RECORD OF DECISION AMENDMENT

CAPE FEAR WOOD PRESERVING SUPERFUND SITE

FAYETTEVILLE, CUMBERLAND COUNTY, NORTH CAROLINA
EPA ID: NCD003188828

PREPARED BY:
U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 4
SUPERFUND & EMERGENCY MANAGEMENT DIVISION
ATLANTA, GEORGIA

RECORD OF DECISION

TABLE OF CONTENTS

PART 1: DECLARATION 1
1.0 Site Name and Location 1
2.0 Statement of Basis and Purpose 1
3.0 Assessment of the Site 1
4.0 Description of the Amended Remedy 2
5.0 Statutory Determinations 2
6.0 Data Certification Checklist 3
7.0 Authorizing Signature 3

PART 2: THE DECISION SUMMARY 4
1.0 Site Name, Location, and Brief Description 4
2.0 Site History and Enforcement Activities 4
2.1 Site Activities Leading to Current Problems 4
2.2 History of Investigations and Cleanup Actions 5
2.3 History of CERCLA Enforcement Activities 7
3.0 Community Participation 7
4.0 Scope and Role of the Response Action 8
5.0 Site Characteristics 8
5.1 Conceptual Site Model 8
5.2 Overview of the Site 9
5.2.1 Geologic, Hydrogeologic, and Topographic Information 9
5.3 Sampling Strategy 10
5.4 Known or Suspected Sources of Contamination 10
5.5 Nature and Extent of Contamination 10
5.5.1 Quantity/Volume of Waste that Needs to Be Addressed 12
5.5.2 Concentrations of COCs in Each Medium 12
5.5.3 RCRA Hazardous Wastes and Affected Media 12
6.0 Current and Potential Future Land Uses 13
7.0 Summary of Site Risks 13
7.1 Human Health Risk Assessment 13
7.2 Ecological Risk Assessment 14
7.3 Basis for Action 14
8.0 Remedial Action Objectives (RAOs) 14

9.0 Description of Alternatives 16
9.1 No Action 19
9.2 Alternative 1: Barrier Wall and Cap, followed by Enhanced In-Situ Bioremediation and MNA 20
9.3 Alternative 2: In-Situ Solidification/Stabilization and Cap, followed by Enhanced In-Situ Bioremediation and MNA 21
9.4 Alternative 3: In-Situ Thermal Remediation for the Main Source Area, In-Situ Solidification/ Stabilization and Cap, followed by Enhanced In-Situ Bioremediation and MNA 22
9.5 Alternative 4: In-Situ Smoldering (STAR™) Process for the Main Source Area, In-Situ Solidification/Stabilization and Cap, followed by Enhanced In-Situ Bioremediation and MNA 23
10.0 Comparative Analysis of Alternatives 24
10.1 Overall Protection of Human Health and the Environment 24
10.2 Compliance with ARARs 25
10.3 Long-Term Effectiveness and Permanence 26
10.4 Reduction of Toxicity, Mobility, and Volume 27
10.5 Short-Term Effectiveness 28
10.6 Implementability 28
10.7 Cost 29
10.8 State Acceptance 30
10.9 Community Acceptance 30
11.0 Principal Threat Waste 30
12.0 Amended Remedy 31
12.1 Detailed Description of the Amended Remedy 32
12.2 Summary of the Rationale for the Amended Remedy 33
12.3 Cost Estimate for the Amended Remedy 34
12.4 Estimated Outcomes of the Amended Remedy 34
13.0 Statutory Determinations 35
13.1 Protection of Human Health and the Environment 35
13.2 Compliance with ARARs 36
13.3 Cost Effectiveness 36
13.4 Use of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable 36
13.5 Preference for Treatment as a Principal Element 37
13.6 Five-Year Review Requirements 37
13.7 Documentation of Significant Changes 37
14.0 References 38

PART 3: RESPONSIVENESS SUMMARY 40
1.0 Public Review Process 40
1.1 Introduction 40
1.2 Public Review Process 40
1.3 Public Comment Period, Public Meeting, and Availability Sessions 40
1.4 Receipt and Identification of Comments 41
2.0 References 42

APPENDIX A: FIGURES **A-1**
APPENDIX B: TABLES **B-1**
APPENDIX C: STATE OF NORTH CAROLINA CONCURRENCE **C-1**

FIGURES

Figure 1: Site Location A-2
Figure 2: Site Layout A-3
Figure 3: Aerial Photographs, 1999 and 2021 ..... A-4
Figure 4: Contaminated Media Zone Designations A-5
Figure 5: Selected Amended Remedy A-6

TABLES

Table 1: Groundwater Cleanup Levels 16
Table 2: Costs 30
Table 3: Comparison of 2001 ROD Amendment Groundwater Remedy and 2022 Groundwater Amended Remedy 33
Table 4: Estimated Costs for Amended Remedy 34
Table B-1: Groundwater Analytical Data – New Wells Cape Fear Wood Preserving Superfund Site, Fayetteville, North Carolina, from 2017 Focused Feasibility Study Report B-1
Table B-2: Chemical-specific ARARs/TBCs for the Cape Fear Wood Preserving Superfund Site, Fayetteville, Cumberland County, North Carolina B-3
Table B-3: Location-specific ARARs/TBCs for the Cape Fear Wood Preserving Superfund Site, Fayetteville, Cumberland County, North Carolina B-5
Table B-4: Action-specific ARARs/TBCs for the Cape Fear Wood Preserving Superfund Site, Fayetteville, Cumberland County, North Carolina B-15

ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirement
ATSDR	Agency for Toxic Substance Control and Disease Registry
CCA	Chromated Copper Arsenate
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Chemical of Concern
CSM	Conceptual Site Model
CWA	Clean Water Act
DNAPL	Dense Non-Aqueous Phase Liquid
DO	Dissolved Oxygen
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
FBM	Flood Boundary Map
FIS	Flood Insurance Study
FS	Feasibility Study
HI	Hazard Index
HMTA	Hazardous Material Transportation Act
IMAC	Interim Maximum Allowable Concentration
ISS	In-situ Solidification/Stabilization
LDR	Land Disposal Restrictions
MCL	Maximum Contaminant Level
mg/L	Milligrams per Liter
MNA	Monitored Natural Attenuation
mV	Millivolts
µg/L	Micrograms per Liter
NC DHHS	North Carolina Department of Health and Human Services
NCAC	North Carolina Administrative Code
NCDEQ	North Carolina Department of Environmental Quality
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	Operation and Maintenance
ORP	Oxidation/Reduction Potential
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
PAH	Polycyclic Aromatic Hydrocarbon
POTW	Publicly Owned Treatment Works
PRG	Preliminary Remediation Goal
PRP	Potentially Responsible Party
PTW	Principal Threat Waste
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation

ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SVOC	Semi-volatile Organic Compound
TarGOST®	Tar-specific Green Optical Screening Tool
TBC	To Be Considered
VOC	Volatile Organic Compound
WWTU	Wastewater Treatment Unit

PART 1: DECLARATION

1.0 Site Name and Location

Cape Fear Wood Preserving Superfund Site
1219 South Reilly Road, Fayetteville, Cumberland County, North Carolina
Superfund Site Identification Number NCD003188828

2.0 Statement of Basis and Purpose

This Record of Decision (ROD) Amendment presents the amended remedy to fundamentally change the groundwater remedy for the Cape Fear Wood Preserving Superfund site (Site) in Fayetteville, North Carolina (Figure 1). The U.S. Environmental Protection Agency chose the Amended Remedy (Alternative 2: In-Situ Solidification/Stabilization and Cap, followed by Enhanced In-Situ Bioremediation and Monitored Natural Attenuation [MNA]) in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), as set forth in 40 Code of Federal Regulations (CFR) Section 300.430(f)(2). This decision is based on the Administrative Record file for the Site.

The scope of the Amended Remedy addresses contaminated groundwater and subsurface dense non-aqueous phase liquid (DNAPL), which is from historical releases during wood treatment processes and is a continuing source of groundwater contamination. The Amended Remedy is a change to the groundwater remedy originally selected in the Site's June 30, 1989 Record of Decision (ROD), as modified by three Explanations of Significant Differences (ESDs) (September 24, 1991, August 14, 1995 and May 31, 1996) and by a March 23, 2001 ROD Amendment. The EPA has determined that the existing remedy of groundwater recovery and treatment has not been able to efficiently remove, treat, or contain the mobile and residual DNAPL present in the subsurface. EPA determined that the original remedy will not be able to restore groundwater at the Site to its beneficial use as a potential drinking water source and attain cleanup levels throughout the plume in a reasonable timeframe.

The EPA is the lead agency for site activities. The North Carolina Department of Environmental Quality (NCDEQ) is the support agency. In accordance with 40 CFR Section 300.430(f)(2), NCDEQ provided input during the remedial investigation (RI) and feasibility study (FS) and the remedy selection process. The State of North Carolina concurs with the Amended Remedy presented in this ROD (see Appendix B).

All provisions of the 1989 ROD, the 2001 ROD Amendment, and the three ESDs not inconsistent with this ROD Amendment remain in full force and in effect.

3.0 Assessment of the Site

The response action selected in this ROD Amendment is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances to the environment. Groundwater, at the Site, is classified by NCDEQ as a potential or existing source of drinking water. It is contaminated with chemical concentrations above federal Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs) and state groundwater standards in 15 North Carolina Administrative Code (NCAC) 02L .0202 Groundwater Quality Standards. A fundamental change to the groundwater remedy is warranted to address unacceptable risk to future residents from exposure to chemicals of concern (COCs) in groundwater, to

address residual DNAPL that is a continuing source, and to restore groundwater to its beneficial use as a drinking water source.

Previous remedial actions at the Site removed hazardous materials and physical hazards from the surface of the Site and addressed soil/sediment contamination above the water table. These actions were completed by 1999.

4.0 Description of the Amended Remedy

This ROD Amendment modifies the groundwater remedy from groundwater recovery and treatment to in-situ solidification/stabilization of DNAPL and DNAPL-impacted subsurface soil, and installation of a cap over source areas, followed by enhanced in-situ bioremediation and MNA for dissolved-phase groundwater contamination outside the treatment/capped areas.

The Amended Remedy will address principal threat waste in the form of mobile DNAPL and residual DNAPL in saturated soil by reducing the mobility of the contaminants using in-situ solidification/ stabilization (ISS) treatment. The Amended Remedy is a combination of alternatives evaluated in the March 2017 Focused Feasibility Study, Revision 1, Cape Fear Wood Preserving Superfund Site, Fayetteville, Cumberland County, North Carolina, and presented in the August 2022 Proposed Plan.

The primary components of the Amended Remedy include:

- In-situ solidification/stabilization treatment of DNAPL in the Main Source Area and Secondary Source Area.
- Construction of a composite cap over the treated areas that complies with Resource Conservation and Recovery Act (RCRA) applicable or relevant and appropriate requirements (ARARs).
- Installation of grout walls perpendicular to the railroad to alleviate the need for track replacement.
- Enhanced in-situ bioremediation: injection of oxygen into the aquifer via underground injection wells, to enhance the rate of natural degradation of contaminants in groundwater.
- Long-term cap maintenance and groundwater monitoring.
- Implementation of institutional controls to prevent well installation and use of contaminated groundwater, to provide increased public awareness, and to restrict disturbance of in-situ treated waste that remains at the Site and interference with other remedy components.

5.0 Statutory Determinations

The Amended Remedy meets the requirements for remedial actions set forth in Section 121 of CERCLA, 42 U.S.C. § 9621, and the NCP at 40 CFR § 300.430(f)(1)(ii) because it: 1) is protective of human health and the environment; 2) meets a level or standard of control of hazardous substances, pollutants, and contaminants which at least attains the legally applicable or relevant and appropriate requirements under federal and state laws or justifies invoking a waiver; 3) is cost effective; 4) utilizes permanent solutions and alternative treatments (or resource recovery) technologies to the maximum extent practicable; and
(5) satisfies the statutory preference for treatment as a principal element to the extent practicable. Because this remedy will result in hazardous substances, pollutants, or contaminants remaining above levels that allow for unlimited use and unrestricted exposure, pursuant to CERCLA 121(c) five-year reviews will be required for this remedial action to ensure that the remedy is, or will be, protective of human health and
the environment.

6.0 Data Certification Checklist

The following information is included in the Decision Summary section of this ROD Amendment. More information can be found in the Site's Administrative Record file.

- COCs and their respective concentrations (Section 5).
- Baseline risk represented by the COCs (Section 7).
- Cleanup levels established for COCs and the basis for these levels (Section 8).
- How source materials constituting principal threats will be addressed (Section 11).
- Current and reasonably anticipated future land and groundwater use assumptions (Section 6).
- Potential future land and groundwater use that will be possible at the Site as a result of the Amended Remedy (Section 6).
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (Section 10).
- Key factors that led to selecting the remedy (i.e., describe how the Amended Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision) (Section 12).

7.0 Authorizing Signature

CAROL MONELL

Digitally signed by CAROL MONELL
Date: 2022.09.22 14:46:56 -04'00'

_____ _____

Carol J. Monell, Director — Date
Superfund & Emergency Management Division
U.S. Environmental Protection Agency, Region 4

PART 2: THE DECISION SUMMARY

1.0 Site Name, Location, and Brief Description

The Cape Fear Wood Preserving Superfund Site is located at 1219 South Reilly Road in the city of Fayetteville in Cumberland County, North Carolina (EPA ID: NCD003188828). The Site's coordinates are 35° 02' 57" north latitude and 79° 01' 17" west longitude. Figure 1 shows the location of the Site.

Wood treatment operations took place at the Site from 1953 to 1983. The Site covers 41 acres. The former wood treatment facility developed less than 10 of these acres. The rest of the Site is heavily wooded with pine trees. A single one-story building that housed a groundwater treatment system remains on site.
A chain-link and barbed-wire fence surrounds the entire 41-acre site property. A railroad right of way for the Aberdeen and Rockfish Railroad is located between the northwest perimeter fence and South Reilly Road.
A small manmade ditch along the southern part of the Site extends east to the former location of the diked pond.
A small swampy area is northeast of the developed area of the Site. Figure 2 shows the layout of the Site.

The EPA is the lead agency for site activities. NCDEQ is the support agency. Cleanup of the Site is funded with Superfund monies. The EPA originally selected a site remedy in the Site's 1989 ROD, as modified by three ESDs issued in 1991, 1995 and 1996, and by a 2001 ROD Amendment. The Agency has determined that the groundwater recovery and treatment remedy selected in the 1989 ROD, as modified by the 2001 ROD Amendment and three ESDs, has not been able to efficiently remove, treat, or contain the mobile and residual DNAPL present in the subsurface. The EPA has determined that the original remedy will not be able to restore groundwater at the Site to its beneficial use as a potential drinking water source and attain cleanup levels throughout the plume in a reasonable timeframe.

2.0 Site History and Enforcement Activities

2.1 Site Activities Leading to Current Problems

The facility produced creosote-treated wood from 1953 to 1978, and later treated wood using the chromated copper arsenate (CCA) process. The treatment processes generated liquid and sludge wastes. Operations included disposal of the wastes in a concrete sump, an on-site drainage ditch, and an on-site pond and lagoon. Stormwater runoff from the treatment yard also drained into an on-site ditch.

Coal tar and coal tar creosote contamination was discovered at the Site in 1977. Under direction of state authorities, the owner/operator changed operations to limit further releases, installed a new potable water well for a neighbor west of the Site, and removed 900 cubic yards of creosote-contaminated soil from the treatment yard and the on-site ditch.

Between 1979 and 1980, site operators installed a new closed-circuit CCA plant and decommissioned the old creosote and CCA facilities. The new CCA plant was regulated under RCRA, as amended, as a small quantity hazardous waste generator until 1983, at which time the company went out of business. The Site was abandoned until summer 1988, when Seco Investments, Inc. purchased the property. Seco Investments, Inc. remains the owner of record. The Site's 1989 ROD provides a detailed description of the Site's history. Figure 3 includes aerial photographs of the Site from 1999 and 2021.

2.2 History of Investigations and Cleanup Actions

In October 1984, the EPA conducted a site investigation that included sampling of surface water, groundwater, soil, and sediment from the northeast swamp, the diked pond, the lagoon, the drainage ditch, and a potable well west of the Site. Site-related contaminants, such as polycyclic aromatic hydrocarbons (PAHs), arsenic, chromium, and copper, were detected in the samples. To address immediate risks to human health and the environment, EPA led an emergency removal action at the Site in January and February 1985. It included removal of sludge from the sump; removal of sludge from the lagoon to a depth of 7 feet and solidification of the sludge with fly ash; soil removal from the drainage ditch along the railroad tracks, at a culvert near Reilly Road, and from stained areas in the treatment yard; backfilling of excavations with clean, sandy soil; and characterization, transportation, and disposal of soil and sludges at an off-site permitted RCRA Subtitle C hazardous waste landfill.

The NUS Corporation conducted a site investigation in May and October 1985. It confirmed PAHs and metals in soil, sediment, surface water, and groundwater. In September 1986, site visits found that vandals had shot holes in a 3,000-gallon creosote storage tank. This caused a spill of about 500 gallons of creosote. The EPA led a second emergency removal action and removed creosote-contaminated sludge, the leaking creosote storage tank, and contaminated surface soil, and constructed a recovery dike.

The EPA proposed listing the Site on the Superfund program's National Priorities List (NPL) in June 1986. The EPA finalized the Site's listing on the NPL in July 1987.

In the late 1980s, the EPA conducted the Site's RI/FS. Volatile organic compounds (VOCs), including benzene, were found in site media in addition to the known contaminants (PAHs and metals). Benzene contamination was thought to be attributed to a former underground gasoline storage tank located in the southern processing area.

The EPA selected the Site's remedy in a 1989 ROD. It addressed cleanup of contaminated soil, sediment, surface water and groundwater.

The remedial action objectives (RAOs) in the 1989 ROD were:

- To protect the public health and the environment from exposure to contaminated on-site soils through inhalation, direct contact, and erosion of soils into surface waters and wetlands.
- To prevent off-site movement of contaminated groundwater.
- To restore contaminated groundwater to levels protective of human health and the environment.

The EPA issued ESDs in 1991, 1995 and 1996, and a ROD Amendment in 2001. None of those subsequent decision documents modified the RAOs from the 1989 ROD.

Major components of the remedy selected in the 1989 ROD included:

- Off-site disposal of all on-site wastes.
- Decontamination and demolition of all structures, with off-site disposal of debris.

- Excavation and on-site treatment of contaminated surface and subsurface soils and sediment via soil washing (or, alternately, low-temperature treatment followed by soil washing or soil fixation/solidification/stabilization), with placement of treated soils back in the excavated areas.
- Groundwater extraction and treatment.

The 1991 ESD changed the 1989 remedy by selecting soil washing over low-temperature treatment as the primary treatment technology to address soil contamination. It also acknowledged, the potential need to solidify some soil using a cement/ash mixture to address the elevated concentrations of the metals, arsenic, and chromium. It also modified parts of the groundwater remedy, specifying the type of groundwater treatment and selecting Bones Creek as the discharge point for treated water. The EPA issued a second ESD in 1995. It allowed for limited on-site discharge of treated water. The Agency issued a third ESD in 1996. It eliminated a step in the soil washing process and changed the discharge point for treated water from Bones Creek to the local publicly owned treatment works (sewer system).

The EPA issued a ROD Amendment in 2001 to change the groundwater component of the remedy. The amended groundwater remedy included hydraulic containment and treatment of the shallow and intermediate surficial aquifers with a groundwater recovery and treatment system. The 2001 ROD Amendment made the following changes to the groundwater remedy. It:

- Changed the planned discharge of treated groundwater back to on-site discharge, rather than discharge to the city sewer system.
- Added air sparging wells to enhance benzene removal and bioremediation.
- Added enhanced in-situ bioremediation.
- Specified MNA of the deeper aquifer.
- Revised groundwater performance standards to reflect current North Carolina groundwater standards.

The EPA implemented the remedy described in 1989 ROD, the 1991 ROD Amendment, and the three ESDs from 1995 to 2001. The EPA divided the cleanup into four phases:

- Phase I, completed in 1995, focused on removing hazardous materials and physical hazards from the surface of the Site.
- Phase II, completed in 1996, addressed contaminated soils under an active railroad along the western boundary of the Site. The work included temporary relocation of the railroad track and restoration of the track following the remediation.
- Phase III addressed surface and shallow subsurface soil contamination (soil above the water table). The EPA excavated about 113,000 cubic yards of contaminated soil to depths less than 13 feet below land surface. The excavated soil was treated using a low-thermal desorption technology (the contingency remedy in the 1989 ROD) and reused as backfill on site. The work also included demolition of on-site structures. The EPA completed Phase III in 1999.
- Phase IV focused on cleaning up contaminated groundwater, including DNAPL below the water table. The EPA completed construction of the groundwater treatment system in 2001. This phase of construction also included installation of groundwater recovery wells, monitoring wells, and piezometers; construction of a groundwater treatment plant; installation of the groundwater discharge system (infiltration galleries); and MNA of organic contaminants in the lower aquifer.

O&M and long-term response action activities began in August 2001. The primary objective of the long-term response action was to remediate the dissolved groundwater contamination and remove the DNAPL present in the subsurface. EPA installed four more DNAPL extraction points in 2005 to accelerate DNAPL removal. NCDEQ assumed responsibility for operation of the groundwater recovery and treatment system in 2012.

The EPA conducted more investigations at the Site in 2009 to re-characterize the extent of DNAPL in the subsurface after the soil remedial action. Data collected in October 2009 and summarized in a 2013 Feasibility Study Addendum indicated that about 20,000 gallons of DNAPL remained in the subsurface. The EPA determined that a more aggressive cleanup approach was warranted to address the DNAPL, which was a continuing source of impacts to groundwater.

The EPA conducted more site investigations in December 2015 and October 2016. The December 2015 investigation employed sonic soil boring and the Tar-specific Green Optical Screening Tool (TarGOST®) to better define the extent of DNAPL, particularly near the railroad tracks and South Reilly Road.
The 2015 Data Evaluation Report presented the results of the investigation.

The October 2016 investigation included a soil stabilization/solidification treatability study, a geochemistry investigation, and microbial population testing. Data from the investigations were used to refine the Site's Conceptual Site Model (CSM) and support the 2017 focused feasibility study. The 2017 Focused Feasibility Study Report estimated that about 109,000 gallons of DNAPL remain at the Site.

In anticipation of a remedy modification, NCDEQ, with approval from the EPA, initiated a temporary shutdown of the Site's groundwater recovery and treatment system on March 15, 2019. The groundwater recovery and treatment system had removed over 21,829 gallons of DNAPL from the Site. NCDEQ sampled 21 monitoring wells on March 18 and March 19, 2019, to act as a baseline monitoring event after the shutdown. NCDEQ conducted an additional groundwater monitoring event in fall 2020 and in spring and fall 2021. EPA's 2021 Five-Year Review Report included evaluation of the 2020 groundwater monitoring data.

The EPA's 2021 Five-Year Review Report also included a screening-level evaluation of the vapor intrusion pathway. Based on results of the evaluation, EPA determined that there was not an unacceptable risk to human health. It is EPA's expectation that the Amended Remedy will greatly reduce or eliminate any source of vapors beneath the Site.

2.3 History of CERCLA Enforcement Activities

In December 1984, the EPA issued notice letters to several potentially responsible parties (PRPs) informing them of EPA's intention to conduct CERCLA remedial activities at the Site unless the PRPs chose to conduct such actions themselves. The PRPs were sent notice letters rather than an administrative order because of their presumed inability to pay for either the RI/FS or the remedial action. In June 1989, these PRPs were sent remedial design/remedial action notice letters informing them that the Agency was planning on spending Superfund monies to clean up the Site.

3.0 Community Participation

Initial community involvement activities included sharing of fact sheets with interested parties during the RI/FS process and presentation of cleanup alternatives at public meetings prior to the selection of the initial remedy in the late 1980s. More recently, the EPA has updated the Site's profile page (https://www.epa.gov/superfund/cape-fear-wood-preserving) to provide information to the community.

The EPA released the Proposed Plan for this ROD Amendment for public comment on August 12, 2022. The Proposed Plan and other site-related documents were made available to the public in the Administrative Record file maintained in the Site's online information repository at https://semspub.epa.gov/src/collections/04/AR/NCD003188828. The Site's local information repository is the Cumberland County Public Library & Information Center, located at 300 Maiden Lane in Fayetteville, North Carolina 28301. The library is open. It provides computer access for the community to access the Site's Administrative Record file online. The notice of availability of these documents was published in the *Fayetteville Observer* newspaper on August 14, 2022. A public comment period was held from August 12, 2022 to September 11, 2022.

The EPA held a virtual public meeting on August 30, 2022, to present the Proposed Plan to the community and interested parties. Comments received by EPA during the public comment period are summarized and addressed in the Responsiveness Summary (see Part 3 of this ROD Amendment).

4.0 Scope and Role of the Response Action

The EPA is managing cleanup of the Site as a sitewide operable unit (OU). Previous remedial actions at the Site removed hazardous materials and physical hazards from the surface of the Site and addressed soil/sediment contamination above the water table. These activities finished by 1999. The Amended Remedy in this ROD Amendment will address remaining DNAPL with in-situ solidification/stabilization and will treat the dissolved-phase contaminant plume located outside the treatment/capped areas with enhanced biodegradation followed by MNA. The EPA considers the remaining DNAPL a principal threat waste (PTW). The EPA defines PTW as "source materials considered to be highly toxic or highly mobile that generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur" (EPA 1991). This action is consistent with EPA's expectations in the NCP and its cleanup strategy for contaminated groundwater – to treat source areas with aggressive technologies and to treat the Dissolved Plume with less aggressive technologies.

In 2001, the EPA implemented a groundwater recovery and treatment remedy, but later determined that the remedy was unable to efficiently remove, treat, or contain the mobile and residual DNAPL present in the surficial aquifer. The previous remedy was unable to restore groundwater at the Site to its beneficial use as a potential drinking water source in a reasonable timeframe. The Amended Remedy is necessary to address source material remaining in the subsurface that is leaching COCs into the groundwater. The area of attainment/point of compliance for achieving groundwater cleanup levels is generally expected to be throughout the contaminated plume or at and beyond the edge of a waste management area. Restoration of groundwater beneath the waste management area is generally not required, per EPA policy reflected in the NCP and guidance.

5.0 Site Characteristics

5.1 Conceptual Site Model

The CSM incorporates information on potential chemical sources, affected media, release mechanisms, routes of migration, and known or potential human and ecological receptors. In this way, it illustrates the physical, chemical, and biological relationships between contaminant sources and affected resources.

The 1989 ROD discusses the Site's CSM at the time of initial remedy selection. The information generated since that time has not significantly altered the Agency's understanding of sources, affected media, release

mechanisms, routes of migration, and known or potential human and ecological receptors. The remedial actions completed in 1999 addressed unsaturated soil/sediment contamination at the Site. The 2001 ROD Amendment indicated that since the soils have been remediated, site soil no longer poses unacceptable risks from direct contact exposure to soil (current [trespasser] and future [on-site workers, potential residents] receptors).

The main concern remaining pertains to the potential future use of the groundwater beneath and downgradient of the Site as a source of potable water. DNAPL is present in the subsurface and is a continuing source of groundwater contamination. Investigations in 2015 and 2016 refined the extent of DNAPL and dissolved-phase groundwater contamination. Section 5.5 of this ROD Amendment provides further discussion of the remaining contamination at the Site.

5.2 Overview of the Site

The 41-acre site property is located at 1219 South Reilly Road in Fayetteville, North Carolina.

5.2.1 Geologic, Hydrogeologic, and Topographic Information

The terrain of the Site is mostly flat. Drainage is provided by the swampy area on the northeastern side of the Site and the manmade ditch along the southern side of the Site. The manmade ditch continues off site, flowing to the east. The ditch intersects an unnamed creek south of the Site.

Fayetteville, North Carolina, is in the Coastal Plain physiographic region. The Coastal Plain is a wedge-shaped sequence of mostly marine sediments that gradually thickens to the east. Surficial and weathered sediments blanket the entire Coastal Plain section of the Fayetteville area. These deposits, Cretaceous and younger in age, are predominantly well-sorted, unconsolidated, fine-to-medium-grained sands and clay.

Groundwater beneath the Site occurs in two primary aquifers: the surficial sand aquifer (where all the site-related contamination has been found) and the deeper Cretaceous aquifer. A clay confining layer, which is part of the Middendorf/Cape Fear Formation, separates the surficial sand aquifer from the Cretaceous aquifer.

The surficial aquifer typically consists of unconsolidated, well-sorted, fine-to-medium grained sands, silty sand, clayey sand, silty clay, sandy clay and thin clay layers. It is an unconfined water table aquifer of variable thickness and lateral discontinuity throughout the region. The surficial aquifer is generally less than 40 feet thick. Depth to water ranges from about 10 to 20 feet below land surface. Groundwater flow in the surficial sand aquifer indicates a radial flow pattern from northwest to northeast centered on the Site. Due to the many interbedded layers and lenses of clay and sands, an intermediate aquifer has also been identified at the Site. Groundwater flow in the intermediate aquifer is generally southwestward.

The deeper Cretaceous aquifer is composed of a series of complexly interlayered sandy beds and silty or clayey beds. It has a low permeability and corresponding low yield. The Cretaceous aquifer is about 150 feet thick in the Fayetteville area.

Section 3.1 of the Site's 1989 ROD and Section 3.2 of the 2017 Focused Feasibility Study Report provides a complete discussion of geologic, hydrogeologic, and topographic information.

5.3 Sampling Strategy

The sampling strategy was developed based on a review of previous investigations. Investigations completed in 2015 and 2016 better characterized the areas and volumes of DNAPL remaining in the subsurface, and provided data needed to evaluate remedial alternatives in the 2017 focused feasibility study. The additional work in 2015 included DNAPL delineation, collection of subsurface soil samples for grain size analysis, collection of DNAPL-impacted soil samples for residual soil saturation testing, and collection of DNAPL-impacted soil samples to determine the product density, absolute viscosity, and free product mobility of the site-specific DNAPL. The 2016 investigation included a soil solidification/ stabilization treatability study, a geochemistry investigation, and microbial population testing. Groundwater at the Site has been monitored since 2002.

5.4 Known or Suspected Sources of Contamination

Creosote and CCA wood treatment processes generated liquid and sludge wastes. Operations included disposal of the wastes in a concrete sump, an on-site drainage ditch, and an on-site pond and lagoon. Stormwater runoff from the treatment yard also drained into an on-site ditch. This facility's operations are similar to other wood treatment facilities; creosote and CCA drippage and spillage from treatment and storage processes occurred routinely and systematically across the Site. In 1986, about 500 gallons of creosote was discharged to the ground when vandals shot holes in a 3,000-gallon creosote storage tank.
It is believed that the source of the benzene contamination is a former underground gasoline tank buried at the west end of the metal shed.

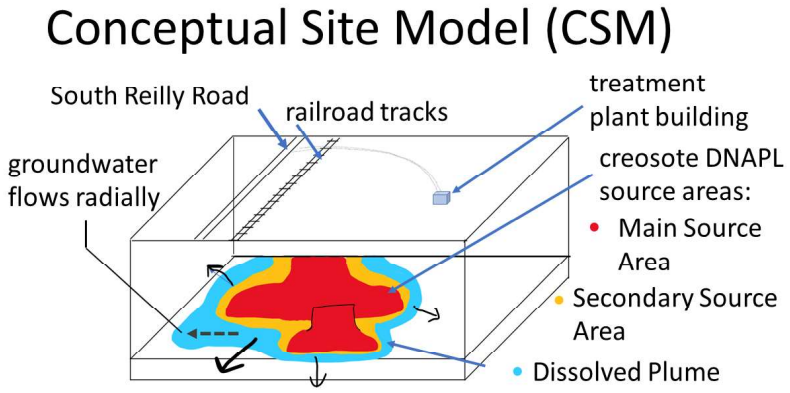
Section 1.2 of the 1989 ROD and Section 3.5 of the 2017 Focused Feasibility Study Report provide more information on sources of contamination.

5.5 Nature and Extent of Contamination

The facility used coal tar creosote and CCA salts in the wood treatment processes and past releases and disposal of wastes during the facility operations resulted in contamination of soil and groundwater and formation of DNAPL.

The remedial actions completed in 1999 addressed unsaturated soil/sediment contamination at the Site. The RI and subsequent investigations from 2009 to 2016 have refined the extent of DNAPL and dissolved-phase groundwater contamination remaining at the Site. Based on the additional data, the 2017 focused feasibility study updated the Site's CSM as it relates to remaining contamination.

The CSM exhibit below shows the creosote DNAPL (in red and yellow) remaining in the saturated zone of soil beneath the Site. DNAPL is above an impermeable clay layer about 35 feet below land surface that prevents the DNAPL from moving deeper. The contaminated soil shallower than the top of the water table (as much as 13 feet below land surface) was removed in 1999 and replaced with clean backfill. Groundwater flow in the shallow aquifer indicates a radial flow pattern from northwest to northeast, centered on the Site. Some groundwater flows from the Site to the west beneath the railroad tracks and South Reilly Road, but the dissolved plume of contamination shown in blue does not extend more than 100 feet beyond the source areas. The plume forms a halo of contaminated groundwater around the DNAPL source material.



DNAPL source areas and groundwater contamination at the Site are classified into three contaminated media zones. Figure 4 shows the contaminated media zone boundaries. The three contaminated media zones are the Main Source Area, the Secondary Source Area, and the Dissolved Plume.

Main Source Area

The Main Source Area consists of DNAPL beneath the areas where past releases occurred. It contains DNAPL present at depths from 4 feet to 35 feet below land surface. This contaminated media zone represents the largest mass of COCs, containing both potentially mobile and residual creosote, and creosote-stained soil having a strong creosote odor. The DNAPL in this zone extends to an average depth of 32 feet below land surface, although DNAPL has also been identified down to the top of the clay.

The Main Source Area has a footprint of about 0.7 acres and a volume of about 12,860 cubic yards of DNAPL-impacted soil containing an estimated 44,000 gallons of DNAPL. The lithology is heterogeneous. It consists of unconsolidated, well-sorted, fine-to-medium-grained sands, silty sand, clayey sand, silty clay, sandy clay and thin clay layers. Surface obstructions in this zone include utilities, the roadway and the railroad in the northern part of the Main Source Area.

Secondary Source Area

The Secondary Source Area surrounds the Main Source Area over a wider area with a lower mass estimate. This zone is impacted principally by residual DNAPL. The soil contains some residual creosote and creosote-stained soil and has a strong creosote odor. Typically, the DNAPL is represented more as discontinuous stringers and mostly defined as thin stringers (less than 1 foot in total thickness and at varying depths) within more permeable lenses or desiccation fractures. The Secondary Source Area contains areas with cumulative thicknesses of DNAPL greater than 10 feet, but these layers are further separated and present a lower overall mass/volume footprint. The zone extends to a depth of about 32 feet below land surface. The Secondary Source Area has a footprint of about 3 acres and a volume of about 18,890 cubic yards of DNAPL-impacted

soil within a total volume of over 170,000 cubic yards. The Secondary Source Area may contain over 65,000 gallons of DNAPL. The lithology is heterogeneous. It consists of unconsolidated, well-sorted, fine-to-medium-grained sands, silty sand, clayey sand, silty clay, sandy clay and thin clay layers. Surface obstructions in this zone include utilities, the roadway and the railroad.

Dissolved Plume (Surficial Aquifer)
The Dissolved Plume in the surficial aquifer surrounds the Secondary Source Area. It contains principally naphthalene, methylnaphthalene, and similar PAHs. The areal extent of groundwater contamination in the Dissolved Plume is about three acres. Figure 3-9 in the 2017 Focused Feasibility Study Report identifies groundwater exceedances in monitoring wells from 2012 to 2016.

Data collected during site investigations and presented in the 2017 Focused Feasibility Study Report suggests that natural aerobic biodegradation may be occurring along the downgradient edge of the Dissolved Plume. The limited off-facility extent of the Dissolved Plume is attributed to this biodegradation and has resulted in a relatively stable dissolved plume. Section 9.0 of this ROD Amendment presents further discussion of natural attenuation of contaminants in groundwater at the Site.

5.5.1 Quantity/Volume of Waste that Needs to Be Addressed

This remedial action will address about 12,860 cubic yards of DNAPL-impacted soil in the Main Source and about 18,890 cubic yards of DNAPL-impacted soil within a total volume of over 170,000 cubic yards in the Secondary Source Area. The total volume of DNAPL to be addressed in both areas is about 109,000 gallons.

5.5.2 Concentrations of COCs in Each Medium

Groundwater is the medium of concern for this ROD Amendment. PAHs and two VOCs are the primary COCs (Table 1). The COCs identified in groundwater include most of the RCRA-regulated hazardous constituents identified for RCRA Listed Waste F034 and F035. The maximum groundwater naphthalene concentration presented in the 2017 Focused Feasibility Study report was 8,600 micrograms per liter (µg/L) in monitoring well MW-37. Table B-1 in Appendix B of this ROD Amendment presents COC concentrations in wells MW-36 and MW-37 from the 2017 Focused Feasibility Study Report. Table 2 in Appendix E of the 2017 report provides a comprehensive summary of groundwater data from 2007 to 2016. The 2017 Focused Feasibility Study Report is available in the Site's Administrative Record file.

5.5.3 RCRA Hazardous Wastes and Affected Media

Under RCRA regulations at 40 CFR 261.31, hazardous wastes from non-specific sources, wastewaters (except those wastewaters that have not come in contact with process contaminants), process residuals, preservative drippage, and spent formulations from wood-preserving processes generated at plants that use creosote formulations are considered a RCRA Listed hazardous waste (F034). Wastewaters (except those wastewaters that have not come in contact with process contaminants), process residuals, preservative drippage, and spent formulations from wood-preserving processes generated at plants that use inorganic preservatives containing arsenic or chromium are considered a RCRA Listed Hazardous waste (F035) under 40 CFR 261.31. These listings do not include K001 bottom sediment sludge from the treatment of wastewater from wood-preserving processes that use creosote and/or pentachlorophenol. F034 and F035 RCRA Listed Waste is retroactive (despite that disposal of such waste may have occurred prior to enactment of RCRA and regulations identifying these wastes as Listed) [53 Fed. Reg. 17586, May 17, 1988]. Under EPA's "contained-in" policy,

contaminated media (e.g., groundwater, soil, sediments) are considered to contain RCRA hazardous waste: (1) when media is contaminated with characteristic hazardous waste and exhibits a characteristic of hazardous waste; or (2) when the media is contaminated with hazardous constituents from RCRA Listed hazardous waste [63 Fed Reg 28617, May 26, 1998].

If RCRA hazardous waste (DNAPL) and/or soils containing RCRA hazardous waste, are excavated (i.e., generated by removal from the ground and actively managed prior to disposal), those wastes must meet identified applicable regulations for staging waste and the RCRA land disposal restriction (LDR) treatment standards before land disposal. When RCRA hazardous waste is left in place as part of a containment remedy, the RCRA Subtitle C landfill cover and closure performance objectives are generally considered to be "relevant and appropriate requirements" [NCP Preamble at 53 Fed. Reg. 51446, December 21, 1988].

6.0 Current and Potential Future Land Uses

The Site is not currently in use. Based on surrounding land uses and other relevant information, the EPA determined that the reasonably anticipated future land uses for the Site are commercial and industrial uses.

Land use near the Site varies. Industrial and commercial businesses are located to the north, northeast, and south. A ready-mix concrete business is directly south of the Site. Residential subdivisions are east and south of the Site. One of the neighborhoods is about a quarter mile south of the Site, along Southgate Road. A second neighborhood is less than a quarter mile east-southeast of the Site. South Reilly Road abuts the Site to the west. Farmland, more homes and Interstate 295 are located beyond the road.

Groundwater at the Site is classified as an existing or potential drinking water source under 15A NCAC 02L.0201. The concrete business south of the Site has a private well; it is not used for drinking water. A nearby private residence also has a private well. NCDEQ sampled both private wells in 2019 and did not find site-related contamination. The Southgate Subdivision located south and east of the Site relies on several community water wells for potable water.

7.0 Summary of Site Risks

Risk assessments were conducted to determine the current and future effects of contaminants on human health and the environment. The results of the risk assessments provide the basis for taking action and identify contaminants and exposure pathways that need to be addressed by the remedial action.

7.1 Human Health Risk Assessment

The Site's human health risk assessment, summarized in the 1989 ROD, evaluated potential risks associated with direct contact with soil and sediment, inhalation of fugitive dust, and ingestion of groundwater from the upper and lower aquifers. The threat posed by heavily stained source area soil to public health and the environment was eliminated when contaminated soils were excavated and treated at the Site in 1998 and 1999, during Phase III of the remedial action. The 2001 ROD Amendment indicated that since the soils have been remediated, site soil no longer poses unacceptable risks from direct contact exposure to soil (current [trespasser] and future [on-site workers, potential residents] receptors).

Based on the exposure pathways identified in the 1989 ROD, the main concern remaining pertains to the potential future use of the groundwater beneath and downgradient of the Site as a source of potable water. Groundwater at the Site is classified as an existing or potential drinking water source under

North Carolina regulations 15A NCAC 02L.0201. Residents and businesses in the area use groundwater as a potable water source. Sampling results from 2019 at two private wells close to the Site did not identify site-related impacts.

The EPA considers two types of risk: cancer risk and noncancer risk. The likelihood of any kind of cancer resulting from a Superfund site is generally expressed as an upper bound probability, for example, a "1 in 10,000 chance". In other words, for every 10,000 people that could be exposed, one extra cancer may occur because of exposure to site contaminants. For noncancer health effects, the EPA calculates a hazard index (HI). The key concept is that a "threshold level" (measured as an HI of less than 1) exists below which noncancer health effects are no longer predicted. A CERCLA response action is generally warranted when cancer risk is greater than 1×10^{-4} or when noncancer health effects are greater than an HI of 1.

Data in the 2017 Focused Feasibility Study Report show that contaminants (primarily PAHs such as naphthalene) in groundwater continue to be detected above federal primary drinking water standards (MCLs) and 15 NCAC 02L .0202 Groundwater Quality Standards. The 2017 report indicates that a maximum naphthalene concentration was collected from monitoring well MW-37, located west of South Reilly Road. The maximum detected concentration of naphthalene in this well in 2016 was 8,600 µg/L. The naphthalene concentration corresponds to an estimated cancer risk of 7×10^{-2}, which is above EPA's acceptable risk range (1×10^{-6} to 1×10^{-4}) for a resident using shallow aquifer groundwater. The 2016 naphthalene concentration also results in a noncancer HI of 1,400, which also exceeds EPA's acceptable HI of 1.

7.2 Ecological Risk Assessment

Potential ecological risk was evaluated prior to EPA's issuance of the 1989 ROD. The 1989 ROD identified an increased risk to birds ingesting water from the northeast swamp, ditch-dike pond area, and concrete plate discharge pond. It also noted that surface waters on site exceeded acute and chronic ambient water quality criteria at that time. Remedial actions at the Site addressed contaminated sediment and surface water, eliminating potential risk to ecological receptors.

7.3 Basis for Action

It is EPA's judgment that the amended groundwater remedy selected in this ROD Amendment is necessary to protect public health and the environment from actual or threatened releases of site-related hazardous substances into the environment.

The basis for remedial action at the Site has not changed since the 2001 ROD Amendment. Groundwater at the Site is a potential or actual source of drinking water. It is contaminated above federal MCLs and more stringent state groundwater standards in 15A NCAC 2L. 0202 Groundwater Quality Standards. A fundamental change to the groundwater remedy is warranted to address potential unacceptable risk to future residents from exposure to COCs in groundwater, to address residual DNAPL that is a continuing source, and to restore groundwater to its beneficial use as a drinking water source.

8.0 Remedial Action Objectives (RAOs)

Before developing cleanup alternatives for a Superfund site, EPA establishes RAOs to protect human health and the environment. RAOs are specific goals to address a particular media and exposure pathway(s) at the

Site in view of protecting human health and the environment. These objectives can include preliminary remediation goals (PRGs) that become cleanup levels in the decision document and are based on available information and standards, such as ARARs, to-be-considered (TBC) guidance, and site-specific, risk-based levels. The RAOs identified in the 1989 ROD are being modified slightly to better reflect the objectives and scope of the Amended Remedy.

The RAOs for this action are:

- Prevent further migration of contaminated groundwater that exceeds drinking water standards.
- Eliminate or contain principal threat waste (DNAPL) in groundwater, to the maximum extent practicable, to minimize the continuing source of contamination to groundwater.
- Restore groundwater quality throughout the plume to meet federal primary drinking water standards (MCLs) or more stringent 15A NCAC 2L standards based on the classification of the aquifer as a potential source of drinking water (Class GA or Class GSA) under 15A NCAC 02L. 0201.
- Prevent human ingestion of and contact with groundwater containing COCs at concentrations above 15A NCAC 2L standards or federal MCLs, whichever is more stringent.

Table 1 lists the Site's groundwater cleanup levels. The cleanup levels are based on the EPA Safe Drinking Water Act MCLs or more stringent state groundwater standards, established in Title 15A of NCAC Section 02L .0202 Groundwater Quality Standards for carcinogenic PAHs, select non-carcinogenic PAHs, and select VOCs. The cleanup level for carbazole is based on the North Carolina interim maximum allowable concentration (IMAC). The IMAC cleanup level for carbazole (April 2022) is considered TBC for this action. Per the NCP at 40 CFR 300.400(g)(3), the TBC category consists of advisories, criteria, or guidance developed by EPA, other federal agencies, or states that may be useful in developing CERCLA remedies.

Table 1: Groundwater Cleanup Levels

COC	Cleanup Level[a] (µg/L)	Basis for Cleanup Level
VOCs		
Benzene	1	15A NCAC 2L
Styrene	70	15A NCAC 2L
Non-Carcinogenic PAHs		
Acenaphthene	80	15A NCAC 2L
Acenaphthylene	200	15A NCAC 2L
Anthracene	2,000	15A NCAC 2L
Fluoranthene	300	15A NCAC 2L
Fluorene	300	15A NCAC 2L
2-Methylnaphthalene	30	15A NCAC 2L
Naphthalene	6	15A NCAC 2L
Phenanthrene	200	15A NCAC 2L
Pyrene	200	15A NCAC 2L
Carbazole (diphenylamine)	2	NC IMAC[b]
Carcinogenic PAHs		
Benzo(a)anthracene	0.05	15A NCAC 2L
Benzo(a)pyrene	0.005	15A NCAC 2L
Benzo(b)fluoranthene	0.05	15A NCAC 2L
Benzo(k)fluoranthene	0.5	15A NCAC 2L
Indeno(1,2,3-cd)pyrene	0.05	15A NCAC 2L
Dibenzo(a,h)anthracene	0.005	15A NCAC 2L
Benzo(g,h,i)perylene	200	15A NCAC 2L
Chrysene	5	15A NCAC 2L

Notes:

- Cleanup levels are at least as stringent as SDWA MCLs, for those COCs for which MCLs have been established. The MCL for benzene is 5 µg/L. The MCL for styrene is 100 µg/L. The MCL for benzo(a)pyrene (PAHs) is 0.2 µg/L.
- Federal and state standards have not been established for carbazole. The cleanup level is based on the North Carolina IMAC for carbazole, available online at https://deq.nc.gov/media/28965/download?attachment (April 2022).

9.0 Description of Alternatives

The 2017 focused feasibility study evaluated 11 remedial alternatives, organized by the Main Source Area, the Secondary Source Area, and the Dissolved Plume (presented in the text box on the following page).

A detailed description of each alternative was presented in the 2017 Focused Feasibility Study Report. After issuing the report, the EPA assembled the remedial options into five alternatives, which were presented in the Proposed Plan and released for public comment in August 2022. The text box on the following page presents the EPA's assembled alternatives for comparative analysis.

ALTERNATIVES FROM THE 2017 FOCUSED FEASIBILITY STUDY REPORT

The 11 remedial alternatives developed in the 2017 Focused Feasibility Study Report, organized by area, are:

- Main Source Area #1: No Action
- Main Source Area #2: Vertical Engineered Barrier with Cap
- Main Source Area #3: In-Situ Solidification/Stabilization with Cap
- Main Source Area #4: In-Situ Thermal Remediation
- Main Source Area #5: In-Situ Smoldering (STAR™) Process

- Secondary Source Area #1: No Action
- Secondary Source Area #2: Vertical Engineered Barrier with Cap
- Secondary Source Area #3: In-Situ Solidification/Stabilization with Large-Diameter Auger

- Dissolved Plume #1: No Action
- Dissolved Plume #2: Enhanced In-Situ Bioremediation and MNA
- Dissolved Plume #3: MNA

ASSEMBLED ALTERNATIVES USED FOR COMPARATIVE ANALYSIS

No Action:

- Main Source Area #1: No Action
- Secondary Source Area #1: No Action
- Dissolved Plume #1: No Action

Alternative 1: Barrier Wall and Cap, followed by Enhanced In-Situ Bioremediation and MNA

- Main Source Area #2: Vertical Engineered Barrier with Cap
- Secondary Source Area #2: Vertical Engineered Barrier with Cap
- Dissolved Plume #2: Enhanced In-Situ Bioremediation and MNA

Alternative 2: In-Situ Solidification /Stabilization and Cap, followed by Enhanced In-Situ Bioremediation and MNA

- Main Source Area #3: In-Situ Solidification/Stabilization with Cap
- Secondary Source Area #3: In-Situ Solidification/Stabilization with Cap
- Dissolved Plume #2: Enhanced In-Situ Bioremediation and MNA

Alternative 3: In-Situ Thermal Remediation for the Main Source Area, In-Situ Solidification/Stabilization and Cap, followed by Enhanced In-Situ Bioremediation and MNA

- Main Source Area #4: In-Situ Thermal Remediation
- Secondary Source Area #3: In-Situ Solidification/Stabilization with Large-Diameter Auger
- Dissolved Plume #2: Enhanced In-Situ Bioremediation and MNA

Alternative 4: In-Situ Smoldering (STAR™) Process for the Main Source Area, In-Situ Solidification/Stabilization and Cap, followed by Enhanced In-Situ Bioremediation and MNA

- Main Source Area #5: In-Situ Smoldering (STAR™) Process
- Secondary Source Area #3: In-Situ Solidification/Stabilization with Large-Diameter Auger
- Dissolved Plume #2: Enhanced In-Situ Bioremediation and MNA

Detailed descriptions of each of the assembled alternatives for the comparative analysis are presented in subsequent sections of this ROD Amendment.

While treatment technologies were considered for the Main Source Area, the Secondary Source Area is a candidate for isolation/containment. Direct thermal or oxidative treatment over such a large volume of soil (over four times that of the Main Source Area) would have an estimated cost above $30 million. Therefore, the 2017 focused feasibility study eliminated these alternatives from further consideration for the Secondary Source Area.

Terminology used to describe and differentiate the five alternatives is described further below:

- Capital costs – expenditures required to construct a remedial alternative.
- O&M costs – the post-remedy construction costs necessary to ensure or verify the continued effectiveness of a remedial alternative. They are estimated on an annual basis.
- Present value – this value represents the amount of money that, if invested in the current year, would be sufficient to cover all costs associated with a project over time, calculated using a discount rate of 7% and a 30-year time interval.
- Construction time – the time required to construct and implement the remedial alternative. It does not include the time required to design the remedy, negotiate the performance of the remedy with responsible parties, or procure contracts for design and construction.

Common Elements Among Remedial Alternatives
All active alternatives share the following common elements: in-situ bioremediation of the Dissolved Plume followed by MNA, institutional controls to prevent land and groundwater use and interference with remedial components, long-term cap maintenance, and groundwater monitoring. Under all alternatives, hazardous substances will remain at the Site above levels that allow for unrestricted use and unlimited exposure. The EPA will conduct a review of the Site every five years (Superfund five-year reviews) pursuant to CERCLA Section 121(c) and the NCP at 40 CFR 300.430(f)(4)(ii).

MNA
MNA is a common element of all alternatives except for the No Action alternative. MNA is a remedial strategy that relies on the use of natural processes already occurring in the subsurface (including natural biodegradation) for contaminant reduction. MNA can only be selected when there are sufficient lines of evidence that demonstrate restoration can be achieved in a reasonable timeframe. The EPA Office of Solid Waste and Emergency Response (OSWER) Directive 9200.4-17P (April 1999) provides a three-tiered approach with increasingly detailed and site-specific data to arrive at the decision that MNA is an appropriate remedy for the restoration of groundwater. The lines of evidence include:

1. Historical data that demonstrate a clear and meaningful trend of decreasing contaminant mass and/or concentration over time.
    - Contaminant trend graphs from the 2021 Fourth Five-Year Review Report show decreasing trends as downgradient effects of the groundwater extraction and treatment system and the rebound of concentrations after the system was shut off in March 2019. There was a “clear and meaningful trend” for the groundwater COCs while the source control measures (i.e., groundwater extraction) were performed. This attenuation is expected to resume once final source control measures are in place.

2. Hydrogeologic and geochemical data that can be used to demonstrate indirectly the type(s) of natural attenuation processes active at the Site, and the rate at which such processes will reduce contaminant concentrations to required levels.
   - PAH compounds degrade in aerobic conditions, as indicated by higher dissolved oxygen (DO) values with more positive oxidation/reduction potential (ORP) values. As stated in the 2017 Focused Feasibility Study Report on page 3-4, "Dissolved plume DO ranges from 0.19 to 0.74 [milligrams per liter] mg/L and ORP ranges from -37.5 to 29.3 [millivolts] mV, although these values are still tenable for aerobic degradation." It further stated, "DO concentrations (0.06 mg/L to 6.58 mg/L) and ORPs (30.8 mV to 341.4 mV) are generally higher in wells farther away from the source area." Degradation rates were not calculated for the dissolved plume remediation, but the contaminant concentrations are already close to the cleanup values and there is high confidence that MNA will be effective in meeting the cleanup values within a standard 30-year cleanup timeframe, if not sooner.

3. Data from field or microcosm studies that directly demonstrate the occurrence of a particular natural attenuation process at the Site and its ability to degrade the COCs (typically used to demonstrate biological degradational processes only).
   - Site groundwater microbial populations were evaluated in a 2016 study by Microbial Insights, Inc. Results indicate that naphthalene dioxygenase and eubacteria are present in the subsurface. The presence of naphthalene dioxygenase is an indication of the presence and activity of Pseudomonas *sp.* bacteria, which is known for degrading naphthalene and other PAHs.

4. Fortunately, the COCs in the Dissolved Plume beyond the areas where active treatment (enhanced in-situ bioremediation) is planned as part of the Amended Remedy are already at relatively low concentrations. The data are not readily available to estimate a first-order rate constant to predict the duration of the MNA portion of the remedy. However, Figure 4 of the Site's fourth Five-Year Review Report (page 220 of 302) shows the attenuation of the contaminants in the groundwater from maximums in December 2014 to non-detect in March 2019. This shows the effect of the pump-and-treat system on groundwater contamination when it cuts off the source area. The active treatments will have the same effect on the source of the groundwater contamination allowing attenuation to proceed rapidly. It is estimated that the dissolved-phase plume will attenuate in five years.

Taken together, these four tiers of evidence indicate that MNA is a viable option for restoration of a portion of the Dissolved Plume of the Site's groundwater.

9.1 No Action

Estimated Capital Cost: $0
Estimated Net Present Worth O&M Costs: $119,400
O&M Period (years): 30
Estimated Net Present Value: $119,400
Estimated Construction Timeframe: 0 years
Estimated Time to Achieve RAOs: RAOs would not be met

Section 300.430(e)(6) of the NCP requires consideration of a No Action alternative to provide a baseline to compare other alternatives. Under the No Action alternative, no funds would be expended to address DNAPL and clean up contaminated groundwater. The Site would remain in its present condition.

Minimal sampling and analysis of COCs in monitoring wells may occur to track contaminant concentrations over a 30-year period. This information will help evaluate site conditions for five-year reviews. The cost estimate for this alternative is based solely on this sampling and analysis element.

9.2 Alternative 1: Barrier Wall and Cap, followed by Enhanced In-Situ Bioremediation and MNA

Estimated Capital Cost: $6,053,489
Estimated Net Present Worth O&M Costs: $1,830,051
O&M Period (years): 30
Estimated Net Present Value: $7,883,540
Estimated Construction Timeframe: <1 year
Estimated Time to Achieve RAOs: 5 years

Alternative 1 consists of construction of a low-permeability subsurface barrier wall around the Main Source Area and the Secondary Source Area, combined with a surface cap across both areas, to isolate and contain all known DNAPL-impacted soils on site. Costs were estimated based on a barrier wall about 2,100 feet long, installed to a depth of about 38 feet below land surface, and keyed into the confining clay below. The barrier wall and cap type most commonly used in this application is a soil-bentonite or cement-bentonite slurry wall combined with a geosynthetic and soil cap on the ground surface. The optimal type of barrier wall and cap would be evaluated in the remedial design phase. The cap would be in compliance with RCRA Subtitle C landfill cover performance requirements identified as ARARs.

Following completion of the barrier wall and cap, enhanced in-situ bioremediation followed by MNA would be used to treat dissolved-phase groundwater contamination in the Dissolved Plume that is located outside the capped area. Enhanced in-situ bioremediation includes injection of oxygen into the aquifer via underground injection wells to enhance the rate of natural degradation of contaminations in groundwater. For the cost estimate, this alternative was based on the following assumptions:

- Oxygen would be prepared in mobile oxygen feed/injection trailers and injected into the aquifer at 24 injection wells spaced across the Dissolved Plume. The cost estimate did not include pH adjustment and/or bioaugmentation (e.g., the addition of nutrients to feed the naturally occurring bacteria).
- The aerobic groundwater conditions and detection of naphthalene dioxygenase in site microorganisms are evidence that natural aerobic biodegradation is active in the Dissolved Plume. With the oxygen enhancement of the aquifer, these bacterial cultures are expected to increase.
- Performance monitoring and optimization will be performed as necessary (e.g., more injection events may be required to increase the degradation rate of contaminants so that cleanup levels can be met in a reasonable timeframe).
- Shallow trenching with manifold lines would be used to connect the injection wells to injection

trailers located in fenced compounds on the west side of South Reilly Road and next to the existing treatment equipment building. Utilities and transportation corridors would not require disruption.
- Transition to MNA supported by site-specific lines of evidence, as detailed in the MNA section of this ROD Amendment.
- Institutional controls to prevent groundwater use while restoration is underway.

In summary, Alternative 1 includes the following key elements:

- Construction of a low-permeability subsurface barrier wall around the Main Source Area and the Secondary Source Area.
- Construction of a composite cap over the Main Source Area and the Secondary Source Area.
- Injection of oxygen into the aquifer via underground injection wells to enhance the rate of natural degradation of contaminants in groundwater (i.e., enhanced in-situ bioremediation), followed by MNA of the Dissolved Plume.
- Long-term cap maintenance and groundwater monitoring.
- Implementation of institutional controls to prevent well installation and use of contaminated groundwater, to provide increased public awareness, and to restrict disturbance of contained contamination that remains at the Site and interference with other remedy components.

9.3 Alternative 2: In-Situ Solidification/Stabilization and Cap, followed by Enhanced In-Situ Bioremediation and MNA

Estimated Capital Cost: $18,719,486
Estimated Net Present Worth O&M Costs: $1,830,051
O&M Period (years): 30
Estimated Net Present Value: $20,549,537
Estimated Construction Timeframe: <1 year
Estimated Time to Achieve RAOs: 5 years

Alternative 2 includes in-situ solidification/stabilization to isolate and stabilize DNAPL and contiguous soil contamination in the Main Source Area and the Secondary Source Area, followed by construction of a composite cap across both areas. In-situ solidification/stabilization involves mixing the DNAPL-impacted soil with a binding agent, such as cement grout, to form a solid material with a low permeability, usually less than $1x10^{-6}$ centimeters per second. While the processes and additives for in-situ solidification/stabilization would be further refined in the remedial design phase, the alternative may include injection of cement grout into the subsurface using large-diameter augers. The augers would break up layers and stringers of DNAPL and homogenize them with the cement grout mixture. Costs for Alternative 2 were estimated based on a target treatment area covering about 3.7 acres and extending to a depth of about 35 feet below land surface. Because parts of the Main Source Area extend beneath the railroad, a grout wall curtain would be installed perpendicular to the railroad to alleviate the need for track replacement.

After completion of solidification/stabilization, a cap would be installed over the stabilized waste in the Main and Secondary Source Areas. The cap would be in compliance with RCRA Subtitle C landfill cover performance requirements identified as ARARs. Following completion of the barrier wall and cap,

enhanced in-situ bioremediation followed by MNA, as described for Alternative 1, would be used to treat dissolved-phase groundwater contamination in the Dissolved Plume located outside of the capped area.

Alternative 2 includes the following key elements.

- Solidification/stabilization of DNAPL-impacted soils in the Main and Secondary Source Areas.
- Installation of grout walls perpendicular to the railroad to alleviate the need for track replacement.
- Construction of a composite cap over the treated areas that complies with identified RCRA Subtitle C ARARs.
- Injection of oxygen into the aquifer via underground injection wells to enhance the rate of natural degradation of contaminants in groundwater (i.e., enhanced in-situ bioremediation), followed by MNA of the Dissolved Plume.
- Long-term cap maintenance and groundwater monitoring.
- Implementation of institutional controls to prevent well installation and use of contaminated groundwater, to provide increased public awareness, and to restrict disturbance of contained contamination that remains at the Site and interference with other remedy components.

9.4 Alternative 3: In-Situ Thermal Remediation for the Main Source Area, In-Situ Solidification/ Stabilization and Cap, followed by Enhanced In-Situ Bioremediation and MNA

Estimated Capital Cost: $21,085,734
Estimated Net Present Worth O&M Costs: $1,649,991
O&M Period (years): 30
Estimated Net Present Value: $22,735,744
Estimated Construction Timeframe: <1 year
Estimated Time to Achieve RAOs: 5 years

Alternative 3 includes in-situ thermal remediation for the Main Source Area, in-situ solidification/ stabilization for the Secondary Source Area, construction of a cap over the Main Source Area and Secondary Source Area, followed by enhanced in-situ bioremediation and MNA of the Dissolved Plume. In-situ thermal remediation is a technology that uses heat to enhance the mobility of DNAPL in the subsurface, allowing it to be recovered and treated aboveground. This alternative would reduce the mass of contamination in the subsurface. Continued thermal treatment would drive off low molecular weight semi-volatile organic compounds (SVOCs) and stabilize the residual COCs in the soil.

Alternative 3 would use a thermal conduction heating (or equivalent) treatment system to promote steam enhanced extraction of DNAPL and thermal soil stabilization. The process includes treatment of extracted contaminated fluids via a heat exchanger, DNAPL separator, tray air stripper, and granular activated carbon prior to injection into existing infiltration galleries and treatment of extracted vapors. Infrastructure to support treatment would need to be brought on site. Costs were estimated based on thermal treatment taking about 220 days.

The in-situ solidification/stabilization, enhanced in-situ bioremediation and MNA components of Alternative 3 are the same as for Alternative 2, except in-situ solidification/stabilization is limited to the Secondary Source Area.

Alternative 3 includes the following components:

- Application of in-situ thermal treatment for the Main Source Area.
- In-situ solidification/stabilization of the Secondary Source Area.
- Construction of a RCRA Subtitle C landfill composite cover over the Main Source Area and the Secondary Source Area.
- Injection of oxygen into the aquifer via underground injection wells to enhance the rate of natural degradation of contaminants in groundwater (i.e., enhanced in-situ bioremediation), followed by MNA of the Dissolved Plume.
- Long-term cap maintenance and groundwater monitoring.
- Implementation of institutional controls to limit land and groundwater use.

9.5 Alternative 4: In-Situ Smoldering (STAR™) Process for the Main Source Area, In-Situ Solidification/Stabilization and Cap, followed by Enhanced In-Situ Bioremediation and MNA

Estimated Capital Cost: $20,349,701
Estimated Net Present Worth O&M Costs: $1,649,991
O&M Period (years): 30
Estimated Net Present Value: $21,999,744
Estimated Construction Timeframe: <1 year
Estimated Time to Achieve RAOs: 5 years

Alternative 4 is similar to Alternative 3; the primary difference is the treatment technology for the Main Source Area. Alternative 4 would use an innovative thermal technology based on the principles of smoldering combustion, where the COCs in the subsurface are the source of fuel. The STAR™ process is a controlled burning reaction that destroys DNAPLs embedded in soil while simultaneously generating enough energy to propagate itself through the subsurface. Bench-scale and pilot-scale testing would be required.

Costs were estimated based on the installation of ignition/air injection wells screened from five feet to the top of the dense clay at about 35 feet. The process would include treatment of extracted vapors with a heat exchanger and a thermal incineration unit, and confirmation soil testing. Thermal treatment is expected to take about 220 days. Savron, the patent-holder for the proprietary STAR™ process, would have to be procured as a sole-source vendor to provide design assistance and provide complete turnkey application of the remedy.

Alternative 4 includes the following components:

- Application of the STAR™ smoldering combustion treatment process in situ for the Main Source Area.
- In-situ solidification/stabilization of the Secondary Source Area.
- Construction of a RCRA Subtitle C landfill composite cover over the Secondary Source Area.

- Injection of oxygen into the aquifer via underground injection wells to enhance the rate of natural degradation of contaminants in groundwater (i.e., enhanced in-situ bioremediation), followed by MNA of the Dissolved Plume.
- Long-term cap maintenance and groundwater monitoring.
- Implementation of institutional controls to limit land and groundwater use.

10.0 Comparative Analysis of Alternatives

In selecting a remedy, EPA considered the factors set out in Section 121 of CERCLA, 42 U.S.C.§ 9621, by conducting a detailed analysis of the viable remedial response measures pursuant to the NCP, 40 CFR §300.430(e)(9), and OSWER Directive 9355.3-01. The detailed analysis consisted of an assessment of each of the individual response measures per remedy component against each of nine evaluation criteria and a comparative analysis focusing on the relative performance of each response measure against the criteria. This section of the ROD describes the relative performance of the five assembled alternatives against the nine criteria, noting how each compare to the other options under consideration.

THRESHOLD CRITERIA – The first two criteria – 1) protection of human health and the environment, and 2) compliance with ARARs – are known as "threshold criteria" because they are the minimum requirements that each response measure must meet in order to be eligible for selection as a remedy.

The EPA determined that the No Action alternative is not a viable alternative for remedy selection because it does not meet the threshold criteria. The No Action alternative was developed as a baseline for comparative analysis purposes. The alternative would not eliminate the hazard posed to receptors by on-site contamination. DNAPL and groundwater contamination would remain.

Because the No Action alternative does not meet the threshold criteria, the remainder of the comparative analysis only includes four alternatives:

- Alternative 1: Barrier Wall and Cap, followed by Enhanced In-Situ Bioremediation and MNA.
- Alternative 2: In-Situ Solidification/Stabilization and Cap, followed by Enhanced In-Situ Bioremediation and MNA.
- Alternative 3: In-Situ Thermal Remediation for the Main Source Area, In-Situ Solidification/Stabilization and Cap for the Secondary Source Area, followed by Enhanced In-Situ Bioremediation and MNA.
- Alternative 4: In-Situ Smoldering (STAR™) Process for the Main Source Area, In-Situ Solidification/Stabilization and Cap for the Secondary Source Area, followed by Enhanced In-Situ Bioremediation and MNA.

10.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls and/or institutional controls.

All active alternatives would be protective of human health and the environment. Alternative 1 would meet the threshold criteria by isolating and containing DNAPL and subsurface soil contamination within a barrier wall and cap that encompasses both the Main and Secondary Source Areas, thereby eliminating direct exposures to

the contamination. Alternative 2 would meet the criteria by stabilizing the DNAPL and soil in place in both the Main and Secondary Source Areas and installing a cap over the stabilized material. Alternatives 3 and 4 would be protective of human health and environment by removing and treating the largest mass of COCs in the Main Source Area and using solidification/stabilization in the Secondary Source Area. All alternatives would also include enhanced in-situ bioremediation of dissolved-phase contamination to treat contaminated groundwater in the Dissolved Plume and long-term monitoring and maintenance of caps. Institutional controls would prevent exposures to contaminated groundwater and to protect the integrity of the cap and other remedial components.

10.2 Compliance with ARARs

Section 121(d) of CERCLA and NCP §300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites attain legally applicable or relevant and appropriate federal and more stringent state requirements, standards, criteria, and limitations that are collectively referred to as "ARARs," unless such ARARs are waived under CERCLA section 121(d)(4). Applicable requirements, as defined in 40 CFR §300.5, mean those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, or contaminant, remedial action, location, or other circumstance at a CERCLA site. Only those state standards identified by the state in a timely manner and that are more stringent than federal requirements may be applicable.

Relevant and appropriate requirements, as defined in 40 CFR §300.5, mean those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, or contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at a CERCLA site that their use is well suited to the particular site. This criterion assesses whether an alternative attains ARARs or provides grounds for invoking one of the ARAR waivers.

ARARs do not include occupational safety or worker protection requirements. Compliance with Occupational Safety and Health Administration (OSHA) standards is required separately by 40 CFR §300.150.

Under CERCLA Section 121(e)(1), federal, state, or local permits are not required for the portion of any removal or remedial action conducted entirely "on site," as defined in 40 CFR §300.5. See also 40 CFR §300.400(e)(1) & (2). Also, CERCLA response actions must only comply with the "substantive requirements", not the administrative requirements of a regulation or law. Administrative requirements include permit applications, reporting, record keeping, inspections and consultation with administrative bodies. Although consultation with state and federal agencies responsible for issuing permits is not required, it is often recommended for determining compliance with certain requirements such as those requirements typically identified as location-specific ARARs.

Per 40 CFR §300.400(g)(4), only those state standards that are promulgated, that are identified in a timely manner, and that are more stringent than federal requirements may be applicable or relevant and appropriate. For purposes of identification and notification of promulgated state standards, the term promulgated means that the standards are of general applicability and are legally enforceable. State ARARs are considered more stringent where there is no corresponding federal ARAR, where the state ARAR provides a more stringent concentration of a contaminant, or where a state ARAR is broader in scope than a federal requirement.

In addition to ARARs, the lead and support agencies may, as appropriate, identify other advisories, criteria, or guidance to be considered for a particular release. The TBC category consists of advisories, criteria, or guidance developed by EPA, other federal agencies, or states that may be useful in developing CERCLA remedies (see 40 CFR §300.400(g)(3)).

ARAR Categories

For ease of identification, EPA created three categories of ARARs: chemical-specific ARARs, location-specific ARARs, and action-specific ARARs. Under 40 C.F.R. §300.400(g)(5), the lead and support agencies shall identify their specific ARARs for a particular site and notify each other in a timely manner, as described in 40 CFR §300.515(d).

Chemical-specific ARARs: requirements that establish health- or risk-based numerical concentration limits or assessment methodologies for chemical contaminants in environmental media. Chemical-specific ARARs are presented in the Table 4-1 of the 2017 Focused Feasibility Study Report.

Location-specific ARARs: requirements that can restrict or limit response action based on specific locations (e.g., wetlands, floodplains, historic places, sensitive habitats). Location-specific ARARs are presented in Table 4-3 of the 2017 Focused Feasibility Study Report.

Action-specific ARARs: requirements that set controls or restrictions on the design, implementation, and performance levels of activities related to the management of hazardous substances, pollutants, or contaminants. Action-specific ARARs are presented in Table 4-2 of the 2017 Focused Feasibility Study Report.

All alternatives are expected to meet the chemical-specific, action-specific, and location-specific ARARs identified in the 2017 Focused Feasibility Study Report.

BALANCING CRITERIA – The next five criteria, criteria three through seven, are known as "primary balancing criteria". These criteria are factors by which tradeoffs between response measures are assessed so that the best options will be chosen, given site-specific data and conditions.

10.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refer to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup levels have been met. This criterion includes the consideration of residual risk that will remain on site after remediation and the adequacy and reliability of controls.

Alternatives 3 and 4 would provide the greatest degree of long-term effectiveness and permanence through treatment of the source areas using thermal technologies, and treatment of groundwater using enhanced in-situ bioremediation. Alternatives 3 and 4 provide a fast and thorough remediation of the Main Source Area, reducing the largest threat that is a continuing source of groundwater contamination. However, Alternatives 3 and 4 would still require long-term maintenance of the cap over stabilized soils in the Secondary Source Area and long-term groundwater monitoring.

Alternative 2 also meets the criteria of long-term effectiveness and permanence through solidification/ stabilization of contamination in the Main Source Area and Secondary Source Area and enhanced in-situ bioremediation of dissolved-phase groundwater. However, it has a somewhat lower long-term effectiveness and permanence ranking because it is possible that solidification/stabilization may not be able to be used for the source area located beneath the road, railroad or other obstructions. In this case, grout walls perpendicular to the rail line along the northern and southern boundaries of the North Main Source Area would be used. Contamination underneath the railroad located between these walls would not be solidified/stabilized. Long-term monitoring of the cap and groundwater monitoring would be required. Residual risks would be managed with institutional controls.

Alternative 1 meets the criteria of long-term effectiveness and permanence through isolation of source material, but it has a somewhat lower ranking compared to Alternatives 2, 3 and 4 because untreated waste, although contained, will remain on site. Alternative 1 would require long-term maintenance of the cap and groundwater monitoring. Containment remedies with vertical barrier walls and cap can function indefinitely, but there is also potential for slow leaching of contaminants through the barrier wall or basal clay unit over time.

These remedial alternatives and the Site are not vulnerable to impacts from climate change. The contamination is in the deep subsurface. The remedial components are not vulnerable to storms, floods, fires, droughts, or other climate change impacts.

The EPA expects that each of these remedial alternatives, by treating or containing the contamination deep in the subsurface beneath the Site, will address equally the remaining risk of exposure present at the Site. That risk was already greatly lowered by the earlier cleanup actions at the Site. Completion of this cleanup, including the removal of the risk of environmental harm posed by contamination currently on site, will be an important step toward environmental justice for the community.

10.4 Reduction of Toxicity, Mobility, and Volume

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy and which permanently and significantly reduces the toxicity, mobility, or volume of the hazardous substances, pollutants, or contaminants as a principal element.

Alternative 1 will not reduce toxicity, mobility, or volume of the contaminants in the source areas through treatment. COC mobility will be reduced through containment within the barrier wall and cap. However, there is potential for slow leaching of dissolved COCs through the barrier wall via diffusion.

Alternative 2 will not reduce the toxicity or volume of contaminants in the source areas, but it will reduce mobility of the contaminants using solidification/stabilization treatment.

Alternatives 3 and 4, if successfully implemented, would provide reduction in mobility, toxicity, and volume of contaminants in the Main Source Area. Both alternatives are thermal treatment technologies that would reduce the mass of contamination in the subsurface. Alternatives 3 and 4 also include solidification/stabilization treatment for the Secondary Source Area, which as noted above for Alternative 2, will reduce the mobility of the contaminants but not their toxicity or volume.

10.5 Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during construction, and operation of the remedy until cleanup levels are achieved.

Alternatives 1 through 4 will have minimal short-term impacts on the community and workers during implementation. Construction activities for all four alternatives should be complete within a year. The potential for short-term exposures to workers and the community will be addressed through proper design and execution of the remedial design, including the use of well-established best management practices and engineering controls.

Alternative 1 may pose the most short-term risks due to increased vehicular traffic and associated safety hazards, potential dust generation from earth-moving activities during excavation and construction for the slurry wall and cap. Alternatives 3 and 4, which include thermal treatment, may also require more engineering controls to minimize and prevent community or worker exposure to electric utilities or heated fluids or vapors.

10.6 Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

Alternatives 1 and 2 are straightforward to implement with readily available equipment. No specialists are required.

There are inherent difficulties in implementing Alternative 1 where the barrier wall and cap would cross the utility corridors, road, and railroads. Two road cuts and three railroad cuts would be required to implement this approach.

Alternative 2 may also require relocating or replacing the existing road and railroad or implementing a variation of the remedy where contamination beneath the road and railroad is contained with grout walls keyed into the solidification/stabilization areas. Large volumes of DNAPL may also be difficult to solidify and stabilize.

Alternative 3, which includes thermal treatment of the Main Source Area, is expected to be relatively complex to implement, requiring adequate electric service and creation of an equipment compound with multiple process units for water and air separation and treatment. The railroad is expected to be reluctant to grant permission for thermal treatment under the active rail lines. The technology is reliable, proven, and easily monitored. Specialists will be needed to implement the thermal treatment component of the remedy, but multiple vendors have the experience, equipment, and capacity for implementing the technology.

The technical reliability of Alternative 4 is a potential concern. The injection well installation and system construction for in-situ smoldering using the STAR™ process are implementable, but implementation will require a specialist. Only one vendor has the capability to construct and operate this technology. Similar to Alternative 3, the railroad is expected to be reluctant to allow thermal treatment under the rail lines.

Each of the four alternatives also includes enhanced in-situ bioremediation of the Dissolved Plume. Construction associated with this technology (e.g., injection well installation) is readily implementable. Effective implementation will be dependent on the ability to generate and maintain aerobic conditions and stimulate natural microbial populations in the aquifer.

10.7 Cost

Cost estimates, including capital costs and long-term operating costs, were prepared for each remedial alternative. All the alternatives include enhanced in-situ bioremediation and MNA for the Dissolved Plume, so differences in cost are driven by the containment or treatment alternatives selected for the Main Source Area and the Secondary Source Area.

Table 2 on the following page summarizes costs for each alternative. These costs are estimates based on the best available information and have an expected accuracy of +50% to -30%.

Alternative 1 has the lowest total net present value estimate. Alternatives 1 and 2 have higher O&M costs compared to Alternatives 3 and 4 due to the O&M costs associated with long-term cap inspections and maintenance and groundwater monitoring of the contained waste or stabilized soils left in place. Alternatives 3 and 4 have higher net present value estimates compared to Alternatives 1 and 2, which are associated with capital costs for the treatment remedies selected for the Main Source Area. Although Alternatives 3 and 4 treat the largest mass of COCs in the Main Source Area, stabilized soils in the Secondary Source Area will still require long-term maintenance and groundwater monitoring.
Alternative 2 falls between Alternative 1 and Alternatives 3 and 4, in terms of net present value costs.

Table 2: Costs

Cost Category	Alternative 1 Barrier Wall and Cap, followed by Enhanced In-Situ Bioremediation and MNA[a]	Alternative 2 In-Situ Solidification/ Stabilization/Cap, followed by Enhanced In-Situ Bioremediation and MNA[b]	Alternative 3 In-Situ Thermal Remediation for the Main Source Area, In-Situ Solidification/ Stabilization/Cap for the Secondary Source Area, followed by Enhanced In-Situ Bioremediation and MNA[c]	Alternative 4 In-Situ Smoldering (STAR™) Process for the Main Source Area, In-Situ Solidification/ Stabilization/Cap for the Secondary Source Area, followed by Enhanced In-Situ Bioremediation and MNA[d]
Capital Cost	$6,053,489	$18,719,486	$21,085,734	$20,349,701
O&M Costs	$1,830,051	$1,830,051	$1,649,991	$1,649,991
Total	$7,883,540	$20,549,537	$22,735,744	$21,999,744

Notes:

a) Combined costs for the barrier wall/cap at the Main and Secondary Source Areas and enhanced in-situ bioremediation and MNA for the plume.
b) Combined costs for in-situ solidification/stabilization/cap at the Main and Secondary Source Areas and enhanced in-situ bioremediation and MNA for the plume.
c) Combined costs for thermal treatment at the Main Source Area, in-situ solidification/stabilization/cap at the Secondary Source Area and enhanced in-situ bioremediation and MNA for the plume.
d) Combined costs for the in-situ STAR™ process for the Main Source Area, in-situ solidification/stabilization/cap for the Secondary Source Area, and enhanced in-situ bioremediation and MNA for the plume.

MODIFYING CRITERIA – The final two evaluation criteria, criteria 8 and 9, are called "modifying criteria" because new information or comments from the state or the community on the Proposed Plan may modify the preferred response measure or cause another response measure to be considered.

10.8 State Acceptance

This criterion indicates whether, based on its review of the RI/FS reports and the Proposed Plan, the state supports, opposes, and/or has identified any reservations with the selected response measure.

The state has reviewed the public comments received and accepts the Preferred Alternative (Appendix C).

10.9 Community Acceptance

This criterion summarizes the public's general response to the response measures described in the Site's Proposed Plan and the RI/FS reports. This assessment includes determining which of the response measures the community supports, opposes, and/or has reservations about.

11.0 Principal Threat Waste

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP Section 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is a waste or material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to groundwater, surface water, or air, or acts as a source for

direct exposure. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur.

Contaminated groundwater generally is not considered to be a source material. However, DNAPL in groundwater is viewed as source material. Principal threat waste in the form of mobile DNAPL and residual DNAPL in saturated soil is present on site. The Amended Remedy will address DNAPL by immobilizing it using in-situ solidification/stabilization.

12.0 Amended Remedy

Based on the above information in the Site's Administrative Record file, as documented in the Proposed Plan, EPA's selected Amended Remedy for site groundwater is Alternative 2: In-Situ Solidification/ Stabilization and Cap, followed by Enhanced In-Situ Bioremediation and MNA.

The estimated cost of Alternative 2 is $20,549,537.

Based on currently available information, EPA has determined that Alternative 2 meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing criteria and modifying criteria. EPA expects the Amended Remedy to satisfy the following statutory requirements of CERCLA Section 121(b), 42 U.S.C. §9621(b): 1) be protective of human health and the environment; 2) comply with ARARs (or justify a waiver); (3) be cost effective; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the statutory preference for treatment as a principal element to the extent practicable.

While contamination would remain in place indefinitely, the COCs would be treated by being bound into a solid low-permeability soil/cement matrix, essentially eliminating the continuing flux of DNAPL and COCs to groundwater, allowing for the restoration of the surficial aquifer outside the Secondary Source Area. This approach will achieve site RAOs by preventing migration of DNAPL and COCs into groundwater. Enhanced in-situ bioremediation of the Dissolved Plume outside the treatment and capped areas followed by MNA would restore contaminated groundwater to attain cleanup levels. Institutional controls will be used to prevent exposure to contaminated groundwater, stabilized waste or waste contained beneath the railroad, and to prevent disturbance of the cover and any other remedy components (e.g., monitoring wells). Alternative 2 would also reduce the excess cancer risks and noncancer hazard associated with exposure to contaminated groundwater, achieve groundwater cleanup levels, and attain ARARs.

Alternative 2 was selected over the other alternatives because of its overall potential effectiveness and efficiency in addressing site contamination. In-situ solidification/stabilization is a less complex technology to implement compared to the thermal treatment technologies in Alternatives 3 and 4, and it provides the same level of protectiveness at a lower cost. It would not require aboveground infrastructure to treat extracted vapors or fluids. The Amended Remedy satisfies the statutory preference to use treatment as a principal element of the remedy by treating the DNAPL as well as dissolved-phase groundwater contamination.

12.1 Detailed Description of the Amended Remedy

The major components of the selected Amended Remedy include:

- In-situ solidification/stabilization treatment of DNAPL in the Main Source Area and Secondary Source Area.
- Construction of a composite cap over the treated areas that complies with identified RCRA ARARs for a Subtitle C landfill final cover.
- Installation of grout walls perpendicular to the railroad to alleviate the need for track replacement.
- Enhanced in-situ bioremediation: injection of oxygen into the aquifer via underground injection wells to enhance the rate of natural degradation of contaminants in groundwater.
- Long-term cap maintenance and groundwater monitoring.
- Implementation of institutional controls to prevent well installation and use of contaminated groundwater, to provide increased public awareness, and to restrict disturbance of in-situ treated waste that remains at the Site and interference with other remedy components.

The Amended Remedy includes in-situ solidification/stabilization treatment to isolate and stabilize DNAPL and contiguous soil contamination in the Main Source Area and Secondary Source Area. The target treatment area covers about 3.7 acres and extends to about 35 feet below ground surface. The processes and additives for in-situ solidification/stabilization will be further refined in the remedial design. The selected additives will be prepared in a batch plant on site and then injected into the subsurface using large diameter augers or other processes as determined during remedial design. The additive formulation may be adjusted based on specific soil characteristics or relative percentage of DNAPL encountered.

Because parts of the Main Source Area extend beneath the railroad, the Amended Remedy also includes installation of in-situ solidification/stabilization grout walls perpendicular to the railroads along the northern and southern boundaries of the North Main Source Area using angled jet or permeation grout injection wells (or a single column of large diameter augers). This approach will alleviate the need to remove or relocate the railroad tracks. The grout walls will be keyed into the solidification/stabilization areas on either side of the railroad to contain contamination. Contamination underneath the railroad located between the grout walls would not be solidified/stabilized.

Once the in-situ solidification/stabilization remedy component is implemented, more characterization of the subsurface soil and groundwater may be performed to support an evaluation of whether installation of the RCRA landfill cap remedy component is necessary in order to achieve RAOs. If based on the results of an evaluation, the EPA determines that the cap is not necessary, then an ESD would be issued to describe the changes in the scope of the remedy (including that the waste management area would be changed to only include the separate in-situ solidification/stabilization treatment areas as opposed to one larger waste management area that encompassed both treatment areas) and describe any change in the cost of remedy.

Following implementation of in-situ solidification/stabilization and construction of a cap, enhanced in-situ bioremediation followed by MNA will be used to treat contamination in the Dissolved Plume outside of the waste management area. Treatment will include installation of injection wells in the

shallow aquifer for the addition of infused oxygen. The number of injection wells needed will be determined during the remedial design. Performance monitoring and optimization will be performed as necessary (e.g., more injection events may be required to increase the degradation rate of contaminants so that cleanup levels can be met in a reasonable timeframe).

Institutional controls will be implemented as part of the Amended Remedy. Institutional controls are non-engineering measures which usually include legal controls to affect human activities in such a way to prevent or reduce exposure to contamination. The purpose of the institutional controls is to impose on a subject property or area "use" restrictions for the purpose of implementing, facilitating, and monitoring a remedial action to reduce exposure, thereby protecting human health and the environment. Some of the institutional controls to prevent well installation and use of contaminated groundwater, to provide increased public awareness and to prevent disturbance of the cap, in-situ treated waste and waste beneath the railroad, and other remedy components include, but are not limited to:

- Environmental covenants (e.g., restrictive covenants).
- Deed notices.
- Recordation of a Notice of Contaminated Site under N.C.G.S. 143B-279.10.
- Local zoning/ordinances.
- State and local rules.

The Amended Remedy replaces the groundwater recovery and treatment remedy selected in the 2001 ROD Amendment. Table 3 is a side-by-side comparison of the existing groundwater remedy in the 2001 ROD Amendment and the Amended Remedy selected in this ROD Amendment.

Table 3: Comparison of 2001 ROD Amendment Groundwater Remedy and 2022 Groundwater Amended Remedy

2001 ROD Amendment Remedy Component	2022 Amended Remedy Component
Extraction of contaminated groundwater and DNAPL using recovery wells and a French drain.	In-situ solidification/stabilization of source areas containing mobile and residual DNAPL followed by construction of a cap over stabilized waste; containment of DNAPL-impacted soil beneath the railroad with grout wall curtains.
On-site treatment of contaminated groundwater, including addition of oxygen and nutrients to the water to promote and sustain in-situ biodegradation of organic contaminants.	Injection of oxygen directly into the aquifer via underground injection wells to enhance the rate of natural degradation of contaminants in groundwater followed by MNA.
Construction of infiltration galleries for on-site discharge of treated water.	No longer applicable.
Installation of air sparging wells to help sustain in-situ biodegradation.	No longer applicable.
Groundwater monitoring.	Groundwater monitoring and long-term cap maintenance.
	Implementation of institutional controls to prevent well installation and use of contaminated groundwater, to provide increased public awareness, and to restrict disturbance of in-situ treated waste and interference with remedy components.

12.2 Summary of the Rationale for the Amended Remedy

Based on consideration of the results of site investigations, CERCLA requirements, the detailed analysis of the response measures, and public comments, EPA has determined that Alternative 2: In-Situ

Solidification/Stabilization and Cap, followed by Enhanced In-Situ Bioremediation and MNA, is the appropriate remedy for the Site, because it best satisfies the requirements of Section 121 of CERCLA, 42 U.S.C. § 9621, and the NCP's nine evaluation criteria for remedial alternatives, 40 CFR §300.430(e)(9). Of those alternatives that are protective of human health and the environment and comply with ARARs, the EPA has determined that the selected Amended Remedy provides the best balance of tradeoffs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element, bias against off-site treatment and disposal, and considering state and community acceptance.

The EPA and NCDEQ concur that the selected Amended Remedy will satisfy the following statutory requirements of CERCLA Section 121(b), 42 U.S.C. § 9621(b):

12.3 Cost Estimate for the Amended Remedy

The cost estimate information in Table 4 is based on the best available information regarding the anticipated scope of the Amended Remedy. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum, in the Administrative Record file, an ESD or a ROD Amendment.

Table 4: Estimated Costs for Amended Remedy

Activity	Alternative 2
Estimated capital cost	$18,719,486
Estimated net present worth O&M cost	$1,830,051
Estimated net present worth total cost	$20,549,537

12.4 Estimated Outcomes of the Amended Remedy

The Amended Remedy will protect human health and the environment by eliminating, reducing, or controlling risks at the Site through treatment of DNAPL and DNAPL-impacted soils and placement of a RCRA landfill cap over stabilized wastes, treatment of dissolved-phase groundwater contamination, and implementation of institutional controls to limit land and groundwater use. Implementation of the Amended Remedy will accomplish the RAOs for the Site, as described in Section 8.0.

The Amended Remedy is expected to contain and stabilize principal threat waste (DNAPL) in ground-water, eliminating it as a continuing source of groundwater contamination. Soil/stabilization and installation of a RCRA C landfill cap over the waste management area (e.g., area of stabilized waste) are expected to take less than one year to complete, at which time long-term maintenance of the cap will begin.

The Amended Remedy is expected to restore groundwater outside of the waste management area to its beneficial use as a potential drinking water source and attain cleanup levels throughout the plume. The time for restoration will depend on the degradation rate of contaminants following source reduction and enhanced in-situ bioremediation efforts. Based on groundwater monitoring trend plots from the Site's fourth Five-Year Review Report, the dissolved plume beyond the area of active treatment should attenuate in approximately five years.

The Amended Remedy will prevent exposure to contaminated groundwater and solidified waste through use of institutional controls. Institutional controls will remain in place for as long as contamination remains on site.

Future land use of the Site is anticipated to be commercial/industrial. The future land use is supported by the Amended Remedy.

Completion of this cleanup, including the removal of the risk of environmental harm posed by contamination currently on site, will be an important step toward environmental justice for the community. EPA strives to have meaningful public engagement with the community around the Site throughout the Superfund process. EPA shared its Proposed Plan with the community on its website as well as through a fact sheet mailed to stakeholders and every mailing address within a 1-mile radius of the Site. Additional public outreach and meaningful engagement will occur during the remedial design and construction stages of the process, which will be more visible to the community.

Table 1 in Section 8.0 of this ROD Amendment specifies the groundwater cleanup levels for the remedial action.

13.0 Statutory Determinations

As noted previously, Section 121(b)(1) of CERCLA, 42 U.S.C. § 9621(b)(1) mandates that remedial actions must be protective of human health and the environment, cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Section 121(b)(1) of CERCLA, 42 U.S.C. § 9621(b)(1) also establishes a preference for remedial actions that employ treatment to permanently and significantly reduce the volume, toxicity or mobility of the hazardous substances, pollutants or contaminants at a site. Section 121(d) of CERCLA, 42 U.S.C. § 9621(d) further specifies that a remedial action must attain a degree of cleanup that satisfies ARARs under federal and state environmental laws, unless a waiver can be justified pursuant to Section 121(d)(4) of CERCLA, 42 U.S.C. § 9621(d)(4).

13.1 Protection of Human Health and the Environment

The EPA has determined that the Amended Remedy meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The EPA expects the selected Amended Remedy to satisfy the following statutory requirements of CERCLA 121(b) and (d): (1) be protective of human health and the environment; (2) comply with ARARs (or justify a waiver); (3) be cost effective; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the statutory preference for treatment as a principal element to the extent practicable.

Alternative 2 was selected over the other alternatives because of its overall potential effectiveness and efficiency in addressing site contamination. In-situ solidification/stabilization is a less complex technology to implement compared to the thermal treatment technologies in Alternatives 3 and 4, and it provides the same level of protectiveness at a lower cost. It would not require aboveground infrastructure to treat extracted vapors or fluids. The Amended Remedy satisfies the statutory preference to use treatment as a principal element of the remedy by treating the DNAPL as well as dissolved-phase groundwater contamination.

13.2 Compliance with ARARs

Section 121(d) of CERCLA, as amended, specifies, in part, that remedial actions for cleanup of hazardous substances must comply with requirements and standards under federal or more stringent state environmental laws and regulations that are applicable or relevant and appropriate (i.e., ARARs) to the hazardous substances or particular circumstances at a site or justify invoking a waiver under Section 121(d)(4) (see also 40 C.F.R. §§ 300.430(f)(1)(ii)(B) and (C), and 40 C.F.R. §§ 300.430(f)(5)(ii)(B) and (C)). ARARs include only promulgated federal and state environmental or facility siting laws/regulations. They do not include occupational safety or worker protection requirements. Compliance with OSHA standards is required by 40 C.F.R. § 300.150. Therefore, the CERCLA requirement for compliance with or waiver of ARARs does not apply to OSHA standards.

In accordance with 40 C.F.R. § 300.430(f)(5)(ii)(B), this ROD Amendment includes ARARs that the remedy is expected to attain that were identified by the EPA and the state of North Carolina. Table B-2, Table B-3 and Table B-4 in Appendix B list, respectively, the chemical-specific, location-specific and action-specific ARARs/TBCs for the selected remedial action described in this ROD Amendment. A waiver is not being invoked for any of the identified ARARs.

13.3 Cost Effectiveness

The EPA has determined that the selected Amended Remedy is cost effective, and that the overall protectiveness of the remedy is proportional to the overall cost. As specified in 40 CFR § 300.430(f)(1)(ii)(D), the cost effectiveness of the selected Amended Remedy was assessed by comparing the protectiveness of human health and the environment in relation to three balancing criteria (long-term effectiveness and permanence, reduction in toxicity, mobility or volume, and short-term effectiveness), with the other alternatives considered.

While more than one remedial alternative can be considered cost effective, CERCLA does not mandate the selection of the most cost-effective or least-expensive remedy.

13.4 Use of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The EPA has determined that the Amended Remedy represents the maximum extent to which permanent solutions can be used in a practicable manner at the Site.

While contamination will remain in place indefinitely, the COCs will be treated by being bound into a solid low-permeability soil/cement matrix; contamination beneath the railroad will be contained with grout curtains. The treatment will limit further migration of DNAPL and COCs into groundwater, allowing for the restoration of the Dissolved Plume located outside the stabilized waste areas.

Groundwater monitoring and institutional controls are critical components to ensure that the Amended Remedy is protective and will achieve RAOs. The Amended Remedy represents a permanent solution to address the risks posed at the Site, restore groundwater to its beneficial use as a drinking water source, and attain ARARs.

13.5 Preference for Treatment as a Principal Element

The Amended Remedy, which includes in-situ solidification/stabilization of DNAPL (considered PTW) to about 35 feet below land surface for the Main and Secondary Source Areas and enhanced in-situ bioremediation for the Dissolved Plume, will reduce the toxicity, mobility, or volume of contamination through isolation/containment and treatment. In-situ solidification/stabilization of soil will isolate and stabilize the DNAPL and contiguous soil contamination, thereby reducing contaminant migration into the groundwater. Existing contamination in the Dissolved Plume outside the ISS treatment areas will be treated by enhanced in-situ bioremediation. These Amended Remedy components will provide for a faster transition to MNA.

13.6 Five-Year Review Requirements

Because hazardous substances, pollutants, or contaminants will remain at the Site above levels that allow for unlimited use and unrestricted exposure, EPA will continue to review the remedial actions taken at the Site no less than every five years per CERCLA Section 121(c) and the NCP at 40 CFR 300.430(f)(4)(ii). If results of the five-year reviews reveal that remedy integrity is compromised and protection of human health and the environment is insufficient, EPA and NCDEQ will evaluate the need for additional action.

13.7 Documentation of Significant Changes

Pursuant to CERCLA Section 117(b) and NCP §300.430(f)(3)(ii), the ROD Amendment must document any significant changes made to the Preferred Alternative discussed in the Proposed Plan.

EPA reviewed all written and oral comments submitted during the public comment period. There are no other significant changes to the remedy, as originally identified in the Proposed Plan.

14.0 References

Black & Veatch, 2010. NAPL Investigation Report – 2009, Cape Fear Wood Preserving Site, Fayetteville, Cumberland County, North Carolina. November 1, 2010.

Black & Veatch, 2011. Remedial Technology Evaluation, Cape Fear Wood Preserving Superfund Site, Fayetteville, Cumberland County, North Carolina. January 1, 2011.

Black & Veatch, 2013a. Feasibility Study Report, Revision 0, Cape Fear Wood Preserving Superfund Site, Fayetteville, Cumberland County, North Carolina. July 1, 2013.

Black & Veatch, 2013b. Feasibility Study Report, Revision 0, Addendum 1, Cape Fear Wood Preserving Superfund Site, Fayetteville, Cumberland County, North Carolina. December 1, 2013.

Black & Veatch, 2016. 2015 Data Evaluation Report, Revision 0, Cape Fear Wood Preserving Superfund Site, Fayetteville, Cumberland County, North Carolina. April 1, 2016.

Black & Veatch, 2017. Focused Feasibility Study, Revision 1, Cape Fear Wood Preserving Superfund Site, Fayetteville, Cumberland County, North Carolina. March 1, 2017.

Camp Dresser & McKee (CDM), 1988. Final Remedial Investigation Report for Cape Fear Wood Preserving Site, Fayetteville, North Carolina. October 6, 1988.

CDM, 1988. Draft Final Feasibility Study Report for Cape Fear Wood Preserving Site, Fayetteville, North Carolina. December 16, 1988.

EPA, 1989. Record of Decision, Remedial Alternative Selection, Cape Fear Wood Preserving Site, Fayetteville, Cumberland County, North Carolina. June 30, 1989.

EPA, 1991. Explanation of Significant Difference in Components of the Remedy to be Implemented at the Cape Fear Wood Preserving Site, Fayetteville, Cumberland County, North Carolina. September 24, 1991.

EPA, 1995. Explanation of Significant Difference to the Remedial Action for the Cape Fear Wood Preserving Site, Fayetteville, Cumberland County, North Carolina. August 8, 1995.

EPA, 1996. Explanation of Significant Difference to the Remedial Action, Cape Fear Wood Preserving Superfund Site, Fayetteville, Cumberland County, North Carolina. May 31, 1996.

EPA, 2001. Amendment to the Record of Decision, Remedial Alternative Selection, Cape Fear Wood Preserving Site, Cumberland County, North Carolina. March 23, 2001.

EPA, 2021. Fourth Five-Year Review Report, Cape Fear Wood Preserving Site, Fayetteville, Cumberland County, North Carolina. September 30, 2021.

EPA, 2022a. Proposed Plan Cleanup Summary, Cape Fear Wood Preserving Superfund Site, Fayetteville, Cumberland County, North Carolina. August 1, 2022.

EPA, 2022b. Proposed Plan. US Finishing/Cone Mills Superfund Site, Fayetteville, Cumberland County, North Carolina. August 2022.

Qi, Q., 2022. Email from Qu Qi, NCDENR to Hilary Thornton, EPA. Re: Cape Fear Proposed Plan AROD Update and Question. July 14, 2022.

PART 3: RESPONSIVENESS SUMMARY

1.0 Public Review Process

1.1 Introduction

This Responsiveness Summary provides a summary of comments and concerns received during the public comment period related to the Proposed Plan at the Site. It also provides EPA's responses to those comments and concerns.

A Responsiveness Summary serves two functions. First, it provides the decision maker with information about the views of the public, government agencies, and potentially responsible parties regarding the proposed remedial action and other alternatives. Second, it documents the way in which public comments have been considered during the decision-making process and provides answers to significant comments.

Public involvement in the review of Proposed Plans is stipulated in CERCLA Section 117(a) and Sections 300.430(f)(3)(i)(F) and 300.430(f)(5)(iii)(B) of the NCP. These regulations provide for active solicitation of public comment.

This Responsiveness Summary addresses all public comments received. The Responsiveness Summary was prepared following guidance provided by the EPA in its 1992 Community Relations in Superfund: A Handbook and its 1988 Community Relations during Enforcement Activities and Development of the Administrative Record. The comments presented in this document have been considered in EPA's decision in the selection of a groundwater remedy for the Site.

The text of this Responsiveness Summary explains the public review process and how the EPA responded to public comments.

1.2 Public Review Process

The EPA relies on public input to make sure community concerns are considered when selecting an effective remedy for each Superfund site. The EPA released the Site's Proposed Plan for public comment on August 12, 2022.

The complete Administrative Record file, which contains the RI/FS reports and risk assessments on which the selected Amended Remedy is based, is available at the locations listed below.

Online at: https://semspub.epa.gov/src/collections/04/AR/NCD003188828.

The Site's local information repository is the Cumberland County Public Library & Information Center, located at 300 Maiden Lane in Fayetteville, North Carolina 28301. The library is open. It provides computer access for the community to access the Site's Administrative Record file online.

1.3 Public Comment Period, Public Meeting, and Availability Sessions

The goal of the public comment period is to gather information about the views of the public regarding both the remedial alternatives and general concerns about the Site. A notice of the start of the public comment period, the public meeting date, the preferred remedy, contact information and the

availability of above-referenced documents was provided in a fact sheet distributed to the public on August 12, 2022, and published in the *Fayetteville Observer* newspaper on August 14, 2022.

The public comment period for the Proposed Plan started on August 12, 2022. It continued until September 11, 2022, for a total of 30 days.

1.4 Receipt and Identification of Comments

Public comments on the Proposed Plan and EPA Region 4 responses were received as written comments submitted to the EPA Region 4 via email.

Comment 1: My family and I moved to the Southgate community in 1980. There are many folks living along Southgate Road and Granada Drive that have come down with cancer, including myself. There are seven people on Granada Drive alone that are/were victims of cancer. Some have died or moved over the years but some of us are still here. Are these cancer victims a result of the contamination of the wells? No proof of that, just hearsay. At the beginning of the cleanup, we were getting our water from many wells in the subdivision which have now been eliminated due to contamination. It was also said that the contamination had reached all the way to 71st High School on Raeford Road. It is my opinion that a door-to-door survey be conducted along the entire area of contamination.

Response 1: Cancer clusters are a valid concern, and in some cases also a public health concern. At the Site, contamination is localized and confined within the Site's boundary and is being routinely monitored. Additional sampling of the on-site groundwater monitoring wells will occur in the future to prepare for and then monitor the new remedy. The two closest private water wells to the Site were last sampled by NCDEQ in 2019, a private residence and one at the S&W Ready Mix concrete plant. No contamination was detected in either sample.

At the Southgate subdivision, further away from the Site to the south and east, several community wells supply water for the residents. The water supplier's name is Brookwood Community Water System, ID NC0326127. There are six water supply wells for the Southgate subdivision located within 1 mile of the Site: wells 40, 51, 61, 80, 81, and 87. These wells are routinely sampled, and the results posted publicly in the NC Public Water Supply database (link below). Regulatory review of the sampling reports showed no detections.

Below is the link to the NC Public Water Supply database:
https://www.pwss.enr.state.nc.us/NCDWW/JSP/WaterSystemDetail.jsp?tinwsys_is_number=15789&tinwsys_st_code=NC&wsnumber=NC0326127.

On the page, click "Other Chemical Results by Analyte". Then, pick a chemical of concern, then click a well to see the results for that analyte from that well.

However, this does not negate the need to investigate the potential for an elevation in the cancer incidence rate in the Southgate Road community. The role of the EPA Superfund program is to develop procedures and methods to contain and mitigate contamination and to clean up the environment following a hazardous substance release. For addressing public health concerns, the EPA defers to the North Carolina Department of Health and Human Services (NC DHHS)

and the local county health department. These agencies work together with the Agency for Toxic Substance Control and Disease Registry (ATSDR) to respond to inquiries about a suspected cancer cluster. They have access to specialized tools and cancer registries with the latest cancer incidence rate for the area that can be used to determine whether the cancer incidence rate for the Southgate Road community exceeds that of the average rate for the state, county, or city. These agencies have access to the most current local data which can be parsed by county and Health Service Area.

According to the American Cancer Society, the current cancer rate in the United States is 1 in 2 for women and 1 in 3 for men. Given this background risk for developing cancer just by living in America, there are a variety of factors that public health experts examine when trying to determine causality between a type of cancer and the suspected environmental contaminant. These factors include: the route of exposure, how much, how long, and how often a person was potentially exposed, general health condition, genetics, age/demographic characteristics of cases (e.g., lung cancer in a younger age group that usually occurs in older age groups), family history of cancer, lifestyle choices, types of cancer and number of cases of each type, and other environmental exposures and stressors in the geographic area that may play a role. Due to these factors, identifying a cancer cluster does not guarantee that a common cause or an environmental contaminant will be implicated. For additional information on the cancer incidence rate for Fayetteville, North Carolina, visit http://www.ncdhhs.gov or contact Dr. Susan Kansagra at 919-707-5000 or the State Center for Health Statistics at 919-733-4728.

2.0 References

EPA, 1988. Community Relations During Enforcement Activities and Development of the Administrative Record. Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C. OSWER Directive 9836.0-01A. November 1988.

EPA, 1992. Community Relations in Superfund: A Handbook. Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C. OSWER Directive 9230.0-03C. EPA 540-R-92-009. January 1992.

APPENDIX A: FIGURES

Figure 1: Site Location

Figure 2: Site Layout

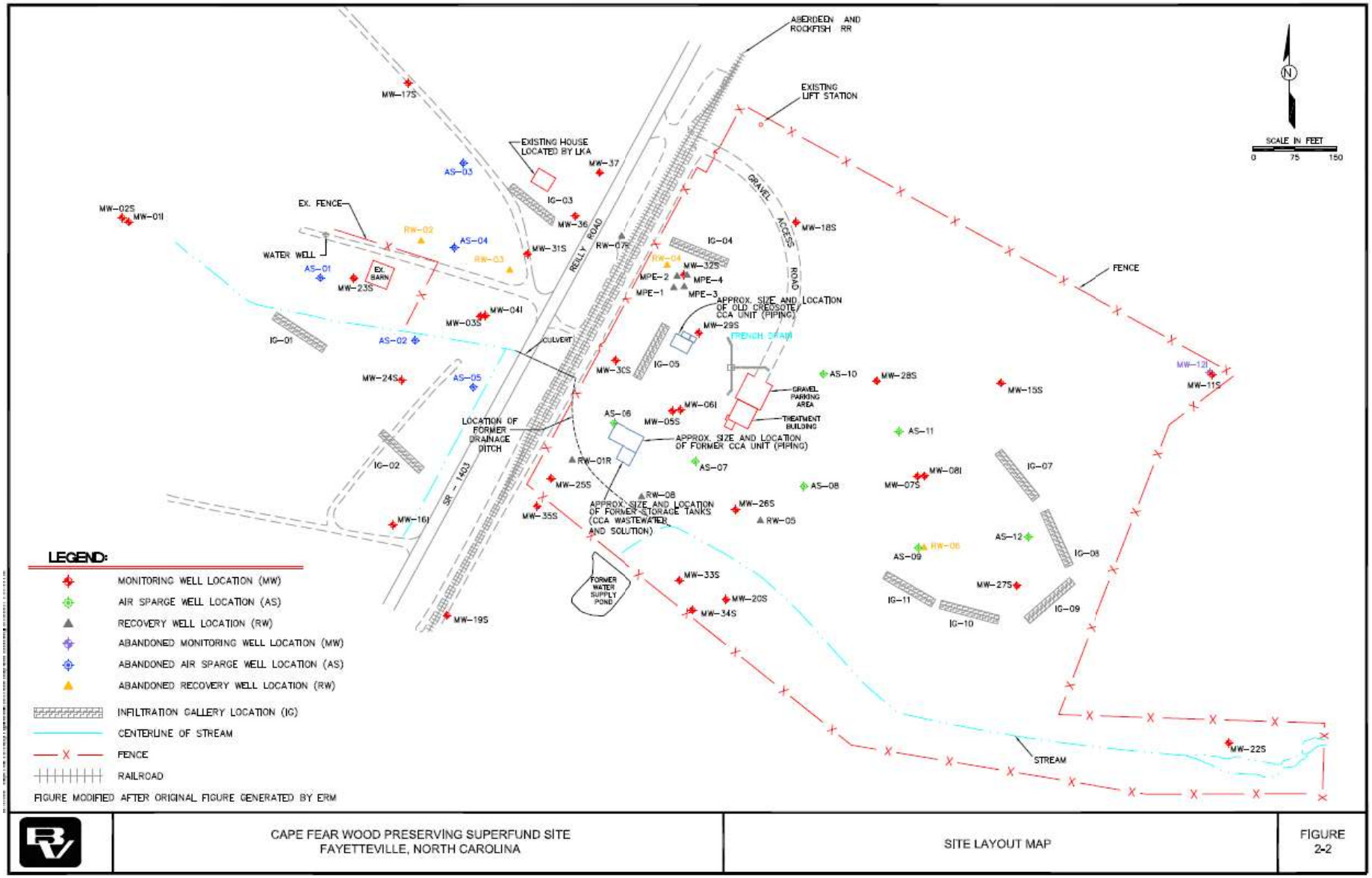


Figure 3: Aerial Photographs, 1999 and 2021

1999

2021

Figure 4: Contaminated Media Zone Designations

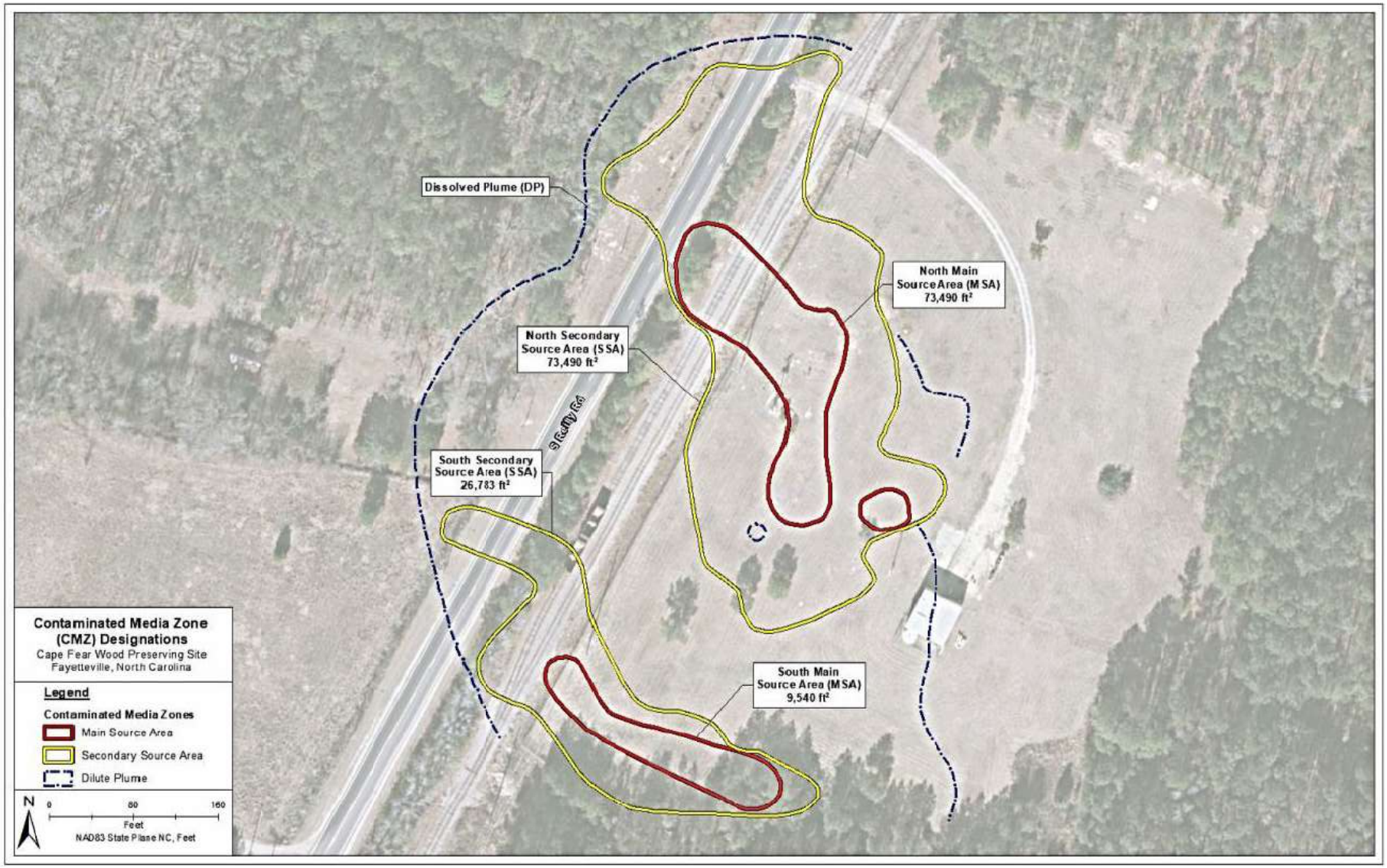
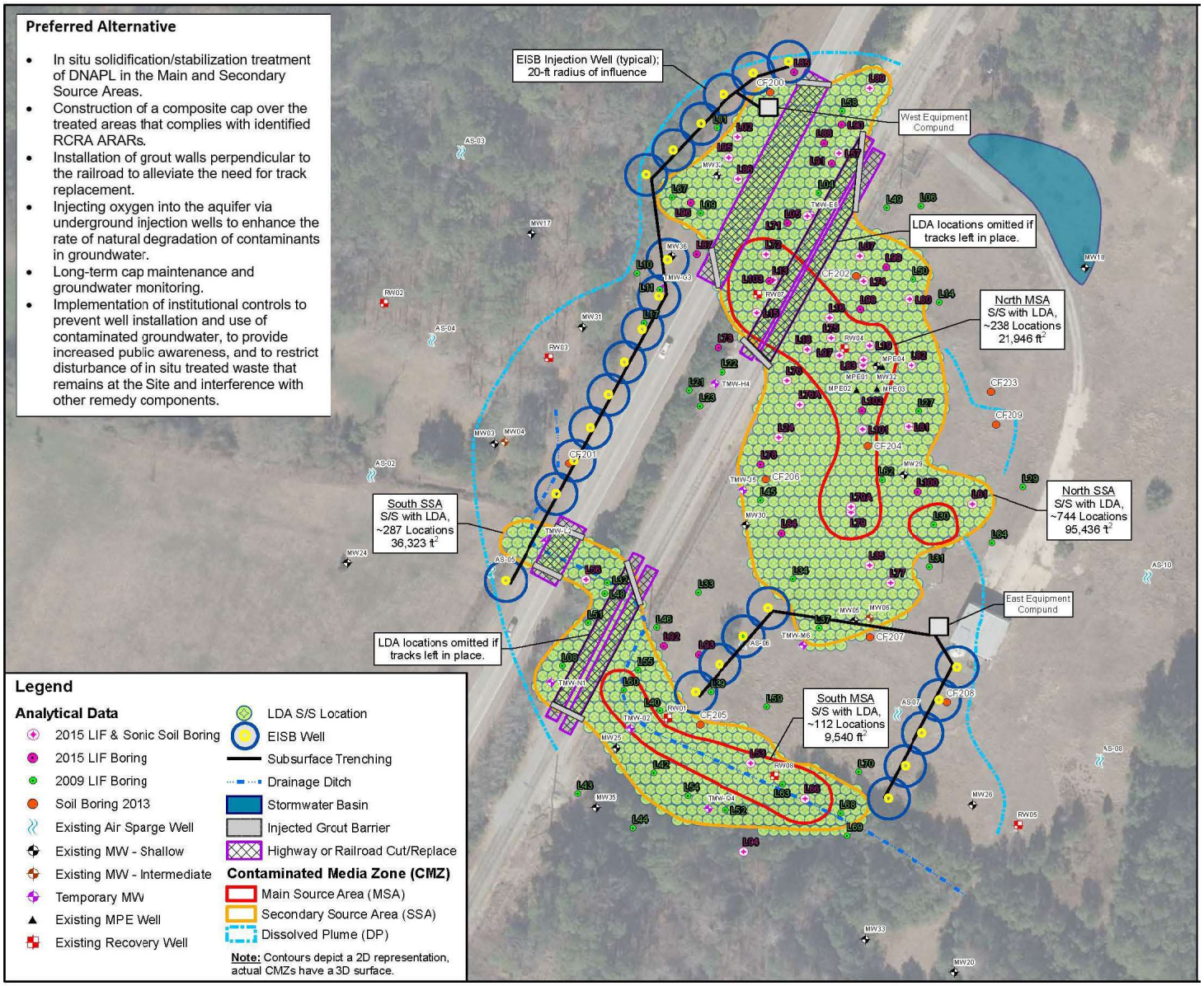


Figure 5: Selected Amended Remedy



APPENDIX B: TABLES

Table B-1: Groundwater Analytical Data – New Wells Cape Fear Wood Preserving Superfund Site, Fayetteville, North Carolina, from 2017 Focused Feasibility Study Report

Sample Location / Sample Date / Sample Identification No.			MW36	MW37	MW37 (duplicate)
			10/13/2016	10/12/2016	10/12/2016
			MW36GW102016	MW37GW102016	MW937GW102016
Analyte	**Units**	**CAPE FEAR ROD - NC2L**	**Result Qualifier**	**Result Qualifier**	**Result Qualifier**
Classical/Nutrient Analyses					
Alkalinity, Total (as CaCO3)	mg/L		25 O	NA	NA
Carbon, Organic	mg/L		1 U,O	NA	NA
Nitrate as N	mg/L		NA	NA	NA
Nitrate/Nitrite as N	mg/L		0.05 U,O	NA	NA
Nitrite as N	mg/L		NA	NA	NA
Sulfate as SO4	mg/L		1.5 O	NA	NA
Total Metals					
Iron	µg/L		13000	NA	NA
Semi Volatile Organics					
(3-and/or 4-)Methylphenol	µg/L		10 U,O	120	120
1,1-Biphenyl	µg/L		2.1 O	180	190
1,4-Dioxane	µg/L		2 U,O	2 U	2 U
2,3,4,6-Tetrachlorophenol	µg/L		10 U,O	10 U	10 U
2,4,5-Trichlorophenol	µg/L		10 U,O	10 U	10 U
2,4,6-Trichlorophenol	µg/L		10 U,O	10 U	10 U
2,4-Dichlorophenol	µg/L		10 U,O	400 U	400 U
2,4-Dimethylphenol	µg/L		10 U,O	280 J,O	300 J,O
2,4-Dinitrophenol	µg/L		20 U,O	20 U	20 U
2,4-Dinitrotoluene	µg/L		10 U,O	10 U	10 U
2,6-Dinitrotoluene	µg/L		10 U,O	10 U	10 U
2-Chloronaphthalene	µg/L		10 U,O	10 U	10 U
2-Chlorophenol	µg/L		10 U,O	10 U	10 U
2-Methyl-4,6-dinitrophenol	µg/L		10 U,O	10 U	10 U
2-Methylnaphthalene	µg/L		4.1 O	980	970
2-Methylphenol	µg/L		10 U,O	68	70
2-Nitroaniline	µg/L		10 U,O	10 U	10 U
2-Nitrophenol	µg/L		10 U,O	400 U	400 U
3,3'-Dichlorobenzidine	µg/L		10 U,O	10 U	10 U
3-Nitroaniline	µg/L		10 U,O	10 U	10 U
4-Bromophenyl phenyl ether	µg/L		10 U,O	10 U	10 U
4-Chloro-3-methylphenol	µg/L		10 U,O	400 U	400 U
4-Chloroaniline	µg/L		10 U,O	400 U	400 U
4-Chlorophenyl phenyl ether	µg/L		10 U,O	10 U	10 U
4-Nitroaniline	µg/L		10 U,O	10 U	10 U
4-Nitrophenol	µg/L		10 U,O	10 U	10 U
Acenaphthene	µg/L	80	6.4 O	790	810
Acenaphthylene	µg/L	200	NA	82	83
Acetophenone	µg/L		10 U,O	10 U	10 U
Anthracene	µg/L	2000	NA	33	32
Atrazine	µg/L		10 U,O	10 U	10 U
Benzaldehyde	µg/L		10 U,O	10 U	10 U
Benzyl butyl phthalate	µg/L		10 U,O	10 U	10 U
Bis(2-chloroethoxy)methane	µg/L		10 U,O	400 U	400 U
bis(2-Chloroethyl) Ether	µg/L		10 U,O	10 U	10 U
Bis(2-chloroisopropyl) ether	µg/L		10 U,O	10 U	10 U

Table B-1: Groundwater Analytical Data – New Wells Cape Fear Wood Preserving Superfund Site, Fayetteville, North Carolina, from 2017 Focused Feasibility Study Report

Sample Location			MW36	MW37	MW37 (duplicate)
Sample Date Sample Identification No.			10/13/2016	10/12/2016	10/12/2016
			MW36GW102016	MW37GW102016	MW937GW102016
Analyte	**Units**	**CAPE FEAR ROD - NC2L**	**Result Qualifier**	**Result Qualifier**	**Result Qualifier**
Bis(2-ethylhexyl) phthalate	µg/L		10 U,O	10 U	10 U
Caprolactam	µg/L		10 U,O	400 U	400 U
Carbazole	µg/L	5	4.7 O	560	550
Dibenzofuran	µg/L		5.2 O	460	460
Diethyl phthalate	µg/L		10 U,O	10 U	10 U
Dimethyl phthalate	µg/L		10 U,O	10 U	10 U
Di-n-butylphthalate	µg/L		10 U,O	10 U	10 U
Di-n-octylphthalate	µg/L		10 U,O	10 U	10 U
Fluoranthene	µg/L	300	NA	35	36
Fluorene	µg/L	300	3 O	390	390
Hexachlorobenzene (HCB)	µg/L		10 U,O	10 U	10 U
Hexachlorocyclopentadiene (HCCP)	µg/L		10 U,O	10 U	10 U
Hexachloroethane	µg/L		10 U,O	10 U	10 U
Isophorone	µg/L		10 U,O	400 U	400 U
Naphthalene	µg/L	6	21 O	8600	8400
Naphthalene, 1-methyl-	µg/L		3.2 O	490	490
Nitrobenzene	µg/L		10 U,O	400 U	400 U
n-Nitroso di-n-Propylamine	µg/L		10 U,O	10 U	10 U
n-Nitrosodiphenylamine/Diphenylamine	µg/L		10 U,O	10 U	10 U
Pentachlorophenol	µg/L		1 U,O	1 U	1 U
Phenanthrene	µg/L	200	3.6 O	360	360
Phenol	µg/L		10 U,O	10 U	10 U
Pyrene	µg/L	200	NA	21	22
Semi Volatile Organics SIM					
Acenaphthylene	µg/L	200	0.2 O	NA	NA
Anthracene	µg/L	2000	0.2 J,O	NA	NA
Benzo(a)anthracene	µg/L	0.05	0.1 U,O	0.58	0.63
Benzo(a)pyrene	µg/L	0.005	0.1 U,O	0.12	0.097 J,O
Benzo(b)fluoranthene	µg/L	0.05	0.1 U,O	0.1 U	0.1 U
Benzo(g,h,i)perylene	µg/L		0.1 U,O	0.15 J	0.089 J,O
Benzo(k)fluoranthene	µg/L	0.5	0.1 U,O	0.1 U	0.089 J,O
Chrysene	µg/L	5	0.1 U,O	0.53	0.54
Dibenzo(a,h)anthracene	µg/L	0.005	0.1 U,O	0.2 J	0.11 J
Fluoranthene	µg/L	300	0.25 O	NA	NA
Indeno (1,2,3-cd) pyrene	µg/L	0.05	0.1 U,O	0.19 J	0.11 J
Pyrene	µg/L	200	0.14 O	NA	NA

Notes:
J = The identification of the analyte is acceptable; the reported value is an estimate.
mg/L = milligrams per liter
µg/L = micrograms per liter
NA = not analyzed
U = not detected
O = result greater than MDL but less than MRL
ROD = Record of Decision
NC2L = NC Administrative Code (NCAC), 15A NCAC 02L, Levels Protective of Groundwater, April 1, 2013

Table B-2: Chemical-specific ARARs/TBCs for the Cape Fear Wood Preserving Superfund Site, Fayetteville, Cumberland County, North Carolina

CHEMICAL-SPECIFIC ARARs and TBCs			
Action/Media	**Requirements**	**Prerequisite**	**Citation(s)**
Classification of contaminated groundwater	Groundwaters in the state naturally containing 250 mg/L or less of chloride are classified as GA under 15A NCAC 02L .0201(1). Best usage: Existing or potential source of drinking water supply for humans.	Groundwaters located within the boundaries or under the extraterritorial jurisdiction of the State of North Carolina – **Applicable**	15A NCAC 02L .0201(1) Groundwater Classifications
	Groundwaters in the state naturally containing greater than 250 mg/L of chloride are classified as GSA under 15A NCAC 02L .0201(2). Best usage: Existing or potential source of water supply for potable mineral water and conversion to fresh waters.		15A NCAC 02L .0201(2)

CHEMICAL-SPECIFIC ARARs and TBCs			
Action/Media	**Requirements**	**Prerequisite**	**Citation(s)**
Restoration of groundwater as a potential drinking water source	Shall not exceed the groundwater quality standards[1] for contaminants specified as site-related COCs. • Benzene (1 µg/L) • Benzo(a)anthracene (0.05 µg/L) • Benzo(b)fluoranthene (0.05 µg/L) • Benzo(k)fluoranthene (0.5 µg/L) • Benzo(a)pyrene (0.005 µg/L) • Benzo(g,h,i)perylene (200 µg/L) • Chrysene (5 µg/L) • Carbazole (2 µg/L)[2] • Dibenzo(a,h)anthracene (0.005 µg/L) • Indeno(1,2,3-cd)pyrene (0.05 µg/L) • Acenaphthene (80 µg/L) • Acenaphthylene (200 µg/L) • Anthracene (2,000 µg/L) • Fluoranthene (300 µg/L) • Fluorene (300 ug/L) • 2-Methylnaphthalene (30 µg/L) • Naphthalene (6 µg/L) • Phenanthrene (200 µg/L) • Pyrene (200 µg/L) • Styrene (70 µg/L)	Class GA or GSA groundwaters with contaminant(s) concentrations exceeding standards listed in 15A NCAC 02L .0202 – **Relevant and Appropriate**	15A NCAC 02L .0202(a) and (b) Groundwater Quality Standards
	Shall not exceed SDWA national revised primary drinking water regulations: MCLs for organic contaminants specified in 40 C.F.R. § 141.61(a).	Groundwaters classified as GA or GSA which are an existing or potential source of drinking water – **Relevant and Appropriate**	40 C.F.R. § 141.61(a) 15A NCAC 18C .1517

[1] Unless otherwise indicated, the standard refers to the total concentration in µg/L of any constituent in a dissolved, colloidal, or particulate form that is mobile in groundwater. This does not apply to sediment or other particulate matter that is preserved in a groundwater sample as a result of well construction or sampling procedures.

[2] The cleanup standard for carbazole (2 µg/L) is based on North Carolina IMACs (April 2022), which is recognized as TBC for this action.

Table B-3: Location-specific ARARs/TBCs for the Cape Fear Wood Preserving Superfund Site, Fayetteville, Cumberland County, North Carolina

LOCATION-SPECIFIC ARARs and TBCs			
Location	**Requirements**	**Prerequisite**	**Citation(s)**
Aquatic Resources			
Presence of wetlands	Shall take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance beneficial values of wetlands.	Federal actions that involve potential impacts to, or take place within, wetlands – **TBC**	Executive Order 11990 Section 1.(a) Protection of Wetlands
	Shall avoid undertaking construction located in wetlands unless: (1) there is no practicable alternative to such construction; and (2) that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use.		Executive Order 11990, Section 2.(a) Protection of Wetlands
Presence of wetlands or other waters influenced by wetlands	The following activities for which Section 404 permits are not required pursuant to Section 404(f)(1) of the Clean Water Act (CWA) and which are not recaptured into the permitting process pursuant to Section 404(f)(2) are deemed to be in compliance with wetland standards in 15A NCAC 2B .0231: • Construction of temporary sediment control measures or best management practices as required by the North Carolina Sediment and Erosion Control Program on a construction site, provided that the temporary sediment control measures or best management practices are restored to natural grade and stabilized within two months of completion of the project and native woody vegetation is reestablished during the next appropriate planting season and maintained.	Activities within wetlands, as defined by G.S. 143-212(6), that comply with the most current versions of the federal regulations to implement Section 404 (f) (EPA and U.S. Army Corps of Engineers, including 40 CFR 232.3) and the Sedimentation Pollution Control Act, G.S. 113A, Article 4 – **Applicable**	15A NCAC 02B. 0230(a)(5)
	The following standards shall be used to assure the maintenance or enhancement of the existing uses of wetlands identified in Paragraph (b) of this Rule: • Liquids, fill, or other solids or dissolved gases shall not be present in amounts that may cause adverse impacts on existing wetland uses. • Floating or submerged debris, oil, deleterious substances, or other material shall not be present in amounts that may cause adverse impacts on existing wetland uses. • Materials producing color or odor shall not be present in amounts that may cause adverse impacts on existing wetland uses.	Activities within, wetlands as defined by G.S. 143-212(6) – **Applicable**	15A NCAC 02B. 0231(c)(1)-(3)

Presence of wetlands or other waters influenced by wetlands (continued)	The following standards shall be used to assure the maintenance or enhancement of the existing uses of wetlands identified in Paragraph (b) of this Rule: • Materials that adversely affect the palatability of fish or aesthetic quality of the wetland shall not be present in amounts that may cause adverse impacts on existing wetland uses. • Concentrations or combinations of substances which are toxic or harmful to human, animal, or plant life shall not be present in amounts which individually or cumulatively may cause adverse impacts on existing wetland uses. • Hydrological conditions necessary to support the biological and physical characteristics naturally present in wetlands shall be protected to prevent detrimental impacts on: (A) Water currents, erosion, or sedimentation patterns. (B) Natural water temperature variations. (C) The chemical, nutrient, and dissolved oxygen regime of the wetland. (D) The movement of aquatic fauna. (E) The pH of the wetland. (F) Water levels or elevations. • The populations of wetland flora and fauna shall be maintained to protect biological integrity as defined in Rule .0202.	Activities within, wetlands as defined by G.S. 143-212(6) – **Applicable**	15A NCAC 02B. 0231(c)(4)-(7)

LOCATION-SPECIFIC ARARs and TBCs			
Location	**Requirements**	**Prerequisite**	**Citation(s)**
Floodplains			
Presence of floodplains designated as such on a map[3]	Shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains.	Federal actions that involve potential impacts to, or take place within, floodplains – **TBC**	Executive Order 11988 Section 1. Floodplain Management
	Shall consider alternatives to avoid, to the extent possible, adverse effects and incompatible development in the floodplain. Design or modify its action in order to minimize potential harm to or within the floodplain.		Executive Order 11988 Section 2.(a)(2) Floodplain Management
	Where possible, an agency shall use natural systems, ecosystem processes, and nature-based approaches when developing alternatives for consideration.		Executive Order 13690 Section 2 (c)
	The Agency shall design or modify its actions so as to minimize[4] harm to or within the floodplain.	Federal actions affecting or affected by floodplain, as defined in 44 CFR § 9.4 – **Relevant and Appropriate**	44 CFR § 9.11(b)(1) Mitigation
	The Agency shall restore and preserve natural and beneficial floodplain values.		44 CFR § 9.11(b)(3) Mitigation
	The Agency shall minimize: • Potential harm to lives and the investment at risk from base flood, or, in the case of critical actions,[5] from the 500-year flood. • Potential adverse impacts that action may have on floodplain values.		44 CFR § 9.11(c)(1) and (3) Minimization provisions

[3] Under 44 CFR § 9.7 Determination of proposed action's location, Paragraph (c) floodplain determination. One should consult the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM), the Flood Boundary Floodway Map (FBFM) and the Flood Insurance Study (FIS) to determine if the Agency proposed action is within the base floodplain.

[4] Minimize means to reduce to smallest amount or degree possible. See 44 CFR § 9.4 Definitions.

[5] See 44 CFR § 9.4 Definitions, Critical action. Critical actions include, but are not limited to, those which create or extend the useful life of structures or facilities such as those that produce, use or store highly volatile, flammable, explosive, toxic, or water-reactive materials.

Wildlife, Threatened, or Endangered Species			
Presence of migratory birds listed in 50 C.F.R. 10.13	No person may take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such bird, except as may be permitted under the terms of a valid permit issued pursuant to the provisions of this part and part 13 of this chapter, or as permitted by regulations in this part, or part 20 of this subchapter (the hunting regulations).	Action that has potential impacts on, or is likely to result in a 'take' (as defined in 50 C.F.R. 10.12) of migratory birds – **Applicable**	Migratory Bird Treaty Act, 16 U.S.C. § 703(a) 50 C.F.R. § 21.11

ARAR = applicable or relevant and appropriate requirement
CFR = Code of Federal Regulations
CWA = Clean Water Act of 1972
EPA = U.S. Environmental Protection Agency
NCAC = North Carolina Administrative Code
TBC = to be considered
USACE = U.S. Army Corps of Engineers
U.S.C. = United States Code

Table B-4: Action-specific ARARs/TBCs for the Cape Fear Wood Preserving Superfund Site, Fayetteville, Cumberland County, North Carolina

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
General Construction Standards – All land–disturbing activities (e.g., excavation, trenching, grading)			
Managing stormwater runoff from land-disturbing activities	Shall install erosion and sedimentation control devices and practices sufficient to retain the sediment generated by the land-disturbing activity within the boundaries of the tract during construction.	Land-disturbing activity (as defined in N.C.G.S. Ch. 113A-53) of more than 1 acre of land – **Applicable**	N.C.G.S. Ch.113A-157(3) Mandatory standards for land-disturbing activity
	Shall plant or otherwise provide permanent ground cover sufficient to restrain erosion after completion of construction.		N.C.G.S. Ch.113A-157(3)
	The land-disturbing activity shall be conducted in accordance with the approved erosion and sedimentation control plan. Note: Plan that meets the objectives of 15A NCAC 4B. 0106 would be included in the CERCLA remedial design or Remedial Action Work Plan.		N.C.G.S. Ch.113A-157(5)
	Shall take all reasonable measures to protect all public and private property from damage caused by such activities.	Land-disturbing activity (as defined in N.C.G.S. Ch. 113A-52) of more than 1 acre of land – **Applicable**	15A NCAC 4B. 0105

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Managing stormwater runoff from land-disturbing activities (continued)	Erosion and sedimentation control plan shall be designed to address the following: (1) Identify areas subject to accelerated erosion, and off-site areas vulnerable to damage from erosion and sedimentation. (2) Limit the size of the area exposed at any one time. (3) Limit exposure to the shortest time specified in G.S. 113A-57. (4) Control surface water run-off originating upgrade of exposed areas. (5) All land-disturbing activity shall be planned to prevent off-site sedimentation damage. (6) Plans shall be designed so that any increase in velocity of stormwater runoff resulting from a land-disturbing activity will not result in accelerated erosion of the receiving stormwater conveyance or at the point of discharge.		15A NCAC 4B. 0106
Managing storm water runoff from land-disturbing activities	Erosion and sedimentation control measures, structures, and devices shall be planned, designed, and constructed to provide protection from the run-off of 10-year storm.	Land-disturbing activity (as defined in N.C.G.S. Ch. 113A-52) of more than 1 acre of land – **Applicable**	15A NCAC 4B. 0108
	Shall provide a design for the land-disturbing activity so that the post-construction velocity of the 10-year storm runoff in the receiving stormwater conveyance to, and including, the discharge point does not exceed the parameters provided in this Rule.		15A NCAC 4B. 0109
	Shall install and maintain all temporary and permanent erosion and sedimentation control measures.		15A NCAC 4B. 0113
Control of fugitive dust emissions	The owner/operator of a facility shall not cause fugitive dust emissions to cause or contribute to the substantive complaints or visible emissions.	Activities potentially generating fugitive dust as defined in 15A NCAC 02D .0540 (a)(2) – **Relevant and Appropriate**	15A NCAC 02D .0540(c)

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Waste Characterization – Primary Waste (e.g., contaminated media) and Secondary Waste (e.g., wastewaters, spent treatment media)			
Characterization of solid waste (all primary and secondary wastes) and listed hazardous waste determination	Must make an accurate determination as to whether that waste is a hazardous waste in order to ensure wastes are properly managed according to applicable RCRA regulations. A hazardous waste determination is made using the following steps: • The hazardous waste determination for each solid waste must be made at the point of waste generation, before any dilution, mixing, or other alteration of the waste occurs, and at any time in the course of its management that it has, or may have, changed its properties as a result of exposure to the environment or other factors that may change the properties of the waste such that the RCRA classification of the waste may change. • Must determine whether the waste is excluded from regulation under 40 CFR 261.4; and • Must use the knowledge of the waste to determine whether waste meets any of the listing descriptions under subpart D of 40 CFR Part 261. Acceptable knowledge that may be used in making an accurate determination as to whether the waste is listed may include waste origin, composition, the process producing the waste, feedstock, and other reliable and relevant information.	Generation of solid waste as defined in 40 C.F.R. § 261.2 – **Applicable**	40 CFR § 262.11(a), (b), and (c) 15A NCAC 13A .0107(a)
Determination of characteristic hazardous waste	The person then must also determine whether the waste exhibits one or more hazardous characteristics as identified in subpart C of 40 CFR part 261 by following the procedures in paragraph (d)(1) or (2) of this section, or a combination of both.	Generation of solid waste which is not excluded under 40 CFR 261.4(a) – **Applicable**	40 CFR § 262.11(d) 15A NCAC 13A .0107

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Determination of characteristic hazardous waste through knowledge	The person must apply knowledge of the hazard characteristic of the waste in light of the materials or the processes used to generate the waste. Acceptable knowledge may include process knowledge (e.g., information about chemical feedstocks and other inputs to the production process); knowledge of products, byproducts, and intermediates produced by the manufacturing process; chemical or physical characterization of wastes; information on the chemical and physical properties of the chemicals used or produced by the process or otherwise contained in the waste; testing that illustrates the properties of the waste; or other reliable and relevant information about the properties of the waste or its constituents. A test other than a test method set forth in subpart C of 40 CFR part 261, or an equivalent test method approved by the Administrator under 40 CFR 260.21, may be used as part of a person's knowledge to determine whether a solid waste exhibits a characteristic of hazardous waste. However, such tests do not, by themselves, provide definitive results. Persons testing their waste must obtain a representative sample of the waste for the testing, as defined at 40 CFR 260.10.		40 CFR § 262.11(d)(1) 15A NCAC 13A .0107
Determination of characteristic hazardous waste through testing	When available knowledge is inadequate to make an accurate determination, the person must test the waste according to the applicable methods set forth in subpart C of 40 CFR part 261 or according to an equivalent method approved by the Administrator under 40 CFR 260.21; or and in accordance with the following: (i) Persons testing their waste must obtain a representative sample of the waste for the testing, as defined at 40 CFR 260.10. (ii) Where a test method is specified in subpart C of 40 CFR part 261, the results of the regulatory test, when properly performed, are definitive for determining the regulatory status of the waste.	Generation of solid waste which is not excluded under 40 CFR 261.4(a) – **Applicable**	40 CFR § 262.11(d)(2) 15A NCAC 13A .0107
	Must refer to Parts 261, 262, 264, 265, 266, 268, and 273 of Chapter 40 for possible exclusions or restrictions pertaining to management of the specific waste	Generation of solid waste which is determined to be hazardous – **Applicable**	40 CFR § 262.11(e) 15A NCAC 13A .0107

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Identifying hazardous waste numbers for small and large quantity generators	Must identify all applicable EPA hazardous waste numbers (EPA hazardous waste codes) in subparts C and D of part 261 of this chapter. Prior to shipping the waste off site, the generator also must mark its containers with all applicable EPA hazardous waste numbers (EPA hazardous waste codes) according to § 262.32.		40 CFR 262.11(g) 15A NCAC 13A .0107
General waste analysis	Must obtain a detailed chemical and physical analysis on a representative sample of the waste(s), which at a minimum contains all the information that must be known to treat, store, or dispose of the waste in accordance with pertinent sections of 40 C.F.R. 264 and 268.	Generation of RCRA hazardous waste or nonhazardous wastes if applicable under § 264.113(d) for storage, treatment or disposal – **Applicable**	40 C.F.R. § 264.13(a)(1) 15A NCAC 13A .0109(c)
Special rules for characteristic hazardous waste	Must determine each EPA Hazardous Waste Number (waste code) applicable to the waste in order to determine the applicable treatment standards under subpart D of this part. This determination may be made concurrently with the hazardous waste determination required in § 262.11 of this chapter. For purposes of part 268, the waste will carry the waste code for any applicable listed waste (40 CFR part 261, subpart D). In addition, where the waste exhibits a characteristic, the waste will carry one or more of the characteristic waste codes (40 CFR part 261, subpart C), except when the treatment standard for the listed waste operates in lieu of the treatment standard for the characteristic waste, as specified in paragraph (b) of this section.	Generation of characteristic hazardous waste for storage, treatment or disposal – **Applicable**	40 CFR § 268.9(a) 15A NCAC 13A .0112(a)
	Must determine the underlying hazardous constituents [as defined in 40 CFR 268.2(i)] in the characteristic waste.	Generation of RCRA characteristic hazardous waste (and is not D001 non-wastewaters treated by CMBST, RORGS, or POLYM of § 268.42 Table 1) for storage, treatment, or disposal – **Applicable**	40 CFR § 268.9(a) 15A NCAC 13A .0112(a)

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Determinations for land disposal of hazardous waste	Must determine if the waste has to be treated before it can be land disposed. This is done by determining if the hazardous waste meets the treatment standards in §268.40, 268.45, or §268.49. This determination can be made concurrently with the hazardous waste determination required in §262.11 of this chapter, in either of two ways: testing the waste or using knowledge of the waste. If the generator tests the waste, testing would normally determine the total concentration of hazardous constituents, or the concentration of hazardous constituents in an extract of the waste obtained using test method 1311 in "Test Methods of Evaluating Solid Waste, Physical/Chemical Methods", EPA Publication SW–846, (incorporated by reference, see §260.11 of this chapter), depending on whether the treatment standard for the waste is expressed as a total concentration or concentration of hazardous constituent in the waste's extract. (Alternatively, the generator must send the waste to a RCRA-permitted hazardous waste treatment facility, where the waste treatment facility must comply with the requirements of §264.13 of this chapter and paragraph (b) of this section.)	Generation of hazardous waste for storage, treatment, or disposal – **Applicable**	40 CFR § 268.7(a) 15A NCAC 13A .0112(a)
	Must comply with the special requirements of 40 C.F.R. § 268.9 in addition to any applicable requirements in 40 C.F.R. § 268.7.	Generation of waste or soil that displays a hazardous characteristic of ignitability, corrosivity, reactivity, or toxicity for storage, treatment, or disposal **– Applicable**	40 C.F.R. § 268.7(a)(1) 15A NCAC 13A .0112(a)
Characterization of industrial wastewater	Industrial wastewater discharges that are point source discharges subject to regulation under section 402 of the CWA, as amended, are not solid wastes for the purpose of hazardous waste management. [Comment: This exclusion applies only to the actual point source discharge. It does not exclude industrial wastewaters while they are being collected, stored or treated before discharge, nor does it exclude sludges that are generated by industrial wastewater treatment.]	Generation of industrial wastewater and discharge into surface water **– Applicable**	40 C.F.R. § 261.4(a)(2) 15A NCAC 13A .0106(a)

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Waste Storage – Primary Waste (e.g., contaminated media) and Secondary Waste (e.g., wastewaters, spent treatment media)			
Storage of solid waste	All solid waste shall be stored in such a manner as to prevent the creation of a nuisance, insanitary conditions, or a potential public health hazard.	Generation of solid waste which is determined not to be hazardous – **Relevant and Appropriate**	15A NCAC 13B .0104(d)
Temporary on–site accumulation of hazardous waste in containers	A small quantity generator may accumulate hazardous waste on site without a permit or interim status, and without complying with the requirements of parts 124, 264 through 267, and 270 of this chapter, or the notification requirements of section 3010 of RCRA, provided that all the substantive conditions for exemption listed in this section are met.	Accumulation of RCRA hazardous waste on site as defined in 40 C.F.R. §260.10 – **Applicable**	40 CFR § 262.16(a)
Condition of containers	If a container holding hazardous waste is not in good condition, or if it begins to leak, the small quantity generator must immediately transfer the hazardous waste from this container to a container that is in good condition, or immediately manage the waste in some other way that complies with the conditions for exemption of this section.		40 CFR 262.16(b)(2)(i)
Compatibility of waste with container	Must use a container made of or lined with materials that will not react with, and are otherwise compatible with, the hazardous waste to be accumulated, so that the ability of the container to contain the waste is not impaired.	Accumulation of 55 gallons or less of RCRA hazardous waste or one quart of acutely hazardous waste listed in §261.33(e) at or near any point of generation – **Applicable**	40 CFR 262.16(b)(2)(ii)
Management of containers	(A) A container holding hazardous waste must always be closed during accumulation, except when it is necessary to add or remove waste. (B) A container holding hazardous waste must not be opened, handled, or accumulated in a manner that may rupture the container or cause it to leak.		40 CFR 262.16(b)(2)(iii)

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Special conditions for accumulation of incompatible wastes	(A) Incompatible wastes, or incompatible wastes and materials, (see appendix V of part 265 for examples) must not be placed in the same container, unless § 265.17(b) of this chapter is complied with. (B) Hazardous waste must not be placed in an unwashed container that previously held an incompatible waste or material (see appendix V of part 265 for examples), unless § 265.17(b) of this chapter is complied with. (C) A container accumulating hazardous waste that is incompatible with any waste or other materials accumulated or stored nearby in other containers, piles, open tanks, or surface impoundments must be separated from the other materials or protected from them by means of a dike, berm, wall, or other device.	Accumulation of incompatible wastes, or incompatible wastes and materials on site – **Applicable**	40 CFR 262.16(b)(2)(v)
Labeling and marking of containers	A small quantity generator must mark or label its containers with the following: (A) The words "Hazardous Waste". (B) An indication of the hazards of the contents (examples include, but are not limited to, the applicable hazardous waste characteristic(s) (i.e., ignitable, corrosive, reactive, toxic); hazard communication consistent with the Department of Transportation requirements at 49 CFR part 172 subpart E (labeling) or subpart F (placarding); a hazard statement or pictogram consistent with the OSHA Hazard Communication Standard at 29 CFR 1910.1200; or a chemical hazard label consistent with the National Fire Protection Association code 704). (C) The date upon which each period of accumulation begins clearly visible for inspection on each container.	Accumulation of RCRA hazardous waste on site as defined in 40 CFR 260.10 **– Applicable**	40 CFR § 262.16(b)(6)(i) 15A NCAC 13A .0106, .0107
Condition of container	If a container holding hazardous waste is not in good condition, or if it begins to leak, the owner or operator must transfer the hazardous waste from this container to a container that is in good condition, or manage the waste in some other way that complies with the requirements of this part.	Storage of RCRA hazardous waste in containers – **Applicable**	40 CFR § 265.171

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Compatibility of waste with container	Must use a container made of or lined with materials which will not react with, and are otherwise compatible with, the hazardous waste to be stored, so that the ability of the container to contain the waste is not impaired.		40 CFR § 265.172
	Containers must always be closed during storage, except when necessary to add or remove waste. Container must not be opened, handled, or stored in a manner which may rupture the container or cause it to leak.		40 CFR § 265.173(a) and (b)
Storage of hazardous waste in container area	Container storage areas must have a containment system designed and operated in accordance with 40 CFR § 264.175(b).	Storage of RCRA–hazardous waste in containers with free liquids **– Applicable**	40 CFR § 264.175(a) 15A NCAC 13A .0109(j)
	Area must be sloped or otherwise designed and operated to drain liquid from precipitation, or Containers must be elevated or otherwise protected from contact with accumulated liquid.	Storage of RCRA–hazardous waste in containers that do not contain free liquids (other than F020, F021, F022, F023, F026, and F027) **– Applicable**	40 CFR § 264.175(c)(1) and (2) 15A NCAC 13A .0109(j)
Closure performance standard for RCRA container storage unit	Must close the facility (e.g., container storage unit) in a manner that: • Minimizes the need for further maintenance. • Controls minimizes or eliminates to the extent necessary to protect human health and the environment, post–closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or the atmosphere. • Complies with the closure requirements of subpart, but not limited to, the requirements of 40 C.F.R. 264.178 for containers.	Storage of RCRA hazardous waste in containers **– Applicable**	40 C.F.R. § 264.111 15A NCAC 13A .0109(h)

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Closure of RCRA container storage unit	At closure, all hazardous waste and hazardous waste residues must be removed from the containment system. Remaining containers, liners, bases, and soils containing or contaminated with hazardous waste and hazardous waste residues must be decontaminated or removed. [Comment: At closure, as throughout the operating period, unless the owner or operator can demonstrate in accordance with40 C.F.R. 261.3(d) of this chapter that the solid waste removed from the containment system is not a hazardous waste, the owner or operator becomes a generator of hazardous waste and must manage it in accordance with all applicable requirements of parts 262 through 266 of this chapter].	Storage of RCRA hazardous waste in containers in a unit with a containment system **– Applicable**	40 C.F.R. § 264.178 15A NCAC 13A .0109(j)
Storage of Remediation Waste in a Staging Pile			
Temporary on-site storage of remediation waste in RCRA staging pile (e.g., excavated soils)	Must be located within the contiguous property under the control of the owner/operator where the wastes are to be managed in the staging pile originated. For purposes of this section, storage includes mixing, sizing, blending, or other similar physical operations so long as intended to prepare the wastes for subsequent management or treatment.	Accumulation of solid non-flowing hazardous remediation waste (or remediation waste otherwise subject to LDRs) as defined in 40 CFR § 260.10 – **Applicable**	40 CFR § 264.554(a)(1) 15A NCAC 13A .0109(s)
	Staging piles may be used to store hazardous remediation waste (or remediation waste otherwise subject to LDRs) based on approved standards and design criteria designated for that staging pile. Note: Design and standards of the staging pile should be included in CERCLA remedial design document approved or issued by EPA.		40 CFR § 264.554(b) 15A NCAC 13A .0109(s)

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Performance criteria for RCRA staging pile	Staging pile must be designed to: • Facilitate a reliable, effective, and protective remedy. • Prevent or minimize releases of hazardous wastes and constituents into the environment, and minimize or adequately control cross–media transfer, as necessary to protect human health and the environment (e.g., use of liners, covers, runoff/run-on controls).	Storage of remediation waste in a staging pile – **Applicable**	40 CFR § 264.554(d)(1)(i) and (ii) 15A NCAC 13A .0109(s)
Design criteria for RCRA staging pile	In setting standards and design criteria, must consider the following factors: • Length of time pile will be in operation. • Volumes of waste to be stored in the pile. • Physical and chemical characteristics of the wastes to be stored in the unit. • Potential for releases from the unit. • Hydrogeological and other relevant environmental conditions at the facility that may influence the migration of any potential releases. • Potential for human and environmental exposure to potential releases from the unit.	Storage of remediation waste in a staging pile – **Applicable**	40 CFR § 264.554(d)(2)(i) –(vi) 15A NCAC 13A .0109(s)
Waste Limitations	Must not place ignitable or reactive remediation waste in a staging pile unless the remediation waste has been treated, rendered, or mixed before placed in the staging pile so that: • The remediation waste no longer meets the definition of ignitable or reactive under 40 CFR § 261.21 or 40 CFR § 261.23; and • Must comply with 40 CFR § 264.17(b); or • Must manage the remediation waste to protect it from exposure to any material or condition that may cause it to ignite or react.	Storage of ignitable or reactive remediation waste in staging pile – **Applicable**	40 CFR § 264.554(e) 40 CFR § 264.554(e)(1)(i) and (ii) 40 CFR §264.554(e)(2) 15A NCAC 13A .0109(s)
	Must not place incompatible remediation wastes in the same staging pile unless you have complied with 40 CFR § 264.17(b).	Storage of "incompatible" remediation waste (as defined in 40 CFR § 260.10) in staging pile – **Applicable**	40 CFR § 264.554(f)(1) 15A NCAC 13A .0109(s)

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
	Must separate the incompatible materials, or protect them from one another by using a dike, berm, wall, or other device.	Staging pile of remediation waste stored nearby to incompatible wastes or materials in containers, other piles, open tanks, or land disposal units – **Applicable**	40 CFR § 264.554(f)(2) 15A NCAC 13A .0109(s)
	Must not pile remediation waste on same base where incompatible wastes or materials were previously piled unless the base has been sufficiently decontaminated to comply with 40 CFR § 264.17(b).		40 CFR § 264.554(f)(3) 15A NCAC 13A .0109(s)
Operational limits of a RCRA staging pile	The staging pile must not operate for more than two years, except when the Director grants an operating term extension under 40 CFR § 264.554(i). Must measure the two-year limit or other operating term specified by the Director in the permit, closure plan or order from first time remediation waste placed in a staging pile. Note: EPA decision on operating term will be specified in the ROD.	Storage of remediation waste in a staging pile – **Applicable**	40 CFR § 264.554(d)(1)(iii) 15A NCAC 13A .0109(s)
	The Director may allow a staging pile to operate for up to two years after the hazardous waste is first placed into the pile. Must not use staging pile longer than the length of time designated by the Director in the permit, closure plan, or order ("operating term"), except as provided in paragraph (i) of this section. Note: Additional time limits for storage will be justified and documented in an ESD or ROD Amendment issued by EPA.		40 CFR § 264.554(h) 15A NCAC 13A .0109(s)

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
	The Director may grant one operating term extension of up to 180 days beyond the operating term limit contained in the permit, closure plan, or order. To justify to the Director the need for the extension, the Director must be provided with sufficient and accurate information to enable the Director to determine that continued use of the staging pile: (i) Will not pose a threat to human health and the environment. (ii) Is necessary to ensure timely and efficient implementation of the remedial actions at the facility.		40 CFR § 264.554(i)(1) 15A NCAC 13A .0109(s)
Closure of a staging pile	Must be closed within 180 days after the operating term by removing or decontaminating all remediation waste, contaminated containment system components, and structures and equipment contaminated with waste and leachate.	Storage of remediation waste in staging pile in previously contaminated area – **Applicable**	40 CFR § 264.554(j)(1) 15A NCAC 13A .0109(s)
	Must decontaminate contaminated subsoils in a manner that EPA determines will protect human and the environment.		40 CFR § 264.554(j)(2) 15A NCAC 13A .0109(s)
	Must be closed within 180 days after the operating term according to 40 CFR §§ 264.258(a) and 264.111, or according to §§ 265.258(a) and 265.111.	Storage of remediation waste in staging pile in uncontaminated area – **Applicable**	40 CFR § 264.554(k)(1) 15A NCAC 13A .0109(s)
Waste Treatment and Disposal – Primary Wastes (e.g., contaminated media) and Secondary Wastes (e.g., contaminated equipment or treatment residuals)			
Disposal of solid waste	Shall ensure that waste is disposed of at a site or facility which is permitted to receive the waste.	Generation of solid waste intended for off-site disposal – **Relevant and Appropriate**	15A NCAC 13B .0106(b)
Disposal of RCRA-hazardous waste in a land-based unit	May be land disposed if it meets the requirements in the table "Treatment Standards for Hazardous Waste" at 40 C.F.R. 268.40 before land disposal.	Land disposal, as defined in 40 C.F.R.268.2, of restricted RCRA waste – **Applicable**	40 C.F.R. § 268.40(a) 15A NCAC 13A .0112(d)

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Disposal of RCRA–hazardous waste soil in a land–based unit (continued)	All underlying hazardous constituents [as defined in 40 C.F.R. 268.2(i)] must meet the Universal Treatment Standards, found in 40 C.F.R. 268.48 Table UTS prior to land disposal.	Land disposal of restricted RCRA characteristic wastes (D001 –D043) that are not managed in a wastewater treatment system that is regulated under the CWA, that is CWA equivalent, or that is injected into a Class I nonhazardous injection well – **Applicable**	40 C.F.R. §268.40(e) 15A NCAC 13A .0112(d)
	To determine whether a hazardous waste identified in this section exceeds the applicable treatment standards of 40 C.F.R. 268.40, the initial generator must test a sample of the waste extract or the entire waste, depending on whether the treatment standards are expressed as concentration in the waste extract or waste, or the generator may use knowledge of the waste. If the waste contains constituents (including UHCs in the characteristic wastes) in excess of the applicable UTS levels in 40 C.F.R. 268.48, the waste is prohibited from land disposal, and all requirements of part 268 are applicable, except as otherwise specified.	Land disposal of RCRA toxicity characteristic wastes (D004 –D011) that are newly identified (i.e., wastes, soil, or debris identified by the TCLP but not the Extraction Procedure) – **Applicable**	40 C.F.R. § 268.34(f) 15A NCAC 13A .0112(c)
	Must be treated according to the alternative treatment standards of 40 C.F.R.268.49(c) or according to the UTSs [specified in 40 C.F.R.268.48 Table UTS] applicable to the listed and/or characteristic waste contaminating the soil prior to land disposal.	Land disposal, as defined in 40 C.F.R. § 268.2, of restricted hazardous *soils* **– Applicable**	40 C.F.R. § 268.49(b) 15A NCAC 13A .0112(d)
Disposal of RCRA characteristic wastewaters in a National Pollutant Discharge Elimination System (NPDES) permitted wastewater treatment unit (WWTU)	Are not prohibited, if the wastes are managed in a treatment system which subsequently discharges to waters of the U.S. pursuant to a permit issued under § 402 the CWA (i.e., NPDES permitted) unless the wastes are subject to a specified method of treatment other than DEACT in 40 CFR § 268.40, or are D003 reactive cyanide. Note: For purposes of this exclusion, a CERCLA on-site WWTU that meets all of the identified CWA ARARs for point source discharges from such a system, is considered a wastewater treatment system that is NPDES permitted.	Land disposal of hazardous wastewaters that are hazardous only because they exhibit a hazardous characteristic and are not otherwise prohibited under 40 C.F.R. Part 268 – **Applicable**	40 C.F.R. § 268.1(c)(4)(i) 15A NCAC 13A .0112(a)

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Disposal of RCRA characteristic wastewaters in a publicly operated treatment works (POTW)	Are not prohibited, if the wastes are treated for purposes of the pre-treatment requirements of section 307 of the CWA unless the wastes are subject to a specified method of treatment other than DEACT in 40 C.F.R. § 268.40, or are D003 reactive cyanide.		40 C.F.R. § 268.1(c)(4)(ii) 15A NCAC 13A .0112(a)
Capping Waste in Place – (Landfill Final Closure and Post-closure Care)			
RCRA C Landfill closure performance standard	Must close the unit in a manner that: • Minimizes the need for further maintenance. • Controls, minimizes, or eliminates to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to ground or surface waters or to the atmosphere. • Complies with the relevant closure and post-closure requirements of 40 C.F.R. §264.310.	Closure of a RCRA hazardous waste management unit – **relevant and appropriate**	40 C.F.R. § 264.111(a)-(c) 15A NCAC 13A .0109
RCRA C Landfill cover design and construction	Must cover the landfill or cell with a final cover designed and constructed to: • Provide long-term minimization of migration of liquids through the closed landfill. • Function with minimum maintenance. • Promote drainage and minimize erosion or abrasion of the cover. • Accommodate settling and subsidence so that the cover's integrity is maintained. • Have a permeability less than or equal to the permeability of any bottom-liner system or natural subsoils present.	Closure of a RCRA hazardous waste management unit – **Relevant and Appropriate**	40 C.F.R. § 264.310(a)(1)-(5) 15A NCAC 13A .0109

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
RCRA C Landfill cover design and construction	Describes a design for landfill covers that will meet the requirements of RCRA regulations. Multi-layered system consisting, from the top down, of: • A top layer of at least 60 centimeters of soil, either vegetated or armored at the surface. • Granular or geosynthetic drainage layer with a hydraulic transmissivity no less than 3×10^{-5} centimeters per second. • A two-component low-permeability layer composed of: (1) a flexible membrane liner installed directly on; (2) a compacted soil component with a hydraulic conductivity no greater than 1×10^{-7} centimeters per second. • Optional layers may be added, such as a biotic barrier layer or a gas vent layer, depending on the need.	Construction of a RCRA hazardous waste landfill final cover – **TBC**	EPA Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments, EPA OSWER 530-SW-89-047 (July 1989)
Run-on/runoff control systems for landfill cover	Run-on control system must be capable of preventing flow onto the active portion of the landfill during peak discharge from a 25-year storm event.	Construction of a RCRA hazardous waste landfill cover – **Relevant and Appropriate**	40 C.F.R. § 264.301(g) 15A NCAC 13A .0109
	Runoff management system must be able to collect and control the water volume from a runoff resulting from a 24-hour, 25-year storm event.		40 C.F.R. § 264.301(h) 15A NCAC 13A .0109
Protection of closed landfill	Post-closure use of property must never be allowed to disturb the integrity of the final cover, liners, or any other components of the containment system or the facility's monitoring system unless necessary to reduce a threat to human health or the environment.	Closure of a RCRA hazardous waste landfill – **Relevant and Appropriate**	40 C.F.R. § 264.117(c) 15A NCAC 13A .0109

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
General post-closure care for closed RCRA C landfill	Owner or operator must: • Maintain the effectiveness and integrity of the final cover including making repairs to the cap as necessary to correct effects of settling and erosion. • Prevent run-on and runoff from eroding or otherwise damaging final cover. • Protect and maintain surveyed benchmarks used to locate waste cells.	Closure of a RCRA hazardous waste landfill – **Relevant and Appropriate**	40 C.F.R. § 264.310(b)(1), (5) and (6) 15A NCAC 13A .0109
Post-closure notices for closed RCRA C landfill	Must submit to the local zoning authority a record of the type, location, and quantity of hazardous wastes disposed of within each cell of the unit.	Closure of a RCRA hazardous waste landfill – **Relevant and Appropriate**	40 C.F.R. § 264.119(a)
	Must record, in accordance with state law, a notation on the deed to the facility property or on some other instrument normally examined during a title search, that will in perpetuity notify any potential purchaser of the property that: • Land has been used to manage hazardous wastes. • Its use is restricted under 40 CFR Part 264 Subpart G regulations. • The survey plat and record of the type, location, and quantity of hazardous wastes disposed within each cell or other hazardous waste disposal unit of the facility required by Sections 264.116 and 264.119(a) have been filed with the local zoning authority and with the EPA Regional Administrator.	Closure of a RCRA hazardous waste landfill – **Relevant and Appropriate**	40 C.F.R. § 264.119(b)(1)(i)-(iii)
Discharge of Wastewater from Groundwater Treatment Unit			
Discharge into POTW: General prohibitions	A user may not introduce into a POTW any pollutant(s) which cause pass through or interference. These general prohibitions and the specific prohibitions in paragraph (b) of this section apply to each user introducing pollutants into a POTW whether or not the user is subject to other national pretreatment standards or any national, state, or local pretreatment requirements.	Indirect discharge of pollutants into POTW from Industrial User as defined 40 C.F.R. §403.3 – **Applicable**	40 C.F.R. § 403.5 (a)(1) National pretreatment standards: Prohibited discharges 15A NCAC 02H .0909

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Discharge into POTW: Specific prohibitions	In addition, the following pollutants shall not be introduced into a POTW: (1) Pollutants which create a fire or explosion hazard in the POTW, including, but not limited to, waste streams with a closed cup flashpoint of less than 140 degrees Fahrenheit or 60 degrees Centigrade using the test methods specified in 40 C.F.R. §261.21.		40 C.F.R. § 403.5 (b)(1) 15A NCAC 02H .0909
	(2) Pollutants which will cause corrosive structural damage to the POTW, but in no case Discharges with pH lower than 5.0, unless the works is specifically designed to accommodate such Discharges.	Indirect discharge of pollutants into POTW from Industrial User as defined 40 C.F.R. §403.3 – **Applicable**	40 C.F.R. § 403.5 (b)(2) 15A NCAC 02H .0909
	(3) Solid or viscous pollutants in amounts which will cause obstruction to the flow in the POTW resulting in Interference.		40 C.F.R. § 403.5 (b)(3) 15A NCAC 02H .0909
	(4) Any pollutant, including oxygen demanding pollutants (e.g., BOD) released in a discharge at a flow rate and/or pollutant concentration which will cause Interference with the POTW.		40 C.F.R. § 403.5 (b)(4) 15A NCAC 02H .0909
	(5) Heat in amounts which will inhibit biological activity in the POTW resulting in Interference, but in no case heat in such quantities that the temperature at the POTW Treatment Plant exceeds 40 °C (104 °F) unless the Approval Authority, upon request of the POTW, approves alternate temperature limits.		40 C.F.R. § 403.5 (b)(5) 15A NCAC 02H .0909
	(6) Petroleum oil, nonbiodegradable cutting oil, or products of mineral oil origin in amounts that will cause interference or pass through.		40 C.F.R. § 403.5 (b)(6) 15A NCAC 02H .0909
	(7) Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity that may cause acute worker health and safety problems.		40 C.F.R. § 403.5 (b)(7) 15A NCAC 02H .0909
	(8) Any trucked or hauled pollutants, except at discharge points designated by the POTW.		40 C.F.R. § 403.5 (b)(8) 15A NCAC 02H .0909

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Discharge into POTW: Specific prohibitions (continued)	(9) Local limits. Where specific prohibitions or limits on pollutants or pollutant parameters are developed by a POTW in accordance with 40 C.F.R. § 403.5 (c), such limits shall be deemed Pretreatment Standards for the purposes of section 307(d) of the CWA.	Indirect discharge of pollutants into POTW from Industrial User as defined 40 C.F.R. §403.3 – **Applicable**	40 C.F.R. § 403.5 (d) 15A NCAC 02H .0909
Transport and conveyance of collected RCRA wastewater to WWTU located on the facility	Any dedicated tank systems, conveyance systems, and ancillary equipment used to treat, store or convey wastewater to an on-site NPDES-permitted WWTU are exempt from the requirements of RCRA Subtitle C standards.	On-site WWTU [as defined in 40 C.F.R. 260.10] subject to regulation under §402 or §307(b) of the CWA (i.e., NPDES permitted) that manages hazardous wastewaters – **Applicable**	40 C.F.R. § 264.1(g)(6) 15A NCAC 13A .0109
Groundwater Remediation Wells – Air Injection Wells, Extraction Wells, Re-injection Wells, and UIC Wells for Additives			
General standard for recovery wells (e.g., multi-phase extraction wells)	Recovery wells shall be located, designed, constructed, operated and abandoned with materials and by methods which are compatible with the chemical and physical properties of the contaminants involved, specific site conditions and specific subsurface conditions.	Design, construction, or operation of any recovery well – **Applicable**	15A NCAC 02C .0108(c)
	Recovery well boreholes shall not penetrate to a depth greater than the depth to be monitored or the depth from which contaminants are to be recovered. Any portion of the borehole that extends to a depth greater than the depth to be monitored or the depth from which contaminants are to be recovered shall be grouted completely to prevent vertical migration of contaminants.		15A NCAC 02C .0108(d)
Standards for pumps and equipment for extraction wells	The pumping capacity of the pump shall be consistent with the intended use and yield characteristics of the well.	Design, construction, or operation of any extraction well (not used for water supply) – **Applicable**	15A NCAC 02C .0109(a)
	The pump and related equipment for the well shall be located to permit easy access and removal for repair and maintenance.		15A NCAC 02C .0109(b)
	The base plate of a pump placed directly over the well shall be designed to form a watertight seal with the well casing or pump foundation.		15A NCAC 02C .0109(c)
	In installations where the pump is not located directly over the well, the annular space between the casing and pump intake or discharge piping shall be closed with a watertight seal.		15A NCAC 02C .0109(d)

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Standards for pumps and equipment for extraction well (continued)	The well head shall be equipped with a screened vent to allow for the pressure changes within the well except if a suction lift pump or single-pipe jet pump is used or artesian, flowing well conditions are encountered.		15A NCAC 02C .0109(e)
	A priming tee shall be installed at the well head in conjunction with offset jet pump installations.		15A NCAC 02C .0109(g)
	Joints of any suction line installed underground between the well and pump shall be tight under system pressure.	Design, construction, or operation of any extraction well (not used for water supply) – **Applicable**	15A NCAC 02C .0109(h)
	The drop piping and electrical wiring used in connection with the pump shall meet all applicable underwriters' specifications.		15A NCAC 02C .0109(i)
Design criteria for all injection wells	No person shall construct, operate, maintain, convert, plug, abandon, or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant into underground sources of drinking water if the presence of that contaminant may cause a violation of any applicable groundwater quality standard specified in Subchapter 02L or may otherwise adversely affect human health.	Design, construction, or operation of any injection well – **Applicable**	40 C.F.R. § 144.12 15A NCAC 02C.0211(c)
Injection of remediation amendments into groundwater	An injection activity cannot allow the movement of fluid containing any contaminant into underground sources of drinking water, if the presence of that contaminant may cause a violation of the primary drinking water standards under 40 CFR part 141 or other health-based standards, or may otherwise adversely affect the health of persons.	Class V wells [as defined in 40 CFR § 144.6(e)] – **Relevant and Appropriate**	40 CFR § 144.82(a)(1)
	This prohibition applies to well construction, operation, maintenance, conversion, plugging, closure, or any other injection activity.		
	Wells must be closed in a manner that complies with the above prohibition of fluid movement. Also, any soil, gravel, sludge, liquids, or other materials removed from or adjacent to the well must be disposed or otherwise managed in accordance with substantive applicable federal, state, and local regulations and requirements.		40 CFR § 144.82(b)

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Injection of substances into underground wells	Groundwater remediation wells used to inject additives, treated groundwater, or ambient air for treatment of contaminated soil or groundwater may inject only additives determined by Department of Health and Human services not to adversely affect human health.	Injection of fluids into or air into an underground well for the purposes of groundwater remediation – **Applicable**	15A NCAC 02C .0225(a)
	Rule requirements for other wells shall be treated as one of the injection well types in Rule .0209(5)(b) that most closely resembles the equivalent hydrogeologic complexity and potential to adversely affect groundwater quality. The Director may permit by rule the emplacement or discharge of a fluid or solid into the subsurface for any activity that meets the definition of an "injection well" that the Director determines not to have the potential to adversely affect groundwater quality and does not fall under other rules in this Section.	Injection of substances into an underground well other than liquids or air – **TBC**	15A NCAC 02C .0230
	Multi-screened wells shall not connect aquifers or zones having differences in water quality which would result in a degradation of any aquifer or zone.		15A NCAC 02C .0225(g)(17)
Construction of air injection wells [as defined in 15A NCAC 02C.0224(2)]	The air injected shall not exceed ambient air quality standards set forth in 15A NCAC 02D.0400 and shall not contain petroleum or any constituent that would cause a violation of groundwater standards specified in Subchapter 02L. Shall be constructed in accordance with the well construction standards applicable to monitoring wells specified in Rule .0108 of this Subchapter.	Installation of groundwater remediation wells for the subsurface injection of ambient air for the treatment of contaminated soil or groundwater (permitted by Rule) – **Applicable**	15A NCAC 02C .0225(b)(4)(A) and (B)
Injection zone determination	Shall specify the horizontal and vertical portion of the injection zone within which the proposed injection activity shall occur based on the hydraulic properties of that portion of the injection zone specified. No violation of groundwater quality standards specified in Subchapter 02L resulting from the injection shall occur outside the specified portion of the injection zone as detected by a monitoring plan approved by the Division.	Installation of groundwater remediation wells (other than permitted by Rule) for injection of additives – **Applicable**	15A NCAC 02C .0225(e)(2)

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Location of groundwater remediation wells	Wells shall not be located where: (A) Surface water or runoff will accumulate around the well due to depressions, drainage ways, or other landscapes that will concentrate water around the well. (B) A person would be required to enter confined spaces to perform sampling and inspection activities. (C) Injectants or formation fluids would migrate outside the approved injection zone as determined by the applicant in accordance with Subparagraph (e)(2) of this Rule.	Installation of groundwater remediation wells (other than permitted by Rule) for injection of additives – **Applicable**	15A NCAC 02C .0225(g)(1)
Construction of remediation wells	The methods and materials used in construction shall not threaten the physical and mechanical integrity of the well during its lifetime and shall be compatible with the proposed injection activities.	Installation of groundwater remediation wells (other than permitted by Rule) for injection of additives – **Applicable**	15A NCAC 02C .0225(g)(3)
	The well shall be constructed in such a manner that surface water or contaminants from the land surface cannot migrate along the borehole annulus either during or after construction.		15A NCAC 02C .0225(g)(4)
	The borehole shall not penetrate to a depth greater than the depth at which injection will occur unless the purpose of the borehole is the investigation of the geophysical and geochemical characteristics of an aquifer. Following completion of the investigation the borehole beneath the zone of injection shall be grouted completely to prevent the migration of any contaminants.		15A NCAC 02C .0225(g)(5)
Construction of remediation wells: grouted wells	Only allowable grout listed under Rule .0107 of this Subchapter shall be used with the exception that bentonite grout shall not be used: (A) To seal zones of water with a chloride concentration of 1,500 mg/L or greater as determined by tests conducted at the time of construction; or (B) In areas of the state subject to saltwater intrusion that may expose the grout to water with a chloride concentration of 1,500 mg/L or greater at any time during the life of the well.	Installation of groundwater remediation wells (other than permitted by Rule) for injection of additives – **Applicable**	15A NCAC 02C .0225(g)(8)

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Construction of remediation wells: grouted wells (continued)	The annular space between the borehole and casing shall be grouted: (A) With a grout that is non-reactive with the casing or screen materials, the formation, or the injectant. (B) From the top of the gravel pack to land surface and in such a way that there is no interconnection of aquifers or zones having differences in water quality that would result in degradation of any aquifer or zone. (C) So that the grout extends outward from the casing wall to a minimum thickness equal to either one-third of the diameter of the outside dimension of the casing or 2 inches, whichever is greater; but in no case shall a well be required to have an annular grout seal thickness greater than 4 inches.	Installation of groundwater remediation wells (other than permitted by Rule) for injection of additives – **Applicable**	15A NCAC 02C .0225(g)(9)
	Grout shall be emplaced around the casing by one of the following methods: (A) Pressure. Grout shall be pumped or forced under pressure through the bottom of the casing until it fills the annular space around the casing and overflows at the surface; (B) Pumping. Grout shall be pumped into place through a hose or pipe extended to the bottom of the annular space which can be raised as the grout is applied. The grout hose or pipe shall remain submerged in grout during the entire application; or (C) Other. Grout may be emplaced in the annular space by gravity flow in such a way to ensure complete filling of the space. Gravity flow shall not be used if water or any visible obstruction is present in the annular space at the time of grouting.	Installation of groundwater remediation wells (other than permitted by Rule) for injection of additives – **Applicable**	15A NCAC 02C .0225(g)(10)

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Construction of remediation wells: grouted wells (continued)	All grout mixtures shall be prepared prior to emplacement per the manufacturer's directions with the exception that bentonite chips or pellets may be emplaced by gravity flow if water is present or otherwise hydrated in place. If an outer casing is installed, it shall be grouted by either the pumping or pressure method. The well shall be grouted within seven days after the casing is set or before the drilling equipment leaves the site, whichever occurs first. No additives that will accelerate the process of hydration shall be used in grout for thermoplastic well casing.	Installation of groundwater remediation wells (other than permitted by Rule) for injection of additives – **Applicable**	15A NCAC 02C .0225(g)(11)- (14)
Construction of remediation wells: well casings	A casing shall be installed that extends from at least 12 inches above land surface to the top of the injection zone. Wells with casing extending less than 12 inches above land surface and wells without casing may be approved when one of the following conditions is met: (A) Site-specific conditions directly related to business activities, such as vehicle traffic, would endanger the physical integrity of the well; or (B) It is not operationally feasible for the well head to be completed 12 inches above land surface due to the engineering design requirements of the system.	Installation of groundwater remediation wells (other than permitted by Rule) for injection of additives – **Applicable**	15A NCAC 02C .0225(g)(15) and (16)
	Prior to removing the equipment from the site, the top of the casing shall be sealed with a water-tight cap or well seal, as defined in G.S. 87-85, to preclude contaminants from entering the well.		15A NCAC 02C .0225(g)(18)

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Construction of remediation wells: gravel and sand-packed wells	Packing materials for gravel and sand packed wells shall be: (A) Composed of quartz, granite, or other hard, non-reactive rock material. (B) Clean, of uniform size, water-washed and free from clay, silt, or other deleterious material. (C) Disinfected prior to subsurface emplacement. (D) Emplaced such that it shall not connect aquifers or zones having differences in water quality that would result in the deterioration of the water qualities in any aquifer zone. (E) Evenly distributed around the screen and shall extend to a depth at least 1 foot above the top of the screen. A minimum 1-foot-thick seal composed of bentonite clay or other sealing material approved by the Director shall be emplaced directly above and in contact with the packing material.	Installation of groundwater remediation wells (other than permitted by Rule) for injection of additives – **Applicable**	15A NCAC 02C .0225(g)(19)
	A hose bibb, sampling tap, or other collection equipment approved by the Director shall be installed on the line entering the injection well such that a sample of the injectant can be obtained immediately prior to its entering the injection well.	Installation of groundwater remediation wells (other than permitted by Rule) for injection of additives – **Applicable**	15A NCAC 02C .0225(g)(21)
	If applicable, all piping, wiring, and vents shall enter the well through the top of the casing unless otherwise approved by the Director based on a design demonstrated to preclude surficial contaminants from entering the well.		15A NCAC 02C .0225(g)(22)
Construction of remediation wells: well heads	The well head shall be completed in such a manner so as to preclude surficial contaminants from entering the well and well head protection shall include: (A) An accessible external sanitary seal installed around the casing and grouting. (B) A water-tight cap or seal compatible with the casing and installed so that it cannot be removed without the use of hand or power tools.	Installation of groundwater remediation wells (other than permitted by Rule) for injection of additives – **Applicable**	15A NCAC 02C .0225(g)(23)

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
	Unless permitted by this rule, pressure at the well head shall be limited to a maximum which will ensure that the pressure in the injection zone does not initiate new fractures or propagate existing fractures in the injection zone, initiate fractures in the confining zone, or cause the migration of injected or formation fluids outside the injection zone or area. Injection between the outermost casing and the well borehole is prohibited. Monitoring of the operating processes at the well head shall be provided for by the well owner, as well as protection against damage during construction and use.		15A NCAC 02C .0225(i)(1)-(3)
Mechanical integrity of wells	All permanent injection wells require tests for mechanical integrity, which shall be conducted in accordance with Rule .0207 of this Section. An injection well has internal mechanical integrity when there is no leak in the casing, tubing, or packer. An injection well has external mechanical integrity when there is no fluid movement into groundwaters through vertical channels adjacent to the injection well bore.	Installation of groundwater remediation wells (other than permitted by Rule) for injection of additives – **Applicable**	15A NCAC 02C .0225(h) 15A NCAC 0207(a) and (b)
Operation and maintenance of treatment system	Shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used. Proper operation and maintenance includes effective performance and adequate laboratory and process controls, including appropriate quality assurance procedures.	Operation of a well for injection of additives or groundwater underground – **Applicable**	15A NCAC 02C .0211(k)

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Monitoring of injection wells (continued)	Monitoring wells shall be of sufficient quantity and location so as to detect any movement of injection fluids, injection process byproducts or formation fluids outside the injection zone as determined by the applicant in accordance with Subparagraph (e)(2) of this Rule. The monitoring schedule shall be consistent with the proposed injection schedule, pace of the anticipated reactions, and rate of transport of the injectants and contaminants. Note: The monitoring will be specified in a monitoring plan included as part of a CERCLA document (e.g., remedial design or Remedial Action Work Plan).	Installation of groundwater remediation wells (other than permitted by Rule) for injection of additives – **Applicable**	15A NCAC 02C .0225(e)(9)
	If affected, may require additional monitoring wells located to detect any movement of injection fluids, injection process byproducts, or formation fluids outside the injection zone as determined by the applicant in accordance with Subparagraph (e)(2) of this Rule. If the operation is affected by subsidence or catastrophic collapse, the monitoring wells shall be located so that they will not be physically affected and shall be of an adequate number to detect movement of injected fluids, process byproducts, or formation fluids outside the injection zone or area.	Installation of monitoring wells in (or adjacent to) the injection zone that may be affected by injection operations – **Applicable**	15A NCAC 02C .0225(j)(3)
Monitoring Well Installation, Operation, and Abandonment			
Implementation of groundwater monitoring systems	Must install and implement a monitoring system to evaluate the effects of the discharge upon waters of the state, including the effect of any actions taken to restore groundwater quality, and the efficiency of any treatment facility. Note: The monitoring will be specified in a monitoring plan included as part of a CERCLA document (e.g., remedial design or Remedial Action Work Plan).	Groundwater remediation activities – **Applicable**	15A NCAC 02L .0110(a)
	Shall be constructed in a manner that will not result in contamination of adjacent groundwaters of a higher quality.	Installation of monitoring system to evaluate effects of any actions taken to restore groundwater quality, as well as the efficacy of treatment – **Applicable**	15A NCAC 02L .0110(b)

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Construction of groundwater monitoring wells	No well shall be located, constructed, operated, or repaired in any manner that may adversely impact the quality of groundwater.	Installation of wells (including temporary wells, monitoring wells) other than for water supply – **Applicable**	15A NCAC 02C .0108(a)
	Shall be located, designed, constructed, operated, and abandoned with materials and by methods which are compatible with the chemical and physical properties of the contaminants involved, specific site conditions, and specific subsurface conditions.	Installation of wells (including temporary wells, monitoring wells) other than for water supply – **Applicable**	15A NCAC 02C .0108(c)
	Monitoring well and recovery well boreholes shall meet the construction requirements set forth in the cited regulations related to: • Borehole depth and hydraulic connectivity. • Construction materials, packing material, well screen and seals. • Grout placement and contents. • Well construction. • Locking well cap. • Well casing and covers. • Identification. • Wellhead protection.	Installation of wells (including temporary wells, monitoring wells) and boreholes other than for water supply – **Applicable**	15A NCAC 02C .0108(d) thru 15A NCAC 02C .0108(p) Standards of Construction
	Shall be constructed in such a manner as to preclude the vertical migration of contaminants within and along the borehole channel.	Installation of temporary wells and all other non-water supply wells **– Applicable**	15A NCAC 02C .0108(t)
Monitoring well development	Shall be developed such that the level of turbidity or settleable solids does not preclude accurate chemical analyses of any fluid samples collected or adversely affect the operation of any pumps or pumping equipment.	Installation of wells (including temporary wells, monitoring wells) other than for water supply – **Applicable**	15A NCAC 02C .0108(q)
Maintenance of groundwater monitoring wells	A well that is not maintained by the owner to conserve and protect groundwater resources or that constitutes a source or channel of contamination to the water supply or any aquifer shall be permanently abandoned in accordance with Rule .0113(b).	Installation of wells (including temporary wells and monitoring wells) other than for water supply **– Applicable**	15A NCAC 02C .0112(a)

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Abandonment of groundwater monitoring and remediation wells	Shall be abandoned by filling the entire well up to land surface with grout, dry clay, or material excavated during drilling of the well and then compacted in place.	Permanent abandonment of wells (including temporary wells, monitoring wells, and test borings) other than for water supply less than 20 feet in depth and which do not penetrate the water table **– Applicable**	15A NCAC 02C .0113(d)(1)
	Shall be abandoned by completely filling with a bentonite or cement-type grout.	Permanent abandonment of wells (including temporary wells, monitoring wells, and test borings) other than for water supply greater than 20 feet in depth and which do not penetrate the water table **– Applicable**	15A NCAC 02C .0113(d)(2)
	All wells shall be permanently abandoned in which the casing has not been installed or from which the casing has been removed, prior to removing drilling equipment from the site.	Permanent abandonment of wells (including temporary wells) other than for water supply **– Applicable**	15A NCAC 02C .0113(f)
Transportation of Wastes – Primary and Secondary Wastes			
Transportation of hazardous materials	Shall be subject to and must comply with all applicable provisions of the Hazardous Materials Transportation Act (HMTA) and hazardous materials regulations at 49 C.F.R. 171–180.	Any person who, under contract with a department or agency of the federal government, transports "in commerce," or causes to be transported or shipped, a hazardous material – **Applicable**	49 C.F.R. § 171.1(c)
Transportation of hazardous waste off site	Must comply with the generator standards established in this part (e.g., 40 CFR Sect. 262.20–23 for manifesting, Sect. 262.24-25 for electronic manifesting; Sect. 262.30 for packaging, Sect. 262.31 for labeling, Sect. 262.32 for marking, Sect. 262.33 for placarding and Sect. 262.40 and 262.41(a) for record keeping requirements, and Sect. 262.18 to obtain EPA ID number.	Preparation of shipment of RCRA hazardous waste off-site **– Applicable**	40 C.F.R. § 262.10(h) 15A NCAC 13A .0107
Transportation of hazardous waste on site	The generator manifesting requirements of 40 C.F.R. Sect. 262.20-262.32(b) do not apply. Generator or transporter must comply with the requirements set forth in 40 C.F.R. § 263.30 and § 263.31 in the event of a discharge of hazardous waste on a private or public right of way.	Transportation of hazardous wastes on a public or private right of way within or along the border of contiguous property under the control of the same person, even if such contiguous property is divided by a public or private right-of-way – **Applicable**	40 C.F.R. § 262.20(f) 15A NCAC 13A .0107

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Transportation of samples (i.e., contaminated soils and wastewaters)	Are not subject to any requirements of 40 CFR Parts 261 through 268 or 270 when: • The sample is being transported to a laboratory for the purpose of testing. • The sample is being transported back to the sample collector after testing. • The sample is being stored by sample collector before transport to a lab for testing.	Generation of samples of hazardous waste for purpose of conducting testing to determine its characteristics or composition – **Applicable**	40 C.F.R. § 261.4(d)(1)(i)-(iii) 15A NCAC 13A .0106(a)
	In order to qualify for the exemption in 40 C.F.R. 261.4 (d)(1)(i) and (ii), a sample collector shipping samples to a laboratory must: • Comply with U.S. Department of Transportation, U.S. Postal Service, or any other applicable shipping requirements. • Assure that the information provided in (1) thru (5) of this section accompanies the sample. • Package the sample so that it does not leak, spill, or vaporize from its packaging.		40 CFR 261.4(d)(2) 40 CFR 261.4(d)(2) (ii)(A) and (B) 15A NCAC 13A .0106(a)
Institutional Controls for Contamination Left in Place			
Notice of contaminated site	Prepare and certify by professional land surveyor a survey plat which identifies contaminated areas which shall be entitled "NOTICE OF CONTAMINATED SITE". Notice shall include a legal description of the site that would be sufficient as a description in an instrument of conveyance and meet the requirements of N.C.G.S. 47-30 for maps and plans.	Contaminated site subject to current or future use restrictions included in a remedial action plan as provided in N.C.G.S. 143B-279.9(a) – **TBC**	N.C.G.S. 143B-279.10(a)
	The Survey plat shall identify: • The location and dimensions of any disposal areas and areas of potential environmental concern with respect to permanently surveyed benchmarks. • The type, location, and quantity of contamination known to exist on the site. • Any use restriction on the current or future use of the site.		N.C.G.S. 143B-279.10(a)(1)-(3)

ACTION-SPECIFIC ARARs and TBCs			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
	The Notice (survey plat) shall be filed in the register of deeds office in the county or counties in which the land is located.		N.C.G.S. 143B-279.10(b)
	The deed or other instrument of transfer shall contain in the description section, in no smaller type than used in the body of the deed or instrument, a statement that the property is a contaminated site and reference by book and page to the recordation of the Notice.	Contaminated site subject to current or future use restrictions as provided in N.C.G.S. 143B-279.9(a) that is to be sold, leased, conveyed, or transferred — **TBC**	N.C.G.S. 143B-279.10(e)

ARAR = applicable or relevant and appropriate requirement
C.F.R. = *Code of Federal Regulations*
CWA = Clean Water Act of 1972
DOT = U.S. Department of Transportation
EPA = U.S. Environmental Protection Agency
NCAC = *North Carolina Administrative Code*
N.C.G.S. = North Carolina General Statutes
NPDES = National Pollutant Discharge Elimination System
POTW = Publicly Owned treatment Works
HMR = Hazardous Materials Regulations
HMTA = Hazardous Materials Transportation Act
RCRA = Resource Conservation and Recovery Act of 1976
TBC = to be considered
UTS = Universal Treatment Standard
WWTU = wastewater treatment unit

APPENDIX C: STATE OF NORTH CAROLINA CONCURRENCE

ROY COOPER
Governor
ELIZABETH S. BISER
Secretary

NORTH CAROLINA
Environmental Quality

September 19, 2022

Mr. Hilary Thornton
Superfund Branch, Waste Management Division
US EPA Region IV
61 Forsyth Street. SW
Atlanta, Georgia 30303

SUBJECT: Concurrence with Amended Record of Decision (AROD)
Cape Fear Wood Preserving
Fayetteville, Cumberland County

Dear Mr. Thornton:

The State of North Carolina by and through its Department of Environmental Quality, Division of Waste Management (herein after referred to as "the state"), reviewed the Amended Record of Decision received by the Division on September 16, 2022, for the Cape Fear Wood Preserving Superfund Site and concurs with the AROD subject to the following conditions:

1. State concurrence on the AROD for this site is based solely on the information contained in the AROD received by the State on September 16, 2022. Should the State receive new or additional information which significantly affects the conclusions or remedy contained in the AROD, it may modify or withdraw this concurrence with written notice to EPA Region IV.

2. State concurrence on this AROD in no way binds the State to concur in future decisions or commits the State to participate, financially or otherwise, in the cleanup of the site. The State reserves the right to review, overview comment, and make independent assessment of all future work relating to this site.

3. If, after remediation is complete, the total residual risk level exceeds 10^{-6}, the State may require deed recordation/restriction to document the presence of residual contamination and possibly limit future use of the property as specified in NCGS 130A-310.8.

North Carolina Department of Environmental Quality
217 West Jones Street | 1601 Mail Service Center | Raleigh, North Carolina 27699-1601
919.707.8600

The State appreciates the opportunity to comment on the ROD and looks forward to working with EPA on the remedy for the subject site. If you have any questions or comments, please call Ms. Beth Hartzell (919) 707-8335.

Sincerely,

William F. Hunneke

William Hunneke, Chief
Superfund Section
Division of Waste Management

cc: Qu Qi, NC Superfund

North Carolina Department of Environmental Quality
217 West Jones Street | 1601 Mail Service Center | Raleigh, North Carolina 27699-1601
919.707.8600