



# Smurfit-Stone Mill Site OU3 Human Health Risk Assessment Fact Sheet

• UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

• REGION 8

• APRIL 2022

The 3,200-acre Smurfit-Stone Mill Site is located 11 miles northwest of Missoula, Montana. A pulp mill operated on site from 1957 to 2010. Site environmental investigations have been ongoing since 2013 under the EPA's Superfund program. The remedial investigation is proceeding to characterize the contamination; assess potential risks to human health and the environment; and inform the selection of cleanup actions.

EPA has organized the Site into three operable units (OUs):

- **OU1** covers approximately 1,200 acres, largely agricultural lands.
- **OU2** is approximately 255 acres encompassing the core industrial footprint of the mill.
- **OU3** includes approximately 1,700 acres that comprise the areas of historic wastewater treatment facilities (consisting of a clarifier and settling ponds, aeration basins, and polishing ponds), areas of treated water holding ponds and infiltration basins, any part of the Clark Fork River where hazardous substances from Site activities have come to be located, and Site wide groundwater containing or impacted by hazardous substances from Site activities.



This fact sheet provides an introduction to human health risk assessments (HHRAs) and a brief summary of the conclusions from the *Final Human Health Risk Assessment for the Smurfit-Stone/Frenchtown Mill Operable Unit 3 Site Located in Missoula County, Montana* (OU3 HHRA). The reader is encouraged to read the complete OU3 HHRA report that can be found on EPA's website from the link provided on page 5 of this fact sheet.

HHRAs consider potential risks to human receptors from exposure to contaminated media through complete pathways. Separate from the OU3 HHRA, EPA completed an HHRA for OU2 in December 2021. In October 2021, EPA released the final baseline ecological risk assessment (BERA) that evaluates risks to various types of ecological communities and species.

## What is a Human Health Risk Assessment?

An HHRA report documents the process to estimate the nature and probability of potential adverse health effects in humans who may be exposed to chemicals in contaminated environmental media, now or in the future.

HHRAs provide information to risk managers to:

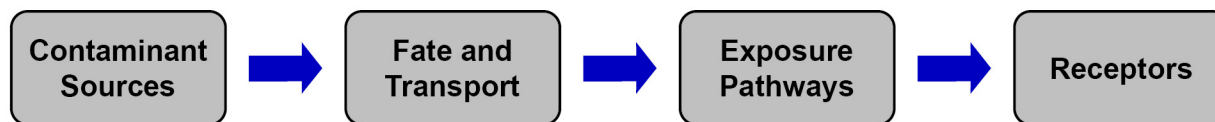
- communicate potential risks to interested parties and the general public;
- help determine areas where limiting exposure to chemical contamination may be necessary;
- inform remedial options; and/or
- develop monitoring plans to confirm risk reduction.

HHRAs, along with other relevant information, inform the risk managers of the various human health risks needing to be considered when identifying remedial action options; risk assessments do not dictate the remediation.

## What is the goal of the Operable Unit 3 Human Health Risk Assessment?

The goal of the OU3 HHRA is to characterize the potential risks to humans, both now and in the future, from Site-related contaminants that are present at the Site, assuming that no steps are taken to remediate the environment or to reduce human contact with contaminated environmental media.

The characterization presented in the OU3 HHRA report provides information necessary to achieve the risk management goal at the Site: to ensure adequate protection of human receptors within the Site from potential adverse effects of exposure to Site-related releases of hazardous substances. The diagram below shows the general pathway from contaminant sources to receptors considered during the OU3 HHRA process.



## What questions do Human Health Risk Assessments address?

HHRAs address questions such as:

1. Are some people more likely to be susceptible to Site-related contaminants because of factors such as age, genetics, pre-existing health conditions, ethnic practices, gender, etc.?
2. Are some groups of people more likely to be exposed to Site-related contaminants because of factors such as where they work, where they play, what they like to eat, etc.?
3. What Site-related contaminants are people exposed to, at what levels, and for how long?
4. What types of health problems may be caused by Site-related contaminants?
5. Is there a level below which some Site-related contaminants do not pose a human health risk?
6. What is the chance that people will experience health problems when exposed to different levels of Site-related contaminants?

The answers to these questions come from three steps of the risk assessment process: Exposure Assessment (questions 1, 2, and 3), Toxicity Assessment (questions 4 and 5), and Risk Characterization (question 6).

## What human receptors are evaluated in the Exposure Assessment?

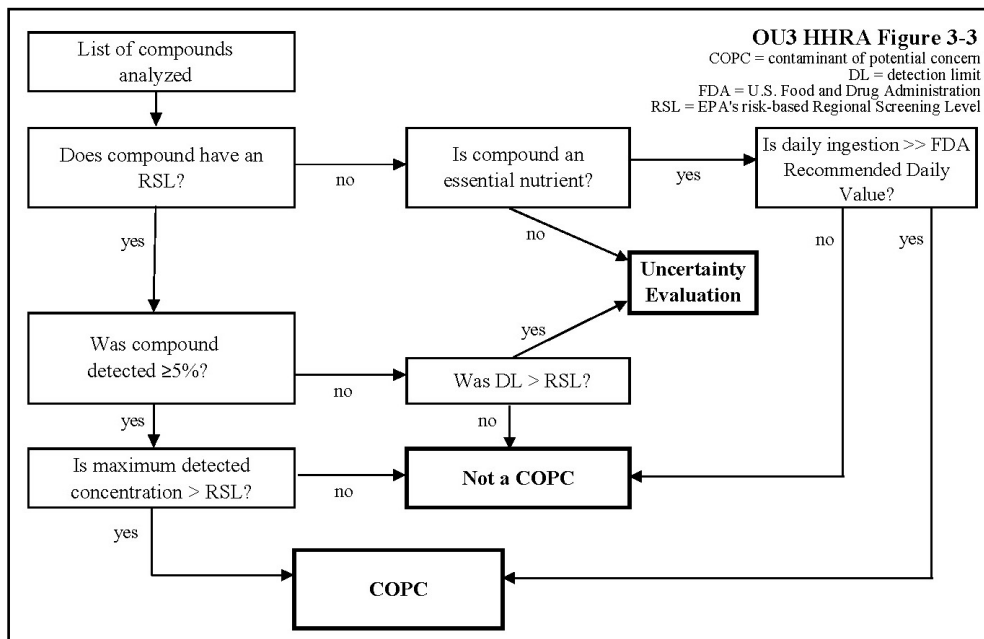
The OU3 HHRA evaluates the potential for unrestricted future use of OU3; therefore, EPA selected the following receptors and exposure pathways for evaluation.

| Exposed Population                                                   | Exposure Pathway                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hypothetical future residents (adults and children age 0 to 6 years) | <ul style="list-style-type: none"><li>• Incidental ingestion of and dermal contact with surface soil</li><li>• Ingestion of groundwater as drinking water</li></ul>                                                                                                       |
| Hypothetical future commercial/ industrial workers                   | <ul style="list-style-type: none"><li>• Incidental ingestion of and dermal contact with surface soil</li><li>• Ingestion of groundwater as drinking water</li></ul>                                                                                                       |
| Hypothetical future construction workers                             | <ul style="list-style-type: none"><li>• Incidental ingestion of and dermal contact with surface and subsurface soil</li><li>• Inhalation of soil particulates created by mechanical disturbances of surface soils</li></ul>                                               |
| Recreational visitors: Hiker                                         | <ul style="list-style-type: none"><li>• Incidental ingestion of and dermal contact with surface soil</li></ul>                                                                                                                                                            |
| Recreational visitors: Camper                                        | <ul style="list-style-type: none"><li>• Incidental ingestion of and dermal contact with surface soil</li><li>• Ingestion of surface water as drinking water</li><li>• Incidental ingestion of and dermal contact with surface water and sediment while swimming</li></ul> |
| Recreational Fisher                                                  | <ul style="list-style-type: none"><li>• Incidental ingestion of and dermal contact with surface soil</li><li>• Incidental ingestion of and dermal contact with surface water and sediment while fishing</li><li>• Ingestion of fish</li></ul>                             |
| Tribal Fisher                                                        | <ul style="list-style-type: none"><li>• Incidental ingestion of and dermal contact with surface soil</li><li>• Incidental ingestion of and dermal contact with surface water and sediment while fishing</li><li>• Ingestion of fish</li></ul>                             |

## What are the Contaminants of Potential Concern at Operable Unit 3?

Contaminants of potential concern (COPCs) are contaminants from Site-related sources that exist in the environment within OU3 at concentration levels which may be of potential health concern to humans.

After comparing Site-specific sample results to established risk based concentrations (i.e., screening values) and identifying compounds present at the Site that are essential nutrients (e.g., vitamins and minerals), EPA retained certain contaminants in soil and groundwater for quantitative evaluation of risks to human receptors. This process resulted in a list of COPCs for OU3, which may be different from the COPCs for OU2 and different from the contaminants of potential ecological concern (COPECs) identified during the baseline ecological risk assessment.



| COPC                     | Soil | Groundwater | Surface Water | Sediment | Fish |
|--------------------------|------|-------------|---------------|----------|------|
| TEQ <sub>(D/F)</sub>     | Yes  | Yes         | No            | No       | Yes  |
| TEQ <sub>(PCB)</sub>     | No   | No          | No            | No       | Yes  |
| TEQ <sub>(D/F/PCB)</sub> | No   | No          | No            | No       | Yes  |
| Total PCBs               | No   | No          | No            | No       | Yes  |
| Aroclor-1260             | No   | Yes         | No            | No       | No   |
| Aluminum                 | Yes  | Yes         | No            | No       | No   |
| Antimony                 | Yes  | Yes         | No            | No       | No   |
| Arsenic                  | Yes  | Yes         | Yes           | Yes      | No   |
| Barium                   | Yes  | Yes         | No            | No       | No   |
| Beryllium                | No   | Yes         | No            | No       | No   |
| Cadmium                  | Yes  | Yes         | No            | No       | No   |
| Chromium                 | Yes  | Yes         | Yes           | Yes      | No   |
| Cobalt                   | Yes  | Yes         | No            | No       | No   |
| Copper                   | No   | Yes         | No            | No       | No   |
| Iron                     | Yes  | Yes         | No            | No       | No   |
| Manganese                | Yes  | Yes         | No            | No       | No   |
| Mercury                  | Yes  | No          | No            | No       | No   |
| Nickel                   | No   | Yes         | No            | No       | No   |
| Thallium                 | Yes  | Yes         | No            | No       | No   |
| Vanadium                 | Yes  | Yes         | No            | No       | No   |
| 1,4-dichlorobenzene      | No   | Yes         | No            | No       | No   |
| Benzene                  | No   | Yes         | No            | No       | No   |
| Chlorobenzene            | No   | Yes         | No            | No       | No   |

TEQ<sub>(D/F)</sub> = toxicity equivalent of dioxins/furans

TEQ<sub>(PCB)</sub> = toxicity equivalent of coplanar polychlorinated biphenyls (PCBs)

TEQ<sub>(D/F/PCB)</sub> = toxicity equivalent of dioxins/furans and coplanar PCBs

It is important to note this COPC selection procedure is intended to be conservative. That is, it is expected some chemicals may be identified as COPCs that are actually of little or no concern to human health based on current EPA guidelines while at the same time ensuring no chemicals of authentic concern will be overlooked. The COPCs, by media, identified for evaluation are summarized in the adjacent table.



*Northern Pike collected in June 2019 as a part of the EPA's fish sampling effort to support the Human Health and Ecological risk assessments.*

### What are the potential health effects to human receptors in Operable Unit 3?

The objective of a toxicity assessment is to identify what adverse health effects a contaminant may cause and at what exposure level (dose) does the adverse health effect (response) occur. This is known as the dose-response relationship. An adverse health effect can be based on either non-cancer or cancer responses. Other factors to consider when evaluating the dose-response relationship are pathway of exposure (i.e., ingestion, dermal, inhalation) and the duration of the exposure (i.e., subchronic, chronic, or lifetime). Therefore, a full description of the toxic effects of a chemical includes a listing of what adverse health effects the chemical may cause, and how the occurrence of these effects depends upon dose, pathway of exposure, and duration of exposure.

Given the complexity of the relationship involving dose, response, pathway of exposure, duration of exposure, and types of receptors for each COPC, this fact sheet does not discuss the potential health effects of the COPCs in detail. These factors and potential health effects are discussed in detail in the OU3 HHRA report. In addition, potential health effects are only relevant if a contaminant is present at a dose that may potentially elicit a response. For more information on the potential health effects of the OU3 COPCs, the reader is encouraged to review the toxicological profiles published by the Agency for Toxic Substances and Disease Registry from the links provided on page 6 of this fact sheet.

*Photographs are from Appendix C of the 2018 Data Summary Report on the Supplemental Soil Sampling in OU3 to Support Risk Assessments. Surface and subsurface sampling efforts were conducted in October 2017. The document is available online at: <https://semspub.epa.gov/work/08/100004945.pdf>.*



---

## What are the potential risks of adverse health effects from the contaminants in Operable Unit 3?

Risk characterization integrates the exposure assessment and the toxicity assessment to estimate non-cancer hazards and cancer risks for the human receptor populations of concern at OU3. Non-cancer hazards and cancer risks calculated during risk characterization are compared to established EPA health guidelines to determine a relative level of concern. Non-cancer hazards are evaluated by comparing an estimated exposure level or dose with a reference dose that is without appreciable risk of adverse health effects. Cancer risk is expressed as the probability that a hypothetical individual could develop cancer over a lifetime as a result of exposure to a potential carcinogen. These risks are based on an unrestricted future land use scenario (i.e., no remedial action or land use controls). The OU3 HHRA report provides the risk characterization results by receptor. This fact sheet provides a summary of the overall findings.

- Unacceptable risks are predicted for hypothetical future residents from exposure to COPCs in OU3 surface soils and Site groundwater. Risks are primarily from the consumption of Site groundwater as drinking water. The primary risk drivers in groundwater are arsenic and manganese, and to a lesser extent cobalt, iron, and chromium. Risk drivers in OU3 surface soils include chromium followed by arsenic, as well as dioxins/furans and manganese in four localized areas associated with the primary settling ponds.
- Risks to hypothetical future commercial/industrial workers from exposure to OU3 soils are within EPA's acceptable risk management range. Unacceptable risks from ingestion of Site groundwater as drinking water are similar to those of future residents.
- Risks to hypothetical future construction workers exposed to OU3 soils are within EPA's acceptable risk management range.
- Risks to current and/or hypothetical future hikers exposed to OU3 surface soils are within EPA's acceptable risk management range.
- Risks to current and/or hypothetical future campers exposed to OU3 surface soils, surface water, and sediment are generally within EPA's acceptable risk management range. One exception is cancer risk from incidental ingestion of surface soil by hypothetical campers in the vicinity of Primary Settling Pond 17.
- Risks to both recreational and tribal fishers exposed to floodplain surface soils, and surface water and sediment in the Clark Fork River are within EPA's acceptable risk management range. Unacceptable risks are predicted for both recreational and tribal fishers from the consumption of fish collected from the Clark Fork River as a significant portion of their diet. Risks from fish consumption are primarily driven by PCBs with dioxins/furans contributing to a lesser extent.



*View from OU3 looking northwest towards berm and trees at the edge of the Clark Fork River (October 2017)*

**For more information, please visit the EPA Smurfit-Stone Mill Site Website**

**[www.epa.gov/superfund/Smurfit-stone](http://www.epa.gov/superfund/Smurfit-stone)**

**or contact one of the following agency representatives:**

**Dana Barnicoat**

EPA Community Involvement Coordinator  
[barnicoat.dana@epa.gov](mailto:barnicoat.dana@epa.gov), 406-560-6261

**Allie Archer**

EPA Site Project Manager  
[archer.allie@epa.gov](mailto:archer.allie@epa.gov), 406-438-6255

**Wil George**

Montana Department of Environmental Quality  
Project Officer  
[william.george@mt.gov](mailto:william.george@mt.gov), 406-444-6420

**Moira Davin**

Montana Department of Environmental Quality  
Public Information Officer  
[moira.davin@mt.gov](mailto:moira.davin@mt.gov), 406-444-6360



**Sources of Additional Information**

**<https://www.epa.gov/risk/human-health-risk-assessment>**

EPA Risk Assessment Guidance documents available online at:

<https://www.epa.gov/risk/risk-assessment-guidance#tab-3>

Agency for Toxic Substances and Disease Registry Toxicological Profiles. Available online at:

<https://www.atsdr.cdc.gov/toxprofiledocs/index.html> and specifically:

Arsenic: <https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=22&tid=3>

Chromium: <https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=62&tid=17>

Cobalt: <https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=373&tid=64>

Dioxin: <https://wwwn.cdc.gov/TSP/ToxFAQs/ToxFAQsDetails.aspx?faqid=363&toxid=63>

Furan: <https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=938&tid=194>

Manganese: <https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=102&tid=23>

PCBs: <https://wwwn.cdc.gov/TSP/ToxFAQs/ToxFAQsDetails.aspx?faqid=140&toxid=26>

EPA Smurfit Stone Website. Smurfit-Stone Mill Frenchtown Missoula, MT Reports and Documents: *Final Human Health Risk Assessment for the Smurfit-Stone/Frenchtown Mill Operable Unit 3 Site Located in Missoula County, Montana* (OU3 HHRA).

Available online at: <https://semspub.epa.gov/work/08/100011496.pdf>