 2023

**MEMORANDUM**

**SUBJECT:** Proposed Soil Removal Management Levels  
Berry Wood Products  
Fredericktown, Missouri

**FROM:** Elizabeth Cole, Toxicologist  
Applied Sciences Branch  
Laboratory Services and Applied Science Division

**ELIZABETH  
COLE** Digitally signed by ELIZABETH COLE  
Date: 2023.06.28 06:26:41 -0500

**TO:** Andrew Gieseke, On-Scene Coordinator  
Response and Removal Emergency Preparedness Section  
Assessment Emergency Response and Removal Branch  
Superfund and Emergency Management Division

As requested, this memorandum provides a removal management level (RML) for pentachlorophenol in soil at the Berry Wood Products Site, located rurally, approximately 5 miles south of Fredericktown, Missouri.

**Background**

It is understood that the site operated as a wood treating facility from 1969 to 1998. Wood pressure treating and preservation processes occurred at the facility until 1996. One treatment process used a 5% pentachlorophenol and 95% diesel fuel mixture, and another used zinc naphthenate solutions to process wood logs for log home construction. After 1996, the facility operated only as a sawmill until 1998, when all operations reportedly ceased. The property was later subdivided into three parcels and sold.

Missouri Department of Natural Resources (MoDNR) conducted site sampling in December 1996. Elevated levels of pentachlorophenol were detected in surface and sub-surface soils. The data indicated that contamination had migrated from the source area down drainage pathways to the east. Only two samples were analyzed for dioxin (2,3,7,8-tetrachlorodibenzo-p-dioxin) during this investigation, and both were non-detect (less than 0.30 parts per billion [ppb]). Pentachlorophenol was not detected in groundwater samples from two wells on site.

Leachate from residual pentachlorophenol solution in storage tanks and staining of sawdust and milling waste piles, as well as evidence of combustion of these piles have been observed at the Site. Most, but not all, of the former operations buildings have since been razed. Buildings that remain are the former owner's residence, occupied by a new owner, and to the west, two former office buildings now occupied as a residence. Additionally, Parcel 1, contains the main former operations area of the site, which is also being used as a residence. The new owner is in the process of building a new home on the property while living on-site in a travel trailer.



On August 9, 2022, MoDNR referred the site to the EPA Region 7 Superfund Removal Program for further evaluation and removal action consideration. EPA subsequently tasked Tetra Tech Superfund Technical Assessment and Response Team to assist with the removal assessment. Additional samples were collected in November 2022 to further characterize the concentrations of pentachlorophenol in surface and subsurface soil, surface water, and waste materials in tanks abandoned on site. Pentachlorophenol has been identified as a primary Contaminant of Concern (COC) at the site, and other possible COCs identified were semi-volatile organic compounds, dioxin, and diesel fuel. There are no current restrictions (e.g., zoning or an environmental covenant) limiting site use (Tetrattech 2023).

The highest detected concentration of pentachlorophenol in surface soil was 570 mg/kg, from the November 2022 removal assessment sampling event. Other COCs that were detected were below a level of concern for removal action, predominantly polyaromatic hydrocarbons (PAHs), were co-located with the pentachlorophenol contamination. All dioxin samples collected during these sampling activities were waste samples and not from environmental media (Tetrattech 2023).

The objective of this memorandum is to propose pentachlorophenol RMLs for evaluation of the available soil data at this site, in support of a proposed removal action. Based on the presence of residential homes and current lack of use restrictions, RMLs are proposed for residential use scenario in which residents are exposed to pentachlorophenol in site surface soil daily, for many years, via incidental ingestion, dermal contact, and inhalation.

### **Derivation of Removal Management Levels**

Soil RMLs for a residential scenario were derived using EPA's Regional RML calculator (EPA 2023), based on a non-cancer hazard quotient (HQ) of 1 and an excess individual lifetime cancer risk of 1E-04, which is the upper end of EPA's target cancer risk range as directed by the National Contingency Plan (EPA, 1991a). To be protective for both cancer and non-cancer health effects, the final selected cleanup goal for any individual constituent cannot exceed an excess cancer risk of 1E-04 or an HQ of 1. Further, EPA assumes that both cancer risks and non-cancer hazards posed by exposure to multiple compounds are additive. If the total cancer risk posed by exposure to all Site contaminants exceeds 1E-04, even if the concentrations of the individual contaminants are less than their respective RMLs, removal action may be warranted.

In general, the equations used in the RML calculator to calculate aggregate exposure, incidental ingestion, and dermal absorption are from Risk Assessment Guidance for Superfund, Volume I, Part B (EPA, 1991b), while those for inhalation exposure are from Risk Assessment Guidance for Superfund, Volume I, Part F (EPA, 2009) and the EPA's Supplemental Soil Screening Guidance (EPA, 2002). The EPA's standard default exposure parameters (EPA, 2014) were used in the equations to best represent the reasonable maximum exposure scenario, which is defined as the highest exposure that is reasonably expected to occur at a site for the resident (EPA, 1989). The toxicity values for pentachlorophenol were selected according to the hierarchy presented in EPA (2003).

### **Site Specific RMLs**

Table 1, below, presents the surface soil RMLs for a residential scenario. The yellow highlighted cell indicates the lower of the RML value based on excess cancer risk or non-cancer hazard. Thus, the pentachlorophenol RML identified for removal action cannot exceed 100 mg/kg, which poses an excess individual lifetime cancer risk of 1E-04. However, as previously mentioned, removal action could be



warranted in a location where pentachlorophenol is less than its respective RML, if the total excess cancer risk were to exceed 1E-04.

<b>Table 1. Surface Soil Removal Management Levels for a Resident at Berry Wood Products Site</b>		
	<b>Removal Management Level (RML)</b>	
	<b>Excess Individual Lifetime Cancer Risk = 1E-04</b>	<b>Non-Cancer Hazard Quotient = 1</b>
Pentachlorophenol	<b>100 mg/kg</b>	<b>250 mg/kg</b>

RMLs for a residential scenario typically apply only to surface soil, which may be defined as shallow as the top two centimeters of soil. However, without restrictions prohibiting disturbance of site soils, it is possible that deeper soils could be brought to the surface in the future. It is recommended to apply the residential RML to both the surface and subsurface soil contamination, to reduce potential health risks associated with direct contact to subsurface soils that could be brought to the surface.

The output files from the EPA's RML calculator for residential RMLs are provided in the Attachment. If you have any questions or need further assistance, please contact me at x7188.

Attachments

## **References**

- Tetrattech. 2023. Removal Assessment Report with Data Summary Berry Wood Products Site, Fredericktown, Missouri. Superfund Technical Assessment and Response Team (START). April 12, 2023.
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# Default Resident Soil Inputs

Variable	Value
THQ (target hazard quotient) unitless	1
TR (target risk) unitless	0.0001
LT (lifetime) years	70
ET <sub>roc</sub> (exposure time) hours/day	24
ET <sub>roc,r</sub> (child exposure time) hours/day	24
ET <sub>roc,a</sub> (adult exposure time) hours/day	24
ET <sub>0.2</sub> (mutagenic exposure time) hours/day	24
ET <sub>2.6</sub> (mutagenic exposure time) hours/day	24
ET <sub>6.16</sub> (mutagenic exposure time) hours/day	24
ET <sub>16.76</sub> (mutagenic exposure time) hours/day	24
ED <sub>roc</sub> (exposure duration) years	26
ED <sub>roc,r</sub> (exposure duration - child) years	6
ED <sub>roc,a</sub> (exposure duration - adult) years	20
ED <sub>0.2</sub> (mutagenic exposure duration) years	2
ED <sub>2.6</sub> (mutagenic exposure duration) years	4
ED <sub>6.16</sub> (mutagenic exposure duration) years	10
ED <sub>16.76</sub> (mutagenic exposure duration) years	10
BW <sub>roc,r</sub> (body weight - child) kg	15
BW <sub>roc,a</sub> (body weight - adult) kg	80
BW <sub>0.2</sub> (mutagenic body weight) kg	15
BW <sub>2.6</sub> (mutagenic body weight) kg	15
BW <sub>6.16</sub> (mutagenic body weight) kg	80
BW <sub>16.76</sub> (mutagenic body weight) kg	80
SA <sub>roc,r</sub> (skin surface area - child) cm <sup>2</sup> /day	2373
SA <sub>roc,a</sub> (skin surface area - adult) cm <sup>2</sup> /day	6032
SA <sub>0.2</sub> (mutagenic skin surface area) cm <sup>2</sup> /day	2373
SA <sub>2.6</sub> (mutagenic skin surface area) cm <sup>2</sup> /day	2373
SA <sub>6.16</sub> (mutagenic skin surface area) cm <sup>2</sup> /day	6032
SA <sub>16.76</sub> (mutagenic skin surface area) cm <sup>2</sup> /day	6032
EF <sub>roc</sub> (exposure frequency) days/year	350
EF <sub>roc,r</sub> (exposure frequency - child) days/year	350
EF <sub>roc,a</sub> (exposure frequency - adult) days/year	350
EF <sub>0.2</sub> (mutagenic exposure frequency) days/year	350

# Default Resident Soil Inputs

Variable	Value
EF <sub>7,6</sub> (mutagenic exposure frequency) days/year	350
EF <sub>6,16</sub> (mutagenic exposure frequency) days/year	350
EF <sub>16,36</sub> (mutagenic exposure frequency) days/year	350
IFS <sub>rec,3,6f</sub> (age-adjusted soil ingestion factor) mg/kg	36750
IFSM <sub>rec,3,6f</sub> (mutagenic age-adjusted soil ingestion factor) mg/kg	166833.3
IRS <sub>rec,r</sub> (soil intake rate - child) mg/day	200
IRS <sub>rec,r</sub> (soil intake rate - adult) mg/day	100
IRS <sub>rec,3</sub> (mutagenic soil intake rate) mg/day	200
IRS <sub>7,6</sub> (mutagenic soil intake rate) mg/day	200
IRS <sub>6,16</sub> (mutagenic soil intake rate) mg/day	100
IRS <sub>16,36</sub> (mutagenic soil intake rate) mg/day	100
AF <sub>rec,3</sub> (skin adherence factor - adult) mg/cm <sup>2</sup>	0.07
AF <sub>rec,r</sub> (skin adherence factor - child) mg/cm <sup>2</sup>	0.2
AF <sub>7,6</sub> (mutagenic skin adherence factor) mg/cm <sup>2</sup>	0.2
AF <sub>6,16</sub> (mutagenic skin adherence factor) mg/cm <sup>2</sup>	0.2
AF <sub>16,36</sub> (mutagenic skin adherence factor) mg/cm <sup>2</sup>	0.07
DFS <sub>rec,3,6f</sub> (age-adjusted soil dermal factor) mg/kg	103390
DFSM <sub>rec,3,6f</sub> (mutagenic age-adjusted soil dermal factor) mg/kg	428260
AT <sub>rec</sub> (averaging time - resident carcinogenic)	365
City (PEF Climate Zone) Selection	Default
A <sub>e</sub> (PEF acres)	0.5
Q/C <sub>wind</sub> (g/m <sup>2</sup> -s per kg/m <sup>3</sup> )	93.77
PEF (particulate emission factor) m <sup>3</sup> /kg	1359344438
A (PEF Dispersion Constant)	16.2302
B (PEF Dispersion Constant)	18.7762
C (PEF Dispersion Constant)	216.108
V (fraction of vegetative cover) unitless	0.5
U <sub>m</sub> (mean annual wind speed) m/s	4.69
U <sub>t</sub> (equivalent threshold value)	11.32
F(x) (function dependent on U <sub>m</sub> /U <sub>t</sub> ) unitless	0.194
City (VF Climate Zone) Selection	Default
A <sub>s</sub> (VF acres)	0.5

# Default Resident Soil Inputs

Variable	Value
$Q/C_{vol}$ (g/m <sup>2</sup> -s per kg/m <sup>3</sup> )	68.18
foc (fraction organic carbon in soil) g/g	0.006
$p_h$ (dry soil bulk density) g/cm <sup>3</sup>	1.5
$p_c$ (soil particle density) g/cm <sup>3</sup>	2.65
$n$ (total soil porosity) $L_{non-aq}/L_{soil}$	0.43396
Theta <sub>a</sub> (air-filled soil porosity) $L_{air}/L_{soil}$	0.28396
Theta <sub>w</sub> (water-filled soil porosity) $L_{water}/L_{soil}$	0.15
T (exposure interval) s	819936000
A (VF Dispersion Constant)	11.911
B (VF Dispersion Constant)	18.4385
C (VF Dispersion Constant)	209.7845
$d_s$ (depth of source) m	.
T <sub>w</sub> (groundwater temperature) Celsius	25

Default

Resident Risk-Based Removal Management Levels (RML) for Soil

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; W = TEF applied; E = RPF applied; G = see user guide; U = user provided; ca = cancer; nc = noncancer; \* = where: nc SL < 100X ca SL; \*\* = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	SF <sub>0</sub> (mg/kg-day) <sup>-1</sup>	SF <sub>0</sub> Ref <sub>0</sub> (ug/m <sup>3</sup> ) <sup>-1</sup>	IUR	IUR Ref	RfD	RfD Ref	RfC	RfC Ref	GIABS	ABS	RBA
Pentachlorophenol	87-86-5	No	No	Organics	4.00E-01	I	5.10E-06	C	5.00E-03	I	-	-	1	0.25	1

Soil Saturation Concentration (mg/kg)	S (mg/L)	K <sub>oc</sub> (cm <sup>3</sup> /g)	K <sub>d</sub> (cm <sup>3</sup> /g)	HLC (atm-m <sup>3</sup> /mole)	Henry's Law Constant Used in Calcs		Normal Boiling Point		Critical Temperature		T <sub>c</sub> \ Chemical Ref	Type	D <sub>10</sub> (cm <sup>2</sup> /s)	D <sub>100</sub> (cm <sup>2</sup> /s)
					H` and Calcs (unitless)	H` and HLC Ref	BP (K)	BP (K)	T <sub>c</sub> (K)	T <sub>c</sub> (K)				
-	1.40E+01	5.92E+02	-	2.45E-08	1.00E-06	PHYSPROP	582.65	EPI	-	-	HERB	2.95E-02	8.01E-06	

D \ (cm <sup>2</sup> /s)	Particulate Emission Factor (m <sup>3</sup> /kg)	Volatilization		Volatilization Factor	Selected (m <sup>3</sup> /kg)	Ingestion SL	Dermal SL	Inhalation SL	Carcinogenic SL	Ingestion SL	Dermal SL	Inhalation SL
		Factor Unlimited Reservoir (m <sup>3</sup> /kg)	Mass Limit (m <sup>3</sup> /kg)			TR=0.0001 (mg/kg)	TR=0.0001 (mg/kg)	TR=0.0001 (mg/kg)	TR=0.0001 (mg/kg)	THQ=1 (mg/kg)	THQ=1 (mg/kg)	THQ=1 (mg/kg)
-	1.36E+09	-	-	-	-	1.74E+02	2.47E+02	7.48E+07	1.02E+02	3.91E+02	6.59E+02	-

Noncarcinogenic SL	Child THI=1 (mg/kg)	Ingestion SL Adult THQ=1 (mg/kg)	Dermal SL Adult THQ=1 (mg/kg)	Inhalation SL Adult THQ=1 (mg/kg)	Noncarcinogenic SL Adult THI=1 (mg/kg)	Screening Level (mg/kg)
2.45E+02	4.17E+03	3.95E+03	-	-	2.03E+03	1.02E+02 ca