



®

**Feasibility Study
Balance of Plant and Groundwater Operable Units
Niagara Falls Storage Site
Lewiston, NY**

**U.S. Army Corps of Engineers
Buffalo District
October 2019**

Building Strong ®

Formerly Utilized Sites Remedial Action Program

The Formerly Utilized Sites Remedial Action Program (FUSRAP) was initiated in 1974 to identify, investigate, and if necessary, clean up or control sites throughout the United States that were contaminated by activities related to the nation's early atomic energy program. Congress transferred execution of FUSRAP from the U.S. Department of Energy to the U.S. Army Corps of Engineers in 1997. When implementing FUSRAP, the Corps of Engineers follows the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan.

Site Description and History

The Niagara Falls Storage Site (NFSS) is a 191-acre federal property located in Lewiston, New York. The Manhattan Engineer District and Atomic Energy Commission brought radioactive materials to the site during the 1940s and 1950s. During the 1980s, the Department of Energy consolidated these materials into the Interim Waste Containment Structure (IWCS), a 10-acre structure in the southwest portion of the site (Figure 1).



Figure 1: NFSS Interim Waste Containment Structure

Materials stored in the IWCS are uranium ore processing residues or byproduct material. They include the K-65 residues that contain high concentrations of radium-226, which is the main contaminant associated with uranium ore processing residues. Radium-226 undergoes radioactive decay to produce radon gas. The IWCS was engineered to inhibit radon gas emissions (notably radon-222), infiltration of precipitation, and contaminant migration to groundwater.

To manage CERCLA activities at the NFSS, the Corps of Engineers established three operable units (OUs) for the site: IWCS, Balance of Plant, and Groundwater. The IWCS OU applies to all of the material within the IWCS; the Balance of Plant OU includes all of

the material at the NFSS not in the IWCS (soils, buildings and building foundations, utilities, roads, and roadbeds); and the Groundwater OU refers to groundwater contamination remaining after implementation of the selected remedial action for the IWCS.

Nature and Extent of Contamination

Based on the information gathered from numerous investigations, monitoring events, and studies of the site, the following media in the Balance of Plant OU are impacted: soil, road bedding, Building 433, building foundations, groundwater, and utilities (former Building 401 drain system).

In 2007, the Corps of Engineers completed a remedial investigation report, which included a baseline risk assessment. In the baseline risk assessment, the 191-acre NFSS was divided into smaller areas for purposes of quantifying exposures to human receptors, because a work place or residence typically encompasses a much smaller area. The areas are termed exposure units (EUs), and are assumed to represent parcels of land in which a person might live, work, or recreate. Seventeen on-site EUs are evaluated in this human health risk assessment. EUs 1-16 are subsections of the NFSS while EU 17 represents a site-wide unit. EU 18 refers to the off-site areas where background samples were collected. These EUs provided the geographical framework for the determination of site-related constituents which are defined as those compounds that exceed background screening levels in their respective EUs. Additional investigations and risk evaluations were performed to support this feasibility study, which refined the conclusions of the baseline risk assessment for purposes of developing remedial alternatives. The risk evaluations supported identification of constituents and radionuclides of concern and associated preliminary remediation goals for the feasibility study.

A groundwater fate and transport modeling report was released with the remedial investigation report. The three-dimensional model predicted the migration of contaminants originating from the NFSS. The model was updated in 2011 and in 2016 to incorporate newly collected groundwater data. The NFSS and surrounding vicinity are underlain by two water-bearing zones within 50 feet of the ground surface; these are separated by an aquitard, or confining unit. The two water-bearing zones are known as the upper water-bearing zone and the lower water-bearing zone. Both water-bearing zones exhibit significant concentrations of naturally occurring total dissolved solids that indicate the NFSS groundwater is a New York State Class GSA water resource (saline groundwater). Groundwater resources underlying the NFSS reflect the U.S. Environmental Protection Agency (EPA) Class IIIB criteria for nonpotable and limited beneficial use water (U.S. EPA 1986). To be a potable water source, groundwater at the NFSS would require expensive and energy intensive treatment by reverse osmosis (desalination). Since there is a replaceable surface water source via the Niagara River/Lake Ontario and groundwater south of the site (Lockport Formation), it is

reasonable to assume that no municipality or service would find NFSS groundwater economically viable.

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The reasonable future land use for the site is industrial. This was determined based on the current zoning of NFSS (light industrial) and the presence of adjacent municipal and hazardous waste landfills. Under industrial use, the construction worker was selected as the group of individuals reasonably expected to receive the greatest exposure to residual contamination. The refined risk assessment estimated the potential exposure and dose to the construction worker from the impacted media. From this determination, radionuclides of concern and chemicals of concern were identified. These are discussed below in conjunction with the preliminary remediation goals.

The feasibility study identifies potential remedial technologies and process options and screens those alternatives to identify those that could achieve the cleanup goals for radionuclides and chemicals of concern developed to be protective of potential construction workers for the Balance of Plant and Groundwater OUs. Remedial action objectives, applicable or relevant and appropriate requirements, and preliminary remedial action goals are established before alternatives are developed.

Remedial Action Objectives

Remedial action objectives consist of media-specific goals for protecting human health and the environment. The goals take into consideration contaminants and media of interest, exposure pathways, and associated risk to human health or ecological receptors based on an industrial future land use for the site. The remedial action objectives for the Balance of Plant and Groundwater OUs are as follows:

- Prevent unacceptable exposure of the construction worker to hazardous site-related constituents of concern via incidental ingestion, inhalation, dermal contact (for chemicals of concern) and external gamma (for radionuclides of concern) present within the Balance of Plant soils, road bedding, buildings/foundations, and utilities by reducing/removing contaminant concentrations to applicable or relevant and appropriate requirement-based remediation goals.
- Prevent unacceptable exposure of the construction worker to chlorinated volatile organic compounds present within the groundwater by reducing/removing contaminant concentrations to risk-based remediation goals.

Applicable or Relevant and Appropriate Requirements

CERCLA requires that any action taken be protective of human health and the environment and comply with applicable or relevant and appropriate requirements. The

applicable or relevant and appropriate requirements for the Balance of Plant OU are listed on the next page.

- Title 10 Code of Federal Regulations Part 40 Appendix A, Criterion 6(6) is considered relevant and appropriate for radionuclides in Balance of Plant soil, Manhattan Engineer District-impacted road bedding, and building foundations. 10 Code of Federal Regulation Part 40, Appendix A, Criterion 6(6) is used as an applicable or relevant and appropriate requirement to for radium cleanup criteria and to derive cleanup goals for nonradium radionuclides, particularly uranium and thorium.
- The Toxic Substances Control Act, codified under Title 40 Code of Federal Regulation 761, is considered applicable for polychlorinated biphenyls in building foundations, and relevant and appropriate for polychlorinated biphenyls in utility sediments.
- Title 6 New York Codes, Rules, and Regulations Part 375-6.8(b) for restricted industrial use, is relevant and appropriate for polycyclic aromatic hydrocarbons in Balance of Plant soil.

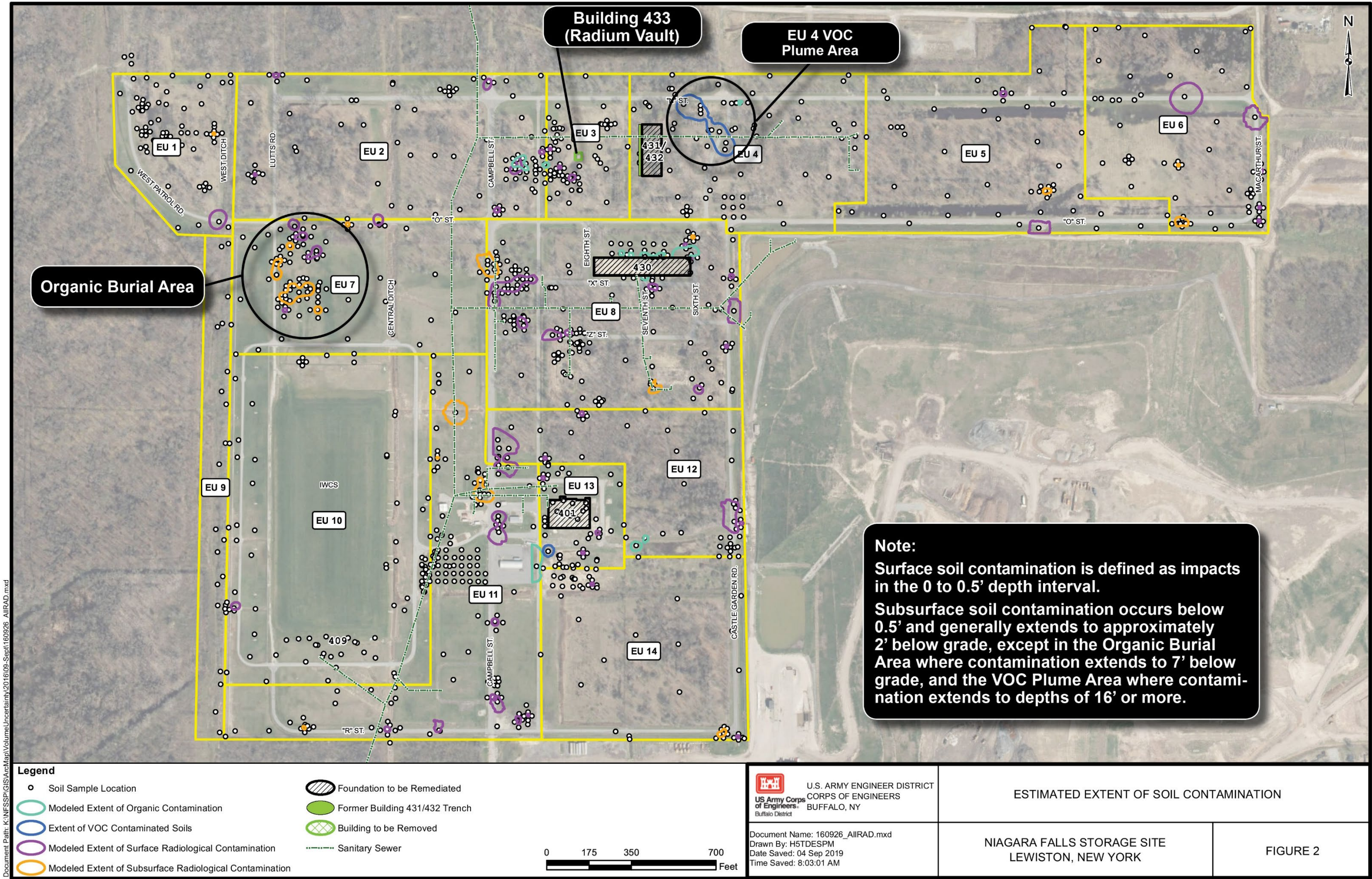
Preliminary Remediation Goals

Preliminary remediation goals are contaminant concentration goals for various media (e.g., soil, groundwater) that are considered protective to human health and the environment for a site's anticipated future land use. The preliminary remediation goals comply with all applicable or relevant and appropriate requirements and serve as a target during the initial development, analysis, and selection of cleanup alternatives.

Eight radionuclides of concern were identified for the construction worker in soil, Building 433, road bedding, utility sediment, and building foundations. Preliminary remediation goals were developed for three of these radionuclides, including uranium-238, thorium-230, and radium-226, since these goals account for the presence of the other five.

Chemical constituents of concern for the construction worker are chlorinated volatile organic compounds, in EU 4 (soil and groundwater) and in EU 13 (soil). Some polychlorinated biphenyl impacts were found in pipeline sediments and water in Building 401 drains and in the concrete foundation of Building 401. Surface and near surface soil and building foundations impacted with polycyclic aromatic hydrocarbons were identified in several EUs. Please see Figure 2 on Page 5.

The Corps of Engineers calculated site-specific risk-based cleanup criteria for polychlorinated biphenyls in utility water in former Building 401 drains and chlorinated volatile organic compounds in soil and groundwater in EU 4 and in soil in EU 13.



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Summary of Feasibility Study Remedial Alternatives

Five remedial alternatives were retained for detailed evaluation in the feasibility study for the Balance of Plant and Groundwater OUs. The remedial alternatives include:

Alternative 1 – No action (required for comparison purposes, but not protective)

Alternative 1 includes no remedial actions for the Balance of Plant and Groundwater OUs. The no action alternative provides a baseline against which to compare other remedial alternatives and is required by CERCLA guidance. This alternative assumes that no additional remedial actions would be implemented – the site would be left as is and the baseline maximum potential exposure would be compatible with industrial use. Site security (i.e., fencing) would be left in place, but would not be maintained. Continued routine monitoring of air, groundwater, surface water and sediment would not be performed.

Alternative 2 – Complete Removal

Alternative 2 consists of excavating all impacted soil and other media that exceeds the feasibility study preliminary remediation goals for industrial land use and disposing the materials off-site. This includes the excavation and removal of radionuclide of concern/polycyclic aromatic hydrocarbon-contaminated soil, volatile organic compound-contaminated soil, radionuclide of concern contaminated roadbedding, contaminated building foundations, and the Building 401 foundation and drains. Volatile organic compound-contaminated groundwater in EU 4 would be removed via dewatering during the excavation of the impacted soil from that area. Amendments would be added to the EU 4 volatile organic compound excavation area prior to backfilling to enhance the degradation of residual, dissolved-phase impacts. Following removal of all materials exceeding the feasibility study preliminary remediation goals, the excavated areas would be backfilled, the site would be restored, and would be suitable for industrial land use. Five-year reviews would be required to ensure the protectiveness of the remedy.

Alternative 3 – Removal with Building Decontamination

Alternative 3 consists of excavating all impacted soil at the site that exceeds the feasibility study preliminary remediation goals and disposing of the materials off-site. This includes the excavation and removal of radionuclide of concern/polycyclic aromatic hydrocarbon-contaminated soil and volatile organic compound-contaminated soil and radionuclide of concern roadbedding. Volatile organic compound-contaminated groundwater in EU 4 would be removed via dewatering during the excavation of the impacted soil from that area. Amendments would be added to the EU 4 volatile organic compound excavation area prior to backfilling to enhance the degradation of residual, dissolved-phase impacts. Following the removal of all soil exceeding the feasibility study preliminary remediation goals, the excavated areas would be backfilled and the site

would be restored. The Building 430, 431/432, and 433 foundations would be left in place, but would be decontaminated to remove the risk associated with these media. The Building 401 foundation and drains would be removed. Five-year reviews would be required to ensure the protectiveness of the remedy.

Alternative 4 – Removal with Building Decontamination and In Situ Remediation

Alternative 4 consists of excavating soil and materials impacted by radionuclides of concern, polycyclic aromatic hydrocarbons, and EU 13 volatile organic compounds (excludes the EU 4 volatile organic compound plume soil) that exceed the feasibility study preliminary remediation goals, and disposing the materials off-site. Following the removal of all radionuclide of concern, polycyclic aromatic hydrocarbon and EU 13 volatile organic compound contaminated soil and materials exceeding the feasibility study preliminary remediation goals, the excavated areas would be backfilled and the site would be restored. Volatile organic compound plume contaminated soil and groundwater in EU 4 would be treated via *in situ* thermal treatment methods. The Building 430, 431/432, and 433 foundations would be left in place, but would be decontaminated to remove the risk associated with these media. The Building 401 foundation and drains would be removed. Five-year reviews would be required to ensure the protectiveness of the remedy.

Alternative 5 – Removal with Building Decontamination and Ex Situ Remediation

Alternative 5 consists of excavating radionuclide of concern, polycyclic aromatic hydrocarbon, and EU 13 volatile organic compound-impacted materials and soil that exceed the feasibility study preliminary remediation goals and disposing the materials off-site. Following removal, the excavated areas would be backfilled with clean fill and the site restored. The volatile organic compound impacted soil and groundwater plume in EU 4 that contain contamination above the feasibility study preliminary remediation goals would be excavated and treated via *ex situ* thermal treatment methods. Amendments would be added to the EU 4 volatile organic compound excavation area prior to backfilling to enhance the degradation of residual, dissolved-phase impacts. A final step in the thermal treatment process would be destruction of the volatile organic compounds collected in the treatment system off-gasses. Following successful treatment, the soil would remain on-site. Groundwater would not be treated on-site, but taken off-site for treatment and disposal. The Building 430, 431/432, and 433 foundations would be left in place, but would be decontaminated to remove the risk associated with these media. The Building 401 foundation and drains would be removed. Five-year reviews would be required to ensure the protectiveness of the remedy.

In accordance with the National Oil and Hazardous Substances Pollution Contingency Plan, the remedial alternatives developed in the feasibility study are evaluated against nine CERCLA evaluation criteria. The first two criteria, overall protection of human health and the environment and compliance with applicable or relevant and appropriate

requirements, are threshold criteria that must be met. The next five criteria, long-term effectiveness and permanence, short-term effectiveness, reduction of toxicity, mobility or volume through treatment, implementability, and cost, are considered balancing criteria that must be addressed.

To provide the rationale for eventual remedy selection, each remedial alternative is screened against the seven CERCLA evaluation criteria. Details of the screening analyses are presented in the feasibility study. The feasibility study comparative analysis table is provided on the next page.

Next Step

Now that the feasibility study for the two OUs is complete, the next step in the process will be to prepare a proposed plan, which will contain the Corps of Engineers preferred alternative for the OUs. The preferred alternative will be chosen from one of the alternatives evaluated in the feasibility study. The proposed plan is currently scheduled to be released for public comment in 2021. The remaining two CERCLA evaluation criteria, state and community acceptance, will be based on comments received on the proposed plan, and will be addressed in the record of decision.

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Comparative Analysis of Alternatives

CERCLA Evaluation Criterion	Alternative 1 – No Action	Alternative 2 – Complete Removal	Alternative 3 – Removal with Building Decontamination	Alternative 4 – Removal with Building Decontamination and <i>In Situ</i> Remediation	Alternative 5 – Removal with Building Decontamination and <i>Ex Situ</i> Remediation
Overall protection of human health and the environment	No	Yes	Yes	Yes	Yes
Compliance with ARARs	No	Yes	Yes	Yes	Yes
Long-term effectiveness and permanence	Low	High	High	High	High
Reduction of toxicity, mobility, or volume through treatment	Low	Low	Low	Moderate	Moderate
Short-term effectiveness	High	Low	Low	Low	Low
Implementability	Low	High	High	Moderate	Moderate
Cost (capital)	Zero cost	\$23,814,326	\$17,557,536	\$17,180,164	\$19,784,859
Cost (O&M discounted)	Zero cost	\$414,153	\$414,153	\$414,153	\$414,153
Contingency costs	Zero cost	\$11,440,418	\$6,564,779	\$5,320,836	\$7,066,521
Total Cost	Zero cost	\$35,668,897	\$24,536,468	\$22,915,153	\$27,265,533

ARAR = applicable or relevant and appropriate requirement
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
O&M = operation and maintenance

Administrative Record File

The administrative record file for the NFSS contains CERCLA-related documentation used in the decision making process for the site. Reports and documents in the administrative record file are available electronically at the following locations:

Town of Lewiston Public Library
305 South 8th Street
Lewiston, NY 14092

Youngstown Free Library
240 Lockport Street
Youngstown, NY 14174

Ransomville Free Library
3733 Ransomville Road
Ransomville, New York 14131

By appointment only Phone: 800-833-6390 (Option 4)
U.S. Army Corps of Engineers
1776 Niagara Street
Buffalo, NY 14207

The feasibility study is available in the reports section of the Buffalo District website listed below.

**U.S. ARMY CORPS OF ENGINEERS – BUFFALO DISTRICT
ENVIRONMENTAL PROJECT MANAGEMENT TEAM**

1776 NIAGARA STREET, BUFFALO, NEW YORK 14207

Phone: 800-833-6390 (Option 4)

Email: fusrap@usace.army.mil

Website: <https://www.lrb.usace.army.mil/Missions/HTRW/FUSRAP/Niagara-Falls-Storage-Site/>

