SUPERFUND

PROPOSED PLAN

Chlor-Alkali Facility Superfund Site Berlin, NH

U.S. EPA | HAZARDOUS WASTE PROGRAM AT EPA NEW ENGLAND

THE SUPERFUND PROGRAM protects human health and the environment by locating, investigating, and cleaning up abandoned hazardous waste sites and engaging communities throughout the process. Many of these sites are complex and need long-term cleanup actions. Those responsible for contamination are held liable for cleanup costs. EPA strives to return previously contaminated land and ground-water to productive use.

CLEANUP PROPOSAL SNAPSHOT

EPA is issuing this Proposed Plan which evaluates remedial alternatives for addressing contamination at the former Chlor Alkali facility in Berlin, NH, and proposes the following actions:

- Maintenance and monitoring of an existing construction debris landfill that contains hazardous materials.
- Removal of contaminated soils that pose an unacceptable risk to human health and either on-site disposal at the existing landfill or off-site disposal at a licensed facility.
- Removal of mercury and mercury-contaminated materials (including amalgams and debris) as it appears in the Androscoggin River.
- In-situ treatment of contaminated groundwater in bedrock beneath the Site to restore that groundwater to a beneficial use as a source of drinking water.
- Restrictions on residential and other unrestricted use activities on the Site.
- Monitoring of groundwater and Five-Year Reviews.

EPA's proposed remedy, including long term monitoring, has an estimated total cost of $5 million in present value[1]. The proposed remedy is expected to prevent the ingestion of contaminated groundwater, prevent contact with contaminated soils and landfilled materials, and reduce the potential for exposure to elemental and amalgam mercury that appears in the river.

continued on next page >

A virtual Public Informational Meeting immediately followed by a Formal Public Hearing will be held:

WEDNESDAY • JUNE 10, 2020 BEGINNING AT 7 P.M.

Go to **www.epa.gov/superfund/chloralkali**

Click on the "Join EPA Skype meeting" button OR

Open the PDF presentation and join by phone:
1-857-299-6148
PIN: 616539680#

[1]"Present Value" is an estimate of the amount of money that would need to be set aside today to ensure that enough money is available over the expected life of the project, assuming certain conditions (e.g., inflation). The discount rate applied was 7% over 30 years.

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TOLL-FREE CUSTOMER SERVICE
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epa.gov/superfund/chloralkali

June 2020

SEMS Doc ID 643481

YOUR OPINION COUNTS: OPPORTUNITIES TO COMMENT ON THE PLAN

EPA, as the lead agency[2], will be accepting public comments on this proposed cleanup plan from June 3, 2020 through July 3, 2020. EPA is seeking input on all the alternatives and the rationale for the preferred alternative. Additionally, new information or arguments the lead agency learns during the public comment period could result in the selection of a final remedial action that differs from the preferred alternative. You don't need to be a technical expert to comment. If you have a concern, suggestion, or preference regarding the Proposed Plan, EPA wants to hear from you before making a final decision on how to protect your community.

Comments can be sent by mail, email or fax. Anyone may also offer oral comments during the formal public hearing (see pages 27-28 for details). If you have specific needs for the public meeting or hearing, questions about accessing the event on-line or questions on how to comment, please contact Sarah White at 617-918-1026 or email: white.sarah@epa.gov

General Information:
EPA New England - Superfund and Emergency Management Division
NH/RI Superfund Section, Mail code: 07-1
5 Post Office Square
Boston, MA 02109-3912
(617) 918-1111

Please notify the EPA Project Manager or Community Involvement Coordinator if you do not have computer access and need materials to participate over the telephone[3]. The meeting is an opportunity for residents and other interested persons to learn more about the Proposed Plan to clean up the Site and provide formal comments on the Proposed Plan which will be recorded, transcribed and included in the Site Administrative Record.

It should be noted that during the public meeting portion of the event EPA will give a presentation describing the proposed cleanup plan for the Site. During the hearing portion of the event that will immediately follow the public meeting, EPA will accept oral public comment on the Chlor-Alkali Proposed Plan which will be recorded for the Site Administrative Record. EPA will NOT be responding to comments during the hearing but will be providing written responses to comments as part of its final decision document which is expected to be issued later this year.

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[2] New Hampshire Department of Environmental Services (NHDES) is the support agency for the Site.

[3] In accordance with Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the law that established the Superfund program, this document summarizes EPA's cleanup proposal. For detailed information on the cleanup options evaluated for use at the Site, see the Chlor-Alkali Facility Feasibility Study and other documents contained in the Site's Administrative Record available for review online at: http://www.epa.gov/superfund/chloralkali

Additionally, EPA will accept public comments during the 30-day public comment period from June 3, 2020 through July 3, 2020. Comments can also be faxed, mailed or emailed no later than July 3, 2020 to the EPA project manager:

Darryl Luce
U.S. EPA Region 1, Mail code: 07-01
5 Post Office Square
Boston, MA 02109

Or email luce.darryl@epa.gov or FAX: 617-918-0336
EPA has established a dedicated voice mailbox at 617-918-1122 to receive oral comments during the comment period.

Copies of the EPA's Proposed Plan or EPA's presentation may be viewed on the Chlor-Alkali Facility Superfund Site web page at: www.epa.gov/superfund/chloralkali or obtained by contacting:

Sarah White
Community Involvement
U.S. EPA Region 1
617-918-1026
email: white.sarah@epa.gov

After issuing the Proposed Plan, EPA will consider all written and oral comments submitted by residents, members of the public and interested stakeholders during the comment period and then make a formal decision selecting a cleanup plan. That cleanup plan will be set forth in a formal document known as the Record of Decision (ROD) which will include a "Response to Comments" section to address all comments received during the public comment period. EPA expects to issue the ROD before the end of September 2020.
(See Acronym List on page 29)

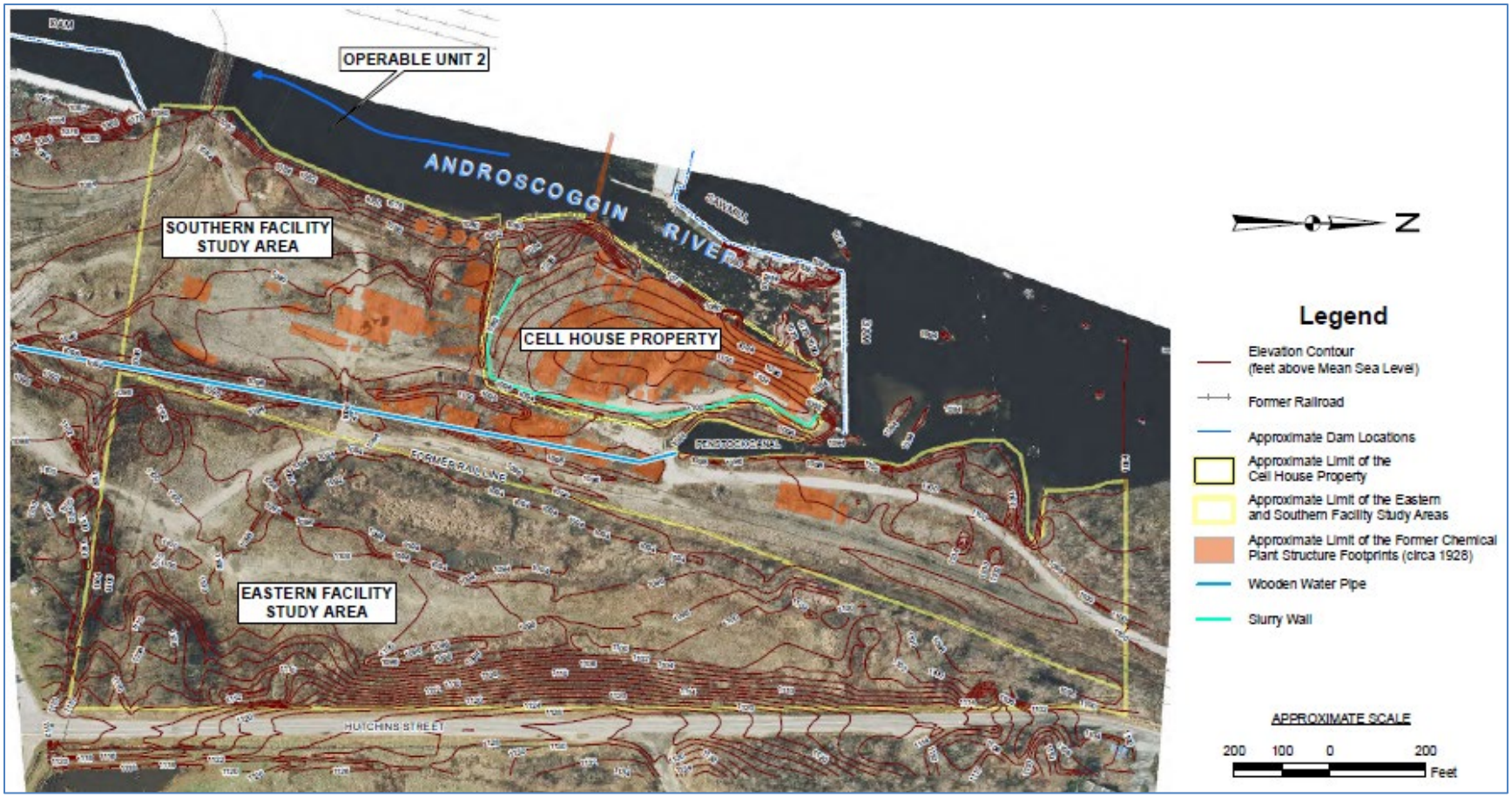

Figure 1: Details and features of the Site. The location of structures of the Chemical Plant are superimposed. Bleach and lye were manufactured on the Cell House Property. Chemical products, such as chloroform were created on the Southern Facility Study Area. Only one structure still stands on the Site, the brick inlet to a pipe that supplies clean water to the Gorham Tissue factory further south through the noted "wooden water pipe." The structures were demolished and eventually all placed in a 4-acre landfill on the Cell House Property enclosed by the slurry wall shown as a green line. The Androscoggin River flows southward, just west of the Site.

A CLOSER LOOK AT EPA'S PROPOSAL

EPA began its investigation of contamination at the Chlor-Alkali Facility (the "Site") in 2009. That study resulted in a Remedial Investigation (RI) Report and a Human Health Risk Assessment (HHRA), both issued in 2014. The results of a Supplemental Remedial Investigation (SRI) issued in 2018 furthered the investigation of contamination in the landfill and river. Collectively, the RI and SRI form the basis for the Feasibility Study (FS) from which this Proposed Plan is now developed. EPA defined three areas of contamination that were divided into Operable Units (OUs) to better define remedial alternatives developed for each area. The OUs and the alternative EPA proposes as a final remedy for each:

CHP Landfill, OU-1: EPA's preferred alternative for the Cell House Property Landfill (the "CHP Landfill") is described in the FS as Alternative OU-1-2 and consists of the following actions:

- Engineering Controls (ECs): maintaining the fence and the containment system. The containment system consists of the CHP Landfill cap, monitoring wells, the retaining wall, and the slurry wall. Maintenance will consist of removing vegetation on the cap, inspections, and repairs to the infrastructure, as needed.
- Institutional Controls (ICs): legally-enforceable restrictions that will prohibit the construction of buildings on the CHP Landfill, disturbance of the existing landfill cap and other remedial infrastructure (including monitoring wells, the retaining wall and slurry wall), use of the property for residential and other unrestricted uses, and prohibit the use of groundwater for anything other than monitoring.
- Monitoring of ICs and ECs will ensure that the containment system will continue to isolate the waste within the CHP Landfill and prevent its release to the River and adjacent drinking water aquifers.

The CHP Landfill contains debris and other material from the demolition of the Chemical Plant. The CHP Landfill has been capped since 1999 with a 40-mil low-permeability liner overlain, respectively, by a drainage layer and approximately two-feet of woodchips. The CHP Landfill is bounded on the west by a retaining wall (a former foundation wall for one of the demolished buildings), and on the east and south by a slurry wall installed in 1999. A 0.6-acre area of the CHP, southwest of the CHP Landfill, contains soils similar in composition and levels of contamination to those in the SFSA. The contaminated soils in this area will be remediated in the same manner as those areas requiring remediation within the SFSA.

Soils in the SFSA and EFSA, OU-2:
EPA's preferred alternative for the soil cleanup outside of the landfill in the Southern Facility Study Area (SFSA) and the Eastern Facility Study Area (EFSA) is Alternative OU-2-4 in the FS: Excavation, Backfill, Off-site or On-site disposal and Institutional Controls. Isolated patches of contaminated soils within the SFSA and EFSA were found during the RI that are associated with a subsurface ash-layer. This alternative will consist of the following actions:

- Additional testing to refine the extent of contamination in those areas identified by the Human Health Risk Assessment in the EFSA, SFSA and the uncapped portion of the CHP Landfill.
- Excavation of soils that exceed Preliminary Remediation Goals (PRGs)[3] for addressing unacceptable risks for commercial/industrial exposure.
- Disposal of excavated soils, either beneath the CHP Landfill cap or at appropriate off-site facilities.
- Institutional Controls that will consist of legally enforceable restrictions to prohibit residential and other unrestricted uses.

The disposal of soils, either the existing landfill at the Site or an off-site facility, that exceed the PRGs shown in Table 1 on page 30 will be determined by the type of material removed and the availability of off-site facilities to accept the waste and the comparative costs of on-site versus off-site disposal.

Groundwater and the Androscoggin River, OU-3: This OU consists of two types of contamination: contaminated groundwater in fractured bedrock beneath OU-1 and OU-2, and liquid elemental mercury, hardened metal amalgams, and mercury-contaminated debris in the riverbed of the Androscoggin River.

When it was operating, the Chemical Plant contaminated groundwater by releases of solvents called Volatile Organic Compounds (VOCs) such as chloroform, tetrachloroethene, and carbon disulfide, onto the ground. Metal contaminants also entered the subsurface after handling or on-site disposal. Those compounds migrated into bedrock beneath the Site. The result is a plume of groundwater contamination that lies beneath both the CHP Landfill and portions of the SFSA. Three approaches are proposed for the OU-3 remedy, two of these for VOCs in groundwater (under the landfill and outside the landfill) and another approach for mercury in the river:

> Groundwater Beneath the CHP Landfill, OU-3: EPA's preferred cleanup alternative for groundwater beneath the CHP Landfill is described in the FS as Alternative OU-3-CHP-2 and consists of ICs and Monitoring. This remedy was selected because under federal guidance standards, contaminated groundwater beneath a waste management area does not require active cleanup if migration of the contaminated groundwater is controlled. Alternative OU-3-CHP-2 will monitor groundwater beneath the CHP Landfill to determine if the contaminated groundwater remains contained within a "compliance boundary," which would be established around the footprint of the CHP Landfill.

[3] In the FS and this Proposed Plan remediation standards are referred to a "Preliminary Remediation Goals." When EPA selects a final remedy in the Record of Decision the remediation standards will be finalized and referred to as "Cleanup Goals."

Monitoring would confirm that contaminated groundwater from beneath the CHP Landfill is neither migrating into the River nor contaminating adjacent drinking water aquifers. ICs will consist of legally enforceable restrictions to protect the containment system and other remedial infrastructures, prohibit the use of groundwater for drinking water, prohibit the building of structures on the landfill and prohibit any residential or other unrestricted uses. Groundwater monitoring Performance Standards are provided in Table 1(A.) for groundwater within the compliance boundary on page 30.

Groundwater Outside the CHP Landfill, OU-3: EPA's preferred cleanup alternative for contaminated groundwater outside the CHP Landfill compliance boundary and beneath the SFSA is described in the FS as Alternative OU-3-GW-3, *In-Situ* Chemical Oxidation (ISCO), monitoring and ICs. ISCO treats groundwater contaminants, such as VOCs and immobilizes some metals, in-place by adding oxidizing chemicals to groundwater wells and allowing those chemicals to react with the contaminants in the aquifer. There are a variety of treatment methods for ISCO and pre-design studies will be necessary to select an effective treatment type. The treatment will be followed by monitoring to assess the effectiveness of the treatment and to determine if additional treatments are required. ICs will consist of legally enforceable restrictions to prohibit the use of groundwater as drinking water and prohibit the building of structures without mitigation to prevent vapor intrusion. PRGs for groundwater outside the CHP Landfill are provided in Table 1(B.) on page 30.

Androscoggin River Mercury Cleanup, OU-3: The disposal of mercury used at the Chemical Plant contaminated the riverbed of the Androscoggin River. EPA's preferred alternative for the mercury and mercury-contaminated material in the river is described in the FS as Alternative OU-3-AR-3-2, Liquid Elemental Mercury, Hardened Metal Amalgam, and Mercury-Containing Debris Removal and Monitoring. The remedy will consist of liquid mercury, hardened metal amalgams and mercury-contaminated debris removals performed on at least an annual basis with accompanying inspections to map the trend of mercury appearance and the effectiveness of the remedy.

EPA supports the above proposed remedial actions for all three operable units as the final actions to protect human health and the environment. After the final remedy is selected and implemented, EPA will perform statutory Five-Year Reviews of environmental conditions within 5 years after the initiation of remedial action and continue for as long as contamination is present on-site to determine cleanup progress and the protectiveness of the remedy.

EPA IS REQUESTING PUBLIC COMMENTS ON THE FOLLOWING PROPOSED DETERMINATIONS

Impacts to Wetlands and Floodplains

Section 404 of the Clean Water Act (CWA), federal regulations at 44 C.F.R. Part 9, and Executive Order 11990 (Protection of Wetlands) require a determination that there is no practical alternative to taking federal actions in waters of the United States or wetlands. Should there be no alternative, the federal actions should minimize the destruction, loss, or degradation of these resources and preserve and enhance their natural and beneficial values.

EPA has determined the existence of wetlands at the Site that include not only the Androscoggin River, but also vegetated wetlands present on the EFSA and that Site-related wastes exist in these areas. Through analysis of the alternatives (see FS, Section 7), EPA has further determined that there is no practicable alternative to conducting work in these areas. As required by the CWA, EPA has determined, through its analysis of the various alternatives, that the proposed cleanup alternatives, which impact wetland areas, are the least environmentally damaging practicable alternatives for protecting wetland resources.

EPA will minimize potential harm and avoid adverse impacts to wetlands by using best management practices during excavation of contaminated soils in and adjacent to wetlands and during mercury removal efforts in the River to minimize harmful impacts on the wetlands, wildlife or their habitat, and by restoring these areas consistent with federal and state wetlands protection laws. Any wetlands affected by remedial work will be restored with native vegetation as a wetland area and such restoration will be monitored until the wetland vegetation becomes re-established. Other mitigation measures will be used to protect wildlife and aquatic life during restoration, as necessary.

Before EPA can select a cleanup alternative, Executive Order 11988 (Floodplain Management) and federal regulations at 44 C.F.R. Part 9 require EPA to make a determination that there is no practicable alternative to activities that affect or result in the occupancy and modification of the 100- and 500-year floodplain. Through its analysis of alternatives (see FS, Section 7), EPA has determined that the proposed cleanup will cause temporary impacts but will not result in the occupancy and modification of floodplains (see RI, Figure 3-2).

While disturbance of the river bottom will occur to recover mercury in the river and on the banks of the Androscoggin River, the impact of this will be minor. Best management practices will be employed in removing existing anthropogenic materials that contain mercury to ensure the restoration of natural flow. The work area will be between two hydroelectric dams that control flow in these areas. Subsequent high flows will sweep materials and any unwary Site workers to the upstream base of Riverside Dam. The landfill cover system, particularly the retaining wall along the River will be monitored and maintained to ensure there is no release of landfill contaminants in the event of up to a 500-year storm event.

TSCA PCB Determination

This Proposed Plan includes a draft finding by EPA that polychlorinated biphenol (PCB)-contaminated soil and landfill debris at the Site meets the definition of a PCB remediation waste, as defined under 40 C.F.R. Section 761.3 of regulations promulgated under the Toxic Substances Control Act (TSCA), 15 U.S.C. § 2601 *et seq*., and thus are regulated for cleanup and disposal under 40 C.F.R. Part 761. Under 40 C.F.R. Section 761.61(c), EPA may authorize disposal of PCBs in a manner not otherwise specified, provided EPA determines that the disposal will not pose an unreasonable risk of injury to health or the environment. EPA is soliciting public comment on EPA's draft TSCA finding through this Proposed Plan.

TSCA Determination

Consistent with the TSCA regulatory requirements at 40 C.F.R. Section 761.61(c), EPA has reviewed the Administrative Records for the proposed remedial action, which includes the following activities:

(1) Any PCB-contaminated debris or soil currently existing within the CHP landfill is currently covered with a landfill cap that meets the TSCA regulatory requirements of 40 C.F.R. Section 761.61(a)(7) and RCRA Subtitle C regulations (40 C.F.R. Section 264.310).

(2) PCB-contaminated soil from the EFSA with equal or greater than (≥) 10 parts per million (ppm) (measured *in situ*) will be excavated and disposed of at an off-site disposal facility or on-site under the CHP landfill cap. If the existing cap is opened to receive additional on-site wastes, the opening will be repaired to meet the TSCA regulatory requirements of 40 C.F.R. Section 761.61(a)(7) and RCRA Subtitle C regulations (40 C.F.R. Section 264.310). Removal and disposal of the ≥ 10 ppm PCB-contaminated soil from the EFSA will address potential human health risks posed to commercial/industrial workers from PCB-contaminated soil within the Site.

(3) The existing CHP Landfill containing PCB-contaminated waste will be monitored and maintained to prevent any release of and exposure to PCB-contaminated material within the landfill.

(4) Remaining uncapped areas of contaminated soil with PCB-contaminated soil at ≥ 1 ppm but less than < 10 ppm PCBs that pose an unacceptable risk for residential and unrestricted use exposure will be addressed through institutional controls that will restrict residential development and other unrestricted uses.

The PCB cleanup standards are based on EPA human health and ecological risk assessments that have determined that the soil PCB cleanup levels established will not pose an unacceptable risk of injury to health or to the environment. EPA has determined that the proposed on-site disposal or excavation/off-site disposal of PCB-contaminated soil, as set out in the

Administrative Record for the proposed remedy, will not pose an unacceptable risk of injury to health or the environment as long as the following conditions are met:

(1) any soil designated for either on-site or off-site disposal shall be tested for PCBs *in situ*, and depending on any PCB contamination identified, shall be managed as required under 40 C.F.R. § 761.61 and if required, disposed of in an off-site disposal facility licensed to accept the concentration of PCB-contaminated material identified.

(2) any water generated from excavations or dewatering of PCB-contaminated soils shall be tested for PCBs and, depending on any PCB contamination identified, managed, treated (if required) and disposed of in compliance with the TSCA requirements at 40 C.F.R. § 761.79(b).

(3) air monitoring and appropriate dust suppression measures shall be implemented and maintained to ensure that airborne PCB levels are below levels of concern as specified in the ROD during any excavation, passive dewatering, and management of excavated soil conducted prior to off-site disposal and during site work prior to construction completion of the clean covers.

(4) the PCB marking and storage requirements for PCB waste under 40 C.F.R. §§ 761.40, 761.45, and 761.65 are implemented.

(5) land use restrictions shall be established to prohibit residential and other unrestricted use, to prohibit construction of buildings on the landfill cap, and to require maintenance of the landfill cap.

(6) a long-term monitoring and maintenance plan shall be developed and implemented for the landfill cap, with groundwater and River monitoring to ensure the effectiveness of the landfill containment in eliminating direct exposure and ensuring no migration of PCBs from the capped areas.

EPA makes the above draft findings based on all information contained in the Administrative Record for the proposed remedy. EPA reserves its right to modify this 40 C.F.R. § 761.61(c) determination and the right to require additional remedial measures in the event of changes in site conditions or use, review of long-term monitoring results, or if any new information is presented that indicates these measures are no longer effective, including the discovery of additional PCB contamination or previously unknown conditions.

SITE BACKGROUND

Site Description

The Site lies on the east bank of the Androscoggin River. It is bound on the west by Hutchins Street and a closed municipal landfill, the Dummer Yard. To the south lies a small residential area and the Burgess Biomass power plant, which is located on a portion of a former Brown Company paper mill property. North of the Site is Bridge Street, a small recreational area, and a residential area. West of the Androscoggin River and directly across the river from the Site is a residential and commercial area, south of which is the larger part of downtown Berlin. The Androscoggin River is dammed for hydroelectric power adjacent to the Site. Sawmill Dam meets the east bank at the northern end of the CHP Landfill and Riverside dam meets the east bank at the southern end of the Site. Figure 2 shows the general location of the Site relative to these features.

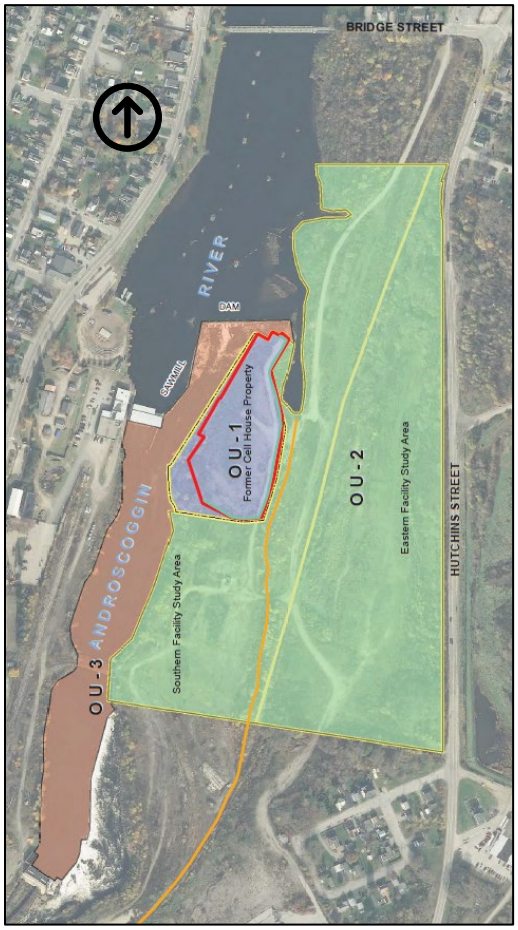

Figure 2, map at right:
The Site and surrounding features.

During the 1890's the paper mill began operating the Chemical Plant in the area of where the CHP and SFSA are now, to produce bleach and other chemicals needed in paper manufacturing.

The Chemical Plant produced a variety of chemicals including caustic soda and chloroform. The facility consisted of several buildings and storage tanks on the CHP and portions of the SFSA.

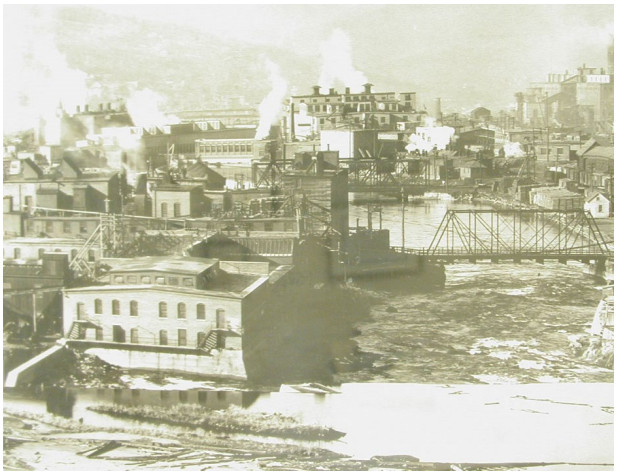

Photo 1, at right: A southward view of the Chemical Plant circa 1920. The Androscoggin River is running southward on the right of the photo and the Chemical Plant on the left (east) bank.

There were also several rail spurs to facilitate shipment to and from the Chemical Plant. Leaks, mis-handling, and direct dumping of materials over the operating life of the Chemical Plant resulted in contaminants entering the soil and eventually bedrock groundwater. According to reports, the production of bleach at the Cell House ceased in 1963. The buildings stood and appear to have been occupied and used, at least periodically, until 1999 when the last cell house was demolished and debris from the area of the Chemical Plant was consolidated within the CHP Landfill. The 40-mil cap and drainage layers were installed over the CHP Landfill by a prior operator of the Site, Crown Vantage, Inc., with oversight by NHDES[4]. The history of manufacturing and ownership in this area is described in detail in the RI and SRI.

Investigations and Sampling

EPA conducted the RI investigation from 2009 through 2014. EPA excavated test pits, installed groundwater monitoring wells, and took samples from soil borings at the Site. The investigation found that air on the CHP Landfill and emanating from four landfill vents did not pose an unacceptable risk to human health or the environment. Beneath the cap, EPA identified debris and soils contaminated with mercury, PCBs, dioxins and furans, and semi-volatile organic compounds. Groundwater beneath the landfill and SFSA was found to be contaminated with many of these same compounds and elements.

Soil borings, groundwater monitoring, and sampling of soil invertebrates in the EFSA and SFSA, found contamination in limited areas of the soil, confined primarily to portions of an ash-layer that is scattered through the area. The contamination consisted of limited areas containing semi-volatile organic compounds (SVOCs), dioxins and furans, PCBs and mercury that exceed risk-based standards. A small area of groundwater beneath the SFSA in bedrock fractures, covering fewer than 4-acres adjacent to the Androscoggin River, was contaminated with Volatile Organic Compounds (VOCs).

Sampling in the Androscoggin River occurred from Pontook Reservoir, 12 miles upstream of the Site (the background location), to Shelburne Reservoir, 13 miles downstream of the Site. EPA coordinated a complex and broad effort because of the concern that mercury and mercury-contaminated material on the banks and in the riverbed were mobile in the environment and may have been swept downstream and affected sediment and wildlife. EPA coordinated this work with the U.S. Department of Fish and Wildlife, U.S. Geological Survey, New Hampshire Department of Environmental Services, Dartmouth College, EPA's Environmental Services Assistance Team, and EPA's contractor, Nobis. The investigations examined and sampled surface water, sediment, pore-water in sediment, birds (both nestlings and songbirds), Bald Eagle chicks, bats, insects, and fish. While it was found that mercury concentrations did increase downstream of the Site, it was not significantly above that found upstream of the Site. The investigation found contamination in small mouth bass did increase downstream of the Site but only in the most distant location, Shelburne Reservoir. Sampling did

[4] New Hampshire Department of Environmental Services (NHDES) is the support agency for the Site.

find that fish were significantly contaminated with PCBs, dioxin, and furan downstream of the Site but that it was not possible to link that contamination to the Site. EPA presented the findings of that investigation to the public in March 2014 which include the RI, Human Health Risk Assessment, and Ecological Risk Assessments.

Photos 2 & 3: EPA installed nest boxes over 20 miles of the river to sample, non-destructively, Swallow nestlings, and worked with the U.S. Fish & Wildlife Service to sample Bald Eagle Chicks.

To better understand mercury distribution in the landfill and river, Georgia-Pacific agreed to perform a Supplemental Remedial Investigation (SRI). Between 2015 and 2018 EPA oversaw the SRI that performed additional test-pitting in the landfill, additional groundwater monitoring, and annual removals of mercury. The SRI evolved a fourth hypothesis that mercury was directly disposed into the Androscoggin River in the past and appears due to hydraulic forces bringing it out of fractures and debris.

Current and Future Land Use

The City of Berlin has zoned the area of the CHP Landfill, the SFSA and the EFSA as Industrial and Business use. Residential use may be allowed through Special Exception by the City. Currently the land is vacant and re-vegetating with birch, poplar and various shrubs.
From 2007 to 2008 EPA hosted meetings in Berlin with residents of the City and Berlin public officials to solicit future use preferences for the CHP, an abandoned property. The EFSA and SFSA, part of a larger property owned by North American Dismantling, Inc., were not discussed. The resulting document outlined the community preference that the CHP area be retained for future recreation, primarily for hiking and historic interpretation uses. To the extent that portions of the EFSA and SFSA have been used in the more recent past, that use

has been consistent with the Industrial and Business zoning, and it is assumed that future use would remain industrial/commercial.

The groundwater at the Site has been designated as a medium use and although there are no current uses of this groundwater, the State requires all groundwater to be suitable for drinking water purposes.

The State has designated the Androscoggin River as recreational use and does allow fishing downstream of the Site as catch-and-release only. Beginning from Sawmill Dam just upstream of the Site, downstream past Riverside Dam and at the outfall of Smith Hydro Dam, approximately 4,500 feet, the river falls 100 feet. The stretch of the river adjacent to the Site lies between Sawmill Dam to the north (upstream) and Riverside Dam to the south. There is no public access to the river in the stretch of river between these dams that EPA designated as AR-3 during its investigation.

WHERE AND WHY CLEANUP IS NEEDED

EPA has determined that there is both current and potential future unacceptable risk to human health in soils in the SFSA and EFSA, as well as in groundwater, and future potential unacceptable risk to human health and the environment in the landfilled debris at the CHP. EPA has also determined that mercury disposed of as characteristic hazardous wastes in the landfill and within the river must be contained within the landfill and removed from the river.

Site Contaminants

The EFSA and SFSA contain areas with contaminated soil, estimated to total approximately 150 cubic yards. The Contaminants of Concern (COCs) in these soils are dioxins, furans, and metals including lead and mercury. These same contaminants are present in the debris contained in the CHP Landfill, contained within the landfill by its cover system, the slurry wall, and the retaining wall. Therefore, the CHP Landfill COCs pose only a future threat to human health and the environment if the landfill cap, slurry wall or retaining wall fail to contain the COCs.

COCs in groundwater beneath the SFSA and CHP include VOCs such as trichloroethene, carbon tetrachloride and chloroform, as well as metals including mercury. In the Androscoggin River mercury is the only COC and occurs in liquid elemental form, in a solid amalgam with lead, and in debris. The liquid beads of elemental mercury range from between 0.5 millimeter in diameter to elongated forms that are 1 centimeter in diameter and up to 3 centimeters in length. Amalgam mercury occurs as coatings on pebbles and solid metal forms that range up to the size of chicken eggs.

How is Risk to People Expressed?

In evaluating risk to humans, estimates for risk from carcinogens and non-carcinogens (chemicals that may cause adverse effects other than cancer) are expressed differently.

For carcinogens, risk estimates are expressed in terms of probability. For example, exposure to a particular carcinogenic chemical may present a 1 in 10,000 increased chance of causing cancer over an estimated lifetime of 70 years. This can also be expressed as 1×10^{-4}. The EPA acceptable risk range for carcinogens is 1×10^{-6} (1 in 1,000,000) to 1×10^{-4} (1 in 10,000). In general, calculated risks higher than this range would require consideration of clean-up alternatives.

For non-carcinogens, exposures are first estimated and then compared to a reference dose (RfD). RfDs are developed by EPA scientists to estimate the amount of a chemical a person (including the most sensitive person) could be exposed to over a lifetime without developing adverse health effects. The exposure dose is divided by the RfD to calculate the measure known as a hazard index (HI) (a ratio). An HI greater than 1 suggests that adverse effects may be possible.

Exposure Pathways & Potential Risk

Risk occurs through exposure to contaminants. Exposures occur when people eat, drink, breathe or have direct skin contact with a substance or waste material. Based on existing or reasonable anticipated future land use, EPA develops different exposure scenarios to determine potential risks, and appropriate cleanup actions, as needed to meet the site cleanup goals.

The Human Health Risk Assessment (HHRA) conducted for the RI, included an evaluation of potential cancer risks and non-cancer health effects as a result of exposure to Site contaminants in groundwater and soils, assuming no additional remediation was performed, to evaluate the need for remedial response actions.

Human Health Risks

The HHRA found current unacceptable risks to people from exposures to soil in the SFSA and EFSA and potential future unacceptable risk from exposure to hazardous substances/COCs from the CHP Landfill if the cap were to fail to contain wastes, groundwater if used as drinking water, and indoor air from vapor intrusion if buildings were constructed and occupied. A further discussion of these risks relevant to their media are discussed below.

EXPOSURE ASSESSMENT

The exposure assessment in the HHRA examined the physical setting of the Site and evaluated the potential exposures to people. The factors for exposure are a source of contamination, how people may contact those contaminants in different media such as surface water, soils, and sediment, and the current and potential future uses of the contaminated areas.

Current exposures include exposure to contaminated soil in the EFSA and SFSA, and to mercury appearing in the Androscoggin River. People working or trespassing in the SFSA or EFSA may be exposed to soil contaminants. No current exposure exists at the CHP Landfill due to the cap and other containment features. Workers or trespassers in the stretch of the Androscoggin River between the two hydroelectric dams, Sawmill and Riverside, may come into contact with liquid elemental mercury or hardened metal amalgams.

Exposure of future residents and workers may occur if the areas of the EFSA, SFSA or CHP are occupied. Future residents and other unrestricted users would be exposed to contaminated soils in the EFSA and SFSA if contaminants remain and the area is occupied. If the cap of the CHP Landfill were compromised in the future, exposure to contaminants may occur. Any structures built on the CHP or the SFSA may expose future residents and workers to indoor air contaminants from vapor intrusion due to underlying groundwater contamination. There are no current uses of groundwater either on-site or nearby and therefore there is no current exposure to contaminated groundwater and therefore no current unacceptable risk. If groundwater at the Site were to be used it would create an unacceptable exposure risk.

Based on the results of the HHRA, EPA found that the following pathways pose unacceptable human health risks because the calculated risks exceed EPA's acceptable cancer risk range of 10^{-6} to 10^{-4}, the non-cancer Hazard Index of 1, or EPA's risk-based standard for lead (or some combination of these):

- Current and future residents and trespassers in the EFSA and SFSA. In the EFSA, SVOCs such as benzo(a)pyrene and benzo(a)anthracene, dioxin, furans, arsenic and mercury posed unacceptable risk. In the SFSA dioxin, furans, mercury and, arsenic posed unacceptable risk.
- Current and future workers in the EFSA and SFSA. In the EFSA, dioxin, furans, and mercury posed unacceptable risk. In the SFSA, mercury and lead posed unacceptable risk.
- Future residents, workers, and trespassers in the CHP could be exposed to dioxin, furan, mercury, and benzo(a)pyrene that would create an unacceptable risk if the cap failed to contain the wastes.
- Future use of groundwater as drinking water would create an unacceptable exposure risk due to chloroform, carbon tetrachloride, chromium, arsenic and, beneath the landfill, dioxin.

- The occupation of future buildings in the SFSA or CHP would create an unacceptable risk due to vapor intrusion of volatile contaminants in groundwater.

The RI found no contamination in the Androscoggin surface water and therefore no unacceptable risk. The HHRA found that sediment in the Androscoggin River did contain COCs, but the contaminants did not exceed background levels in the River, so that site-related contaminants were not found to pose an unacceptable risk to adult or child recreator visitors. Table 6.2-1 in the HHRA quantifies the risk to each of the potential receptors in each of the media. Tables 3a and 3b on pages 32-33 summarize risks at the Site.

The State of New Hampshire prohibits the taking and consumption of fish from Sawmill Dam downstream to the Maine State line due to the presence of contamination in those fish. EPA found many of the COCs in fish sampled downstream of the Site but, with many other potential downstream sources, could not attribute those contaminants as originating solely from the Site.

Threats to the Environment

EPA assessed risk to the environment through two analyses: Terrestrial Screening Level Ecological Risk Assessment (TSLERA) for exposure to biota in the area of the EFSA, SFSA, and CHP, and a Baseline Ecological Risk Assessment (BERA) for biota in the Androscoggin River.

In the EFSA and SFSA the TSLERA found little to no potential for adverse effects to plant and soil invertebrate communities. A potential for adverse effects to bird and mammal populations was found to exist in these areas from the presence of dioxins, furans, PCBs, lead and PAHs. The CHP is capped and therefore there is only a future risk to bird and mammal populations if the cap were to fail.

In the Androscoggin River the BERA found that, excepting mercury in bats foraging in the vicinity of the Shelburne Reservoir, the risk from mercury, PCB, and dioxin/furan exposure to the flora and fauna inhabiting the river is of limited ecological significance. None of the evaluations conducted as part of the assessment provided evidence that the levels of contaminants in sediments (surface water was uncontaminated) in the Androscoggin River from Sawmill Dam, downstream to Shelburn Dam in Gorham, were sufficiently high to induce effects above the regional variability in reproduction, maintenance, and survival of the flora and fauna in the river. It was not possible to determine the source or impact of the mercury present in the Shelburne Reservoir bats therefore no impact from site-related contamination was identified.

It is the lead agency's current judgement that the Preferred Alternative identified in this Proposed Plan, is necessary to protect public health or welfare and the environment from actual or threatened releases of hazardous substances into the environment.

CLEANUP ALTERNATIVES CONSIDERED

To develop cleanup remedies an analysis of the types of contamination, risk, and exposure pathways at the Site is used to develop Remedial Action Objectives (RAOs). General response actions to meet these RAOs are then developed and reviewed during the development of the alternatives. The general response actions include:

- No-Action alternatives are required by the NCP to demonstrate the uncontrolled risks and to compare to the effectiveness of other alternatives.
- Institutional Controls (ICs), enforceable under applicable law, which serve to prohibit certain uses of the property or area.
- Engineering Controls (ECs), which physically restrict access to areas of contamination.
- Containment, which includes maintenance, monitoring, and institutional controls to restrict exposure by maintaining waste isolation.
- *In situ* remedies treat contamination in-place to reduce toxicity, mobility and volume.
- *Ex situ* remedies remove contamination from the general environment and treat it to reduce toxicity, mobility and volume.
- Removal and disposal actions remove the contaminated material from its original location and disposes of it in an area that isolates it from the environment.

The remedial alternatives developed for the Chlor-Alkali Site for each of the OUs, along with the RAOS, are listed below:

1. Contaminated debris in the CHP Landfill. The RAOs for this area are:

- Prevent direct human contact, ingestion or inhalation of COCs within the CHP Landfill that exceed ARARs or risk-based criteria.
- Prevent exposure of ecological receptors to landfill contents that present an unacceptable ecological risk.
- Control CHP Landfill runoff and erosion.
- Prevent the release and migration of COCs through leaching from the CHP Landfill to groundwater outside the CHP Landfill groundwater compliance boundary or the Androscoggin River.
- Prevent infiltration and washout during flooding, up to a 500-year event.

Two alternatives were developed in the FS to address contamination in the CHP Landfill, based on EPA presumptive remedy guidance standards for landfill remedies. The designations and general actions:

a. OU-1-1: No Action.

b. OU-1-2: The remedy will consist of continued maintenance and monitoring of the existing cap, slurry wall and retaining wall, along with ICs and ECs, to ensure that wastes remain contained within the landfill.

2. Contaminated soils in the SFSA and EFSA. The RAO for the contamination in these areas:

- Prevent exposure to COCs in soil that exceed ARARs or risk-based criteria for human health.

Four alternatives were developed in the FS:

a. OU-2-1: No Action.
b. OU-2-2: ECs to prohibit use and contact with soils exceeding commercial/industrial PRGs, and ICs to prohibit disturbance of the ECs and prohibit exposure to soils exceeding both commercial/industrial and residential PRGs.
c. OU-2-3: A vegetative soil cover over soils exceeding commercial/industrial PRGs, with long-term monitoring and maintenance, and ICs to prohibit disturbance of the cover and restrict residential and unrestricted uses.
d. OU-2-4: Excavation of contaminated soils exceeding commercial/industrial PRGs, backfilling of the excavation, and off-site or on-site disposal under the CHP Landfill cap, followed by ICs to prohibit residential and unrestricted uses.

3. Contaminated Groundwater beneath the CHP and SFSA. Groundwater is divided into two areas of action: beneath the CHP Landfill and outside of a compliance boundary around the footprint of the landfill. Groundwater beneath the CHP Landfill has been demonstrated in the RI to not be migrating beyond the compliance boundary. The RAOs for groundwater beneath the landfill:

- Prevent potential human exposure to COC concentrations in groundwater in excess of ARARs or risk-based criteria within the compliance boundary for the CHP Landfill.
- Prevent migration of Site COCs in groundwater from beyond the edge of the compliance boundary of the waste management area.
- Prevent exposure by future building occupants to indoor air vapors, via a vapor intrusion pathway, containing Site contaminants that would result in a total excess lifetime cancer risk greater than the target risk range of 10^{-6} to 10^{-4}, or a non-cancer Hazard Index greater than 1.

The RAOs for groundwater beyond the landfill compliance boundary:

- Return the groundwater to its beneficial use as a source of drinking water.
- Prevent use of groundwater with COC concentrations greater than ARARs or risk-based standards until groundwater cleanup standards are achieved.

- Prevent exposure by future building occupants to indoor air vapors, via a vapor intrusion pathway, containing Site contaminants that would result in a total excess lifetime cancer risk greater than the target risk range of 10^{-6} to 10^{-4}, or a non-cancer Hazard Index greater than 1, until groundwater cleanup standards are achieved.

The alternatives developed in the FS to address contaminated groundwater:

a. Within the CHP Landfill:
    i. OU-3-CHP-1: No Action.
    ii. OU-3-CHP-2: ICs and monitoring.
b. Outside of the CHP Landfill (a 0.6-acre area of the CHP and the SFSA).
    i. OU-3-GW-1: No Action.
    ii. OU-3-GW-2: Monitored natural attenuation (MNA)/Monitoring and ICs to prohibit groundwater use and restrict potential vapor exposure until groundwater cleanup standards achieved. This alternative was evaluated in the FS; however, because there is insufficient data to evaluate MNA, this alternative has not been demonstrated to meet the threshold criteria. Therefore, this alternative will not be evaluated in this Proposed Plan but may be evaluated once a MNA evaluation study is completed.
    iii. OU-3-GW-3: *In situ* treatment with oxidants to restore groundwater, monitoring, and ICs to prohibit groundwater use and restrict potential vapor exposure until groundwater cleanup standards achieved.

4. Liquid and amalgam mercury and mercury contaminated debris appearing on the banks and in the riverbed of the Androscoggin River. The RAO for the Androscoggin River are:

- Reduce the presence of liquid elemental mercury, hardened metal amalgams, and mercury-containing debris in Reach AR-3 adjacent to the CHP to protect designated use and to meet surface-water quality or other ARAR standards.

The alternatives developed in the FS:

a. OU-3-AR-3-1: No Action.
b. OU-3-AR-3-2: Liquid elemental mercury, hardened mercury amalgam, and ongoing, periodic mercury-containing debris removal and monitoring.

Following an analysis of the remedies developed in the FS, EPA selected proposed remedies for each of the areas of contamination that best meet seven of nine criteria set forth by the NCP for selecting a remedy. The text box lists all nine of the evaluation criteria that EPA will ultimately consider in selecting and documenting appropriate remedies for the contaminated areas at the Site.

THE NINE CRITERIA FOR CHOOSING A CLEANUP PLAN

EPA uses nine criteria to evaluate cleanup alternatives and select a final cleanup plan. EPA has already evaluated how well each of the cleanup alternatives developed for the Chlor-Alkali Site meets the first seven criteria presented in the Feasibility Study. Once comments from the state and the community are received and considered, EPA will select the final cleanup plan.

1. Overall Protection of human health and the environment: Will it protect the public and the plant and animal life on and near the Site? EPA will not choose a cleanup plan that does not meet this basic criterion.

2. Compliance with Applicable and Relevant and Appropriate Requirements (ARARs): Does the alternative meet all federal environmental statutes and regulations and more stringent state environmental and facility siting statutes and regulations? The cleanup plan must meet this criterion unless a waiver is invoked.

3. Long-term effectiveness and permanence: Will the effects of the cleanup plan last or could contamination cause contamination and cause future unacceptable risk?

4. Reduction of toxicity, mobility or volume through treatment: Using treatment, does the alternative reduce the harmful effects of the contaminants, the spread of contaminants and the amount of contaminated material?

5. Short-term effectiveness: How soon will site unacceptable risks be adequately reduced? Could the cleanup cause short-term hazards to workers, residents or the environment?

6. Implementability: Is the alternative technically feasible? Are the right goods and services (*i.e.* treatment equipment, space at an approved disposal facility) available?

7. Cost: What is the total cost of an alternative over time? EPA must select a cleanup plan that provides the necessary protection for a reasonable cost.

8. State Acceptance: Do State environmental agencies agree with EPA's proposal?

9. Community Acceptance: What support, objections, suggestions or modifications did the public offer during the public comment period?

CLEANUP ALTERNATIVES COMPARISON

The alternatives considered for groundwater were compared with each other to identify how well each alternative meet EPA's evaluation criteria. The discussion below and a summary of this discussion in Tables 4a and 4b on pages 34-35, present a general comparison summary of how the alternatives meet or do not meet each of the criteria. A more detailed evaluation and comparison of alternatives is included in the FS.

CHP Landfill

The No Action alternative, OU-1-1, would not be protective of human health and the environment under CERCLA because no actions would be taken to maintain the cap or ensure that exposure was controlled. OU-1-2 (Monitoring and maintenance of the landfill cap, foundation/retaining wall and slurry wall, ECs and ICs) will be protective of human health and the environment through maintenance of existing containment infrastructure, ECs, implementation and enforcement of legally enforceable ICs established pursuant to a selected remedy under CERCLA, and construction and O&M of additional ECs (*i.e.*, fencing and signage). Maintenance of the CHP Landfill engineered cover system, slurry wall, and foundation/retaining wall will prevent potential exposure to soil/debris beneath the CHP Landfill engineered cover system. Implementation and enforcement of ICs as well as installation and O&M of additional ECs as part of alternative OU-1-2 will further minimize potential future exposure via land use and access restrictions.

Alternative OU-1-2 is a presumptive remedy for landfill sites under EPA guidance standards and complies with ARARs. This alternative is effective in the short term since the engineered cap system is currently in place and would meet the relevant and appropriate requirements for a hazardous waste landfill cap. Long-term effectiveness of landfill capping has been demonstrated broadly at many Superfund remedial sites. Alternative OU-1-2 is readily implementable, the cap is already in place, the reliability of the technology is broadly demonstrated, and the ability to monitor the effectiveness of the alternative as a remedy is easily accomplished.

Alternative OU-1-1 has no cost except the cost to conduct statutorily-required five-year reviews. Alternative OU-1-2 has relatively low capital and O&M costs. Part of the cost of monitoring is also covered under OU-3 alternatives, which address groundwater monitoring and surface water monitoring in the Androscoggin River in Reach AR-3. Alternative OU-1-2 would not reduce the toxicity, mobility, or volume of the contamination through treatment, but represents an effective alternative that may incorporate previously-implemented ECs with implementation of ICs and additional ECs (fencing and signage) to restrict and prohibit future activities by which exposure could occur.

Soil Contamination in the Eastern and Southern Facility Study Areas

The No Action alternative, OU-2-1, would not protect human health and the environment because COCs would remain in soil at concentrations greater than industrial/commercial and

residential PRGs and no measures would exist to prevent exposure. Alternatives OU-2-2 (Installation/maintenance of ECs and ICs to protect the ECs and prohibit residential and unrestricted uses), OU-2-3 (a soil cover, monitoring/maintenance and ICs to protect the cover and prohibit residential and unrestricted uses), and OU-2-4 (excavation and disposal with ICs to prohibit residential and unrestricted uses) are protective of human health and the environment. Alternative OU-2-2 relies on on-going maintenance of fencing and enforcement of ICs, and Alternative OU-2-3 relies on maintenance of soil covers to prevent access to contaminated material that exceeds commercial/industrial standards, along with ICs to protect the cover and prohibit residential and unrestricted uses. Alternative OU-2-4 is protective because it removes contaminated soil exceeding commercial/industrial PRGs and disposes of it off-site at a licensed disposal facility or under the CHP Landfill cap. ICs would prohibit residential and unrestricted uses.

No Action would not meet ARARs or risk-based cleanup levels. Alternative OU-2-2 would only meet ARARs and risk-based cleanup levels if ECs are maintained and ICs are enforced. Alternatives OU-2-3 and OU-2-4 would meet ARARs and risk-based cleanup levels by either covering or removal and off-site or on-site disposal of contaminated soils exceeding commercial/industrial PRGs and ICs to prohibit residential and unrestricted exposure.

Alternatives OU-2-2 and OU-2-3 provide short- and long-term effectiveness maintenance/monitoring of ECs or soil covers, respectively, and through legally enforceable ICs established pursuant to a selected remedy under CERCLA, although Alternative OU-2-3 is more effective because it isolates soil contaminants under a cap rather than relying on maintaining fences to restrict contaminant exposure. Alternative OU-2-4 provides long-term effectiveness and permanence through excavation and disposal of soil exceeding commercial/industrial PRGs either at an off-Site facility or on-Site in the CHP Landfill. OU-2-2, OU-2-3, and OU-2-4 all use ICs to prohibit residential and unrestricted use exposure. Alternative OU-2-4 poses potential short-term hazards to workers since contaminated soil will require excavation and management prior to disposal. On-Site disposal adds short-term hazards related to opening and re-sealing the CHP Landfill engineered cover system; however, proper use of best management practices will prevent short-term hazards.

None of the Alternatives will reduce toxicity, mobility, or volume through treatment.

Alternatives OU-2-2 and OU-2-3 have implementability challenges with monitoring and maintaining ECs and soil covers, respectively. For Alternative OU-2-4, on-Site disposal in the CHP Landfill presents greater implementability challenges than off-Site disposal, owing to technical requirements for CHP Landfill disruption and repair. However, there may be implementability issues with off-site disposal since the number of licensed disposal facilities that can accept the waste generated from the Site may be limited due to the presence of dioxin and furans in the waste. The availability of disposal at licensed facilities will be the deciding factor in whether soils are disposed on-Site or off-Site. Alternatives OU-2-3 and OU-2-4 add

implementability challenges related to access and potential engineering constraints related to ponding precipitation/runoff and wetlands.

Alternative OU-2-1 has no cost except the cost to conduct statutorily-required five-year reviews. Alternative OU-2-2 has the lowest estimated cost: $285,000, excluding the No Action alternative. Alternative OU-2-3 has an estimated cost of approximately $700,000, while estimated costs for Alternative OU-2-4 are approximately $500,000 for off-Site disposal and $560,000 for on-Site disposal beneath the existing landfill cap.

Groundwater Contamination Beneath the CHP Landfill

The No Action alternative, OU-3-CHP-1, does not protect human health and the environment and would not meet ARARs or risk-based standards. Alternative OU-2-CHP-2 is protective of human health and the environment and meets ARARs or risk-based standards.

Alternative OU-3-CHP-2 will be effective in the short term, relying on ICs to prohibit potential exposure to groundwater vapor within the compliance boundary for the CHP Landfill. In conjunction with ICs, monitoring would be conducted to evaluate migration of COCs relative to the compliance boundary and groundwater and surface-water quality. Neither Alternative will reduce toxicity, mobility, or volume through treatment.

Alternative OU-3-CHP-1 is not effective in either the short-term or long-term. Alternative OU-3-CHP-2 is effective in the short term and maintenance and monitoring of groundwater ensures the long-term effectiveness and permanence of this alternative. ICs will be effective at restricting use of Site groundwater and exposure to soil vapor underlying the CHP Landfill and protecting remedial components of the alternative.

Alternative OU-3-CHP-1 is implementable because no action will be taken and will incur no costs. Alternative OU-3-CHP-2 is implementable because long-term monitoring and establishment/enforcement of ICs do not pose any significant implementability issues. The No Action alternative has no cost except the cost to conduct statutorily-required five-year reviews. and the estimated cost of Alternative OU-3-CHP-2 is approximately $900,000 over 30 years.

Groundwater Contamination Outside of the CHP Landfill

No Action, OU-3-GW-1, would neither be protective of human health and the environment, nor meet ARARs or risk-based criteria. Alternative OU-3-GW-3, *in-situ* chemical oxidation (ISCO), ICs and monitoring, is protective of human health and the environment via ISCO treatment to reduce VOC concentrations. Alternative OU-3-GW-3 will achieve ARARs in approximately 20 years and implementation of ICs will prohibit groundwater use and exposure to groundwater vapor until groundwater cleanup standards are achieved.

Alternative OU-3-GW-3 reduces toxicity, mobility or volume through treatment through addition of *in situ* chemical reagents. Alternative OU-3-GW-1 is implementable because no

action will be taken. Alternative OU-3-GW-3 is implementable because ISCO is a well-known treatment process, however site-specific factors can significantly impact treatment effectiveness (treatment effects may be localized in the vicinity of the injection point due the characteristics of deep bedrock at the Site).

Alternative OU-3-GW-1 will not be effective in the short-term because no action will be taken. Alternative OU-3-GW-3 is effective in the short term through implementation of ICs that will control groundwater use and prohibit exposure to soil vapor and monitoring to evaluate and confirm that COCs are not migrating into adjacent uncontaminated areas of groundwater or affecting surface water quality.

Alternative OU-3-GW-3 provides short-term protectiveness through ICs to prohibit groundwater use and exposure to groundwater vapor. Although, Alternative OU-3-GW- 3 may have short-term impact to workers implementing the treatment remedy, these impacts can be addressed through best management practices and health and safety requirements. Alternative OU-3-GW-1 is not protective in the long-term because no action will be taken. Alternative OU-3-GW-3 is expected to be protective in the long-term because it permanently treats contaminated groundwater.

Alternative OU-3-GW-1 has no cost except the cost to conduct statutorily-required five-year reviews. Alternative OU-3-GW-3 has an estimated cost of approximately $1,600,000.

Mercury and Mercury-contaminated Material Appearing on the Banks and in the Riverbed of the Androscoggin River

The OU-3 River remedy would be implemented in the stretch of river defined as AR-3, that is the run of river between Sawmill Dam and Riverside Dam and adjacent to the CHP. The No Action alternative, OU-3-AR-3-1 would not comply with ARARs allowing mercury exceeding regulatory standards to remain in the river. The alternative would not include surface-water monitoring to ensure the protectiveness of Alternative OU-1-2 remedy, as well as remedial alternatives implemented for groundwater.

Alternative OU-3-AR-3-2 removes liquid elemental mercury, hardened metal amalgams, and mercury-containing debris as well as subsequent monitoring and ongoing removal of the same materials, as required from Reach AR-3. These actions would meet ARARs by removing improperly disposed hazardous materials.

Alternative OU-3-AR-3-2 involves an adaptive management process to continue and enhance removal of liquid elemental mercury, hardened metal amalgams, and mercury-containing debris from Reach AR-3 consistent with previously implemented actions taken since 1999 by NHDES, EPA, and GP in succession. Neither alternative reduces the mobility, toxicity and volume of contamination through treatment (unless for Alternative OU-3-AR-3-2 some treatment of

water generated from dewatering of the removed material is required prior to discharge of the water back to the river).

Alternative OU-3-AR-3-2 is implementable as demonstrated in previously-implemented actions by NHDES, EPA and others beginning in 1999, plus the adaptive management process commenced by GP in 2015. Alternative OU-3-AR-3-2 is also effective, both short-term and long-term, with an estimated cost of $1,200,000. The No Action alternative has no cost except the cost to conduct statutorily-required five-year reviews.

WHY EPA RECOMMENDS THIS CLEANUP PROPOSAL?

EPA recommends the cleanup measures listed above for the soils in the EFSA and SFSA, groundwater outside of the CHP Landfill. In addition, EPA recommends the continued maintenance and monitoring of the CHP Landfill containment system consisting of the existing landfill cover, retaining wall, and slurry wall. Lastly, EPA recommends the continued recovery of mercury and mercury-contaminated materials that appears on the banks and in the riverbed of the Androscoggin River.

EPA finds that a current and future unacceptable risk to human health and the environment exists for the public and environment from contaminants inside the landfill, in surrounding Site soils, and in groundwater beneath the Site.

EPA believes that the proposed alternatives presented in this Proposed Plan will meet the RAOs, protect human health and the environment and achieve the best balance among EPA's seven criteria assessed within this Proposed Plan. The final two criteria, State and community acceptance, will be considered following public comment.

Permanent, legally enforceable ICs will be required to prohibit disturbance to the CHP Landfill remedy, prohibit exposure to contaminated groundwater within the landfill compliance boundary, and prohibit residential and unrestricted uses on the Site. Temporary, legally enforceable ICs will be required to prohibit groundwater use and exposure to potential vapor unacceptable risks until groundwater quality standards are achieved in contaminated groundwater outside of the compliance boundary (in about 20 years).

There are no impacts to the community from this proposal other than the short-term unacceptable risks mentioned above, which would be controlled through Engineering Controls and best management practices. This proposal allows for the City of Berlin to move forward and develop a reuse for the Site once the soil remedy in the EFSA and SFSA is completed, the groundwater remedy is implemented, and necessary ECs and ICs are established.

NEXT STEPS

After the public comment period, EPA expects to review and evaluate all comments received on this proposal and will issue a Record of Decision (ROD) for the entire Site, including the CHP Landfill, soils, groundwater, and river. This ROD will be a written document that describes the chosen cleanup plan and includes a summary of responses to any public comments (the Responsiveness Summary). Once signed, this document will then be made available to the public on the EPA Website for the Chlor-Alkali Facility Site as well as at the Berlin Public Library at 270 Main Street. EPA will announce the final decision on the cleanup plan through the local media and via EPA's website.

WHAT IS A FORMAL COMMENT?

EPA will accept public comments during a 30-day formal comment period – June 3 through July 3, 2020. EPA considers and uses these comments to assess the public's concerns and opinions concerning its proposed cleanup approach and to potentially use the information provided to modify the proposed cleanup, if necessary, to address public concerns. EPA will hold a virtual informational meeting prior to the start of the formal Public Hearing. During the comment period, EPA can only accept written comments via mail, email, and fax. Comments may also be made orally during the formal Public Hearing, during which a stenographer will record all offered comments during the hearing. Additionally, EPA has established a dedicated voice mailbox at 617-918-1122 to receive oral comments during the comment period. EPA will not respond to your comments during the formal Public Hearing.

EPA will review the transcript of all formal comments received at the hearing, and all written comments received during the formal comment period, before making a final cleanup decision. EPA will then prepare a written response to all the formal written and oral comments received. Your formal comment will become part of the official public record. The transcript of comments and EPA's written responses will be issued in the Responsiveness Summary as part of the final cleanup decision.

FOR MORE DETAILED INFORMATION

The Administrative Record, which includes all documents that EPA has considered or relied upon in proposing this cleanup plan for groundwater at the Site, is available for public review and comment and can be found online, along with other Site information at www.epa.gov/superfund/chloralkali

SEND US YOUR COMMENTS

Provide EPA with your written comments about this Proposed Plan for the CHP Landfill, soils, groundwater, and river at the Chlor-Alkali Facility Superfund Site.

Please email (luce.darryl@epa.gov), fax (617-918-0336), leave a voice message on EPA's dedicated voicemail box at 617-918-1122, or mail comments, postmarked no later than **Thursday, July 3, 2020** to:

Darryl Luce
EPA Region New England, Mail Code 07-1
5 Post Office Square
Boston, MA 02109-3912

For any comments please state your name and place of residence or association (Town Official, etc.) prior to your comment.

ACRONYMS

AGQS	Ambient Groundwater Quality Standard
ARAR	Applicable or Relevant and Appropriate Requirement
BERA	Base-line Ecological Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CHP	Cell House Parcel, property with the landfill
COCs	Contaminants of Concern
EC	Engineering Controls such as fencing and landfill caps
EFSA	Eastern Facility Area, a 17-acre area lying east of the Site
EPA	United States Environmental Protection Agency
FS	2020 Feasibility Study
GP	Georgia-Pacific
HHRA	Human Health Risk Assessment
IC	Institutional Controls such as deed restrictions or Ordinances
ISCO	*In-Situ* Chemical Oxidation
MCL	Maximum Contaminant Level
MNA	Monitored Natural Attenuation
NCP	National Contingency Plan
NHDES	New Hampshire Department of Environmental Services
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PAH	Polyaromatic Hydrocarbons
PCB	Polychlorinated Biphenols
PRG	Preliminary Remediation Goal
RAO	Remedial Action Objective
RI	2014 Remedial Investigation
ROD	Record of Decision
SFSA	Southern Facility Study Area
SRI	Supplemental Remedial Investigation
SVOC	Semi-volatile Organic Compound
TSLERA	Screening Level Ecological Risk Assessment (Terrestrial)
VOC	Volatile Organic Compound

Table 1 Groundwater Cleanup Levels and Performance Standards

Chlor-Alkali Facility Superfund Site, Berlin, New Hampshire

A. Performance Standards for Groundwater Inside the CHP Landfill Boundary

Contaminant	Cleanup Level	Basis, Notes
Carbon tetrachloride	5 µg/L	ARAR basis, MCL and AGQS
Chloroform	70 µg/L	ARAR basis, AGQS is lower than MCL (80).
cis-1,2-Dichloroethene	70 µg/L	ARAR basis, MCL and AGQS
Hexachlorobutadiene	0.5 µg/L	ARAR basis, AGQS. No MCL.
Tetrachloroethene	5 µg/L	ARAR basis, MCL and AGQS
Trichloroethene	5 µg/L	ARAR basis, MCL and AGQS
Vinyl Chloride	2 µg/L	ARAR basis, MCL and AGQS
Mercury	2 µg/L	ARAR basis, MCL and AGQS

B. Cleanup Standards for Groundwater Outside the CHP Landfill Boundary

Contaminant	Cleanup Level	Basis, Notes
1,3-Dichlorobenzene	600 µg/L	ARAR basis, MCL and AGQS
Carbon tetrachloride	5 µg/L	ARAR basis, MCL and AGQS
cis-1,2-Dichloroethene	70 µg/L	ARAR basis, MCL and AGQS
Trichloroethene	5 µg/L	ARAR basis, MCL and AGQS

Notes:

µg/L = micrograms per liter (parts per billion).

MCL = Maximum Contaminant Level in drinking water.

MCLG = Maximum Contaminant Level Goal in drinking water.

NHDES = New Hampshire Department of Environmental Services.

ARAR = Applicable and Relevant and Appropriate Requirements.

AGQS = NHDES Ambient Groundwater Quality Standard.

Table 2 Soil/Debris Cleanup Levels

Chlor-Alkali Facility Superfund Site, Berlin, New Hampshire

Contaminant of Concern	Commercial / Industrial PRGs (mg/kg)[1]	
	OU-1 – CHP Cap Area Landfilled Soil/Debris	OU-2 – EFSA and SFSA and OU-1 Uncapped Area Soil
PCB (high risk = Aroclor 1254)2	26	10
PCDD/PCDF (TEQ)	1.17E-03	7.24E-04
Benzo(a)anthracene	307	207
Benzo(a)pyrene	31	21
Benzo(b)fluoranthene	308	211
Dibenz(a,h)anthracene	31	21
Arsenic (inorganic)	92	30
Mercury (elemental)	319	50
Mercuric Chloride and Other Salts	547	350
Lead	1,000	1,000

[1] PRGs: Preliminary Remediation Goals. (mg/kg): milligram per kilogram or parts per million.
The PRGs were developed using the RSL calculator and the Exposure Point Concentrations for all COCs for the two respective scenarios above, excepting lead.

[2] The RSL calculations incorporate potential non-carcinogenic risk and "high risk" Aroclor 1254 for PCB PRGs. The 10 mg/kg PRG for PCBs was developed using EPA's RSL calculator, consistent with procedures outlined in the Final SRI Report. The 10 mg/kg PRG is the more protective of the carcinogenic and non-carcinogenic screening levels developed via EPA RSL calculator. Attachment I of the Final SRI Report included the RSL output files.

[3] The PRG for lead is based on the Region 1, Regional Screening Level, January 2018, for Commercial and Industrial exposure with a targeted Blood Lead Level of 5 µg/dL.

Table 3a: Risk due to On-Site Soils at the Chlor-Alkali Site					
		Total Cancer Risk		Total Non-Cancer Hazard Quotient	
Area	Receptor	Surface Soil	Aggregate Soil	Surface Soil	Aggregate Soil
CHP	Adult Resident	1.3×10^{-2}	2.5×10^{-2}	126	654
	Child Resident			1023	2158
	Adult Recreational Visitor	1.1×10^{-3}	Not evaluated	34	Not evaluated
	Child Recreational Visitor	2.6×10^{-3}	Not evaluated	300	Not evaluated
	Adolescent Trespasser	7.3×10^{-4}	Not evaluated	50	Not evaluated
	Commercial/Industrial Worker	3.1×10^{-3}	4.9×10^{-3}	89	253
	Day-Care Child	5.2×10^{-3}	1.0×10^{-2}	724	1318
SFSA	Adult Resident	4.6×10^{-4}	3.3×10^{-4}	5.6	4.8
	Child Resident			22	22
	Adolescent Trespasser	2.4×10^{-5}	Not evaluated	1	Not evaluated
	Construction Worker	Not evaluated	5.2×10^{-6}	Not evaluated	3.9
	Commercial/Industrial Worker	6.7×10^{-5}	5.5×10^{-5}	2.4	2.3
	Day-Care Child	1.9×10^{-4}	1.4×10^{-4}	14	15
ESFA	Adult Resident	1.9×10^{-3}	1.8×10^{-3}	8.4	8.9
	Child Resident			59	67
	Adolescent Trespasser	1.0×10^{-4}	Not evaluated	2.9	Not evaluated
	Construction Worker	Not evaluated	1.6×10^{-5}	Not evaluated	9.5
	Commercial/Industrial Worker	2.4×10^{-4}	2.5×10^{-4}	5.3	5.9
	Day-Care Child	7.8×10^{-4}	7.5×10^{-4}	41	47
Notes: The merged Adult and Child resident represent an age-adjusted resident. Yellow highlighted cells exceed unacceptable risk levels.					

Table 3b: Risk from other Media at the Chlor-Alkali Site		
Media, Exposure and Receptor	Total Cancer Risk	Total Non-Cancer Hazard Quotient
Groundwater used as drinking water by an Age-Adjusted Resident	5.8 x 10-1	2510
Sediment exposure to an Adult Visitor	5.8 x 10-6	Less than 0.01
Sediment exposure to a Child Visitor	2.0 x 10-5	0.41
Fish consumption by an Age-Adjusted Angler	5.8 x 10-1	Not evaluated
Fish consumption by an Adult Angler	Not evaluated	126
Fish consumption by a Child Angler	Not evaluated	238
Yellow highlighting of a cell indicates an unacceptable risk in that particular media and for the noted receptor. For Fish consumption the main risk driver was PCBs that could not be directly attributed to the Site. Mercury did impart non-cancer risk, but again direct attribution was not possible as mercury concentrations in fish downstream of the site were not significantly different from those upstream of the Site.		

Table 4a Comparison of Alternatives for the Cell House Parcel Landfill and Soils in the Southern and Eastern Facility Study Areas

OU – Contaminated Media →	OU 1 CHP Landfill		OU 2 Contaminated Soils in SFSA and EFSA			
Alternative →	OU-1-1	OU-1-2	OU-2-1	OU-2-2	OU-2-3	OU-2-4
Remedial Actions →	No-Action	Continued Maintenance and Monitoring of the Landfill and ICs.	No-Action	ECs and ICs	Soil Cover and ICs	Excavation and Disposal and ICs
Evaluation Criteria						
Protects human health and the environment	No	Yes	No	Yes	Yes	Yes
Meets Federal & State requirements	No	Yes	No	Yes	Yes	Yes
Provides long-term protection	No	Yes	No	Yes	Yes	Yes
Reduces toxicity, mobility and volume through treatment	No	No	No	No	No	No
Provides short-term protection	No	Yes	No	Yes	Yes	Yes
Implementable	Yes	Yes	Yes	Yes	Yes	Yes
Capital costs	$0	$45,000	$0	$155,000	$500,000	$475,000
Operation & maintenance costs	$0	$675,000	$0	$130,000	$200,000	$85,000
Total Present Value Cost	$0	$720,000	$0	$285,000	$700,000	$560,000
State Agency acceptance	To be determined after the public comment period.		To be determined after the public comment period.			
Community acceptance	To be determined after the public comment period.		To be determined after the public comment period.			

EPA's preferred alternative for each contaminated media is highlighted in green.

Note: This table depicts a summary of the alternatives. It is not a substitute for the detailed analysis included in the Feasibility Study.
Costs are approximate values, -30% to +50%, details of cost are in the FS, Attachment D. Present Value is provided at a discount rate of 7%. No Action Alternatives do have costs associated with statutorily required five-year reviews.

Table 4b Comparison of Alternatives for Groundwater and the Androscoggin River

OU – Contaminated Media →	OU 3 Groundwater beneath the CHP Landfill		OU 3 Groundwater beneath OU 2		OU 3 Mercury in Androscoggin River, Sawmill to Riverside Dam	
Alternative →	OU-3-CHP-1	OU-3-CHP-2	OU-3-GW-1	OU-3-GW-3	OU-3-AR-3-1	OU-3-AR-3-2
Remedial Actions → / Evaluation Criteria	No-Action	Monitoring and ICs	No Action	ISCO, Monitoring, and ICs	No-Action	Continual Removal of Mercury and Mercury-Contaminated Material and Monitoring
Protects human health and the environment	No	Yes	No	Yes	Yes	Yes
Meets Federal & State requirements	No	Yes	No	Yes	No	Yes
Provides long-term protection	No	Yes	No	Yes	No	Yes
Reduces toxicity, mobility and volume through treatment	No	No	No	Yes	No	No[1]
Provides short-term protection	No	Yes	No	Yes	No	Yes
Implementable	Yes	Yes	Yes	Yes	Yes	Yes
Capital costs	$0	$55,000	$0	$1,100,000	$0	$0
Operation & maintenance costs	$0	$845,000	$0	$500,000	$0	$95,000/year for 30 years
Total Present Value Cost	$0	$900,000	$0	$1,600,000	$0	$1,200,000
State Agency acceptance	To be determined after the public comment period.		To be determined after the public comment period.		To be determined after the public comment period.	
Community acceptance	To be determined after the public comment period.		To be determined after the public comment period.		To be determined after the public comment period.	

EPA's preferred alternative for each contaminated media is highlighted in green.

Note: This table depicts a summary of the alternatives. It is not a substitute for the detailed analysis included in the Feasibility Study.

Costs are approximate values, -30% to +50%, details of cost are in the FS, Attachment D. Present Value is provided at a discount rate of 7%. No Action Alternatives do have costs associated with statutorily required five-year reviews.

1 There may be limited treatment of any water generated from the removal work that requires treatment prior to discharge back to the River.