Smurfit-Stone Mill Site
OU2 Human Health Risk Assessment
Fact Sheet

• UNITED STATES ENVIRONMENTAL PROTECTION AGENCY • REGION 8 • DECEMBER 2021

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 2 Site Located in Missoula County, Montana* (OU2 HHRA). The reader is encouraged to read the complete OU2 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 OU2 HHRA, EPA will complete an HHRA for OU3. 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:

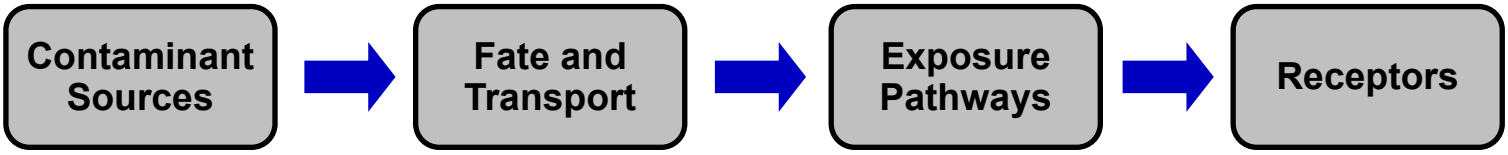
- communicate potential risks to interested parties and the general public;
- help determine areas where limiting exposure to chemical contamination may be necessary;
- inform remedial options; and/or
- develop monitoring plans to confirm risk reduction.

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 2 Human Health Risk Assessment?

The goal of the OU2 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 OU2 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 OU2 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).

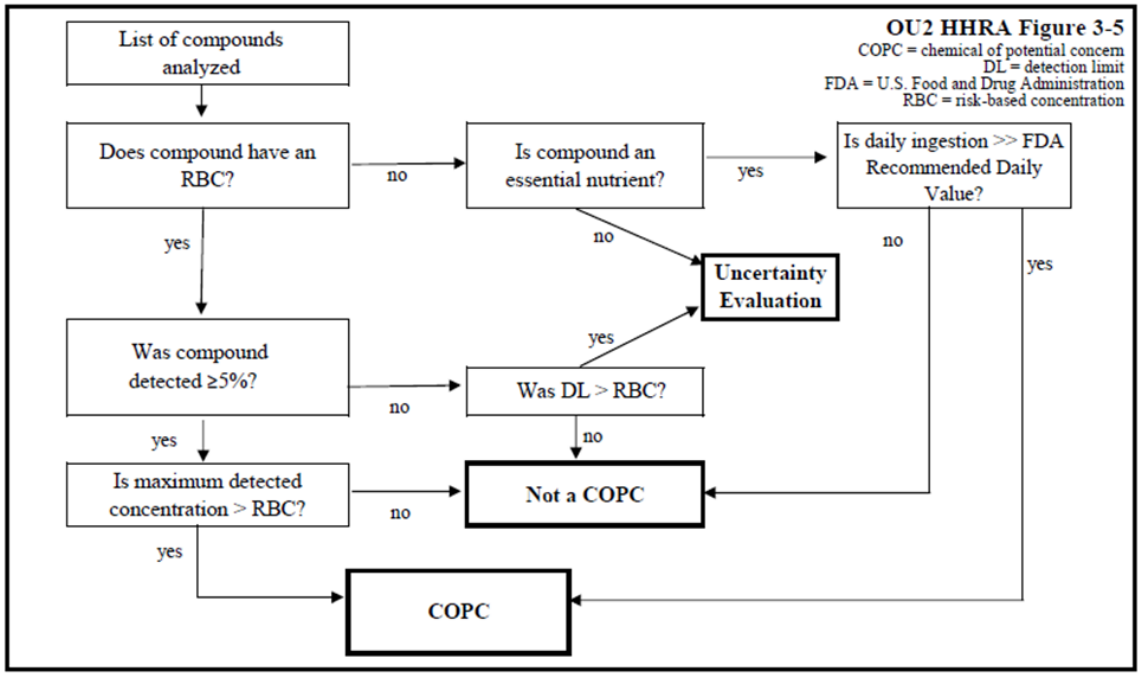
What human receptors are evaluated in the Exposure Assessment?

The OU2 HHRA evaluates the potential for unrestricted future use of OU2; therefore, EPA selected the following receptors and exposure pathways for evaluation.

Exposed Population	Exposure Pathway
Hypothetical future residents (adults and children age 0-6 years)	• Incidental ingestion of surface soil • Dermal contact with surface soil • Ingestion of groundwater as drinking water
Current and hypothetical future commercial/industrial workers	• Incidental ingestion of surface soil • Dermal contact with surface soil • Ingestion of groundwater as drinking water
Hypothetical future construction workers	• Incidental ingestion of surface and subsurface soil • Dermal contact with surface and subsurface soil • Inhalation of soil particulates created by mechanical disturbances of surface soils

What are the Contaminants of Potential Concern at Operable Unit 2?

Contaminants of potential concern (COPCs) are contaminants from Site-related sources that exist in the environment within OU2 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 OU2, which may be different from the COPCs for OU3 and different from the contaminants of potential ecological concern (COPECs) identified during the baseline ecological risk assessment.

Typical groundwater sampling set up.

COPC	Soil	Groundwater
$TEQ_{(D/F)}$	X	X
$TEQ_{(D/F/PCB)}$	X	
Total PCBs	X	
Aroclor-1254	X	
Aroclor-1260		X
Aluminum	X	
Arsenic	X	X
Barium		X
Chromium	X	X
Cobalt	X	X
Copper		X
Iron	X	X
Manganese	X	X
Thallium	X	
Vanadium		X

$TEQ_{(D/F)}$ = toxicity equivalent of dioxins/furans
$TEQ_{(D/F/PCB)}$ = toxicity equivalent of dioxins/furans and coplanar polychlorinated biphenyls (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.

What are the potential health effects to human receptors in Operable Unit 2?

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.

Soil sampling in an upland area of OU2 after excavator removed surface layer of wood chips (October 2017)

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 OU2 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 OU2 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 5 of this fact sheet.

What are the potential risks of adverse health effects from the contaminants in Operable Unit 2?

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 OU2. 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 an individual will develop cancer over a lifetime as a result of exposure to a potential carcinogen. The OU2 HHRA report provides the risk characterization results by receptor. This fact sheet provides a summary of the overall findings.

- Risks to potential human receptors from exposure to COPCs in OU2 soils generally do not exceed EPA's health guidelines. One exception is the ingestion of chromium by a hypothetical future resident in OU2 soils limited to areas near the former chip screening/chip yard and the multi-fuel boiler. The OU2 HHRA conservatively based the toxicity calculations solely on the more toxic form of chromium, hexavalent chromium, thereby potentially overestimating risk. The calculated risk based on hexavalent chromium is still within EPA's risk management range.

- Elevated levels of manganese and to a lesser extent arsenic, cobalt, and iron in groundwater may contribute to risks above a level of concern for hypothetical future residents and commercial/industrial workers who consume Site groundwater as drinking water.

Hypothetical future residents and commercial/industrial workers may be exposed to COPCs in surface soil and groundwater used as drinking water under an unrestricted land use scenario. Combined risks from surface soil and groundwater exceed EPA health guidelines in some, but not all, areas of OU2. These risks are largely driven by exposure to COPCs in groundwater.

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

www.epa.gov/superfund/Smurfit-stone

or contact one of the following agency representatives:

Dana Barnicoat
EPA Community Involvement Coordinator
barnicoat.dana@epa.gov, 406-560-6261

Allie Archer
EPA Site Project Manager
archer.allie@epa.gov, 406-438-6255

Wil George
Montana Department of Environmental Quality Project Officer
william.george@mt.gov, 406-444-6420

Moira Davin
Montana Department of Environmental Quality Public Information Officer
moira.davin@mt.gov, 406-444-6360

Industrial Area now known as OU2 (October 2012)

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

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 2 Site Located in Missoula County, Montana* (OU2 HHRA).
Available online at: https://semspub.epa.gov/work/08/100011173.pdf

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:

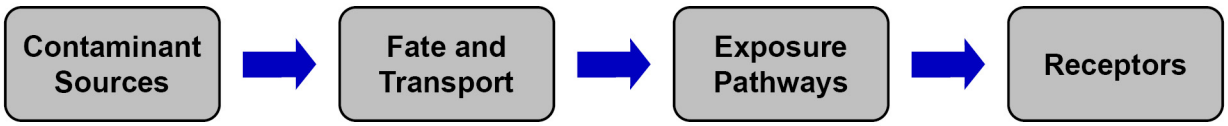
- communicate potential risks to interested parties and the general public;
- help determine areas where limiting exposure to chemical contamination may be necessary;
- inform remedial options; and/or
- develop monitoring plans to confirm risk reduction.

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).

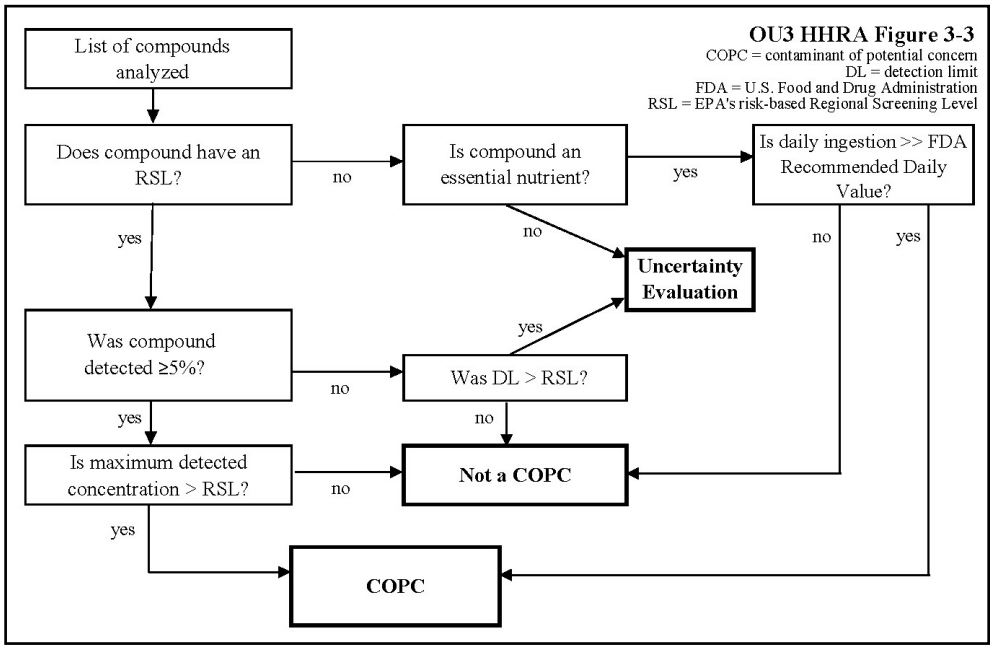
What human receptors are evaluated in the Exposure Assessment?

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)	• Incidental ingestion of and dermal contact with surface soil • Ingestion of groundwater as drinking water
Hypothetical future commercial/ industrial workers	• Incidental ingestion of and dermal contact with surface soil • Ingestion of groundwater as drinking water
Hypothetical future construction workers	• Incidental ingestion of and dermal contact with surface and subsurface soil • Inhalation of soil particulates created by mechanical disturbances of surface soils
Recreational visitors: Hiker	• Incidental ingestion of and dermal contact with surface soil
Recreational visitors: Camper	• Incidental ingestion of and dermal contact with surface soil • Ingestion of surface water as drinking water • Incidental ingestion of and dermal contact with surface water and sediment while swimming
Recreational Fisher	• Incidental ingestion of and dermal contact with surface soil • Incidental ingestion of and dermal contact with surface water and sediment while fishing • Ingestion of fish
Tribal Fisher	• Incidental ingestion of and dermal contact with surface soil • Incidental ingestion of and dermal contact with surface water and sediment while fishing • Ingestion of fish

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
$TEQ_{(D/F)}$	Yes	Yes	No	No	Yes
$TEQ_{(PCB)}$	No	No	No	No	Yes
$TEQ_{(D/F/PCB)}$	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

$TEQ_{(D/F)}$ = toxicity equivalent of dioxins/furans
$TEQ_{(PCB)}$ = toxicity equivalent of coplanar polychlorinated biphenyls (PCBs)
$TEQ_{(D/F/PCB)}$ = 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

or contact one of the following agency representatives:

Dana Barnicoat
EPA Community Involvement Coordinator
barnicoat.dana@epa.gov, 406-560-6261

Allie Archer
EPA Site Project Manager
archer.allie@epa.gov, 406-438-6255

Wil George
Montana Department of Environmental Quality
Project Officer
william.george@mt.gov, 406-444-6420

Moira Davin
Montana Department of Environmental Quality
Public Information Officer
moira.davin@mt.gov, 406-444-6360

2009 aerial imagery of OU3 area
Source: https://msl.mt.gov/geoinfo/data/aerial_photos/

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

Smurfit-Stone Mill Site
Ecological Risk Assessment Fact Sheet

• UNITED STATES ENVIRONMENTAL PROTECTION AGENCY • REGION 8 • OCTOBER 2021

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 ecological risk assessments and a brief summary of the conclusions from the *Baseline Ecological Risk Assessment for Operable Units 2 & 3 of the Smurfit -Stone/Frenchtown Mill Site Located in Missoula County, Montana* (BERA). The reader is encouraged to read the complete BERA which can be found on EPA's website from the link provided on page 4 of this fact sheet.

As the BERA evaluates risks to various types of ecological communities and species; EPA is also conducting human health risk assessments for Operable Units 2 and 3. The human health risk assessments consider risks to human receptors from exposure to contaminated media through complete pathways. An example of this is the ingestion of groundwater by hypothetical future Site workers.

What is an Ecological Risk Assessment?

Ecological risk assessment is the process for evaluating how likely it is that the environment might be impacted as a result of exposure to chemical contamination.

Ecological risk assessments provide information to risk managers to:

- communicate with interested parties and the general public;
- limit exposure to chemical contamination;
- inform remedial options; and/or
- develop monitoring plans to confirm risk reduction.

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

What is the Smurfit Biological Technical Assistance Group?

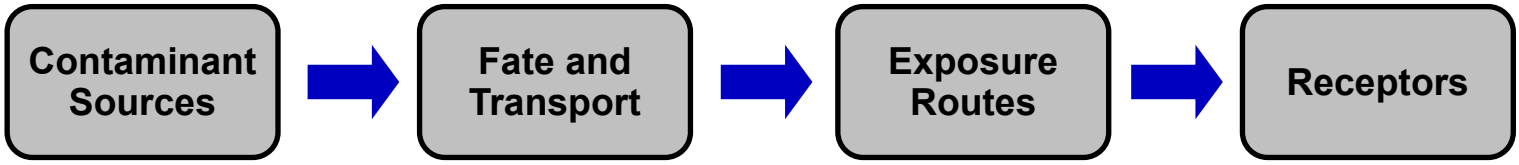
EPA begins an ecological risk assessment by planning the overall approach with dialogue between the risk managers, risk assessors, and other interested parties or stakeholders. EPA formed the Smurfit Stone Biological Technical Assistance Group (BTAG) in 2016. Led by EPA, the BTAG membership includes representatives from the:

- Confederated Salish and Kootenai Tribes
- Kalispel Tribe
- Missoula County Water Quality District
- Montana Department of Environmental Quality
- Montana Department of Fish, Wildlife and Parks
- Montana Natural Resource Damage Program
- Potentially Responsible Parties
- US Bureau of Land Management
- US Fish and Wildlife Service
- US Forest Service

EPA consistently engaged the BTAG in the BERA process to discuss sampling methods and locations, data gaps, and analytical results. The BTAG provided recommendations on the types of plants and animals (both aquatic and terrestrial, known as receptors) that should be assessed at the Site. However, this list of receptors was longer than necessary for performing the BERA. Therefore, the BTAG identified a subset of species which are representative and conservatively protective of the different taxonomic groups and feeding guilds and include the wide range of ecological receptors potentially impacted by the Site. These surrogate receptors are evaluated in the BERA.

What is the goal of the Smurfit Baseline Ecological Risk Assessment?

The risk management goal at the Site is to ensure adequate protection of ecological receptors within the Site from adverse effects of exposure to Site-related releases of hazardous substances. The focus is on ensuring sustainability of the local population, rather than on protection of every individual member of a population. The diagram below shows the general pathway from contaminant sources to receptors considered during the BERA process:



What ecological receptors were evaluated in the Smurfit Baseline Ecological Risk Assessment?

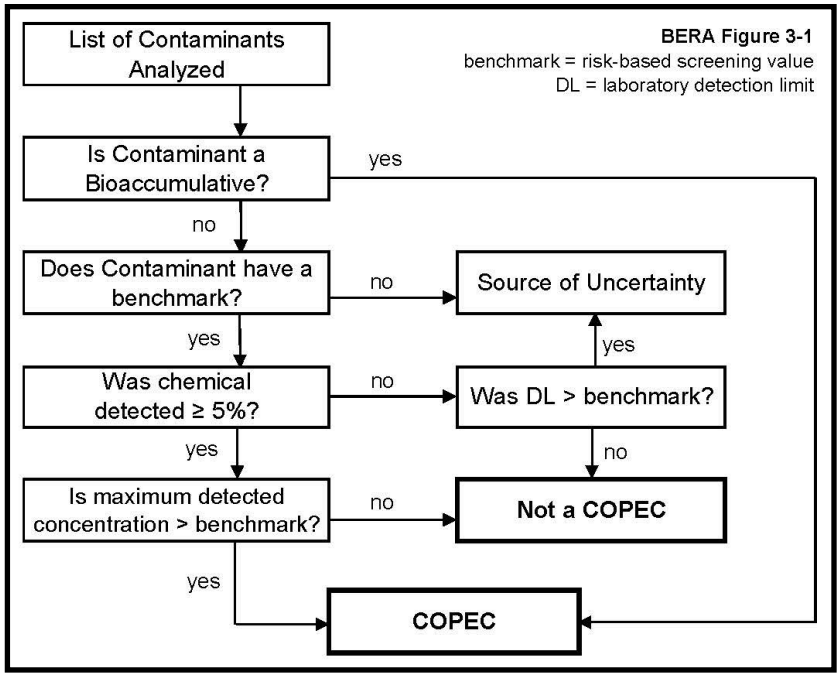
The BERA assesses ecological community-level risks within the study area for aquatic receptors (fish, invertebrates, amphibians, aquatic plants), terrestrial plants and soil organisms, and wildlife (birds, mammals). While there are many more wildlife species known to be present, the BTAG identified the following receptors as surrogates of the taxonomic groups and feeding guilds expected to occur at the Site. Risks to wildlife are based on the nineteen surrogate species tabulated below.

Feeding Guild	SURROGATE WILDLIFE SPECIES	
	Avian	Mammalian
Terrestrial Insectivore	American Robin; Gray Catbird	Vagrant Shrew
Aerial Insectivore	Tree Swallow (a)	Big Brown Bat
Aquatic Insectivore	American Dipper (a)	(b)
Herbivore	Blue Grouse	White-tail Deer and Montane Vole
Carnivore	American Kestrel	Red Fox and American Mink (a)
Piscivore	Belted Kingfisher (a) and Osprey (a)	River Otter (a)
Omnivore	Mallard (a), Northern Flicker, and Clark's Nutcracker	Deer Mouse

a. This receptor feeds on aquatic prey, such as aquatic invertebrates and fish.
b. This class of receptor is not expected at the Site.

What are the Contaminants of Potential Ecological Concern at Smurfit?

After comparing Site-specific sample concentrations to established risk-based screening values and identifying contaminants present at the Site that bioaccumulate, EPA retained certain contaminants for quantitative evaluation of risks to fish, plants, invertebrates and wildlife in surface waters, sediments, pond pore water, and/or surface soils. This process resulted in a list of contaminants of potential ecological concern (COPECs) for the Site, which may be unique from the contaminants of potential concern (COPCs) developed during the human health risk assessments.



The collective list of COPECs include aluminum, antimony, arsenic, barium, cadmium, chromium, copper, dioxin/furan toxicity equivalence (TEQ), lead, manganese, mercury, methyl mercury, nickel, polychlorinated biphenyls (PCBs), selenium, silver, thallium, vanadium, and zinc.

What are the potential risks to ecological receptors at Smurfit?

The BERA provides definitions of the risk categories “minimal,” “low,” “moderate,” and “high.” Uncertainty in risk estimates is inherent in any risk assessment, regardless of the quality of field studies or data. The BERA details the uncertainty associated with these conclusions.

Risks to aquatic receptors, such as fish, are minimal in O’Keefe and Lavelle Creek and low in the Clark Fork River. For example, manganese is of primary concern in the Clark Fork River and possibly poses a risk to aquatic receptors in on-Site ponds. Mercury contamination in OU2 and OU3 soils may be causing adverse effects in terrestrial plants and soil invertebrates. Terrestrial receptors may also be adversely affected by aluminum in soils. Barium, copper, selenium, and zinc all pose low risks to terrestrial receptors.

Contamination may travel up the food chain. To that end, the BTAG identified surrogate species of wildlife used for risk evaluation; species-specific risks were not calculated.

- Risks to large home range receptors, like bats and foxes, are low. For example, bats may be at low risk from the ingestion of dioxins/furans in terrestrial invertebrates.
- Risks to medium home range receptors, like grouse and deer, are low to moderate. For example, exposures to mercury as inorganic mercury in soils and as methyl mercury in prey items may result in adverse effects.
- Risks to small home range receptors, like mice and robins, are low to high. For example, exposures to mercury in their diet (like plants and/or terrestrial invertebrates) may result in adverse effects.

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

www.epa.gov/superfund/Smurfit-stone

or contact one of the following agency representatives:

Dana Barnicoat
EPA Community Involvement Coordinator
barnicoat.dana@epa.gov, 406-560-6261

Allie Archer
EPA Site Project Manager
archer.allie@epa.gov, 406-438-6255

Wil George
Montana Department of Environmental Quality Project Officer
william.george@mt.gov, 406-444-6420

Moira Davin
Montana Department of Environmental Quality Public Relations Specialist
moira.davin@mt.gov, 406-444-6360

Page 3 photograph:
Collection of Benthic Macroinvertebrates using dip nets in O'Keefe Creek (August 2018)

Left photograph:
Collection of sediment and Benthic Macroinvertebrates using an Ekman grab sampler from a holding pond (summer 2018)

Right photograph:
Electrofishing and dip netting for Longnose Dace in the Clark Fork River (summer 2018)

Sources of Additional Information

https://www.epa.gov/risk/ecological-risk-assessment

EPA Publications, ECO Update Bulletin Series. Intermittent Bulletins.
Available online series at: https://www.epa.gov/risk/eco-update-bulletin-series

Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments - Interim Final.
Available online at: https://www.epa.gov/risk/ecological-risk-assessment-guidance-superfund-process-designing-and-conducting-ecological-risk

EPA Smurfit Stone Website. Smurfit-Stone Mill Frenchtown Missoula, MT Reports and Documents: Baseline Ecological Risk Assessment for Operable Units 2 & 3 of the Smurfit-Stone/Frenchtown Mill Site Located in Missoula County, Montana (BERA).
Available online at: https://semspub.epa.gov/work/08/100010969.pdf

Smurfit Stone Mill Site
Air Deposition Fact Sheet

• UNITED STATES ENVIRONMENTAL PROTECTION AGENCY • REGION 8 • MARCH 2021

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. EPA proposed the site as a national priority under EPA's Superfund program in 2013. The Site is currently organized into three operable units (OUs):

- OU1 covers approximately 1,200 acres; largely agricultural lands.
- OU2 is approximately 255 acres and encompasses 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.

The remedial investigation is ongoing to characterize the contamination; assess potential risks to human health and the environment; and inform what clean up actions are required. As part of the remedial investigation and based on both the operational history of the site as well as community testimony, EPA evaluated site soils for contaminants possibly deposited through the air when the mill was operating.

As outlined below, EPA believes there is sufficient data to indicate that airborne deposition of contaminants is not a concern for surface soils at this Site.

How EPA investigated for aerial deposition impacts:

- In 2015, 101 on-site surface soil samples were collected and analyzed for contaminants of potential concern (COPCs) to evaluate aerial deposition.
- Surface soil samples were collected from a depth of 0 to 2 inches.

Potential Environmental Concern	Approach
Airborne deposition of contaminants of potential concern (COPCs) to surface soils from past industrial area emissions and mobilization of dust from the wastewater treatment system.	- An EPA-approved statistical approach was used to identify the number of sample locations necessary to characterize mean constituent concentrations in surface soils with 95% confidence and a maximum error of 20%. Some composite samples were collected along a transect line based on a prevailing windrow. - Two samples were collected at each location; one from 0-2 inches and one from 5-7 inches below the surface. Soil samples were analyzed for dioxins, metals and Polycyclic Aromatic Hydrocarbons (PAHs).
	- Collected 78 surface soil samples to investigate airborne deposition of COPCs within OU1. - Collected 23 surface soil samples in OU2 and in addition collected 4 in the area of transformer storage to investigate for presence of Polychlorinated Biphenyls (PCB s), collected 2 surface soil samples from the Multi-Fuel Boiler scrubber loadout area to investigate for the presence of COPCs related to boiler emissions.

- The locations of surface soil samples were determined based on predominant wind patterns in the Frenchtown area.
- OU1 surface soil samples analyzed reported dioxin levels below the background number of 3.7 ng/kg established in the Montana Department of Environmental Quality (DEQ) Dioxin Background Report (DEQ, 2011).
- Arsenic and manganese surface soil samples from OU1 are also low and below any soil screening levels. The new power boiler that came on-line in the early 1980s was operated in compliance with emission limits and other permit requirements established by DEQ throughout its operational lifetime.
- Testing of the boiler's emissions in 2008 demonstrated that it was in compliance with both current and proposed emission standards for dioxins and other COPCs without any additional controls.

EPA has concluded that the potential impacts to the surrounding environment from past emissions from the Mill are very low for the following reasons:

⇒ Extensive sampling was conducted at the Mill in 2015 to evaluate whether airborne deposition from the Mill impacted the surrounding environment. Sample locations were deliberately placed along the prevailing wind pathways from the boiler stacks. *No pollutants were detected at concentrations of concern to human health.*

⇒ Bleach plant effluent is known to contain detectable dioxins. Primary sludge containing bleach plant effluent was burned in the boiler between February 1995 and June of 1999. During this time, the Mill was using an elemental chlorine-free bleaching process that results in minimal dioxin formation. As part of the permit review and approval process required before the Mill could burn the dewatered primary sludge from the wastewater treatment system, DEQ concluded that because there would be no increase in dioxin emissions at the Mill from this practice, "…this permitting action would not result in an adverse impact to human health or the environment" (MDEQ 1995).

⇒ In 2009, as part of the development of the EPA rules known as the Industrial, Commercial and Institutional Boilers and Process Heaters: National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Major Sources (Boiler MACT), the Mill conducted emissions testing to determine the amount of dioxins that were being emitted from the Multi-fuel Boiler. The results of that testing indicated that the

---

References

Bighorn, (2009). Bighorn Environmental Air Quality. Smurfit-Stone Container Enterprises, Inc. Multi Fuel Boiler, EPA Section 114 Information Collection Request Test Report, Missoula, Montana Containerboard Mill, June 29-July 1, 2009. Springfield, OR.

MDEQ, (1995). Montana Department of Environmental Quality. Permit Determination for Stone Container Permit #2589 -05. Helena, MT.

MDEQ, (2011). Montana Department of Environmental Quality. Montana Dioxin Background Investigation Report. Helena, MT.

Urban, J.D. et. Al, (2013). A Review of Background Dioxin concentrations in Urban/Suburban and Rural Soils across the United States: Implications for Site Assessments and the Establishment of Soil Cleanup Levels. Science of the Total Environment. www.elsevier.com

boiler emissions would comply with the proposed rule's standards for dioxin emissions without any modifications or changes to air pollution control equipment or fuels (Bighorn 2009). Dioxin emission standards were never established in the final rule.

⇒ Available data (MDEQ 2011) indicate that dioxins and furans in soils of Missoula are typical of rural areas elsewhere in the United States, and well below urban areas elsewhere in the United States (Urban et al. 2013).

Summary of Risk Characterizations:

OU1 Human Health and Ecological Risk Assessments

EPA completed risk assessments for OU1 in 2017 with the objective to identify any impacts from airborne deposition of COPCs to surface soils. No elevated levels of COPCs in surface soils, including dioxin, were found, and ***EPA determined OU1 does not pose a potential human health concern. Ecological risk in OU1 is limited to selenium in soils, which poses a low risk to mammals and plants.***

OU2 draft Human Health Risk Assessment (HHRA)

As described in the draft HHRA, risks to potential human receptors from exposures to OU2 soil do not exceed USEPA's health guidelines. Total risks (exposure to soil and groundwater) are driven by exposures to groundwater; risks from exposures to OU2 soils do not contribute significantly to total risk.

OU3 draft Human Health Risk Assessment

Risks to Hypothetical Future Residents

As described in the draft HHRA, risks to potential future residential receptors from exposures to OU3 surface soils within the upland areas do not exceed USEPA's health guidelines anywhere except within the area of former settling pond 17 (grid 74).

Risks to Hypothetical Future Workers

Risks to potential commercial/industrial and/or construction workers from exposures to OU3 surface soils do not exceed USEPA's health guidelines

Risks to Tribal Fishers and Recreational Visitors

Risks to recreational visitors (hikers, campers or fishers) from exposures to OU3 surface soils do not exceed USEPA's health guidelines.

OU2 & OU3 draft Baseline Ecological Risk Assessment

Terrestrial Setting

Metal contamination in Site surface soils may be causing adverse effects to plants and soil invertebrates.

Aluminum concentrations in Site surface soils may be contributing to adverse effects in wildlife.

Risks to large home range wildlife receptors are low (excluding risks associated with ingestion of aluminum).

Risks to medium home range wildlife receptors are low to moderate. Exposures to mercury as inorganic mercury in surface soils and as methyl mercury in prey items may result in adverse effects.

For more information, feel free to visit the EPA Smurfit-Stone Mill Site Website at:

www.epa.gov/superfund/Smurfit-stone

Or contact one of the following agency representatives:

Jennifer Chergo, EPA Public Affairs Specialist, chergo.jennifer@epa.gov, 303-548-6998

Allie Archer, EPA Site Project Manager, archer.allie@epa.gov, 406– 438-6255

Keith Large, Montana Department of Environmental Quality Project Officer, klarge@mt.gov, 406– 444-6569

Moira Davin, Public Relations Specialist, Montana Department of Environmental Quality, moira.davin@mt.gov , 406-444-6360

Smurfit-Stone Mill Site Dioxins/Furans Fact Sheet

• UNITED STATES ENVIRONMENTAL PROTECTION AGENCY • REGION 8 • JUNE 2021

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.

What are dioxins and furans?

Dioxins and furans are the abbreviated names for a specific family of environmental pollutants consisting of chlorine atoms surrounding a pair of organic carbon rings. Depending on the chemical reaction that creates the dioxin or furan, the resulting compound can have a variety of structures varying in the position and number of chlorine atoms. These similar, yet distinct chemical compounds are called congeners. There are 75 possible dioxin congeners and 135 possible furan congeners.

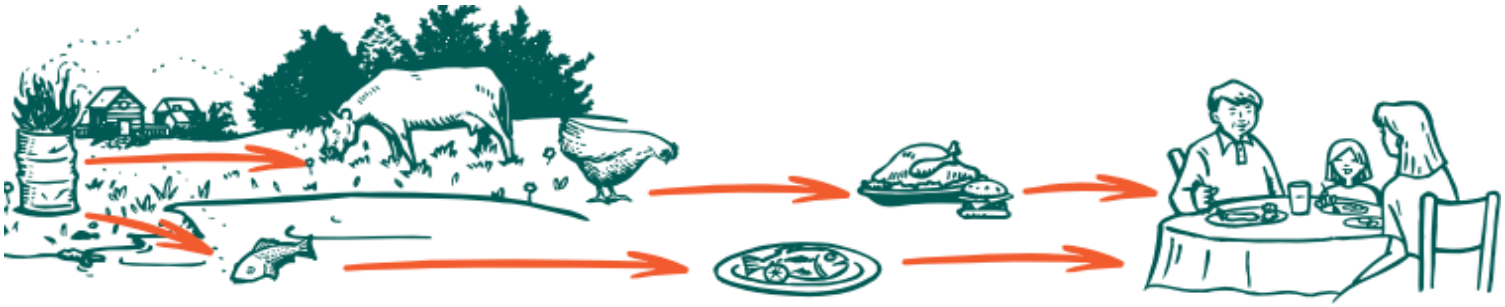
Where do dioxins and furans come from?

Dioxins and furans are formed when organic material is burned at temperatures less than 400ºC such as building fires, forest fires, domestic fireplaces, backyard burning of household waste, and poorly operated incinerators, as well as from chemical reactions associated with industrial processes such as smelting, bleaching pulp to make paper products, and the manufacturing of herbicides and pesticides. Dioxins and furans are generally transported through the air and deposited on surfaces; they are found world-wide in air, soil, sediment, and water.

The best way to protect yourself and your family from the health effects of all toxins, including dioxins and furans, is to avoid the most likely exposures.

How are we exposed to dioxins and furans and what are their health effects?

Dioxins and furans are highly insoluble in water, but readily bind to organic matter and fatty tissues. As a result, dioxins and furans tend to accumulate in the food chain and are found in the tissues of organisms throughout the world. Because dioxins and furans accumulate in the tissues of organisms, exposures are primarily through the ingestion of food, especially fats derived from animals including meat, dairy, fish, and human breast milk. Due to their insoluble nature and tendency to bind to organic carbon, dioxins and furans are most likely found in environmental media, such as ash, soil, and sediment high in organic material. Dioxins and furans can be mobile in surface water systems and to a lesser extent, in groundwater systems when bound to suspended sediments or dissolved organic material. Dioxins and furans may cause a range of non-cancer and/or cancer effects, including changes in hormone levels and skin disease.

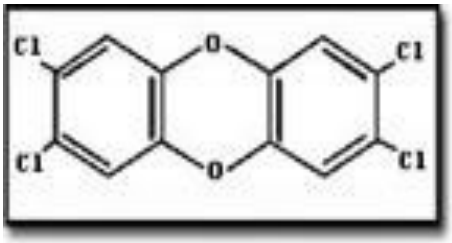


How are concentrations of dioxins and furans measured?

The toxicity level of the individual dioxin or furan compound is directly related to the position of the chlorine atoms. Although there are 210 possible dioxin and furan congeners, only 17 are considered highly toxic. The most studied and most toxic of all dioxins is 2,3,7,8-tetrachlorodibenzo-p-dioxin. To facilitate risk assessment, the World Health Organization's method for summarizing the total toxicity translates the individual toxicities to a common scale using toxic equivalent factors (TEFs) for the 17 dioxin and furan compounds. Concentrations of those 17 compounds are multiplied by their individual TEFs and then added together, resulting in a total toxicity equivalency (TEQ) value. EPA calculates TEQs from site-specific sample results, which are generated from detected and non-detected congener results. EPA uses the TEQ values, and not the concentrations of individual dioxin and furan congeners, when evaluating site information and establishing cleanup standards.

TEQ values can be reported in a variety of units. In this fact sheet, TEQ values for dioxins and furans in environmental media are reported as picograms per liter (pg/L) or picograms per gram (pg/g). A 'pico' is one part per trillion or 0.000000000001 of a unit. One 'pico' is equivalent to one second in roughly 31,500 years, one square inch in 250 square miles, or one drop of water in 20 Olympic size swimming pools.

2,3,7,8-tetrachlorodibenzo-p-dioxin



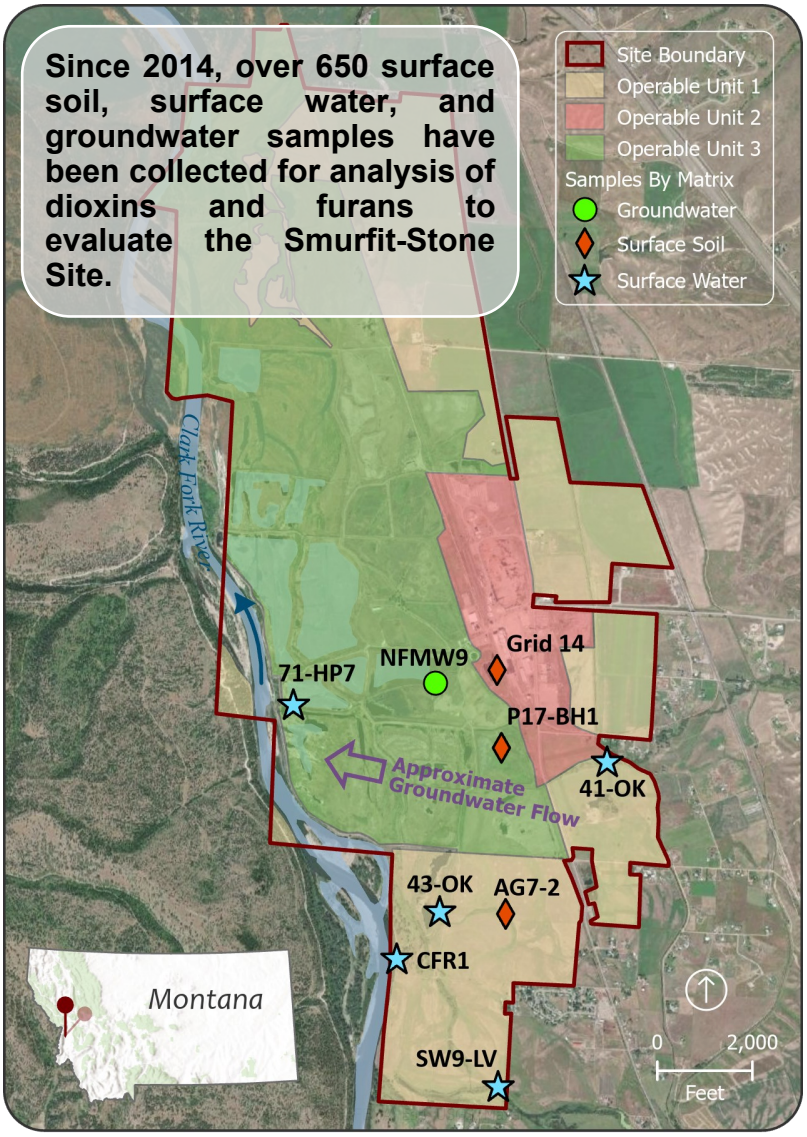
For further information on the calculation and reporting of TEQ values, visit the EPA or World Health Organization websites on dioxins and furans listed on page 4 of this fact sheet.

What do we know about dioxins and furans at Smurfit?

The dioxins and furans present at the Site were not made or used for any specific purpose. Historical mill operations may have formed and waste management may have distributed dioxins and furans at the Site, for example, the chemical reaction of chlorine (bleach) with paper fiber during bleaching.

To evaluate the presence of dioxins and furans across and adjacent to the Site, the responsible parties have collected over 650 surface soil, surface water, and groundwater samples for analysis of dioxins and furans since 2014. The maximum TEQ values included in this fact sheet are based on the results of these samples. The table and figure identify the maximum values of TEQ in soil, groundwater, and surface water within the boundaries of the Site. The same table compares the maximum TEQ values at the Site to final cleanup standards established in Records of Decision from similar state and federal Superfund sites in Montana. EPA considers site-specific factors such as the amount of dioxins and furans present, land use types (such as recreational, industrial, residential), and cultural or subsistence practices when making risk management decisions. The cleanup standards presented from the other Montana sites are based on risks to human health and represent the range in values for different land use types applicable to those sites. EPA will address risks to ecological receptors in a separate fact sheet. Questions regarding the data in the table below, including database query parameters and any other questions on how the Site data is presented, can be directed to the EPA Site Project Manager identified on the last page. The references for the Maximum TEQ table are provided on the next page.

Sample Locations of Maximum TEQ Results



Maximum TEQ values from Smurfit-Stone and TEQ cleanup standards from other Montana sites

Matrices	Smurfit-Stone Mill Site			Examples of Cleanup Criteria at Other Montana Sites [b c d]
	General Location	Sample ID (on figure)	Maximum TEQ value [a]	
Surface Soil (pg/g)	OU1	AG7-2	1.24	30 - 1,000
	OU2	Grid 14	25.29	
	OU3	P17-BH1	756.48 *	
Groundwater (pg/L)	Site-wide	NFMW9	16.41	2 - 30
Surface Water (pg/L)	Clark Fork River	CFR1	0.44	10
	LaValle Creek	SW9-LV	0.42	
	O'Keefe Creek	41-OK and 43-OK	0.39	
	Ponds	71-HP7	0.62	

**The next highest TEQ value in a surface soil sample from OU3 is 194.58 pg/g from the same area (Pond 17).*

Maximum TEQ Table References

a. EPA. 2021. Smurfit-Stone Mill Site Scribe Database Export. The TEQ values presented in this table are a result of calculations using one-half of the laboratory detection limit to represent results where the congener was not detected in the sample.

b. Montana Department of Environmental Quality. 2019. Draft Final Explanation of Significant Differences. Montana Pole and Treating Plant Site. Available online at: https://deq.mt.gov/Land/fedsuperfund/mtpole

c. Montana Department of Health & Environmental Sciences. 1992. Record of Decision, Idaho Pole National Priorities List Site. Bozeman, Montana. Available online at: https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0800379

d. Montana Department of Environmental Quality. 2015. Record of Decision Missoula White Pine Sash Facility Missoula, Montana. Available online at: https://deq.mt.gov/Land/statesuperfund/missoulawhitepinesash

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

www.epa.gov/superfund/Smurfit-stone

or contact one of the following agency representatives:

Dana Barnicoat
EPA Community Involvement Coordinator
barnicoat.dana@epa.gov, 406-560-6261

Allie Archer
EPA Site Project Manager
archer.allie@epa.gov, 406-438-6255

Keith Large
Montana Department of Environmental Quality Project Officer
klarge@mt.gov, 406-444-6569

Moira Davin
Montana Department of Environmental Quality Public Relations Specialist
moira.davin@mt.gov, 406-444-6360

Sources of Additional Information

https://www.epa.gov/dioxin/learn-about-dioxin

EPA. Priority PBTs: Dioxins and Furans Fact Sheet. Washington, D.C. Available online at: https://archive.epa.gov/epawaste/hazard/wastemin/web/pdf/dioxfura.pdf

EPA. Reducing Backyard Burning in Indian Country. Washington, D.C. Available online at: http://www7.nau.edu/itep/main/HazSubMap/docs/Burning/EPAReducingBackyardBurningIndianCountry.pdf

EPA. Dioxin and Dioxin-Like Compounds Toxic Equivalency Information. Available online at: https://www.epa.gov/toxics-release-inventory-tri-program/dioxin-and-dioxin-compounds-toxic-equivalency-information#rule-history

World Health Organization. 2021. Online Fact Sheet: Available online at: https://www.who.int/news-room/fact-sheets/detail/dioxins-and-their-effects-on-human-health

World Health Organization. 2010. Exposure to Dioxin and Dioxin-like substances: A Major Public Health Concern. Available online at: https://cdn.who.int/media/docs/default-source/food-safety/dioxins.pdf?sfvrsn=4bcd5f4d_1

Montana Department of Environmental Quality. 2019. Montana Numeric Water Quality Standards. Available online at: https://deq.mt.gov/water/Surfacewater/standards

EPA. 2021. Maximum Contaminant Levels. Available online at: https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations

Smurfit-Stone Mill Site
Polychlorinated Biphenyls (PCBs) Fact Sheet

• UNITED STATES ENVIRONMENTAL PROTECTION AGENCY • REGION 8 • AUGUST 2021

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.

What are PCBs?

Polychlorinated biphenyls, commonly known as PCBs, are mixtures of up to 209 individual chlorinated compounds, referred to as congeners. Depending how the PCB is created, the resulting congeners have varying positions and numbers of chlorine atoms. PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. While PCBs were manufactured and sold under many names, the most common was the Aroclor numeric series (e.g., Aroclor 1260 and Aroclor 1254).

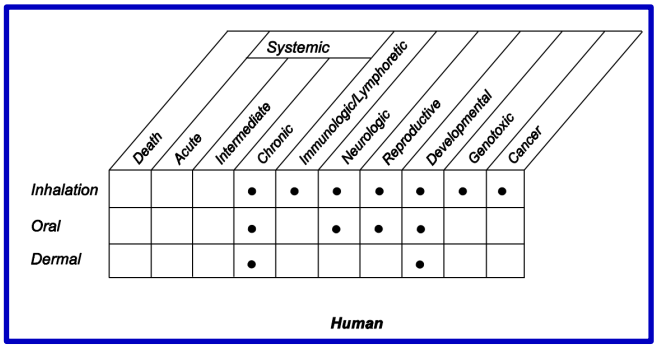
In 1979, the United States banned the manufacture of PCBs based on mounting evidence that they were toxic to humans and wildlife.

Where do PCBs come from?

There are no known natural sources of PCBs. PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they are stable at high temperatures, don't readily break down in use, and are good insulators. Products made before 1979 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and old microscope and hydraulic oils. PCBs enter the air, water, and soil during their manufacture, use, and improper disposal; such as accidental spills and leaks during transport, and leaks from the product or equipment where PCBs are used. PCBs remain in the environment for a very long time. PCBs have been found in at least 500 Superfund sites in the U.S.

How are we exposed to PCBs and what are their health effects?

Existing Information on Health Effects of PCBs



Generally, human exposures to PCBs can occur from direct contact with PCB-containing products, consumption of contaminated food sources, breathing air or having contact with soil or sediment at or near contaminated sites, and drinking impacted water. In the workplace or at home, people may come in contact with PCB-containing products during repair and maintenance of old fluorescent lighting fixtures and electrical devices/appliances, and especially transformers. PCBs can travel long distances in the air and be deposited in areas far away from where they were released. PCBs are taken up by wildlife, small aquatic organisms, and fish. PCBs do not easily break down and can bioaccumulate in the fatty tissues of fish and mammals. People who eat subsistence-caught or sport-caught fish consume more fish than the overall U.S. population and may have increased PCB exposures. PCBs bind strongly to soil, so although plants may uptake PCBs, the amount is relatively small compared to the amount in soil. In water, a small amount of PCBs may remain dissolved, but most stick to organic particles and bottom sediments.

PCBs are one of the most widely studied environmental contaminants. Non-cancer health effects associated with exposure to PCBs include acne-like skin conditions in adults and neurobehavioral and immunological changes in children. Studies in animals provide conclusive evidence that PCBs cause cancer. Studies in humans raise further concerns regarding the potential carcinogenicity of PCBs. Taken together, the data strongly suggest that PCBs are probable human carcinogens.

Since health impacts from PCBs were first recognized, public health agencies and researchers began monitoring PCB exposure in various target populations (industry workers, indigenous peoples, breastfed babies, and other groups). Subsequent studies indicate that the PCB levels detected in these and other groups have decreased over time due to reduced exposures to PCBs in their food sources, workplaces, and environments.

What are the general regulations and recommendations made by the government to protect human health?

EPA has set a limit of 0.0005 milligrams of PCBs per liter of drinking water (0.0005 mg/L). Discharges, spills or accidental releases of 1 pound or more of PCBs into the environment must be reported to EPA. The Food and Drug Administration (FDA) requires that infant foods, eggs, milk and other dairy products, fish, shellfish, poultry, and red meat contain no more than 0.2 to 3.0 mg/L or mg/ kilogram (kg) PCBs in food.

Many states, including Montana, also have established fish and wildlife consumption advisories for PCBs and other contaminants. EPA does not issue these consumption advisories.

EPA considers site-specific factors such as the concentration and mixtures of PCBs detected, land use types (industrial, residential, recreational), and regionally prevalent cultural or subsistence practices when making risk management decisions.

EPA also has regional screening levels (RSLs) for PCBs that aid in their risk-based decision making for contaminated sites. For PCBs, these are specific to the type(s) of PCB mixture present and the land use, for examples:

Residential Direct-Contact RSLs for surface soil (0 to 2 feet below ground surface [bgs]):

- 0.240 mg/kg for Aroclor 1254
- 0.240 mg/kg for Aroclor 1260

Industrial Direct-Contact RSLs for subsurface soils (deeper than 2 feet bgs):

- 0.970 mg/kg for Aroclor 1254
- 0.990 mg/kg for Aroclor 1260

Visit the EPA websites linked on page 4 of this fact sheet for more information on the various EPA Criteria and RSLs for PCBs and other chemicals.

What do we know about PCBs at Smurfit?

During the remedial investigation (RI), approximately 280 samples were collected from various media across OU1, OU2, and OU3, and analyzed for PCBs. None of the samples collected from OU1 or OU3 exceeded the EPA RSLs in soil or the drinking water-related criteria in groundwater or surface water samples.

OU2 includes two areas where sampling results identified PCBs in soil. The contamination was associated with the **High Density Pulp Tank (HDPT**) and **Transformer Storage Building (TSB)** foundations. Storage Building (TSB) foundations.

During the December 2015 RI sampling event, 33 surface soil samples were collected and analyzed for PCBs throughout the OU2 area. Analytical results indicated that a commercial PCB mixture, Aroclor 1260, was detected in three samples above the Industrial and Residential Direct-Contact RSLs (see page 2).

HDPT Foundation – Two samples were collected at depths of 12 and 24 inches, and exhibited Aroclor 1260 concentrations of 1.440 mg/kg and 1.740 mg/kg, respectively.

TSB Foundation – The composite sample collected from depths of 0 to 2 inches had an Aroclor 1260 concentration of 7.490 mg/kg.

The HDPT and TSB areas had samples where concentrations exceeded the Industrial and Residential Direct-Contact RSLs, prompting voluntary response actions, which were successfully completed in 2018. The response actions included additional sampling and analyses of PCBs in soil to further determine the extent of contamination, and the removal and off-site disposal of PCB-impacted soil with concentrations that exceeded the RSLs.

Samples collected from the sidewalls and bottoms of the excavations at the HDPT and TSB foundations confirmed removal of PCB-impacted soils.

Excavated PCB-impacted soils were disposed of at the Missoula Landfill and clean material was used to backfill the excavations (see page 4 photographs).

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

www.epa.gov/superfund/Smurfit-stone

or contact one of the following agency representatives:

Dana Barnicoat
EPA Community Involvement Coordinator
barnicoat.dana@epa.gov, 406-560-6261

Allie Archer
EPA Site Project Manager
archer.allie@epa.gov, 406-438-6255

Keith Large
Montana Department of Environmental Quality Project Officer
klarge@mt.gov, 406-444-6569

Moira Davin
Montana Department of Environmental Quality Public Relations Specialist
moira.davin@mt.gov, 406-444-6360

EPA Region 8 PCB Information Center: (800) 227-8917

Clean material was used to backfill the excavations at the HDPT and TSB areas.

Photographs from January 25, 2018.

Sources of Additional Information

https://www.epa.gov/pcbs/learn-about-polychlorinated-biphenyls-pcbs

Agency for Toxic Substances and Disease Registry (ATSDR) Division of Toxicology and Human Health Sciences. ToxFAQs PCBs. Available online at: https://www.atsdr.cdc.gov/toxfaqs/tfacts17.pdf

ATSDR Division of Toxicology and Human Health Sciences. Toxic Substances Portal website. Available online at: https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=142&tid=26

ATSDR Division of Toxicology and Human Health Services. 2000. Toxicological Profile for PCBs. Available online at: https:www.atsdr.cdc.gov/toxprofiles/tp17.pdf

EPA. 2003. [Archived] PCB Fact Sheet: Polychlorinated Biphenyls (PCBs). Available online at: https://archive.epa.gov/epawaste/hazard/wastemin/web/pdf/pcb-fs.pdf

EPA. 2017. Smurfit-Stone Mill Frenchtown Missoula, MT Reports and Documents: HUMAN HEALTH RISK ASSESSMENT FOR THE SMURFIT-STONE/FRENCHTOWN MILL OPERABLE UNIT 1. Available online at: https://semspub.epa.gov/work/08/1883251.pdf

EPA. 2020. Smurfit-Stone Mill Frenchtown Missoula, MT Reports and Documents: DRAFT HUMAN HEALTH RISK ASSESSMENT FOR THE SMURFIT-STONE/FRENCHTOWN MILL OPERABLE UNIT 2. Available online at: https://semspub.epa.gov/work/08/100009223.pdf

EPA. 2020. Smurfit-Stone Mill Frenchtown Missoula, MT Reports and Documents: DRAFT HUMAN HEALTH RISK ASSESSMENT FOR THE SMURFIT-STONE/FRENCHTOWN MILL OPERABLE UNIT 3. Available online at: https://semspub.epa.gov/work/08/100009224.pdf

EPA. 2021. Maximum Contaminant Levels. Available online at: https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations

NewFields. 2018. Version 2 Final Construction Completion Report PCB-Impacted Soil in Operable Unit 2 (OU2). Smurfit-Stone/Frenchtown Mill. Available online at: https://semspub.epa.gov/work/08/100004857.pdf