Five-Year Review Report

Second Five-Year Review Report
for
Weyerhaeuser Co. Plymouth Wood Treating Plant
NCD991278540

Plymouth
Martin County, North Carolina

June 2015

United States Environmental Protection Agency
Region 4
Atlanta, Georgia

Approved by: _____ Date: 6/2/15

Franklin E. Hill
Director, Superfund Division

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for
Weyerhaeuser Co. Plymouth Wood Treating Plant
1475 NC-149
Plymouth
Martin County, North Carolina

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List of Acronyms

AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
bgs	Below ground surface
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	Contaminant of Concern
eMNR™	Enhanced Monitored Natural Recovery
EPA	United States Environmental Protection Agency
FYR	Five-Year Review
IC	Institutional Control
LRR	Lower Roanoke River
MCL	Maximum Contaminant Level
µg/L	Microgram per liter
mg/kg	Milligram per kilogram
mg/L	Milligram per liter
MNR	Monitored Natural Recovery
NC DENR	North Carolina Department of Environment and Natural Resources
NC DHHS	North Carolina Department of Health and Human Services
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ng/kg	Nanogram per kilogram
ng/L	Nanogram per liter
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PRG	Preliminary Remediation Goals
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RI/FS	Remedial Investigation and Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SWAC	Surface Weighted Area Concentration
TBC	To-Be-Considered
TCDD	Tetrachlorodibenzo-p-dioxin
TEF	Toxicity Equivalency Factor
TEQ	Toxicity Equivalent Concentration
TRC	TRC Environmental Corporation
WHO	World Health Organization

Executive Summary

The Weyerhaeuser Co. Plymouth Wood Treating Plant Superfund Alternative site (the Site) is located about 1.5 miles west of the city limits of Plymouth, Martin County, North Carolina. Pulp and paper manufacturing operations have occurred near the Site continuously since 1937. Facility operations contaminated soil, sediment, surface water, groundwater and fish with dioxin, mercury and heavy metals. The United States Environmental Protection Agency (EPA) divided the Site into four operable units (OUs) and selected remedies to address contamination in four Records of Decision (RODs). OU1 consists of the Former Landfill No. 1 Area. Cleanup at OU1 included installation of a landfill cap, natural recovery for the adjacent wetland soils and institutional controls. OU2 is the Lower Roanoke River (LRR). Remedial activities at OU2 include monitored natural recovery, institutional controls and long term monitoring. OU3 consists of the Former Chlorine Plant Area. Remediation at OU3 included excavation of contaminated soil, installation of a barrier wall and surface cap, groundwater monitoring and institutional controls. OU4 is Welch Creek. Cleanup at OU4 included installation and maintenance of a thin sand cap over contaminated sediment, long-term monitoring of the cap, sediment, surface water and biota, and institutional controls.

The EPA did not list the Site on the Superfund program's National Priorities List (NPL) but considers it an NPL-caliber site. The Site is being addressed through the Superfund Alternative Approach, which uses the same process and standards used for investigation and cleanup of NPL sites. The EPA, the State of North Carolina and the Site's primary potentially responsible party (PRP) have investigated site conditions and have taken steps to clean up the Site to protect human health and the environment. The Site's PRP has completed remedy construction for all four OUs. Long-term monitoring activities are ongoing. The triggering action for this five-year review (FYR) was the signing of the previous FYR on May 5, 2010.

The remedies at all OUs currently protect human health and the environment because exposure pathways that could result in unacceptable risks have been addressed. However, in order for the remedies to be protective in the long term, the following actions need to be taken:

- OU1 - Institutional controls are needed to limit land use to industrial land use only and prohibit the installation of groundwater drinking wells.
- OU3 - Institutional controls are needed to prohibit the potable use of groundwater from the shallow aquifer and restrict land use to prevent exposure to contaminated soil.
- OU4 - Institutional controls are needed to limit land development on the Domtar property that could impact the remedy.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Weyerhaeuser Co. Plymouth Wood Treating Plant		
EPA ID: NCD991278540		
Region: 4	**State:** NC	**City/County:** Plymouth/Martin County

SITE STATUS	
NPL Status: Non-NPL	
Multiple OUs? Yes	**Has the site achieved construction completion?** No

REVIEW STATUS
Lead agency: EPA
Author name: Melissa Oakley and Ryan Burdge (Reviewed by EPA)
Author affiliation: Skeo Solutions
Review period: 12/01/2014 – 05/05/2015
Date of site inspection: 12/11/2014
Type of review: Statutory
Review number: 2
Triggering action date: 5/5/2010
Due date *(five years after triggering action date)*: 5/5/2015

Five-Year Review Summary Form (continued)

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
None

Issues and Recommendations Identified in the Five-Year Review:

OU(s): OU1, OU3 and OU4	Issue Category: Institutional Controls			
	Issue: Institutional controls required by the OU1, OU3 and OU4 RODs have not been implemented.			
	Recommendation: For OU1, implement institutional controls to limit land use to industrial land use only and prohibit the installation of groundwater drinking wells. For OU3, implement institutional controls to prohibit the potable use of groundwater from the shallow aquifer located beneath the Former Chlorine Plant Area and to prevent exposure to contaminated soil. For OU4, implement institutional controls to limit land development on the Domtar property that could impact the remedy.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	05/01/2017

Protectiveness Statements

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU1	Short-term Protective	

Protectiveness Statement:
The selected remedy for OU1 currently protects human health and the environment because exposure pathways that could result in unacceptable risks have been addressed. Fencing and manned security gates restrict landfill access and the landfill cap prevents potential human and environmental receptor exposure to contaminated soil below. Shallow groundwater is not used in the vicinity of the landfill and landfill inspection and maintenance activities ensure the continued integrity of the landfill cap. However, in order for the remedy to be protective in the long term, institutional controls are needed to limit land use to industrial land use only and prohibit the installation of groundwater drinking wells.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU2	Protective	

Protectiveness Statement:
The selected remedy for OU2 is protective of human health and the environment. Exposure pathways that could result in unacceptable risks have been addressed through North Carolina Department of Human Health Services (NC DHHS) fish consumption advisories, which prevent or reduce potential human consumption of contaminated fish.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU3	Short-term Protective	

Protectiveness Statement:
The selected remedy for OU3 currently protects human health and the environment because exposure pathways that could result in unacceptable risks have been addressed. Groundwater is not used in the vicinity of the Former Chlorine Plant Area. The subsurface barrier wall and the limited excavation of mercury-impacted soil have reduced the potential for a future release of mercury to the Lower Roanoke River. The asphalt cap over the Former Chlorine Plant Area reduces infiltration of surface water and prevents potential human exposures to contaminated soil below. However, in order for the remedy to be protective in the long term, institutional controls are needed to prohibit the potable use of groundwater from the shallow aquifer and restrict land use to prevent potential future exposure to contaminated soil.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU4	Short-term Protective	

Protectiveness Statement:
The selected remedy for OU4 currently protects human health and the environment because exposure pathways that could result in unacceptable risks have been addressed. The sand cap serves as an exposure control barrier to underlying sediments and limits re-suspension of impacted underlying sediments. Institutional controls implemented at OU4 help limit the consumption of fish from Welch Creek, maintain the integrity of the sand cap, limit access to the Welch Creek Area, and inform the public of fish advisories and the presence of the sand cap. However, in order for the remedy to be protective in the long term, institutional controls are needed to limit land development on the Domtar property that could impact the remedy.

Five-Year Review Summary Form (continued)

Environmental Indicators
- Current human exposures at the Site are under control. *- Current groundwater migration is under control.*

Are Necessary Institutional Controls in Place?
☐ All ☒ Some ☐ None

Has EPA Designated the Site as Sitewide Ready for Anticipated Use?
☐ Yes ☒ No

Has the Site Been Put into Reuse?
☒ Yes ☐ No

Second Five-Year Review Report
for
Weyerhaeuser Co. Plymouth Wood Treating Plant Superfund Alternative Site

1.0 Introduction

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy will continue to be protective of human health and the environment. FYR reports document FYR methods, findings and conclusions. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The United States Environmental Protection Agency prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Section 121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121 states:

> If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each 5 years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The EPA interpreted this requirement further in the NCP, 40 Code of Federal Regulations Section 300.430(f)(4)(ii), which states:

> If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the selected remedial action.

Skeo Solutions, an EPA Region 4 contractor, conducted the FYR and prepared this report regarding the remedy implemented at the Weyerhaeuser Co. Plymouth Wood Treating Plant Superfund Alternative site (the Site) in Plymouth, Martin County, North Carolina. EPA's contractor conducted this FYR from December 2014 to May 2015. The EPA is the lead agency for developing and implementing the remedy for the potentially responsible party (PRP)-financed cleanup at the Site. The North Carolina Department of Environment and Natural Resources (NC DENR), as the support agency representing the State of North Carolina, has reviewed all supporting documentation and provided input to EPA during the FYR process.

This is the second FYR for the Site. The triggering action for this statutory review is the previous FYR. The FYR is required due to the fact that hazardous substances, pollutants or contaminants

remain at the Site above levels that allow for unlimited use and unrestricted exposure. The Site consists of four operable units (OUs). This FYR report addresses all site OUs.

2.0 Site Chronology

Table 1 lists the dates of important events for the Site.

Table 1: Chronology of Site Events

Event	Date
Pulp and paper production began at the Site	1937
Operators discharged facility wastewater directly to nearby surface water bodies	1937-1956
Weyerhaeuser acquired the site facility from the Kieckhefer-Eddy Company and implemented in-plant waste control improvements	1957
The State of North Carolina issued a permit to Weyerhaeuser to discharge wastewater to Welch Creek	1969
Wastewater discharges became subject to National Pollutant Discharge Elimination System (NPDES) regulations	1975
The State of North Carolina conducted a preliminary site assessment	March 1, 1985
The EPA and Weyerhaeuser entered into an Administrative Order on Consent (AOC) and Weyerhaeuser initiated remedial investigations and feasibility studies (RIs/FSs) for OUs 1, 3 and 4	March 24, 1998
The EPA initiated the OU2 RI/FS	August 13, 1999
The EPA issued a Record of Decision (ROD) for OU1	June 19, 2002
Weyerhaeuser began remedial design of the OU1 remedy	May 3, 2003
The EPA issued a consent decree to Weyerhaeuser for OU1	August 18, 2003
The EPA issued a ROD for OU3 and Weyerhaeuser completed the Site's RIs/FSs for OUs 1 and 3	September 29, 2003
Weyerhaeuser began remedial design of the OU3 remedy	April 23, 2004
The EPA issued a consent decree to Weyerhaeuser for OU3	July 27, 2004
Weyerhaeuser completed remedial design of the OU1 remedy	November 8, 2004
Weyerhaeuser began remedial action for OU1	April 18, 2005
Weyerhaeuser completed remedial design of the OU3 remedy and began remedial action at OU3	June 27, 2005
Weyerhaeuser completed OU1 remedial action	November 9, 2005
Weyerhaeuser completed OU3 remedial action	September 28, 2006
Domtar Paper Company, LLC (Domtar) acquired the Site from Weyerhaeuser and assumed all site-related environmental cleanup obligations	March 7, 2007
The EPA issued a ROD for OU4 and Weyerhaeuser completed the OU4 RI/FS	September 26, 2007
The EPA issued a ROD for OU2 and Domtar completed the OU2 RI/FS	September 24, 2008
The EPA issued a consent decree to Domtar for OU4	January 7, 2009
Domtar began OU4 remedial design	June 2009
The EPA completed the Site's first FYR	May 5, 2010

Event	Date
Domtar completed OU4 remedial design	September 22, 2010
Domtar began OU2 remedial design	September 30, 2010
EPA issued a consent decree to Domtar for OU2	April 5, 2011
Domtar completed OU2 remedial design and initiated OU2 remedial action	September 20, 2011
Domtar began OU4 remedial action	November 7, 2011
Domtar completed remedial action at OU4	February 1, 2012
Domtar began long term monitoring/completed remedial action at OU2	June 2012

3.0 Background

3.1 Physical Characteristics

The Site is located about 1.5 miles west of the city limits of Plymouth, Martin County, North Carolina (Figure 1). The original source of contamination was a paper manufacturing facility (now owned and operated by Domtar Paper Company, LLC (Domtar), from which decades of wastewater discharge contaminated surface water, sediment and fish in Welch Creek and the Lower Roanoke Rive (LRR). The Site is defined only as four operable unit (OU) areas and does not include the Domtar facility (Figure 2). The physical characteristics of each OU are discussed in detail below.

OU1: Landfill No. 1: Landfill No. 1 covers 97 acres, west of the Domtar paper manufacturing facility (formerly Weyerhaeuser) and south of the Highland Prong of Warren Neck Creek. Wooded swamps border the landfill on the northwest, southwest and southeast.

OU2: Lower Roanoke River (LRR): The LRR OU (OU2) in eastern North Carolina consists of 14.3 miles of river from a point upstream of the Domtar facility to the Albemarle Sound. The river is surrounded by extensive coastal wetlands.

OU3: Former Chlorine Plant Area: The Former Chlorine Plant Area occupies about 3 acres within the larger paper manufacturing facility property. The area is primarily covered with asphalt and concrete pavement.

OU4: Welch Creek: The Welch Creek OU is a 4.5-mile portion of the lower creek, extending upstream from its confluence with the Roanoke River. OU4 is bounded by wooded wetlands along the east bank and the non-production paper mill facilities along the west bank.

Sitewide Physical Characteristics
The Site is located in a low-lying area near the confluence of Welch Creek and the Roanoke River. The shallowest geologic unit below the Site is the surficial aquifer, which is less than 50 feet thick. Fifty to 100 feet of confining clay separates the surficial aquifer from the Castle Hayne Aquifer, which is about 130 feet below ground surface near the site; it is the most productive aquifer in North Carolina.

3.2 Land and Resource Use

The surrounding area consists primarily of forest, wetlands and agricultural land. In 2014, the City of Plymouth had an estimated population of 3,850 and Martin County had an estimated population of 23,699. There are a few residences near the U.S. Route 64 bridge, near the southern limit of the Welch Creek OU.

Neither Welch Creek nor the LRR are used as drinking water sources. However, both water bodies support some recreational fishing, subject to fish consumption advisories for bottom-dwelling fish. Shallow groundwater near the Site is not used or expected to be used as a potable water source. The nearest private well is about 1.9 miles south of OU1. This well is screened in the Castle Hayne aquifer.

While Domtar owns the Site property, paper manufacturing activities do not take place within the site OUs. Domtar controls access to much of the Site through a series of manned guard gates and fencing.

In 1994, the former property owner covered the northern portion of OU1 with gravel to use it for material storage, plant construction staging, contractor parking, and a contractor office and work area. Several contractors store equipment on the 41-acre gravel portion of the OU1 landfill cap.

3.3 History of Contamination

The original plant owner discharged wastewater from paper manufacturing processes to the LRR from about 1937 to 1956. From 1957 to 1968, Weyerhaeuser discharged wastewater effluent directly to Welch Creek. From 1968 to 1987, Weyerhaeuser began treating wastewater prior to discharge to Welch Creek. Since 1988, the facility's National Pollutant Discharge Elimination System (NPDES) permit has allowed discharge of treated wastewater into the Roanoke River. Domtar acquired the Site from Weyerhaeuser on March 7, 2007, and assumed all site-related environmental cleanup obligations.

The Former Landfill No. 1 (OU1) operated from the mid-1950s until the early 1980s. The landfill is unlined and does not have a leachate collection system. Materials disposed of at the landfill consisted predominately of bark, sawdust, lime grits and waste paper. In 1981, the landfill was closed using wastewater treatment solids from the plant's on-site settling ponds as the cover material. The wastewater treatment solids contained dioxin and heavy metals. Weyerhaeuser subsequently used the landfill area as a log storage yard in the mid-1980s.

Between 1952 and 1968, paper plant activities included the operation of a chlorine plant (now OU3). Chlorine plant operations and surface water runoff and/or other discharges from the former plant contaminated soil and river sediment with mercury.

3.4 Initial Response

Initial EPA and NC DENR investigations determined that the four OU areas caused releases and/or could cause releases of hazardous substances to the environment. In March 1988,

Weyerhaeuser entered into an Administrative Order on Consent (AOC) to perform remedial investigations and feasibility studies (RIs/FSs) for OUs 1, 3 and 4. The EPA initiated the OU2 RI/FS in August 1999. At the request of the EPA, Domtar completed the OU2 RI/FS in September 2008.

Weyerhaeuser conducted voluntary cleanup at the Former Chlorine Plant Area (OU3) between 1986 and 1992. Those actions included building demolition and the excavation and off-site disposal of mercury-contaminated soil down to the water table, about 4 feet below ground surface (bgs). The excavation was backfilled with soil and concrete and paved with asphalt.

The EPA did not list the Site on the Superfund program's National Priorities List (NPL) but considers it an NPL-caliber site. The Site is being addressed through the Superfund Alternative Approach, which uses the same process and standards used for investigation and cleanup of NPL sites. The EPA, the State of North Carolina and the Site's primary PRP have investigated site conditions and have taken steps to clean up the Site to protect human health and the environment.

3.5 Basis for Taking Action

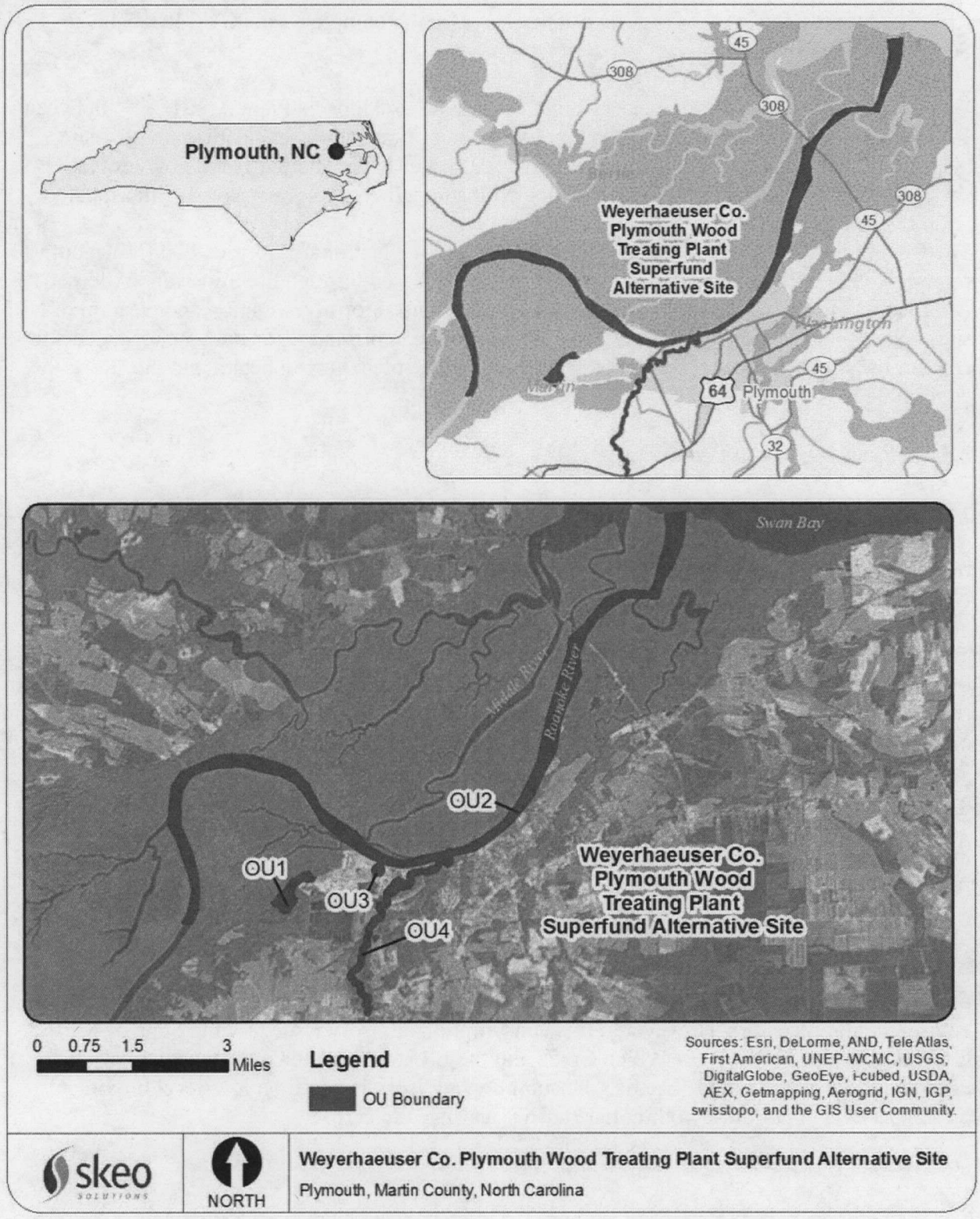
The baseline ecological risk assessment for OU1 determined that dioxin and metals in cover and wetland soils presented unacceptable risk to environmental receptors. The baseline human health risk assessment determined that dioxin in groundwater would present an unacceptable risk to future residents if they installed drinking water wells in the contaminated aquifer.

The baseline risk assessment for OU2 determined that human consumption of whole fish from the LRR results in a potential risk slightly above the 10^{-4} risk level. However, calculating human risk based on consumption of whole fish may overstate the risk. The OU2 remedial investigation also identified potential risks to some ecological receptors, such as birds or mammals that ingest LRR fish, sediment or wetland soil.

The human health risk assessment for OU3 calculated a current low risk associated with mercury in soil and groundwater. However, the assessment determined that there was a possibility that a future release of large quantities of mercury contained in sub-surface soils in OU3 could occur and that this release could result in an unacceptable risk to human health and the environment.

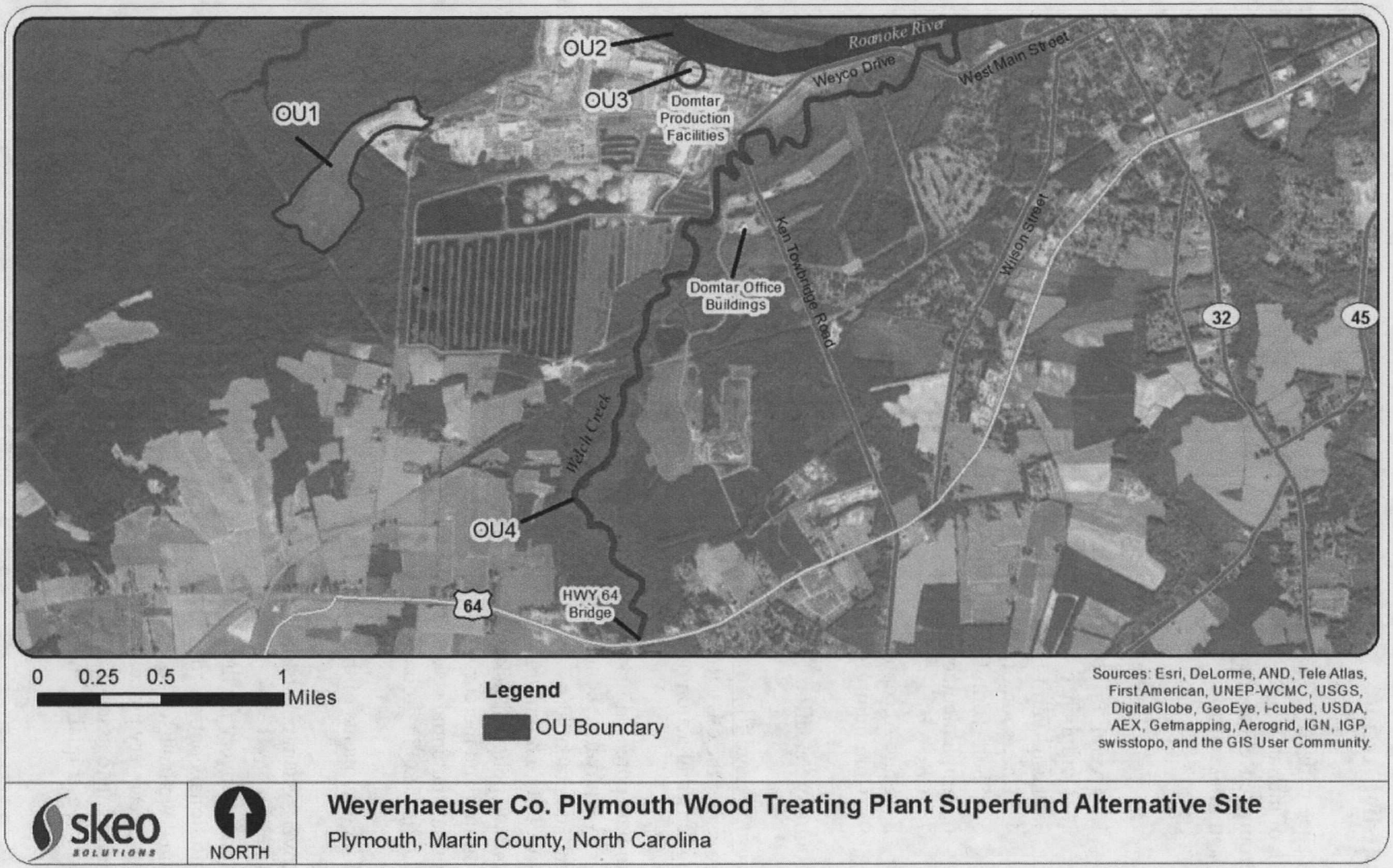
According to the OU4 baseline risk assessment, dioxin concentrations in LRR sediments do not present an unacceptable risk to human health, but do present a potentially unacceptable risk to environmental receptors. However, a fish consumption advisory issued by the State of North Carolina remains in effect for Welch Creek and the LRR, which indicates the potential for unacceptable risk to people. The fish consumption advisory is based on low-level dioxin concentrations in bottom-dwelling fish, such as catfish and carp.

Figure 1: Site Location Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

Figure 2: Detailed Site Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

4.0 Remedial Actions

In accordance with CERCLA and the NCP, the overriding goals for any remedial action are protection of human health and the environment and compliance with Applicable or Relevant and Appropriate Requirement (ARARs). A number of remedial alternatives were considered for the Site, and final selection was made based on an evaluation of each alternative against nine evaluation criteria that are specified in Section 300.430(e)(9)(iii) of the NCP. The nine criteria are:

1. Overall Protection of Human Health and the Environment
2. Compliance with ARARs
3. Long-Term Effectiveness and Permanence
4. Reduction of Toxicity, Mobility or Volume through Treatment
5. Short-Term Effectiveness
6. Implementability
7. Cost
8. State Acceptance
9. Community Acceptance

4.1 Remedy Selection

OU1 – Former Landfill No. 1

The EPA issued the OU1 Record of Decision (ROD) in June 2002. The ROD identified the following remedial action objectives (RAOs):

- Eliminate potential risk to site-specific human receptors associated with exposure to dioxin toxicity equivalent concentrations (TEQ) in cover soil.
- Eliminate potential risk to site-specific ecological receptors associated with exposure to dioxin TEQ, chromium, lead, mercury, selenium and vanadium in landfill cover soil.
- Eliminate potential risk to site-specific ecological receptors associated with exposure to chromium and mercury in the wetland soils adjacent to Landfill No. 1.
- Eliminate potential risk to hypothetical future residential receptors associated with exposure to dioxin TEQ in groundwater near the Landfill No. 1 area.

The major components of the selected remedy for OU1 include:

- A cover system consisting of a geotextile barrier and soil and gravel over the entire surface of Landfill No. 1.
- Natural recovery for the adjacent wetland soils.
- Institutional controls to restrict groundwater use and limit land use to industrial purposes.
- Annual wetland soil monitoring for site contaminants of concern (COCs) to assess the natural recovery process until the cleanup standards are met.
- Monitoring to assess the effectiveness of this remedial alternative for protection of groundwater quality and routine maintenance of the landfill cap.

The OU1 ROD identified COCs for surface soil and wetland soil (Table 2). No landfill-related constituents were detected in the groundwater above the then-current North Carolina groundwater quality standards, so the EPA did not select a dioxin groundwater cleanup goal for OU1.

Table 2: OU1 Soil and Wetland Cleanup Goals

Surface Soil COCs	ROD Cleanup Goal[c]
Dioxin TEQ[a*]	370 ng/kg
Dioxin TEQ[b*]	770 ng/kg
Chromium	110 mg/kg
Lead	70 mg/kg
Mercury	0.4 mg/kg
Selenium	4.0 mg/kg
Vanadium	140 mg/kg
Wetland Soil COCs	**ROD Cleanup Goal**
Mercury	0.4 mg/kg
Chromium	110 mg/kg

Notes:
[a] Based on World Health Organization (WHO, 1988) mammalian method.
[b] Based on WHO 1988 avian method (WHO, 1988).
[c] Baseline ecological risk assessment results formed the basis for the numerical cleanup goals presented in the ROD.
* Both methods of calculation must be performed and applied to verify the cleanup standard is achieved.
ng/kg – nanogram per kilogram.
mg/kg – milligram per kilogram.

OU2 – LRR

The EPA issued the OU2 ROD in September 2008. The ROD identified the following human health RAOs for OU2:

- Maintain acceptable levels of potential risk to site-specific human receptors.
- Maintain concentrations of surface water contaminants at or below surface water standards, to the extent practicable.
- Continue progress toward removal of remaining fish consumption advisories in the LRR.

The OU2 ROD identified the following ecological RAOs for OU2:

- Protect the habitat of LRR OU2 to maintain the health of local populations and communities of biota.
- Reduce the dioxin concentrations in whole fish tissues over time to the extent practicable.
- Minimize the adverse effects of remediation activities on the existing aquatic environment and/or wetland habitat to the extent practicable.
- Protection of the striped bass fishery and habitat.

The selected remedy for OU2 consists of monitored natural recovery (MNR) for the LRR, institutional controls and long-term monitoring to document improving conditions in the area. The OU2 ROD also requires that the North Carolina Department of Human Health Services (NC DHHS) fish consumption advisories remain in place until state standards have been met. Appendix G includes additional details regarding the long-term monitoring and inspection components of the selected remedy for OU2.

OU3 – Former Chlorine Plant Area

The EPA issued the OU3 ROD in September 2003. The ROD identified the following RAOs for OU3:

- Maintain acceptable levels of potential risk to site-specific human receptors associated with exposure to mercury in soil and groundwater at the Former Chlorine Plant Area.
- Reduce groundwater levels of mercury to a point of compliance with the North Carolina Maximum Acceptable Concentration of 1.1 microgram per liter (µg/L).
- Prevent a potential future release of the large quantities of mercury in subsurface soils to groundwater that may contaminate the Roanoke River.

Components of the selected remedy for OU3 include:

- A barrier wall containment system for contaminated soils largely within the footprint of the Former Chlorine Plant building.
- Shallow target area excavations of contaminated soils.
- A surface cap containment system.
- Groundwater monitoring.
- Institutional controls for land and groundwater use.

The cleanup levels selected for the contaminated media at the Former Chlorine Plant Area are in Table 3.

Table 3: OU3 Mercury Cleanup Goals

Media	ROD Cleanup Goal
Soil	20 mg/kg[a]
Groundwater	1.1 µg/L[b]
Surface Water	0.012 µg/L[c]

Notes:
[a] EPA selected a soil cleanup goal that would be protective of groundwater.
[b] Cleanup goal based on North Carolina Allowable Concentrations (North Carolina 2L standards).
[c] Cleanup goal based on North Carolina Fresh Surface Water Quality Standards for Class C Waters.

OU4 – Welch Creek Area

The EPA issued the OU4 ROD in September 2007. The ROD identified the following human health RAOs for OU4:

- Maintain acceptable levels of potential risk to site-specific human receptors.

- Continue progress toward removal of the remaining fish consumption advisory in Welch Creek.

The ROD identified the following ecological RAOs for OU4:

- Protect the health of local populations and communities of biota.
- Reduce the dioxin concentrations in whole fish tissues over time to the extent practicable.
- Achieve concentrations of surface water contaminants at or below surface water standards, to the extent practicable.
- Limit biological uptake of COCs from the sediment in areas with excess potential risk to the extent practicable.
- Minimize the adverse effects of remediation activities on the existing aquatic environment and/or wetland habitat to the extent practicable.

The components of the selected remedy for OU4 include:

- Enhanced monitored natural recovery (eMNR™) for sediment with dioxin above the 1 µg/kg cleanup goal for the Upper Reach of Welch Creek through placement of a thin layer sand cap.
- Mobility monitoring for the Midstream Reach of Welch Creek.
- Long-term monitoring and maintenance of the sand cap.
- Long-term testing and monitoring of sediment, surface water and biota to document the performance of the remedy and compliance with cleanup goals.
- Institutional controls to limit the consumption of fish from Welch Creek; maintain the integrity of the sand cap; maintain the existing fencing, which limits access to the Welch Creek Area; maintain signs in Welch Creek noting fish advisories and the presence of the sand cap; and placement of deed restrictions to limit land development on the Domtar property that could affect the remedy.

The cleanup levels selected for the contaminated media at the Welch Creek area are in Table 4.

Table 4: OU4 COCs Cleanup Goals

Sediment COC	ROD Cleanup Goal
Dioxin TEQ[a]	1 µg/kg
Surface Water COC	**ROD Cleanup Goal**
Dioxin (2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD))	1.4×10^{-5} ng/L
Note: [a] EPA International TEQ Factors, EPA 1989.	

4.2 Remedy Implementation

The Site's PRPs have completed remedy construction for all four OUs. Remedy implementation activities for each OU are discussed below.

OU1 – Former Landfill No. 1

Pursuant to a 2003 Consent Decree between Weyerhaeuser and the EPA, Weyerhaeuser conducted the remedial design for OU1 between May 2003 and November 2004 and performed remedy construction between April and November 2005. Weyerhaeuser contracted remedial construction coordination and construction activities to several subcontracting companies. Activities were performed according to design specifications set forth in the remedial design and included installation of a geotextile material over the Landfill No.1 surface, placement of 12 inches of cover soil over the geotextile material and establishment of vegetation on the soil cover. Remedy construction also included placement of 6-12 inches of gravel aggregate on the northern end of OU1 and ongoing performance monitoring to include landfill cover inspections, wetland monitoring and groundwater monitoring. Signs have been installed around OU1 notifying contractors that penetration of the landfill cap is prohibited. The EPA and NC DENR conducted the final construction inspection in December 2005, and the EPA approved the remedial action report for OU1 in June 2006. The OU1 ROD required implementation of groundwater and land use restrictions. See section 6.3 for additional institutional control status information.

OU2 – LRR

Pursuant to a 2011 Consent Decree between Domtar and the EPA, Domtar initiated the remedial design for OU2 in September 2010; they completed remedial design and initiated remedial action in September 2011.

Domtar initiated natural recovery monitoring in 2010 as outlined in the approved 2011 *Remedial Design/Remedial Action Work Plan for the Lower Roanoke River*. Ongoing monitoring activities include collection and analysis of fine-layer sediment, surface water and fish tissues. Domtar submitted the Year 1 Natural Recovery Monitoring Report in May 2013 and the Year 2 Report in February 2014. Ongoing remedy-related activities performed by Domtar also include annual inspection of the NC DENR fish consumption advisory sign, maintenance of fish consumption advisories until state standards have been met and the review of reports on local habitat conditions that could adversely affect biota habitats. The EPA considers the construction of the OU2 remedy complete. Due to the nature of the selected remedy (consisting primarily of monitoring requirements), the EPA does not intend to issue a remedial action report for OU2.

OU3 – Former Chlorine Plant Area

Pursuant to a 2004 Consent Decree between Weyerhaeuser and the EPA, Weyerhaeuser performed the remedial design for OU3 between April 2004 and June 2005. Remedy construction took place between March 2006 and August 2006. Remedial activities included limited excavation of mercury-contaminated soil (with disposal in an active permitted on-site landfill) and installation of a coated steel sheet pile wall around remaining mercury-contaminated subsurface soil in the area of the Former Chlorine Plant Area. Additional remedial activities included installation of an asphalt cap near the barrier wall. The OU3 ROD also requires groundwater monitoring, cap inspections, and implementation of land and groundwater use restrictions. See section 6.3 for additional institutional control status information. The EPA and NC DENR conducted a pre-final construction inspection in August 2006. The EPA approved the remedial action report for OU3 in September 2006.

OU4 – Welch Creek Area

Pursuant to a 2009 Consent Decree between Domtar and the EPA, Domtar performed the OU4 remedial design between June 2009 and September 2010. Remedy construction took place between November 2011 and February 2012. Remedial activities included spreading 2 to 4 inches of sand over a 1-mile stretch of Welch Creek to cover dioxin-contaminated sediment. Additional remedial activities included installation of signage along the creek notifying boaters of the sand cap and prohibiting the use of equipment that could damage the cap, such as anchors, trot-lines or traps. Additional signage notifies the public of the fish consumption advisory. As required by the OU4 ROD, the PRP performs long-term monitoring and maintenance of the sand cap, mobility monitoring, and long-term monitoring of sediment, surface water and biota. The OU4 ROD also requires institutional controls. See section 6.3 for additional institutional control status information. NC DENR performed a final inspection of remedy construction in May 2012. The EPA approved the revised remedial action report for OU4 in July 2012.

4.3 Operation and Maintenance (O&M)

OU1 – Former Landfill No. 1

Weyerhaeuser documented an O&M schedule for OU1 in the 2004 *Performance Standards Verification Plan*. The PRP initiated performance monitoring in November 2005, which consists of landfill cover inspections, wetland soil monitoring and groundwater monitoring. Domtar has contracted TRC Environmental Corporation (TRC) to perform site O&M activities. Domtar submits annual monitoring reports, prepared by TRC, for OU1 to the EPA for review, with the most recent report for 2014 O&M activities submitted in January 2015.

The landfill cover is inspected on a quarterly basis by Domtar Mill personnel and annually by TRC personnel, with repairs performed as necessary. Landfill inspections performed since the 2010 FYR have not identified any major issues. Domtar contractor, General Maintenance Inc., routinely mows the landfill cap. During TRC's November 2013 OU1 sampling event and during this FYR site inspection, areas of ponded water were observed. In addition, Dominion Power contractors are performing maintenance on the power lines on the southwestern portion of the landfill.

The PRP conducted wetland soil and groundwater monitoring annually from 2005 to 2009. Based on 2010 FYR findings, the EPA recommended the following modifications to and/or continuations of aspects of the performance monitoring program:

- Reducing frequency of wetland soil monitoring from annually to once per FYR period.
- Discontinuing leaf litter sampling and analysis.
- Reducing frequency of groundwater sampling from annually to once every two years, and limiting it to sampling the shallow wells (FL-01-1, FL-02-1, FL-03-1, FL-05-1, FL-07-1 and FL-09-1) every two years plus sampling the intermediate depth wells (FL-01-2, FL-02-2, FL-03-2, FL-05-2, FL-07-2 and FL-09-2) at these locations at least once during the next five-year cycle.
- Continuing quarterly inspections of the landfill cover.

Domtar implemented the EPA's recommendations beginning in the 2010 monitoring year.

OU1- Former Landfill #1

The 2014 Annual Inspection and Monitoring Report recommended the following modifications for the performance monitoring approach beginning in 2015:

- Wetland soil monitoring locations be reduced from five to three; FLWS-03 and FLWS-05 soil sampling locations would be eliminated and only FLWS-01, FLWS-04, and FLWS-06 be sampled once in the next 5-year period.
- Shallow groundwater monitoring wells FL-01-1, FL-02-1, FL-03-1, FL-05-1, FL-07-1, and FL-09-1, currently sampled for dioxin every 2 years, would be sampled once in the next 5-year period.

OU2 – LRR

Domtar submits annual natural recovery monitoring reports, prepared by TRC, for OU2 to the EPA for review. Since the initiation of the OU2 remedy, Domtar has submitted three such reports, one in May 2013, one in February 2014 and one in January 2015. The contractor performs O&M activities at OU2 as specified in the 2011 *Remedial Design/Remedial Action Work Plan for the Lower Roanoke River*. O&M activities include collection and analysis of fish tissue samples, surface water and sediment from the LRR. Additional activities include annual inspections of fish advisory signs and annual reviews of reports on local habitat conditions that could adversely affect biota habitats. Domtar/TRC have not identified any significant O&M issues at OU2 since remedy implementation. The 2014 Monitored Natural Recovery Report suggested removing mercury from the fish tissue analytical program and modifying surface water sampling frequency from annually to once every four years, commencing in 2015. Appendix G includes additional details regarding the long-term monitoring and inspection components of the selected remedy for OU2.

OU3 – Former Chlorine Plant Area

On behalf of Domtar, TRC conducts inspection, monitoring and reporting activities at OU3 as specified by the 2005 *Performance Standards Verification Plan for the Former Chlorine Plant Area* and according to recommendations of the 2010 FYR. O&M activities for OU3 address two topics: surface cap monitoring/maintenance and groundwater monitoring. The surface cap containment system, which includes concrete, asphalt and stormwater system components, reduces infiltration of surface water near the Former Chlorine Plant Area. TRC inspects the surface cap containment system during groundwater monitoring events for surface cracks, holes, depressions or other signs of surface integrity degradation. Domtar/TRC have not identified cap degradation or the need for additional cap maintenance since the 2010 FYR. The PRP initiated groundwater sampling in November 2006. Based on groundwater monitoring results since the 2010 FYR, the 2014 Monitored Natural Recovery Report recommended that monitoring wells currently on the annual sampling schedule (CP-02-1, MW-1B, CP-01-2, CP-04-1 and CP-05-1) and monitoring wells currently on the biennial sampling schedule (MW-2, CP-02-2, CP-06-1, CP-07-1, CP-08-1, CP-09-1, CP-10-1, CP-13-1 and CP-14-1) be sampled once every five years.

OU4 – Welch Creek Area

Domtar submits annual enhanced monitored natural recovery performance monitoring reports, prepared by TRC, for OU4 to the EPA for review. Since the initiation of the OU4 remedy,

Domtar has submitted three such reports, one in May 2013, one in March 2014 and one in February 2015. On behalf of Domtar, TRC conducts inspection, monitoring and reporting activities at OU4 as specified by the 2011 *Performance Standards Verification Plan/Operations and Maintenance Plan for the Welch Creek Area* and according to recommendations of the 2010 FYR. TRC performs monitoring of the cap and surface water, and specialty contractors are relied upon for sampling of creek biota and fish. The contractor also inspects signage along the creek; sign inspections since the 2010 FYR verify the signs are in place and in good condition.

The 2014 Enhanced Monitored Natural Recovery Report recommended the following modifications to OU4 performance monitoring, beginning in 2015:

- Discontinue the collection of annual Midstream Reach sediment samples, analyzed for mercury, TOC and grain size. It is recommended that Midstream Reach sediment sampling be conducted during a routine Welch Creek sampling event following a severe storm event.
- Discontinue mobility monitoring, surface water baseline and post flood sampling, including removal of the Sonde and Sontek equipment from Welch Creek.
- Discontinue mercury analysis in fish tissue.

O&M Costs

The approximate O&M costs, as supplied by the PRP, are presented below in Table 5. The RODs for each OU presented the following estimated annual O&M costs:

- OU1 - $82,500.
- OU2 - The OU2 ROD does not specify annual O&M costs, but provides a total present worth O&M cost of $1,491,800.
- OU3 - $39,465.
- OU4 - The OU4 ROD estimated the annual O&M costs for Years 0-5 at between $450,000 and $500,000 and provides a total present worth O&M cost of $4,231,250.

Table 5: Annual O&M Costs

	2010	2011	2012	2013	2014
OU	**Total Cost *(rounded to the nearest $1,000)***				
OU1	$34,500	$38,500	$16,000	$44,000	$17,500
OU2			$121,500	$102,000	$20,500
OU3	$17,500	$25,500	$10,000	$30,000	$14,000
OU4			$141,000	$214,500	$214,000
Note: O&M costs provided by Domtar.					

Actual O&M costs for all four OUs are considerably lower than the estimated O&M costs presented in the RODs.

5.0 Progress Since the Last Five-Year Review

The protectiveness statement from the 2010 FYR for the Site stated the following:

The remedy at OU1 currently protects human health and the environment because the landfill cover has been constructed and is inspected and maintained. Long term monitoring of groundwater and wetland soil is also performed. However, in order for the remedy to be protective in the long term, ICs [institutional controls] need to be added to the property deed. The ICs would be in addition to the existing deed notice and would limit future land use to industrial uses, prohibit future potable use of groundwater, and protect the integrity of the cap.

The remedy at OU3 currently protects human health and the environment because a sheetpile wall has been installed to encircle the area of impacted soil. In addition, there was limited excavation of contaminated soil from the impacted area and the impacted area has been capped. The cap is inspected and maintained and long term monitoring of groundwater is performed. However, in order for the remedy to be protective in the long term, ICs need to be added to the existing property deed notice. The ICs would prohibit future potable use of groundwater and protect the integrity of the cap and sheetpile wall.

The remedies for OU2 and OU4 have not been implemented, but it is anticipated that the remedies will be implemented within the next five years and will be evaluated at the next FYR.

The 2010 FYR included two issues and recommendations. This report summarizes each recommendation and its current status below.

Table 6: Progress on Recommendations from the 2010 FYR

Recommendations	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Implement deed restrictions (for OU1) following NC DENR format.	Domtar	12/30/2014	Deed restrictions have not yet been put in place for OU1. Domtar and EPA have had initial discussions regarding draft deed restrictions. The most recent model Declaration of Perpetual Land Use Restrictions from NCDENR was provided to Domtar in March 2015.	NA
Implement deed restrictions (for OU3) following NC DENR format.	Domtar	12/30/2014	Deed restrictions have not yet been put in place for OU3. Domtar and EPA have had initial discussions regarding draft deed restrictions. The most recent model Declaration of Perpetual Land Use Restrictions from NCDENR was provided to Domtar in March 2015.	NA
Note: NA – Not applicable.				

6.0 Five-Year Review Process

6.1 Administrative Components

EPA Region 4 initiated the FYR in December 2014 and scheduled its completion for May 2015. The EPA remedial project manager (RPM) Randy Bryant led the EPA site review team, which included contractor support provided to the EPA by Skeo Solutions. The review schedule established consisted of the following activities:

- Community notification.
- Document review.
- Data collection and review.
- Site inspection.
- Local interviews.
- FYR Report development and review.

6.2 Community Involvement

In February 2015, the EPA published a public notice in the *Roanoke Beacon* newspaper announcing the commencement of the FYR process for the Site, providing EPA contact information and inviting community participation. The press notice is available in Appendix B. No one contacted the EPA as a result of the advertisement.

The EPA will make the final FYR Report available to the public. Upon completion of the FYR, the EPA will place copies of the document in the designated site repository: 201 East Third Street, Plymouth, North Carolina. (Note: The Site is located along a county border. The Site is in Martin County, but the closest library is nearby in Washington County.)

6.3 Document Review

This FYR included a review of relevant, site-related documents including the RODs, remedial action reports and recent monitoring data. A complete list of the documents reviewed can be found in Appendix A.

ARARs Review

CERCLA Section 121(d)(1) requires that Superfund remedial actions attain "a degree of cleanup of hazardous substance, pollutants and contaminants released into the environment and of control of further release at a minimum which assures protection of human health and the environment." The remedial action must achieve a level of cleanup that at least attains those requirements that are legally applicable or relevant and appropriate.

- Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental, state environmental or facility siting laws that specifically address a hazardous substance, remedial action, location or other circumstance found at a CERCLA site.
- Relevant and appropriate requirements are those standards that, while not "applicable," address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are more stringent than federal requirements may be applicable or relevant and appropriate.
- To-Be-Considered (TBC) criteria are non-promulgated advisories and guidance that are not legally binding, but should be considered in determining the necessary remedial action. For example, TBCs may be particularly useful in determining health-based levels where no ARARs exist or in developing the appropriate method for conducting a remedial action.

Chemical-specific ARARs are health- or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish an acceptable amount or concentration of a chemical that may remain in, or be discharged to, the ambient environment. Examples of chemical-specific ARARs include

maximum contaminant levels (MCLs) under the federal Safe Drinking Water Act and ambient water quality criteria enumerated under the federal Clean Water Act.

Action-specific ARARs are technology- or activity-based requirements or limits on actions taken with respect to a particular hazardous substance. These requirements are triggered by a particular remedial activity, such as discharge of contaminated groundwater or in-situ remediation.

Location-specific ARARs are restrictions on hazardous substances or the conduct of the response activities solely based on their location in a special geographic area. Examples include restrictions on activities in wetlands, sensitive habitats and historic places.

Remedial actions are required to comply with the chemical-specific ARARs identified in the ROD. In performing the Five-Year Review for compliance with ARARs, only those ARARs that address the protectiveness of the remedy are reviewed.

Groundwater ARARs

According to the OU1 and OU3 RODs, the North Carolina groundwater standards for mercury and dioxin are the ARARs for the Site. The State of North Carolina primary drinking water standards are lower than federal primary drinking standards for dioxin and mercury (Table 7). Although iron, manganese and arsenic were detected in groundwater at levels that exceed the state standards, these levels were deemed consistent with background levels. The standard for 2,3,7,8-TCDD (specifically, the 2,3,7,8-TCDD congener) has not changed. While the current groundwater standard for mercury is slightly more stringent than at the time of the ROD, the change is not significant and does not affect the protectiveness of the remedy.

Table 7: Previous and Current ARARs for Groundwater COCs

COC	ROD Standard[a]	Current Standard	Changes
2,3,7,8-TCDD	$2x10^{-10}$ mg/L[b]	$2x10^{-10}$ mg/L	None
Mercury	1.05 µg/L	1 µg/L	More Stringent

Notes:
[a] Based on the lower of federal MCLs and State of North Carolina groundwater standards: 15A NCAC 02L.0202 (http://portal.ncdenr.org/c/document_library/get_file?uuid=336fb0ce-0786-4164-8729-82c345065a18&groupId=38364).
[b] Applies specifically to the 2,3,7,8-TCDD congener.
mg/L – milligram per liter.

Surface Water ARARs

The OU4 ROD identified the North Carolina 2B surface water standards for Welch Creek as ARARs for the Site. The OU4 surface water cleanup level for Welch Creek was based on the 2003 North Carolina 2B surface water standard for TCDD of 1.4×10^{-5} ng/L, which has since been revised to 5.0×10^{-6} ng/L (Table 8).

Table 8: Previous and Current ARARs for 2,3,7,8-TCDD in Surface Water

COC	ROD Standard[a]	Current Standard	Changes
2,3,7,8-TCDD	1.4×10^{-5} ng/L[b]	5.0×10^{-6} ng/L	More Stringent

[a] Based on the of North Carolina 2B surface water standards: 15A NCAC 02L.0202 (http://reports.oah.state.nc.us/ncac/title%2015a%20-%20environment%20and%20natural%20resources/chapter%2002%20-%20environmental%20management/subchapter%20b/15a%20ncac%2002b%20.0208.pdf).

[b] Applies specifically to the 2,3,7,8-TCDD congener.

Institutional Control (IC) Review

The OU1 ROD requires deed and groundwater use restrictions for the Landfill No. 1 area to limit land use to industrial land use and prohibit the installation of groundwater drinking wells.

The OU2 ROD requires institutional controls to prevent or reduce potential human consumption of contaminated fish in the LRR. The NC DHHS fish consumption advisories fulfill this requirement, and will remain in place until state standards have been met. In addition, TRC routinely inspects the fish consumption advisory sign posted at OU2.

The OU3 ROD requires land and groundwater use restrictions for the Former Chlorine Plant Area. The ROD requires groundwater use restrictions to prohibit the potable use of groundwater from the shallow aquifer under the Former Chlorine Plant Area and mercury plume areas. The purpose of the land use restrictions would be to maintain the integrity of the remedy and prevent exposure to contaminated soil. The ROD also requires a deed notice for the property to reflect the selected remedy, to meet the North Carolina administrative process, and to meet any additional requirements to maintain the integrity of the remedy and to limit exposure to contaminated soil and groundwater.

Weyerhaeuser has filed deed notices for OU1 and OU3 with the county recorder of deeds office that notify future deed holders of the Consent Decree with the EPA. Weyerhaeuser also filed a Notice of Inactive Hazardous Substance or Waste Disposal Site for the OU3 Former Chlorine Production Building in 1997. However, the deed notices and the Notice of Inactive Hazardous Substance or Waste Disposal Site do not restrict land or groundwater use. Therefore, institutional controls required by the OU1 and OU3 RODs have not been fully implemented. Domtar and EPA have had initial discussions regarding draft deed restrictions. The most recent model Declaration of Perpetual Land Use Restrictions from NCDENR was provided to Domtar in March 2015.

The OU4 ROD requires institutional controls to limit the consumption of fish from Welch Creek; maintain the integrity of the sand cap; maintain the existing fencing, which limits access to the Welch Creek Area; maintain signs in Welch Creek noting fish advisories and the presence of the sand cap; and place deed restrictions to limit land development on Domtar-owned property. All institutional controls for OU4 have been implemented except for the placement of a deed restriction.

Skeo Solutions staff conducted research by accessing online property records for the Site on Martin County's Register of Deeds website and found the deed information pertaining to the Site listed in Table 9.

Table 9: Deed Documents from the Martin County Registrar of Deeds

Date	Type of Document	Description	Book #	Page #
11-10-97	Deed Notice	Notice of Inactive Hazardous Substance or Waste Disposal Site For Former Chlorine Production Building (OU3)	CAB-C	007A
01-14-03	Deed Notice	Notice of Consent Decree for OU1	0U-19	341
09-30-04	Deed Notice	Notice of Consent Decree for OU3	G-20	831
02-16-09	Deed Notice	Notice of Consent Decree for OU4	E-23	641
03-05-07	Warranty Deed	Transfer of the on-site paper manufacturing facility from Weyerhaeuser Company to Domtar Paper Company, LLC	A-22	0096

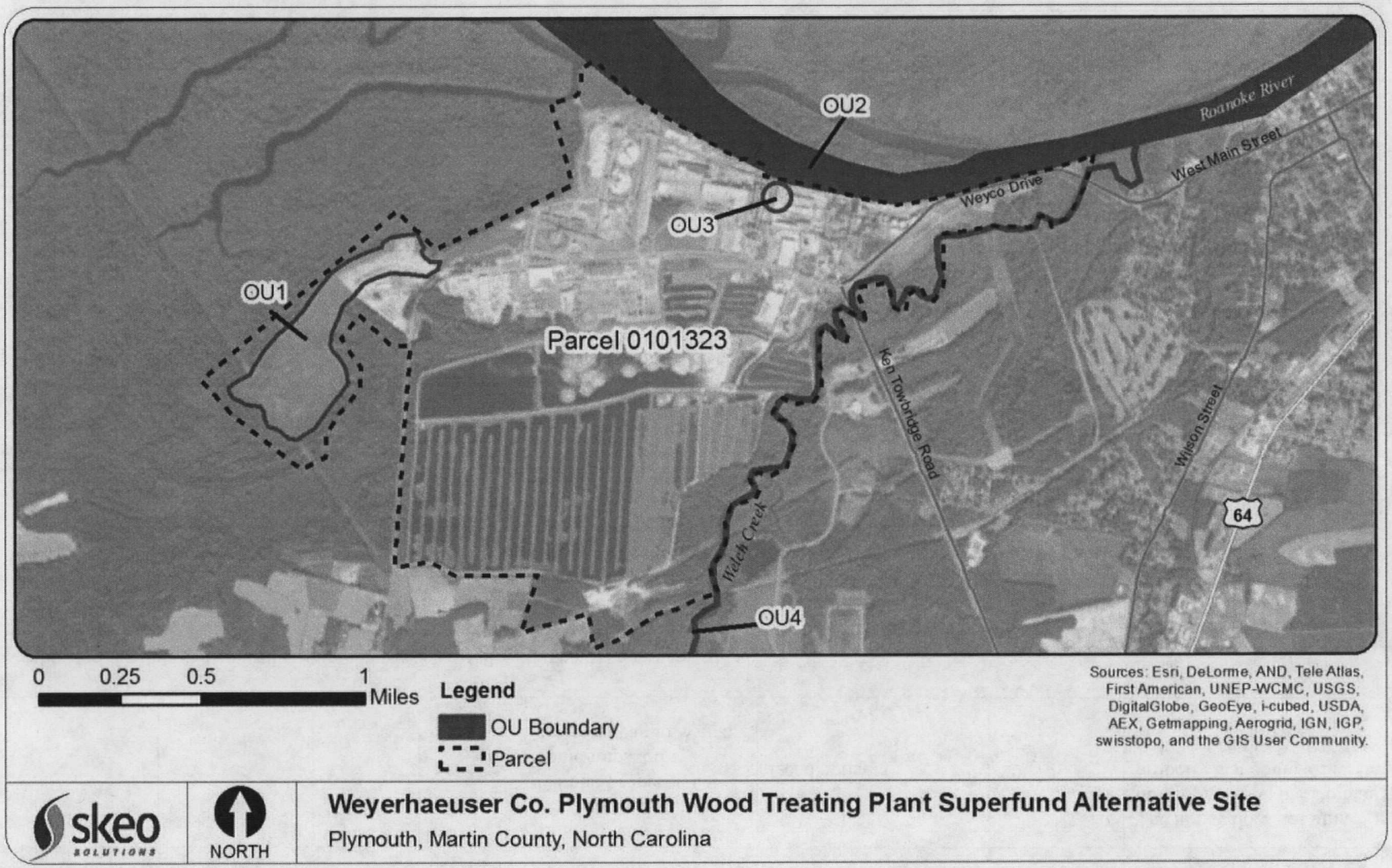
Table 10 lists the institutional controls associated with areas of interest at the Site.

Table 10: Institutional Control (IC) Summary Table

OU	Contaminated Media	ICs Needed?	ICs required by ROD?	IC Objective	IC Instrument in Place	Year of IC Instrument	Notes
OU1 (Former Landfill No. 1)	Groundwater	Yes	Yes	Prohibit installation of drinking water wells.	Deed notice	2003	The notice does not prohibit installation of drinking water wells.
	Soil	Yes	Yes	Limit land use to industrial land use only.	Deed notice	2003	The notice does not limit land use to industrial land use only.
OU3 (Former Chlorine Plant Area)	Groundwater	Yes	Yes	Prohibit the potable use of groundwater from the shallow aquifer located beneath the Former Chlorine Plant Area and mercury plume areas.	Deed notice and Notice of Inactive Hazardous Substance or Waste Disposal Site For Former Chlorine Production Building	1997	The notices do not prohibit the potable use of shallow groundwater.
	Soil	Yes	Yes	Prevent exposure to contaminated soil.	Deed notice and Notice of Inactive Hazardous Substance or Waste Disposal Site For Former Chlorine Production Building	1997	The notices do not prevent exposure to contaminated soil.
OU4 (Welch Creek)	Fish	Yes	Yes	Limit fish consumption from Welch Creek and maintain fish advisory signage along Welch Creek.	Performance Standards Verification Plan/Operations and Maintenance Plan for the Welch Creek Area	2011	As outlined in the OU4 O&M plan, Domtar routinely inspects and maintains fish consumption advisory signs along Welch Creek.
	Sand Cap	Yes	Yes	Maintain the integrity of the sand cap, the existing fencing that limits access to the Welch Creek area and signage that notifies the public of the cap.	Performance Standards Verification Plan/Operations and Maintenance Plan for the Welch Creek Area	2011	Domtar maintains Welch Creek fencing and maintains and routinely inspects signage along Welch Creek.

OU	Contaminated Media	ICs Needed?	ICs required by ROD?	IC Objective	IC Instrument in Place	Year of IC Instrument	Notes
		Yes	Yes	Limit upland development on the Domtar property that could impact the sediment cap in Welch Creek.	Deed notice	2009	The notice does not limit development on the Domtar property that could affect the sediment cap in Welch Creek.
Note: All areas subject to institutional control requirements are located within parcel number 0101323.							

Figure 3: Institutional Control Base Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

6.4 Data Review

This FYR examined monitoring data for all site-related media in order to assess remedy performance and identify trends in contaminant concentrations. Data review findings are discussed by OU and media below. Additional detailed findings are discussed in Appendix F.

OU1

OU1 – Groundwater

This FYR reviewed OU1 groundwater monitoring results from 2005 through 2013, as reported in TRC's OU1 annual monitoring reports, with a focus on sampling results collected since the 2010 FYR. Based on 2010 FYR recommendations, TRC reduced the frequency of groundwater sampling from annually to once every two years, beginning in 2010. Therefore, there have been two groundwater monitoring events during this FYR period, in November 2011 and November 2013.

The current North Carolina drinking water standard for the 2,3,7,8-TCDD congener is $2x10^{-10}$ mg/L. The 2,3,7,8-TCDD congener was not detected in groundwater samples from the 2011 or 2013 events. Therefore, no current groundwater quality standards or criteria have been exceeded during the last five years. Prior to the 2011 sampling event, 2,3,7,8-TCDD was detected in FL-04-1 in 2006 and in FL-06-1 in 2005 and 2006, but has not been detected otherwise.

Between 2005 and 2013, the dioxin TEQ value was calculated for each monitoring well and compared to the proposed North Carolina groundwater standard of 2.3×10^{-10} mg/L, as required by the ROD. While dioxin TEQ concentrations for several wells exceeded the proposed state standard during the November 2011 and 2013 sampling events, all results were consistent with or lower than historically-observed concentrations. Between 2005 and 2013, dioxin TEQ concentrations in groundwater have ranged from a low of no congeners at FL-02-2 in November 2013 to a maximum observed concentration of 2.9015×10^{-08} mg/L at FL-09-1 in November 2011. Between 2005 and November 2013, most wells showed overall declining trends in TEQ concentrations (Appendix F: Tables F-1and F-2 and Figure F-1).

OU1 – Wetland Soil

TRC samples wetland soil once every five years, at five locations (FLWS-01, FLWS-03, FLWS-04, FLWS-05 and FLWS-06) (Figure F-1). Wetland soil samples were last collected and analyzed for chromium and mercury in November 2013. Results are compared to the ecological cleanup goals established in the OU1 ROD (Table F-3). In 2013, chromium concentrations at FLWS-04 (111 mg/kg) and FLWS-06 (150 mg/kg) exceeded the ecological cleanup goal of 110 mg/kg for chromium. In 2013, the mercury concentration at FLWS-06 (2.01 mg/kg) exceeded the ecological cleanup goal for mercury of 0.4 mg/kg. However, the 2013 annual monitoring report qualified that result as an estimated concentration. All other results were below the cleanup goals for chromium and mercury. Sampling results between 2005 and 2013 reveal no

significant temporal trends in wetland soil contaminant concentrations. The only noticeable trend is at FLWS-03, where chromium concentrations have consistently decreased.

OU2

OU2 – Surface Water

TRC collects annual surface water samples for 2,3,7,8-TCDD analysis and measurement of field parameters. TRC has performed surface water sampling three times since implementation of the OU2 remedy, in June of 2012, 2013 and 2014. One of the RAOs is to maintain surface water concentrations at or below surface water standards, to the extent practicable. According to the OU2 Natural Recovery Monitoring Reports, North Carolina has established a cleanup target level for 2,3,7,8-TCDD in surface water of $5x10^{-6}$ ng/L.[1]

2,3,7,8-TCDD was not detected in any of the surface water samples between 2012 and 2014. However, the analytical method/instrumentation used to analyze the samples is not capable of detecting 2,3,7,8-TCDD at the current surface water cleanup target level of $5x10^{-6}$ ng/L. Based on the limitations of the analytical instrumentation, it is not clear if 2,3,7,8-TCDD is present in surface water at concentrations higher than the state cleanup level, but lower than the analytical detection limits. Figure F-2 shows OU2 surface water sampling locations.

OU2 – Sediment

In 2012, TRC collected sediment samples from the LRR for dioxin and mercury analysis. According to the Year 1 Natural Recovery Monitoring Report for OU2, dioxin concentrations within the top 6 inches of sediment were below the target cleanup level of 1 µg/kg, which is generally consistent with historical concentrations. Mercury concentrations observed in 2012 sediment samples were generally consistent with historical concentrations. See Appendix F for additional detailed data review information. Figure F-3 shows OU2 sediment sampling locations.

OU2 – Fish Tissue

In accordance with NC DENR permits, CZR, Inc. (CZR) performed fish collection activities in 2012 and 2013. CZR will conduct additional sampling in 2015 (Year 4) and 2017 (Year 6), after which fish tissue data will be reviewed to determine the need for continued sampling to support the OU2 remedy.

Fish collected in 2012 had higher dioxin TEQ concentrations than in previous years. However, due to sample preparation and confirmatory sample inconsistencies, the Year 2 Natural Recovery Monitoring Report states that the 2012 dioxin/furan results for fish tissue should not be relied on for evaluation of MNR performance. Fish collected during the 2013 OU2 MNR effort had dioxin TEQ concentrations consistent with previous years, with the exception of the 2012 results.

The ROD did not establish a cleanup goal for mercury in OU2 fish, given the regional influence of airborne deposition from other sources. Mercury observations in 2012 and 2013 from OU2

[1] The surface water cleanup target level for 2,3,7,8 –TCDD is the groundwater quality standard as specified by Title 15A, subchapter 2B of the North Carolina Administrative Code.

fish tissues were consistent with historical site-specific and regional mercury concentrations in fish tissues. See Appendix F for additional detailed data review information.

OU3

OU3 – Groundwater
Between 2006 and 2013, the highest mercury concentration was observed at CP-06-1 (0.073 mg/L) in November 2013. Elevated mercury concentrations are expected at well CP-06-1, as it is in the middle of the former source area, within the footprint of the barrier wall. A review of all groundwater monitoring between 2006 and 2013 reveals no trends in mercury concentrations. Historically, mercury results have been below the method detection limit for most of the groundwater samples collected. The North Carolina groundwater quality standard for mercury is 1 µg/L (2L Standard). See Appendix F for additional detailed data review information. Figure F-4 shows OU3monitoring well locations.

OU4

OU4 – Sediment
To assess cap integrity, TRC collects and analyzes sediment cores from random locations throughout the cap. The February 2015 Year 3 eMNR™ Performance Monitoring Report for OU4 concluded that the cap meets the required thickness at each sampled location.

TRC also evaluates dioxin TEQ concentrations in the top 5 centimeters of the cap. Although well below the 1 µg/kg dioxin TEQ target level and 2012 observations, average dioxin TEQ from the 2013 and 2014 performance monitoring cores were greater than average TEQs observed in confirmation samples collected immediately following remedy installation. Given the absence of noticeable mixing, increases in dioxin concentrations do not appear to be related to the interaction of the thin-layer cap with underlying contaminated creek sediments. Instead, observed increases in dioxin concentrations are likely attributable to limited accumulation of new surficial sediment, surficial debris and atmospheric deposition. It is not anticipated that the surficial dioxin TEQ concentrations in the capped reach of Welch Creek will increase to above the 1 µg/kg target level in individual samples.

According to the 2014 monitoring report for OU4, historical mercury concentrations in surface sediments in the Midstream Reach of Welch Creek have ranged from 0.2 to 15.1 milligrams per kilogram (mg/kg). In 2012, 2013 and 2014, mercury and total organic carbon concentrations in Welch Creek Midstream Reach sediments were at the lower end of the range of mercury concentrations historically observed in that reach. The 2014 monitoring report results suggest that bioavailability of metals in the Midstream Reach of Welch Creek is limited, consistent with previous assessments. See Appendix F for additional detailed data review information. Figure F-5 shows OU4 sampling locations and the location of the sediment cap.

OU4 – Surface Water
The OU4 surface water cleanup level for Welch Creek was based on the 2003 North Carolina 2B surface water standard for TCDD of 1.4×10^{-5} ng/L, which has since been revised to 5.0×10^{-6}

ng/L. Surface water sampling data are compared to the current North Carolina 2B surface water standard for TCDD in surface water of 5.0×10^{-6} ng/L.

Analytical results from surface water collected during 2014 performance monitoring were consistent with samples collected during remedy implementation. 2,3,7,8-TCDD was not detected in any of the Welch Creek surface water samples in 2012, 2013 or 2014. However, the instrumentation used to analyze the samples is not capable of detecting 2,3,7,8-TCDD concentrations as low as the current surface water cleanup target level of 5.0×10^{-06} ng/L. Based on the limitations of the analytical instrumentation, it is not clear if 2,3,7,8-TCDD is present in surface water at concentrations higher than the state cleanup level, but lower than the analytical detection limits. See Appendix F for additional detailed data review information.

OU4 – Benthic Organisms
The OU4 remedial action and work plan requires sampling and analysis of the benthic community in Years 2 (2013), 3 (2014) and 5 (2016) following remedy implementation to identify the organisms present at OU4, determine if they pose a threat to the cap, and investigate whether dioxin TEQ is present in the organisms. According to the 2013 and 2014 monitoring report, a diverse and abundant benthic macroinvertebrate community has re-colonized the capped area of Welch Creek. A comparison of the 2013 and 2014 downstream results to 1999 remedial investigation data reveal that dioxin TEQ values have decreased by an order of magnitude between the 1999 sampling even and the 2013 and 2014 sampling events. According to the 2014 report, benthic tissue dioxin TEQs from downstream locations are now consistent with background concentrations. See Appendix F for additional detailed data review information.

OU4 – Fish Tissue
Domtar contracted CZR to perform fish tissue sampling activities in 2012, 2013 and 2014. Fish collected during 2012 had higher dioxin TEQ concentrations than previous years. However, due to sample preparation and confirmatory sample inconsistencies, the 2013 monitoring report states that the 2012 dioxin/furan results for fish tissue should not be relied on for evaluation of MNR performance. Fish collected during 2013 had dioxin TEQ concentrations consistent with previous years, with the exception of the 2012 results. Of the fish fillet composites collected during the 2014 sampling effort, only one had a dioxin TEQ concentration (of 7.05 ng/kg) slightly greater than the North Carolina fish consumption level (4 ng/kg). In 2013 and 2014, total mercury concentrations in Welch Creek fish tissues were consistent with historical site-specific and regional mercury concentrations.

6.5 Site Inspection

A site inspection was conducted on December 11, 2014. Site inspection participants included: Randy Bryant (EPA Region 4 RPM), Nile Testerman (NC DENR), Diane Hardison and Kari Kahoon (Domtar), Michelle Hays (Domtar's O&M contractor, TRC), and Melissa Oakley and Sarah Alfano (Skeo Solutions).

The site inspection began with a tour of Former Landfill No. 1. A fence, locking gates and a manned guard house restrict landfill access. Several contractors who perform work for Domtar store equipment on the gravel portion of the landfill cap. Landfill cap vegetation appeared well-maintained and healthy. No evidence of erosion or burrowing was observed. Groundwater

monitoring wells around the landfill cap were clearly labeled, were secured with locks and appeared to be in good condition. Signs are posted around the edge of the landfill's gravel cap and on the fence surrounding the vegetated landfill cap, clearly restricting any activities that could potentially disturb the cap. Storage buildings, the Domtar storehouse, parking areas and contractor office trailers were observed immediately south of the landfill's gravel cap area.

Dominion Power contractors are performing maintenance on the power lines on the southwestern portion of Former Landfill No. 1. Contractor trucks were observed driving on the landfill cap along the northern edge of the landfill. Site inspection participants observed that truck tires have caused deep ruts in the surface of the cap along the landfill's northern boundary. The cap is only one foot deep; however, there is a bright orange indicator layer between the bottom of the cap and the top of the landfill soil. Because the orange layer was not observed in the ruts, it is assumed that the tires are not contacting contaminated landfill soil. Standing water was observed in a few low areas on the cap. Domtar is aware of the pooled water and has arranged for Domtar's on-site contractor, General Maintenance Inc., to grade those areas and the tire ruts following the completion of Dominion Power's power line maintenance activities. On May 4th, Domtar informed EPA via email that they had begun work to repair the rutted and low areas on the cap.

Access to the Domtar mill, and therefore the Former Chlorine Plant Area, is restricted to facility employees only by manned guard gates. The asphalt cap that covers the Former Chlorine Plant Area footprint and subsurface barrier wall appeared to be in good condition. All monitoring wells in the area are flush with the ground surface and are secured with bolts.

Site inspection participants toured Welch Creek by boat. The tour covered the length of the 1-mile long sand cap. Monitoring stations were observed along the creek. Warning signs were observed at both ends of the cap clearly identifying the area as an EPA sediment remediation area and restricting any activities that could disturb the sand cap.

A fish consumption advisory sign was observed at the Water Street Landing Boat Access Area, located along the LRR.

On December 10th, Skeo Solutions staff visited the local information repository for the Site, located at the Washington County Public Library, at 201 East Third Street in Plymouth, North Carolina. A records review verified that a large collection of site-related documents, for all four OUs, is available for public viewing at the information repository. Examples of site-related documents reviewed include: remedial investigation reports, risk assessment reports, feasibility studies, RODs, site inspection reports, sampling and analysis plans, and the Site's first (2010) FYR.

Appendix D includes a completed Site Inspection Checklist. Appendix E includes photographs taken during the site inspection.

6.6 Interviews

The FYR process included interviews with parties affected by the Site, including the regulatory agencies involved in Site activities or aware of the Site. The purpose was to document the perceived status of the Site and any perceived problems or successes with the phases of the

remedy implemented to date. All interview responses were submitted by email following the Site inspection. The interviews are summarized below. Appendix C provides the complete interviews.

EPA RPM Randy Bryant has a positive impression of remedial activities at the Site and believes that the remedy is successfully functioning as designed. While there are deed notices in place, not all institutional control requirements have been met. However, Mr. Bryant indicated that this does not affect the protectiveness of the remedy in the short term, as Domtar continues to own and control access to the Site property. Mr. Bryant stated that it may take some time before the fish consumption advisory in Welch Creek can be lifted. In the meantime, the necessary long-term monitoring is being conducted to evaluate trends in fish tissue contaminant concentrations.

NC DENR Project Manager Nile Testerman indicated that the Site is well-maintained and that monitoring reports indicate the remedies are performing as designed. NC DENR routinely reviews all monitoring reports and remedy-related documentation and performs site visits to observe remedial activities. He stated that institutional controls are not in place for the Site, but that no other outstanding issues have been noted.

Domtar's Environmental Manager Diane Hardison has a positive impression of remedial activities at the Site and believes that the remedy is successfully functioning as designed. There have been no complaints or inquiries regarding environmental issues or the remedial action from nearby residents since implementation of the cleanup. Ms. Hardison noted that the EPA keeps Domtar well-informed regarding the site activities and remedial progress.

TRC Project Manager Michelle Hays has an overall positive impression of remedial and O&M activities for each OU. She noted that monitoring data indicate that the remedies for each OU are successful and functioning as designed. Monitoring data also indicate that there have not been any significant changes in the quality of groundwater, sediment, surface water, fish tissue or benthic tissue in the last five years. Ms. Hays explained that Domtar optimized monitoring activities by modifying the OU2 fish sampling schedule from annually to once every two years. In addition, certain analyses that have not provided valuable data, such as the simultaneously extracted metals/acid-volatile sulfide analyses of Welch Creek's Midstream Reach sediment, were removed following approval from the EPA.

7.0 Technical Assessment

7.1 Question A: Is the remedy functioning as intended by the decision documents?

The review of documents, ARARs and risk assumptions and the site inspection indicate that the remedy is functioning as intended by the Site's decision documents. Contaminated soils and sediments have been excavated or capped, as needed, and monitoring data indicate contaminant levels are below cleanup levels or consistent with historic levels. However, institutional controls required by the OU1, OU3 and OU4 RODs have not been fully implemented.

While deed notices have been filed for OU1 and OU3, the notices do not restrict land or groundwater use. The OU1 ROD requires institutional controls to limit land use to industrial land use only and to prohibit the installation of groundwater drinking wells. The OU3 ROD requires

institutional controls to prohibit the potable use of groundwater from the shallow aquifer located beneath the Former Chlorine Plant Area, maintain the integrity of the selected remedy and prevent exposure to contaminated soil. All institutional controls for OU4 have been implemented except for the placement of a deed restriction to limit land development on the Domtar property that could affect the remedy.

At OU1, fencing and manned security gates restrict landfill access and the landfill cap prevents potential human and environmental receptor exposure to contaminated soil below. Shallow groundwater is not used near the landfill. During the most recent wetland soil sampling event in 2013, nearly all wetland soil samples contained concentrations of mercury and chromium below their respective cleanup levels. Landfill inspection and maintenance activities ensure the continued integrity of the landfill cap. Domtar is aware of the standing water and ruts present on the landfill surface and has made arrangements to grade the affected areas following the completion of power line maintenance activities.

According to the 2012 Natural Recovery Monitoring Report for OU2, dioxin concentrations within the top 6 inches of sediment were below the target cleanup level of 1 µg/kg, which is generally consistent with historical concentrations. Mercury concentrations observed in 2012 sediment samples were also generally consistent with historical concentrations. Fish collected during the 2013 OU2 MNR effort had dioxin TEQ concentrations consistent with previous years, with the exception of the 2012 results.

While groundwater at some OU3 sampling locations contains mercury concentrations above the cleanup goal, the groundwater is not used near the Former Chlorine Plant Area. The installation of the subsurface barrier wall and the limited excavation of mercury-impacted soil have reduced the potential for a future release of mercury to the LRR. The asphalt cap over the Former Chlorine Plant Area reduces infiltration of surface water and prevents potential human exposures to contaminated soil below.

Institutional controls implemented at OU4 help limit the consumption of fish from Welch Creek, maintain the integrity of the sand cap, limit access to the Welch Creek Area, and inform the public of fish advisories and the presence of the sand cap. According to the 2013 Enhanced Monitored Natural Recovery Performance Monitoring Report for OU4, a diverse and abundant benthic macroinvertebrate community has re-colonized the capped area of Welch Creek. The benthic community has not affected the integrity of the sand cap as observed from the core samples. Benthic tissue dioxin TEQ concentrations decreased by an order of magnitude between 1999 and 2013. According to the 2013 report, benthic tissue dioxin TEQs from downstream locations are now consistent with background concentrations. Fish collected during 2013 had dioxin TEQ concentrations consistent with previous years, with the exception of the 2012 results. Total mercury concentration observations in Welch Creek fish tissues remained consistent with historical site-specific and regional mercury concentration in fish tissues.

Analytical results indicate that 2,3,7,8-TCDD was not detected in any of the OU2 or OU4 surface water samples in 2012 or 2013. However, the instrumentation used to analyze the samples is not capable of detecting 2,3,7,8-TCDD concentrations as low as the current surface water cleanup target level of 5×10^{-6} ng/L. Therefore, based on the limitations of the analytical

instrumentation, it is not clear if 2,3,7,8-TCDD is present in surface water at concentrations higher than the state cleanup level, but lower than the analytical detection limits.

7.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of remedy selection still valid?

The groundwater cleanup goals for OU1 and OU3 remain valid. The cleanup standard for 2,3,7,8-TCDD has not changed. While the current groundwater standard for mercury is slightly more stringent than at the time of the ROD, the change is not significant and does not affect the protectiveness of the remedy. There are no completed exposure pathways for groundwater.

The OU1 ROD requires that groundwater samples be compared to the proposed state standard dioxin TEQ standard, based on the 1989 World Health Organization (WHO) toxicity equivalency factor (TEF) calculations. Although the state has not adopted the proposed dioxin TEQ standard, groundwater data are compared to the proposed standard listed in the ROD. However, the EPA has adopted WHO's updated 2005 TEFs calculations for calculating dioxin TEQ.

The EPA's current Regional Screening Level for dioxin in industrial soil, based on an updated toxicity value for dioxin and updated default exposure factors is 730 ng/kg. The OU1 site-specific soil cleanup goals for dioxin TEQ of 370 ng/kg and 770 ng/kg remain valid. Changes to the dioxin toxicity value and default exposure factors do not affect the soil remedy because dioxin concentrations in soil just outside the boundary of the landfill are below the Regional Screening Level for dioxin in soil. The soil cleanup goals for the remaining COCs remain lower than the current soil preliminary remediation goals for commercial/industrial soil.

The North Carolina 2B surface water standard for mercury selected for OU3 surface water standard has not changed.

The OU4 surface water cleanup level for Welch Creek was based on the 2003 North Carolina 2B surface water standard for 2,3,7,8-TCDD of 1.4×10^{-5} ng/L, which has since been revised to 5.0×10^{-6} ng/L. According to the OU2 and OU4 monitoring reports, surface water sampling data are compared to the current North Carolina 2B surface water standard for 2,3,7,8-TCDD of 5.0×10^{-6} ng/L. However, this standard is not recorded in a decision document as a cleanup goal. It is worthwhile to note that the results for annual surface water samples collected in Welch Creek during 2012-2014 were non-detect for 2,3,7,8-TCDD. The detection limits for the most recent samples were somewhat lower than the method detection limit. The current NC surface water standard for 2,3,7,8-TCDD is approximately 2000 times lower than the method detection limit of 1.0×10^{-2} ng/l. Welch Creek is not a source of drinking water and that exposure to surface water does not pose an unacceptable risk according to the site specific human health risk assessment. While the surface water standard also considers the protection of human health based on the consumption of fish, there are specific fish consumption advisories based on fish tissue concentrations established by the State of North Carolina which are also noted in the ROD.

For the OU4 Welch Creek area, the range of calculated remedial goals for sediment varied from 0.41 µg/kg to 4.1 µg/kg in the approved Welch Creek baseline ecological risk assessment. The

EPA selected a surficial sediment cleanup goal of 1 µg/kg dioxin TEQ (1,000 ng/kg) from within the range of remedial goal options. The intention of the sediment cleanup goal is to be protective of surface water and fish consumption. Fish consumption advisories are in place and will remain in effect until tissue concentrations have met the state guidelines.

7.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

7.4 Technical Assessment Summary

The review of documents, ARARs and risk assumptions and the site inspection indicate that the remedy is functioning as intended by the Site's decision documents. There are no complete exposure pathways for site-related contaminants at any of the OU areas. Monitoring data for all media across all OUs indicate that site-related contaminant concentrations are either below their respective cleanup levels or consistent with historical concentrations. Exposure assumptions, toxicity data and RAOs used at the time of remedy selection are still valid. The EPA recently updated the toxicity data for dioxins, but this change does not affect the protectiveness of the soil remedy. However, institutional controls required by the OU1, OU3 and OU4 RODs have not been fully implemented.

8.0 Issues, Recommendations and Follow-up Actions

Table 11: Issues and Recommendations Identified in the Five-Year Review

OU(s): OU1, OU3 and OU4	Issue Category: Institutional Controls			
	Issue: Institutional controls required by the OU1, OU3 and OU4 RODs have not been implemented.			
	Recommendation: For OU1, implement institutional controls to limit land use to industrial land use only and prohibit the installation of groundwater drinking wells. For OU3, implement institutional controls to prohibit the potable use of groundwater from the shallow aquifer located beneath the Former Chlorine Plant Area and to prevent exposure to contaminated soil. For OU4, implement institutional controls to limit land development on the Domtar property that could impact the remedy.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	05/01/2017

The following additional items, though not expected to affect protectiveness, warrant additional follow-up:

- The OU1 ROD requires that groundwater samples be compared to the proposed state standard dioxin TEQ standard, based on the 1989 WHO TEF calculations. Although the state has not adopted the proposed dioxin TEQ standard, groundwater data are compared to the proposed standard listed in the ROD. However, the EPA has adopted WHO's updated 2005 TEFs calculations for calculating dioxin TEQ. The WHO's updated 2005 TEFs calculations should be used to calculate dioxin TEQ for all monitored media.
- Standard sample collection/analytical methods used to analyze surface water samples for 2,3,7,8-TCDD are not currently capable of detecting 2,3,7,8-TCDD concentrations as low as the North Carolina surface water cleanup target level of 5.0×10^{-6} ng/L.
- In the future, it may be appropriate to update the surface water cleanup goal for 2,3,7,8-TCDD in a decision document. The current North Carolina 2B surface water standard for 2,3,7,8-TCDD of 5.0×10^{-6} ng/L. However, it is worthwhile to note that the results for annual surface water samples collected in Welch Creek during 2012-2014 were non-detect for 2,3,7,8-TCDD. The current NC surface water standard for 2,3,7,8-TCDD is approximately 260-400 times lower than the achieved detection limits reported for the 2014 samples. The achieved detection limits for the most recent samples were somewhat lower than the method detection limit.
- Institutional controls for OU1 should clarify that activities on the capped area must protect the integrity of the cap.

Recommendations that do not impact the protectiveness of the remedy, but that would streamline sampling efforts and reduce costs are noted below. Sampling locations and frequency are subject to change depending upon the results from a given sampling event.

OU1:

- Reduce the number of wetland soil monitoring locations from five to three by eliminating FLWS-03 and FLWS-05. FLWS-03 and -05 have been well below the cleanup numbers for six sampling events between 2005 and 2013. FLWS-01, -04 and -05 should be sampled twice during the next five year review period since the concentrations have been variable (above and below the cleanup goal) at -04 and -05.
- Reduce the frequency of sampling for shallow groundwater monitoring wells FL-01-1, FL-02-1, FL-03-1, FL-05-1, FL-07-1 and FL-09-1 to once within the period of 2016-2020 (target date of approximately 2018).

OU2:

- Reduce the frequency of mercury fish sampling to once during the next five year review cycle.
- Reduce the frequency of surface water monitoring from annual to every two years during 2016-2020.

OU3:

- Reduce the frequency of sampling for selected monitoring wells. Wells to be sampled every two years include: CP-02-1, MW-1B, CP-01-2, CP-04-1, CP-05-1, CP-06-1, CP-07-1 and CP-08-1. Wells to be sampled once every five years include MW-2, MW-2-2, CP-02-2, CP-01-3R, CP-03-3, CP-04-2, CP-04-3, CP-05-2, CP-07-2, CP-09-1, CP-10-1, CP-13-1 and CP-14-1.

OU4:

- Discontinue the collection of annual Midstream Reach sediment samples, analyzed for mercury, TOC and grain size. Instead, collect sediment samples during a scheduled Welch Creek sampling event that follows a severe storm event.
- Reduce the frequency of mercury fish sampling to once within the next five year review cycle.

9.0 Protectiveness Statements

Table 12: Protectiveness Statements

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU1	Short-term Protective	

Protectiveness Statement:
The selected remedy for OU1 currently protects human health and the environment because exposure pathways that could result in unacceptable risks have been addressed. Fencing and manned security gates restrict landfill access and the landfill cap prevents potential human and environmental receptor exposure to contaminated soil below. Shallow groundwater is not used in the vicinity of the landfill and landfill inspection and maintenance activities ensure the continued integrity of the landfill cap. However, in order for the remedy to be protective in the long term, institutional controls are needed to limit land use to industrial land use only and prohibit the installation of groundwater drinking wells.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU2	Protective	

Protectiveness Statement:
The selected remedy for OU2 is protective of human health and the environment. Exposure pathways that could result in unacceptable risks have been addressed through NC DHHS fish consumption advisories, which prevent or reduce potential human consumption of contaminated fish.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU3	Short-term Protective	

Protectiveness Statement:
The selected remedy for OU3 currently protects human health and the environment because exposure pathways that could result in unacceptable risks have been addressed. Groundwater is not used in the vicinity of the Former Chlorine Plant Area. The subsurface barrier wall and the limited excavation of mercury-impacted soil have reduced the potential for a future release of mercury to the Lower Roanoke River. The asphalt cap over the Former Chlorine Plant Area reduces infiltration of surface water and prevents potential human exposures to contaminated soil below. However, in order for the remedy to be protective in the long term, institutional controls are needed to prohibit the potable use of groundwater from the shallow aquifer and to restrict land use to prevent potential future exposure to contaminated soil.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU4	Short-term Protective	

Protectiveness Statement:
The selected remedy for OU4 currently protects human health and the environment because exposure pathways that could result in unacceptable risks have been addressed. The sand cap serves as an exposure control barrier to underlying sediments and limits re-suspension of impacted underlying sediments. Institutional controls implemented at OU4 help limit the consumption of fish from Welch Creek, maintain the integrity of the sand cap, limit access to the Welch Creek Area, and inform the public of fish advisories and the presence of the sand cap. However, in order for the remedy to be protective in the long term, institutional controls are needed to limit land development on the Domtar property that could impact the remedy.

10.0 Next Review

The next FYR will be due within five years of the signature/approval date of this FYR.

Appendix A: List of Documents Reviewed

CERCLA Information System Site Information accessed from website http://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0403156. Accessed December 2014.

Domtar Paper Company, LLC Plymouth Site 2011Annual Monitoring Report for the Former No. 1 Landfill (OU1). Prepared by TRC for Domtar Paper Company, LLC and EPA. January 2012.

Domtar Paper Company, LLC Plymouth Site 2012Annual Monitoring Report for the Former No. 1 Landfill (OU1). Prepared by TRC for Domtar Paper Company, LLC and EPA. January 2013.

Domtar Paper Company, LLC Plymouth Site 2013Annual Monitoring Report for the Former No. 1 Landfill (OU1). Prepared by TRC for Domtar Paper Company, LLC and EPA. February 2014.

Domtar Paper Company, LLC Plymouth Site 2014Annual Monitoring Report for the Former No. 1 Landfill (OU1). Prepared by TRC for Domtar Paper Company, LLC and EPA. January 2015.

First Five-Year Review for the Weyerhaeuser Company Superfund Site, Plymouth, Martin County, North Carolina. United States Environmental Protection Agency Region 4. May 5, 2010.

Operable Unit No. 3 (OU3) – Former Chlorine Plant Area Monitoring Report, Domtar Paper Company, LLC, Martin County, North Carolina. Prepared by RMT for Domtar Paper Company, LLC and EPA. January 2011.

Operable Unit No. 3 (OU3) – Former Chlorine Plant Area Monitoring Report, Domtar Paper Company, LLC, Martin County, North Carolina. Prepared by TRC for Domtar Paper Company, LLC and EPA. January 2012.

Operable Unit No. 3 (OU3) – Former Chlorine Plant Area Monitoring Report, Domtar Paper Company, LLC, Martin County, North Carolina. Prepared by TRC for Domtar Paper Company, LLC and EPA. January 2013.

Operable Unit No. 3 (OU3) – Former Chlorine Plant Area Monitoring Report, Domtar Paper Company, LLC, Martin County, North Carolina. Prepared by TRC for Domtar Paper Company, LLC and EPA. January 2014.

Record of Decision, Domtar Paper Company, LLC (Domtar) (formerly Weyerhaeuser Company) Site, Lower Roanoke River Area – Operable Unit 2, Martin County, North Carolina. United States Environmental Protection Agency Region 4. September 24, 2008.

Record of Decision, Domtar Paper Company, LLC (Domtar) (formerly Weyerhaeuser Company) Site, Welch Creek Area – Operable Unit 4, Martin County, North Carolina. United States Environmental Protection Agency Region 4. September 26, 2007.

Record of Decision, Weyerhaeuser Co. Plymouth Wood Treating Plant, Former Chlorine Plant Area– Operable Unit 3, Martin County, North Carolina. United States Environmental Protection Agency Region 4. September 29, 2003.

Record of Decision, Weyerhaeuser Co. Plymouth Wood Treating Plant, Landfill No. 1 Area – Operable Unit 1, Plymouth, North Carolina. United States Environmental Protection Agency Region 4. June 19, 2002.

Remedial Action Report, Former Chlorine Plant Area– Operable Unit 3, Weyerhaeuser Company, Plymouth, North Carolina. United States Environmental Protection Agency Region 4. September 2006.

Remedial Action Report, Former Landfill No. 1 Area – Operable Unit 1, Weyerhaeuser Company, Plymouth, North Carolina. United States Environmental Protection Agency Region 4. February 2006, Revised June 2006.

Remedial Action Report, Welch Creek Area – Operable Unit 4, Domtar Paper Company, LLC, Plymouth, Martin County, North Carolina. Prepared by TRC for United States Environmental Protection Agency Region 4. April 2012, Revised July 2012.

Year 1 Natural Recovery Monitoring Report, Domtar Paper Company, LLC, Lower Roanoke River (LRR) Operable Unit #2 (OU2), Plymouth, Martin County, North Carolina. Prepared by TRC for Domtar Paper Company, LLC and EPA. May 2013.

Year 2 Enhanced Monitored Natural Recovery Performance Monitoring Report, Domtar Paper Company, LLC, Welch Creek Operable Unit #4 (OU4), Plymouth, Martin County, North Carolina. Prepared by TRC for Domtar Paper Company, LLC and EPA. March 2014.

Year 3 Enhanced Monitored Natural Recovery Performance Monitoring Report, Domtar Paper Company, LLC, Welch Creek Operable Unit #4 (OU4), Plymouth, Martin County, North Carolina. Prepared by TRC for Domtar Paper Company, LLC and EPA. February 2015.

Year 2 Natural Recovery Monitoring Report, Domtar Paper Company, LLC, Lower Roanoke River (LRR) Operable Unit #2 (OU2), Plymouth, Martin County, North Carolina. Prepared by TRC for Domtar Paper Company, LLC and EPA. February 2014.

Year 2 Natural Recovery Monitoring Report, Domtar Paper Company, LLC, Lower Roanoke River (LRR) Operable Unit #2 (OU2), Plymouth, Martin County, North Carolina. Prepared by TRC for Domtar Paper Company, LLC and EPA. January 2015.

Appendix B: Press Notice

The U.S. Environmental Protection Agency, Region 4
Announces the Second Five-Year Review for
the Weyerhaeuser Co. Plymouth Wood Treating Plant Superfund Alternative Site,
Plymouth, Martin County, North Carolina

Purpose/Objective: EPA is conducting a Five-Year Review of the remedy for the Weyerhaeuser Co. Plymouth Wood Treating Plant Superfund Alternative site (the Site) in Plymouth, North Carolina. The purpose of the Five-Year Review is to make sure the selected cleanup actions effectively protect human health and the environment.

Site Background: The 2,400-acre site is located 1.5 miles west of Plymouth, North Carolina, and includes an active wood and paper products manufacturing facility. A paper mill has operated on site since 1937. Between 1937 and 1956, the facility discharged wastewater associated with bleached pulp directly to the Lower Roanoke River. Beginning in 1957, facility wastewater was discharged to Welch Creek. Investigations determined the wastewater discharges, surface water runoff and on-site waste disposal in an unlined landfill contaminated ground water, sediment, soil, surface water and fish tissue with dioxin and heavy metals. EPA did not list the Site on the Superfund program's National Priorities List (NPL). However, the Agency considers it an NPL-caliber site and is addressing it through the Superfund Alternative Approach.

Cleanup Actions: EPA divided the Site into four separate areas, or operable units (OUs), to better address the cleanup. OU1 includes former landfill #1. OU2 includes the Lower Roanoke River. OU3 addresses the former chlorine plant. OU4 is Welch Creek. EPA has selected remedies for each OU in four separate Records of Decision (RODs). Construction of the OU1 remedy finished in 2005. It included landfill capping and natural recovery of contaminated wetland soil. Remedy implementation for OU2 is underway. It includes monitored natural recovery to address contamination in surface water, sediment and fish tissue. Construction of the OU3 remedy finished in 2006. It included construction of a barrier wall containment system for contaminated soils, shallow excavation of some contaminated soil and installation of a cap over contaminated soil. Construction of the OU4 remedy finished in 2012. It included installation of a sand cap over one mile of Welch Creek bottom sediments, surface water and sediment monitoring, and continuation of an existing fish consumption advisory. Additionally, the final remedies for OUs 1, 3 and 4 require land and ground water use restrictions. Monitoring of ground water, surface water, sediment and fish tissue is ongoing. The Site's potentially responsible party (PRP) performs cleanup and monitoring activities under EPA oversight.

Five-Year Review Schedule: The National Contingency Plan requires review of remedial actions that result in any hazardous substances, pollutants or contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure every five years to ensure the protection of human health and the environment. The second Five-Year Review for the Site will be completed by May 2015.

EPA Invites Community Participation in the Five-Year Review Process: EPA is conducting this Five-Year Review to evaluate the effectiveness of the Site's remedy and to ensure that the remedy remains protective of human health and the environment. As part of the Five-Year Review process, EPA staff is available to answer any questions about the Site. Community members who have questions about the Site or the Five-Year Review process, or who would like to participate in a community interview, are asked to contact:

Randy Bryant, EPA Remedial Project Manager
Phone: (404) 562-8794
Email: bryant.randy@epa.gov

Angela Miller, EPA Community Involvement Coordinator
Phone: (404) 562-8561 | (800) 435-9233 (toll-free)
Email: miller.angela@epa.gov

Mailing Address: U.S. EPA Region 4, 61 Forsyth Street, S.W., 11th Floor, Atlanta, GA 30303-8960

Additional site information is available at the Site's local document repository, located at the Washington County Public Library, 201 E. 3rd Street, Plymouth, NC 27962-1319, and online at: http://www.epa.gov/region4/superfund/sites/npl/northcarolina/wcoplwtpnc.html.

Appendix C: Interview Forms

Weyerhaeuser Co. Plymouth Wood Treating Plant Superfund Alternative Site — **Five-Year Review Interview Form**

Site Name: Weyerhaeuser Co. Plymouth Wood Treating Plant | **EPA ID No.:** NCD991278540

Interviewer Name: _____ | **Affiliation:** _____

Subject Name: Randy Bryant | **Affiliation:** EPA Region 4

Subject Contact Information: Bryant.Randy@epa.gov

Time: _____ | **Date:** 01/30/2014

Interview Location: _____

Interview Format (circle one): In Person | Phone | Mail | Other: Email

Interview Category: EPA Remedial Project Manager

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   Response: There are four operable units or projects at this Site. Overall, I am satisfied with the cleanup, maintenance, and reuse activities. All planned cleanup activities at each of the four operable units have been completed. The necessary maintenance and/or monitoring activities are underway at each operable unit. Site reuse, in the form of continued commercial operations, is underway including the areas at operable unit one (former landfill#1) and operable unit three (former chlorine plant).

2. What have been the effects of this Site on the surrounding community, if any?

   The primary effects of this Site on the surrounding community are associated with the fish consumption advisories for bottom dwelling fish that remain in effect in Welch Creek and the nearby portion of the Lower Roanoke River.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities in the past five years?

   I am not aware of any complaints or inquiries related to the remedial activities at the Site in the past five years. There may be occasional inquiries related to the Site regarding current operations at the facility and those would typically be addressed by the appropriate regulatory staff with the North Carolina Department of Environment and Natural Resources.

4. What is your assessment of the current performance of the remedy in place at the Site?

I believe that the remedies are performing as intended. However, it may take some time before the fish consumption advisory in Welch Creek can be lifted. The necessary long term monitoring is being conducted to evaluate the trends in fish tissue concentrations.

5. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?

   While there are deed notices in place regarding the Site, the particular deed restrictions still need to be implemented. However, this is not a concern in the short term as Domtar continues to own and control access to the Site property.

6. Are you aware of any community concerns regarding the Site or the operation and management of its remedy? If so, please provide details.

   See response to question 3 above.

7. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   Not at this time. I will continue to review the periodic monitoring reports that are generated for each operable unit to evaluate if any changes may be necessary.

Weyerhaeuser Co. Plymouth Wood Treating Plant Superfund Alternative Site **Five-Year Review Interview Form**

Site Name: Weyerhaeuser Co. Plymouth Wood Treating Plant **EPA ID No.:** NCD991278540

Interviewer Name: _____ **Affiliation:** _____

Subject Name: Diane Hardison **Affiliation:** Domtar

Subject Contact Information: Email: Diane.Hardison@domtar.com, Phone: 252-793-8611

Time: _____ **Date:** 12/22/2014

Interview Location: Domtar Paper Company, LLC – Plymouth, NC

Interview Format (circle one): In Person Phone Mail Other: Email

Interview Category: Potentially Responsible Parties (PRPs)

1. What is your overall impression of the remedial activities at the Site?

   Successfully completed, monitored and maintained and aesthetically pleasing.

2. What have been the effects of this Site on the surrounding community, if any?

   None.

3. What is your assessment of the current performance of the remedy in place at the Site?

   Successful.

4. Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents since implementation of the cleanup?

   No, there have been none.

5. Do you feel well-informed regarding the Site's activities and remedial progress? If not, how might the EPA convey site-related information in the future?

   The current level of communication is appropriate and helpful. The Domtar-Plymouth facility remains well informed by the EPA.

6. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?
   Any recommendations will be included in Domtar's annual report to the EPA, which is targeted for submittal by the end of January.

Weyerhaeuser Co. Plymouth Wood Treating Plant Superfund Alternative Site **Five-Year Review Interview Form**

Site Name: Weyerhaeuser Co. Plymouth Wood Treating Plant **EPA ID No.:** NCD991278540

Interviewer Name: _____ **Affiliation:** _____

Subject Name: Michelle Hays **Affiliation:** TRC

Subject Contact Information: Email: Mhays@trcsolutions.com, Phone: 864-234-9461

Time: 8:49 A.M. **Date:** 1/7/15

Interview Location: _____

Interview Format (circle one): In Person Phone Mail Other: Email

Interview Category: O&M Contractor

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   My overall impression of each OU is positive. All OUs are currently in monitoring with minimal, impact to Mill Operations.

2. What is your assessment of the current performance of the remedy in place at the Site?

   Each remedy/OU has been successful as indicated by the annual monitoring.

3. What are the findings from the groundwater, sediment, surface water and fish tissue monitoring data in the past five years? What are the key trends in contaminant levels that are being documented over time at the Site?

   OU1: Groundwater is monitored for dioxin while wetland soil is monitored for chromium and mercury. Concentrations of dioxin TEQ in groundwater have generally been decreasing since 2005 and for 2,3,7,8-TCDD remain below detection limit in all samples. With respect to chromium and mercury in wetland soil, the concentrations are generally stable to decreasing since 2005 at all sampling locations and well below the ecological cleanup criteria except at two locations.

   OU2: Surface water is monitored for 2,3,7,8-TCDD, which has been below laboratory detection limits. Sediment was monitored for dioxin during Year 1 and was consistent with historical USEPA and Weyerhaeuser data sets. Fish tissue is monitored for dioxin and mercury biennially. Dioxin in fish tissue show a decreasing trend of TEQ from the RI while mercury concentrations have remained stable with previous years.

   OU3: Groundwater is monitored for mercury annually and is consistent with historical data and remain stable, showing no increasing trend.

OU4: Benthic samples are, in part, collected to evaluate the recolonization following the application of the sediment cap and determine the impact, if any, of the benthic community on the sediment cap. Benthic samples are also collected to evaluate the dioxin concentrations of the benthos organisms. The benthic surveys post-remedy have shown that re-colonized the capped areas have similar or higher abundance and diversity compared to 2009 and dioxin TEQs were reduced by an order of magnitude in downstream samples post-remedy as compared to 1999 tissue samples.

Fish tissue is monitored for dioxin and mercury. Dioxin in fish tissue show a decreasing trend of dioxin TEQ from the RI while mercury concentrations have remained stable with previous years.

Sediment samples collected from the remedy area are monitored for dioxin and have been below the target level since remedy implementation. Sand cap thickness measurements have indicated the integrity of the sand cap has not been compromised. Sediment samples collected from the Midstream Reach are monitored for mercury, grain size, and TOC. Mercury concentrations in Midstream Reach sediments continue to be on the lower end of range historically observed in Welch Creek and TOC analyses are consistent with previous years.

Surface water samples are collected for 2,3,7,8-TCDD, VSS, TSS, TOC, DOC, Al, Ba, Ca, Fe, Mg, Mn, and Ti. 2,3,7,8-TCDD has not been detected in the surface water while VSS, TSS, TOC, DOC, and metals are within historical ranges.

Further summaries and analyses will be provided in the 2014 annual reports submitted by early February for each OU.

4. Have there been any significant changes in groundwater, sediment, surface water or fish tissue monitoring requirements in the past five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

   There have not been any significant changes in groundwater, sediment, surface water, fish tissue, or benthic tissue in the last 5 years.

5. Please describe any additional activities related to the remedy you are performing.

   TRC monitors the water level in the Roanoke River daily to evaluate mobility monitoring criteria of OU4.

6. Have there been opportunities to optimize monitoring or related activities in the past five years? Please describe changes and any resulting or desired cost savings or improved efficiencies.

   Yes. In OU2, the fish sampling frequency was modified from annually to biennially to correspond with the NPDES permit sampling requirements for the Mill. In OU4, we have removed the GT-11 Sonde (water quality) equipment because the data collected was

inaccurate. Certain analyses that have not provided valuable data, such as the AVS/SEM analyses of the Midstream Reach sediment were removed following approval from the EPA.

7. Do you have any additional comments, suggestions or recommendations regarding on-going groundwater, sediment, surface water or fish tissue monitoring or related activities at the Site?

   None at this time. The Annual reports for each OU are expected to be submitted by early February and will include recommendations regarding on-going monitoring at the site.

Weyerhaeuser Co. Plymouth Wood Treating Plant Superfund Alternative Site **Five-Year Review Interview Form**

Site Name: Weyerhaeuser Co. Plymouth Wood Treating Plant **EPA ID No.:** NCD991278540

Interviewer Name: _____ **Affiliation:** _____

Subject Name: Nile Testerman **Affiliation:** NC DENR

Subject Contact Information: Email: Nile.Testerman@ncdenr.gov, Phone: 919-707-8339

Time: _____ **Date:** _____

Interview Location: _____

Interview Format (circle one): In Person Phone Mail Other: Email

Interview Category: State Agency

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   The site is well maintained.

2. What is your assessment of the current performance of the remedy in place at the Site?

   Monitoring reports indicate the remedies are performing as designed.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?

   Yes. In 2014 a citizen called NC Division of Water Resources that unsafe working conditions and environmental contamination have caused cancer in workers at the Domtar plant. The NC Department of Health and Human Services was notified. The NC Department of Environment and Natural Resources responded to the citizen's concerns.

4. Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.

   Yes. Our office reviews all monitoring reports, remedial designs, etc. Comments are made and the responses to comments are reviewed to see if concerns have been met. Site visits are made to observe remedial activities. There are no outstanding issues except that institutional controls are not in place.

5. Are you aware of any changes to state laws in the past five years that might affect the protectiveness of the Site's remedy?

   No.

6. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?

   Institutional controls are not adequate. A declaration of perpetual land use restrictions document and plat map need to be placed on the deed.

7. Are you aware of any changes in projected land use(s) at the Site?

   No.

8. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

   No.

Appendix D: Site Inspection Checklist

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: Weyerhaeuser Co. Plymouth Wood Treating Plant	**Date of Inspection: 12/11/2014**
Location and Region: Plymouth, NC – Region 4	**EPA ID: NCD991278540**
Agency, Office or Company Leading the Five-Year Review: EPA	**Weather/Temperature: Sunny and 45° F**

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☐ Ground water pump and treatment
- ☐ Surface water collection and treatment
- ☒ Monitored natural attenuation
- ☐ Ground water containment
- ☒ Vertical barrier walls
- ☒ Other: The remedy for OU3 also includes an asphalt cap. The remedy for OU3 included installation of a thin sand cap over contaminated sediment. Site remedies for other OUs also include monitoring of groundwater, sediment, fish tissue and surface water.

Attachments: ☒ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

1. **O&M Site Manager**	Michelle Hays	Remediation Specialist, TRC	01/07/2015
	Name	Title	Date

Interviewed ☐ at site ☒ by email ☐ by phone Phone: _____
Problems, suggestions ☐ Report attached: Interview question responses are summarized in Section 6.6.

2. **O&M Staff**	_____	_____	mm/dd/yyyy
	Name	Title	Date

Interviewed ☐ at site ☐ at office ☐ by phone Phone: _____
Problems/suggestions ☐ Report attached: _____

3. **Local Regulatory Authorities and Response Agencies** (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices). Fill in all that apply.

Agency North Carolina Department of Environment and Natural Resources
Contact Niles Testerman (Name) | Environmental Engineer (Title) | 01/06/2015 (Date) | 919-707-8339 (Phone No.)
Problems/suggestions ☐ Report attached: Interview question responses are summarized in Section 6.6.

Agency _____
Contact _____ Name | _____ Title | _____ Date | _____ Phone No.
Problems/suggestions ☐ Report attached: _____

Agency _____
Contact _____ Name | _____ Title | _____ Date | _____ Phone No.
Problems/suggestions ☐ Report attached: _____

Agency _____
Contact _____ Name | _____ Title | _____ Date | _____ Phone No.
Problems/suggestions ☐ Report attached: _____

Agency _____
Contact _____ Name | _____ Title | _____ Date | _____ Phone No.
Problems/suggestions ☐ Report attached: _____

4. **Other Interviews** (optional) ☐ Report attached: _____

Randy Bryant, EPA Region 4 RPM - Interview question responses are summarized in Section 6.6.

Diane Hardison, Domtar Environmental Manager - Interview question responses are summarized in Section 6.6.

III. ON-SITE DOCUMENTS AND RECORDS VERIFIED (check all that apply)

1. **O&M Documents**

☒ O&M manual	☒ Readily available	☐ Up to date	☐ N/A
☒ As-built drawings	☒ Readily available	☐ Up to date	☐ N/A
☒ Maintenance logs	☒ Readily available	☐ Up to date	☐ N/A

Remarks: _____

2. **Site-Specific Health and Safety Plan**	☒ Readily available	☒ Up to date	☐ N/A
☒ Contingency plan/emergency response plan	☒ Readily available	☒ Up to date	☐ N/A

Remarks: Every contractor that performed remedial work at the Site, or that performs remedy-related O&M work at the Site has their own site-specific health and safety plan. Both Domtar and TRC have their own plans.

3. **O&M and OSHA Training Records**	☒ Readily available	☐ Up to date	☐ N/A

Remarks: Domtar performs an annual on-site safety training which covers relevant OSHA topics. Site contractors are certified in OSHA as required by their respective companies.

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☒ Effluent discharge	☒ Readily available	☒ Up to date	☐ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☐ N/A
☐ Other permits: _____	☐ Readily available	☐ Up to date	☐ N/A

Remarks: While not related to the Site's remedy, Domtar's wastewater discharges are regulated by the facility's NPDES permit.

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☐ N/A

Remarks: There are no settlement monuments located at the OU1 landfill. However, Domtar performs aerial surveys of the landfill, which assess the landfill surface. The last aerial survey wa performed in April 2014.

7. **Ground Water Monitoring Records** ☒ Readily available ☒ Up to date ☐ N/A

Remarks: _____

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

9. **Discharge Compliance Records**

☐ Air	☐ Readily available	☐ Up to date	☐ N/A
☒ Water (effluent)	☒ Readily available	☐ Up to date	☐ N/A

Remarks: While not related to the Site's remedy, Domtar maintains facility effluent discharge records as required by their NPDES permit.

10. **Daily Access/Security Logs** ☒ Readily available ☐ Up to date ☐ N/A

Remarks: Facility access is restricted and monitored by manned guard houses at facility entrances and exits. Every person within the Domtar facility boundaries must have either an employee ID badge or a contractor or visitor's pass.

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house	☐ Contractor for state
☐ PRP in-house	☒ Contractor for PRP
☐ Federal facility in-house	☐ Contractor for Federal facility

☒ Domtar has contracted TRC to perform remedy-related monitoring activities, and General Maintenance Incorporated to perform landfill maintenance activities, such as grading and mowing.

2. **O&M Cost Records**

☒ Readily available ☒ Up to date

☐ Funding mechanism/agreement in place ☐ Unavailable

Original O&M cost estimate: _____ ☐ Breakdown attached

Total annual cost by year for review period if available

Year: 2010	OU1 – $34,500 OU2 – None OU3 – $17,500 OU4 – None	Year: 2011	OU1 – $38,500 OU2 – None OU3 – $25,500 OU4 – None
Year: 2012	OU1 – $16,000 OU2 – $121,500 OU3 – $10,000 OU4 – 141,000	Year: 2013	OU1 – $44,000 OU2 – $102,000 OU3 – $30,000 OU4 – $214,000
Year: 2014	OU1 – $ 17,500 OU2 – $20,500 OU3 – $14,000 OU4 – $214,000		

3. **Unanticipated or Unusually High O&M Costs during Review Period**

Describe costs and reasons: Actual O&M costs for all four OUs are considerably lower than the estimated O&M costs presented in the RODs.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing Damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks: All remedy-related fencing appeared to be in good condition.

B. Other Access Restrictions

1. **Signs and Other Security Measures** ☐ Location shown on site map ☐ N/A

Remarks: Signs displaying remedy-related information and warnings are posted throughout the Site and are in good condition. Guard gates and fences effectively restrict unauthorized Site access.

C. Institutional Controls (ICs)

1. **Implementation and Enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☐ No ☒ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☒ N/A

Type of monitoring (e.g., self-reporting, drive by): _____

Frequency: _____

Responsible party/agency: _____

Contact _____ _____ mm/dd/yyyy _____

Name Title Date Phone no.

Reporting is up to date ☐ Yes ☐ No ☐ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A

Violations have been reported ☐ Yes ☐ No ☐ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks: Institutional controls required by the Site's decision documents have not been implemented. See Section 6.3 for additional details.

D. General

1. **Vandalism/Trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks: _____

2. **Land Use Changes On Site** ☐ N/A

Remarks: On-site land use has not changed. The gravel portion of the OU1 landfill cap is used for storage of contractor equipment. OU3 is located within the Domtar facility and consists of an area covered with an asphalt cap.

3. **Land Use Changes Off Site** ☒ N/A

Remarks: _____

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads Damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks: _____

B. Other Site Conditions

Remarks: _____

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (low spots) ☐ Location shown on site map ☐ Settlement not evident

Arial extent: There are a few areas, roughly 15-20 feet long and 10 feet wide that are lower than than the rest of the surrounding cap. Depth: A few inches

Remarks: The low areas were initially identified during the April 2014 aerial survey of the landfill. Domtar plans to have their on-site contractor, General Maintenance Inc., regrade the areas following the completion of Dominion's power line maintenance.

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident

Lengths: _____ Widths: _____ Depths: _____

Remarks: _____

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident

Arial extent: _____ Depth: _____

Remarks: _____

4. **Holes** ☐ Location shown on site map ☒ Holes not evident

Arial extent: _____ Depth: _____

Remarks: _____

5. **Vegetative Cover** ☒ Grass ☒ Cover properly established

☒ No signs of stress ☐ Trees/shrubs (indicate size and locations on a diagram)

Remarks: Contractor truck tires have caused deep, muddy ruts in the surface of the vegetated landfill cap. However, there is no evidence that the tires have come in contact with contaminated landfill soil located beneath the cap. Domtar is aware of the situation and will arrange for their on-site contractor, General Maintenance Incorporated, to re-grade the tire ruts following the completion of Dominion's power line maintenance activities.

6. **Alternative Cover** (e.g., armored rock, concrete) ☐ N/A

Remarks: The gravel portion of the landfill cap appeared to be in good condition.

7. **Bulges** ☐ Location shown on site map ☒ Bulges not evident

Arial extent: _____ Height: _____

Remarks: _____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident

☒ Wet areas	☐ Location shown on site map	Arial extent: _____
☒ Ponding	☐ Location shown on site map	Arial extent: _____
☐ Seeps	☐ Location shown on site map	Arial extent: _____
☐ Soft subgrade	☐ Location shown on site map	Arial extent: _____

Remarks: Standing/pooled water was observed in a few low areas on the cap. Domtar is aware of the situation and plans to regrade the areas.

9. **Slope Instability** ☐ Slides ☐ Location shown on site map

☒ No evidence of slope instability

Arial extent: _____

Remarks: _____

B. Benches ☐ Applicable ☒ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay

Remarks: _____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay

Remarks: _____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay

Remarks: _____

C. Letdown Channels ☐ Applicable ☒ N/A

(Channel lined with erosion control mats, riprap, grout bags or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ No evidence of settlement

Arial extent: _____ Depth: _____

Remarks: _____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation

Material type:_____ Arial extent: _____

Remarks: _____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion

Arial extent: _____ Depth: _____

Remarks: _____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting

Arial extent: _____ Depth: _____

Remarks: _____

5. **Obstructions** Type: _____ ☐ No obstructions

☐ Location shown on site map Arial extent: _____

Size: _____

Remarks: _____

6. **Excessive Vegetative Growth** Type: _____

☐ No evidence of excessive growth

☐ Vegetation in channels does not obstruct flow

☐ Location shown on site map Arial extent: _____

Remarks: _____

D. Cover Penetrations ☐ Applicable ☒ N/A

1. **Gas Vents** ☐ Active ☐ Passive

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A

Remarks: _____

2. **Gas Monitoring Probes**

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A

Remarks: _____

3. **Monitoring Wells** (within surface area of landfill)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A

Remarks: _____

4. **Extraction Wells Leachate**

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A

Remarks: _____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A

Remarks: _____

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**

☐ Flaring ☐ Thermal destruction ☐ Collection for reuse

☐ Good condition ☐ Needs maintenance

Remarks: _____

2. **Gas Collection Wells, Manifolds and Piping**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)

☐ Good condition ☐ Needs maintenance ☐ N/A

Remarks: _____

F. Cover Drainage Layer ☒ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☒ N/A

Remarks: _____

2. **Outlet Rock Inspected** ☒ Functioning ☐ N/A

Remarks: Stormwater outfalls for the gravel cap area appreared to be in good condition.

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1. **Siltation** Area extent: _____ Depth: _____ ☐ N/A

☐ Siltation not evident

Remarks: _____

2. **Erosion** Area extent: _____ Depth: _____

☐ Erosion not evident

Remarks: _____

3. **Outlet Works** ☐ Functioning ☐ N/A

Remarks: _____

4. **Dam** ☐ Functioning ☐ N/A

Remarks: _____

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident

Horizontal displacement: _____ Vertical displacement: _____

Rotational displacement: _____

Remarks: _____

2. **Degradation** ☐ Location shown on site map ☒ Degradation not evident

Remarks: _____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident

Area extent: _____ Depth: _____

Remarks: _____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A

☐ Vegetation does not impede flow

Area extent: _____ Type: _____

Remarks: _____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident

Area extent: _____ Depth: _____

Remarks: _____

4. **Discharge Structure** ☐ Functioning ☐ N/A

Remarks: _____

VIII. VERTICAL BARRIER WALLS ☒ Applicable ☐ N/A

1. **Settlement** ☐ Location shown on site map ☒ Settlement not evident

Area extent: _____ Depth: _____

Remarks: _____

2. **Performance Monitoring** Type of monitoring: _____

☒ Performance not monitored

Frequency: _____ ☐ Evidence of breaching

Head differential: _____

Remarks: _____

IX. GROUND WATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Ground Water Extraction Wells, Pumps and Pipelines ☐ Applicable ☒ N/A

1. **Pumps, Wellhead Plumbing and Electrical**

☐ Good condition ☐ All required wells properly operating ☐ Needs maintenance ☐ N/A

Remarks: _____

2. **Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

B. Surface Water Collection Structures, Pumps and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps and Electrical**

☐ Good condition ☐ Needs maintenance

Remarks: _____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

C. Treatment System ☐ Applicable ☒ N/A

1. **Treatment Train** (check components that apply)

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation

☐ Air stripping ☐ Carbon adsorbers

☐ Filters: _____

☐ Additive (e.g., chelation agent, flocculent): _____

☐ Others: _____

☐ Good condition ☐ Needs maintenance

☐ Sampling ports properly marked and functional

☐ Sampling/maintenance log displayed and up to date

☐ Equipment properly identified

☐ Quantity of ground water treated annually: _____

☐ Quantity of surface water treated annually: _____

Remarks: _____

2. **Electrical Enclosures and Panels** (properly rated and functional)

☐ N/A ☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Tanks, Vaults, Storage Vessels**

☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs maintenance

Remarks: _____

4. **Discharge Structure and Appurtenances**

☐ N/A ☐ Good condition ☐ Needs maintenance

Remarks: _____

5. **Treatment Building(s)**

☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair

☐ Chemicals and equipment properly stored

Remarks: _____

6. **Monitoring Wells** (pump and treatment remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: _____

D. Monitoring Data

1. **Monitoring Data**

☒ Is routinely submitted on time ☒ Is of acceptable quality

2. **Monitoring Data Suggests:**

☒ Ground water plume is effectively contained ☒ Contaminant concentrations are declining

E. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition

☐ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: All wells observed during the site inspection were secured with locks and appeared to be in good condition.

X. OTHER REMEDIES

If there are remedies applied at the site and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions).

The remedy seems to be effective and functioning as designed. At OU1, the landfill cover prevents exposure to contaminated soil, and landfill O&M ensures the continued effectiveness of the landfill cap. The sheetpile wall and asphalt cap at OU3 prevent potential exposures to contaminated subsurface soil. The sand cap installed over contaminated creek sediment at OU4 helps prevent water flow and aquatic organisms from disturbing contaminated creek sediments. Additionally, warning signs notify Welch Creek anglers of the sediment remediation area and help prevent human activities that could potentially disturb the sand cap. Fish consumption advisory signs posted along the Lower Roanoke River (OU2) help prevent human exposure to potentially contaminated fish. However, for the Site remedies to be protective in the long term, the institutional controls required by the Site's decision documents must be implemented for OU 1, OU3 and OU4. While not specifically required by the ROD, OU1 institutional controls should also prohibit any activities that could potentially compromise the integrity of landfill cap. Additionally, the current North Carolina 2B surface water standard for TCDD in surface water of 5.0 x 10-6 ng/L needs to be established and documented as a surface water cleanup goal in a decision document.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

Overall, the Site seems to be well maintained. However, landfill cap maintenance issues have been identified. Low spots filled with pooled water are present in a few locations on the grass-covered landfill cap. Additionally, contractor truck tires have created deep ruts in the surface of the landfill cap. Domtar is aware of these conditions and plans to have their on-site maintenance contractor re-grade the impacted areas following the completion of the on-site power line maintenance activities.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. No early indicators of potential remedy problems have been identified.
D. Opportunities for Optimization
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. The OU2 fish sampling was optimized by reducing the sampling frequency from annually to once every two years. Additionally, certain analyses that are no longer needed, such as the simultaneously extracted metals/acid-volatile sulfide analyses of Midstream Reach sediment, were discontinued following approval from the EPA.

Appendix E: Photographs from Site Inspection Visit

Notice sign posted on the gravel portion of the landfill cap.

View of the gravel landfill cap, looking northeast.

Contractor equipment stored on the gravel landfill cap.

Notice posted on the vegetated landfill cap perimeter fence.

View of the grass-covered landfill cap, looking southeast.

Tire ruts in the landfill cap along the northern edge of the vegetated landfill.

Deep tire ruts in the landfill cap surface along the landfill's northwestern edge.

Low areas and standing water on the landfill cap (looking southwest).

Low areas and standing water on the landfill cap (looking northeast).

Locked monitoring wells FL-07-1 and FL-07-2 along the landfill's northwestern edge.

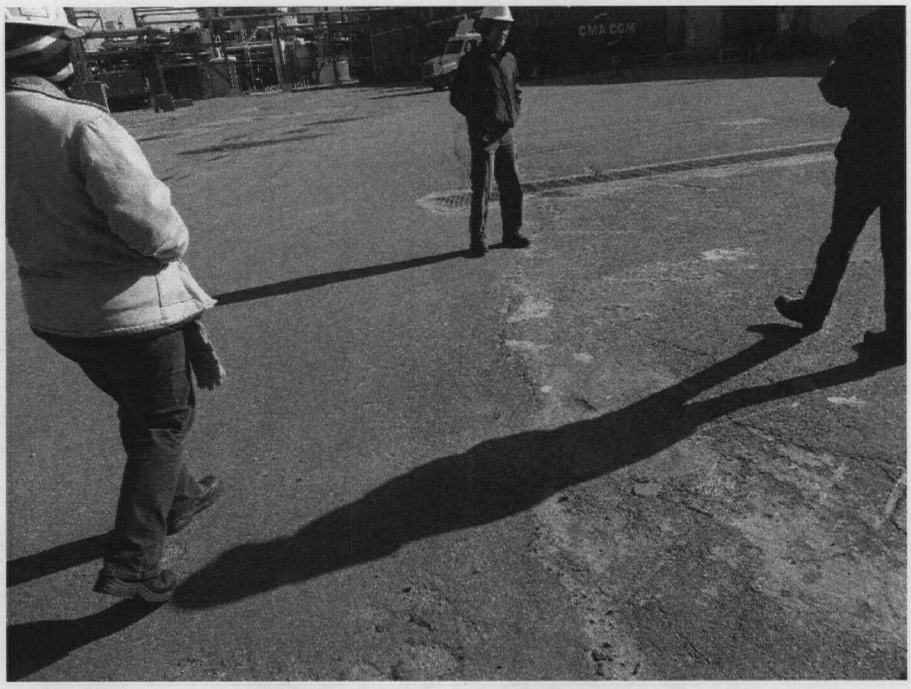
Stormwater outfall CL11 receives runoff from the gravel portion of the landfill cap.

The fence surrounding the grass-covered landfill cap appeared to be in good condition.

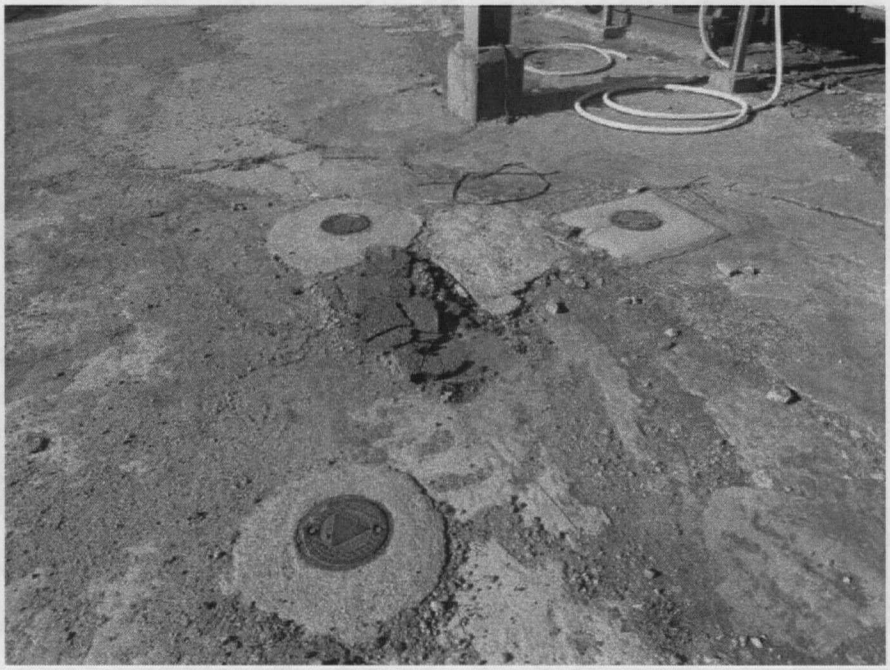
Monitoring wells FL-01-1 and FL-01-2 are located outside of the landfill fence. The wells were locked and appeared to be in good condition.

A manned guard house controls landfill access.

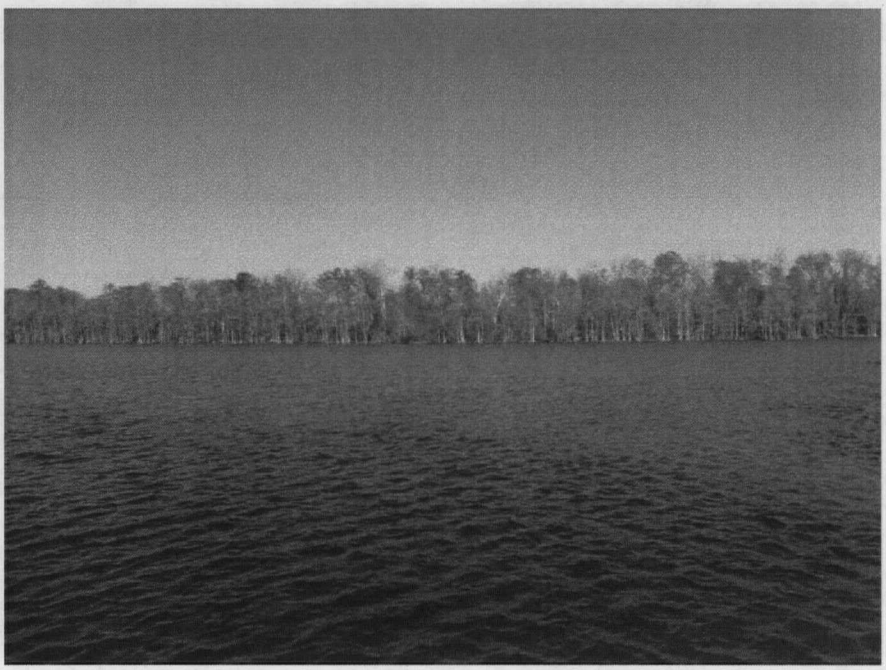
Location of the Former Chlorine Plant Area, OU3.



The seam in the asphalt is located above the buried barrier wall at OU3.



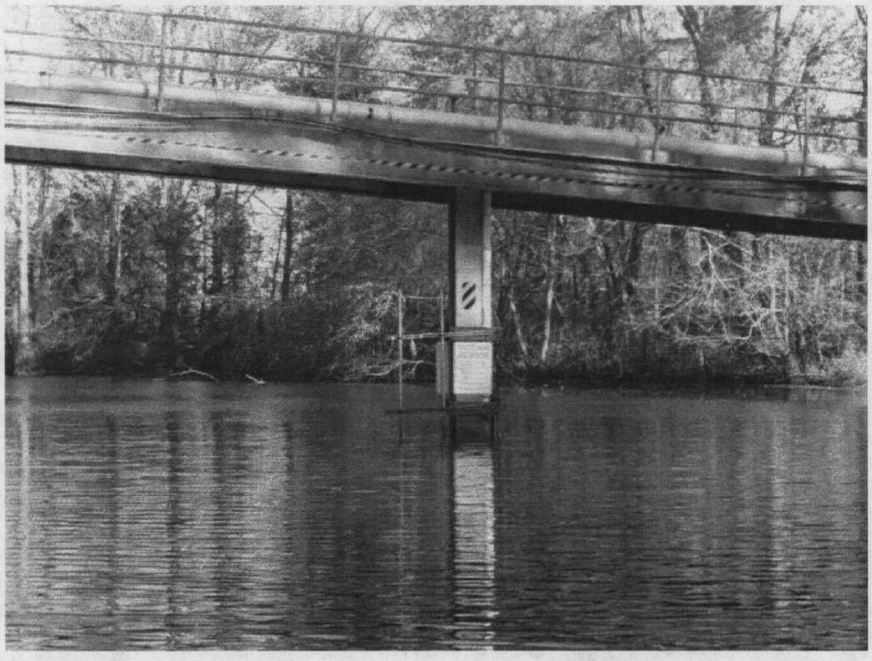
OU3 monitoring wells CP-08-1, CP-08-2 and CP-08-3 were secured with bolts.



View of the Lower Roanoke River (OU2) from the Former Chlorine Plant Area (OU3), looking north.

This railroad trestle marks the beginning of the sediment cap (upstream).

Sign on the railroad trestle notifying anglers of the sediment remediation area.



Pipe bridge and EPA signage at the downstream end of the sediment cap.

Equipment used to monitor the environmental quality and flow of Welch Creek.

This fish consumption advisory sign is clearly posted at the Water Street Landing Boat Access Area, located immediately adjacent to the Lower Roanoke River (OU2).

View of the Lower Roanoke River (OU2), looking west toward the Domtar facility.

Appendix F: Data Review

OU1

OU1 – Groundwater

Between 2005 and November 2013, most wells showed overall declining trends in TEQ concentrations (Tables F-1 and F-2).

Table F-1: OU1 Groundwater Monitoring Results for Dioxin TEQ, 2005-2013

Well ID	Proposed North Carolina Drinking Water Standard[b]	Sampling Date and Results[a]				
		2005	2007	2009	2011	2013
FL-01-1	$2.3x10^{-10}$	**$7.0625x10^{-09}$**	**$3.80x10^{-09}$**	**$2.32x10^{-09}$**	**$1.29x10^{-09}$**	**$1.09x10^{-09}$**
FL-01-2	$2.3x10^{-10}$	**$7.3125x10^{-09}$**	$2.70x10^{-11}$	ND	NS	**$3.62x10^{-10}$**
FL-02-1	$2.3x10^{-10}$	**$6.577x10^{-09}$**	**$6.5x10^{-09}$**	**$4.31x10^{-10}$**	**$1.02x10^{-09}$**	NS
FL-02-2	$2.3x10^{-10}$	NS	NS	NS	NS	NC
FL-03-1	$2.3x10^{-10}$	**$5.6x10^{-09}$**	**$1.87x10^{-09}$**	**$4.85x10^{-10}$**	**$3.2695x10^{-09}$**	$5.43x10^{-11}$
FL-03-2	$2.3x10^{-10}$	**$4.7765x10^{-09}$**	$2.50x10^{-11}$	$2.08x10^{-10}$	NS	$2.17x10^{-11}$
FL-05-1	$2.3x10^{-10}$	**$2.46735x10^{-08}$**	**$1.73x10^{-08}$**	**$4.35x10^{-09}$**	**$3.371x10^{-09}$**	**$1.44x10^{-09}$**
FL-05-2	$2.3x10^{-10}$	**$4.748x10^{-09}$**	$1.69x10^{-10}$	ND	NS	$3.27x10^{-11}$
FL-07-1	$2.3x10^{-10}$	**$2.92x10^{-08}$**	**$1.92x10^{-09}$**	**$6.14x10^{-09}$**	**$1.65x10^{-09}$**	**$4.85x10^{-10}$**
FL-07-2	$2.3x10^{-10}$	**$8.482x10^{-09}$**	**$2.54x10^{-10}$**	**$2.47x10^{-10}$**	NS	$6.89x10^{-11}$
FL-09-1	$2.3x10^{-10}$	**$1.2968X10^{-08}$**	**$2.30x10^{-08}$**	**$6.82x10^{-09}$**	**$2.9015x10^{-08}$**	**$3.67x10^{-09}$**
FL-09-2	$2.3x10^{-10}$	**$7.894x10^{-09}$**	$1.63x10^{-10}$	$1.82x10^{-10}$	NS	$8.30x10^{-11}$

Notes:

[a] Analytical results reported in (mg/L).

[b] Proposed North Carolina 2L drinking water standard for dioxin TEQ.

NS – Not sampled

ND – Not detected

Bold values indicate an exceedance of the proposed North Carolina dioxin TEQ standard.

Table F-2: OU1 Groundwater Monitoring Results for Dioxin TEQ, 2005-2008

Well ID	Proposed North Carolina Drinking Water Standard[b]	Sampling Date and Results[a]							
		11/2005	11/2006	3/2006	3/2006	2/2007	2/2007	12/2008	12/2008
FL-04-1	$2.3x10^{-10}$	**$8.3275x10^{-09}$**	**$1.69x10^{-08}$**	NS	NS	(FL-04-IR) $2.00x10^{-10}$	(FL-04-IR)[c] $4.40x10^{-11}$	(FL-04-IR)[c] $1.91x10^{-11}$	NS
FL-04-2	$2.3x10^{-10}$	NS	NS	NS	NS	NS	NS	ND	(FL-04-2-F)[c] NC
FL-06-1	$2.3x10^{-10}$	**$2.94x10^{-08}$**	**$2.35x10^{-08}$**	**$6.41x10^{-09}$**	**(FL-06-1-F)[c] $5.31x10^{-09}$**	**(FL-06-IR) $2.7x10^{-09}$**	(FL-06-IR-F)[c] $8.00x10^{-11}$	(FL-06-IR) $9.75x10^{-11}$	**(FL-06-IR-F)[c] $3.95x10^{-09}$**
FL-06-2	$2.3x10^{-10}$	NS	NS	NS	NS	NS	NS	$1.28x10^{-10}$	(FL-06-2-F)[c] $5.87x10^{-11}$
FL-08-1	$2.3x10^{-10}$	**$4.1275x10^{-09}$**	NS	NS	NS	NS	NS	$1.81x10^{-10}$	(FL-08-1-F)[c] $1.51x10^{-10}$
FL-08-2	$2.3x10^{-10}$	NS	NS	NS	NS	NS	NS	ND	NS
FL-10-1	$2.3x10^{-10}$	**$9.1425x10^{-09}$**	NS	NS	NS	NS	NS	$2.26x10^{-10}$	(FL-10-1-F)[c] $4.96x10^{-11}$

Notes:

[a] Analytical results reported in milligrams per liter (mg/L).

[b] Proposed North Carolina 2L drinking water standard for dioxin TEQ.

[c] Filtered sample.

NS – Not sampled

ND – Not detected

This table displays sample data collected from wells sampled more than once during the same sampling event.

Bold values indicate an exceedance of the proposed North Carolina dioxin TEQ standard.

Figure F-1: OU1 Boundary and Sampling Locations

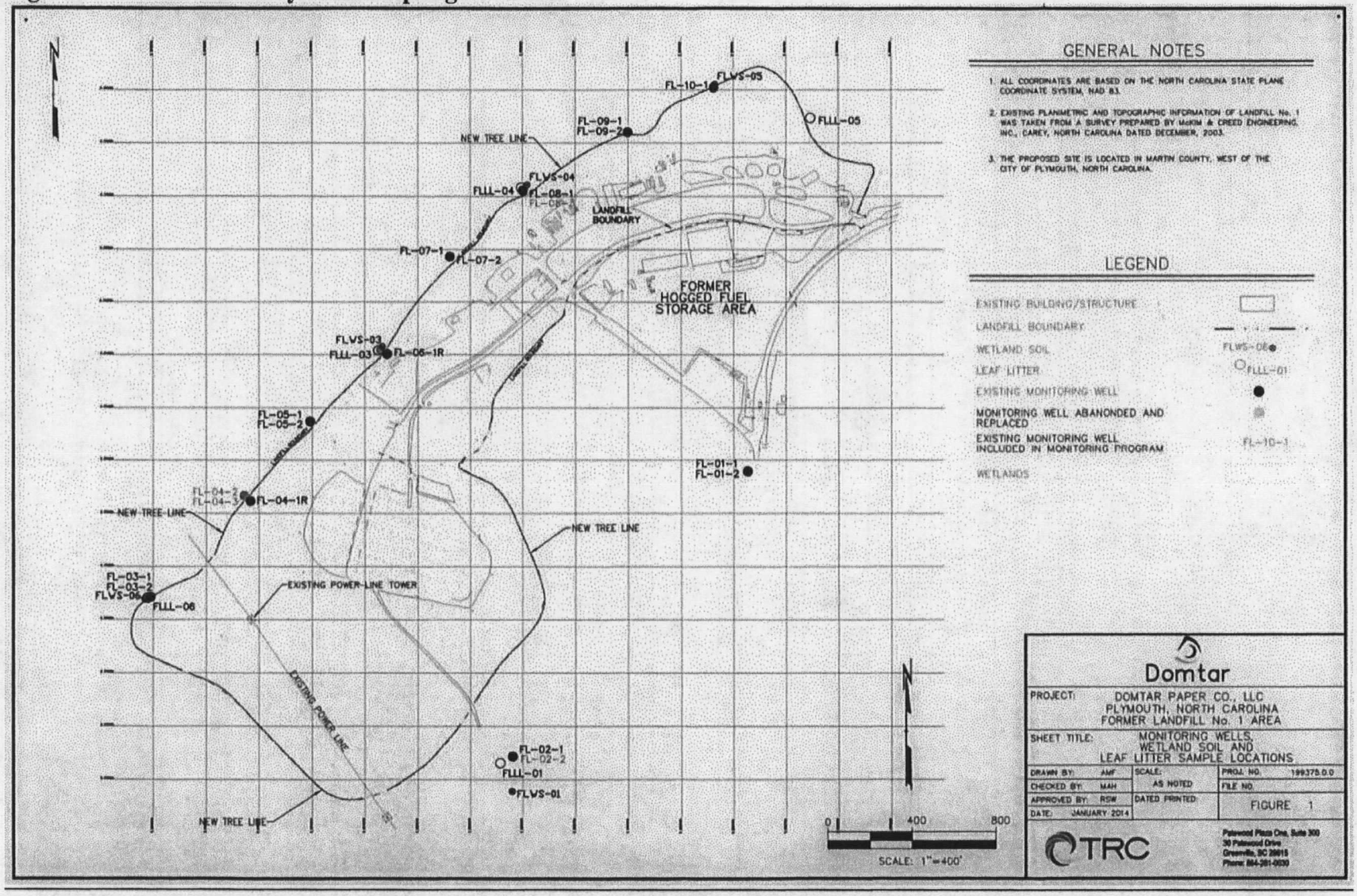


Figure source: 2013 Annual Monitoring Report for the Former No. 1 Landfill (OU1), Domtar Paper Company, LLC. Prepared for Domtar by TRC. February 2014.

Table F-3: OU1 Wetland Monitoring Results, 2005-2013

Historical Wetland Sediment Analytical Results Collected November 2005 - November 2013
Domtar Paper Company, LLC, Martin County, North Carolina

PARAMETER[1]	ECOLOGICAL CLEANUP LEVELS	LOCATION/SAMPLE DATE						
		FLWS-01 11/14/05	(DU-05401) FLWS-01 11/14/05	FLWS-01 11/09/06	FLWS-01 11/06/07	FLWS-01 12/05/08	FLWS-01 12/03/09	FLWS-01 11/05/13
Metals								
Chromium	110	5	5	5	5	5.3	5.63	5.3
Mercury	0.4	<0.1	<0.1	0.0506	0.1	0.031B	0.055 j	0.030 j

PARAMETER[1]	ECOLOGICAL CLEANUP LEVELS	LOCATION/SAMPLE DATE							
		FLWS-03 11/14/05	FLWS-03 11/09/06	(DU-05401) FLWS-03 11/09/06	FLWS-03 11/06/07	(DU-07404) FLWS-03 11/06/07	FLWS-03 12/05/08	FLWS-03 12/03/09	FLWS-03 11/05/13
Metals									
Chromium	110	13	10	6	5	5	2	2.18	1.7
Mercury	0.4	0.1	0.0149	0.0156	<0.1	<0.1	0.004B	<0.031 Uj	0.006 Jj

PARAMETER[1]	ECOLOGICAL CLEANUP LEVELS	LOCATION/SAMPLE DATE					
		FLWS-04 11/14/05	FLWS-04 11/09/06	FLWS-04 11/06/07	FLWS-04 12/05/08	FLWS-04 12/03/09	FLWS-04 11/05/13
Metals							
Chromium	110	28	11	95	128	13.7	111
Mercury	0.4	<0.1	0.0487	0.3	0.3	0.006 Jj	0.353 j

PARAMETER[1]	ECOLOGICAL CLEANUP LEVELS	LOCATION/SAMPLE DATE					
		FLWS-05 11/14/05	FLWS-05 11/09/06	FLWS-05 11/06/07	FLWS-05 12/05/08	FLWS-05 12/03/09	FLWS-05 11/05/13
Metals							
Chromium	110	7	6	8	60	8.37	5.9
Mercury	0.4	<0.1	0.006	<0.1	0.033 B	0.005 Jj	0.005 Jj

PARAMETER[1]	ECOLOGICAL CLEANUP LEVELS	LOCATION/SAMPLE DATE					
		FLWS-06 11/14/05	FLWS-06 11/09/06	FLWS-06 11/06/07	FLWS-06 12/05/08	FLWS-06 12/03/09	FLWS-06 11/05/13
Metals							
Chromium	110	8	212	60	4.8	12.5	150
Mercury	0.4	<0.1	1.06	0.2	0.23	0.018 Jj	2.01 j

(1) Analytical results are reported in milligrams per kilogram (mg/kg) unless otherwise noted.

< Concentration less than the Quantitation Limit.

B (inorganic) The analyte has been detected between the method detection limit and the reporting limit.

J The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.

j Estimated concentration

See laboratory case narrative

Shading indicates concentration exceeds comparison criteria.

Bolding indicates constituent detection.

OU2

OU2 – Surface Water

In 2012, the contractor collected samples from four sampling locations. One sampling location is upstream of the Domtar facility (referred to as location 1), two locations are downstream of the Domtar facility and are associated with the facility's current NPDES-permitted discharge point (locations 2 and 3), and one location is further downstream of the NPDES discharge point (location 4) (Figure F-2). TRC collected surface water samples from locations 1, 2 and 3 during the 2013 and 2014 sampling efforts. 2,3,7,8-TCDD was not detected in any of the surface water samples between 2012 and 2014 (Table F-4). However, the instrumentation used to analyze the samples is not capable of detecting 2,3,7,8-TCDD at the current surface water cleanup target level of 5x10-6 ng/L.

Figure F-2: OU2 Surface Water Sampling Locations

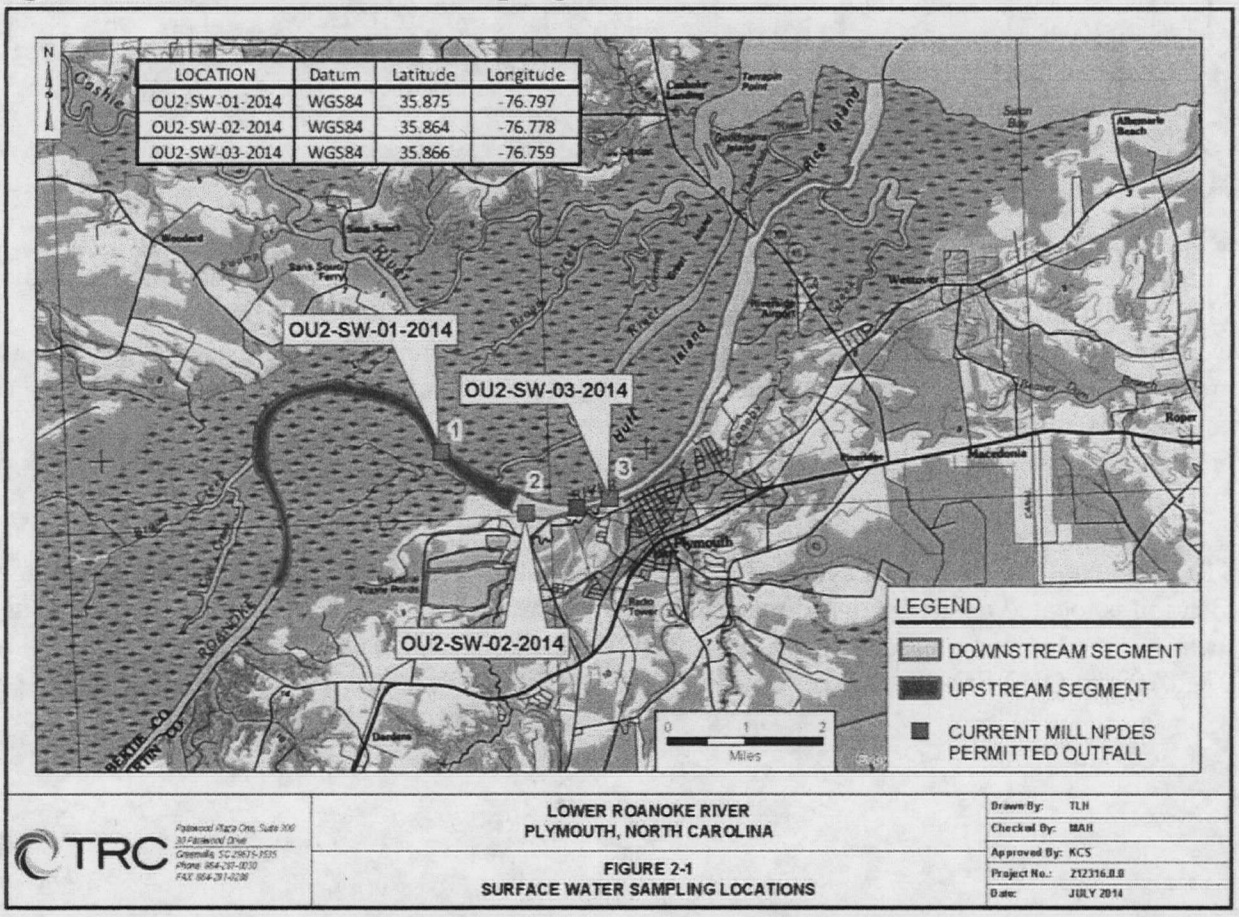


Figure Source: Year 3 Natural Recovery Monitoring Recovery Monitoring Report, Domtar Paper Company, LLC, Lower Roanoke Rover Operable Unit (OU2). Prepared for Domtar by TRC. January 2015.

Table F-4: OU2 Surface Water Monitoring Results, 2014

PARAMETER[1]	CLEANUP TARGET LEVEL[2]	SAMPLING DATE – JUNE 10, 2014			
		OU2-SW-01-2014	OU2-SW-02-2014	OU2-SW-03-2014	DU-14201 (Duplicate of OU2-SW-03-2014)
2,3,7,8-TCDD	0.000005	BDL (<0.00183)	BDL (<0.00152)	BDL (<0.00159)	BDL (<0.00159)
Field Parameters					
Conductance, specific (mS/cm)	--	0.111	0.111	0.124	0.124
DO (mg/L)	--	5.26	5.28	5.46	5.46
ORP (mV)	--	137	133	131	131
pH	--	6.62	6.62	6.09	6.09
Temperature (°C)	--	25.73	25.17	25.51	25.51
Turbidity (ntu)	--	19.7	22.5	20.6	20.6

(1) Dioxin analytical results are reported in nanograms per liter (ng/L) unless otherwise noted.
(2) Groundwater quality standards specified by Title 15A subchapter 2B of the North Carolina Administrative Code (15A NCAC2B).
BDL Below detection limits. Concentration in parentheses reflects the lowest estimated instrument detection limit for the analysis.
ntu nephelometric turbidity unit

OU2 – Sediment

Consistent with the selected remedy for the LRR OU, TRC collected sediment samples from the LRR for dioxin and mercury analysis in 2012: Year 1 of the OU2 remedy. Historical surface area weighted average concentrations in OU2 reveal that lower surficial dioxin concentrations are present in areas where the river is wider, suggesting a greater rate of deposition in areas with larger cross-section and associated lower water flow velocity. Historical OU2 data confirm an ongoing depositional environment that exhibits lower concentrations of dioxin in the bioactive layer than deeper in the sediment profile.

TRC collected sediment core sampled from five sampling locations (Figure F-3). One sampling location is located upstream of Domtar's NPDES permitted outfall (OU2-SD-02-2012) and four locations are located downstream of the outfall (OU2-SD-05-2012, OU2-SD-06-2012, OU2-SD-07-2012 and OU2-SD-08-2012).

Figure F-3: OU2 Sediment Sampling Locations

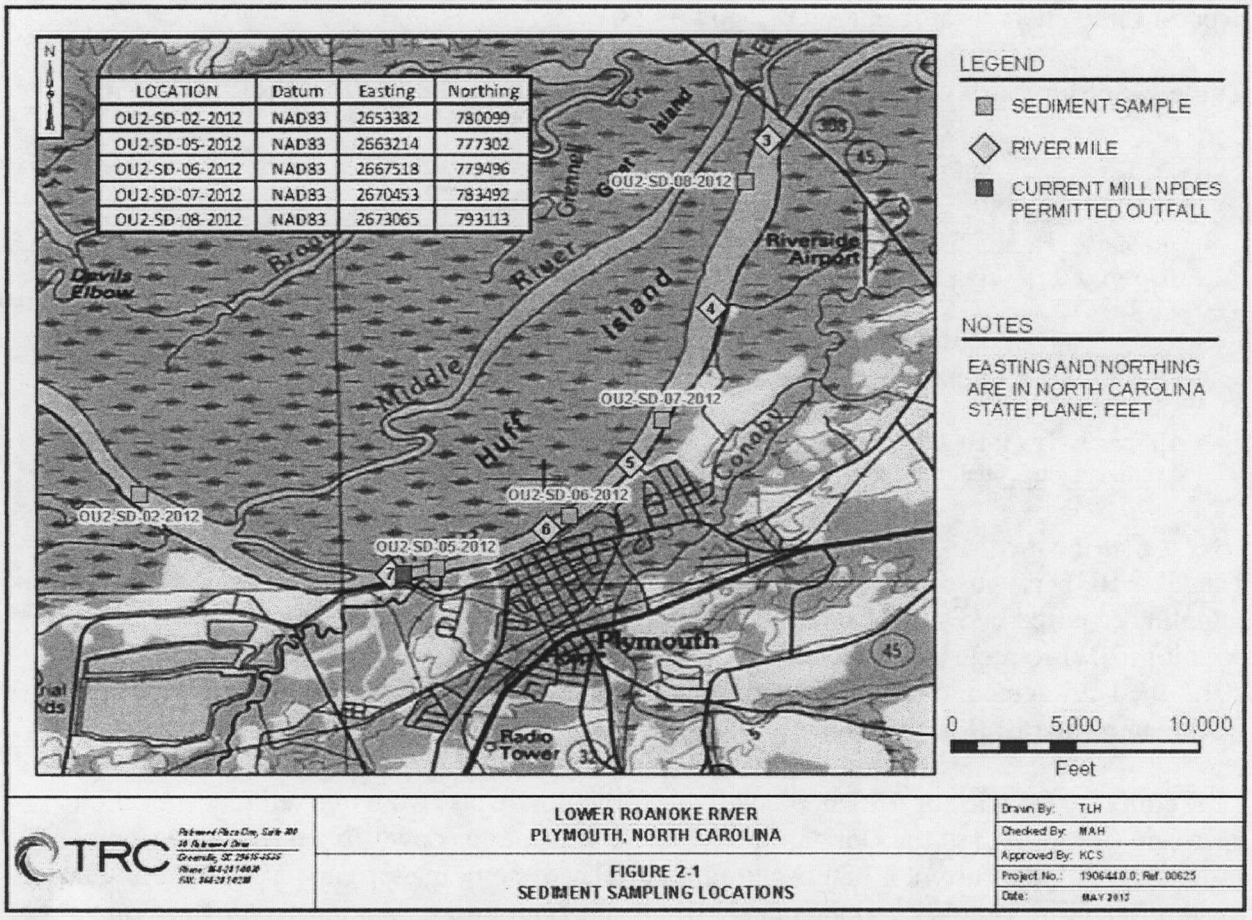


Figure Source: Year 1 Natural Recovery Monitoring Recovery Monitoring Report, Domtar Paper Company, LLC, Lower Roanoke River Operable Unit (OU2). Prepared for Domtar by TRC. May 2013.

Table F-5 presents a compilation and comparison of historical and current mercury data found in OU2 surface sediments. Mercury concentrations observed in 2012 sediment samples are generally consistent with historical concentrations. All individual 2012 upstream samples are within historical observed ranges and the overall average for upstream samples is below the reported historical average. Individual 2012 downstream samples are generally within historical observed ranges, with the exception of the three deepest samples at location OU2-SD-05-2012 (Figure F-3). That sampling location is immediately downstream of Domtar's NPDES outfall; therefore, it is not unexpected to observe slightly higher contaminant concentrations at that location. Similar to the vertical profile of the dioxin concentrations from this core, mercury concentrations increase with depth at OU2, providing evidence of burial. The overall average mercury concentration for downstream surficial samples is greater than the reported historical mercury average. The 2012 report states that this increase in overall average mercury

concentrations for downstream surficial samples is attributable to mercury concentrations in the deepest three intervals at location OU2-SD-05-2012.

Table F-5: Summary of Average Mercury Concentrations in Shallow LRR Sediment

Location/Timing		Range (mg/kg)	Average [Standard Deviation] (mg/kg)
Reference (Upstream)	Historical Data	<0.15 to 1.4	0.262 [0.352]
	2012 MNR Performance Monitoring	0.046 to 0.084	0.065 [0.015]
Downstream	Historical Data	<0.07 to 1.6	0.214 [0.283]
	2012 MNR Performance Monitoring	0.019 to 7.64	0.566 [1.643]

Notes:
All sample data from 0 to 6 inches (sediment depth).
Average includes half the detection limit for non-detected results.

OU2 – Fish Tissue

The OU2 ROD proposed annual fish tissue sampling, to be conducted concurrent with fish tissue sampling required by Domtar's NPDES discharge permit. The state revised Domtar's NPDES permit in 2011 to require fish tissue sampling every two years, beginning in 2013. In January 2012, the EPA agreed to reduce the fish sampling as noted in the remedial design/remedial workplan for the LLR to match the frequency of the revised NPDES permit.

CZR collected samples of catfish, bluegill and largemouth bass from one reference location upstream (location 1) of the Domtar facility and two locations downstream (locations 2 and 3) associated with the current NPDES-permitted discharge point in April and May 2012 and 2013. In addition, CZR sampled a supplemental fish tissue sampling station located downstream of the NPDES discharge point (location 4) during 2012 for performance monitoring.

The NC DHHS issues a fish consumption advisory when the dioxin TEQ concentration in edible fish tissue is greater than 4.0 ng/kg. Dioxin concentrations below this amount are considered safe and acceptable by the NC DHHS. Of the nine fish fillet composites from OU2 in 2013, only two bottom feeder fillet samples, both of which were collected from location 2, exhibited dioxin TEQ at concentrations greater than the NC DHHS fish consumption advisory level.

OU3

OU3 – Groundwater

The objective of the groundwater monitoring program is to assess the effectiveness of the remedy to protect groundwater quality by reducing the migration of mercury from the Former Chlorine Plant Area. A baseline sampling event was conducted in January 2006. The initial sampling event served to evaluate any immediate changes to groundwater flow or groundwater mercury concentrations due to remedial construction activities and as a basis for evaluating remedy performance. The PRP initiated semiannual groundwater sampling events in November 2006.

Mercury concentrations observed during the January 2006 baseline monitoring event exceeded the 2L Standard at the following well locations: CP-01-1, CP-04-1, CP-05-1 and CP-08-1. Between 2006 and 2013, the following wells have routinely exhibited mercury concentrations above the 2L Standard: MW-1B, CP-04-1, CP-05-1, CP-06-1, CP-08-1 and CP-01-2 (Figure F-4).

Figure F-4: OU3 Monitoring Well Locations

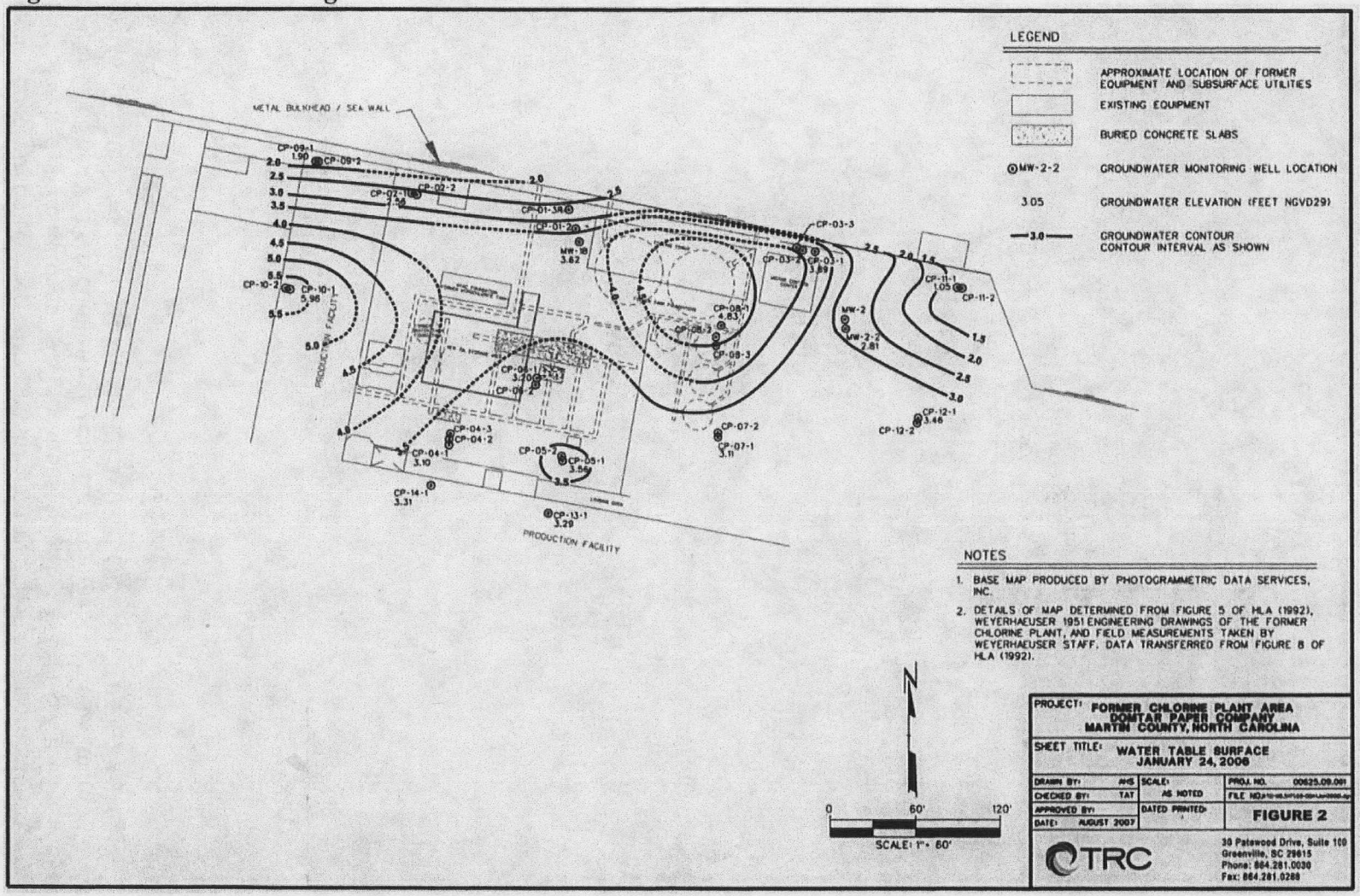


Figure Source: Monitoring Report, Operable Unit No.3 – Former Chlorine Plant Area, Domtar Paper Company LLC. Prepared for Domtar by TRC. January 2013.

OU4

OU4 – Sediment

Performance monitoring activities related to OU4 sediment include physical and chemical assessments of the surficial sediments of the thin layer capping system within the Upper Reach of Welch Creek and chemical and bioavailability assessments of surficial sediments in the Midstream Reach of Welch Creek. Figure F-5 shows the OU4 sampling locations and the location of the cap.

Domtar has contracted TRC to perform cap-related integrity monitoring, which refers to both visual inspections and laboratory analysis of the eMNR™ cap remedy. To assess cap integrity, TRC collects and analyzes sediment cores from random locations throughout the cap. Visual assessment includes verification of cap thickness and identification of cap disturbance by debris displacement, scour, compaction or bioturbation. The March 2014 and February 2015 eMNR™ Performance Monitoring Reports for OU4 reported concluded that the cap meets the required thickness at each sampled location.

TRC also evaluates dioxin TEQ concentrations in the top five centimeters of the cap. This analysis is used to help confirm that the thin layer sediment cap continues to serve as an exposure control barrier to underlying sediments and limits re-suspension of impacted underlying sediments. Dioxin TEQ concentrations in the 2013 performance monitoring cores ranged from 0.0003 to 0.034 µg/kg, well below the cleanup target level of 1 µg/kg. Prior to the installation of the cap, dioxin TEQ concentrations for surficial sediments in the Upper Reach of Welch Creek ranged from 0.6 to 7.6 µg/kg, with a mean concentration of 2.5 µg/kg. The surface weighted area concentration (SWAC) calculated following the remedy implementation was calculated by averaging the dioxin TEQ concentrations of three performance transect samples within each of the 23 segments, then multiplying the 23 TEQ averages by their respective segment-weighted surface area as presented in the 2012 Remedial Action Report. As specified in the OU4 *Performance Standards Verification Plan/Operations and Maintenance Plan*, annual performance monitoring consists of 10 randomly selected sediment core samples. SWACs are based on performance monitoring and determined for the segments represented by the 10 individual samples based on observed dioxin TEQ concentrations and respective surface area. The calculated SWAC in 2014 was 0.015 µg/kg, which is well below the target dioxin TEQ for SWAC of 0.41 µg/kg. The calculated SWAC immediately post-remedy was 0.0004 µg/kg. The calculated 2012 dioxin TEQ SWAC was 0.029 µg/kg; the 2013 dioxin SWAC was 0.006 µg/kg.

OU4 – Surface Water

The ongoing mobility monitoring program is an adaptive management tool to assess both the chances of remedy success and adverse secondary impacts. In June 2013 and June 2014, TRC collected baseline surface water samples from three mobility monitoring stations. TRC submitted the samples to ALS Environmental Laboratory for analysis of 2,3,7,8-TCDD and metals. Water level data collected at the time of sample collection and the analytical results provided baseline data for the OU4 mobility monitoring program.

It should be noted that the instrumentation used to analyze the baseline surface water samples for 2,3,7,8-TCDD was not capable of detecting 2,3,7,8-TCDD concentrations as low as the surface

water cleanup target level of $5x10^{-06}$ ng/L. Therefore, based on the limitations of the analytical instrumentation, it is not clear if 2,3,7,8-TCDD is present in surface water at concentrations higher than the state cleanup level but lower than the analytical detection limits.

According to the 2013 and 2014 *Enhanced Monitored Natural Recovery Performance Monitoring Reports*, analytical results from the baseline flow events were comparable to previous mobility monitoring events. Results from both baseline flow events indicated limited to no mobility of metals, dioxin, total suspended solids and volatile suspended solids from sediment.

OU4 – Benthic Organisms

Survey and analytical results are compared to results from a 2009 baseline survey and the 1999 Remedial Investigation Report. Domtar contracted EA Engineering, Science, and Technology, Inc. to perform the 2013 and 2014 benthic surveys.

In 2013 and 2014, EA Engineering, Science, and Technology, Inc. performed the benthic assessments and collected samples from four locations along the Welch Creek OU. According to both the 2013 and 2014 reports, a diverse and abundant benthic macroinvertebrate community has re-colonized the capped area of Welch Creek. In general the community that re-colonized the capped areas has similar or higher abundance and diversity compared to what was recorded in 2009 baseline data. Differences in the dominant taxa were observed from the 2009 baseline data, which is attributed to the difference in substrate that prefer the sand cap as compared to the underlying silt/mud sediment. The benthic community did not appear to impact the integrity of the sand cap as observed from the core samples.

Benthic tissue sampling and analysis for dioxin was not performed during the 2009 baseline sampling event. Therefore, dioxin concentrations are compared to benthic tissue data collected during the 1999 remedial investigation. A comparison of the 2013 and 2014 downstream results to the 1999 data reveal dioxin TEQ values decreased by an order of magnitude between the 1999 sampling event and the 2013 and 2014 sampling events. According to the 2013 and 2014 reports, benthic tissue dioxin TEQs from downstream locations are now consistent with background concentrations. Table F-6 shows the comparison of benthic tissue dioxin TEQ concentrations from 1999 to those collected in 2013 and 2014.

Table F-6: Summary of OU4 Dioxin TEQ Concentrations for Benthic Tissue Samples

Year	Reference (Upstream: MT-1)	Reference (Upstream: GT-4)	MT-3	MT-4	MT-6	MT-8	Downstream Average Concentration
1999	1.61	NS	NS	NS	19.2	12.0	15.6
2013	NS	2.38	1.59	3.16	3.38	NS	2.71
2014	NS	2.49	0.905	3.56	0.29	NS	1.50

Notes:
All units reported in (ng/kg) wet weight.
NS indicates that sampling was not performed at that location.

Figure F-5: OU4 Sampling Locations

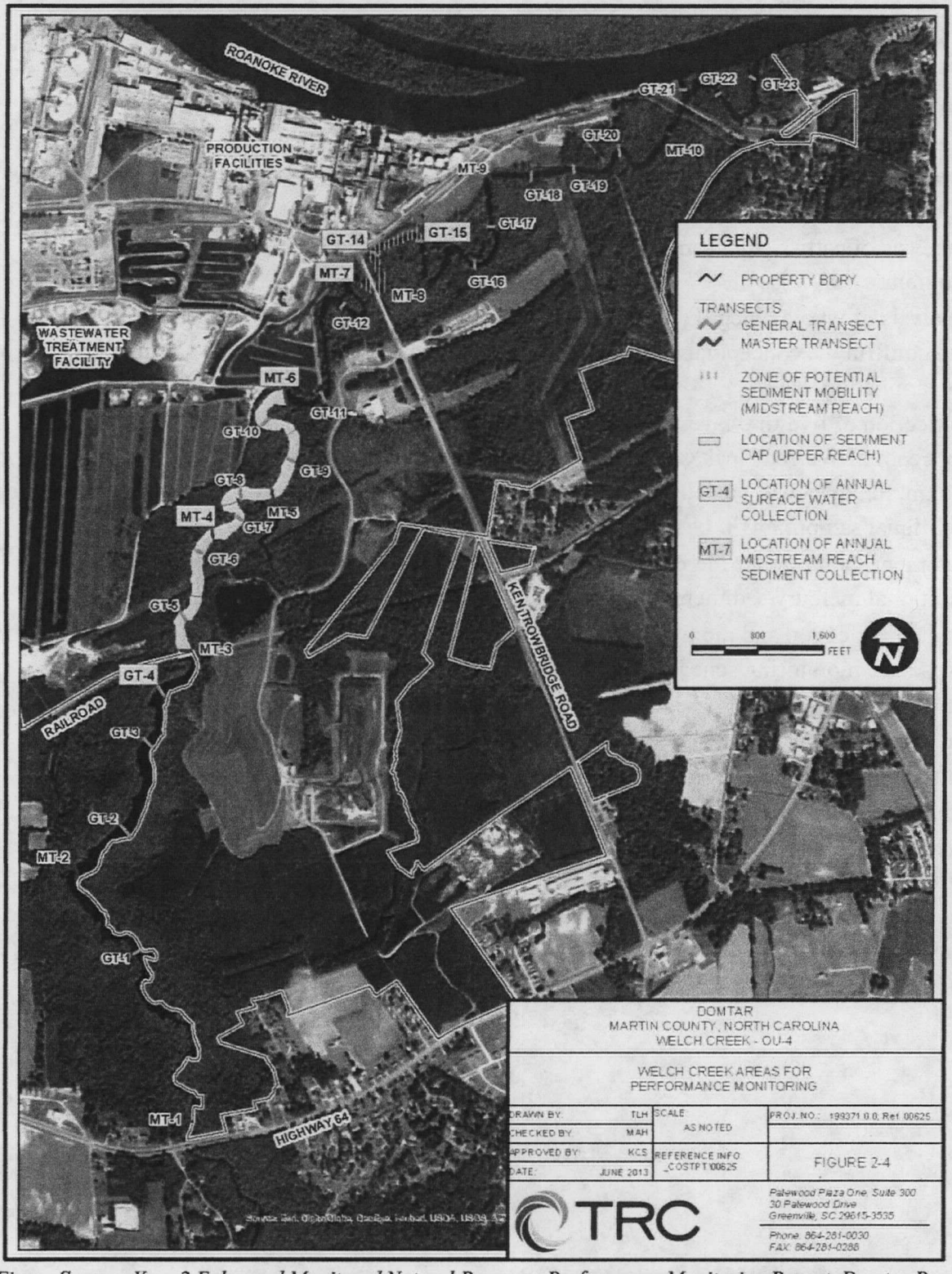


Figure Source: Year 2 Enhanced Monitored Natural Recovery Performance Monitoring Report, Domtar Paper Company, LLC, Welch Creek Operable Unit (OU4). Prepared by TRC for Domtar. March 2014.

Appendix G: Detailed O&M Requirements for OU2

The long-term monitoring and inspection components of the selected remedy for OU2 include:

- For the first five years: annual collection of bluegill, bass and catfish, if possible. After five years, the monitoring will be reduced to bluegill and bass on a biannual basis. Fish samples will be collected at two locations in the LRR (the same two locations where the NPDES fish fillet monitoring is conducted) and one reference location.
- Analysis of catfish fillet samples for dioxin to continue trend analysis from the NPDES program.
- Analysis of whole bluegill and bass for dioxin and mercury to assess concentration trends and confirm the conceptual model that mercury in fish tissue is not due to site-related contamination.
- Collection of five fine-layer sediment core samples at four stations in the LRR and one upstream of Warren Neck Creek. Analysis of about nine subsamples in the top 4-6 inches for dioxin. Samples will be collected at years 1, 4 and 9. Following year 9 sampling, the need for additional sampling will be reassessed.
- Sediment sampling for mercury as part of the first year of monitoring (Year 1) (the need for additional mercury sediment monitoring to be determined).
- Annual collection and dioxin analysis of three 1-liter surface water samples (to coincide with fish tissue monitoring schedule and locations).
- Annual inspection of fish advisory signs (to coincide with fish tissue monitoring schedule and locations).
- Annual review of reports on local habitat conditions such as United States Army Corp of Engineers summaries of dam releases, NC DENR water quality monitoring summaries and overviews of severe weather conditions (e.g., hurricanes or extended droughts) that could adversely impact biota habitats.