EPA/AMD/A2007040001595
2007

EPA Superfund
Record of Decision Amendment:

REASOR CHEMICAL COMPANY
EPA ID: NCD986187094
OU 01
CASTLE HAYNE, NC
06/01/2007

AMENDED
RECORD OF DECISION

REASOR CHEMICAL COMPANY SITE

CASTLE HAYNE, NEW HANOVER COUNTY, NORTH CAROLINA

PREPARED BY:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA, GEORGIA

JUNE 2007

Table of Contents

Section#	Section Name	Page#
List of Acronyms		6
Part 1	THE DECLARATION	8
1.1	Site Name and Location	8
1.2	Purpose	8
1.3	Assessment of Site	10
1.4	Description of Amended Selected Remedy	11
1.5	Statutory Determinations	13
1.6	Data Certification Checklist	13
1.7	Authorizing Signature	14
Part 2	**THE DECISION SUMMARY**	15
2.1	Site Name, Location, and Brief Description	15
2.2	Site History and Enforcement Activities	20
2.2.1	Activities that lead to the current problem	20
2.2.2	History of Investigations	20
2.2.3	Listing and ROD History	20
2.2.4	Enforcement Activities	21
2.3	Community Participation	21
2.3.1	Community Involvement Plan	21
2.3.2	Fact Sheets	21
2.3.3	Newspaper Articles and Ads	22
2.3.4	Community Meetings	23
2.3.5	Information Repositories and Administrative Record	23
2.4	Scope and Role of Response Action	24
2.5	Site Characteristics	24
2.5.1	Conceptual Site Model	24
2.5.2	Site Overview	26
2.5.3	Surface and Subsurface Features	26
2.5.4	Sampling Strategy	28
2.5.5	Known and/or Suspected Sources of Contamination	28
2.5.6	Types of Contamination and Affected Media	28
2.5.7	Location of Contamination and Migration	49
2.5.8	Groundwater Description	54
2.6	Current and Potential Future Land and Water Uses	55
2.6.1	Land Uses	55
2.6.2	Groundwater Uses	55
2.6.3	Surface Water Uses	56
2.7	Summary of Site Risks	56
2.7.1	Summary of Human Health Risk Assessment	56
2.7.2	Summary of Ecological Risk Assessment	64
2.7.3	Conclusion	68
2.8	Remedial Action Objectives	68

2.9 Description of Alternatives 69
2.9.1 Description of Remedy Components 70
2.9.2 Common Elements and Distinguishing Features of Alternatives 75
2.9.3 Expected Outcomes of Alternatives 76
2.10 Comparative Analysis of Alternatives 78
2.10.1 Overall Protection of Human Health and the Environment 79
2.10.2 Compliance with Applicable or Relevant and Appropriate Requirements 81
2.10.3 Long-Term Effectiveness and Permanence 84
2.10.4 Reduction of Toxicity, Mobility, or Volume Through Treatment 85
2.10.5 Short-Term Effectiveness 86
2.10.6 Implementability 88
2.10.7 Cost 90
2.10.8 State/Support Agency Acceptance 101
2.10.9 Community Acceptance 102
2.11 Principal Threat Wastes 110
2.12 Amended Selected Remedy 110
2.12.1 Summary of the Rationale for the Amended Selected Remedy 110
2.12.2 Description of the Amended Selected Remedy 111
2.12.3 Summary of the Estimated Amended Remedy Costs 114
2.12.4 Expected Outcomes of the Amended Selected Remedy 116
2.13 Statutory Determinations 117
2.13.1 Protection of Human Health and the Environment 117
2.13.2 Compliance with Applicable or Relevant and Appropriate Requirements 117
2.13.3 Cost Effectiveness 123
2.13.4 Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable (MEP) 123
2.13.5 Preference for Treatment as a Principal Element 125
2.13.6 Five-Year Review Requirements 125
2.14 Documentation of Significant Changes from Preferred Alternative of Proposed Plan 125

Part 3 RESPONSIVENESS SUMMARY 128

Part 4 REFERENCES 133

Appendix A State Concurrence Letter
Appendix B Written Public Comments
Appendix C Power Point Slides presented at the May 3, 2007 Public Meeting
Appendix D Public Meeting Transcript, May 3, 2007

List of Tables

Table#	Table Name	Page#
1	Conceptual Site Model (Human Receptors)	25
2	Conceptual Site Model (Ecological Receptors)	26
3	Surface Soil Analytical Results That Exceed $1x10^{-6}$ or HQ= 0.1 Risk Value	29
4	Surface Soil TCLP Results	30
5	Proposed Fill Source Sample Results	31
6	Sediment Samples with Results Greater than ATVs	32
7	Sediment TCLP Results	33
8	RI Surface Water Analytical Results Exceeding Surface Water Quality Standards	34
9	ERA Surface Water Data Exceeding Water Quality Standards	35
10	1997 Temporary Well Groundwater Results Exceeding MCLs (excluding metals)	36
11	1999 Temporary Well Groundwater Results Exceeding Inorganic MCLs	40
12	1997-2003 Production Well Sample Results Exceeding Inorganic MCL values	41
13	Groundwater Monitoring Well Analytical Results Exceeding MCL, SMCL or 2L values	42
14	RI Soil Data in Drum Disposal Area for Groundwater COCs	46
15	Residential Well Groundwater Results Exceeding MCL values	47
16	Liquid Tar Sample Results Exceeding Surface Water Standards (Pond 3)	48
17	Baseline Human Health Risk Assessment Soil and Groundwater COCs	57
18	Summary of Hazard Indices and Carcinogenic Risks	58
19	Chemicals and Exposure Routes Exceeding a Carcinogenic Risk of $1x10^{-6}$	59
20	BHHRA Chemicals/Exposure Routes Exceeding a Hazard Index of 1	60
21	Sediment Chemicals of Potential Concern from RI data	65
22	Sediment Chemicals of Concern from ERA data	65
23	Survival of Lumbriculus variegatus After a 4-Day Exposure to Sediment Samples	66
24	Survival and Growth of Hyalella azteca After a 10-Day Exposure to Sediment Samples	66
25	Survival and Growth of Chironomus tentans After a 10-Day Exposure to Sediment Samples	67
26	Summary of Ecological Risks in Sediment	67
27	Remedial Alternatives	70
28	Remedy Similarities and Differences	77
29	Summary of Revised Estimated Costs for All Alternatives	90
30	Soil and Sediment Alternative S1 Revised Cost Estimate	90
31	Soil and Sediment Alternative S2 Revised Cost Estimate	91
32	Soil and Sediment Alternative S3 Revised Cost Estimate	92
33	Soil and Sediment Alternative S4 Revised Cost Estimate	93
34	Soil and Sediment Alternative S5 Cost Estimate	94
35	Groundwater Alternative G1 Revised Cost Estimate	95
36	Groundwater Alternative G2 Revised Cost Estimate	96
37	Groundwater Alternative G3 Revised Cost Estimate	97
38	Groundwater Alternative G4 Revised Cost Estimate	98
39	Groundwater Alternative G5 Cost Estimate	99
40	Surface Water Alternative SW1 Revised Cost Estimate	100
41	Surface Water Alternative SW2 Revised Cost Estimate	100
42	Surface Water Alternative SW3 Revised Cost Estimate	101

43	Surface Water Alternative SW5 Cost Estimate	101
44	Summary of Alternative Evaluation Comparison	102
45	Comparative Analysis of Alternatives	103
46	Estimated Cost of Total Remedy	115
47	Cleanup Goals and Basis	118
48	Federal ARARs Attainment	119
49	State ARARs Attainment	121
50	Cost Effectiveness Matrix	124

List of Figures

Figure#	Figure Name	Page#
1	General Location	16
2	Site Location Map	17
3	Aerial Photograph	18
4	Reasor Chemical Company Site Diagram	19
4-2	Groundwater Monitoring Well Locations	39
5	Areas of Contamination Exceeding Clean-up Goals	53

List of Photographs

Photo#	Description	Page#
1	South Tank Cradle Area	27
2	Refinery Building	27
3	Production Well	37
4	Scrap Copper Area	50
5	Drum Disposal Area	50
6	Pond 1	51
7	Pond 2	51
8	Pond 3	52
9	Pond 4	52

LIST OF ACRONYMS and ABBREVIATIONS

5YR	Five-Year Review
ARARs	Applicable or Relevant and Appropriate Requirements
ATSDR	Agency for Toxic Substances and Disease Registry
ATV	Alternate Toxicity Value
BHHRA	Baseline Human Health Risk Assessment
BQL	Below Quantification Limit
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COCs	Chemicals of Concern
COPC	Chemical of Potential Concern
CSM	Conceptual Site Model
DOJ	Department of Justice
DOT	United States Department of Transportation
DPLUR	Declaration of Perpetual Land Use Restrictions
EPA	United States Environmental Protection Agency
EPS	Exposure Pathway Scenarios
ERA	Ecological Risk Assessment
FS	Feasibility Study
HEAST	Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment
HQ	Hazard Quotient
IRIS	Integrated Risk Information System
J	estimated value
kg	kilogram
L	liter
LOAEL	Lowest Observed Adverse Effects Level
MCL	Maximum Contaminant Level
mg	milligram
MW	Monitoring Well
NA	Not analyzed
NC DENR	North Carolina Department of Environment and Natural Resources
NC SWS	North Carolina Surface Water Standards
NCEA	National Center for Environmental Assessment
NCP	National Oil and Hazardous Substances Contingency Plan
NE	Not established
ng	nanogram
NL	Not Listed
NOAEL	No Observed Adverse Effects Level
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRWQC	National Recommended Water Quality Criteria
O&M	Operation and Maintenance
PA	Preliminary Assessment
PAHs	polycyclic aromatic hydrocarbons
PCBs	Polychlorinated biphenyls

List of Acronyms and Abbreviations (continued)

PGC	Prince George Creek
PRPs	Potentially Responsible Parties
PW	Production Well
RA	Remedial Action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
SDWA	Safe Drinking Water Act
SESD	EPA's Science and Ecosystem Support Division
SI	Site Inspection
SMCL	Secondary Maximum Contaminant Level
SVOCs	semi-volatile organic compounds
TCDD	tetrachlorodibenzodioxin
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxicity Equivalent Quotient
TRV	Toxicity Reference Value
µg	microgram
USFWS	United States Fish and Wildlife Service
VOCs	Volatile Organic Compounds
WESTON	Roy F. Weston, Inc.
yd^3	cubic yards

PART 1: THE DECLARATION

Note: Portions of this document were copied directly from pre-existing Site documents, including, but not limited to, the 2002 Record of Decision.

1.1 Site Name and Location

This Amended Record of Decision is for the Reasor Chemical Company Site, which is located at 5100 North College Road (Hwy 132), in Castle Hayne, New Hanover County, North Carolina. Castle Hayne is approximately 13 miles north of Wilmington, NC. From the road, the Site appears to be a large wooded vacant lot across from the Apex Asphalt Company, near the intersection of Hwy 132 and Kings Castle Road. It is bordered on the southeast by the Prince George Creek. The Site's coordinates are latitude 34° 20' 36.5" N and longitude 77° 53' 31" W. The United States Environmental Protection Agency (EPA) Site Identification Number is NCD986187094.

1.2 Purpose

EPA is updating the selected remedy for the Reasor Chemical Company Site (the "Site") by amending certain aspects of the Record of Decision (ROD). EPA is the lead agency for this Site and the North Carolina Department of Environment and Natural Resources (NC DENR) is the support agency. NCDENR concurs with the amended selected remedy.

New groundwater data and additional information obtained during the remedial design, as well as during negotiations with the Potentially Responsible Parties (PRPs), led EPA to re-evaluate the remedy. EPA has concluded that specific fundamental changes are needed to the original clean-up plan, including a change to the remedy for groundwater, surface water, addition of clean-up goals for sediment, and re-establishment of wetland areas. The original remedy was selected in EPA's September 24, 2002 ROD. EPA is amending the prior remedy decision in accordance with Section 117 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended, and pursuant to Title 40 of the Code of Federal Regulations (CFR) Section 300.435(c)(2)(ii)(A) through (H), Federal Register 8666, 8852, dated March 1990. In accordance with 40 CFR Section 300.825(a)(2), this ROD Amendment will become part of the Administrative Record for the Site. Please refer to Section 2.3 of this ROD Amendment for the location of the information repositories.

EPA is updating the selected remedy based on the new information received after the 2002 ROD was approved. A summary of the rationale for these changes is provided in the following paragraphs.

Soil and Sediment

The United States Fish and Wildlife Service (USFWS) became more involved with this Site after the 2002 ROD was approved by EPA. USFWS requested a modification to the remedy in relation to the ponds. They requested that the ponds be returned to usable wetland habitats rather than being backfilled with soil, which would result in a loss of ecological habitat. Although the United States Army Corps of Engineers determined that the on-site ponds are not "jurisdictional" wetlands, ponds do provide a valuable wetland habitat. Revising the soil/sediment remedy in this manner will improve the ecological habitat at the Site, as well as result in a savings of cost and time to implement. Because the ponds will not be backfilled, sediment clean-up goals are added to the remedy for contaminants that were identified in the 2002 ROD's Remedial Action Objectives. Clean-up goals selected for toluene, methyl ethyl ketone, (3 and/or 4)-methyl phenol, copper and total polycyclic aromatic hydrocarbons (PAHs) were established based on the Ecological Risk Assessment Alternate Toxicity Values.

Surface water

Treatment of contaminated surface water above clean-up goals from Ponds 1, 2, 3 and 4, and from any activities resulting from the remedial action (e.g., dewatering activities) on-site in any manner other than a constructed wetland was not evaluated during the Feasibility Study because it was assumed that it would be more cost efficient to transport and dispose of the contaminated water at an off-site facility. During negotiations with the PRPs, they requested that on-site treatment be re-considered. On-site treatment of surface water is just as effective as treatment at an off-site facility. The cost estimates provided by the PRP indicate that on-site treatment is less expensive. It will also involve less truck traffic. Because treatment effectiveness is identical, EPA considers this request acceptable. To the maximum extent practicable, the treated water will be returned to the cleaned ponds to facilitate wetland restoration and to address at least one community member's concern.

Groundwater

The 2002 ROD identified only two Contaminants of Concern (COC) for groundwater. It also discussed a number of uncertainties in relation to the groundwater data available at that time. During the Remedial Design (RD), two additional monitoring wells (MW-7S and MW-7D) were installed near the drum disposal area, where previous temporary wells had been located that showed high metals concentrations. All wells at the Site were sampled twice during the RD (March and September 2003) with the exception of one production well which had a blockage and could not be sampled; all wells were analyzed for inorganics, with the exception of calcium, iron, magnesium, potassium, sodium, mercury and cyanide.

All sample results for thallium were below the 2002 ROD-established clean-up goal (2 µg/L), which is the current Safe Drinking Water Act's Maximum Contaminant Level (MCL) as well. This confirmed the previous suspicion that the detections of thallium during the Remedial Investigation were most likely "false positive" values. Therefore, EPA believes that thallium should be removed from the list of Contaminants of Concern.

MW-7S and MW-7D, the two wells installed during the Remedial Design, are the only permanent wells at the Site that have concentrations of aluminum that exceed the Human Health Risk Assessment derived clean-up goal of 16,000 µg/L. These two wells are located next to each other, one is screened shallow and the other screened deeper. Aluminum is not a listed hazardous substance, but at high concentrations, is considered a pollutant or contaminant. Background wells had aluminum concentrations ranging from non-detect to 8,500 µg/L; MW-7S had concentrations ranging from 100,000 µg/L to 240,000 µg/L, and MW-7D had concentrations ranging from non-detect to 450,000 µg/L.

MW-7S and MW-7D also had actual or estimated concentrations of beryllium, chromium, and nickel which exceed MCL or 2L values. The concentrations of these metals in background wells and all other wells on-site were below MCL or 2L values. Soil samples collected during the Remedial Investigation in areas near and upgradient to these wells indicated concentrations of aluminum, beryllium, chromium, and nickel similar to background levels. Therefore, the elevated concentrations of these naturally occurring metals in groundwater wells MW-7S and MW-7D are thought to be related to groundwater pH.

The water in wells MW-7S and MW-7D has a very low pH. EPA's Secondary MCL value range for pH is 6.5 - 8.5. Research indicates that the concentration of aluminum (and other metals) in groundwater is affected by the pH and turbidity of the water. Groundwater with a neutral pH (6.5 - 8.5) is the ideal range for lower aluminum concentrations. Acidic water (pH less than 6.5) dissolves metals from the surrounding soil and places it into the groundwater solution. Samples with high turbidity indicate a lot of solids or soil particles collected with the water. Monitoring well MW-7D illustrates the effects of pH and turbidity on concentrations of metals in groundwater. In a groundwater sample collected from MW-7D in March 2003, the non-filtered aluminum concentration was 850 µg/L when the pH was 8.77 and turbidity was 56 NTU. There was no detection of aluminum in the filtered sample. Six months later, the non-filtered aluminum concentration was 450,000 µg/L when the pH was 4.51 with very high turbidity (>1000 NTU). The same water run through a filter to remove particulates had an aluminum concentration of 5,900 µg/L. Similarly, concentrations of beryllium, chromium and nickel were below MCL or 2L values when the pH was 8.77 and turbidity at 56, while greater than MCL or 2L values when the pH was 4.51 with high turbidity (see Table 13d).

EPA believes that addition of an alkaline substance (pH greater than 10) in the excavated area near these two wells will improve the shallow groundwater quality by raising the pH of the surrounding groundwater and reducing the concentration of dissolved metals in the groundwater. It is also essential to minimize the turbidity when collecting water samples for an accurate reflection of the concentration of dissolved metals.

Because the only COCs for groundwater are aluminum, beryllium, chromium, and nickel, and these COCs were only detected in two wells (MW-7S and MW-7D) above the clean-up goals, there is no need to sample every well at the Site and analyze all of them for a long list of chemicals. Therefore, EPA believes it is only necessary to monitor for pH, turbidity, aluminum, beryllium, chromium, and nickel in these two affected wells. Institutional Controls (groundwater use restrictions) are still planned, which will prohibit the use of surficial groundwater at the Site for any purpose until groundwater is determined to be no longer contaminated. This revised remedy adds a treatment component that should correct the groundwater contamination problem much faster and more efficiently than the original remedy.

1.3 Assessment of Site

The response action selected in this Amended Record of Decision is necessary to protect the public health or welfare and the environment from actual or threatened releases of hazardous substances, pollutants and contaminants from this Site which may present an imminent and substantial endangerment.

1.4 Description of Amended Selected Remedy

The overall clean-up strategy for this Site is to reduce the amount of contamination in soils, sediments, surface water and groundwater to protect both human and ecological receptors and return the Site to useable property. While the strategy remains the same as in the 2002 Record of Decision, the methods to achieve it are being modified. The selected amended remedy removes the source materials constituting threats to human health or the environment at the site. The selected amended remedy consists of a combination of Alternative S5 (Soil and Sediment Excavation and Off-site Disposal (modified)), Alternative G5 (Groundwater – Application of Alkaline Substance, Institutional Controls with Monitoring (modified)), and Alternative SW5 (Surface Water – On-site Treatment and Disposal). The combined estimated cost is $560,774, which is significantly less than the 2002 selected remedy cost estimate of $1,200,000 to $2,450,000, while still being protective of human health and the environment. A detailed description of the amended selected remedy can be found in Section 2.12. Briefly, major components include:

- Excavation and off-site disposal of the approximate 1,420 cubic yards (yd^3) of contaminated soil and sediment from the scrap copper area, the pipe shop, the drum disposal area, Pond 1, Pond 2, Pond 3 and Pond 4;

- On-site treatment and disposal of approximate 344,000 gallons of contaminated surface water from Ponds 1, 2, 3 and 4;

- Backfill the excavated soil areas and vegetate with native plant species; return the former ponds to wetland habitats;

- Backfill the drum disposal area with an alkaline substance to raise the pH of shallow groundwater;

- Perform annual monitoring of groundwater to determine if contaminants of concern continue to be elevated;

- Attach a “Declaration of Perpetual Land Use Restrictions” to the property title that prohibits the use of shallow groundwater for any purpose.

The following table illustrates the similarities and differences between the 2002 selected remedy and the 2007 amended selected remedy.

Soil/Sediment Similarities:	
Excavation	
Off-Site Disposal	
Backfill excavated soil areas	
Soil/Sediment Differences:	
2002 Remedy	**2007 Amended**
Backfill ponds	Do not backfill ponds
Reduces wetland habitat	Restores wetlands
Backfill drum disposal area with soil	Backfill drum disposal area with alkaline substance
Volume 1,600 yd^3	Volume 1,420 yd^3
* Updated Estimated Cost: $306,281	Estimated Cost: $278,781
Groundwater Similarities:	
Institutional Controls	
Groundwater monitoring	
Five-Year Reviews	
Groundwater Differences:	
2002 Remedy	**2007 Amended**
No treatment initially	Application of alkaline substance near MW-7
Contingency treatment remedy	No contingency treatment remedy
Annual sampling of 11 (updated to 13) wells	** Annual sampling of 2 wells
Analyze samples for VOCs, SVOCs, metals, and dioxin	*** Analyze for pH, turbidity, aluminum, beryllium, chromium and nickel
Thallium and Aluminum are the COCs	Eliminates Thallium from COC list
* Updated Estimated Cost: $321,532 - $1,694,646	Estimated Cost: $179,832
Surface water Similarities:	
Remediation of contaminated surface water	
Surface water Differences:	
2002 Remedy	**2007 Remedy**
Transportation off-site	No transportation
Treatment and disposal at off-site facility	Treatment and disposal on-site (preferably back into remediated ponds)
~ 4 samples for analysis	~ 14 samples for analysis
Volume Estimate: 500,000 gallons	Volume Estimate: 344,000 gallons
* Updated Estimated Cost: $125,570	Estimated Cost: $116,609
Combined Estimated Cost from 2002 ROD: $1,200,000 - $2,450,000	Combined Estimated Cost: $560,774

* Cost Estimates were revised for each media to reflect current average cost of Five-Year Reviews, current discount rates, and other factors described in more detail in section 2.10.7.
** Sampling frequency may be reduced after the first Five-Year Review.
*** Analysis of aluminum, beryllium, chromium and nickel is only required during annual sampling events if pH value is between 6 and 8.5. However, analysis of aluminum, beryllium, chromium, and nickel is required near the time of the first Five-Year Review for remedy evaluation. In addition, analysis will be required prior to removal of Institutional Controls.

1.5 Statutory Determinations

The Amended Remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action (unless justified by a waiver), is cost effective, and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

For surface water and groundwater, this remedy satisfies the statutory preference for treatment as a principal element of the remedy. For soil and sediment, the remedy is not expected to satisfy the statutory preference for treatment as a principal element for the following reasons. The relatively small quantity of contaminated soil and sediment does not make on-site treatment cost effective. It is doubtful that significant quantities of the excavated soils and sediment will contain concentrations of hazardous substances that are elevated enough to be considered Resource Conservation and Recovery Act (RCRA) hazardous wastes. This was verified during the Remedial Design when Toxicity Characteristic Leaching Procedure (TCLP) testing was conducted, which indicated that most of the soils and sediments could be disposed of in a RCRA permitted Subtitle D landfill as a regulated "non-hazardous" solid waste. Only one area of the soils to be excavated had TCLP results which indicated those soils would need to be treated as RCRA hazardous wastes prior to disposal in a Subtitle D Landfill. Excavated waste will be tested to determine whether the soils are considered hazardous under RCRA for disposal purposes. Any soils categorizing as RCRA hazardous waste will be treated pursuant to RCRA requirements (40 CFR 268) prior to off-site land disposal in a RCRA Subtitle D landfill or will be disposed in a RCRA Subtitle C landfill.

The National Oil and Hazardous Substances Contingency Plan (NCP) establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP §300.430(a)(1)(iii)(A)). There are no principal threat wastes to be addressed as part of this remedy. The contaminated soils in the scrap copper area and the contaminated sediments in the ponds are not considered to be principal threat wastes because the chemicals of concern are not found at highly toxic concentrations that pose a significant risk to either human or ecological receptors.

Because this remedy may result in hazardous substances, pollutants, or contaminants remaining on-site in groundwater above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment. Reviews will continue until the Site is determined to be acceptable for unlimited use/unrestricted exposure.

1.6 Data Certification Checklist

The following information is included in the Decision Summary section of this Amended Record of Decision. Additional information can be found in the Administrative Record file for this Site.

- √ Chemicals of concern and their respective concentrations (pages 28-48)
- √ Baseline risk represented by the chemicals of concern (pages 56-69)
- √ Clean-up levels established for chemicals of concern and the basis for these levels (pages 122-123)

- √ How source materials constituting principal threats are addressed (page 114)
- √ Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the Baseline Risk Assessment and ROD (pages 55-56)
- √ Potential land and groundwater use that will be available at the site as a result of the Selected Remedy (page 121)
- √ Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (pages 119-121)
- √ Key factor(s) that led to selecting the remedy (i.e. describe how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision) (pages 8-10, 114-116)

1.7 Authorizing Signature

This Amended ROD documents the amended selected remedy for contaminated soil, sediment, surface water and groundwater at the Reasor Chemical Company Superfund Site. This amended remedy was selected by EPA with the concurrence of the North Carolina Department of Environment and Natural Resources. (Appendix A includes the concurrence letter). The Director of the Superfund Division (EPA, Region 4) has been delegated the authority to approve and sign this ROD Amendment.

Franklin E. Hill, Director
Superfund Division
US EPA, Region 4

6/1/07
Date

PART 2: THE DECISION SUMMARY

This Decision Summary provides a description of the Site specific factors that led to the amendment of the selected remedy for the Site. It includes background information, the nature and extent of the contamination, the risks posed to human and ecological receptors, and the identification and evaluation of remedial action alternatives. The Site consists of only one operable unit. The United States Environmental Protection Agency (EPA) is the lead agency for the Site. EPA's Site Identification Number is NCD986187094. The North Carolina Department of Environment and Natural Resources (NC DENR) is the support agency. The Potentially Responsible Parties (PRPs) will conduct the remedial action.

2.1 Site Name, Location, and Brief Description

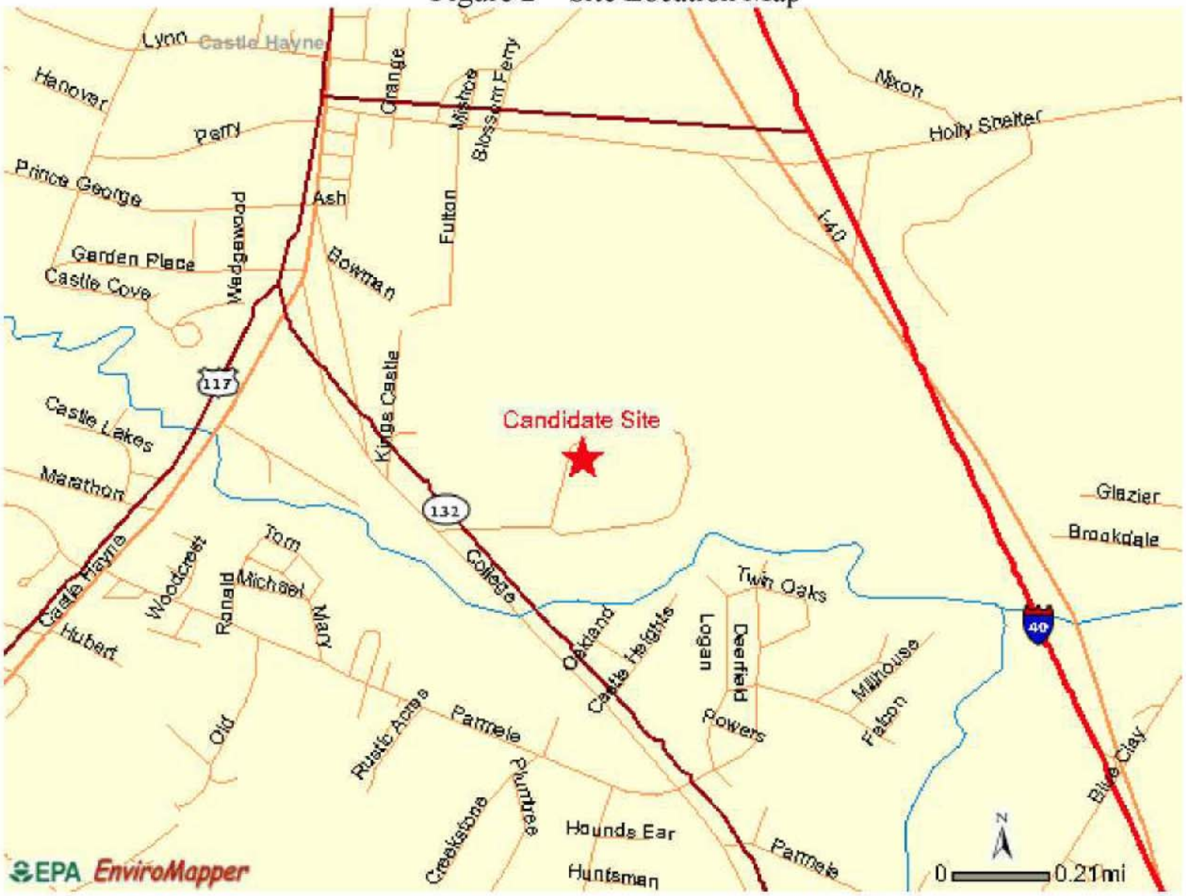
The Reasor Chemical Company Site is located at 5100 North College Road (Hwy 132) in Castle Hayne, New Hanover County, North Carolina. Castle Hayne is approximately 13 miles north of Wilmington, NC. The city had a population of 1,116 in the year 2000, according to census data. Figures 1 and 2 on the following two pages include Site location maps.

From the road the Site appears to be a large wooded vacant lot across from the Apex Asphalt Company near the intersection of Hwy 132 and Kings Castle Road. It is bordered on the southeast by the Prince George Creek. The Site's coordinates are latitude 34° 20' 36.5" N and longitude 77° 53' 31" W. The Site is currently zoned industrial. Both industrial and residential properties neighbor the property. The Site is planned to be rezoned as residential after the clean-up is completed. The surrounding portions of the property are planned to be rezoned from heavy industrial to a mixture of commercial and residential.

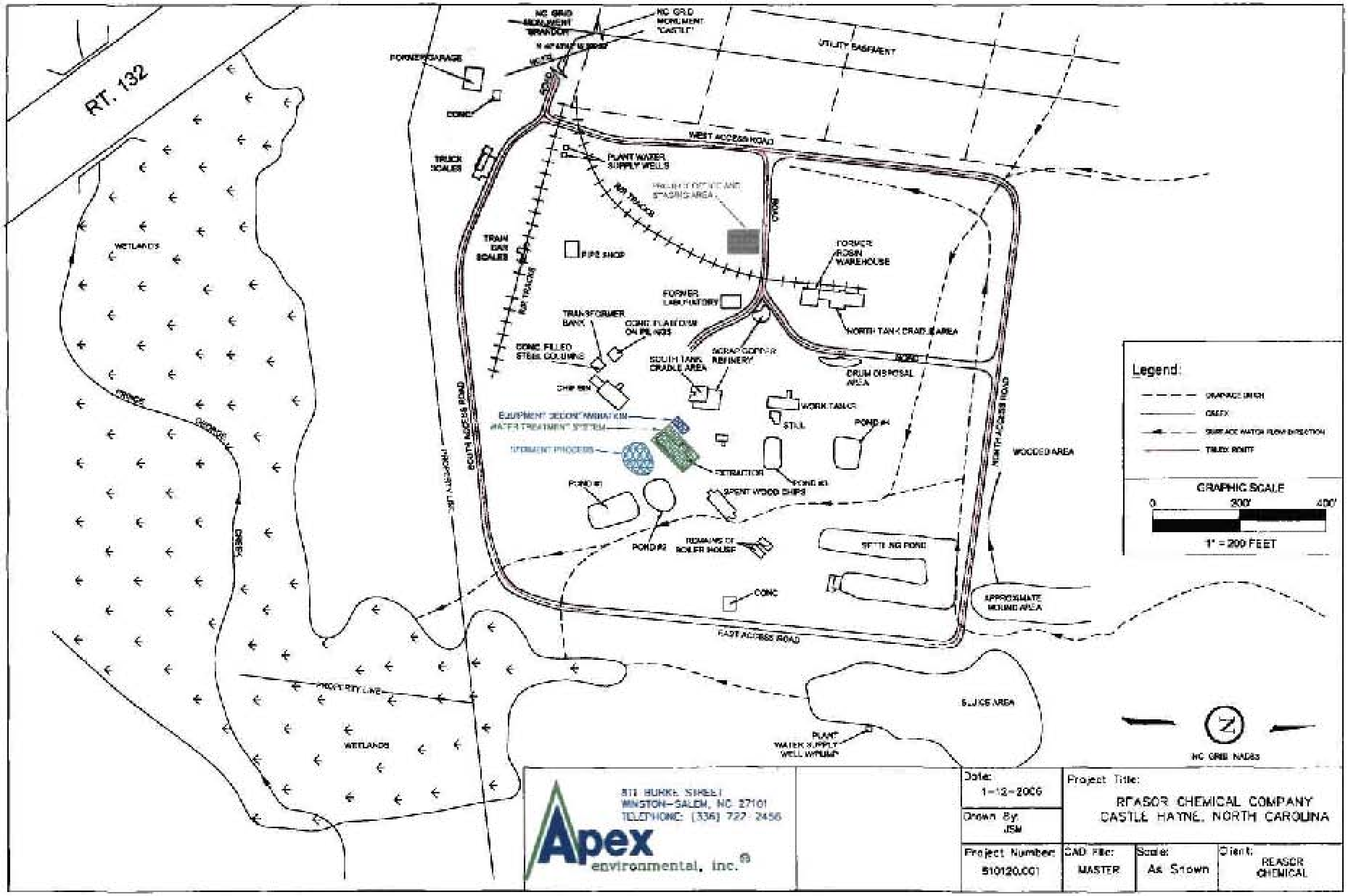
The Site, comprised of approximately 25 acres, is an abandoned stump rendering facility, which operated from 1959 to 1972. A fire and possible explosion occurred on the property on April 7, 1972, which damaged and destroyed the remaining buildings and material on the site property. The property is currently vacant, is overgrown with brush and secondary growth forest, and has unpaved roads running throughout the site. There are a few site features which are still distinguishable, which include: three tank cradle areas, a boiler house, concrete slabs from the former rosin warehouse, laboratory, garage, still, process line, transformer area, train scale, and several other unidentified former buildings. Five ponds used in the manufacturing process, a scrap copper area, two railroad sidings, a surface drum disposal area, a sluice area, and several drainage ditches are also still present at the site. Figure 3 on page 18 is an aerial photograph of the Site and surrounding properties. Figure 4 on page 19 is a Site diagram.

Figure 1 – General Location

Figure 2 – Site Location Map




LOCATION MAP
INTERSTATE 40
HANOVER DESIGN SERVICES, P.A.


RT. 132
NC GRID MONUMENT "CASTLE"
UTILITY EASEMENT
FORMER GARAGE
CONC
WEST ACCESS ROAD
TRUCK SCALES
PLANT WATER SUPPLY WELLS
RR TRACKS
TRAIN CAR SCALES
PIPE SHOP
FORMER ROSIN WAREHOUSE
FORMER LABORATORY
TRANSFORMER BANK
CONC PLATFORM ON PILINGS
CONC FILLED STEEL COLUMNS
SOUTH TANK CRADLE AREA
SCRAP COPPER REFINERY
NORTH TANK CRADLE AREA
DRUM DISPOSAL AREA
CHIP BIN
WORK TANKS
STILL
POND #4
EQUIPMENT DECONTAMINATION
WATER TREATMENT SYSTEM
SEDIMENT PROCESS
EXTRACTOR
POND #1
POND #3
POND #2
SPENT WOOD CHIPS
REMAINS OF BOILER HOUSE
SETTLING POND
CONC
WOODED AREA
NORTH ACCESS ROAD
SOUTH ACCESS ROAD
EAST ACCESS ROAD
APPROXIMATE MOUND AREA
SLUICE AREA
PLANT WATER SUPPLY WELL W/PUMP
WETLANDS
PRINCE GEORGE CREEK
PROPERTY LINE
Legend:
DRAINAGE DITCH
CREEK
SURFACE WATER FLOW DIRECTION
TRUCK ROUTE
GRAPHIC SCALE
0
200'
400'
1" = 200 FEET
NC GRID NAD83
811 BURKE STREET
WINSTON-SALEM, NC 27101
TELEPHONE: (336) 722-2456
Apex environmental, inc.
Date: 1-12-2006
Drawn By: JSM
Project Title:
REASOR CHEMICAL COMPANY
CASTLE HAYNE, NORTH CAROLINA
Project Number: 510120.001
CAD File: MASTER
Scale: As Shown
Client: REASOR CHEMICAL

2.2 Site History and Enforcement Activities

This section of the Amended ROD provides a brief Site history, including previous investigations, the listing process, and enforcement activities.

2.2.1 Activities that lead to the current problem

The Reasor Chemical Company produced turpentine, pine resin, pitch, tall oil, pine oil, camphor, pine tar, and charcoal from pine tree stumps. It is believed that the facility used various solvents to extract raw product from chipped stumps, distilling the extract into separate product fractions. The solvents used in the extraction process were likely stored on site in 55-gallon drums, the remains of which are located in a surface drum disposal area near the center of the property. It is thought that four of the ponds were used in the manufacturing process. These ponds contain sediments with elevated concentrations of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) including polycyclic aromatic hydrocarbons (PAHs), and inorganic compounds. An area thought to have been used to scrap copper is also present, which has elevated concentrations of copper and lead.

2.2.2 History of Investigations

Several environmental investigations have occurred at the Site. Details can be found in the 2002 ROD as well as the source documents. These events include:

- 1989: Law Environmental, Inc. conducted a Preliminary Environmental/Liability Assessment for a prospective purchaser of the property.
- 1991: NC DENR conducted a Preliminary Assessment.
- 1991: Roy F. Weston, Inc. (WESTON) conducted a site investigation for the Emergency Response and Removal Branch of EPA.
- 1995: NC DENR conducted a Site Inspection.
- 1996-2002: WESTON performed the Remedial Investigation/Feasibility Study for EPA.
- 2000-2002: EPA's Science and Ecosystem Support Division completed the Ecological Risk Assessment.
- 2003-2004: WESTON conducted the Remedial Design for EPA.
- 2003-2004: Agency for Toxic Substances and Disease Registry (ATSDR) conducted a Public Health Assessment

2.2.3 Listing and ROD History

The EPA proposed the Site to the National Priorities List (NPL) on September 13, 2001 through publication in the Federal Register (Volume 66, Number 178). The Site was finalized on the NPL through publication in the Federal Register on September 5, 2002 (Volume 67, Number 172). The Record of Decision was approved on September 26, 2002.

2.2.4 Enforcement Activities

In 1996, an initial Potentially Responsible Party (PRP) search was conducted. In 1996 and 1997, EPA sent 104(e) Information Request letters to several parties. In November 2001, follow-up was conducted. While some of the PRPs identified appear no longer viable, EPA continued to investigate the viability of several PRPs.

EPA issued General Notice Letters on February 4, 2003. On August 24, 2004, EPA issued Special Notice Letters to three PRPs. Negotiations between EPA and the PRPs began at that point and were completed on September 26, 2006, on which date the Consent Decree was signed by EPA and referred to the Department of Justice (DOJ). A Notice was published in the Federal Register (Vol. 71, No. 206, page 62488, dated October 25, 2006) that on October 13, 2006, the proposed Consent Decree with Martin Marietta Materials, Inc. Jane C. Sullivan and Hilda C. Dill in *United States v. Martin Marietta Materials, Inc. et al.,* No. 7:06–cv–00154– FL, was lodged with the United States District Court for the Eastern District of North Carolina. The publication date of October 25, 2006, was the beginning of the 30 day public comment period. The Consent Decree was entered by the Court on December 8, 2006. The amended remedy will be implemented by the PRPs.

2.3 Community Participation

This section of the Amended ROD describes EPA's community involvement activities. EPA has communicated with the public through Fact Sheets, meetings, Internet postings, newspaper ads, and answering email and phone inquiries. Current Site information can be found at http://www.epa.gov/region4/waste/npl/nplnc/reasornc.htm.

2.3.1 Community Relations Plan

EPA prepared a Community Relations Plan in July 1997. It contains an overview of Superfund, Site background, community background, public issues and concerns, community relations objectives, community relations techniques, schedule of activities, list of interested parties, information repository, suggested meeting location, technical assistance grant program, and toxicological profiles of contaminants of concern.

2.3.2 Fact Sheets

EPA has published eight Fact Sheets related to the Reasor Chemical Company Site.

- March 24, 1997: EPA published the first Fact Sheet for the Site, to announce the beginning of the Remedial Investigation/Feasibility Study (RI/FS).
- September 1998: EPA published the second Fact Sheet for the Site, presenting a summary of the findings of the Remedial Investigation and announcing that the Feasibility Study is underway.
- October 1998: EPA published a clarification Fact Sheet after numerous questions were received by EPA.

- May 2000: EPA published the third Fact Sheet for the Site, discussing the Remedial Investigation results and planned future activities.
- July 2002: EPA published the Proposed Plan Fact Sheet, announcing the Public Comment period as well as the date and time of a Public Meeting.
- October 2002: EPA published a Record of Decision Fact Sheet.
- March 2004: EPA published a Fact Sheet titled, EPA Approves Remedial Design for Site Remedy.
- March 2007: EPA published the Amended Proposed Plan Fact Sheet, announcing the reasons for remedy change, as well as notification of the Public Comment period.
- April 2007: EPA mailed a one page flyer to the mailing list announcing the date, time and location of the Public Meeting.

2.3.3 Newspaper Articles and Ads

A total of eleven newspaper articles or ads are found in EPA's files related to the Site.

- January 14, 1997: An article was printed in the Star News, Wilmington, NC. The article discussed the Site history and EPA's plans for conducting a study before a clean-up would take place.
- March 26, 1997: An article was printed in *The Pender Chronicle*, Burgaw, NC. The article covered the Public Meeting that was held by EPA at the initiation of the Remedial Investigation.
- July 29-31, 1997: An ad was printed in the *Wilmington Morning Star*, announcing the beginning of field activities during the week of August 4, 1997.
- October 20, 1998: An article was printed in the *Wilmington Morning Star*, providing an update of activities conducted by EPA at the Site.
- June 1, 2000: An article was printed in the *Wilmington Morning Star*, providing an update of activities conducted by EPA at the Site and status of future events.
- July 2002: An ad was run in the *Wilmington Star*, announcing the public comment period for the Proposed Plan and information related to the public meeting for the Proposed Plan.
- September 12, 2002: An article was published in the *Wilmington Star*, discussing the proposed remediation for the Site.
- March 2, 2007: An article was published in the *Star-New*s, titled "Property rezoned for mixed uses, Superfund site use unchanged". The article stated that parcels adjacent to the Site are planned for sale to the county for an elementary school and a passive park. The zoning was changed from "heavy industrial" to a mixture of "residential" and "heavy commercial". The zoning at the Site will not be approved for change until after EPA certifies that remediation has been completed. At that time, it will be rezoned as "residential".
- April 7, 2007: An ad was printed in the *Star-News* announcing the availability of the updated Administrative Record, Amended Proposed Plan, public comment period (April 6–May 6, 2007), and opportunity for a public meeting.
- April 11, 2007: The April 7th ad was reprinted in the *Star-News*.
- April 30, 2007: An ad was printed in the *Star-News* announcing the date, time and location of the Public Meeting.

2.3.4 Community Meetings

Four public meetings or availability sessions have been held or attended by EPA related to the Reasor Chemical Company Site.

- March 1997: RI/FS Kick-off Meeting, held at the Castle Hayne Volunteer Fire Department
- July 30, 2002: Proposed Plan Public Meeting, held at the Castle Hayne Volunteer Fire Department
- March 18, 2003: EPA was present during the Agency for Toxic Substances and Disease Registry's (ATSDR) public availability session at the Northeast Regional Library on Military Cutoff Road in Wilmington, NC
- May 3, 2007: Amended Proposed Plan Public Meeting, held at the New Hanover County Library in Wilmington, NC

Due to the little interest the community has expressed regarding this Site through the years and during the recent rezoning process, EPA (after consultation with NCDENR and the New Hanover Planning Department) decided to offer the opportunity for a public meeting rather than automatically holding one for this ROD Amendment. Offering the opportunity for the meeting is consistent with what is required by the National Oil and Hazardous Substances Contingency Plan (NCP). The first page of the Amended Proposed Plan and the first paragraph of the two newspaper ads clearly stated,

> *"The National Oil and Hazardous Substances Contingency Plan (NCP), requires that EPA provide an opportunity of a public meeting during the public comment period. If you would like for EPA to hold such a meeting in the Castle Hayne area, please contact EPA Community Involvement Coordinator Angela Miller, as soon as possible during the public comment period."*

Several requests for a meeting were received by EPA. Therefore, a meeting was held on May 3, 2007. EPA's response to the comments received during the public comment period is included in the Responsiveness Summary, located in Part 3.

2.3.5 Information Repositories and Administrative Record

The Information Repositories were established in July 2002. The Administrative Record file was updated on April 6, 2007 to incorporate files related to this ROD Amendment. The update was placed in both information repositories listed below.

New Hanover Public Library
201 Chestnut Street
Wilmington, NC 28401
Phone: (910) 798-6301
Hours:

Monday - Thursday:	8 am - 9 pm
Friday & Saturday:	9 am - 5 pm
Sunday:	1 pm - 5 pm

EPA Records Center
61 Forsyth Street, SW
Atlanta, GA 30303-8960
Phone: (404) 562-8946
Hours:

Monday - Friday:	8 am - 4 pm

2.4 Scope and Role of Response Action

The overall clean-up strategy for this Site is to reduce the amount of contamination in soils, sediments, surface water and groundwater to protect both human and ecological receptors and return the Site to useable property. EPA still retains the use of only one Operable Unit for this Site. The remedy will remove soil and sediment above clean-up goals, and will treat surface water from Ponds 1, 2, 3 and 4, and from any activities resulting from the remedial action (e.g., dewatering activities) contaminated with VOCs, SVOCs (primarily PAHs), and inorganic compounds above clean-up goals. The contaminated soil and sediment will be excavated and disposed of at an approved landfill. Surface water will be treated and disposed on-site. A more detailed description is included in Section 2.12. This action will reduce the risks to human and ecological receptors to the level that unrestricted use/unlimited exposure will be allowed for soil, sediment and surface water as soon as the remedial action is completed.

The remedy also includes addition of an alkaline substance in the vicinity of the contaminated groundwater wells to temporarily, and perhaps permanently, increase the pH and thereby, reduce the concentrations of inorganic contaminants. A Declaration of Perpetual Land Use Restrictions will be placed on the property title to prevent human exposure to groundwater. Specifically, it prohibits the use of surficial groundwater for any purpose. This declaration will be attached to the title and will remain enforceable by EPA and NCDENR regardless of property ownership changes. These restrictions will remain in place until the groundwater quality improves enough to allow for unrestricted use and unlimited exposure.

The Remedial Action Work Plan has been drafted and will be finalized and implemented as soon as the ROD Amendment is approved. The draft schedule plans for construction activities to begin in June 2007 and be completed by the end of the summer of 2007.

2.5 Site Characteristics

This section of the Amended ROD provides conceptual site models, an overview of Site contamination, and a description of groundwater. Detailed information can be found in the Remedial Investigation, Risk Assessments and Remedial Design for this Site.

2.5.1 Conceptual Site Model

The Conceptual Site Model (CSM) developed in the Baseline Human Health Risk Assessment (BHHRA) is presented in Table 1. The CSM developed in the Ecological Risk Assessment is presented in Table 2. The CSM identifies sources of contamination, release mechanisms, affected media and exposure routes. These tables are identical to those in the 2002 ROD.

Table 1 - Conceptual Site Model (Human Receptors)

Scenario	Receptor	Exposure Pathway(s)	Exposure Routes
EPS-1 Current Use	Trespasser	Surface Soil (0-1 feet)	Incidental Ingestion
			Dermal Contact
			Inhalation of Particulates
			Inhalation of Volatiles
		Surface Water (Drainages)	Dermal Contact
		Surface Water (Ponds)	Dermal Contact
EPS-2 Future Use	Child and Adult Resident	Surface Soil	Incidental Ingestion
			Dermal Contact
			Inhalation of Particulates
			Inhalation of Volatiles
		Groundwater	Ingestion
			Non-ingestion Uses (inhalation of volatiles from household uses and dermal contact while showering)
		Surface Water (Drainages)	Dermal Contact
		Surface Water (Ponds)	Dermal Contact
EPS-3 Future Use	Industrial Worker	Surface Soil	Incidental Ingestion
			Dermal Contact
			Inhalation of Particulates
			Inhalation of Volatiles
		Groundwater	Ingestion
			Dermal Contact while showering
			Inhalation of volatiles while showering
		Surface Water (Drainages)	Dermal Contact
		Surface Water (Ponds)	Dermal Contact
EPS-4 Future Use	Construction Worker	Surface Soil	Incidental Ingestion
			Dermal Contact
			Inhalation of Particulates
			Inhalation of Volatiles

Table 2 - Conceptual Site Model (Ecological Receptors)

Primary Source	Primary Release Mechanism	Affected Media	Secondary Release Mechanism	Affected Media	Exposure Route	Terrestrial Receptor	Aquatic Receptor
Historical Process Operations	Leaks/ Drips/ Spills	Soil	Soil	Soil	Ingestion	√	
					Dermal	X	
					Inhalation	X	
					Prey	√	
			Runoff	Surface Water	Ingestion	√	√
					Dermal	X	√
					Inhalation	X	√
					Prey	√	√
			Surface Runoff	Sediment	Ingestion	√	√
					Dermal	X	√
					Inhalation	X	√
					Prey	√	√
	Wastewater Discharge	Ditches/Drains		Surface Water	Ingestion	√	√
					Dermal	X	√
					Inhalation	X	√
					Prey	√	√
				Sediment	Ingestion	√	√
					Dermal	X	√
					Inhalation	X	√
					Prey	√	√

Notes:
√ Indicates pathways that were evaluated in the Ecological Risk Assessment
X Indicates potential pathways that were not evaluated in the Ecological Risk Assessment

2.5.2 Site Overview

The Site comprises approximately 25 acres. It is currently vacant and overgrown with vegetation and secondary growth forest. The southern border of the Site approaches wetlands which surround Prince George Creek. Several drainage ditches are present throughout the Site which ultimately flow to Prince George Creek.

2.5.3 Surface and Subsurface Features

During the Remedial Investigation (RI), the Site was broken down into the following 20 areas: Wood Chip Processing, Rosin Warehouse, North Tank Cradle, Work Tanks, South Tank Cradle, Laboratory, Garage, Still, Transformer, Pipe Shop, U-Shaped Settling Pond, Pond 1, Pond 2, Pond 3, Pond 4, Drum Disposal, Refinery Building, Piping System, Sluice, and Scrap Copper Area. Of those, only the following areas were determined to contain concentrations of chemicals above the clean-up goals established in the 2002 ROD: Scrap Copper Area, Drum Disposal Area, Pipe Shop Area, Pond 1, Pond 2, Pond 3 and Pond 4.

Photo 1 - South Tank Cradle

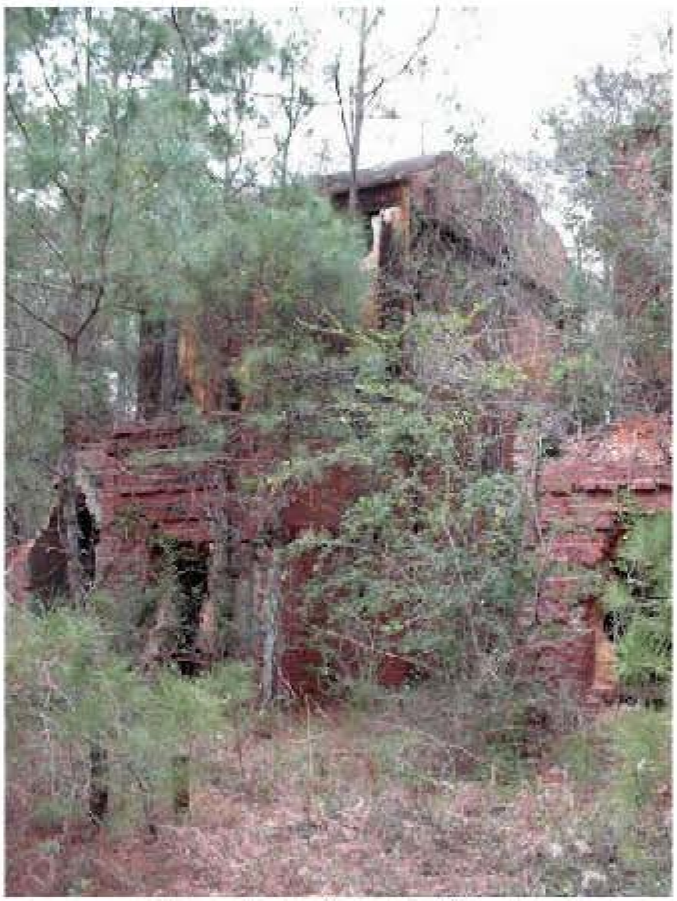


Photo 2 - Refinery Building

2.5.4 Sampling Strategy

During the RI surface soil, subsurface soil, sediment, surface water and groundwater were sampled at over one hundred locations. The samples were analyzed for VOCs, SVOCs, Pesticides, Polychlorinated biphenyls (PCBs), Metals, and Dioxins/Furans. During the Ecological Risk Assessment (ERA), 7 surface soil, 8 sediment and 6 surface water samples were obtained and analyzed for VOCs, SVOCs, Metals, and Dioxins/Furans.

During the Remedial Design (RD), the sampling strategy was to obtain design specific information. A sample was obtained from soil on a portion of the property that the owner requested be used as a fill source during the remedial action, and was analyzed for VOCs, SVOCs, Metals, PCBs and Pesticides. Soil and sediment samples were collected and analyzed by TCLP to determine disposal requirements. Groundwater samples were collected twice during the RD to answer uncertainty questions related to thallium detected during the RI.

2.5.5 Known and/or Suspected Sources of Contamination

Suspected sources of contamination include solvents utilized in the manufacturing process. It appears that wastes were deposited into four of the on-site ponds/surface impoundments. Drums were also left on-site. Another source of contamination is from scrap copper processing on a small portion of the Site.

2.5.6 Types of Contamination and Affected Media

A detailed description of the sampling events from the RI and ERA can be found in the source documents as well as in the 2002 ROD. The following sections include only tables that illustrate sampling locations that exceed the 2002 ROD clean-up goals, and a brief description of the samples collected during the RD.

2.5.6.1 Surface Soil

Surface soils are considered soils ranging between zero and one foot in depth from the soil surface. Over 100 surface soil samples were collected during the RI and ERA. The samples with results greater than $1x10^{-5}$ carcinogenic risk level and non-carcinogenic risk greater than a Hazard Quotient (HQ) of 1 from the Baseline Human Health Risk Assessment and values greater than those thought to be protective of ecological receptors according to the Ecological Risk Assessment are included in Table 3. Clean-up goals were established in the 2002 ROD for surface soil for benzo(a) pyrene, benzo(b &/or k) fluoranthene, dibenzo(a, h) anthracene, antimony, copper and lead.

Table 3 – Surface Soil Analytical Results that Exceed $1x10^{-5}$ or HQ=1 Risk Value

Sample ID:	Clean-up Goal	Note	SS-11	SS-13	SS-14	RC111SS	SS-23	SS-26	RC126SS	SS-85
Sample Date:			1997	1997	1997	2001	1997	1997	2001	1997
Sample Area:			Scrap Copper Area				Drum Disposal Area			Pipe Shop
SVOCs (µg/kg)										
Benzo(a)pyrene	610	1	**620**	**3100**	--	**2500 J**	**850 J**	**3900**	**9500 J**	160 J
Benzo(b&/or k)fluoranthene	6100	1	840 J	4000 J	--	1980 J	1,300 J	5300 J	**11,800 J**	310 J
Dibenzo(a,h)anthracene	610	1	--	--	--	330 J	--	--	**930 J**	--
METALS (mg/kg)										
Antimony	30	2	22	15	31	**370**	NA	NA	3.7	**67 J**
Copper	2700	3	**3400 J**	**5900 J**	**4900 J**	**99,000**	NA	NA	59	**3400**
Lead	400	4	210 J	140 J	330 J	**2,100**	NA	NA	42	**410**

Notes:

Units for SVOCs are microgram/kilogram (µg/kg); metals are milligram/kilogram (mg/kg).

1. Clean-up goal is the value for carcinogenic risk of $1x10^{-5}$.
2. Clean-up goal is the value for non-carcinogenic Hazard Quotient = 1.
3. Clean-up goal is the highest concentration in a sample that did not exhibit toxicity in the Ecological Risk Assessment.
4. Clean-up goal is EPA's guidance on clean-up values for residential properties. Lead was not identified as a COPC in the BHHRA. The highest concentration was detected during the ERA, after the BHHRA was finalized.

-- Concentration below minimum quantification limit

J = estimated concentration

NA = Not analyzed

Concentrations in Bold font/red highlight exceed the Clean-up goal for the analyte in bold font.

During the RD, in March 2003, surface soil samples were collected from the drum disposal area, the scrap copper area and the pipe shop area for the purposes of determining disposal requirements. One surface soil sample (RC-SS-03) was collected from the drum disposal area for TCLP VOC analysis. Composite soil samples were collected from the pipe shop area (RC-SS-Comp1), scrap copper area (RC-SS-Comp2), and drum disposal area (RC-SS-Comp3) for TCLP metals and TCLP extractable organics analysis. Analytical results indicated one sample (RC-SS-Comp2) failed the TCLP criteria for lead. In June 2003 a surface soil sample (SS1) was composited from all three surface soil sample locations and analyzed by TCLP for metals. This sample had a detection of lead, but it was less than the value allowable under RCRA for disposal as non-hazardous. The results are summarized in Table 4.

Table 4 - Surface Soil TCLP Results

Sample ID:		**RC-SS-03**	**RC-SS-Comp1**	**RC-SS-Comp2**	**RC-SS-Comp3**	**SS1**
Sample Area:		**Drum Disposal**	**Pipe Shop**	**Scrap Copper**	**Drum Disposal**	**Composite**
Sample Date:		**3/21/2003**	**3/20/2003**	**3/21/2003**	**3/21/2003**	**6/11/2003**
	RCRA Limit					
TCLP VOCs		BQL	NA	NA	NA	NA
TCLP SVOCs		NA	BQL			
TCLP Metals (mg/L)		NA	BQL	BQL	BQL	BQL
Arsenic	5	NA	BQL	BQL	BQL	BQL
Barium	100	NA	BQL	BQL	BQL	BQL
Cadmium	1	NA	BQL	BQL	BQL	BQL
Chromium	5	NA	BQL	BQL	BQL	BQL
Lead	5	NA	BQL	**12.6**	BQL	1.23
Mercury	0.2	NA	BQL	BQL	BQL	BQL
Selenium	1	NA	BQL	BQL	BQL	BQL
Silver	5	NA	BQL	BQL	BQL	BQL

Notes:
BQL = Below Quantification Limit
NA = Not Analyzed
Red highlight indicates concentration exceeds RCRA limit for disposal as non-hazardous waste.

Also during the RD, a sample was collected from an area that the property owner indicated could be used as a borrow source for backfill material. The sample was analyzed for VOCs, SVOCs, RCRA 8 metals, Pesticides and PCBs. The only detections were for three metals, which are at naturally occurring concentrations. A summary of the results and a listing of average metals concentrations from the four background samples collected during the RI are included in Table 5. The results indicate that the source is acceptable to use as fill material.

Table 5 - Proposed Fill Source Sample Results

Sample ID: Sample Date:	SB-1 9/17/2003	Average RI soil metals background concentration
VOCs	BQL	
SVOCs	BQL	
Metals (mg/kg)		
Arsenic	BQL	BQL
Barium	BQL	7
Cadmium	BQL	0.11
Chromium	3.45	3.6
Lead	4.39	7.4
Mercury	0.0206	BQL
Selenium	BQL	BQL
Silver	BQL	00.18
Pesticides	BQL	
PCBs	BQL	

Notes:
BQL = Below Quantification Limit

2.5.6.2 Subsurface Soil

During the RI, 35 subsurface soil samples were obtained. The samples were obtained from the vadose zone, typically 4- to 8-feet below ground surface. All results were below the clean-up goals that were established in section 2.12.4.2 of the 2002 ROD.

2.5.6.3 Sediment

During the RI, a total of 32 sediment samples were obtained from on-site ponds, on- and off-site drainage ditches, small streams, creeks, and swamps. During the Ecological Risk Assessment process, seven sediment samples were obtained from the ponds, Prince George Creek and one background pond.

Sediment was not considered as a pathway/media of concern in the BHHRA. Four contaminants were present on-site at concentrations exceeding the Baseline Ecological Risk Assessment's Alternative Toxicity Values (ATV). A summary of the sediment results exceeding ATVs are presented in Table 6. The contaminants of concern for sediment are: toluene, (3 and/or 4)-methylphenol, total PAHs, and copper.

Table 6 – Sediment Samples with Results Greater than ATVs

Sample ID:	ATV	SE-02	SE-03	SE-12	SE-25	RC103SS	SE-04	SE-10	RC104SS	SE-9	SE-21
Sample Date:		1999	1999	1997	1998	2001		1997	2001	1997	1997
Sample Area:		Pond 2	Pond 3				Pond 4			Drum Disposal	SW Wetland
VOCs (µg/kg)											
Toluene	8,050	NA	NA	7,600	**29,000**	**29,000**	NA	**500,000**	--	--	460 J
SVOCs (µg/kg)											
(3 and/or 4)-Methylphenol	50	NA	NA	**8300 J**	--	**56,000 J**	NA	**10,000 J**	**4,600 J**	--	**94 J**
Total PAHs	13,660	NA	NA	--	--	**218,690**	NA	--	**25,630**	**85,600**	--
METALS (mg/kg)											
Copper	197	**208 J**	**245 J**	NA	NA	**920**	**655 J**	NA	**770**	NA	NA

Notes:
ATV = Alternate Toxicity Value
J = estimated value
NA = Not Analyzed
-- Concentration below minimum quantification limit
Concentrations in bold font/red highlight exceed the ATV.

During the RD, sediment samples were collected from the four ponds and analyzed by TCLP for VOCs, metals, and extractable organics for the purposes of determining disposal requirements. One sediment sample (RD-SD-01) was collected from Pond 4 for TCLP VOC analysis. A composite sediment sample was collected from Ponds 1, 2, 3, and 4 for TCLP metals and TCLP extractable organics analysis. All results were below the laboratory's quantification limit, which indicates that the sediment may be disposed as a non-hazardous waste.

Table 7 - Sediment TCLP Results

Sample ID:	RC-SD-1	RC-SD-Comp1
Sample Area:	**Pond 4**	**Ponds 1-4**
Sample Date:	**3/23/2003**	**3/21/2003**
TCLP VOCs	BQL	NA
TCLP SVOCs	NA	BQL
TCLP Metals	NA	BQL

Notes:
BQL = Below Quantification Limit
NA = Not Analyzed

2.5.6.4 Surface Water

During the RI, surface water samples were obtained from 19 sample locations from on-site ponds, on- and off-site drainage ditches, and Prince George Creek. During the Ecological Risk Assessment process, six surface water samples were obtained.

Samples exceeding North Carolina Surface Water Standards (NC SWS) or National Recommended Water Quality Criteria (NRWQC) from the RI and ERA are in the following two tables. The results from the RI samples are summarized in Table 8. The results from the ERA samples are summarized in Table 9.

During the Remedial Design, one surface water sample (RC-SW-01) was collected from Pond 2 for TCLP VOC analysis. Surface water was then composited from Ponds 1, 2, 3, and 4 and sampled for TCLP extractable organic and TCLP metals analysis. All results were below the laboratories quantification limits and therefore, no summary table will be presented for this event.

While preparing this ROD Amendment, the current National Ambient Water Quality Criteria were reviewed to determine if any changes have been made since the ROD was written in 2002. The values used in the 2002 ROD are current.

Table 8 – RI Surface Water Analytical Results Exceeding Surface Water Quality Standards

			Sample ID:	SW-1	SW-2	SW-3	SW-4	SW-10	SW-13	SW-15	SW-18	SW-19	SW-20	SW-21
			Sample Area:	Northwest Upgradient		Northeast Upgradient		Pond 3	SE Corner	Sluice & Ditch	East PGC	SE PGC	South PGC	SW PGC
	SWS[1]	WQC[2]	ROD											
VOCs (µg/L)														
Toluene	0.36	6,800[A]	NE	--	--	--	--	23	--	--	--	--	NA	--
SVOCs (µg/L)														
Fluoranthene	0.031[B]	1,300[A]	NE	--	--	--	--	2 J	--	--	--	--	--	--
Phenanthrene	0.031[B]	NL	NE	--	--	--	--	3 J	--	--	--	--	--	--
METALS (µg/L)														
Aluminum	NL	87**	NE	990 J	880 J	--	--	NA	2,200 J	690	4,900	480	998	451
Copper	7*	9	7	33	31	30	28	NA	110	--	--	--	--	--
Iron	1,000*	1,000	1,000	680	510	410	--	NA	8,800	11,000	13,000	725	3,690	1,060
Lead	3.1	2.5	2.5	4	4	--	--	NA	13	--	9	--	--	--
Silver	0.06*	3.4***	NE	31	18	11	12	NA	44	--	--	--	--	--
Zinc	50*	120	50	26	33	23	45	NA	95	29	30	10.2	26.6	19.3
PESTICIDES (µg/L)														
Heptachlor	0.004	0.0038	NE	--	--	--	0.0095 J	NA	--	--	--	--	--	--
Alpha-Chlordane	0.004	0.0043	NE	--	--	--	0.019 J	NA	--	--	--	--	--	--

Notes:

1 North Carolina Surface Water Standards

2 National Recommended Water Quality Criteria for Priority and Non-Priority Toxic Pollutants, freshwater Criterion Continuous Concentration

A human health for consumption of water plus organism

B polynuclear aromatic hydrocarbons (surface waters) to protect human health from carcinogens through consumption of fish only

* Numerical ambient surface water quality standard

** EPA is aware of field data indicating that many high quality waters in the US contain more than 87 µg aluminum/L, when either total recoverable or dissolved measured

*** Criteria Maximum Concentration

-- concentration below quantification limit

J = estimated value

NA = Not Analyzed

NE = Clean-up goal not established in 2002 ROD.

NL = Not Listed

PGC = Prince George Creek

Concentration exceeds either a State or Federal surface water quality standard. No clean-up goals were set for these contaminants in the 2002 ROD.

Concentration exceeds 2002 ROD surface water clean-up goals.

Table 9 – ERA Surface Water Data Exceeding Water Quality Standards

	SWS[1]	WQC[2]	ROD	RC105SW	RC101SW	RC102SW	RC121SW	RC122SW	RC222SW (Duplicate)	RC123SW
Sample Area:				Back-ground Pond	Pond 1	Pond 2	PGC			PGC Back-ground
VOCs (μg/L)										
Toluene	0.36	6,800^A	NE	--	--	4	--	--	--	--
METALS (μg/L)										
Aluminum	NL	87**	NE	680 J	240 J	280 J	210 J	280 J	130 J	140 J
Copper	7*	9	7	--	61 J	--	40 J	--	--	--
Iron	1,000*	1,000	1,000	310	6900	4800	750	1600	1800	3500
Lead ^	3.1	2.5	2.5	18 J	35 J	8.6 J	18 J	12 J	15 J	13 J
Zinc	50*	120	50	50	61	41	51	39	--	--

Notes:

1 North Carolina Surface Water Standards

2 National Recommended Water Quality Criteria for Priority and Non-Priority Toxic Pollutants, freshwater Criterion Continuous Concentration

A human health for consumption of water plus organism

* Numerical ambient surface water quality standard

** EPA is aware of field data indicating that many high quality waters in the US contain more than 87 μg aluminum/L, when either total recoverable or dissolved measured.

-- Concentration below minimum quantification limit

^ Lead was also detected in the trip blank at 4.4 μg/kg

NE = Clean-up goal not established in 2002 ROD

NL = Not Listed

PGC = Prince George Creek

Concentration exceeds either a State or Federal surface water quality standard. No clean-up goals were set for these contaminants in the 2002 ROD.

Concentration exceeds 2002 ROD surface water clean-up goals.

2.5.6.5 Groundwater

During the RI, groundwater samples were obtained from temporary wells, pre-existing on-site production wells, permanent monitor wells installed during the RI, residential wells, and community wells. During the RD, two permanent wells were installed and two rounds of sampling were conducted.

2.5.6.5.1 Temporary Wells

In 1997, 36 groundwater samples were obtained from temporary wells installed as a part of the RI. Of these samples, only two exceeded either the North Carolina Administrative Code, Subchapter 2L, Maximum Contaminant Level or the Federal Safe Drinking Water Act Maximum Contaminant Level (MCLs) for VOCs. All 32 samples analyzed for metals exceeded MCLs or Federal Safe Drinking Water Act Secondary MCLs (SMCLs) for at least one metal, including the 4 background samples. Table 10 includes sample locations which exceeded MCL values, excluding metals.

Table 10 - 1997 Temporary Well Groundwater Results Exceeding MCLs (excluding metals)

		Sample ID:	GPW-4	GPW-4	GPW-13	GPW-15
		Depth Collected (feet):	7.5	23	11.5	22.5
		Sample Area:				
	MCL[1]	MCL[2]	Northwest Upgradient (Background)		Still	Pipeline
VOCs (µg/L)						
Benzene	1	5	--	--	2J	2J
METALS (µg/L)						
NUMEROUS EXCEEDED MCLS BUT ARE NOT INCLUDED IN THIS TABLE[3]						

Notes:
1 North Carolina Administrative Code, Subchapter 2L, Maximum Contaminant Level
2 Federal Safe Drinking Water Act Maximum Contaminant Level
3 At least one inorganic exceeded MCLs for each of the 32 samples analyzed, but due to questions regarding turbidity, the data isn't presented in this table.
J = estimated value
-- concentration below quantification limit

Concentration exceeds State 2L standard or Federal secondary MCL/treatment technique criteria, but less than the 2002 ROD clean-up goal

Concentration exceeds the 2002 ROD clean-up goal

Because of the elevated inorganic concentrations in all 1997 temporary wells, including upgradient ones, and the lack of turbidity data, it was thought that the elevated concentrations may have been a result of turbid samples. Therefore, additional temporary well sampling occurred in May 1999.

An attempt was made to reduce the amount of turbidity in the samples. All ten had at least one metal concentration above MCLs/SMCLs. One of the four samples analyzed for dioxins/furans had a dioxin TEQ concentration which exceeded the 2,3,7,8-TCDD MCL. Neither of the two samples analyzed for VOCs and SVOCs, located in the scrap copper area and drum disposal area, exceeded MCLs. A summary of results that exceeded MCL values for at least one inorganic compound are included in Table 11 on the following page.

2.5.6.5.2 Production Wells

Photo 3 - Rusted rectangular box is covering a production well

During the RI, the three on-site existing production wells were sampled in 1997. Two of the wells were sampled again in 1999. None of the VOCs, SVOCs, or pesticides/PCBs exceeded MCLs. All five samples exceeded MCLs for metals and one sample obtained in 1997 exceeded 2,3,7,8-TCDD MCLs for dioxin TEQ.

During the RD, attempts were made to resample PW-3 for inorganic analysis in March and September 2003. During both attempts, blockages were encountered in the well which prevented sampling. Samples were obtained from PW-1 and PW-2. The sample results that exceeded MCLs for inorganic compounds are listed in Table 12.

2.5.6.5.3 Permanent Monitor Wells

During the RI, 8 permanent monitor wells were installed, sampled, and analyzed for VOCs, SVOCs, Pesticides, PCBs, Dioxin, and Metals. In May 1999, monitoring well MW-1 was sampled and analyzed for metals only. Only aluminum, iron and manganese exceeded state groundwater standards (2L) and federal secondary MCLs.

During the RD, a shallow and deep well (MW-7S and MW-7D) were installed near the drum disposal area where temporary monitoring well 8, which had elevated concentrations of metals, had been placed. All monitoring wells were sampled in March and September 2003, and were analyzed for inorganics, with the exception of calcium, iron, magnesium, potassium, sodium, mercury and cyanide. The sample results that exceeded MCLs for permanent monitoring wells are listed in Tables 13a-13d. As is indicated in the tables, thallium was not detected above MCL values during the RD sampling events. Background wells only had detections of aluminum, iron and manganese above secondary MCL or 2L values. Aluminum was only detected in wells MW-7S and MW-7D above the 2002 ROD established clean-up goal. Arsenic was detected above the MCL value in March 2003 in well MW-2, but the value was below the MCL in the September 2003 sampling event. Wells MW-7S and MW-7D had concentrations of beryllium, chromium, iron manganese and nickel which exceed MCL or 2L values. These wells also had pH and turbidity values outside of acceptable ranges. Figure 4-2 on the following page illustrates groundwater flow information from the RD as well as permanent monitoring well locations.

Soil samples collected from the Drum Disposal Area (close to wells MW-7S and MW-7D) during the RI indicated concentrations of these metals to be approximately the same as background values. Therefore, the elevated concentrations of these naturally occurring metals in groundwater wells MW-7S and MW-7D are thought to be related to groundwater pH. Table 14 includes concentrations of metals from background and Drum Disposal Area samples for metals that groundwater had exceedances of MCLs or 2L values.

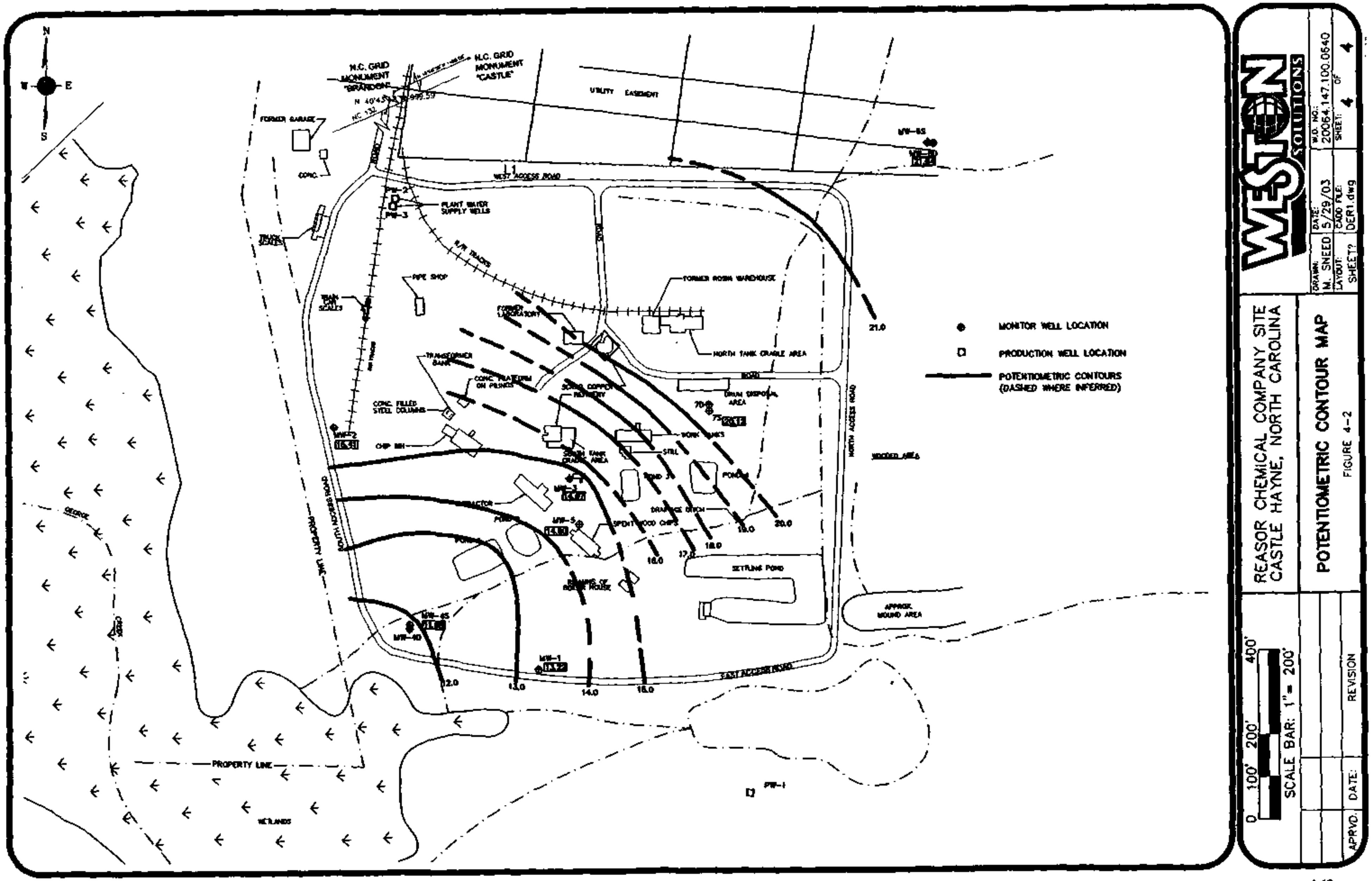

WESTON SOLUTIONS
REASOR CHEMICAL COMPANY SITE
CASTLE HAYNE, NORTH CAROLINA
POTENTIOMETRIC CONTOUR MAP
FIGURE 4-2
DRAWN: M. SNEED
DATE: 5/29/03
W.O. NO.: 20064.147.100.0640
LAYOUT: SHEET?
CADD FILE: DER1.dwg
SHEET: 4 OF 4
SCALE BAR: 1" = 200'
0 100' 200' 400'
REVISION
APPRVD. DATE:
MONITOR WELL LOCATION
PRODUCTION WELL LOCATION
POTENTIOMETRIC CONTOURS (DASHED WHERE INFERRED)
N.C. GRID MONUMENT "BRANDON"
N.C. GRID MONUMENT "CASTLE"
UTILITY EASEMENT
WEST ACCESS ROAD
NORTH ACCESS ROAD
EAST ACCESS ROAD
SOUTH ACCESS ROAD
PROPERTY LINE
FORMER GARAGE
PLANT WATER SUPPLY WELLS
R/R TRACKS
PIPE SHOP
FORMER ROSIN WAREHOUSE
FORMER LABORATORY
NORTH TANK CRADLE AREA
TRANSFORMER BANK
DRUM DISPOSAL AREA
WORK TANKS
STILL
POND 3
POND 4
DRAINAGE DITCH
SPENT WOOD CHIPS
SETTLING POND
APPROX. MOUND AREA
WOODED AREA
WETLANDS
CHIP MH
MW-1
MW-2
MW-3
MW-5
MW-4S
MW-4D
MW-6S
PW-1
PW-2
PW-3
12.0
13.0
14.0
15.0
16.0
17.0
18.0
19.0
20.0
21.0

Table 11 - 1999 Temporary Well Groundwater Results Exceeding Inorganic MCLs

	2L[1]	MCL[2]	ROD	TMW-1	TMW-2	TMW-3	TMW-4	TMW-5	TMW-6	TMW-7	TMW-8	TMW-9	TMW-10
Sample Depth (ft bgs):				15	18	17	16	18	16	18	18.5	19	16
Sample Area:				NW Upgradient	W Boundary	SW Corner	Sluice	Southern Border	Pipe Shop	Scrap Copper	Drum Disposal	Pond 4	Chip Proc.
TURBIDITY (NTU):				1.11	8.23	1084	5.32	41.9	71.3	8.29	6.12	8.8	9.8
METALS (µg/L)													
Aluminum	NL	50-200*	16000	622	202	14,000	96.5 B	638	15,100	229	20,600	299	348
Beryllium	NL	4		--	0.13 B	0.54 B	--	--	0.13 B	--	4.6 B	--	--
Iron	300	300*		1870	3680	6510	1800	11,200	4760	3810	51,600	1400	3170
Lead	15	15**		2 B	2.2 B	18.4	2.4 B	1.7 B	11.4	2.9 B	1.2 B	1.8 B	2.2 B
Manganese	50	50*		144	103	181	21.7	79.5	90.7	93.5	532	68.5	89.1
Thallium	NL	2	2	2.8 B	--	2.5 B	--	4.8 B	--	--	8.4 B	--	--

Notes:

1 North Carolina Administrative Code, Subchapter 2L, Maximum Contaminant Level (MCL)

2 Federal Safe Drinking Water Act MCL

* Secondary MCL - These values are based on aesthetics rather than health effects and are not used by EPA as clean-up goals for Superfund sites.

** in more than 10% of tap water samples

B = analyte analyzed and value obtained from reading less than Contract Required Detection Limit but greater than or equal to Instrument Detection Limit

ft bgs = feet below ground surface

NA = Not Analyzed

NL = Not Listed

Proc. = Processing

-- concentration below quantification limit

Concentration exceeds State 2L standard or Federal secondary MCL/treatment technique criteria, but less than the 2002 ROD clean-up goal

Concentration exceeds the 2002 ROD clean-up goal

Table 12 – 1997-2003 Production Well Sample Results Exceeding Inorganic MCLs

			SAMPLE ID:	**PW-1**				**PW-2**					**PW-3**		
			Date Collected:	**Dec-97**	**Mar-03**	**Mar-03**	**Sep-03**	**Dec-97**	**May-99**	**Mar-03**	**Mar-03**	**Sep-03**	**Dec-97**	**May-99**	**2003**
			Sample timeframe:	**RI**	**RD-1**	**RD-1**	**RD-2**	**RI**	**RI**	**RD-1**	**RD-1**	**RD-2**	**RI**	**RI**	**RD**
			Special Notes:			**Filtered**					**Duplicate**				**Blockage**
			Sample Area:	**East of Sluice**				**SW Corner (West)**					**SW Corner (East)**		
			Depth to Water:	**NI**	**8.11**	**8.11**	**8.57**	**NI**	**NI**	**10.1**	**10.1**	**11.86**	**NI**	**NI**	**NA**
	2L[1]	**MCL[2]**	**ROD**												
TURBIDITY		1***		3.3	986	986	8	6.6	9.95	9.47	9.47	6	3	16.9	NA
pH	6.5	6.5-8.5*		6.7	6.29	6.29	6.3	7.9	NI	6.67	6.67	5.21	4.8	NI	NA
METALS (µg/L)															
Aluminum	NL	50 to 200*	16000	--	4600 J	--	200 J	3200 J	1710	1400 J	1400 J	1200 J	--	25.2 B	NA
Iron	300	300*		15,000	120,000	1600	NA	14,000	7640	6300	6400	NA	11,000	9820	NA
Manganese	50	50*		150	99	92	330	74	45	57	58	53	110	123	NA
Mercury	1.1	2**		2.0	--	--	NA	--	--	--	--	NA	--	0.24	NA
Thallium	NL	2	2	NI	--	--	--	NI	--	--	--	0.03 J	NI	2.6 B	NA

Notes:

[1]North Carolina Administrative Code, Subchapter 2L Maximum Contaminant Level

[2]Safe Drinking Water Act (SWDA) Maximum Contaminant Level (MCL), Secondary MCL or Treatment Technique Requirement

* = Secondary Maximum Contaminant Level

** = inorganic mercury

*** = SDWA Treatment Technique requirement prior to consumption

-- concentration below quantification limit

µg/L = micrograms per liter

B = reported value obtained from a reading less than Contract Required Detection Limit but greater than or equal to Instrument Detection Limit

J = estimated value

NI = Data not included in RI summary table

NL = Not Listed

NA = Not Analyzed

Concentration exceeds State 2L standard or Federal secondary MCL, but less than the 2002 ROD clean-up goal

Concentration exceeds the 2002 ROD clean-up goal

Table 13a - Groundwater Monitoring Well Analytical Results Exceeding MCL, SMCL, or 2L values (Background)

			SAMPLE ID:	Background: MW-6S					Background: MW-6D		
			Date Collected:	Dec-97	Mar-03	Mar-03	Sep-03	Sep-03	Dec-97	Mar-03	Sep-03
			Sample Timeframe:	RI	RD-1	RD-1	RD-2	RD-2	RI	RD-1	RD-2
			Special Notes:			Filtered		Filtered			
			Sample Area:	Background wells - Northwest Upgradient							
			Depth to Water (feet):	NI	2.93	2.93	5.65	5.65	NI	11.73	12.1
	2L[1]	MCL[2]	ROD								
TURBIDITY		1***		132.3	67.9	67.9	50	50	27.7	10.12	10
pH	6.5	6.5-8.5*		4.1	7.48	7.48	5.11	5.11	7.3	10.32	9.62
METALS (µg/l)											
Aluminum	NL	50 TO 200*	16000	8,500	2,100 J	--	2,700 J	150 J	--	--	110 J
Arsenic	50	10		--	--	--	3.7	2.7	--	--	0.52 J
Beryllium	NL	4		--	--	--	0.12 J	--	--	--	--
Chromium	50	100		13	3.9	--	7.2	--	--	--	--
Iron	300	300*		3,700	7,900	7,200	NA	NA	11,000	7,000	NA
Lead	15	15**		5	1.2 R	--	4.4 J	0.10 J	--	--	--
Manganese	50	50*		50	54	54	56 J	51 J	130	100	49 J
Nickel	100	NL		10 J	1.5 R	--	7.6 J	1.9 J	--	5.7	5.8 J
Thallium	2	2	2	--	--	--	0.03 J	--	--	--	--

Notes:

[1]North Carolina Administrative Code, Subchapter 2L Maximum Contaminant Level

[2]Safe Drinking Water Act (SWDA) Maximum Contaminant Level (MCL), Secondary MCL or Treatment Technique Requirement

* = Secondary Maximum Contaminant Level

** = in more than 10% of tap water samples

*** = SDWA Treatment Technique requirement prior to consumption

-- concentration below quantification limit

B = value obtained is less than Contract Required Detection Limit but greater than or equal to Instrument Detection Limit

J = estimated value

NI = Information not included in RI report

NL = Not Listed

R = concentration of analyte can not be accurately determined, data unusable

NA = Not Analyzed

Concentration exceeds State 2L standard or Federal secondary MCL, but less than the 2002 ROD clean-up goal

Concentration exceeds the 2002 ROD clean-up goal

Table 13b – Groundwater Monitoring Well Analytical Results Exceeding MCL, SMCL, or 2L values (MW-1 and MW-2)

			SAMPLE ID:	MW-1					MW-2				
			Date Collected:	Dec-97	May-99	Mar-03	Sep-03	Sep-03	Dec-97	Mar-03	Mar-03	Sep-03	Sep-03
			Sample Timeframe:	RI	RI	RD-1	RD-2	RD-2	RI	RD-1	RD-1	RD-2	RD-2
			Special Notes:					Duplicate			Filtered		Filtered
			Sample Area:	Eastern Border					Southern Border				
			Depth to Water (feet):	NI	NI	6.58	8.12	8.12	NI	7.91	7.91	8.59	8.59
	2L[1]	MCL[2]	ROD										
TURBIDITY		1***		5.65	NI	0.6	0	0	17.25	20.7	20.7	25	25
pH	6.5	6.5-8.5*		3.6	NI	6.08	4.87	4.87	4.5	7.8	7.8	5.74	5.74
METALS (µg/l)													
Aluminum	NL	50 TO 200*	16000	--	672	--	--	--	--	--	--	270 J	--
Arsenic	50	10		--	--	9.1	1.1	0.84 J	--	--	41	5.6	2.2
Beryllium	NL	4		--	0.41	--	0.5 J	0.51 J	--	--	--	--	--
Chromium	50	100		--	2.1	--	--	--	--	--	6.8	--	--
Iron	300	300*		380	1,860	8,100	NA	NA	790	2,300	39,000	NA	NA
Lead	15	15**		--	2.5	--	--	--	--	--	--	0.43 J	--
Manganese	50	50*		36	142	45	23 J	23	94	44	53	47 J	58 J
Nickel	100	NL		94	22.0	8.9	1.7 J	1.7 J	--	--	--	0.23 J	0.53 J
Thallium	2	2	2	--	--	--	--	0.01 J	--	--	--	--	0.08 J

Notes:

[1]North Carolina Administrative Code, Subchapter 2L Maximum Contaminant Level

[2]Safe Drinking Water Act (SWDA) Maximum Contaminant Level (MCL), Secondary MCL or Treatment Technique Requirement

* = Secondary Maximum Contaminant Level

** = in more than 10% of tap water samples

*** = SDWA Treatment Technique requirement prior to consumption

-- concentration below quantification limit

B = value obtained is less than Contract Required Detection Limit but greater than or equal to Instrument Detection Limit

J = estimated value

NA = Not Analyzed

NI = Information not included in RI report

NL = Not Listed

R = concentration of analyte can not be accurately determined, data unusable

Concentration exceeds State 2L standard or Federal secondary MCL, but less than the 2002 ROD clean-up goal

Concentration exceeds the 2002 ROD clean-up goal

Table 13c – Groundwater Monitoring Well Analytical Results Exceeding MCL, SMCL, or 2L values (MW-3, MW-4S and MW-4D)

			SAMPLE ID:	MW-3			MW-4S			MW-4D			
			Date Collected:	Dec-97	Mar-03	Sep-03	Dec-97	Mar-03	Sep-03	Dec-97	Mar-03	Mar-03	Sep-03
			Sample Timeframe:	RI	RD-1	RD-2	RI	RD-1	RD-2	RI	RD-1	RD-1	RD-2
			Special Notes:									Filtered	
			Sample Area:	Refinery			Southeast Corner						
			Depth to Water (feet):	NI	6.69	8.76	NI	3.3	4.84	NI	2.69	2.69	4.24
	2L[1]	MCL[2]	ROD										
TURBIDITY		1***		29.6	9.38	1	95.1	10.1	1	86.3	18.2	18.2	5
pH	6.5	6.5-8.5*		8.4	5.09	4.87	7.4	8.16	6.5	5.1	8.03	8.03	6.5
METALS (µg/l)													
Aluminum	NL	50 TO 200*	16000	1,700	--	220 J	--	--	--	1,200	--	--	--
Arsenic	50	10		--	--	0.76 J	--	--	0.72 J	--	--	--	2.9
Beryllium	NL	4		--	--	0.03 J	--	--	--	--	--	--	0.03 J
Chromium	50	100		--	1.6 R	3.2	--	--	--	--	--	--	--
Iron	300	300*		1,700	25,000	NA	13,000	15,000	NA	11,000	20,000	20,000	NA
Lead	15	15**		4	--	0.14 J	--	--	0.21 J	--	--	--	0.13 J
Manganese	50	50*		52	45	32 J	140	150	150 J	180	140	140	130 J
Nickel	100	NL		--	--	0.23 J	--	--	2.1 J	--	1.5 R	--	3.7 J
Thallium	2	2	2	--	--	--	--	--	0.01 J	--	--	--	0.01 J

Notes:

[1]North Carolina Administrative Code, Subchapter 2L Maximum Contaminant Level

[2]Safe Drinking Water Act (SWDA) Maximum Contaminant Level (MCL), Secondary MCL or Treatment Technique Requirement

* = Secondary Maximum Contaminant Level

** = in more than 10% of tap water samples

*** = SDWA Treatment Technique requirement prior to consumption

-- concentration below quantification limit

B = value obtained is less than Contract Required Detection Limit but greater than or equal to Instrument Detection Limit

J = estimated value

NA = Not Analyzed

NI = Information not included in RI report

NL = Not Listed

R = concentration of analyte can not be accurately determined, data unusable

Concentration exceeds State 2L standard or Federal secondary MCL, but less than the 2002 ROD clean-up goal

Concentration exceeds the 2002 ROD clean-up goal

Table 13d – Groundwater Monitoring Well Analytical Results Exceeding MCL, SMCL or 2L values (MW-5, MW-7S and MW-7D)

			SAMPLE ID:	MW-5			MW-7S				MW-7D			
			Date Collected:	Dec-97	Mar-03	Sep-03	Mar-03	Mar-03	Sep-03	Sep-03	Mar-03	Mar-03	Sep-03	Sep-03
			Sample Timeframe:	RI	RD-1	RD-2	RD-1	RD-1	RD-2	RD-2	RD-1	RD-1	RD-2	RD-2
			Special Notes:					Filtered		Duplicate		Filtered		Filtered
			Sample Area:	S Tank Cradle			Drum Disposal Area							
			Depth to Water (feet):	NI	6.81	8.88	4.2	4.2	6.6	6.6	10.09	10.09	11.2	11.2
	2L[1]	MCL[2]	ROD											
TURBIDITY		1***		19.95	4.13	1.4	102.8	102.8	1.3	1.3	56	56	>1000	>1000
pH	6.5	6.5-8.5*		5.1	6.91	5.32	2.31	2.31	3.1	3.1	8.77	8.77	4.51	4.51
METALS (µg/l)														
Aluminum	NL	50 TO 200*	16000	--	--	110 J	220,000	240,000	110,000 J	100,000 J	850 J	--	450,000 J	5,900 J
Arsenic	50	10		--	--	1.8	6.5 R	3.7 U	2.4	1.8 J	--	--	4.4	0.66 J
Beryllium	NL	4		--	--	--	8.3	8.6	5.6 J	5.6 J	--	--	9.3 J	1.2 J
Chromium	50	100		--	0.81 R	--	40	26	690	640	--	--	91	9.7
Iron	300	300*		19,000	44,000	NA	160,000	170,000	NA	NA	36,000	35,000	NA	NA
Lead	15	15**		--	--	0.25 J	26	22	13 J	13 J	--	--	5.5 J	0.13 J
Manganese	50	50*		51	19	12 J	1300	1300	670	640	410	390	940	990
Nickel	100	NL		--	--	0.30 J	200	210	260 J	250 J	14	5.8 R	160 J	160 J
Thallium	2	2	2	--	--	--	--	--	0.28 J	0.28 J	--	--	0.18 J	0.03 J

Notes:

[1]North Carolina Administrative Code, Subchapter 2L Maximum Contaminant Level

[2]Safe Drinking Water Act (SWDA) Maximum Contaminant Level (MCL), Secondary MCL or Treatment Technique Requirement

* = Secondary Maximum Contaminant Level

** = in more than 10% of tap water samples

*** = SDWA Treatment Technique requirement prior to consumption

-- concentration below quantification limit

B = value obtained is less than Contract Required Detection Limit but greater than or equal to Instrument Detection Limit

J = estimated value

NA = Not Analyzed

NI = Information not included in RI report

NL = Not Listed

R = concentration of analyte can not be accurately determined, data unusable

Concentration exceeds State 2L standard or Federal secondary MCL, but less than the 2002 ROD clean-up goal

Concentration exceeds the 2002 ROD clean-up goal

Table 14 - RI Soil Data in Drum Disposal Area for Groundwater COCs

		Surface Soils				Subsurface Soils				
SAMPLE ID:		Min	Max	Calculation of twice the maximum background	SS-01	GP-4	GP-5	Calculation of twice the maximum background	HA-8	SU-01
Sample Interval (ft bgs):		0-1			0-1	0-4	4-8		2-4	2-3
Date Collected:		1997			1999	1997	1997		1997	1999
Sample Area:		Background			Drum Disposal	NW Background	NE Background		Drum Disposal	Drum Disposal
METALS (mg/kg)	***RBC[1]***									
Aluminum	78,000	1,300	3,400	6,800	1,290	2,300	4,400J	8,800	2,500J	2,260
Beryllium	160	--	--	--	0.11	--	--	--	--	0.12
Chromium	230	--	3.7	7	2.9	3.9J	6.4J	12.8	4.7	2.6
Iron	23,000	560	1,100	2,200	1,320	320J	4,300J	8,600	530	198
Manganese	1,600	6.5J	7.8J	16	3.1	--	3.9J	7.8	3.9J	1.2
Nickel	1,600	--	--	--	2.4	--	--	--	--	0.98
Thallium	5.5	--	--	--	1.0	--	--	--	--	0.92

Notes:

-- concentration below quantification limit

ft bgs = feet below ground surface

mg/kg = milligrams per kilogram

[1]EPA Region III Risk Based Concentration for human ingestion of soil in a residential scenario (October 1998)

Values greater than twice the maximum background concentration are shaded

2.5.6.5.4 Residential and Community Wells

During the RI, three residential wells and one community well were sampled. The residential wells were within a 3-mile radius of the Site. The community well was within a 2-mile radius of the Site. All results were below MCLs except for two metals, iron and manganese (which are secondary MCLs), in the residential wells. The results exceeding MCLs are presented in Table 15.

Table 15 - Residential Well Groundwater Results Exceeding MCL values

		Sample ID:	**RW-1**	**RW-2**	**RW-3**
	2L[1]	**MCL[2]**	**1997**	**1997**	**1997**
METALS (µg/L)					
Iron	300	300*	1,900	3,000	2,500
Manganese	50	50*	69	92	74

Notes:
1 North Carolina Administrative Code, Subchapter 2L, Maximum Contaminant Level
2 Federal Safe Drinking Water Act Maximum Contaminant Level
* Secondary MCL - These values are based on aesthetics rather than health effects and are not used by EPA as clean-up goals for Superfund sites.

Concentration exceeds State 2L standard or Federal secondary MCL. Clean-up standards for these inorganics were not set in the 2002 ROD.

During the RI, analytical data was reviewed for the Prince George Estates Community Wells. The wells were sampled in June of 1994, and May 1996. The results were below Federal MCL levels, but two exceeded State MCL levels (bromoform and chloroform). Neither of these is attributable to the Reasor Chemical Company Site.

2.5.6.6 Liquid Tar Sample

During the RI, a sample of the tar-like material immediately above the sediments in Pond 3 was sampled and analyzed for SVOCs and metals. Results were compared to surface water standards. The concentrations for five metals (copper, iron, lead, silver and zinc) exceeded State surface water standards. The results exceeding surface water standards are included in Table 16.

Table 16 - Liquid Tar Sample Results Exceeding Surface Water Standards (Pond 3)

			Sample ID:	TAR-POND 3
			Sample Area:	Pond 3
	SWS[1]	WQC[2]	ROD	
METALS (µg/L)				
Copper	7*	9	7	692
Iron	1,000*	1,000	1,000	15,100
Lead	3.1	2.5	2.5	35.9
Silver	0.06*	3.2**	NE	0.43
Zinc	50*	120	50	209

Notes:
1 North Carolina Surface Water Standards
2 National Recommended Water Quality Criteria for Priority and Non-Priority Toxic Pollutants, freshwater Criterion Continuous Concentration
* Numerical ambient surface water quality standard
** Acute value
NE = Clean-up goal not established in 2002 ROD

Concentration exceeds State or Federal surface water criteria. A clean-up goal for silver was not established in the 2002 ROD.
Concentration exceeds the 2002 ROD clean-up goal

2.5.7 Location of Contamination and Migration

This section of the Amended ROD discusses the lateral and vertical extent of contamination, current and potential future surface and subsurface routes of human or environmental exposure, and the likelihood for migration of contaminants.

2.5.7.1 Lateral and Vertical Extent of Contamination

Surface soils are contaminated with PAHs and metals above clean-up goals derived from the human health or ecological risk assessments in the following areas: Scrap copper, pipe shop, and drum disposal. Contamination extends to a depth of approximately one foot. The estimated volume of contaminated surface soil is 345 cubic yards (yd^3).

Sediments are contaminated with VOCs, SVOCs, PAHs and metals at concentrations that exceed clean-up goals. The volume of contaminated sediment is approximately 1,075 yd^3 from four specific areas: Pond 1, Pond 2, Pond 3 and Pond 4.

Surface water is contaminated with metals at concentrations that exceed clean-up goals. The volume of contaminated surface water is approximately 344,000 gallons and is currently located in Ponds 1 and 2. (Note: Ponds 3 and 4 were dry during several visits to the property.)

Groundwater is contaminated with aluminum, beryllium, chromium and nickel at concentrations that exceed clean-up goals derived in the Human Health Risk Assessment (aluminum) or MCL or 2L standards in two monitoring wells at the Site, MW-7S and MW-7D. The groundwater depths for these two wells range from 4 to 11 feet below the land surface.

Photographs of most of the areas of the Site that have contamination exceeding clean-up goals are on the following three pages. Figure 5 illustrates the areas of known contamination exceeding clean-up goals.

Photo 4 - Scrap Copper Area

Photo 5 - Drum Disposal Area

Photo 6 - Pond 1

Photo 7 - Pond 2

Photo 8 - Pond 3

Photo 9 - Pond 4 (mostly dry)

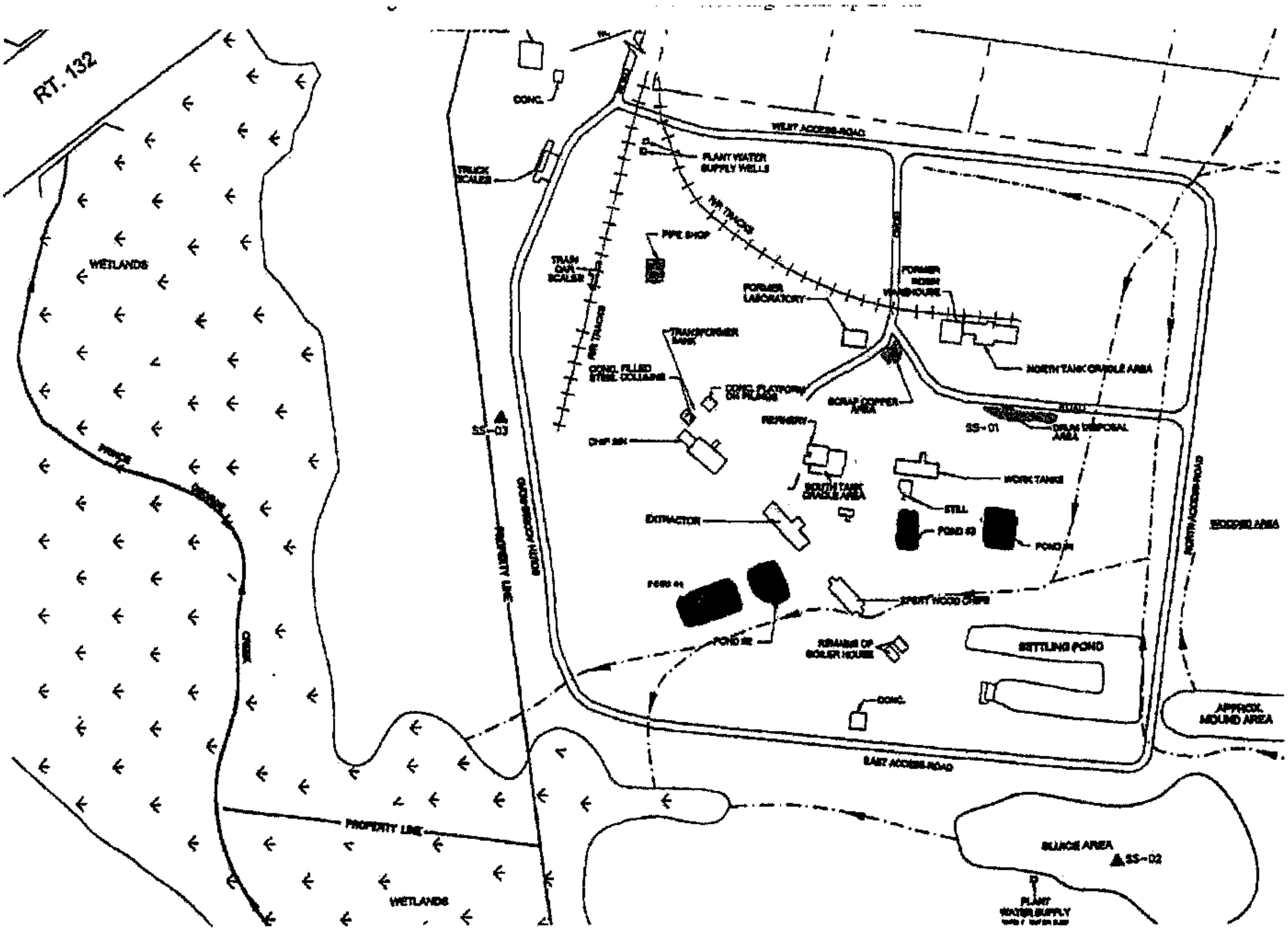


FIGURE 5 - AREAS OF CONTAMINATION EXCEEDING CLEAN-UP GOALS

2.5.7.2 Current and Potential Future Surface and Subsurface Routes of Human or Environmental Exposure

The property is currently vacant, but has been utilized by trespassers. The current routes for human exposure come from direct contact with the contaminated surface soils and surface water. Environmental impacts are occurring currently by exposure of ecological receptors to contaminated soil, sediment and surface water. The most conservative potential future routes of human exposure come from the future resident scenario. In that scenario, human exposure could come from direct contact with contaminated surface soil and surface water, in addition to ingestion of contaminated groundwater.

2.5.7.3 Likelihood for Migration

The likelihood for migration of the contaminants of concern is moderate. Surface soil and surface water contamination exist above clean-up goals on site. The site is located near a wetland and Prince George Creek. The creek has been known to flood occasionally. Heavy rains would cause the existing contamination to migrate down gradient. Down gradient migration may affect the wetlands and creek. The contaminants may also migrate into the groundwater, which may migrate off-site.

2.5.8 Groundwater Description

During the RI, hydrogeological conditions were characterized during the Geoprobe and monitor well installation, collection of water level data from temporary and monitor well locations, and hydraulic testing of newly installed monitor wells. The water table is typically found in unconsolidated overburden materials. The aquifer ranges in thickness from 17 feet thick on the southwest and northeast portion of the site to 29 feet thick on the southeast portion of the site. The depth to water ranges from approximately 3 to 12 feet. Groundwater flow direction follows site topography, flowing from the higher area contours at the northwestern edge of the site southeast toward the channel of Prince George Creek.

During the RI, WESTON installed 2 bedrock monitor wells and seven Geoprobe borings that terminated at auger refusal, which corresponded to the upper surface of the bedrock aquifer underlying the overburden aquifer. According to boring log data and information gained from the 1985 Geologic Map of North Carolina, the bedrock aquifer is a sandstone unit of the Peedee Formation.

The potentiometric surfaces of the overburden groundwater table were used to estimate the magnitude of the hydraulic gradient in the overburden aquifer. The gradient magnitude was calculated to be 0.006 ft/ft. Hydraulic conductivity in the top of bedrock monitor wells, ranged from 2.1 feet per day (ft/day) at MW-1 to 0.04 ft/day at MW-3, with an average of 0.9 ft/day. This indicated the wells are screened in silts, sandy silts, and clayey sands. The range in hydraulic conductivities reflects the heterogeneity of overburden soils.

2.6 Current and Potential Future Land and Water Uses

2.6.1 Land Uses

The Site is currently vacant and is zoned for industrial use. There is evidence that it has been used for hunting purposes. Correspondence from a nearby resident indicated that teens and adults utilize the property for recreational purposes such as riding 4-wheelers, motorcycles and possibly horses. However, since the time the 2002 ROD was written, measures were taken by the property owner to limit access to the Site by vehicular traffic. Surrounding property use is both residential and industrial. Because the adjacent properties are zoned both residential and industrial, it is possible that the property could be rezoned as residential. On November 27, 2006, EPA was contacted by New Hanover Planning Department inquiring as to whether or not the Site is safe to convert to residential zoning. The property owners have requested that the Site, and adjoining parcels, be converted from I-2 Industrial to R-10 Residential use. According to an article in the March 2, 2007 edition of StarNewsOnline.com, in February 2007, the request was denied to convert the Site from industrial to residential. However, the New Hanover County Planning Board agreed to rezone the surrounding parcels from heavy industrial to a mix of residential and heavy commercial. The Planning Department stated that the Site would automatically be rezoned to residential, once EPA certified that the remediation work had been completed. The article also stated that, “Separate portions of the property, bounded roughly by Interstate 40, Holly Shelter Road, Fulton Avenue and North College Road, are expected to eventually be sold to the county for a new elementary school and a passive park site.”

2.6.2 Groundwater Uses

Because the Site is vacant, there are currently no groundwater users at the Site. A survey of groundwater use in the Site vicinity during previous investigations indicated no municipal water supply wells or distribution lines within four miles of the Site. Domestic and community wells supplied the entire population within four miles of the Site. The closest community well is located in a mobile home park 1,500 to 2,500 feet southwest of the site (Shady Haven MHP). Another community well is located 3,000 feet southeast of the site in a housing subdivision (Prince George Estates). The closest domestic well is located 1,200 feet from the site. There are three production wells located on-site which were utilized as water supply for industrial purposes. One of those wells was determined during the RD to have an obstruction which prevented sample collection. These three wells tap into the Peedee and Castle Hayne aquifers and range in depth from 148 to 150 feet below ground surface. Because of the lack of municipal water supply lines, it is anticipated that future groundwater use for the Site would include drinking water. During correspondence with the New Hanover County Planning Department in 2006, it was confirmed that there are still no municipal water or sewer lines to the property.

2.6.3 Surface Water Uses

Humans do not currently use surface water in the existing ponds and drainage ditches at the Site. Once the restoration is completed, the surface water in the restored wetlands is planned to be used as an ecological habitat.

2.7 Summary of Site Risks

This section of the Amended ROD discusses a summary of Human Health and Ecological Risks. Because the risk assessments were not revised only a few tables and a brief discussion are provided in this section to highlight Site risks. Please refer to the 2002 ROD, the Baseline Human Health Risk Assessment, and the Ecological Risk Assessment for a more extensive discussion of these topics.

2.7.1 Summary of Human Health Risk Assessment

The baseline risk assessment estimates what risks the site poses if no action were taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action.

2.7.1.1 Identification of Chemicals of Concern

The Baseline Human Health Risk Assessment (BHHRA) evaluated soil, surface water and groundwater. Of these, only the soil and groundwater media were found to have Chemicals of Concern (COCs) at concentrations that may pose risk to human receptors. Those COCs, their frequency of detection, as well as the maximum detected concentration during the RI are listed in Table 17. Groundwater data from the RD has been added to the table. As described in the BHHRA, to develop the clean-up goals at the site, EPA first identified chemicals of potential concern (COPCs), which are the chemicals whose data are of sufficient quality for use in the quantitative risk assessment, are potentially site-related, are above background concentrations at the site, and represent the most significant contaminants in terms of potential toxicity to humans.

A list of COCs was then derived from the COPCs identified for the Site. The BHHRA assessed the total cancer and non cancer risks for each COPC for all human health pathways for each type of human receptor (i.e., receptors with separate exposure pathways).

Table 17 - Baseline Human Health Risk Assessment Soil and Groundwater COCs

	Soil		Groundwater	
	Frequency of Detection	**Maximum Concentration**	**Frequency of Detection**	**Maximum Concentration**
SVOCs		µg/kg		µg/kg
Benzo(a) anthracene	19/94	4400		
Benzo(b &/or k) fluoranthene	24/94	5300		
Benzo(a) pyrene	19/94	3900		
Dibenzo(a, h) anthracene	5/94	360		
Indeno(1,2,3-cd) pyrene	16/94	2100		
DIOXINS/FURANS		ng/kg		ng/L
TEQ	4/4	15	5/12	0.003
METALS		mg/kg		µg/L
Aluminum - RI			14/18	20,600*
Aluminum - RD			20/35	450,000
Antimony - RI	5/19	67		
Arsenic – RI	2/19	10	4/18	3*
Arsenic - RD	NE	NE	18/35	41
Beryllium - RD ***			11/35	9.3 J
Chromium - RD ***			12/35	690
Copper - RI	19/19	5900		
Nickel - RD ***			23/35	260 J
Thallium - RI			4/18	8.4**
Thallium - RD			10/35	0.28

Notes:
TEQ = Toxicity Equivalent Quotient
NE = Not evaluated
* Higher concentrations detected during the RD (see Table 13)
** During the RD, all results were less than the MCL
*** Was not identified as a COC during the BHHRA because all results during RI were below MCL or 2L standards. Two wells had concentrations of these metals in excess of MCL or 2L values during the RD.
Dark green shaded cells indicate contaminant was not identified as a COC for that media.

2.7.1.2 Exposure Assessment

There were four potentially exposed populations evaluated in the Baseline Human Health Risk Assessment. The four Exposure Pathway Scenarios (EPS) evaluated included Current On-Site Trespassers (EPS-1), Future Child and Adult Residents (EPS-2), Future Industrial Worker (EPS-3), and Future Construction Workers (EPS-4).

2.7.1.3 Toxicity Assessment

The BHHRA utilized information from the Integrated Risk Information System (IRIS), Health Effects Assessment Summary Tables (HEAST) and National Center for Environmental Assessment (NCEA). The assessment looked at both carcinogenic and non-carcinogenic effects.

2.7.1.4 Risk Characterization

Since the Risk Characterization was not re-evaluated, please refer to the 2002 ROD for a description of the risk characterization process. Risks that exceed a Hazard Index of 0.1 or a carcinogenic risk of $1x10^{-6}$ are presented in Table 18.

Table 18 - Summary of Hazard Indices and Carcinogenic Risks

Media	Exposure Scenario	Total Hazard Index	Total Cancer Risk
Risks from Soil	Trespasser	0.1	$4x10^{-6}$
	Child Resident	4	$3x10^{-5}$
	Adult Resident	0.5	$3x10^{-5}$
	Combined Resident	--	$6x10^{-5}$
	Industrial Worker	0.2	$1x10^{-5}$
Risks from Groundwater	Child Resident	8	$2x10^{-5}$
	Adult Resident	3	$4x10^{-5}$
	Combined Resident	--	$6x10^{-5}$
	Industrial Worker	1.2	$1x10^{-5}$
Combined Risks	Trespasser	0.1	$4x10^{-6}$
	Child Resident	12	$5x10^{-5}$
	Adult Resident	4	$6x10^{-5}$
	Combined Resident	--	$1x10^{-4}$
	Industrial Worker	1.4	$3x10^{-5}$

Notes: -- indicates Value less than 0.1

Red shading indicates Scenarios exceeding the clean-up goals of HI= 1 and Cancer Risk of $1x10^{-5}$

Under the NCP, EPA's goal is to reduce the excess cancer risk to the range of $1x10^{-4}$ to $1x10^{-6}$ for the expected future land use at the Site.

Upon consideration of a variety of site-specific factors, EPA set remedial goals at the site based on a $1x10^{-5}$ cancer risk level (see later discussion on remedial goal options). Thus, EPA has decided that risks greater than $1x10^{-5}$ at this Site would be considered unacceptable. Thus, the COCs were those contaminants that indicated exceedances in excess cancer risk levels within each of the various potential exposure scenarios at the site that based on a $1x10^{-5}$ risk level or an HQ of 1. Section 2.12.4.2 of this ROD Amendment notes the Final Clean-up Goals for this site and describes how they were developed.

Chemicals and exposure routes that exceed a carcinogenic risk of $1x10^{-6}$ are included in Table 19.

Table 19 - Chemicals and Exposure Routes Exceeding a Carcinogenic Risk of $1x10^{-6}$

Receptor:	Trespasser	Child Resident	Adult Resident	Combined Resident	Industrial Worker
SOIL					
SVOCs					
Benzo(a) anthracene		$1.9x10^{-6}$	$1.3x10^{-6}$	$3.2x10^{-6}$	
Benzo(a) pyrene	$1.1x10^{-6}$	$1.9x10^{-6}$	$1.4x10^{-6}$	$3.3x10^{-6}$	$7.7x10^{-6}$
Benzo(b) fluoranthene		$1.8x10^{-6}$	$1.3x10^{-6}$	$3.2x10^{-6}$	
Dibenzo(a, h) anthracene		$3.4x10^{-6}$	$2.5x10^{-6}$	$5.9x10^{-6}$	$1.4x10^{-6}$
Indeno(1,2,3-cd) pyrene		$1.8x10^{-6}$	$1.3x10^{-6}$	$3.1x10^{-6}$	
Dioxin/Furans					
2,3,7,8-TCDD	$2.5x10^{-6}$	$3.8x10^{-6}$	$4.2x10^{-6}$	$8.0x10^{-6}$	$2.9x10^{-6}$
Metals					
Arsenic		$1.8x10^{-6}$		$2.6x10^{-6}$	
Exposure Routes					
Dermal Contact	$2.9x10^{-6}$	$5.6x10^{-6}$	$1.3x10^{-6}$	$1.9x10^{-6}$	$9.9x10^{-6}$
Soil Ingestion	$1.3x10^{-6}$	$2.8x10^{-6}$	$1.2x10^{-6}$	$4.0x10^{-6}$	$4.4x10^{-6}$
GROUNDWATER					
Dioxin/Furans					
2,3,7,8-TCDD		$1.9x10^{-6}$	$3.2x10^{-6}$	$5.1x10^{-6}$	$1.2x10^{-6}$
Metals					
Arsenic		$1.9x10^{-6}$	$3.2x10^{-6}$	$5.1x10^{-6}$	$1.2x10^{-6}$
Exposure Routes					
Groundwater Ingestion		$2.1x10^{-6}$	$3.5x10^{-6}$	$5.6x10^{-6}$	$1.3x10^{-6}$
COMBINED RISKS					
SVOCs					
Benzo(a) anthracene		$1.9x10^{-6}$	$1.3x10^{-6}$	$3.2x10^{-6}$	
Benzo(a) pyrene	$1.1x10^{-6}$	$1.9x10^{-6}$	$1.4x10^{-6}$	$3.3x10^{-6}$	$7.7x10^{-6}$
Benzo(b) fluoranthene		$1.8x10^{-6}$	$1.3x10^{-6}$	$3.2x10^{-6}$	
Dibenzo(a, h) anthracene		$3.4x10^{-6}$	$2.5x10^{-6}$	$5.9x10^{-6}$	$1.4x10^{-6}$
Indeno(1,2,3-cd) pyrene		$1.8x10^{-6}$	$1.3x10^{-6}$	$3.1x10^{-6}$	
Dioxin/Furans					
2,3,7,8-TCDD	$2.6x10^{-6}$	$5.9x10^{-6}$	$8.0x10^{-6}$	$1.4x10^{-6}$	$4.1x10^{-6}$
Metals					
Arsenic		$2.0x10^{-6}$	$3.3x10^{-6}$	$5.3x10^{-6}$	$1.2x10^{-6}$
Exposure Routes					
Soil Pathways	$4.2x10^{-6}$	$3.4x10^{-6}$	$2.5x10^{-6}$	$5.9x10^{-6}$	$1.4x10^{-6}$
Groundwater Pathways		$2.1x10^{-6}$	$3.5x10^{-6}$	$5.6x10^{-6}$	$1.3x10^{-6}$

Notes:

Dark green shading indicates risks were below $1x10^{-6}$ for that chemical/exposure route for that receptor.

Red shading indicates risks greater than 2002 ROD clean-up goals.

Exposure Scenario for a Construction Worker, had carcinogenic risks less than $1.0x10^{-6}$, and therefore is not included.

As calculated during the BHHRA, there were only two receptors which had Hazard Indexes greater than one. These receptors were Child Resident and Adult Resident. Only four inorganic compounds had Hazard Indexes greater than one. These included aluminum, antimony, copper and thallium.

During the Remedial Design, higher concentrations of aluminum, beryllium, chromium, and nickel were found in groundwater wells, but Hazard Indexes were not recalculated. During the RD, thallium was not detected in groundwater wells, but Hazard Indexes were not recalculated. Table 20 includes a summary of chemicals and exposure routes exceeding a Hazard Index of 1, as calculated during the BHHRA.

Table 20 – BHHRA Chemicals/Exposure Routes Exceeding a Hazard Index of 1

SOIL		
Receptor:	**Child Resident**	**Adult Resident**
Metals		
Antimony	1.4	
Copper	2.1	
Exposure Routes		
Soil Ingestion	3.7	
GROUNDWATER* **		
Metals		
Aluminum*	1.1	
Thallium**	4.2	1.8
Exposure Routes		
Groundwater Ingestion*,**	7.6	3.2
COMBINED RISKS* **		
Metals		
Aluminum*	1.1	
Antimony	1.4	
Copper	2.1	
Thallium**	4.3	1.8
Exposure Routes		
Soil Pathways	3.9	
Groundwater Pathways*,**	7.9	3.4

Note:
* Higher concentrations of aluminum were detected during the RD, but Hazard Indexes was not recalculated.
** Thallium was not detected during the RD, but Hazard Indexes were not recalculated.
*** Concentrations of beryllium, chromium, and nickel were detected above MCL or 2L standards during the RD, but Hazard Indexes were not recalculated. Therefore, the Exposure Route Risk may be underestimated.

Dark green shading indicates Hazard Index was below 1 for that chemical/exposure route for that receptor. Only receptors and chemicals with Hazard Indices greater than 1 are presented in this table.

2.7.1.5 Uncertainties

Most of the uncertainties described in the 2002 ROD are still relevant. Please refer to the 2002 ROD for a complete listing of uncertainties. Those that are not expounded on further in this ROD Amendment are summarized as:

- J-flagged data (over/under estimation)
- Values used for Non-detected chemicals (over/under estimation)
- Assumption that all chromium was in the hexavalent form (over estimation)
- Lack of pesticide and PCB data from pond sediment (under estimation)
- Conservative exposure assumptions (over estimation)
- Lack of Reference Dose for some chemicals (over or under estimation)

This ROD Amendment will further discuss the uncertainties related to thallium detected in groundwater during the RI. The 2002 ROD stated that an uncertainty factor for three inorganic compounds in groundwater sample results was not addressed in the BHHRA. The 2002 ROD stated,

> *After the BHHRA was completed, EPA Region 4's Office of Technical Services sent out "OTS Alert #2", dated January 31, 2001, regarding: "Use of the ICP analytical method (CLP SOW ILM04.1, SW-846 6010, MCAWW 200.7) for drinking water samples may result in false positive detections of arsenic, lead, and/or thallium above their respective MCLs". That Alert states, "The current CLP Statement of Work for inorganic analytical methods includes the techniques of Inductively Coupled Plasma (ICP) and Atomic Absorption (AA). At the time the Statement of Work was developed, most laboratories used a combination of these techniques with Atomic Absorption being the method of choice for low-level work, particularly for certain Metals which might not be detected by ICP. Over the last few years, most laboratories have changed to using a Trace version of ICP and doing little or no work with AA. During this time, we have observed few detection level problems for non-detects. However, some low-level detections at Region 4 sites have been called into question for a number of cases, particularly involving Arsenic, Lead, and Thallium. In most of these cases, re-sampling followed by re-analysis at the Regional laboratory in Athens, GA has shown the CLP low-level detects to be potential false positives."*

The 2002 ROD indicated that this may be applicable to the Reasor Chemical Company Site. The only detections of arsenic and thallium above the most conservative remedial goal option values were from samples obtained in 1999 which were analyzed through the CLP program. The concentrations that were detected were all flagged with a qualifier that the reported value was less than Contract Required Detection Limit but greater than or equal to Instrument Detection Limit. This would be considered "low-level" detections. During the RD, two rounds of samples were collected and analyzed by EPA's regional lab in Athens, Georgia. Of the 36 samples collected, only 10 samples had detections of thallium. The maximum concentration of thallium detected was 0.28 µg/L, which is well below the MCL value of 2 µg/L. Therefore, it is believed that the concentrations of thallium found in groundwater during the RI were "false positives". Consequently, thallium is being removed from the list of contaminants of concern for this Site.

Additional uncertainties associated with the BHHRA which are not described in the 2002 ROD include uncertainties related to data evaluation, exposure pathways and parameters, toxicity, and risk characterization, as discussed in the following paragraphs.

Data Evaluation

The purpose of data evaluation is to determine which constituents, if any, are present at the Site at concentrations requiring further investigation. The screening process used to select COPCs to evaluate in the BHHRA was intended to include all chemicals with concentrations high enough to be of concern for the protection of public health.

Uncertainty with respect to data evaluation can arise from many sources, such as the quality and quantity of the data used to characterize the Site, the process used to select data to use in the risk assessment, and the statistical treatment of data.

Exposure Pathways and Parameters

The exposure assumptions directly influence the calculated doses (daily intakes), and ultimately the risk calculations. For the most part, site-specific data were not available for this BHHRA; therefore, conservative default exposure assumptions were used in calculating exposure doses such as the selection of exposure routes and exposure factors (e.g., contact rate). In most cases, this uncertainty may overestimate the most probable realistic exposures and, therefore, may overestimate risk. This is appropriate when performing risk assessments of this type so that the risk managers can be reasonably assured that the public risks may not be underestimated, and so that risk assessments for different locations and scenarios can be compared.

In order to estimate a receptor's potential exposure at a site, it is necessary to determine the geographical location where the receptor is assumed to be exposed. Once the area of interest has been defined, the appropriate data can be selected and the exposure point concentration can be calculated. The primary source of uncertainty associated with estimating exposure point concentrations involves the statistical methods used to estimate these concentrations and the assumptions inherent in these statistical methods. Generally, an upper bound estimate of the mean concentration is used to represent the exposure point concentration instead of the measured mean concentration. This is done to account for the possibility that the true mean is higher than the measured mean because unsampled areas of the Site may have higher constituent concentrations. Listed below are a few site-specific uncertainties which relate to the exposure point concentration (EPC) calculation.

- Due to small sample data sets (less than 10 samples per data set), the maximum detected concentration was used to represent the EPC. This may result in an overestimation of risk.

- COPC concentrations in soil for future use were assumed to be the same as current concentrations, with no adjustment due to migration or degradation. This may overestimate dose.

Ideally, areas of exposure should be defined based on actual exposures or known behaviors of receptors at the Site. Often, however, this information is unavailable. Lacking absolute knowledge about the behaviors of receptors at or near the Site, it is necessary to make some assumptions. This risk assessment conservatively assumed that current and future use of the Site is residential. Such assumptions add to the uncertainty in the BHHRA.

The reasonable maximum exposure concept was used to develop exposure doses in the current and future scenarios and is defined as the maximum exposure that is reasonably expected to occur at the site. Several variables that were used to determine the exposure dose for the reasonable maximum exposure were generally based on upper-bound (typically 90th percentile or greater) estimates. These are:

- Maximum detected concentration used to calculate the exposure dose,
- Exposure duration (ED) (upper-bound value),
- Intake/contact rate (IR), and
- Exposure frequency (EF).

Therefore, the calculated exposure dose for any given chemical, which results from integration of these variables, typically represents an upper-bound probable exposure dose estimate. The use of these upper bound exposure parameters, coupled with conservative estimates of toxicity, will yield risk results that represent an upper-bound estimate of the occurrence of carcinogenic and noncarcinogenic health effects.

Generally, in order to present a range of possible exposure estimates, a central tendency risk describer is calculated in addition to the reasonable maximum exposure risk, in accordance with Region 4 policy. The reasonable maximum exposure approach characterizes risk at the upper end of the risk distribution, while the central tendency approach characterizes either the arithmetic mean risk or the median risk. The inclusion of both reasonable maximum exposure and central tendency risk describers provides perspective for the risk manager. However, the National Contingency Plan (NCP) Section 300.430(d) states, "The reasonable maximum exposure estimates for future uses of the site will provide the basis for the development of protective exposure levels."

Toxicity Assessment

For a risk to exist, both significant exposure to the chemicals of potential concern and toxicity at these predicted exposure levels must exist. The toxicological uncertainties primarily relate to the methodology by which carcinogenic and noncarcinogenic criteria (i.e., cancer slope factors and reference doses) are developed. In general, the methodology currently used to develop cancer slope factors and reference doses is very conservative and likely results in overestimation of human toxicity.

Risk Characterization

Ideally, areas of exposure should be defined based on actual exposures or known behaviors of receptors at the Site. Often, however, as in the case of this risk assessment, this information is unavailable. Lacking absolute knowledge about the behaviors of receptors at or near the Site, it was necessary to make some assumptions. This risk assessment made assumptions about exposure units (or areas) based on contaminant distribution and likely areas of exposure based on Site features. Such assumptions will add to the uncertainty in the BHHRA.

The number of samples used to evaluate a particular medium should also be considered. Unfortunately, a limited number of samples were used to evaluate groundwater at this Site. Again, contributing to the uncertainty in the BHHRA.

Each complete exposure pathway concerns more than one contaminant. Uncertainties associated with summing risks or hazard quotients for multiple substances are of concern in the risk characterization step. The assumption ignores the possibility of synergistic or antagonistic activities in the metabolism of the contaminants. This could result in over- or under-estimation of risk.

The potential risks developed for the Site were directly related to COPCs detected in the environmental media at this Site. No attempt was made to differentiate between the risk contributions from other sites and those being contributed from this Site.

Aluminum was identified as COC at the Site. The reference dose for aluminum is based on provisional (interim) values, meaning that they have not gone through the verification necessary to be placed by EPA on IRIS or HEAST. Additional toxicological data would be needed in order to complete this verification process.

All of the uncertainties discussed above ultimately effect the risk estimate. Most of the uncertainties identified will result in the potential for overestimation of risk (e.g., the combination of several upper-bound assumptions for some exposure scenarios).

2.7.2 Summary of Ecological Risk Assessment

The Ecological Risk Assessment evaluated soil, sediment and surface water. Because the ERA has not been re-evaluated, and clean-up goals for soil and surface water are not being changed, only information from the ERA addressing sediment are discussed in this ROD Amendment. Please refer to the 2002 ROD or the Ecological Risk Assessment Report for more information.

2.7.2.1 Identification of Chemicals of Concern for Sediment

The Chemicals of Potential Concern (COPCs), which were identified in the Baseline Ecological Risk Assessment (BERA), for sediment are included in Table 21.

Table 21 - Sediment Chemicals of Potential Concern from RI data

Chemical of Potential Concern	Minimum Conc.	Maximum Conc.	Frequency of Detection	Background Conc.	Alternate Toxicity Value (ATV)	ATV Source	HQ	COPC?
VOCs	µg/kg	µg/kg		µg/kg	µg/kg			
Toluene	6	500,000	7/18	14.3	8,050	DiToro	62	Yes
SVOCs	µg/kg	µg/kg		µg/kg	µg/kg	MHSPE		
(3- and/or 4-) Methylphenol	94	10,000	3/18	--	50		200	Yes
Total PAHs	NA	85,600	3/18	--	13,660	EPA	6.3	Yes
Dioxins/Furans	ng/kg	ng/kg		ng/kg	ng/kg			
2,3,7,8-TCDD Equivalents (mammal)	0.033	602	NA	1.865	2.5	EPA	241	Yes
Equivalents (fish)	0.008	602	NA	1.952	60		10	Yes
(bird)	0.008	603	NA	2.31	21		29	Yes
Metals	mg/kg	mg/kg		mg/kg	mg/kg			
Copper	5.2	655	5/7	--	197	Smith	3.3	Yes

Notes:
-- = Below Detection Limit HQ = Hazard Quotient
COPC = Chemical of Potential Concern NA = Information not Available
Conc. = Concentration NSL = No Screening Level
DiToro and McGrath, 2000
MHSPE (2000), Ministry of Housing Spatial planning and Environment, Target value
EPA (1996a). ARCS; Probable Effects Concentration
Smith et al (1996); Freshwater Sediment PELs

During the ERA, additional sediment samples were obtained to determine the final COCs. The final COC list was not derived solely from those contaminants with HQ's greater than one. Toxicity testing and Food Chain Modeling were conducted and that information was factored into the final COC decision. The results of the December 2001 sediment sampling are summarized in Table 22.

Table 22 Sediment Contaminants of Concern from ERA Data

Chemical of Potential Concern	Minimum Conc.	Maximum Conc.	Mean Conc.	Frequency of Detection	Background Conc.	Alternate Toxicity Value (ATV)	ATV Source	HQ	COC?
VOCs	µg/kg	µg/kg	µg/kg		µg/kg	µg/kg			
Toluene	4.1	29,000	8.075	4/4	--	8,050	DiToro	3.6	Yes
Methylethyl Ketone	--	1,200	NA	1/4	--	136.96	DiToro	8.8	Yes
Methylcyclohexane	4800	30,000	18,200	4/4	--	9,760	DiToro	3.1	Yes
SVOCs	µg/kg	µg/kg	µg/kg		µg/kg	µg/kg			
(3- and/or 4-) Methylphenol	4600	56,000	NA	2/4	--	50	MHSPE	1120	Yes
Total PAHs	277	218,690	64,364	4/4	--	13,660	EPA	16	Yes
Dioxins/Furans	ng/kg	ng/kg	ng/kg		ng/kg	ng/kg			
2,3,7,8-TCDD									
Equivalents (mammal)	0.996	13.74	5.88	4/4	10.1	25	EPA	0.4	No
(fish)	0.775	7.07	3.59	4/4	8.753	600		0.09	No
(bird)	0.936	9.55	4.71	4/4	16.54	210		0.08	No
Metals	mg/kg	mg/kg	mg/kg		mg/kg	mg/kg			
Copper	100	920	34	4/4	475	197	Smith	4.67	Yes

Notes:
-- = Below Detection Limit
Conc. = Concentration
NA = Information not Available
COC = Contaminant of Concern
HQ = Hazard Quotient
NSL = No Screening Level
DiToro and McGrath, 2000
MHSPE (2000), Ministry of Housing Spatial planning and Environment, Target value
EPA (1996a). ARCS; Probable Effects Concentration
Smith et al (1996); Freshwater Sediment PELs

2.7.2.2 Exposure Assessment

The Exposure Assessment has not been re-evaluated. Please refer to the 2002 ROD or Ecological Risk Assessment for this information.

2.7.2.3 Ecological Effects Assessment

As stated in the 2002 ROD, in 2001, soil, sediment and surface water samples were collected for analysis, toxicity testing, bioaccumulation testing, and food web modeling. Samples were obtained from the locations of the highest concentrations found previously at the Site and locations with data gaps (scrap copper area, drum disposal area, pipe shop area, south tank cradle area, ponds, Prince George Creek, background locations). Detrimental effects were shown in the samples taken from the scrap copper area, Pond 1 and Pond 4. The results of the toxicity testing for sediment is included in Tables 23 through 25. Please refer to the 2002 ROD or Ecological Risk Assessment for other media results.

Table 23 - Survival of Lumbriculus variegatus After a 4-Day Exposure to Sediment Samples

Sample ID	Location	Number Alive[a]	Percent Survival	Continue with Test[b]?
Control		40	100	Yes
RC-105-SD	Background	40	100	Yes
RC-101-SD	Pond 1	0	0[c]	No

Notes:
a Forty organisms were exposed per sample (ten organisms per replicate)
b Decision to continue bioaccumulation tests was based on the 4-day screen survival. Since there was no survival, bioaccumulation testing could not be performed.
c Significantly different from the laboratory control and background sediments (p= 0.05)

Table 24 - Survival and Growth of *Hyalella azteca* After a 10-Day Exposure to Sediment Samples

Sample ID	Location	Number Alive[a]	Percent Survival
Control		80	100
RC-105-SD	Background	79	99
RC-101-SD	Pond 1	28	35[c]
RC-104-SS**	Pond 4	20	25[c]

Notes:
a Eighty organisms were exposed per sample (ten organisms per replicate)
c Significantly different from the laboratory control and background sediments (p= 0.05)
** This sediment sample was labeled soil sample because the pond was dry

Table 25 - Survival and Growth of *Chironomus tentans* After a 10-Day Exposure to Sediment Samples

Sample ID	Location	Number Alive[a]	Percent Survival
Control		67	84
RC-105-SD	Background	67	84
RC-101-SD	Pond 1	0	0[c]
RC-104-SS**	Pond 4	0	0[c]

Notes:
a Eighty organisms were exposed per sample (ten organisms per replicate)
c Significantly different from the laboratory control and background sediments (p= 0.05)
** This sediment sample was labeled soil sample because the pond was dry

2.7.2.4 Ecological Risk Characterization

Because only the sediment cleanup goals are changing in this ROD Amendment, only sediment information is presented in this Section. Refer to the 2002 ROD or the Ecological Risk Assessment for more information. A summary of the ecological risks posed by the contaminated sediments at the Site are found in Table 26.

Table 26 - Summary of Ecological Risks in Sediment

<table>
<tr><th>Assessment Endpoint</th><th>Lines of Evidence</th><th>COPCs Involved</th><th>Affected Locations</th></tr>
<tr><td rowspan="3">Protection of Insectivorous Birds</td><td rowspan="3">HQs from Food Web Model greater than one when compared with NOAEL and LOAEL TRVs</td><td>Copper</td><td>Ponds 3 and 4</td></tr>
<tr><td>VOCs</td><td>Ponds 2, 3, and 4</td></tr>
<tr><td>Total PAHs</td><td>Pond 3</td></tr>
<tr><td rowspan="6">Protection of Benthic Macroinvertebrates</td><td rowspan="3">HQs greater than unity using mean and maximum exposure point concentrations</td><td>Copper</td><td>Ponds 3 and 4</td></tr>
<tr><td>VOCs</td><td>Ponds 2, 3, and 4</td></tr>
<tr><td>Total PAHs</td><td>Pond 3</td></tr>
<tr><td rowspan="3">Site-specific toxicity tests showing acute toxicity in the sediment samples to Chironomus tentans, Hyalella azteca, and Lumbriculus variegatus</td><td>Copper</td><td>Ponds 1 and 4</td></tr>
<tr><td>VOCs</td><td>Pond 3</td></tr>
<tr><td>Total PAHs</td><td>Ponds 1, 2, 3 and 4</td></tr>
</table>

Notes:
COPC = Chemical of Potential Concern
HQ = Hazard Quotient
LOAEL = Lowest Observed Adverse Effects Level
NOAEL = No Observed Adverse Effects Level
PAH = Polycyclic Aromatic Hydrocarbon
VOC = Volatile Organic Compound
TRV = Toxicity Reference Value

Because of limited site-specific data, clean-up goals could not be calculated for sediment. The following is copied from the 2002 ROD.

> *The sediments in Pond 1 are highly toxic. There was 0% survival of chironomids (Chironomus tentans), 35 % survival of amphipods (Hyalella azteca), and 0% survival of sediment worms (Lumbriculus variegatus). This is significant because sediment worms are hardy animals that generally survive long term toxicity tests and accumulate contaminants from the sediments.*

Pond 2 was the least contaminated of the four ponds sampled during the December 2001 investigation. The sediments had elevated levels of VOCs, SVOCs and unidentified compounds, but the concentrations of the COCs were less than the Alternative Toxicity Values (HQ<1). RI sampling data from 1999, however, showed copper concentrations in slight excess of the Alternative Toxicity Values. No toxicity samples were collected at this location.

Because of the high levels of volatile compounds in the sediment of Pond 3, as indicated in analytical results and by field air monitoring, it was decided in the field not to collect a toxicity sample for this location.

Pond 4 is currently dry. When the sediments were treated as a soil sample, using toxicity testing animals generally used for soils (earthworms), there was no acute or chronic toxicity effects. However, the earthworms exhibited an avoidance behavior. When the sediments were treated as a sediment sample, using toxicity testing animals generally used for sediments, both test animals showed acute toxicity: 25% survival of amphipods and 0% survival of chironomids.

In summary, all four ponds (Ponds 1-4) have contaminated sediments. Ponds 1, 3, and 4 sediments are highly toxic and are unsuitable for sustaining an aquatic community. The data indicate the contaminated sediments in ponds 1-4 need to be remediated to eliminate ecological risks, however, clean up levels to protect ecological receptors can not be developed from the site-specific data currently available. A contaminant concentration gradient was not evident from samples collected during this December 2001 investigation. Sediment contaminant concentrations were either extremely high or low. This is not conducive for developing clean up levels.

The ponds are small, and under current conditions, do not and cannot support an aquatic ecosystem. Therefore, effective remediation would be to remove the contaminated sediments based on another type of clean up criteria, such as the Alternative Toxicity Values. ATVs are generally more stringent than human health clean-up goals.

2.7.3 Conclusion

The response action selected in this Amended Record of Decision is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances, pollutants, and contaminants into the environment.

2.8 Remedial Action Objectives

The remedial action objectives (RAO) for sediment and surface water have not changed from the original remedy. The RAO for soil is being corrected to remove two contaminants which were erroneously included in the 2002 ROD. The RAO for groundwater is being changed. The RAOs that will remain the same are:

Sediment:

- prevent further migration of contaminants from sediment to groundwater and surface water above levels exceeding groundwater and surface water clean-up goals (Table 47)

- eliminate exposure of ecological receptors to contaminated sediment
- achieve ecological risk based sediment clean-up goals (Table 47) for: methyl ethyl ketone, toluene, (3- and/or 4-) methylphenol, total PAHs, and copper

Surface water:

- prevent further migration of contaminants above clean-up goals (Table 47) from Ponds 1, 2, 3 and 4, to soil, groundwater and down-gradient surface water bodies
- eliminate exposure to contaminated surface water above levels exceeding clean-up goals by aquatic receptors
- achieve the North Carolina Surface Water Quality Standards (NCAC Title 15A, Chapter 2, Subchapter 2B.0100 and 2B.0200) in Ponds 1, 2, 3 and 4 for: copper, lead, iron and zinc

The Soil and Groundwater revised RAOs are:

Soil:

- prevent further migration of contaminants from soil to groundwater and surface water above levels exceeding groundwater and surface water clean-up goals (Table 47)
- eliminate unacceptable risk to human health and the environment
- achieve the human health and ecological risk based clean-up goals (Table 47) for: benzo(a) pyrene, benzo(b &/or k) fluoranthene, dibenzo(a, h) anthracene, total PAHs, antimony, copper and lead.

Note: The 2002 ROD erroneously included benzo(a) anthracene and ideno(1,2,3-cd) pyrene in the RAO for soil. The concentrations of these two chemicals are already below the clean-up goals set in the 2002 ROD. Removal of those two is the only revision being made to the original RAO for soil.

Groundwater:

The 2002 RAO was: restore groundwater to drinking water levels by attaining Federal Drinking Water or risk-based standards for the contaminants of concern: thallium (Federal MCL) and aluminum (risk-based).

The Amended RAO will be: prevent human consumption of contaminated groundwater until risk-based standards for aluminum, and MCLs for beryllium, chromium and nickel, are attained.

2.9 Description of Alternatives

Twelve alternatives were developed for detailed evaluation during the FS. Four alternatives were evaluated for the combined media of soil and sediment, four alternatives were evaluated for surface water, and four alternatives were evaluated for groundwater. Since the time that the 2002 ROD was approved, additional information has been obtained and the remedies have been re-evaluated. A fifth alternative has been added for each media for consideration.

Table 27 - Remedial Alternatives

Media	Designation	Description
Soil and Sediment	S1	No Action
	S2	Institutional Controls
	S3	Excavation and Off-Site Disposal
	S4	Excavation and On-Site Stabilization/Solidification
	S5	Excavation and Off-Site Disposal (modified)
Groundwater	G1	No Action
	G2	Institutional Controls with Monitoring
	G3	Extraction and Treatment Using Chemical Precipitation
	G4	Extraction and Treatment Using Constructed Wetlands
	G5	Application of Alkaline Substance, Institutional Controls with Monitoring (modified)
Surface Water	SW1	No Action
	SW2	Institutional Controls with Monitoring
	SW3	Off-Site Treatment/Disposal
	SW4	On-Site Treatment through Constructed Wetlands
	SW5	On-Site Treatment/Disposal

2.9.1 Description of Remedy Components

2.9.1.1 Soil and Sediment Alternatives

The 2002 ROD evaluated four alternatives for soil and sediment. These included:

1. No Action
2. Institutional Controls
3. Excavation and Off-site Disposal
4. Excavation and On-site Stabilization/Solidification

Details related to these four alternatives can be found in the 2002 ROD. A fifth alternative is considered in this ROD Amendment. It is a variation of alternative S3, which was selected in the 2002 ROD as the remediation choice for soil and sediment. The primary difference is elimination of the requirement to backfill the excavated ponds and the addition of lime in the drum disposal excavation area. The selected alternative S3, copied directly from the 2002 ROD, and the new alternative S5 are described on the following pages.

Alternative 3 - Excavation and Off-site Disposal

This alternative consists of excavation of surface soil and sediment that exceed clean-up goals. Pond water would be removed and treated by surface water alternative 3 or 4 discussed in section 2.9.1.3 of this ROD. Excavated soil and sediment would be sampled and analyzed under the TCLP procedure to determine if it is a RCRA characteristic hazardous waste. It is anticipated that the results will show that it is not a hazardous waste. The excavated soil and sediment would then be transported to an off-site permitted facility for landfilling as a regulated "non-hazardous" solid waste. If the TCLP results indicate that the wastes are hazardous, they would be transported to an off-site permitted Subtitle C facility for treatment/disposal. Decaying drums in the drum disposal area will be disposed with soils and sediments. Based on the assumed areas of contamination (scrap copper area, pipe *shop, drum disposal area, Ponds 1-4), the calculated volume of soil and sediment requiring remediation is approximately 1,600 cubic yards (see Table 45 in section 2.12.2.3 for details of volume estimates).*

Prior to excavation and treatment, the following general site preparation would be necessary:

- *Survey and mark the limits of the area to be excavated.*
- *Prepare an area for decontamination of excavation equipment. Construct a lined pad with curbs and sump for the collection of decontamination water. The wastewater would be stored and tested to determine final disposition.*

Excavation would be performed with standard construction equipment consisting mainly of an excavator. Excavated materials would be placed on a lined staging area prior to loading in trucks for offsite disposal. Dust suppression by wetting the soil would be performed as necessary.

Trucks to transport soil to an approved disposal facility would enter designated areas of the site and would be directed to a specific loading area. Each truck must adhere to U.S. Department of Transportation (DOT) requirements and follow manifesting procedures.

After excavation, the areas will be backfilled with imported fill and graded to match the contour of the adjacent land. All disturbed areas would be revegetated with native plants or covered with crushed stone as appropriate.

<u>Alternative S5 – Excavation and Off-site Disposal (modified)</u>

This alternative is a modification of the remedy that was selected in the 2002 ROD. As with the 2002 selected remedy, it consists of excavation of surface soil and sediment that exceed clean-up goals (see Table 47). Pond water will be removed and treated using the surface water remedy, which is discussed later.

Excavated soil and sediment will be sampled and analyzed using the Toxicity Characteristic Leaching Procedure (TCLP) to determine if it is a Resource Conservation and Recovery Act (RCRA) characteristic hazardous waste, and sampled to meet any other requirements of the disposal facility. It is anticipated that the results will show that it is not a hazardous waste, as was observed for samples obtained during the RD. The excavated soil and sediment will then be transported to an off-site permitted landfill as a regulated "non-hazardous" solid waste or to a facility that uses wood tar contaminated material as a fuel alternative. If the TCLP results indicate that the wastes are RCRA hazardous because they fail the TCLP test, excavated soils which fail TCLP will be disposed in a permitted RCRA Subtitle D landfill when the soil both: a) meets applicable treatment standards under 40 CFR 268; and b) no longer exhibits a hazardous waste characteristic (i.e., the soils pass TCLP after treatment). Decaying drums in the drum disposal area will be disposed with soils and sediments. Based on the known areas of contamination (scrap copper area, pipe shop, drum disposal area, Ponds 1-4), the calculated volume of soil and sediment requiring remediation was revised in the RD from 1,600 yd^3 to approximately 1,420 yd^3.

Prior to excavation, the following general site preparation will be necessary:

- Survey and mark the limits of the area to be excavated.
- Prepare a staging area for dewatering sediments
- Prepare a decontamination area. Construct a lined pad with curbs and sump for the collection of decontamination water. The wastewater will be stored and tested to determine final disposition.

Excavation will be performed with standard construction equipment consisting mainly of an excavator. Excavated materials will either be loaded directly into trucks or placed on a lined staging area prior to off-site disposal. If the sediments are too wet to load directly into trucks, they will be staged and allowed to dry before loading into trucks. If necessary, drying agents (such as cement or kiln dust) may be added to the stockpiled sediments to facilitate the drying process. Any water accumulated will be treated through the surface water treatment system. For extremely dry soils, dust suppression by wetting the soil will be performed as necessary. Trucks to transport soil to an approved disposal facility will enter designated areas of the site and will be directed to a specific loading area. Each truck must adhere to U.S. Department of Transportation requirements and follow manifesting procedures.

After excavation, the soil removal areas will be backfilled with clean soil and graded to match the contour of the adjacent land. The drum disposal area will be backfilled with lime, or similar alkaline substance, to decrease the acidity of groundwater in the area (near well MW-7S and MW-7D). All disturbed areas will be vegetated with native plants or covered with crushed stone as appropriate. The excavated ponds will not be backfilled, which will provide the opportunity for natural establishment as a wetland habitat. Due to this, clean-up goals for sediment are being added to the remedy. A Habitat Verification Plan will be prepared.

Federal and State ARARs, that have been determined to be applicable, potentially applicable or "To Be Considered", are included in Tables 48 and 49.

This alternative is expected to be completed, with Remedial Action Objectives attained, within two months of mobilization to the Site. The estimated capital costs for this alternative are $278,781. No long-term O&M or Five-Year Reviews will be required for this alternative, so the capital costs are equivalent to the Net Present-Worth Cost. Because this activity is expected to take less than two months to complete, a discount rate was not applied to the estimate. Refer to Table 34 for a more detailed cost estimate.

2.9.1.2 Groundwater Alternatives

The 2002 ROD evaluated four alternatives for groundwater. These included:

1. No Action
2. Institutional Controls with Monitoring
3. Groundwater Extraction and Treatment Using Chemical Precipitation
4. Groundwater Extraction and Treatment Using Constructed Wetlands

Details related to these four alternatives can be found in the 2002 ROD. A fifth alternative is considered in this ROD Amendment. It is a variation of alternative G2, which was selected in the 2002 ROD as the remediation choice for groundwater. The primary difference is the reduction of the number of wells to be sampled and chemicals to be analyzed. The selected alternative G2, copied directly from the 2002 ROD, and the new alternative G5 are described below.

Alternative 2 - Institutional Controls with Monitoring

No active remediation would be conducted under this alternative. Instead, institutional measures of deed recordations would be used to prevent/minimize exposure to contaminated groundwater. EPA will work with the State of North Carolina to place notices on property deeds on-site and downgradient of the suspected source area which will state that groundwater contamination potentially exists on the property. These recordations will remain in place until the groundwater quality improves enough to allow for unrestricted use. Under this alternative, groundwater monitoring will take place annually at the existing on-site monitor wells and former production wells to determine the accuracy of previous data on groundwater contamination. In addition, five-year reviews will also be conducted to determine if contaminants that remain on-site are causing additional risk to human health or the environment. As a result of this review, EPA will determine if additional site remediation is required. Five-year reviews are assumed to be conducted for a 30-year period.

Alternative G5 - Application of Alkaline Substance, Institutional Controls with Monitoring (modified)

Under this alternative, lime, or a similar alkaline substance, will be placed in the excavated drum disposal area, as mentioned previously under the soil alternative S5. This should reduce the acidity of the groundwater in the area, which affects the concentrations of metals in groundwater.

Institutional Controls in the form of a "Declaration of Perpetual Land Use Restrictions" will be used to prevent human exposure to contaminated groundwater. Specifically, it prohibits the use of surficial groundwater for any purpose. Any groundwater well or other device for access to groundwater for any purpose other than monitoring groundwater quality must include an isolation seal between the surficial aquifer and the Peedee Formation aquifer located below. This declaration will be attached to the title and will remain enforceable by EPA and NCDENR regardless of property ownership changes. These restrictions will remain in place until the groundwater quality improves enough to allow for unrestricted use and unlimited exposure. The document has been drafted by NC DENR, edited by EPA and NCDENR and reviewed by the current property owners. It is expected that it will be implemented within the next six months. A Site figure will be included with the document. The property owner is responsible for implementing the IC, which is enforceable by NCDENR and EPA. The declaration shall run with the land and shall be binding on all parties having any right, title or interest in the Site or any part thereof, their heirs, successors and assigns.

Groundwater monitoring will take place annually at wells MW-7S and MW-7D to evaluate the effectiveness of the lime application in reducing the aluminum, beryllium, chromium, and nickel concentrations in groundwater. These wells will be sampled and the pH value will be obtained. If pH values are within a neutral range, the sample will be analyzed for aluminum, beryllium, chromium and nickel. In this amended remedy, thallium is removed from the COC list. Five-year reviews will be conducted to evaluate whether the groundwater remedy remains protective to human health or the environment until the groundwater quality improves enough to allow unrestricted use and unlimited exposure. The frequency of monitoring may be reduced after the first Five-Year Review.

Federal and State ARARs, that have been determined to be applicable, potentially applicable or "To Be Considered", are included in Tables 48 and 49.

The RAO for groundwater is to prevent human consumption of contaminated groundwater until risk-based standards for aluminum, and MCLs for beryllium, chromium and nickel are attained. Although groundwater is not currently being used at the Site, the implementation of the IC, Declaration of Perpetual Land Use Restriction, will be the enforceable instrument which will prevent human consumption of groundwater until clean-up goals are attained. The IC is expected to be implemented within the next six months. Addition of lime will be conducted during the soil remediation and should take less than a day to apply. It has not been determined how long it may take for metal concentrations in groundwater to achieve MCL, 2L or risk based standards.

A thirty year monitoring time-frame and a seven percent (7%) discount rate were used in determining costs. The capitol costs are estimated at $10,500. O&M costs are estimated at $7,560 per year. Five-Year Reviews are estimated at $25,000 per event. The Total Net-Present Worth for this alternative is estimated at $179,832. Refer to Table 39 for a more detailed cost estimate.

2.9.1.3 Surface water Alternatives

The 2002 ROD evaluated four alternatives for surface water with contaminants above clean-up goals from Ponds 1, 2, 3 and 4. These included:

1. No Action
2. Institutional Controls with Monitoring
3. Off-site Treatment/Disposal
4. On-Site Treatment Through Constructed Wetlands

Details related to these four alternatives can be found in the 2002 ROD. A fifth alternative is considered in this ROD Amendment. Alternative SW3 was selected in the 2002 ROD as the remediation choice for surface water with contaminants above clean-up goals from Ponds 1, 2, 3 and 4. The selected alternative SW3, copied directly from the 2002 ROD, and the new alternative SW5 are described below.

Alternative 3 - Off-site Treatment/Disposal

This alternative consists of removal of surface water located in the four manmade ponds which have contaminant concentrations exceeding State surface water criteria. In order to be effective, this alternative would be implemented in conjunction with soil and sediment Alternative 3 or 4, which would remove the sediment and prevent further contamination of accumulated surface water in the ponds.

Surface water would be extracted from the ponds using a vacuum tanker truck and transported to an off-site facility for treatment. Prior to removal, samples would be collected and analyzed for waste profiling that will determine the final treatment method. The treatment facility will have the RCRA permits to accept and treat contaminated materials. The transporter will also be required to follow proper manifesting procedures as determined by the waste characterization analysis.

For estimating purposes, it was assumed that the depth of water in each pond is 4 feet. Pond 4 has been observed to be dry during past investigations; however, this may be affected by seasonal rainfall and will be conservatively estimated with 4 feet of water. This results in an estimated 526,592 gallons of contaminated surface water (see Table 44 in section 2.12.2.2 for breakdown).

Trucks to transport the water to an approved treatment and disposal facility will enter designated areas of the site and will be directed to a specific loading area. Each truck must adhere to U.S. DOT requirements for general bulk transportation and will follow manifesting procedures.

<u>Alternative SW5 - On-Site Treatment/Disposal</u>

This alternative consists of pumping water from each of the contaminated ponds into an aboveground storage tank, treating the water by an ion exchange resin for metals removal followed by activated carbon adsorption for organic wastes, post-treatment filtration and then on-site disposal. To the maximum extent possible, the treated water will be pumped back into the remediated ponds to enhance the natural wetland restoration process. When this is not practicable, the water will be sprayed onto the property for infiltration through the soil. Samples will be collected from the treated water to ensure compliance with discharge requirements. Volume estimates were revised in the RD from 500,000 gallons to 344,000 gallons of contaminated surface water above clean-up goals from Ponds 1, 2, 3 and 4.

Federal and State ARARs, that have been determined to be applicable, potentially applicable or "To Be Considered", are included in Tables 48 and 49.

This alternative is expected to be completed, with Remedial Action Objectives attained, within two months of mobilization to the Site. The estimated capital costs for this alternative are $116,609. No long-term O&M or Five-Year Reviews will be required for this alternative, so the capital costs are equivalent to the Net Present-Worth Cost. Because this activity is expected to take less than two months to complete, a discount rate was not applied to the estimate. Refer to Table 43 for a more detailed cost estimate.

2.9.2 Common Elements and Distinguishing Features of Alternatives

Alternative 1 for each of the media (soil and sediment, groundwater, and surface water), is the No Action alternative. This alternative includes the Five-Year Review which would be required if this alternative is chosen. {A Five-Year Review evaluates the effectiveness of the remedy, and occurs at least once every five years for Sites where hazardous substances are left on-site}. Alternative 2 for each of the media is Institutional Controls with monitoring for surface water and groundwater. The monitoring would be conducted annually, in addition to a Five-Year Review.

A comparison of 4 alternatives for each media was presented in the 2002 ROD. Those comparisons are still valid. This section will address the common elements and distinguishing features of the 2002 ROD selected remedy with the new alternative 5 for each media. Please refer to the 2002 ROD for more details on the comparison of the original alternatives.

Alternatives 3 and 5 for **soil and sediment** include the common elements of excavation and disposal. The difference between the two is simply a variation of backfilling. Alternative 3 required backfilling all excavated areas, whereas, alternative 5 provides for backfilling only the excavated soil areas, addition of an alkaline substance in the drum disposal area excavation, and allowing the ponds to reestablish as wetland habitats. Alternative 3 relied on soil clean-up goals, whereas alternative 5 returns the ponds to wetlands, so sediment clean-up goals are needed.

Alternatives 2 and 5 for **groundwater** both require institutional controls, monitoring and Five-Year Reviews. The differences are the application of an alkaline substance to subsurface soils at the drum disposal area near wells MW-7S and MW-7D, and variations of requirements for wells monitored and the extent of sampling. Alternative 5 requires monitoring at fewer wells and analysis for fewer contaminants.

Alternatives 3 and 5 for **surface water** vary in treatment location (off-site vs. on-site), but both alternatives would achieve the standards required for discharge of the treated water.

The clean-up goals for soil and surface water remain the same. The 2002 ROD assumed the sediment areas would be turned into soil areas, so sediment clean-up levels were not established. Since the revised remedy will return the ponds to wetland type habitat, sediment clean-up goals are being added based on Alternative Toxicity Values presented in the Ecological Risk Assessment process. The proposed amendment will eliminate the clean-up goal for thallium in groundwater. The clean-up goal for aluminum in groundwater will remain the same; clean-up goals for groundwater are being added for beryllium, chromium and nickel, to levels that achieve federal or state MCLs. Clean-up goals are included in Table 47.

Table 28 on the following page highlights the similarities and differences between the 2002 selected remedy and the new alternatives proposed.

2.9.3 Expected Outcomes of Alternatives

The expected outcomes of the original alternatives remain the same. The expected outcome for the 2002 ROD selected alternatives are copied below. They are followed by a description of the expected outcome of the new alternative for each media. Please refer to the 2002 ROD for expected outcomes of the other three original alternatives.

2.9.3.1 Soil and Sediment Alternatives

Alternative 3, Excavation and Off-Site Disposal, would return the Site to unrestricted/unconditional use for the soil media. The risks to human and ecological receptors would be reduced to acceptable levels.

Alternative S5, Excavation and Off-Site Disposal (modified), will return the Site to unrestricted/ unconditional use for the soil/sediment media. The risks to human and ecological receptors would be reduced to acceptable levels. The addition of an alkaline substance into the excavated drum disposal area is expected to affect the pH of the groundwater in the area which should reduce the concentrations of inorganic contaminants found in groundwater. Allowing the ponds to return to a natural wetland habitat, rather than backfilling, was recommended by the U.S. Fish and Wildlife Service as more beneficial for ecological receptors.

Table 28 – Remedy Similarities and Differences

Soil/Sediment Similarities:	
Excavation	
Off-Site Disposal	
Backfill excavated soil areas	
Soil/Sediment Differences:	
2002 Remedy	**2007 Amended**
Backfill ponds	Do not backfill ponds
Reduces wetland habitat	Restores wetlands
Backfill drum disposal area with soil	Backfill drum disposal area with alkaline substance
Volume 1,600 yd^3	Volume 1,420 yd^3
* Updated Estimated Cost: $306,281	Estimated Cost: $278,781
Groundwater Similarities:	
Institutional Controls	
Groundwater monitoring	
Five-Year Reviews	
Groundwater Differences:	
2002 Remedy	**2007 Amended**
No treatment initially	Application of alkaline substance near MW-7
Contingency treatment remedy	No contingency treatment remedy
Annual sampling of 11 (updated to 13) wells	** Annual sampling of 2 wells
Analyze samples for VOCs, SVOCs, metals, and dioxin	*** Analyze for pH, turbidity, aluminum, beryllium, chromium and nickel
Thallium and Aluminum are the COCs	Eliminates Thallium from COC list
* Updated Estimated Cost: $321,532 - $1,694,646	Estimated Cost: $179,832
Surface water Similarities:	
Remediation of contaminated surface water	
Surface water Differences:	
2002 Remedy	**2007 Remedy**
Transportation off-site	No transportation
Treatment and disposal at off-site facility	Treatment and disposal on-site (preferably back into remediated ponds)
~ 4 samples for analysis	~ 14 samples for analysis
Volume Estimate: 500,000 gallons	Volume Estimate: 344,000 gallons
* Updated Estimated Cost: $125,570	Estimated Cost: $116,609
Combined Estimated Cost from 2002 ROD: $1,200,000 - $2,450,000	Combined Estimated Cost: $560,774

* Cost Estimates were revised for each media to reflect current average cost of Five-Year Reviews, current discount rates, and other factors described in more detail in section 2.10.7.
** Sampling frequency may be reduced after the first Five-Year Review.
*** Analysis of aluminum, beryllium, chromium and nickel is only required during annual sampling events if pH value is between 6 and 8.5. However, analysis of aluminum, beryllium, chromium, and nickel is required near the time of the first Five-Year Review for remedy evaluation. In addition, analysis will be required prior to removal of Institutional Controls.

2.9.3.2 Groundwater Alternatives

Alternative 2, Institutional Controls with Monitoring, would deter future use of the groundwater for drinking purposes. Since there are no current groundwater uses at the Site, this alternative would reduce the risks to human receptors.

Alternative G5, Addition of Alkaline Substance and Institutional Controls with Monitoring (modified), will prohibit future use of the groundwater for drinking purposes. Since there are no current groundwater uses at the Site, this alternative will reduce the risks to human receptors in the future. The addition of an alkaline substance into the excavated drum disposal area near MW-7S and MW-7D is expected to affect the pH of the groundwater in the area which is expected to reduce the concentrations of inorganic contaminants found in groundwater. Since wells MW-7S and MW-7D are the only wells that exceed clean-up goals, reducing the monitoring requirement from all wells to only these two wells, and reducing the analytical requirements will result in a cost savings, with the same level of protection of human health as the original remedy.

2.9.3.3 Surface Water Alternatives

Alternative 3, Off-site Treatment/Disposal, would return the Site to unrestricted/unconditional use for the surface water media only if used in conjunction with either Soil/Sediment Alternatives 3 or 4. The risks from surface water to human and ecological receptors would be reduced to acceptable levels.

Alternative SW5, On-Site Treatment, will treat the contaminated surface water above clean-up goals from Ponds 1, 2, 3 and 4 to acceptable levels for on-site discharge, preferably into the remediated ponds. It will return the Site to unrestricted exposure/unconditional use for the surface water media if used in conjunction with Soil and Sediment Alternatives SW3, SW4 or SW5.

2.10 Comparative Analysis of Alternatives

In this section, each alternative is evaluated using the nine evaluation criteria required in Section 300.430(f)(5)(i) of the NCP. The nine criteria include:

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

In the following sections, where applicable, the alternatives are ranked. In the tables presented in the following sections, the new alternative 5 is in bold font and the remedy selected in the 2002 ROD is italicized. Those shaded green meet the requirements of that particular criteria, those shaded yellow partially meet the requirements of the criteria, and those shaded red, do not meet the requirements of the criteria. Discussions are only included for the new alternative 5 and alternatives ranked near it. Please refer to the 2002 ROD for details on the original alternatives that aren't discussed in the following subsection. Tables 44 and 45, located at the end of section 2.10, provide a summary of the information that follows.

2.10.1 Overall Protection of Human Health and the Environment

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

2.10.1.1 Soil and Sediment Alternatives

Ranking of Soil and Sediment Alternatives		
#1	**S5**	**Excavation and Off-Site Disposal (modified)**
#2	S3	Excavation and Off-Site Disposal
#3	S4	Excavation and On-Site Stabilization/Solidification
#4	S2	Institutional Controls
#5	S1	No Action

The above illustrates the ranking of the soil and sediment alternatives in relation to overall protection of human health and the environment. They are ranked in order of most protective to least protective.

The 2002 ROD stated regarding the former selected remedy, Alternative 3 would reduce or eliminate the risk of direct exposure to contaminants in soils and sediments by potential human and ecological receptors. The contaminated soil and sediments would be removed from the site and therefore would not be available for exposure or leaching to groundwater.

Likewise, Alternative S5 would reduce or eliminate the risk of direct exposure to contaminants in soils and sediments by potential human and ecological receptors. The contaminated soil and sediments would be removed from the site and therefore would not be available for exposure or leaching to groundwater.

Alternative S5 is considered more protective of the environment than Alternative S3 because of the following reasons. Alternative S5 includes the addition of an alkaline substance into the drum disposal excavation area, which is intended to increase the pH of the nearby groundwater, and thereby reduce the inorganic contaminant concentrations in the groundwater. Alternative S5 also allows for returning the ponds to a wetland habitat rather than backfilling them. This was recommended by the U.S. Fish and Wildlife Service as more beneficial for ecological receptors.

2.10.1.2 Groundwater Alternatives

Ranking of Groundwater Alternatives		
#1	**G5**	**Application of Alkaline Substance, Institutional Controls with Monitoring (modified)**
#2	G4	Extraction and Treatment Using Constructed Wetlands
#3	G3	Extraction and Treatment Using Chemical Precipitation
#4	G2	Institutional Controls with Monitoring
#5	G1	No Action

The above illustrates the ranking of the groundwater alternatives in relation to overall protection of human health and the environment. They are ranked in order of most protective to least protective.

The 2002 ROD stated, *Alternative 4 would provide significant protection of human health and the environment. The contaminated groundwater would be extracted from the aquifer and pumped through a constructed wetlands system to capture the metals. The water leaving the constructed wetlands would be of acceptable quality for discharge to tributaries to Prince George Creek. This alternative adds an extra layer of environmental protection by the construction of additional wetlands on-site, which would provide habitats for ecological receptors.*

The 2002 ROD stated regarding the former selected remedy, *Alternative 2 would provide protection of human health through the use of deed recordations, alerting potential purchasers of the potential hazards associated with contaminated groundwater. There are currently no on-site groundwater users and there are questions about some of the groundwater data (possible overestimation of concentrations). Long-term groundwater monitoring would be used to monitor changes in groundwater contamination.*

It was determined during the RD, that only one well pair at the Site has impacted groundwater. The impact is low pH and high aluminum, beryllium, chromium and nickel content in well pair MW-7S and MW-7D. A pump and treatment system is not a realistic solution for this problem. Alternative G5 (Application of Alkaline Substance, Institutional Controls with Monitoring (modified)) includes a treatment component, addition of an alkaline substance near the impacted well pair. Therefore, it is considered more protective of human health and the environment than the other alternatives.

2.10.1.3 Surface Water Alternatives

Ranking of Surface Water Alternatives		
#1	**SW5**	**On-Site Treatment/Disposal**
#1	SW3	Off-Site Treatment/Disposal
#3	SW4	On-Site Treatment through Constructed Wetlands
#4	SW2	Institutional Controls with Monitoring
#5	SW1	No Action

The above illustrates the ranking of the surface water alternatives in relation to overall protection of human health and the environment. They are ranked in order of most protective to least protective.

The 2002 ROD stated regarding the former selected remedy, *Alternative 3 would reduce or eliminate the risk of direct exposure to contaminants in surface water by potential human and ecological receptors. The contaminated water would be removed from the property and therefore, would not be available for exposure or leaching to groundwater. This alternative is only effective if used in conjunction with Soil and Sediment Alternatives 3 or 4. Unless the contaminated sediment is removed, removal of ponded surface water would only result in eventual contamination of rain water that would later fill the contaminated ponds.*

Alternative 4 would reduce or eliminate the risk of direct exposure to contaminants in surface water by potential human and ecological receptors. The contaminated surface water would be directed through the wetlands and treated before discharge. This alternative is only effective if used in conjunction with Soil and Sediment Alternatives 3 or 4. Unless the contaminated sediment is removed, removal of ponded surface water would only result in eventual contamination of rain water that would later fill the contaminated ponds.

Alternative SW5 would rank the same as alternative SW3. Alternative SW5 would reduce or eliminate the risk of direct exposure to contaminants in surface water at levels above clean-up goals by potential human and ecological receptors.

The contaminated surface water above clean-up goals from Ponds 1, 2, 3 and 4 would be run through a contained treatment system before being discharged on-site. It is more protective than Alternative SW4 due to the contained treatment system, rather than contaminants being retained by an on-site wetland system.

2.10.2 Compliance with Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA and NCP § 300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations, which are collectively referred to as ARARs, unless such ARARs are waived under CERCLA section 121(d)(4).

Applicable requirements are those clean-up standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility citing laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those State standards that are identified by a state in a timely manner and that are more stringent than Federal requirements may be applicable. Relevant and appropriate requirements are those clean-up standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility citing laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, 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 identified in a timely manner and are more stringent than Federal requirements may be relevant and appropriate

Compliance with ARARs addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes or provides a basis for invoking waiver. For additional information on ARARs for this Site, see section 2.13, Tables 48 and 49, ARARs Attainment.

2.10.2.1 Soil and Sediment Alternatives

Ranking of Soil and Sediment Alternatives		
#1	**S5**	**Excavation and Off-Site Disposal (modified)**
#1	S3	Excavation and Off-Site Disposal
#1	S4	Excavation and On-Site Stabilization/Solidification
#4	S2	Institutional Controls
#5	S1	No Action

Alternatives S3, S4 and S5 are ranked equally regarding compliance with ARARs. The ARARs discussed in the 2002 ROD are still applicable. Additional ARARs have been added as potentially applicable and "To Be Considered". ARARs applicable to alternative S3 in the 2002 ROD are applicable to Alternative S5 as well. Specifically, there are no chemical-specific ARARs for contaminated soils and sediments. There are chemical-specific State guidelines that are To Be Considered: North Carolina's Inactive Hazardous Sites Response Act of 1987 (North Carolina General Statute 130A-310 et. seq), the associated *Guidelines for Assessment and Clean up* (NC DENR, Inactive Hazardous Sites Program, 2006) and the soil/sediment remediation requirements detailed in Section 4 of the *Guidelines.* Alternatives S3, S4, and S5 would achieve the soil/sediment remediation requirements of the ARAR.

There are several action-specific ARARs for soil and sediment. All soil and sediment alternatives will attain Federal and State action-specific ARARs. Alternatives S3, S4, and S5 would require compliance with

- OSHA standards, 29 CFR Part 1910, regarding worker safety
- Identification and Listing of Hazardous Wastes, 40 CFR Part 261
- Noise Control Act of 1972 42 USC Sect. 4901 et seq.
- NC Hazardous Waste Management Rules, NCAC Title 15A Subchapter 13A; regulations dealing with management of hazardous materials
- NC Solid Waste Management Rules, NCAC Title 15A Subchapter 13B regulations mandated to control flow and handling of solid waste materials
- NC Erosion and Sediment Control Rules, NCAC Title 15A Subchapter 4B

In addition to the above, Alternatives S3 and S5 would require compliance with

- RCRA standards, 40 CFR Parts 262 and 263, regarding generation and transportation of hazardous wastes.
- Hazardous Materials Transportation Act; and Hazardous Materials Transportation Regulations 49 USC Sect. 1801-1813; and 49 CFR Parts 107, 171-177, regarding transportation of DOT-defined hazardous materials.

2.10.2.2 Groundwater Alternatives

Ranking of Groundwater Alternatives		
#1	**G5**	**Application of Alkaline Substance, Institutional Controls with Monitoring (modified)**
#1	G3	Extraction and Treatment Using Chemical Precipitation
#1	G4	Extraction and Treatment Using Constructed Wetlands
#4	G2	Institutional Controls with Monitoring
#5	G1	No Action

Alternatives G3, G4 and G5 are ranked equally regarding compliance with ARARs. There are potential action-specific and chemical-specific ARARs for contaminated groundwater. All groundwater alternatives will attain action-specific Federal and State ARARs.

The chemical-specific ARARs are potentially applicable because they are geared towards public drinking water systems which supply water to at least 25 people. The groundwater at this Site is not currently utilized by a public supply system. The potential chemical-specific ARARS include:

- Safe Drinking Water Act, 40 CFR Part 141: National Primary Drinking Water Standards
- NC Drinking Water and Groundwater Standards; NCAC Title 15, Chapter 2, Subchapter 2L. 0200 and 0.0201, Groundwater Classifications and Standards

Please refer to the 2002 ROD for the action-specific ARARs related to alternatives G3 and G4.

Alternatives G3, G4 and G5 will treat groundwater such that the contaminant concentrations may be reduced to below remediation goals. These treatment options will comply with location- and action-specific ARARs and, decades into the future, may comply with chemical-specific ARARs.

Alternative G2 will not meet potential chemical-specific ARARs. Contaminants of concern in groundwater will remain in groundwater above the chemical-specific ARARs for an indefinite period of time. However, concentrations may decrease with time due to natural attenuation or through improved sampling and analysis techniques. This alternative will comply with location- and action-specific ARARs during the installation of the additional monitoring wells and during the sampling of the wells.

2.10.2.3 Surface Water Alternatives

Ranking of Surface Water Alternatives		
#1	**SW5**	**On-Site Treatment/Disposal**
#1	SW3	Off-Site Treatment/Disposal
#1	SW4	On-Site Treatment through Constructed Wetlands
#4	SW2	Institutional Controls with Monitoring
#5	SW1	No Action

Alternatives SW3, SW4 and SW5 are ranked equally regarding attainment of ARARs. There are action-specific and chemical-specific ARARs for contaminated surface water.

The chemical-specific ARARs for surface water include:

- 33 U.S.C. §1313, CWA Part 303, 40 CFR Part 131, Water quality criteria
- NC Water Pollution Control Regulations, NCAC Title 15A Subchapter 2B, Classification and Water Quality Standards Applicable to the Surface Waters and Wetlands of North Carolina

The action-specific ARARs for surface water include:

- RCRA, 40 CFR Part 262, Requirements for hazardous waste generators (Alternative SW3)
- RCRA, 40 CFR Part 263, Requirements for hazardous waste transporters (Alternative SW3)
- 33 U.S.C. §1342, CWA Part 402, 40 CFR Part 122, NPDES requirements (Alternatives SW4 and SW5)
- 33 U.S.C. §1311, CWA Part 301(b), Technology-based effluent limitations
- 29 U.S.C. §651-678, OSHA, 29 CFR Part 1910, Safety of Workers
- 49 U.S.C. §1801-1813, Hazardous Materials Transportation Act, 49 CFR Parts 107, 171-177, Regulates transportation of DOT-defined hazardous materials (Alternative SW3)
- NC Water Pollution Control Regulations, NCAC Title 15A Subchapter 2H, Procedures for Permits: Approvals, Point Source Discharges to the Surface Waters

Alternatives SW3, SW4 and SW5 would comply with all chemical-specific, location-specific and action specific ARARs. Alternatives SW1 and SW2 would not meet chemical-specific ARARs.

2.10.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up goals have been met. This criterion includes the consideration of residual risk that will remain on-site following remediation and the adequacy and reliability of controls. Each alternative, except the No Action alternative, provides some degree of long-term protection. Alternatives are ranked in order of most effective/permanent to least effective/permanent for each media.

2.10.3.1 Soil and Sediment Alternatives

Ranking of Soil and Sediment Alternatives		
#1	**S5**	**Excavation and Off-Site Disposal (modified)**
#2	S3	Excavation and Off-Site Disposal
#3	S4	Excavation and On-Site Stabilization/Solidification
#4	S2	Institutional Controls
#5	S1	No Action

The 2002 ROD stated *Alternative 3 would effectively reduce the risk to human and ecological receptors by permanently removing the contaminated soils and sediments.*

Alternative S5 ranks the highest in this category. It is similar to alternative S3, but would provide a higher level of protection to ecological receptors by re-establishing a healthy wetland habitat. Application of an alkaline substance is also more beneficial to groundwater than backfilling with soil alone.

2.10.3.2 Groundwater Alternatives

Ranking of Groundwater Alternatives		
#1	G3	Extraction and Treatment Using Chemical Precipitation
#1	G4	Extraction and Treatment Using Constructed Wetlands
#3	**G5**	**Application of Alkaline Substance, Institutional Controls with Monitoring (modified)**
#4	G2	Institutional Controls with Monitoring
#5	G1	No Action

The 2002 ROD stated *Alternative 2 would make residents and potential purchasers aware of the contamination and thus potentially prevent ingestion and direct contact with contaminated groundwater, thereby reducing risk. The long-term monitoring results and the actual effectiveness of the deed recordations would require periodic reassessment. There may be a remaining risk associated with future potential groundwater use for an extended period of time.*

Alternative G5 ranks above alternative G2 in this category because it involves treatment. Long-term effectiveness of the treatment component is not yet known. Therefore, long-term effectiveness of this alternative is currently dependent on Institutional Controls.

2.10.3.3 Surface Water Alternatives

Ranking of Surface Water Alternatives		
#1	**SW5**	**On-Site Treatment/Disposal**
#1	SW3	Off-Site Treatment/Disposal
#3	SW4	On-Site Treatment through Constructed Wetlands
#4	SW2	Institutional Controls with Monitoring
#5	SW1	No Action

The 2002 ROD stated *Alternative 3 would permanently remove the contaminants from the site which would effectively reduce the risk to human and ecological receptors. The removal of the contaminants is permanent and irreversible.*

Alternative SW3 and SW5 rank highest in this category. They will treat the contaminated water and would effectively reduce the risk to human and ecological receptors. The contaminants would be bound in a treatment system, which would be disposed of off-site instead of on-site in the constructed wetland system (alternative SW4). Therefore, alternative SW3 and SW5 provide for more long-term protection than SW4.

2.10.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy. Alternatives 1 and 2 do not require treatment as a component of the remedy. Therefore, these alternatives would not reduce the toxicity, mobility, or volume of contamination at the site.

2.10.4.1 Soil and Sediment Alternatives

Ranking of Soil and Sediment Alternatives		
#1	S4	Excavation and On-Site Stabilization/Solidification
#2	**S5**	**Excavation and Off-Site Disposal (modified)**
#2	S3	Excavation and Off-Site Disposal
#4	S2	Institutional Controls
#5	S1	No Action

The 2002 ROD stated *Alternative 4 includes treatment of the principal threats, which reduces the mobility of the contaminants. Binding the contaminants in a stabilized mass results in reduced toxicity to receptors. Using binding agents increases the volume. Alternative 3 is not an active treatment method, but addresses the principal threats by removing the source. A significant reduction in toxicity, mobility, and volume of contaminants at the Site would occur under Alternative 3.*

Alternative S5 is identical to Alternative S3 in the method that contamination is reduced. They both reduce toxicity, mobility and volume through removal. If sample analysis at the time of disposal indicates treatment is required prior to placement in a landfill, treatment will reduce toxicity mobility and volume.

2.10.4.2 Groundwater Alternatives

Ranking of Groundwater Alternatives		
#1	**G5**	**Application of Alkaline Substance, Institutional Controls with Monitoring (modified)**
#1	G4	Extraction and Treatment Using Constructed Wetlands
#1	G3	Extraction and Treatment Using Chemical Precipitation
#4	G2	Institutional Controls with Monitoring
#5	G1	No Action

The 2002 ROD stated *Alternatives 3 and 4 would both reduce the toxicity, mobility and volume through treatment. It is expected that both alternatives would provide the same amount of reduction in toxicity, mobility and volume.*

Alternative G5 is ranked equal to Alternatives G3 and G4, and higher than Alternative G2. Alternative G5 is also expected to reduce toxicity, mobility and volume through treatment. It is ranked higher than Alternative G2 because it includes a treatment component, where Alternative G2 does not.

2.10.4.3 Surface Water Alternatives

Ranking of Surface Water Alternatives		
#1	**SW5**	**On-Site Treatment/Disposal**
#1	SW3	Off-Site Treatment/Disposal
#3	SW4	On-Site Treatment through Constructed Wetlands
#4	SW2	Institutional Controls with Monitoring
#5	SW1	No Action

The 2002 ROD stated *Alternatives 3 and 4 would both reduce the toxicity, mobility and volume through treatment. It is expected that both alternatives would provide the same amount of reduction in toxicity, mobility and volume. However, the contaminants would be bound on-site using Alternative 4, and disposed elsewhere using Alternative 3.*

Alternative SW5 will reduce the toxicity, mobility and volume through treatment as well. Therefore, it is ranked equal with Alternative SW3.

2.10.5 Short-Term Effectiveness

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

2.10.5.1 Soil and Sediment Alternatives

Ranking of Soil and Sediment Alternatives		
#1	**S5**	**Excavation and Off-Site Disposal (modified)**
#2	S3	Excavation and Off-Site Disposal
#3	S4	Excavation and On-Site Stabilization/Solidification
#4	S2	Institutional Controls
#5	S1	No Action

The 2002 ROD stated, *Alternative 3 is the active remediation soil and sediment alternative that will be completed in the shortest time period and would have limited impact to workers or the community. The primary adverse impacts during the implementation of this alternative include: dust created during the actual excavation, soil erosion, and truck traffic through the community. All of these potential risks can be addressed. The dust can be controlled with water sprays on-site while an air-monitoring program is implemented to detect any trace levels of contaminants in the air. Soil erosion can be controlled with silt fences placed in downgradient areas. To prevent any contamination from being spread by trucks, a decontamination area will be constructed and the trucks will be decontaminated prior to departing the site. Only OSHA trained personnel will be allowed to perform activities at the site during remedial activities. A site-specific health and safety plan will be developed and implemented outlining all the physical and chemical hazards associated with the site. This plan will also present the appropriate personal protective equipment necessary to safely perform each job function during the remediation work. The total time for excavation and transportation is estimated to be 20 working days excluding mobilization/demobilization and inclement weather days.*

The information presented in the 2002 ROD for Alternative S3 is applicable to Alternative S5 as well. However, the number of days to implement the Alternative S5 remedy will be less than that of Alternative S3 due to eliminating the requirement of backfilling the ponds.

2.10.5.2 Groundwater Alternatives

Ranking of Groundwater Alternatives		
#1	**G5**	**Application of Alkaline Substance, Institutional Controls with Monitoring (modified)**
#2	G3	Extraction and Treatment Using Chemical Precipitation
#3	G4	Extraction and Treatment Using Constructed Wetlands
#4	G2	Institutional Controls with Monitoring
#5	G1	No Action

The 2002 ROD stated *Alternatives 3 and 4 would both provide short-term effectiveness. During installation of the extraction wells and water treatment system, the usual precautions necessary for construction activities will be taken. The installation of wells and the treatment system will not involve a significant release of volatiles to the environment. Disposal of any wastes generated during construction and operation would follow established handling practices. Alternative 4 is expected to take approximately 1 month longer to complete construction than Alternative 3.*

Alternative G5 will take much less time to implement than Alternatives G3 and G4. Because it does not require construction of a treatment system, it poses less risk to construction workers and less destruction of the existing habitat provided by the Site.

2.10.5.3 Surface Water Alternatives

Ranking of Surface Water Alternatives		
#1	**SW5**	**On-Site Treatment/Disposal**
#1	SW3	Off-Site Treatment/Disposal
#3	SW4	On-Site Treatment through Constructed Wetlands
#4	SW2	Institutional Controls with Monitoring
#5	SW1	No Action

The 2002 ROD stated *Alternative 3 is the surface water alternative that would take the least amount of time to implement. During the implementation of this alternative, dust created during the hauling, soil erosion, worker safety and truck traffic through the community will be controlled as described in section 2.10.5.1.*

Alternative SW5 will take about a week longer to implement than Alternative SW3, and months less than Alternative SW4. Disposal of wastes generated during the treatment process would follow applicable disposal requirements. Alternative SW5 will require much less truck traffic than Alternative SW3, and therefore, pose less risk to the community.

2.10.6 Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered. Alternative 1, No Action, for all media would be the most easily implemented alternative, because it does not require any present or future efforts. Alternative 2, Institutional Controls, would require the cooperation of the State and local governments.

2.10.6.1 Soil and Sediment Alternatives

Ranking of Soil and Sediment Alternatives		
#1	S1	No Action
#2	S2	Institutional Controls
#3	**S5**	**Excavation and Off-Site Disposal (modified)**
#4	S3	Excavation and Off-Site Disposal
#5	S4	Excavation and On-Site Stabilization/Solidification

Alternative S1 would be the easiest to implement since it requires no action other than Five-Year Reviews. Alternative S2 would be the next easiest to implement since it only involves addition of land use restrictions on the property deed and Five-Year Reviews.

Alternatives S3 and S5 would be the third easiest to implement. The 2002 ROD stated, *Alternative 3 can be readily implemented with conventional construction and excavation equipment. Since the soil and sediments are not expected to be classified or listed as RCRA wastes, they do not fall under the land disposal restrictions and can be directly landfilled into a Subtitle D Landfill.*

Alternative 4 has been used on CERCLA sites and is a proven technology. Excavation and backfilling is accomplished using standard earthwork equipment and several vendors are available with the mixing equipment.

Alternative S5 implementation is very similarly to alternative S3. One difference is the addition of an alkaline substance into one of the excavation areas and reduction of areas to be backfilled. This material is readily available. Also, the soils to be excavated will be tested for whether they fail RCRA toxicity characteristics requirements prior to disposal. If the TCLP results indicate that the wastes are RCRA hazardous because they fail the TCLP test, excavated soils which fail TCLP will be disposed in a permitted RCRA Subtitle D landfill when the soil both: a) meets applicable treatment standards under 40 CFR 268; and b) no longer exhibits a hazardous waste characteristic (i.e., the soils pass TCLP after treatment).

2.10.6.2 Groundwater Alternatives

Ranking of Groundwater Alternatives		
#1	G1	No Action
#2	**G5**	**Application of Alkaline Substance, Institutional Controls with Monitoring (modified)**
#3	G2	Institutional Controls with Monitoring
#4	G3	Extraction and Treatment Using Chemical Precipitation
#5	G4	Extraction and Treatment Using Constructed Wetlands

For the same reasons cited under section 2.10.6.1, Alternative G1 would be the easiest to implement.

The treatment component of Alternative G5 only requires the application of an alkaline substance, which is easily accomplished. Identical to Alternative G2, Alternative G5 includes ICs which would require the cooperation of State and local governments. The monitor wells and production wells to be sampled are already in place. The monitoring component of Alternative G5 is easier to implement than that of Alternative G2 because of the reduction in monitoring requirements. Five-Year reviews are required for both of these alternatives, which is relatively easy to implement.

Alternatives G3 and G4 are the most difficult of the five to implement because they involve installation of groundwater extraction wells, small pumps, air compressor, piping and a treatment unit of either a sand filter or a constructed wetland.

2.10.6.3 Surface Water Alternatives

Ranking of Surface Water Alternatives		
#1	SW1	No Action
#2	SW2	Institutional Controls with Monitoring
#3	SW3	Off-Site Treatment/Disposal
#4	**SW5**	**On-Site Treatment/Disposal**
#5	SW4	On-Site Treatment through Constructed Wetlands

For the same reasons described in Section 2.10.6.2, Alternatives SW1 and SW2 are the easiest to implement. As stated in the 2002 ROD, *Alternative 3 can be readily implemented with conventional construction and vacuum tanker equipment. Proper manifesting and truck transportation requirements must be maintained and documented. The disposal facility has the capacity to accept the volume of surface water that could be removed daily.*

Alternative 4 is a simple construction project. It has the same implementability issues as described for the groundwater Alternative 4 in section 2.10.6.2. Because of water needed to maintain a wetland environment, this surface water alternative can only be implemented if groundwater Alternative 4 is implemented.

Alternative SW5 is slightly more difficult to implement than Alternative SW3, but easier to implement than Alternative SW4. Alternative SW5 can be readily implemented with conventional equipment included pumps, hoses, storage tanks and a filter press.

2.10.7 Cost

The estimated present-worth costs for the alternatives are presented in the following subsections. The values presented here differ from what was included in the 2002 ROD. Cost estimates were updated to reflect current day average cost for Five-Year Reviews. The FS and 2002 ROD estimated a Five-Year Review to cost $8,000. Currently, the average Five-Year Review for a typical Site costs approximately $25,000. Costs are greater when sampling is required. The FS and 2002 ROD used a one and a half percent (1.5%) discount rate in calculating the Present-Worth Costs. The current discount rate used for Superfund Sites is seven percent (7%). The FS and 2002 ROD included rough estimates for volumes and costs. During the RD, more precise measurements were used to determine volumes and more details were built into the cost estimates. The number of permanent monitoring wells located at the Site prior to the 2002 ROD was eleven. During the RD, two more wells were installed, which would increase the number of permanent monitoring wells at the Site from eleven to thirteen. In preparing this ROD Amendment, it was also noted that the cost estimate for Alternative G2 included analysis of VOCs, SVOCs, Metals and Dioxins, while the selected remedy description only called for analysis of metals. Therefore, that cost estimate changed drastically. A summary of revised cost estimates is provided in Table 29, with details presented in the following subsections.

Table 29 - Summary of Revised Estimated Costs for All Alternatives

Media: Total Costs	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Soil and Sediment	$75,520	$82,520	$307,531	$644,270	$278,781
Groundwater	$164,028	$343,109	$1,684,686	$1,394,791	$179,832
Surface Water	$109,956	$280,568	$125,570	$1,394,791	$116,609

Note: The Surface water Alternative 4 costs were included in the Groundwater Alternative 4 Cost Estimate

2.10.7.1 Soil and Sediment Alternatives

Because the cost estimates have changed for the original alternatives, the tables provided in the Feasibility Study were updated and are presented on the following pages in Tables 30-33. The cost estimate for the new alternative S5 is included in Table 34. Costs for all soil and sediment alternatives, except Alternative S2, have increased. Alternative S2 decreased slightly. Alternative S1, No Action, is the least expensive. Alternative S4, Excavation and On-site Stabilization/Solidification is the most expensive. Alternative S5 (Excavation and Off-site Disposal (modified)) is approximately 10% less expensive than Alternative S3 (Excavation and Off-site Disposal), the 2002 ROD selected remedy.

Table 30 - Soil and Sediment Alternative S1 Revised Cost Estimate

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Capital					**$0**
Annual O&M					**$0**
Five-Year Reviews					
1	Conduct Five-Year Review (No Sampling)	1	Lump Sum	$25,000	$25,000
2	Administration (15%)				$3,750
3	Contingency (25%)				$6,250
	Total Five-Year Reviews				**$35,000**
Total Present-Worth Cost					**$75,520**

Notes:
1) The 2002 ROD estimated the Total Present-Worth Cost to be $52,208. The difference in the two estimates is due to updating the Five-Year Review cost from $8,000 to $25,000 and increasing the discount rate from 1.5% to 7%.
2) Total Present-Worth Cost assumes a 7% discount rate and six Five-Year Reviews over a 30 year period.

Table 31 - Soil and Sediment Alternative S2 Revised Cost Estimate

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Capital					
1	Deed Recordations	1	Lump Sum	$5,000	$5,000
2	Administration (15%)				$750
3	Contingency (25%)				$1,250
	Total Capital				**$7,000**
Annual O&M					**$0**
Five-Year Reviews					
4	Conduct Five-Year Review (No Sampling)	1	Lump Sum	$25,000	$25,000
5	Administration (15%)				$3,750
6	Contingency (25%)				$6,250
	Total Five-Year Reviews				**$35,000**
Total Present-Worth Cost					**$82,520**

Notes:
1) The 2002 ROD estimated the Total Present-Worth Cost to be $84,837. The difference in the two estimates is due to updating the Five-Year Review cost from $8,000 to $25,000 and increasing the discount rate from 1.5% to 7%.
2) Total Present Worth Cost assumes a 7% discount rate and six Five-Year Reviews over a 30 year period, plus the one time expense of deed recordation at no discount rate.

Table 32 - Soil and Sediment Alternative S3 Revised Cost Estimate

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Capital					
1	Site Visit and Documentation Review	1	Lump Sum	$1,000	$1,000
2	Project Plans	3	Each	$2,500	$7,500
3	Erosion Control	1000	Linear feet	$5	$5,000
4	Mobilization/Demobilization	2	Each	$3,300	$6,600
5	Site Preparation and Set-up	1	Lump Sum	$30,000	$30,000
6	Excavation	1420	cubic yards	$15	$21,300
7	Waste Disposal Analysis	2	Each	$2,000	$4,000
8	Off-Site Transportation/Disposal	1915	Tons	$15	$28,725
9	Verification Sampling	1	Lump Sum	$23,000	$23,000
10	On-site borrow area prep	1	Lump Sum	$5,000	$5,000
11	Load and Haul Backfill from on-site borrow area	1420	cubic yards	$11	$15,620
12	Backfill/grade	1420	cubic yards	$9	$12,780
13	Site restoration and reseeding	2	acre	$1,500	$3,000
14	Construction Management	1	Lump Sum	$46,000	$46,000
15	Project Admin. Support	1	Lump Sum	$30,000	$30,000
16	Project Reporting - Draft and Final	1	Lump Sum	$6,500	$6,500
17	Contingency (25%)				$61,506
	Total Capital				**$307,531**
Annual O&M					**$0**
Five-Year Reviews					**$0**
Total Present-Worth Cost					**$307,531**

Notes:
1) The 2002 ROD estimated the Total Present-Worth Cost to be $166,547. During the RD, a more detailed cost estimate was prepared, which represents the difference in costs from what was included in the 2002 ROD.
2) Tons calculated using a soil density of 100 pounds per cubic foot (1.35 tons/yd^3).
3) Bulk transportation assumes hauling with over the road dump trucks to the New Hanover County Landfill located approximately 10 miles from the Site. 4) Disposal rate of $17.25/ton assumes classification as regulated "non-hazardous" solid waste.

Table 33 - Soil and Sediment Alternative S4 Revised Cost Estimate

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Capital					
1	Site Visit and Documentation Review	1	Lump Sum	$1,000	$1,000
2	Project Plans	3	Each	$2,500	$7,500
3	Treatability Study	1	Each	$50,000	$50,000
4	Erosion Control	1000	Linear feet	$5	$5,000
5	Mobilization/Demobilization	2	Each	$3,300	$6,600
6	Site Preparation and Set-up	1	Lump Sum	$30,000	$30,000
7	Excavation	1420	cubic yards	$15	$21,300
8	Solidification/Stabilization	1917	Tons	$100	$191,700
9	Verification Sampling	1	Lump Sum	$23,000	$23,000
10	On-site borrow area prep	1	Lump Sum	$5,000	$5,000
11	Load and Haul Backfill from on-site borrow area	1420	cubic yards	$11	$15,620
12	Backfill/grade	1420	cubic yards	$9	$12,780
13	Site restoration and reseeding	2	acre	$1,500	$3,000
14	Construction Management	1	Lump Sum	$46,000	$46,000
15	Project Admin. Support	1	Lump Sum	$30,000	$30,000
16	Project Reporting - Draft and Final	1	Lump Sum	$6,500	$6,500
17	Contingency (25%)				$113,750
	Total Capital				**$568,750**
Annual O&M					**$0**
Five-Year Reviews					**$0**
18	Conduct Five-Year Review (No Sampling)	Every 5 years	Each	$25,000	$25,000
19	Administration (15%)				$3,750
20	Contingency (25%)				$6,250
	Total Five-Year Review				**$35,000**
	Present Worth (Five-Year Review)				**$75,520**
Total Present-Worth Cost					**$307,531**

Notes:

1) The 2002 ROD estimated the Total Present-Worth Cost to be $527,681. The FS cost estimate was updated with cost information obtained during the RD for certain elements. In addition, the cost for Five-Year Reviews was increased from $8,000 to $25,000, and the discount rate used to calculate present-worth was increased from 1.5% to 7%.

2) Tons calculated using a soil density of 100 pounds per cubic foot (1.35 tons/yd^3).

3) Total Present Worth Cost assumes a 7% discount rate and six Five-Year Reviews over a 30 year period.

Table 34 - Soil and Sediment Alternative S5 Cost Estimate

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Capital					
1	Site Visit and Documentation Review	1	Lump Sum	$1,000	$1,000
2	Project Plans	3	Each	$2,500	$7,500
3	Erosion Control	1000	Linear feet	$5	$5,000
4	Mobilization/Demobilization	2	Each	$3,300	$6,600
5	Site Preparation and Set-up	1	Lump Sum	$30,000	$30,000
6	Excavation	1420	cubic yards	$15	$21,300
7	Waste Disposal Analysis	2	Each	$2,000	$4,000
8	Off-Site Transportation/Disposal	1915	Tons	$15	$28,725
9	Verification Sampling	1	Lump Sum	$23,000	$23,000
10	On-site borrow area prep	1	Lump Sum	$5,000	$5,000
11	Load and Haul Backfill from on-site borrow area	345	cubic yards	$11	$3,795
12	Backfill/grade	345	cubic yards	$9	$3,105
13	Site restoration and reseeding	1	acre	$1,500	$3,000
14	Construction Management	1	Lump Sum	$46,000	$46,000
15	Project Admin. Support	1	Lump Sum	$30,000	$30,000
16	Project Reporting - Draft and Final	1	Lump Sum	$6,500	$6,500
17	Contingency (25%)				$55,756
	Total Capital				**$278,781**
Annual O&M					**$0**
Five-Year Reviews					**$0**
Total Present-Worth Cost					**$278,781**

Notes:

1) Cost estimate derived from a modification of the RD cost estimate for Alternative S3. Primary values changed include reduction in volume of backfill and restoration costs.

2) Tons calculated using a soil density of 100 pounds per cubic foot (1.35 tons/yd^3).

3) Bulk transportation assumes hauling with over the road dump trucks to the New Hanover County Landfill located approximately 10 miles from the Site.

4) Disposal rate of $15/ton assumes classification as regulated "non-hazardous" solid waste.

2.10.7.2 Groundwater Alternatives

Because the cost estimates have changed for the original alternatives, the tables provided in the Feasibility Study were updated and are presented on the following pages in Tables 35-38. The cost estimate for the new Alternative G5 is presented in Table 39. Costs for all groundwater alternatives have decreased, primarily due to the change in discount rate in calculating Present-Worth Cost. Updates included increasing the number of wells to be sampled from 11 to 13 for the four original alternatives to include the wells installed during the RD, updating the costs of five-year reviews to reflect the current average, and increasing the discount rate in calculating present-worth costs. It was also realized that there was a discrepancy between the cost estimate of Alternative G2 and the description of the selected remedy. The original cost estimate included analysis of VOCs, SVOCs, metals and dioxin, while the written description of the selected alternative only required analysis of metals.

Alternative G5 (Application of Alkaline Substance, Institutional Controls with Monitoring (modified)) is the second least expensive, costing only slightly more than Alternative G1 (No Action).

Alternative G2 (Institutional Controls with Monitoring), the 2002 ROD selected remedy, is approximately twice as expensive as Alternative G5. The primary difference in cost is the reduction of the number of wells to be sampled as well as a reduction of types of analysis to be performed for each sample.

Table 35 - Groundwater Alternative G1 Revised Cost Estimate

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Capital					**$0**
Annual O&M					**$0**
Five-Year Reviews					
1	Sampling of monitor and production wells	1	Lump Sum	$6,000	$6,000
2	VOC, SVOC, Metals, and Dioxin Analysis	13	Each	$1,600	$20,800
3	Labor (Analytical Report Preparation)	1	Lump Sum	$2,500	$2,500
4	Conduct Five-Year Review	1	Lump Sum	$25,000	$25,000
5	Administration (15%)				$8,145
6	Contingency (25%)				$13,575
	Total Five-Year Reviews (per event)				**$76,020**
Total Present-Worth Cost					**$164,028**

Notes:

1) The 2002 ROD estimated the Total Present-Worth Cost to be $222,535. The difference in the two estimates is due to updating the number of wells from 11 to 13 to reflect the two wells installed during the RD, updating the Five-Year Review cost from $8,000 to $25,000, and increasing the discount rate from 1.5% to 7%.

2) Total Present Worth Cost assumes a 7% discount rate and six Five-Year Reviews over a 30 year period to include sampling of 10 existing monitor wells and 3 former production wells.

Table 36 - Groundwater Alternative G2 Revised Cost Estimate

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Capital					
1	Deed Recordation	1	Lump Sum	$5,000	$5,000
2	Administration (15%)				$750
3	Contingency (25%)				$1,250
	Total Capital Costs				**$7,000**
Annual O&M					
4	Sampling of monitor and production wells	1	Lump Sum	$6,000	$6,000
5	Metals Analysis	13	Each	$500	$6,500
6	Labor (Report Preparation)	1	Lump Sum	$2,500	$2,500
7	Administrative costs (15%)				$2,250
8	Contingency (25%)				$3,750
	Total O&M Costs				**$21,000**
	Total Present-Worth O&M Cost				**$260,590**
Five-Year Review					
9	Conduct Five-Year Review (No additional sampling)	Every 5 years	Lump Sum	$25,000	$25,000
10	Administration (15%)				$3,750
11	Contingency (25%)				$6,250
	Total Five-Year Reviews (per event)				**$35,000**
	Total Present-Worth of Five-Year Reviews				**$75,520**
Total Present-Worth Cost					**$343,109**

Notes:

1) The 2002 ROD estimated the Total Present-Worth Cost to be $921,830. The difference in the two estimates is due to updating the number of wells from 11 to 13 to reflect the two wells installed during the RD, decreasing the sample analysis cost to be consistent with the remedy description, updating the Five-Year Review cost from $8,000 to $25,000, and increasing the discount rate from 1.5% to 7%.

2) The remedy description in the 2002 ROD indicated analysis of metals only. The original cost estimate included analysis of VOCs, SVOCs, metals and Dioxin. Line item #11 above was updated to reflect the current number of wells (13 instead of 11), and to change the analytical type and costs to match the remedy description chosen.

3) Total Present-Worth assumes a 7% discount rate, annual groundwater monitoring over a 30 year period, and six Five-Year Reviews.

Table 37 – Groundwater Alternative G3 Revised Cost Estimate

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Capital					
1	Treatment system installation (includes system, building, etc.)	1	Lump Sum	$100,000	$100,000
2	Extraction well installation	5	Each	$5,000	$25,000
3	Extraction well pumps and piping	5	Each	$1,000	$5,000
4	Piping between wells and connection to the treatment system	1	Lump Sum	$15,000	$15,000
5	Engineering design, specifications, regulatory approval, and permits (20% of Items 1-4)	1	Lump Sum	$29,000	$29,000
6	Administration (15%)				$26,100
7	Contingency (25%)				$43,500
	Total Capital Costs				**$243,600**
Annual O&M					
8	Treatment System (utilities: power usage based on $0.06 per kw-hr.)	1	Lump Sum	$10,000	$10,000
9	Treatment System (cleaning sand filter backwash and precipitation tank; assume 4 events per year at $3,000 per event)	4	Each	$3,000	$12,000
10	Weekly inspections/minor repair costs to treatment system	52	Each	$750	$39,000
11	Annual sampling of monitor and production wells	1	Lump Sum	$6,000	$6,000
12	Analytical costs of annual well sampling	13	Each	$500	$6,500
13	NPDES Influent and Effluent Sampling (once per quarter)	8	Each	$650	$5,200
14	Labor (Report Preparation)	1	Lump Sum	$5,000	$5,000
15	Administration (15%)				$12,555
16	Contingency (25%)				$20,925
	Total Annual O&M Costs				**$117,180**
	Total Present-Worth O&M Cost				**$1,365,567**
Five-Year Review					
17	Conduct Five-Year Review (No additional sampling)	Every 5 years	Lump Sum	$25,000	$25,000
18	Administration (15%)				$3,750
19	Contingency (25%)				$6,250
	Total Five-Year Review Costs (per event)				**$35,000**
	Present-Worth Cost of Five-Year Reviews				**$75,520**
Total Present-Worth Cost					**$1,684,686**

Notes:

1) The 2002 ROD estimated the Total Present-Worth Cost to be $2,593,406. The difference in the two estimates is due to updating the number of wells from 11 to 13 to reflect the two wells installed during the RD, increasing the analytical costs from $200 to $500 for consistency between the alternatives, updating the Five-Year Review cost from $10,000 to $25,000, and increasing the discount rate from 1.5% to 7%.

2) Total Present Worth Cost assumes a 7% discount rate, six Five-Year Reviews, and annual groundwater monitoring over a 25 year period at which time the groundwater treatment is anticipated to be complete.

Table 38 – Groundwater Alternative G4 Revised Cost Estimate

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Capital					
1	Engineering Design Services (Survey, Soil Analyses, Drawings, Specs, Permitting)	1	Lump Sum	$75,000	$75,000
2	Engineering Services During Bidding and Construction	1	Lump Sum	$35,000	$35,000
3	Extraction Well Installation	5	Each	$5,000	$25,000
4	Piping (between wells and connections to the pond and cells)	1	Lump Sum	$25,000	$25,000
5	Excavation of Pond and Cells	1	Lump Sum	$50,000	$50,000
6	Cell Construction Earthwork	1	Lump Sum	$30,000	$30,000
7	Clay or GCL liners	1	Lump Sum	$35,000	$35,000
8	Hydraulic Appurtenances	1	Lump Sum	$15,000	$15,000
9	Erosion Control Installation and Main.	1	Lump Sum	$25,000	$25,000
10	Plants Installed	7500	Each	$0.60	$4,500
11	Final Grading and Grassing	6	Acres	$2,000	$12,000
12	Monitoring Station	1	Lump Sum	$20,000	$20,000
13	Administration (15%)				$52,725
14	Contingency (25%)				$87,875
	Total Capital Costs				**$492,100**
Annual O&M					
15	Extraction Well Electricity	1	Lump Sum	$8,000	$8,000
16	Maintenance Labor (2 days per month)	1	Lump Sum	$15,000	$15,000
17	Report Labor	1	Lump Sum	$5,000	$5,000
18	Annual sampling of monitor and production wells	1	Lump Sum	$6,000	$6,000
19	Analytical costs of annual well sampling	13	Each	$500	$6,500
20	Analytical Costs of Influent and Effluent Sampling (Once per quarter - NPDES)	8	Each	$650	$5,200
21	Other Expenses	1	Lump Sum	$5,000	$5,000
22	Administration (15%)				$7,605
23	Contingency (25%)				$12,675
	Total Annual O&M Costs				**$70,980**
	Total Present-Worth O&M Cost				**$827,171**
Five-Year Review					
24	Conduct Five-Year Review (No additional sampling)	Every 5 years	Lump Sum	$25,000	$25,000
25	Administration (15%)				$3,750
26	Contingency (25%)				$6,250
	Total Five-Year Review Costs (per event)				**$35,000**
	Total Present-Worth Cost of Five-Year Review				**$75,520**
Total Present-Worth Cost					**$1,394,791**

Notes:

1) The 2002 ROD estimated the Total Present-Worth Cost to be $1,884,660. The difference in the two estimates is due to updating the number of wells from 11 to 13 to reflect the two wells installed during the RD, increasing the analytical costs from $200 to $500 for consistency between the alternatives, updating the Five-Year Review cost from $10,000 to $25,000, and increasing the discount rate from 1.5% to 7%.

2) Total Present-Worth Cost assumes a 7% discount rate, six Five-Year Reviews, and annual groundwater monitoring over a 25 year period at which time the groundwater treatment is anticipated to be complete.

Table 39 - Groundwater Alternative G5 Cost Estimate

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Capital					**$0**
1	Application of Alkaline Substance	200	tons	$12.50	$2,500
2	Deed Recordation	1	Lump Sum	$5,000	
3	Administration (15%)				$1,125
4	Contingency (25%)				$1,875
	Total Capital Costs				**$10,500**
Annual O&M					
5	Sampling of monitor and production wells	1	Lump Sum	$3,000	$3,000
6	Analysis (pH, turbidity, aluminum, beryllium, chromium, and nickel)	2	Each	$200	$400
7	Labor (Report Preparation)	1	Lump Sum	$2,000	$2,000
8	Administrative costs (15%)				$810
9	Contingency (25%)				$1,350
	Total O&M Costs				**$7,560**
	Total Present-Worth O&M Cost				**$93,812**
Five-Year Review					
10	Conduct Five-Year Review (No additional sampling)	Every 5 years	Lump Sum	$25,000	$25,000
11	Administration (15%)				$3,750
12	Contingency (25%)				$6,250
	Total Five-Year Reviews (per event)				**$35,000**
	Total Present-Worth of Five-Year Reviews				**$75,520**
Total Present-Worth Cost					**$179,832**

Notes:
1) Total Present-Worth Cost assumes a 7% discount rate, six Five-Year Reviews, and annual groundwater monitoring over a 30 year period.

2.10.7.3 Surface Water Alternatives

Because the cost estimates have changed for the original alternatives, the tables provided in the Feasibility Study were updated and are presented on the following pages in Tables 40-42. The cost estimate for the new alternative SW5 is included in Table 43. Costs for some of the alternatives have increased, while others have decreased from the 2002 ROD. Values that were modified from the FS tables were Five-Year Review costs, discount rate, and volume of contaminated surface water above clean-up goals from Ponds 1, 2, 3, and 4. Changes were made based on current costs of Five-Year Reviews and the updated volume calculations during the RD. Alternative SW1, No Action, is the least expensive. Alternative SW4, On-site Treatment through a Constructed Wetland is the most expensive. Alternative SW3, Off-Site Treatment/Disposal, the 2002 ROD selected remedy, is 7% more expensive than Alternative SW5.

Table 40 - Surface Water Alternative SW1 Revised Cost Estimate

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Capital					**$0**
Annual O&M					**$0**
Five-Year Reviews					
1	Sampling of four existing ponds	1	Lump Sum	$2,500	$6,000
2	VOC, SVOC, Metals, and Dioxin Analysis	4	Each	$1,600	$6,400
3	Labor (Analytical Report Preparation)	1	Lump Sum	$2,500	$2,500
4	Conduct Five-Year Review	1	Lump Sum	$25,000	$25,000
5	Administration (15%)				$5,460
6	Contingency (25%)				$9,100
	Total Five-Year Reviews (per event)				**$50.960**
Total Present-Worth Cost					**$109,956**

Note:

1) The 2002 ROD estimated the Total Present-Worth Cost to be $74,396. The difference in the two estimates is due to updating the Five-Year Review cost from $8,000 to $25,000 and increasing the discount rate from 1.5% to 7%.

2) Total Present-Worth Cost assumes a 7% discount rate and six Five-Year Reviews over a 30 year period to include sampling of the four ponds as described above.

Table 41 - Surface Water Alternative SW2 Revised Cost Estimate

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Capital					
1	Deed Recordation	1	Lump Sum	$5,000	$5,000
2	Administration (15%)				$750
3	Contingency (25%)				$1,250
	Total Capital Costs				**$7,000**
Annual O&M					
4	Sampling of four existing ponds	1	Lump Sum	$2,500	$2,500
5	VOC, SVOC, Metals, and Dioxin Analysi	4	Each	$1,600	$6,400
6	Labor (Report Preparation)	1	Lump Sum	$2,500	$2,500
7	Administrative costs (15%)				$1,710
8	Contingency (25%)				$2,850
	Total O&M Costs				**$15,960**
	Total Present-Worth O&M Cost				**$198,048**
Five-Year Review					
9	Conduct Five-Year Review (No additional sampling)	Every 5 years	Lump Sum	$25,000	$25,000
10	Administration (15%)				$3,750
11	Contingency (25%)				$6,250
	Total Five-Year Reviews (per event)				**$35,000**
	Total Present-Worth of Five-Year Reviews				**$75,520**
Total Present-Worth Cost					**$280,568**

Notes:

1) The 2002 ROD estimated the Total Present-Worth Cost to be $427,584. The difference in the two estimates is due to updating the Five-Year Review cost from $8,000 to $25,000 and increasing the discount rate from 1.5% to 7%.

2) Total Present-Worth Cost assumes a 7% discount rate and annual surface water monitoring over a 30 year period.

Table 42 - Surface Water Alternative SW3 Revised Cost Estimate

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Capital					
1	Project Plans	1	Lump Sum	$10,000	$10,000
2	Mobilization	1	Lump Sum	$5,000	$5,000
3	Waste Characterization Analysis	4	Each	$700	$2,800
4	Off-Site Disposal (T&D)	344,000	gallons	$0.20	$68,800
5	Construction Management (5%)				$4,330
6	Engineering, Administration (15%)				$12,990
7	Contingency (25%)				$21,650
	Total Capital Costs				**$125,570**
Annual O&M					**$0**
Five-Year Review					**$0**
Total Present-Worth Cost					**$125,570**

Notes:
1) The 2002 ROD estimated the Total Present-Worth Cost to be $170,810. The difference in the two estimates is due to reduction of the estimated volume from 500,000 gallons (FS) to 344,000 gallons (RD).

2) Off-site disposal includes transportation (vacuum tanker) and disposal at treatment facility located in Southport, NC approximately 40 miles south of Castle Hayne.

A table was not created specifically for Surface Water Alternative SW4. Costs for treatment of surface water through a constructed wetland are dependent on Groundwater Alternative G4 being selected as the remedy. Please refer to Groundwater Alternative G4 costs ($1,373,214).

Table 43 - Surface Water Alternative SW5 Cost Estimate

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Capital					
1	Project Plans	1	Lump Sum	$10,000	$10,000
2	Mobilization	1	Lump Sum	$5,000	$5,000
3	Waste Characterization Analysis	14	Each	$250	$3,500
4	Off-Site Disposal (T&D)	344,000	gallons	$0.18	$61,920
5	Construction Management (5%)				$4,021
6	Engineering, Administration (15%)				$12,063
7	Contingency (25%)				$20,105
	Total Capital Costs				**$116,609**
Annual O&M					**$0**
Five-Year Review					**$0**
Total Present-Worth Cost					**$116,609**

2.10.8 State/Support Agency Acceptance

The State supports Soil and Sediment Alternatives S3, S4 and S5, Groundwater Alternatives G2, G3, G4 and G5, and Surface Water Alternatives SW3, SW4 and SW5. The State does not believe that Alternative 1 for each media and Alternative 2 for Soil, Sediment and Surface water provide adequate protection of human health and the environment.

2.10.9 Community Acceptance

The Public Comment period lasted from April 6, 2007 to May 6, 2007. During that time period, two sets of written comments were received. Seven members of the community attended the Amended Proposed Plan public meeting, which was held at 6 p. m. on Thursday, May 3, 2007, at the New Hanover County Library. A summary is provided in the following paragraphs. Please refer to Part 3, the Responsiveness Summary, for more details.

The bulk of the comments received at the Public Meeting were related to questions regarding why it has taken so long for the cleanup to begin. Concerns were also expressed about local incidences of cancer. Some spoke of groundwater contamination (not related to this Site) found in other parts of New Hanover County, and wanted assurance that the property would be remediated to a level acceptable for future use. A few people expressed acceptance of the proposed changes, some remained totally silent, and none verbally objected to the changes being proposed. Most were glad that the cleanup will occur very soon.

Of the written comments, only one person expressed that they were against the changes being proposed. That community member lives across from Prince George Creek and stated she did not want the surface water discharged on-site due to frequent flooding of the Creek, which backs up into her yard. To accommodate this concern, and to enhance the wetland restoration process, the treated water will be discharged back into the remediated ponds, to the maximum extent practicable, rather than discharging elsewhere on site.

Table 44 – Summary of Alternative Evaluation Comparison

Nine Criteria	Soil Alternatives					Groundwater Alternatives					Surface Water Alternatives				
	S1	S2	S3	S4	S5	G1	G2	G3	G4	G5	SW1	SW2	SW3	SW4	SW5
Overall Protectiveness	Does not meet	Does not meet	Meets	Meets	Meets	Does not meet	Partially meets	Meets	Meets	Meets	Does not meet	Does not meet	Meets	Meets	Meets
Compliance with ARARs	Does not meet	Does not meet	Meets	Meets	Meets	Does not meet	Does not meet	Meets	Meets	Meets	Does not meet	Does not meet	Meets	Meets	Meets
Long-Term Effectiveness and Performance	Does not meet	Does not meet	Meets	Meets	Meets	Does not meet	Partially meets	Meets	Meets	Meets	Does not meet	Does not meet	Meets	Meets	Meets
Reduction of Toxicity, Mobility, or Volume through Treatment	Does not meet	Does not meet	Partially meets	Meets	Partially meets	Does not meet	Does not meet	Meets	Meets	Meets	Does not meet	Does not meet	Meets	Meets	Meets
Short-Term Effectiveness	Does not meet	Partially meets	Meets	Meets	Meets	Partially meets	Partially meets	Meets	Meets	Meets	Does not meet	Partially meets	Meets	Meets	Meets
Implementability	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets
Cost	#1 (Meets)	#2 (Meets)	#4 (Partially meets)	#5 (Does not meet)	#3 (Meets)	#1 (Meets)	#3 (Partially meets)	#5 (Does not meet)	#4 (Does not meet)	#2 (Meets)	#1 (Meets)	#4 (Partially meets)	#3 (Meets)	#5 (Does not meet)	#2 (Meets)
State Acceptance	Does not meet	Does not meet	Meets	Meets	Meets	Does not meet	Meets	Meets	Meets	Meets	Does not meet	Does not meet	Meets	Meets	Meets
Community Acceptance	Does not meet	Does not meet	Meets	Meets	Meets	Does not meet	Meets	Meets	Meets	Meets	Does not meet	Does not meet	Meets	Meets	Meets

Key:

2002 selected remedy (S3, G2, SW3) | EPA's preferred alternative (S5, G5, SW5)

Meets criteria | Partially meets criteria | Does not meet criteria

Cost ranking from least (#1) to most (#5) expensive

Table 45 – Comparative Analysis of Alternatives

Criteria/Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Soil & Sediment:	**No Action**	**Institutional Controls, Monitoring**	**Excavation and Off-site Disposal**	**Excavation and On-site Stabilization**	**Excavation and Off-site Disposal (modified)**
Surface Water:	**No Action**	**Institutional Controls, Monitoring**	**Off-site Treatment and Disposal**	**On-site: Constructed Wetlands**	**On-site Treatment & Disposal**
Groundwater:	**No Action**	**Institutional Controls, Monitoring**	**Extraction, Chemical Precipitation**	**Extraction, Constructed Wetlands**	**Application of Alkaline Substance, Institutional Controls with Monitoring (modified)**
OVERALL PROTECTIVENESS					
Human Health Protection					
Direct Contact/Soil Ingestion	No Risk Reduction	Minimal risk reduction, only to the extent ICs are enforced.	Risks reduced to unrestricted land use.	Risks reduced to restricted land use.	Risks reduced to unrestricted land use.
Groundwater Ingestion for Current Users	No current users	No current users	No current users	No current users	No current users
Groundwater Ingestion for Potential Future Users	No Risk Reduction	Risks are reduced to the extent that ICs are enforced.	Risks reduced to MCLs once remediation is completed.	Risks reduced to MCLs once remediation is completed.	Risks potentially reduced to MCLs once remediation is complete. If ineffective, risks are reduced to the extent that ICs are enforced.
Environmental Protection	No Risk Reduction	No Risk Reduction	Risks reduced to levels protective of ecological receptors	Risks reduced to levels protective of ecological receptors. Also provides new ecological habitats.	Risks reduced to levels protective of ecological receptors. Provides more habitat than Alternative 3.

Table 45 – Comparative Analysis of Alternatives (continued)

Criteria/Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
COMPLIANCE WITH ARARS					
Chemical Specific					
Soil/Sediment	No Chemical Specific ARARs	No Chemical Specific ARARs	No Chemical Specific ARARs	No Chemical Specific ARARs	No Chemical Specific ARARs
Surface Water	Contaminants will exceed surface water standards	Contaminants will exceed surface water standards	Contaminated water would be removed	Contaminated water would be treated to meet ARARs	Contaminated water would be treated to meet ARARs
Groundwater	Contaminants will exceed drinking water standards	Contaminants will exceed drinking water standards	Groundwater would achieve drinking water standards in ~30 years	Groundwater would achieve drinking water standards in ~30 years	Groundwater may achieve drinking water standards
Location Specific	Not Applicable	Would comply with wetlands and floodplain ARARS	Would comply with wetlands and floodplain ARARS	Would comply with wetlands and floodplain ARARs	Would comply with wetlands and floodplain ARARs
Action Specific					
Soil/Sediment	Not Applicable	Not Applicable	Would comply with Action specific ARARs	Would comply with Action specific ARARs	Would comply with Action specific ARARs
Surface Water	Not Applicable	Monitoring would comply with Action specific ARARs	Would comply with Action specific ARARs	Would comply with Action specific ARARs	Would comply with Action specific ARARs
Groundwater	Not Applicable	Monitoring would comply with Action specific ARARs	Would comply with Action specific ARARs	Would comply with Action specific ARARs	Would comply with Action specific ARARs
Other Criteria and Guidance	Contaminants will exceed health and ecological based clean-up goals	Contaminants will exceed health and ecological based clean-up goals	Would reduce both the human health and ecological risks to acceptable levels	Would reduce both the human health and ecological risks to acceptable levels	Would reduce both the human health and ecological risks to acceptable levels

Table 45 – Comparative Analysis of Alternatives (continued)

Criteria/Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
LONG TERM EFFECTIVENESS AND PERFORMANCE					
Magnitude of Residual Risk					
Direct Contact/Soil Ingestion	Current risk remains	Reduces risk to the extent ICs are enforced	Reduces risks to residential levels ($1x10^{-5}$, HQ=1)	Reduces risks to residential levels ($1x10^{-5}$, HQ=1)	Reduces risks to residential levels ($1x10^{-5}$, HQ=1)
Groundwater Ingestion for Current Users	No current users	No current users	No current users	No current users	No current users
Groundwater Ingestion for Potential Future Users	Current risk remains	Reduces risk to the extent ICs are enforced	Reduces risks to acceptable levels (MCL, HQ=1)	Reduces risks to acceptable levels (MCL, HQ=1)	Should reduce risks to acceptable levels (MCL, HQ=1).
Adequacy and Reliability of Controls	Contaminants would remain on-site above health and ecological based levels. No controls.	Contaminants would remain on-site above health and ecological based levels. ICs would provide more reliability than No Action, but less reliability than other alternatives.	These alternatives are adequate and reliable.	These alternatives are adequate and reliable.	These alternatives are adequate and reliable.

Table 45 – Comparative Analysis of Alternatives (continued)

Criteria/Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT					
Treatment Process Used					
Soil/Sediment	None	None	None, unless required under RCRA prior to disposal.	Stabilization	None, unless required under RCRA prior to disposal
Surface Water			TBD	Constructed Wetlands	Metals precipitation, carbon absorption
Groundwater			Chemical Precipitation	Constructed Wetlands	pH adjustment
Amount Destroyed or Treated					
Soil/Sediment	None	None	None anticipated	1420 cubic yards	None anticipated
Surface Water			344,000 gallons	344,000 gallons	344,000 gallons
Groundwater			TBD	TBD	TBD
Reduction of Toxicity, Mobility or Volume	None	None	Reduces toxicity, mobility and volume	Reduces toxicity, mobility and volume	Reduces toxicity, mobility and volume
Irreversible Treatment	None	None	These alternatives provide for irreversible treatment for surface and groundwater, but no treatment for soil and sediment unless required at the time of disposal.	These alternatives provide for Irreversible Treatment for all media.	These alternatives provide for irreversible treatment for surface and groundwater, but no treatment for soil and sediment unless required at the time of disposal.
Type and Quantity of Residuals Remaining After Treatment	Contamination remains	Contamination remains	None	Stabilized mass ~ 2,100 cubic yards	None

Table 45 – Comparative Analysis of Alternatives (continued)

Criteria/Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
SHORT-TERM EFFECTIVENESS					
Community Protection	Continued Risk to Community through No Action	Limited Community Protection to the extent that ICs are enforced.	Limited Risk to Community through off-site transportation	Minimal Risk to Community due to distance to nearest resident	Limited Risk to Community through off-site transportation
Worker Protection	No risk to workers	Minimal risk to workers during sampling.	Protection required during excavation and handling of wastes.	Protection required during excavation and treatment of wastes.	Protection required during excavation and handling of wastes.
Environmental Impacts	Continued impacts from existing condition	Continued impacts from existing condition	Negative impacts would be eliminated	Negative impacts would be eliminated. Constructed Wetlands would provide added environmental benefit of increased ecological habitat.	Negative impacts would be eliminated. The soil/sediment remedy provides more environmental benefit of increased ecological habitat than alternative 3.
Time Unit Action is Complete	Not applicable	ICs could be in place in about 1 year.	Construction could be completed in about 3 months. Groundwater treatment would take ~30 years.	Construction could be completed in about 4 months. Groundwater treatment would take ~30 years.	Construction could be completed in about 3 months. Groundwater treatment may take 5 years.

Table 45 – Comparative Analysis of Alternatives (continued)

Criteria/Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
IMPLEMENTABILITY					
Ability to Construct and Operate	No construction or operation.	No construction, easily sampled.	Easily constructed. Groundwater operation would require moderate effort.	Easily constructed. Groundwater operation would require minimal effort.	Easily constructed and monitored.
Ease of Doing More Action if Needed	Would require ROD amendment.	May require ROD amendment.	Easy	Easy	Easy
Ability to Monitor Effectiveness	5-Year Reviews	Monitoring is part of this alternative	Effectiveness is easily monitored by sampling and analysis.	Effectiveness is easily monitored by sampling and analysis.	Effectiveness is easily monitored by sampling and analysis.
Ability to obtain Approvals and Coordinate with Other Agencies	No Approval Necessary	Would require assistance from the State to implement ICs.	Would require coordination.	Would require coordination.	Would require coordination and assistance from the State to implement ICs.
Availability of Equipment, Specialists and Materials	Readily Available	Readily available	Readily available	Readily available	Readily available
Availability of Technologies	Readily Available	Readily available	Readily available	Readily available	Readily available

Table 45 – Comparative Analysis of Alternatives (continued)

Criteria/Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
COST					
Soil/Sediment					
Capital	$0	$7,000	$307,531	$568,750	$278,781
Annual O&M	$0	$0	$0	$0	$0
Five-Year Reviews	$35,000	$35,000	$0	$35,000	$0
Present-Worth Cost	**$75,520**	**$82,520**	**$307,531**	**$644,270**	**$278,781**
Surface Water					
Capital	$0	$7,000	$125,570	$492,100	$116,609
Annual O&M	$0	$15,960	$0	$70,980	$0
Five-Year Reviews	$50,960	$35,000	$0	$35,000	$0
Present-Worth Cost	**$109,956**	**$280,568**	**$125,570**	**$1,394,791**	**$116,609**
Groundwater					
Capital	$0	$7,000	$243,600	$492,100	$10,500
Annual O&M	$0	$21,000	$117,180	$70,980	$7,560
Five-Year Reviews	$76,020	$35,000	$35,000	$35,000	$35,000
Present-Worth Cost	**$164,028**	**$343,109**	**$1,684,686**	**$1,394,791**	**$179,832**
STATE ACCEPTANCE					
Soil/Sediment	No	No	Yes	Yes	Yes
Surface Water	No	No	Yes	Yes	Yes
Groundwater	No	Yes	Yes	Yes	Yes
COMMUNITY ACCEPTANCE					
Soil/Sediment	No	No	Yes	Yes	Yes
Surface Water	No	No	Yes	Yes	Yes
Groundwater	No	Yes	Yes	Yes	Yes

2.11 Principal Threat Wastes

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP §300.430(a)(1)(iii)(A)). Identifying principal threat waste combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile, which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. The contaminated soils in the scrap copper area and the contaminated sediments in the ponds are not considered to be principal threat wastes because the chemicals of concern are not found at highly toxic concentrations that pose a significant risk to either human or ecological receptors. The ecological toxicity tests performed on soils and sediments from these areas showed significant toxicity with increased mortality and decreased growth.

2.12 Amended Selected Remedy

2.12.1 Summary of the Rationale for the Amended Selected Remedy

2.12.1.1 Soil and Sediment

The Amended Selected Remedy for Soil and Sediment is Alternative S5, Excavation and Off-Site Disposal (modified). Excavated soil and sediment will be sampled and analyzed using the TCLP to determine if it is a RCRA characteristic hazardous waste. If TCLP results indicate that it is not a hazardous waste, as was observed for samples obtained during the RD, the excavated soil and sediment will then be transported to an off-site permitted landfill as a regulated "non-hazardous" solid waste or to a facility that uses wood tar contaminated material as a fuel alternative. If the TCLP results indicate that the wastes are RCRA hazardous because they fail the TCLP test, excavated soils which fail TCLP will be disposed in a permitted RCRA Subtitle D landfill when the soil both: a) meets applicable treatment standards under 40 CFR 268; and b) no longer exhibits a hazardous waste characteristic (i.e., the soils pass TCLP after treatment).

Alternative S5 is equally effective as the 2002 ROD selected remedy. However, it is less expensive and provides a greater habitat for ecological receptors. Alternatives S1 and S2 do not treat or remove the contaminated soils or sediments that are present above levels that are protective of human health or the environment, and are therefore not acceptable to either EPA or the State. Alternatives S3, S4 and S5 significantly reduce the risks to human and ecological receptors. Alternatives S3 and S5 are significantly less expensive than Alternative S4, and would not require a future Five-Year Review based on this media since all soil and sediment contaminated above clean-up levels would be removed from the Site. The soil and sediment remedy is amended to provide a variation on backfill requirements, which will improve groundwater quality and increase ecological habitat value while at the same time, slightly decreasing construction time and costs.

2.12.1.2 Groundwater

The Amended Selected Remedy for Groundwater is Alternative G5, Application of Alkaline Substance and Institutional Controls with Monitoring (modified). The 2002 ROD selected Alternative G2, Institutional Controls with Monitoring, with a contingency of Alternative G4, Extraction and

Treatment Using Constructed Wetlands. That remedy was selected because of uncertainties in the groundwater data. Data collected during the RD show that thallium detections during the RI/FS were most likely false positive detections. Three contaminants exceeded MCL values during the RD (i.e., beryllium, chromium and nickel) in two on-site wells (MW-7S and 7D). Aluminum still exceeds the human health risk assessment calculated remediation goal in two wells only (MW-7S and MW-7D). Those wells also had low pH values. A review of literature indicated that aluminum content in groundwater correlates with pH. Water with pH values outside of the 6-8.5 range has significantly higher aluminum concentrations than the same groundwater sample with a neutral pH. It is believed that the low pH at wells MW-7S and MW-7D are the cause of the high metal concentrations. Addition of an alkaline substance near this well pair should change the pH of the groundwater from acidic to neutral. Annual monitoring will verify its effectiveness. Reducing the monitoring requirements from all wells and a full suite of analysis to two wells (MW-7S and MW-7D) with minimal parameters (pH, turbidity, aluminum, beryllium, chromium, and nickel) will save money while providing the information needed to evaluate the remedy. Institutional Controls are intended to prevent future uses of groundwater and are enforceable by NCDENR and EPA. Since there are no current on-site users of the groundwater, this alternative is protective of human health.

Alternative G2 requires that more data be obtained than necessary to evaluate the remedy. Implementation of a pump and treat system as suggested by Alternatives G3 and G4, is not an efficient way to address contamination at a single location. It appears that the problem is isolated to a small area.

2.12.1.3 Surface Water

The Amended Selected Remedy for Surface Water contaminated above clean-up goals in Ponds 1, 2, 3 and 4 is Alternative SW5, On-Site Treatment and Disposal. Because Alternatives SW1 and SW2 do not provide protection to ecological receptors, they were not selected. Alternative SW4, Treatment Using Constructed Wetlands, is only possible if that remedy is selected for groundwater remediation. That alternative was not selected as the groundwater remedy. The 2002 ROD selected Alternative SW3, Off-site Treatment and Disposal, as the best alternative. Alternative SW5 is less expensive than Alternative SW3 and was preferred by the PRPs. It also requires less truck traffic, which is safer for the community. Both remedies provide for cost effective removal and treatment of the contaminated surface water, which reduces the risks to human and ecological receptors.

Surface water contaminated above surface water clean-up goals in the on-site trenches and in the creek do not require separate remediation, because it is anticipated that the soil and sediment remedies, and treatment of surface water in the ponds, will remove sufficient contamination to reduce the levels of COCs in the creek and trenches to levels below surface water cleanup goals.

2.12.2 Description of the Amended Selected Remedy

The amended selected remedy consists of Soil and Sediment Alternative S5 (Excavation and Off-Site Disposal (modified)), Surface Water Alternative SW5 (On-Site Treatment and Disposal), and Groundwater Alternative G5 (Application of Alkaline Substance, Institutional Controls with Monitoring (modified)). A detailed description of the selected remedy follows in the sequence that is expected to occur. Clean-up goals can be found in Table 47 on page 123.

2.12.2.1 Surface Water

Contaminated surface water from Ponds 1, 2, 3, and 4 will be pumped into an aboveground storage tank, treating the water by an ion exchange resin for metals removal followed by activated carbon adsorption for organic wastes, post-treatment filtration and then on-site disposal. This activity will achieve the Remedial Action Objectives for contaminated surface water within approximately two months of the mobilization date of the contractor. The RAOs include:

- prevent further migration of contaminants above clean-up goals from Ponds 1, 2, 3 and 4, to soil, groundwater and down-gradient surface water bodies
- eliminate exposure to contaminated surface water above levels exceeding clean-up goals by aquatic receptors
- achieve the North Carolina Surface Water Quality Standards (NCAC Title 15A, Chapter 2, Subchapter 2B. 0100 and 2B. 0200) in Ponds 1, 2, 3 and 4 for: copper, lead, iron and zinc

To the maximum extent possible, the treated water will be pumped back into the remediated ponds to enhance the natural wetland restoration process. When this is not practicable, the water will be sprayed onto the property for infiltration through the soil. Samples will be collected from the treated water to ensure compliance with discharge requirements. The current volume estimate is 344,000 gallons of contaminated surface water above clean-up goals from Ponds 1, 2, 3 and 4.

2.12.2.2 Soil and Sediment

After the contaminated water from Ponds 1, 2, 3, and 4 is removed, the soil and sediment remedy will be implemented. There are seven areas that have contamination in soils or sediment above clean-up goals: Scrap Copper Area, Drum Disposal Area, Pipe Shop Area, Pond 1, Pond 2, Pond 3, and Pond 4. This contamination is from approximately zero to one foot below ground surface for all areas except Pond 2, which is estimated to extend to 5 feet below ground surface. The current volume estimate is 1,420 yd^3 of contaminated soil and sediment.

Excavated soil and sediment will be sampled and analyzed using the Toxicity Characteristic Leaching Procedure (TCLP) to determine if it is a Resource Conservation and Recovery Act (RCRA) characteristic hazardous waste, and sampled to meet any other requirements of the disposal facility. It is anticipated that the results will show that it is not a hazardous waste, as was observed for samples obtained during the RD. The excavated soil and sediment will then be transported to an off-site permitted landfill as a regulated “non-hazardous” solid waste or to a facility that uses wood tar contaminated material as a fuel alternative. If the TCLP results indicate that the wastes are RCRA hazardous because they fail the TCLP test, excavated soils which fail TCLP will be disposed in a permitted RCRA Subtitle D landfill when the soil both: a) meets applicable treatment standards under 40 CFR 268; and b) no longer exhibits a hazardous waste characteristic (i.e., the soils pass TCLP after treatment). Decaying drums in the drum disposal area will be disposed with soils and sediments.

Prior to excavation, the following general site preparation will be necessary:

- Survey and mark the limits of the area to be excavated.
- Prepare a staging area for dewatering sediments

- Prepare a decontamination area. Construct a lined pad with curbs and sump for the collection of decontamination water. The wastewater will be stored and tested to determine final disposition.

Excavation will be performed with standard construction equipment consisting mainly of an excavator. Excavated materials will either be loaded directly into trucks or placed on a lined staging area prior to off-site disposal. If the sediments are too wet to load directly into trucks, they will be staged and allowed to dry before loading into trucks. If necessary, drying agents (such as cement or kiln dust) may be added to the stockpiled sediments to facilitate the drying process. Any water accumulated will be treated through the surface water treatment system. For extremely dry soils, dust suppression by wetting the soil will be performed as necessary. Trucks to transport soil to an approved disposal facility will enter designated areas of the site and will be directed to a specific loading area. Each truck must adhere to U.S. Department of Transportation requirements and follow manifesting procedures.

After excavation, the soil removal areas will be backfilled with clean soil and graded to match the contour of the adjacent land. The drum disposal area will be backfilled with lime, or similar alkaline substance, to decrease the acidity of groundwater in the area (near well MW-7S and MW-7D). All disturbed areas will be vegetated with native plants or covered with crushed stone as appropriate. The excavated ponds will not be backfilled, which will provide the opportunity for natural establishment as a wetland habitat. A Habitat Verification Plan will be prepared.

This alternative is expected to be completed, with following Remedial Action Objectives attained, within two months of mobilization to the Site.

Soil RAOs:
- prevent further migration of contaminants from soil to groundwater and surface water above levels exceeding groundwater and surface water clean-up goals
- eliminate unacceptable risk to human health and the environment
- achieve the human health and ecological risk based clean-up goals for: benzo(a) pyrene, benzo(b &/or k) fluoranthene, dibenzo(a, h) anthracene, total PAHs, antimony, copper and lead.

Sediment RAOs:
- prevent further migration of contaminants from sediment to groundwater and surface water above levels exceeding groundwater and surface water clean-up goals
- eliminate exposure of ecological receptors to contaminated sediment
- achieve ecological risk based sediment clean-up goals for: methyl ethyl ketone, toluene, (3- and/or 4-) methylphenol, total PAHs, and copper

2.12.2.3 Groundwater

2.12.2.3.1 Addition of Alkaline Substance

After the contaminated soil is removed, an alkaline substance such as granulated limestone will be placed in the excavated pit of at the drum disposal area. The drum disposal area is immediately upgradient of the well pair of concern, MW-7S and MW-7D. Groundwater is shallow at the Site. In

March and September 2003 (the only sampling events to date for these wells) the depth to groundwater at well MW-7S was 4.2 feet and 6.6 feet respectively. Placement of an alkaline substance in the soil is expected to increase the pH of shallow groundwater, which should reduce the concentration of inorganic compounds detected.

2.12.2.3.2 Monitoring

Initially, samples will be collected annually from Wells MW-7S and MW-7D and field tested for pH. If the pH is between 7.2 and 8.5 at any sampling event, a sample will be collected from these wells using best efforts to reduce turbidity, and will be analyzed for aluminum, beryllium, chromium, and nickel. Field data for turbidity and pH will be recorded at each sampling event. At four years after the initiation of the remedial action, samples will be collected from wells MW-7S and MW-7D and analyzed for aluminum, beryllium, chromium, and nickel with pH and turbidity field data documented. Monitoring frequency may be reduced after the first Five-Year Review.

Five-Year Reviews will be conducted to determine whether the remedy remains protective to human health or the environment. As a result of this review, EPA will determine if additional site remediation is required.

2.12.2.3.3 Institutional Controls:

EPA and NCDENR have worked together over the past several months drafting language for the Declaration of Perpetual Land Use Restrictions (DPLUR). The property owners have submitted comments to EPA and NCDENR on the draft document. It is anticipated that the DPLUR will be filed with the Office of the Register of Deeds for New Hanover County within the next six months. The DPLUR will be used to prevent human exposure to contaminated groundwater. Specifically, it prohibits the use of surficial groundwater for any purpose. Any groundwater well or other device for access to groundwater for any purpose other than monitoring groundwater quality must include an isolation seal between the surficial aquifer and the Peedee Formation aquifer located below. This declaration will be attached to the title and will remain enforceable by EPA and NCDENR regardless of property ownership changes. These restrictions will remain in place until the groundwater quality improves enough to allow for unrestricted use and unlimited exposure. A Site figure will be included with the document. The property owner is responsible for implementing the IC, which is enforceable by NCDENR and EPA. The declaration shall run with the land and shall be binding on all parties having any right, title or interest in the Site or any part thereof, their heirs, successors and assigns.

2.12.3 Summary of the Estimated Remedy Costs

The selected remedy is expected to cost $560,774. Table 46 represents the combined remedy costs. This value is less than the sum of each alternative because duplicate items, such as plan preparation, mobilization, site preparation and set up, etc. were consolidated into one item for all media.

Table 46 – Estimated Cost of Total Remedy

Item	Description	Quantity	Unit	Unit Cost	Total Cost
Capital Costs					
All Media					
1	Site Visit and Documentation Review	1	Lump sum	$1,000	$1,000
2	Project Plans	3	Each	$2,500	$7,500
3	Erosion Control	1000	linear feet	$5	$5,000
4	Mobilization/Demobilization	2	Each	$3,300	$6,600
5	Site Preparation and Set-up	1	Lump sum	$30,000	$30,000
Soil					
6	Excavation	1420	cubic yards	$15	$21,300
7	Waste Disposal Analysis	2	Each	$2,000	$4,000
8	Off-Site Transportation/Disposal	1915	Tons	$15	$28,725
9	Verification Sampling	1	Lump sum	$23,000	$23,000
10	On-site borrow area prep	1	Lump sum	$5,000	$5,000
11	Load and Haul Backfill from on-site borrow area	345	cubic yards	$11	$3,795
12	Backfill/grade	345	cubic yards	$9	$3,105
13	Site restoration and reseeding	1	acre	$1,500	$1,500
14	Construction Management	1	Lump sum	$46,000	$46,000
15	Project Admin. Support	1	Lump sum	$30,000	$30,000
16	Project Reporting - Draft and Final	1	Lump sum	$6,500	$6,500
Groundwater					
17	Application of Alkaline Substance	200	Tons	$12.50	$2,500
18	Deed Restrictions	1	Lump sum	$5,000.00	$5,000
19	Administration (15%)				$1,125
Surface Water					
20	Sample Analysis	14	Each	$250.00	$3,500
21	On-site Treatment and Disposal	344,000	gallons	$0.18	$61,920
22	Construction Management (5%)				$4,021
23	Engineering, Administration (15%)				$12,063
Subtotal Capital Costs					**$313,154**
24	Contingency for all media (25%)				$78,289
Total Capital Costs for all media					**$391,443**
Annual O&M Costs (Groundwater)					
25	Sampling of monitoring and production wells	1	Lump sum	$3,000	$3,000
26	Analysis (aluminum, pH, turbidity)	2	Each	$200	$400
27	Report Preparation	1	Each	$2,000	$2,000
28	Administration (15%)				$810
29	Contingency (25%)				$1,350
Total Annual O&M Costs					**$7,560**
Total Present Worth O&M Costs					**$93,812**
Five-Year Reviews					
30	Conduct Five-Year Review	Every 5 years	Lump sum	$25,000	$25,000
31	Administration (15%)				$3,750
32	Contingency (25%)				$6,250
	Subtotal Five-Year Review				**$35,000**
	Total Present-Worth Cost of Five-Year Review				**$75,520**
Total Present-Worth Cost					**$560,774**

Notes:

1) Tons calculated using a soil density of 100 pounds per cubic foot (1.35 tons/yd^3).

2) Bulk transportation assumes hauling with over the road dump trucks to the New Hanover County Landfill located approximately 10 miles from the Site.

3) Disposal rate of $15/ton assumes classification as regulated "non-hazardous" solid waste.

4) Total Present-Worth Cost assumes a 7% discount rate, six Five-Year Reviews, and annual groundwater monitoring over a 30 year period.

The information in the above cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of implementation of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

2.12.4 Expected Outcomes of the Selected Remedy

2.12.4.1 Available Land Use after Clean-up

The available land use after the clean-up for this amended ROD is the same as it was in the 2002 ROD. The clean-up levels chosen were based on residential, unrestricted use/unlimited exposure scenarios, and on protection of ecological uses. After the soil/sediment and surface water portions of the remedy are completed (several months after they are initiated), the property would be available for residential, commercial or industrial uses with restrictions only on groundwater. The groundwater remedy may be completed in as little as a few years to as long as 30 years (possibly longer). Until the groundwater remedy is complete, restrictions are required to prevent the groundwater from being used in the area of known contamination.

2.12.4.2 Final Clean-up Goals

As discussed in the Baseline Human Health Risk Assessment (BHHRA), EPA calculated clean-up levels for each COC by combining the intake levels of each COC from all appropriate exposure routes for a particular medium and rearranging the risk equations to solve for the concentration term (i.e., the clean-up levels)). Clean-up levels are chemical concentrations which provide remedial design staff with long-term targets to use during analysis and selection of remedial alternatives. Ideally, such goals, if achieved, will comply with applicable or relevant and appropriate requirements (ARARs) and result in residual risks that fully satisfy National Contingency Plan (NCP) requirements for the protection of human health and the environment. Risk-based clean-up levels are guidelines and do not establish that cleanup to meet these goals is warranted. Risk-based clean-up levels were calculated for both cancer and non-cancer effects for the surface soil, subsurface soil and groundwater at the site.

The clean-up goals for the Site were developed specifically to protect human health and to address the risk identified in the BHHRA. These goals are based on available information, standards such as ARARs and the risk-based levels established in the Baseline Risk Assessment. Clean-up goals at the Site were developed by using the more stringent of the COC concentrations which indicate a $1x10^{-5}$ cancer risk or a non-cancer HI of one in surface and subsurface soil, and groundwater, at the site.

As noted in the 2002 ROD, upon consideration of a variety of site-specific factors, EPA set clean-up goals at the site based on a $1x10^{-5}$ cancer risk level or an HQ of 1. Thus, EPA has decided that risks greater than $1x10^{-5}$ or HQ = 1 at this site would be considered unacceptable. Thus, the COCs were those contaminants that indicated exceedances in excess risk levels within each of the various potential exposure scenarios at the site that based on a $1x10^{-5}$ risk level or an HQ of 1.

The Final Clean-up Goals in this amended ROD are the same as the 2002 ROD with the exception of elimination of thallium as a contaminant of concern for groundwater; addition of clean-up goals for beryllium, chromium and nickel in groundwater; and the addition of sediment clean-up goals. As mentioned in previous sections, the results for thallium detected in groundwater samples during the RI were suspected to be “false positives”. Thallium was not detected above MCL values in any wells during the two sampling events of the RD. During the RD, two additional wells were installed (MW-7S and MW-7D). During the two RD sampling events, beryllium, chromium, and nickel were detected above MCL values in only these two wells. The original remedy backfilled the ponds, so only soil clean-up goals were needed. The amended remedy returns Ponds 1, 2, 3 and 4 to wetland habitat, so sediment clean-up goals are needed. The values selected for sediment clean-up goals are the Alternate Toxicity Values used in the Ecological Risk Assessment. The Final Clean-up Goals for soil, sediment, groundwater, and surface water, basis for clean-up goals, and risk at clean-up goal are included in Table 47, on the following page.

2.12.4.3 Anticipated Environmental and Ecological Benefits

Removal of the contaminated soil, sediment and surface water above clean-up goals will improve the quality of the ecological habitat that already exists on-site. Removing the contamination will eliminate contaminated run-off into the existing on- and off-site wetlands and the adjacent Prince George Creek. The modified remedy will return the existing Ponds 1, 2, 3 and 4 to wetlands rather than elimination of those areas as wetlands, which was prescribed in the 2002 ROD.

2.13 Statutory Determinations

2.13.1 Protection of Human Health and the Environment

The selected remedy will adequately protect human health and the environment through treatment, engineering controls, and/or institutional controls (NCP §300.430(f)(5)(ii)). Soil and sediment contaminants concentrations above clean-up goals noted in Table 47 posing cancer risks of greater than $1x10^{-5}$ or Hazard Quotients greater than 1 will be removed from the Site and placed in an off-site landfill. Surface water in Ponds 1, 2, 3 and 4 which have concentrations greater than Federal or State surface water criteria will be treated at the Site and disposed of at the site. Groundwater will be treated at the Site through application of an alkaline substance to raise the pH of the shallow groundwater at wells MW-7S and MW-7D. Raising the pH should lower the aluminum, beryllium, chromium and nickel content to concentrations that are protective of human health. A “Declaration of Perpetual Land Use Restrictions” will be placed on the property deed prohibiting use of groundwater. The groundwater will be monitored until enough data is received that shows that the groundwater is no longer contaminated above clean-up goals noted in Table 47. The property use restrictions will remain in place until the groundwater is returned to adequate quality for unlimited use. All of these measures will reduce the risks to both human and ecological receptors. They are not expected to cause unacceptable short-term risks or cross-media impacts.

2.13.2 Compliance with Applicable or Relevant and Appropriate Requirements

The Federal and State ARARs, potential ARARs and requirements which are To Be Considered, that are relevant to the Site and the Selected Remedy are presented in Tables 48 and 49. The selected remedy will comply with all ARARs in Tables 48 and 49 that are listed as either “Applicable” or “Relevant and Appropriate” under the “ Status” column. Most of the requirements that are identified

Table 47 – Clean-up Goals and Basis

Chemical of Concern	Cleanup Goal	Basis for Cleanup Goal	Risk at Cleanup Goal
Media: Soil			
Benzo(a)pyrene	610 µg/kg	BHHRA	Cancer risk = $1x10^{-5}$
Benzo(b &/or k)fluoranthene	6,100 µg/kg	BHHRA	Cancer risk = $1x10^{-5}$
Dibenzo(a,h)anthracene	610 µg/kg	BHHRA	Cancer risk = $1x10^{-5}$
Antimony	30 mg/kg	BHHRA	HQ = 1
Copper	2,700 mg/kg	ERA Toxicity Tests	HQ = 1
Lead	400 mg/kg	EPA guidance	N/A
Media: Sediment			
Toluene	8,050 µg/kg	ERA ATV	HQ = 1
Methylethyl Ketone	137 µg/kg	ERA ATV	HQ = 1
(3 and/or 4)-methyl phenol	50 µg/kg	ERA ATV	HQ = 1
Total PAHs	13,660 µg/kg	ERA ATV	HQ = 1
Copper	197 mg/kg	ERA ATV	HQ = 1
Media: Groundwater			
Aluminum	16,000 µg/L	BHHRA	HQ = 1
Beryllium	4 µg/L	Federal MCL	HQ = 1
Chromium	50 µg/L	State MCL	HQ = 1
Nickel	100 µg/L	State MCL	HQ = 1
~~Thallium~~	~~2 µg/L~~	~~Federal MCL~~	~~HQ = 1~~
Media: Surface water			
Copper	7 µg/L	NC Water Pollution Control Regulations	HQ = 1
Iron	1000 µg/L	NC Water Pollution Control Regulations, Clean Water Act	HQ = 1
Lead	2.5 µg/L	Clean Water Act	HQ = 1
Zinc	50 µg/L	NC Water Pollution Control Regulations	HQ = 1

Notes:

ATV = Alternate Toxicity Value

BHHRA = Baseline Human Health Risk Assessment

ERA = Ecological Risk Assessment

Federal MCL = Safe Drinking Water Act (SWDA) Maximum Contaminant Level (MCL)

State MCL = North Carolina Administrative Code, Subchapter 2L Maximum Contaminant Level

HQ = Hazard Quotient (non-carcinogenic)

N/A = Not Applicable

Table 48 – Federal ARARs Attainment

Media	Requirement	Status	Synopsis of Requirement	Action to be Taken to Attain Requirement
All	Occupational Safety and Health Act (OSHA), 29 CFR Part 1910	Applicable	Regulates workers' health and safety	All personnel performing the selected remedy will comply with the requirements of this ARAR through the implementation of a Site-specific Health and Safety Plan.
	Noise Control Act of 1972 42 USC Sect. 4901 et seq.	Potentially Applicable	Federal activities must not result in noise that will jeopardize the health or welfare of public.	No actions conducted are expected to cause excessive noise that would jeopardize the health or welfare of the public. The Site-specific Health and Safety Plan addresses noise pollution.
Soil, Sediment & Surface Water	Resource Conservation and Recovery Act, 40 CFR Parts 262 and 263	Applicable	Requirements for hazardous waste generators and for hazardous waste transporters	Handling and transportation of hazardous wastes will be performed in compliance with this ARAR.
	Identification and Listing of Hazardous Wastes, 40 CFR Part 261	Potentially Applicable	Defines those solid wastes which are subject to regulations as hazardous wastes under 40 CFR Parts 262-265 and Parts 124, 270, and 271.	Samples will be collected, analyzed, and analysis reviewed against regulations to ensure compliance.
	Hazardous Materials Transportation Act; and Hazardous Materials Transportation Regulations 49 USC Sect. 1801-1813; and 49 CFR Parts 107, 171-177	Potentially Applicable	Regulates transportation of Department of Transportation (DOT)-defined hazardous materials.	All DOT-defined hazardous materials will be handled as required by this ARAR. Transportation vehicles will be placarded appropriately and carry manifests for each load.
	Endangered Species Act, 50 CFR Part 200, 402	Potentially Applicable	Requires action to conserve endangered species and/or critical habitats upon which endangered species depend.	No endangered species will be affected by the selected remedy. One butterfly and three plant species are identified as rare species within one mile of the site boundary.
	Fish and Wildlife Conservation Act, 16 U.S.C. ' 2901 et seq.	Potentially Applicable	Requires adequate provision for the protection of fish and wildlife resources when any modification of any stream or other water body is proposed.	There are four water bodies that will be modified as a result of the selected remedy. There are no fish in any of these. The contaminant concentrations in these ponds are toxic. The selected remedy will protect wildlife by eliminating the source of contamination. After contamination is removed, the water bodies will be returned to wetland habitats.

Table 48 continues on next page

Table 48 – Federal ARARs Attainment (continued)

Media	Requirement	Status	Synopsis of Requirement	Action to be Taken to Attain Requirement
Groundwater and Surface Water	CWA Part 301(b), Technology-based effluent limitations	Applicable	Establishes guidelines to determine effluent standards based on the Best Available Technology (BAT) economically available.	This ARAR will be complied with by using common water treatment methods.
	National Pollutant Discharge Elimination System (NPDES) Requirements, CWA Part 402, 40 CFR Part 122	Applicable	Requires permit for effluent discharge from any point source into surface waters of the United States.	The substantive requirements of this ARAR will be met for on-site surface water treatment/discharge.
Groundwater	National Primary Drinking Water Standards, 40 CFR Part 141	Relevant and Appropriate	Establishes health-based enforceable standards for public water systems (maximum contaminants levels (MCLs)).	The Site groundwater is not currently a source for public water system. Neutralizing groundwater pH should reduce inorganics to below MCL values.
Surface Water	CWA Part 303, 40 CFR Part 131, Water Quality Criteria	Applicable	Surface Water Quality Standards	The on-site surface water with concentrations exceeding this ARAR will be treated to achieve these standards.
Surface water, Floodplains and wetlands	Discharges into waters of US Section 401(a)(1)	Potentially Applicable	Requires discharges into waters of the United States to receive certification (or a waiver) that the discharge will comply with, among other things, the applicable water quality standards.	The remedial action does not anticipate discharging into waters of the US (i.e. Prince George Creek). However, water quality standards will be achieved prior to treated water discharge on-site, in the event of accidental discharge into waters of the US.
Floodplains and wetlands	Dredge or Fill Requirements (Section 404) 40 CFR Parts 230 and 231	Potentially Applicable	Requires permits for discharge of dredged or fill material into navigable waters.	The remedial action will not discharge dredged or fill material into navigable waters.
	Section 10 Permit 33 CFR Parts 320-330	Potentially Applicable	Requires permit for structures of work in or affecting navigable waters.	The remedial action will not be conducted in or affecting navigable waters.
Flood plains	Flood plain Management, Executive Order 11988, 40 CFR 6.302, Appendix A	Potentially Applicable	Requires evaluation of potential effects of actions taken in a flood plain to avoid adverse impacts associated with direct and indirect flood plain development.	Certain areas in the southeastern site corner are subjected to 100-year flooding. Contaminant source areas are not located within mapped flood plains.
Wetlands	Protection of Wetlands, Executive Order 11990, 40 CFR 6.302(a) and Appendix A	Potentially Applicable	Requires consideration of adverse impacts associated with destruction or loss of wetlands and to avoid support of new construction in wetlands if practical alternative exists.	Wetlands are mapped at the southern site border. It is not anticipated that existing jurisdictional wetlands will be impacted by the selected remedy. Non-jurisdictional wetland habitats will be restored after the contaminants are removed from the ponds.

Table 49 – State ARARs Attainment

Media	Requirement	Status	Synopsis of Requirement	Action to be Taken to Attain Requirement
Soil and Sediment	Inactive Hazardous Sites Response Act of 1987 (North Carolina General Statute 130A-310 *et. seq.*), the associated *Guidelines for Assessment and Cleanup* (NC DENR), Inactive Hazardous Sites Program, 2001) and the soil/sediment remediation requirements detailed in Section 4 of the *Guidelines*.	To Be Considered	Establishes guidelines for voluntary clean-up actions.	NCDENR believes that the remedy will comply with this guideline.
	NC Sedimentation Control Rules, NCAC Title 15A Subchapter 4B	Potentially Applicable	Erosion and Sediment Control	Erosion and Sedimentation Control measures will be implemented.
	North Carolina Hazardous Waste Management Rules and Solid Waste Management Law, 15A NCAC 13A	Potentially Applicable	Establishes state-level comprehensive hazardous waste management system.	All waste materials will be properly characterized, handled and disposed.
	Identification and Listing of Hazardous Waste, 15A NCAC 13A.0006	Potentially Applicable	Defines those solid wastes which are subject to state regulation as a hazardous waste. Consistent with corresponding federal standards.	All waste materials will be properly characterized.
	Solid Waste Management Rules, 15A NCAC 13B	Potentially Applicable	Establishes state-level comprehensive residual waste management system.	All waste materials will be properly characterized, handled and disposed.
Groundwater	NC Drinking Water and Groundwater Standards, NCAC Title 15, Chapter 2, Subchapter 2L.0200 and 0.0201	Relevant and Appropriate	Groundwater Classifications and Standards. Establishes criteria for protection of state public water supplies	The Site groundwater is not currently a source for a public water supply. There are no State standards identified for aluminum and beryllium. However, the state standards for chromium and nickel will be attained by treatment and/or be addressed via water use restrictions.
	Well Construction Standards, NCAC Title 15A Subchapter 2C.0100	Potentially Applicable	Criteria and Standards Applicable to Water-Supply and Certain Other Type Wells	If additional wells are required, this ARAR will be met.

Table 49 continues on next page

Table 49 – State ARARs Attainment (continued)

Media	Requirement	Status	Synopsis of Requirement	Action to be Taken to Attain Requirement
Surface Water	NC Water Pollution Control Regulations, NCAC Title 15A Subchapter 2B, Classification and Water Quality Standards Applicable to the Surface Waters and Wetlands of North Carolina	Applicable	Establishes a series of classifications and water quality standards for surface waters.	The on-site surface waters with contaminants greater than these standards will be treated at the Site. The water leaving the treatment system will meet this requirement.
	NC Water Pollution Control Regulations, NCAC Title 15A Subchapter 2H, Procedures for Permits: Approvals, Point Source Discharges to the Surface Waters	Potentially Applicable	Requires permit for discharge of effluent from point sources into surface waters. State-level version of federal NPDES program.	The substantive requirements of this ARAR will be met if treated surface water is discharged into a surface water body. It is anticipated that treated water will be placed back into remediated ponds or land applied for infiltration through the soil, rather than discharge into a water body such as Prince George Creek.

as “Potentially Applicable” relate to the contingency groundwater remedy, which is being eliminated by this ROD Amendment. Some “Potentially Applicable” requirements are dependent on further delineation (such as those related to wetlands, floodplains and endangered species). One requirement is identified as “To Be Considered”: NCDENR’s Guidelines for Assessment and Clean-up.

2.13.3 Cost Effectiveness

This section explains how the Selected Remedy meets the statutory requirement that all Superfund remedies be cost-effective. A cost-effective remedy in the Superfund program is one whose “costs are proportional to its overall effectiveness”. (NCP §300.430(f)(1)(ii)(D)). The “overall effectiveness” is determined by evaluating the following three of the five balancing criteria used in the detailed analysis of alternatives: (1) Long-term effectiveness and permanence; (2) Reduction in toxicity, mobility and volume (TMV) through treatment; and, (3) Short-term effectiveness. “Overall effectiveness is then compared to cost” to determine whether a remedy is cost-effective (NCP §300.430(f)(1)(ii)(D)).

For determination of cost effectiveness, a cost effectiveness matrix was utilized (Table 50). In the matrix, the alternatives were listed in order of increasing costs. For each alternative, information was presented on long term effectiveness and permanence, reduction of toxicity, mobility and volume through treatment, and short term effectiveness. The information in those three categories was compared to the prior alternative listed and evaluated as to whether it was more effective, less effective or of equal effectiveness. The selected remedy is considered cost effective because it is a permanent solution that reduces human health and ecological risks to acceptable levels at less expense than the other permanent, risk reducing alternatives evaluated.

2.13.4 Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable (MEP)

The selected remedy provides permanent solutions for all media and treatment for surface water and groundwater. It does not provide for treatment of soil and sediment, unless treatment is determined to be required by the disposal facility.

The selected remedy for soil and sediment, Off-site Disposal, provides for reduction of toxicity, mobility and volume, but not through treatment. The small volume of soil and sediment is not anticipated to be a hazardous waste under RCRA, and therefore, treatment is not anticipated to be required prior to disposal. The sediment and soils to be excavated will be tested to determine whether they are hazardous under RCRA. If the TCLP results indicate that the wastes are RCRA hazardous because they fail the TCLP test, excavated soils which fail TCLP will be disposed in a permitted RCRA Subtitle D landfill when the soil both: a) meets applicable treatment standards under 40 CFR 268; and b) no longer exhibits a hazardous waste characteristic (i.e., the soils pass TCLP after treatment).

The selected remedy for groundwater is Addition of Alkaline Substance, Institutional Controls with Monitoring (modified). The use of an alkaline substance to increase the pH of groundwater, and therefore, decrease the concentration of aluminum, beryllium, chromium and nickel in the groundwater, is potentially a permanent solution.

Table 50 – Cost Effectiveness Matrix

RELEVANT CONSIDERATIONS FOR COST EFFECTIVENESS DETERMINATION:					
Alternative	Cost Effective?	Present Worth Cost	Long Term Effectiveness and Permanence	Reduction of TMV[4] through Treatment	Short Term Effectiveness
Soil/Sediment					
1) No Action	No[1]	$75,520	No Reduction in Long Term Risk	No reduction of TMV	Continued Risk to Community & Environment
2) Institutional Controls	No[1]	$82,520	+ Minimal Reduction in Long Term Risk	= No Reduction of TMV	+ Continued Risk to Environment
5) Off-Site Disposal (modified)	Yes	$278,781	+ Reduces Risks to Acceptable Levels	+ Reduction of TMV (but possibly not through treatment)	+ Controllable risk to workers, reduces other risks
3) Off-Site Disposal	Yes	$307,531	= Reduces Risks to Acceptable Levels	= Reduction of TMV (but possibly not through treatment)	= Controllable risk to workers, reduces other risks
4) On-site stabilization	Yes	$644,270	= Reduces Risks to Acceptable Levels	+ Reduction of Toxicity and Mobility, but not Volume through treatment	= Controllable Risk to workers, Reduces other Risks
Groundwater					
1) No Action	No[1]	$164,028	No current users, no risk reduction to future users	No reduction of TMV	Only risks are for future residents and of migration
5) Application of Alkaline Substance, ICs with Monitoring	Yes	$179,832	+ Reduces Risks to Acceptable Levels	+ Reduction of TMV through treatment	+ Eliminates risks
2) Institutional Controls with Monitoring	No	$343,109	- No current users, limited risk reduction to future users	- No Reduction of TMV	- Minimal risks for future residents if they do not comply with use restrictions. Risks of migration.
4) Constructed Wetlands	No	$1,394,791	+ Reduces Risks to Acceptable Levels	+ Reduction of TMV through treatment	+ Eliminates risks
3) Chemical Precipitation	No	$1,684,686	= Reduces Risks to Acceptable Levels	= Reduction of TMV through treatment	= Eliminates Risks

Table 50 continues on next page. Notes included on next page.

Table 50 – Cost Effectiveness Matrix (*continued*)

RELEVANT CONSIDERATIONS FOR COST EFFECTIVENESS DETERMINATION:					
Alternative	Cost Effective?	Present Worth Cost	Long Term Effectiveness and Permanence	Reduction of TMV[4] through Treatment	Short Term Effectiveness
Surface Water					
1) No Action	No[1]	$109,956	No Reduction in Long Term Risk	No Reduction of TMV	Continued Risk to Community and Environment
5) On-Site Treatment/Disposal	Yes	$116,609	+ Reduces Risks to Acceptable Levels	+ Reduction of TMV through treatment	+ Controllable risk to workers, reduces other risks
3) Off-Site Disposal	Yes	$125,570	= Reduces Risks to Acceptable Levels	= Reduction of TMV through treatment	- Controllable risk to workers, increased short-term risk to community due to truck traffic
2) Institutional Controls with Monitoring	No[1]	$280,568	+ Minimal Reduction in Long Term Risk	= No Reduction of TMV	- Continued Risk to Community and Environment
4) Constructed Wetlands	No	Included in G4	+ Reduces Risks to Acceptable Levels	+ Reduction of TMV through Treatment	+ Controllable risk to workers, reduces other risks

Notes:

1. These alternatives do not reduce risks to either human health or the environment and therefore are not considered cost effective.

TMV = Toxicity, Mobility and Volume

+ More effective than previous alternative

- Less effective than previous alternative

= No change in effectiveness over previous alternative

The selected remedy for surface water is on-site treatment and disposal. The contaminants will be removed from the surface water by the common treatment method utilized. Contaminated soils and sediments above clean-up goals noted in Table 47 will be removed from the Site. Therefore, this is thought to be a permanent solution.

2.13.5 Preference for Treatment as a Principal Element

The selected remedies for surface water and groundwater include treatment. The selected remedy for soil and sediment does not include treatment as a principal element. It is believed that the soil and sediment will not contain hazardous characteristics that would require it to be considered a RCRA hazardous waste. Excavated soil and sediment will be sampled and analyzed using the TCLP to determine if it is a RCRA characteristic hazardous waste. If TCLP results indicate that it is not a hazardous waste, as was observed for samples obtained during the RD, the excavated soil and sediment will then be transported to an off-site permitted landfill as a regulated "non-hazardous" solid waste or to a facility that uses wood tar contaminated material as a fuel alternative. If the TCLP results indicate that the wastes are RCRA hazardous because they fail the TCLP test, excavated soils which fail TCLP will be disposed in a permitted RCRA Subtitle D landfill when the soil both: a) meets applicable treatment standards under 40 CFR 268; and b) no longer exhibits a hazardous waste characteristic (i.e., the soils pass TCLP after treatment).

2.13.6 Five-Year Review Requirements

Because the remedy may result in hazardous substances, pollutants, or contaminants remaining on-site in groundwater above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment. Reviews will continue until the Site is determined to be acceptable for unlimited use/unrestricted exposure.

2.14 Documentation of Significant Changes from Preferred Alternative of Proposed Plan

The Proposed Plan for the Reasor Chemical Company Site was finalized on March 27, 2007, and was mailed to the community the following week. The public comment began on April 6, 2007 and was concluded on May 6, 2007. The Proposed Plan identified Soil and Sediment Alternative S5 (Excavation and Off-Site Disposal (modified)), Groundwater Alternative G5 (Addition of Alkaline Substances, Institutional Controls with Monitoring (modified)), and Surface Water Alternative SW5 (On-Site Treatment and Disposal) as the Preferred Alternative for remediation. Two sets of written comments on the Proposed Plan were received by EPA during the public comment period and a few oral comments were presented during the public meeting.

Three changes have been made to the remedy as a result of public comments on the Proposed Plan and EPA Headquarters (HQ) review of the draft ROD Amendment. They are described in the following three paragraphs.

(1) The proposed remedy for surface water calls for on-site disposal. One community member wrote that she did not want that remedy due to frequent flooding of Prince George Creek which backs up

into her yard. To address this concern, the treated water will be discharged back into the remediated ponds, to the maximum extent practicable, to prevent flooding caused by discharging large volumes of water on-site.

(2) The Proposed Plan only included clean-up goals for aluminum in groundwater. During HQ's review, they noted that concentrations of beryllium, chromium and nickel also exceed state or federal MCL values in wells MW-7S and MW-7D. Therefore, these three are being added as contaminants of concern with clean-up goals established as the Federal MCL for beryllium, and the State MCL for chromium and nickel. The elevated concentrations of these naturally occurring metals in groundwater wells MW-7S and MW-7D are thought to be related to groundwater pH.

(3) The Proposed Plan did not include clean-up goals for Total PAHs and Copper for the sediment remedy. Therefore, these two are being added as contaminants of concern with clean-up goals established as the Alternative Toxicity Values from the Ecological Risk Assessment.

PART 3: RESPONSIVENESS SUMMARY

The public comment period for this Amended ROD ran from April 6, 2007 through May 6, 2007. During that time frame two sets of written comments were received. Oral comments were received during the Public Meeting. Following are the comments received and EPA's response.

WRITTEN COMMENTS RECEIVED

1. Email from Doug Darrell, dated April 12, 2007, to EPA RPM Samantha Urquhart-Foster. The text of Mr. Darrell's email is included below in italicized font. EPA's response follows each major point, and is in blue font.

   a. *The notification of an amended remedy for the Reasor Chemical site is disturbing on many fronts. Recently a county meeting discussed the addition of some 300 homes on an adjacent property.*

      EPA RESPONSE: EPA is aware of the plans for development of the property and surrounding parcels to include commercial, residential and public park uses. The selected remedy requires remediation to residential and ecological clean-up goals. Therefore, this type of development is acceptable to EPA, after the soil, sediment and surface water remediation has been completed and as long as institutional controls are in place which prevent use of the surficial groundwater in the onsite area of known contamination above levels exceeding groundwater clean-up goals.

   b. *Not long ago water in the Castle Hayne area was discovered to be contaminated and unusable only a short distance from this site.*

      EPA RESPONSE: Until receipt of this email, EPA was not aware of groundwater contamination found a short distance from the Site. At the public meeting, Mr. Darrell stated that this contaminated water was located on Holly Shelter Road, near Blossom Ferry. Groundwater at the Reasor Chemical Site, flows from the northwest to the southeast to Prince George Creek. Holly Shelter Road/Blossom Ferry is located north of the Site. Therefore, any groundwater contamination found in that area would not be caused by the Reasor Chemical Company Site since groundwater at the Site flows southeast towards Prince George Creek.

   c. *With the addition of more homes and the expected drain on groundwater supplies, more problems can be anticipated. An example is the new PPD building in downtown Wilmington where arsenic has been discovered to be seeping into the site buildings. This site was contaminated just as Reasor and supposedly cleaned up. Apparently not*

      EPA RESPONSE: The project manager for the Reasor Chemical Company Site was not involved in, or aware of, the PPD building cleanup described. However, EPA and NCDENR will oversee the remediation at the Reasor Chemical Company Site, including reviewing confirmation sampling data obtained from the sides and bottom of excavation pits to ensure clean-up goals are attained.

d. *The Reasor site should be thoroughly cleaned. The standing contaminated pond water should be completely removed, new soil should be put in place and then a wetland habitat established and encouraged. Three hundred homes means many new families with children. There should not be any chances taken that the groundwater won't be protected.*

EPA RESPONSE: The Site will be remediated to residential or ecological clean-up goals, which will allow any type of future land use, including, but not limited to: residential, industrial, commercial, recreational, mixed use, etc. The contaminated pond water will be pumped through a treatment system and stored in large temporary tanks until analytical data is received that shows that the treatment process was successful. If the initial analytical results indicate that treatment was not successful, the treatment system will be evaluated, tweaked, and the water will be re-treated and tested. No contaminated water will be allowed to be discharged at the Site. Successfully treated water will be pumped back into the remediated ponds, to the maximum extent practicable. Groundwater is only contaminated in a small area of the Site. It will be treated through pH adjustment, monitored annually for the first five years (frequency may be reduced after the first Five-Year Review), and restrictions will be placed on the property title to prevent use of groundwater in the area of contamination until clean-up goals are attained.

e. *It has been mentioned the county might be purchasing this property for some kind of park. The present owners, whom I'm sure will benefit greatly, should be responsible for doing the appropriate and most effective clean-up possible, before reaping their windfall.*

EPA RESPONSE: The current property owners, along with one former property owner, are paying for the clean-up of the Site. EPA believes the selected remedy is the most appropriate and effective remedy.

f. *Our groundwater is a precious commodity to be protected to the extreme. Leave no chance of a later problem by handling the problem properly now. Thank you for your attention to this situation...*

EPA's RESPONSE: As mentioned under response d, groundwater is only contaminated above clean-up goals in a small area of the Site, near one well cluster. EPA believes the treatment technique described in this amended remedy will be effective.

2. Letter from Mrs. J. Dahl, dated April 16, 2007, to EPA. Mrs. Dahl stated that she lives near the Site and that drainage ditches flood her property regularly. She stated,

> *"I live in Prince George Estates, where is a ditch called a free water way going through our land. The water is corroding our land.*
> *I have asked the town to put a pipe in they said they cannot, so our land is being eaten up. When it rains the ditches are full, and the drainage is bad and the toilets start backing up. We*
> *do not seed wet lands back around our area.*

We generally have enough water hanging around. We don't need the extra aggravation of more flies and mosquitoes.

Thank you for advising us of this situation. We do not want the water disposed onsite to make wet lands."

EPA's RESPONSE: The United States Fish and Wildlife Service requested that the ponds be returned to usable wetland habitats rather than being backfilled with soil, which would result in a loss of ecological habitat. Although the United States Army Corps of Engineers determined that the on-site ponds are not "jurisdictional" wetlands, ponds do provide a valuable wetland habitat. Wetlands provide significant benefits including improved water-quality, increased water storage and supply, reduced flood and storm surge risk, and critical habitat for plants, fish, and wildlife. To prevent adding to the flooding problem of Prince George Creek mentioned by Mrs. Dahl (and others on prior occasions through the years), and to improve the efficiency of wetland restoration of the ponds, the treated surface water will be discharged back into cleaned ponds, to the maximum extent practicable.

ORAL COMMENTS PRESENTED DURING PUBLIC MEETING ON 5/3/2007

A public meeting was held on May 3, 2007, at the New Hanover County Public Library. The meeting officially began at 6:07 PM and concluded at 6:59 PM, according to the transcript. However, one person arrived at the end of the meeting and EPA went through the information with her individually. This was not recorded by the Court Reporter. The meeting was attended by seven members of the community. Ms. Angela Miller, EPA Community Involvement Coordinator, provided an opening statement. Ms. Samantha Urquhart-Foster, EPA Remedial Project Manager, gave a Power Point Presentation discussing the brief site history and changes being proposed to the remedy. After the presentation, three members of the community spoke. The questions and comments were primarily for clarification or looking for additional information rather than questions or comments on the remedy changes. Most questions were answered at the meeting. A brief summary of individual questions and comments are included on the following pages. Please refer to the transcript in Appendix D for more details.

3. Mr. Doug Darrell (identified as "Mr. Darrow" in the transcript) had several questions related to the Site, but no comments regarding the Preferred Alternative.

    a. Cancer – Mr. Darrell's wife and several people that currently live or formerly lived in Castle Lakes Subdivision have cancer and one person has died of cancer. Is there a correlation?

       EPA's RESPONSES: The Agency for Toxic Substances and Disease Registry (ATSDR) conducted a Public Health Assessment for the Reasor Chemical Company Site in 2003. The report stated, "Using very conservative exposure assumptions it is unlikely that adverse cancer and non-cancer health effects would occur in persons who access the Reasor Chemical Company site." On May 11, 2007, Samantha Urquhart-Foster provided Mr. Darrell with names and phone numbers of ATSDR representatives that conducted the Public Health Assessment. On May 15, 2007, Samantha Urquhart-Foster mailed a copy of the Public Health Assessment to Mr. Darrell.

b. Why wasn't the cleanup conducted in 1991?

EPA's RESPONSE: The contamination identified in the early 1990s was not at high enough concentrations to warrant an emergency removal action. Therefore, the Site went through the remedial process, which takes several years. The cleanup plan was selected in a Record of Decision in September 2002. Sites go through a ranking process in order to receive federal funds for clean-ups. Prior to receiving federal funds for remedial actions, EPA must exhaust all efforts at finding a Potentially Responsible Party to pay for the clean-up. After several years of negotiations, EPA and the two current and one previous property owner came to an agreement for them to reimburse EPA for a portion of past expenses related to this Site, as well as for them to pay for and conduct the remedial action. That agreement was entered by the courts in December 2006.

c. What were contaminants at Blossom Ferry on Holly Shelter Road?

EPA's RESPONSE: EPA does not have any information related to contaminated groundwater at Blossom Ferry on Holly Shelter Road. EPA has asked the North Carolina Department of Environment and Natural Resources to look in their files. If we find information, we will let you know. This location is upgradient of the Reasor Chemical Company Site. Therefore, any contamination found there, would not be related to the Reasor Chemical Company Site.

d. Do you know what they will do with the property? Is it residential?

EPA's RESPONSE: The property owners have requested that the New Hanover County Planning Department change the zoning of the property from industrial to mixed use (heavy commercial and residential). That request has not yet been approved. The property owners have not made a decision yet on the future use.

4. Ms. Olsen

a. How deep does the contamination go?

EPA's RESPONSE: The contamination in the shallow groundwater is 3-12 feet below the land surface. The contaminated soils are only on the surface (top 12 inches), with the exception of one pond, in which the contaminated sediment is estimated to be 5 feet deep.

b. Can you guarantee it will all be cleaned up and "won't come back and bite us later"?

EPA's RESPONSE: It is not possible to guarantee the outcome of clean-up actions. The effectiveness of remedial action is dependant on a good design, based on a sound investigation, and verification sampling when the remedial action is completed. Extensive sampling of the Reasor Chemical Company Site was conducted during previous investigations. Samples will be collected of surface water after it flows through the treatment system and before it is discharged at the Site. After soils and sediments are excavated, the bottoms and sides will be sampled to determine if all contamination was removed and additional excavation will be required if these samples show that clean-up goals have not been achieved. The data will be incorporated into a Remedial Action Report and will be available, upon request. Groundwater monitoring will be conducted for numerous years.

5. Ms. Shiver lives nearby. Most of her neighbors did not know about the meeting. Newspaper isn't the best method of announcement because a lot of people don't read the newspaper. She suggested TV ads. She didn't receive anything in the mail either.

   EPA's RESPONSE: EPA mailed an announcement to over 600 addresses in the community that are on our mailing list. We will add your name and address to the mailing list for future notices. If anyone else has not received direct mailings from EPA and is interested in receiving them, please provide us with your name and address and we will add you to the mailing list.

PART 4: REFERENCES

The references listed below are the documents used in writing this ROD Amendment. In several sections of the ROD Amendment (e.g. section 2.7), sources were identified that are not included in this Part. Those sources weren't directly looked at in the preparation of this document, and are cited in the references of some of the following documents (e.g. risk assessments).

Birkeland, 1984. Relationship between pH and solubility of aluminum, iron, amorphous silica, and quartz. Figure.

Daughtridge, 2006. E-mail correspondence dated November 28, 2006.

Consent Decree, 2006.

McGrath, 2007. Star-News Online. *Property Rezoned for mix of uses, Superfund site use unchanged*. March 2, 2007.
http://www.wilmingtonstar.com/apps/pbcs.dll/article?AID=/20070302/NEWS/703020377/1004/news01

USEPA, 2006. Current National Ambient Water Quality Criteria. Webpage accessed on November 30, 2006. URL: http://www.epa.gov/waterscience/criteria/wqcriteria.html

USEPA, 2002. Record of Decision. September 26, 2002.
URL: http://www.epa.gov/superfund/sites/rods/fulltext/r0402038.pdf

USEPA, 2002. Excel spreadsheets of data from the Ecological Risk Assessment.

WESTON, 2004. Final Design Submittal, Revision 0. January 2004.

WESTON, 2003. Data Evaluation Summary Report, Revision 2. August 2003.

WESTON, 1999. Remedial Investigation Report, Reasor Chemical Company Site, Castle Hayne, New Hanover County, North Carolina, Revision 2, Volume 1.

http://www.city-data.com/city/Castle-Hayne-North-Carolina.html

APPENDIX A

STATE CONCURRENCE LETTER

NCDENR
North Carolina Department of Environment and Natural Resources

Dexter R. Matthews, Director | Division of Waste Management | Michael F. Easley, Governor
William G. Ross Jr., Secretary

May 21, 2007

Ms. Samantha Urquhart-Foster
Remedial Project Manager
Superfund Branch, Waste Management Division
US EPA Region IV
61 Forsyth Street, 11th Floor
Atlanta, Georgia 30303

RE: State Concurrence with the May 2007 Amended Record of Decision
Reasor Chemical Company Site
Castle Hayne, New Hanover County, NC

Dear Ms. Urquhart-Foster:

The State of North Carolina has reviewed the May 2007 Amended Record of Decision (ROD) for the Reasor Chemical Company Site ("Site"). The State of North Carolina concurs with the May 2007 Amended ROD, subject to the following conditions.

1. State concurrence on the Amended Record of Decision (ROD) and the selected remedy for the Site is based solely on the information contained in the subject Amended ROD. Should the State receive new or additional information that significantly affects the conclusions or remedy selection contained in the Amended ROD, it may modify or withdraw this concurrence with written notice to the United States Environmental Protection Agency (US EPA) Region IV.

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

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

1646 Mail Service Center, Raleigh, North Carolina 27699-1646
Phone 919-508-8400 \ FAX 919-715-4061\ Internet http://wastenotnc.org

The State of North Carolina appreciates the opportunity to comment on the Amended Record of Decision for the subject Site and we look forward to working with the US EPA on the final remedy. If you have any questions or comments, please feel free to contact me at (919) 508-8450.

Sincerely,

Jack Butler
Chief
NC DENR Superfund Section

APPENDIX B

WRITTEN PUBLIC COMMENTS

april 16/07

To Whom it May Concern.

I live in Prince George Estates. Where is a ditch called a free water way going through our land. The water is corroding our land.

I have asked the town to put a pipe in they said they can not, so our land is being eaten up.

When it rains the ditches are full and the drainage is bad and the toilets start backing up.

We do not need wet lands take around our area we generally have enough water hanging around. We don't need the extra aggravation of more flies & mosquitos.

Thank you for advising us of this situation. We do not want the water dispersed onsite to make wet lands

Sincerely
Mrs J. Dahl

"Doug Darrell "
[redacted]
04/12/2007 06:19 PM

To Samantha Urquhart-Foster/R4/USEPA/US@EPA
cc
bcc
Subject Reasor Chemical Company Site Clean-up

The notification of an amended remedy for the Reasor Chemical site is disturbing on may fronts.. Recently a county meeting discussed the addition of some 300 homes on an adjacent property. Not long ago water in the Castle Hayne area was discovered to be contaminated and unusable only a short distance from this site. With the addition of more homes and the expected drain on groundwater supplies, more problems can be anticipated.

An example is the new PPD building in downtown Wilmington where arsenic has been discovered to be seeping into the site buildings. This site was contaminated just as Reasor and supposedly cleaned up. Apparently not......

The Reasor site should be thoroughly cleaned. The standing contaminated pond water should be completely removed, new soil should be put in place and then a wetland habitat established and encouraged. Three hundred homes means many new families with children. There should not be any chances taken that the groundwater won't be protected.

It has been mentioned the county might be purchasing this property for some kind of park. The present owners, whom I'm sure will benefit greatly, should be responsible for doing the appropriate and most effective clean-up possible, before reaping their windfall.

Our groundwater is a precious commodity to be protected to the extreme. Leave no chance of a later problem by handling the problem properly now.. Thank you for your attention to this situation... Doug Darrell

APPENDIX C

POWER POINT SLIDES PRESENTED AT THE MAY 3, 2007 PUBLIC MEETING

Amended Proposed Plan Public Meeting

May 3, 2007

Reasor Chemical Company Superfund Site

Ownership History

1959 - 1972

Reasor Chemical Company operated a stump rendering plant and produced:

- camphor
- pine oil
- pine tar
- tall oil
- charcoal
- pine resin
- pitch
- turpentine

1972 - 2007

- 1972: the property was purchased by Martin Marietta Materials
- 1986: Martin Marietta Materials sold the property to Jane Cameron and Hilda Cameron
- 2007: Property is still owned by Jane C. Sullivan and Hilda C. Dill

Environmental Assessments

- 1989: Preliminary Environmental / Liability Assessment conducted for a prospective purchaser. Contamination found.
- 1991: Preliminary Assessment conducted by North Carolina Department of Environment and Natural Resources
- 1995: Site Assessment conducted by NCDENR, that recommended further action under CERCLA

CERCLA

- Comprehensive Environmental Response, Compensation, and Liability Act
- Commonly known as Superfund
- Enacted by Congress in 1980
- 1986: amended by Superfund Amendments and Reauthorization Act (SARA)
- Authorizes removal actions and long-term response actions to address releases of hazardous substances

EPA Activities

- 1991: Removal Assessment
- 1996-1999: Remedial Investigation
  - Human Health Risk Assessment
- 1999-2002: Ecological Risk Assessment
- 1999-2002: Feasibility Study
- 2002: Finalized on the NPL
- 2002: Record of Decision approved
- 2002-2003: Remedial Design
- 2006: Consent Decree entered by court
- 2007: ROD Amendment

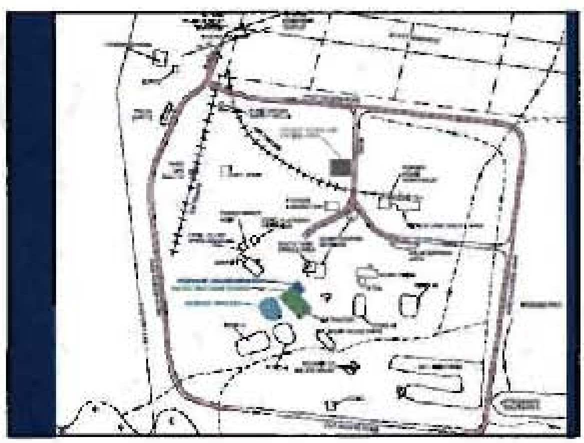
2002 Record of Decision & 2007 Amended Record of Decision

Three components:

- Surface Soil & Sediment
  - currently estimated volume = 1,420 cubic yards
- Surface Water
  - currently estimated volume = 344,000 gallons
- Groundwater
  - Area affected = 2 wells in same area

Soil and Sediment

- Soil Areas of Concern:
  - Drum Disposal Area
  - Pipe Shop Area
  - Scrap Copper Area
- Sediment Areas of Concern:
  - Pond 1
  - Pond 2
  - Pond 3
  - Pond 4



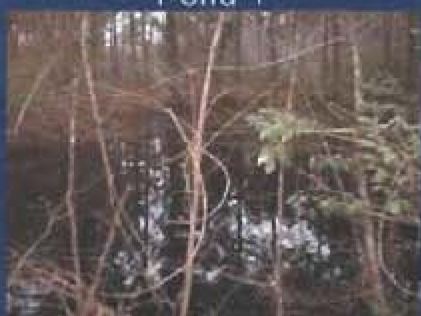
Drum Disposal Area

Approximate Dimensions: 120 feet x 50 feet

Scrap Copper Area

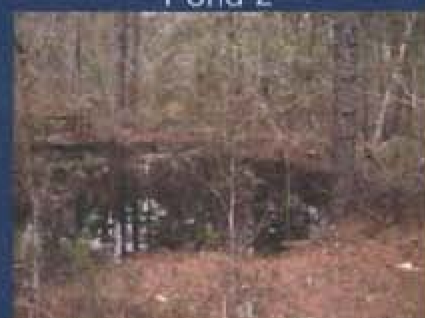
Approximate Dimensions: 50 feet x 50 feet

Pond 1



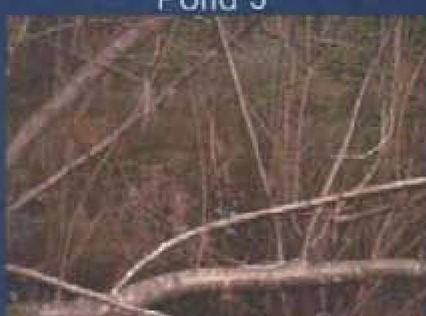
Approximate Dimensions: 110 feet x 60 feet

Pond 2



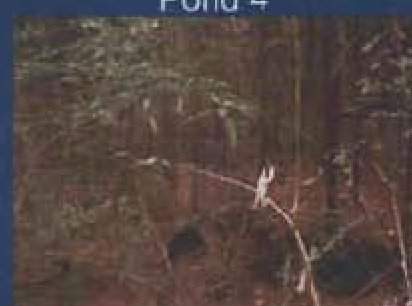
Approximate Dimensions: 80 feet x 50 feet

Pond 3



Approximate Dimensions: 70 feet x 40 feet

Pond 4



Approximate Dimensions: 70 feet x 60 feet

Soil/Sediment Remedy Similarities:	
Excavate contaminated soils and sediments from 7 areas until remaining concentrations are below residential and ecological cleanup goals	
Off-Site Disposal	
Backfill excavated soil areas	
Soil/Sediment Remedy Differences:	
2002 Remedy	**2007 Amended**
Backfill ponds	Do not backfill ponds
Reduces wetland habitat	Restores wetlands
Backfill drum disposal area with soil	Backfill drum disposal area with alkaline substance
Volume 1,600 yd^3	Volume 1,420 yd^3
*Updated Estimated Cost: $306,261	Estimated Cost: $278,781

Why change Soil/Sediment Remedy?

- Two Primary Reasons:
  - Creates Valuable Wetland Habitats
  - Improves Groundwater Quality
- Results in approximately $30,000 cost savings

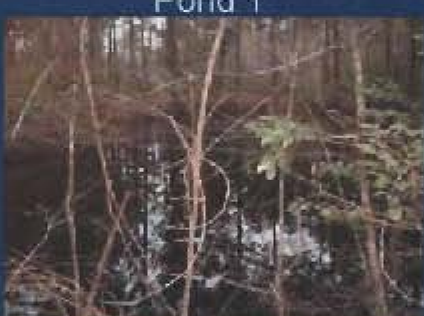
Soil & Sediment Cleanup Goals

Chemical of Concern	Cleanup Goal	Basis for Cleanup Goal	Risk at Cleanup Goal
Media: Soil			
Benzo(a)pyrene	670 ug/kg	HHRA	Cancer risk = 1x10^{-5}
Benzo(b)fluoranthene	6,700 ug/kg	HHRA	Cancer risk = 1x10^{-5}
[illegible]	670 ug/kg	HHRA	Cancer risk = 1x10^{-5}
Antimony	20 mg/kg	HHRA	HQ = 1
Copper	2,700 mg/kg	HHRA	HQ = 1
Lead	400 mg/kg	EPA Guidance	NA
Media: Sediment (all of the above plus...)			
Toluene	[illegible] ug/kg	ERA ATL	HQ = 1
[illegible]	1?? ug/kg	ERA ATL	HQ = 1
[illegible]	[illegible] ug/kg	ERA ATL	HQ = 1

Surface Water

- Surface Water Areas of Concern:
  - Pond 1
  - Pond 2
  - Pond 3
  - Pond 4

Pond 1



Approximate Volume of all ponds: 344,000 gallons

Surface water Remedy Similarities:	
Remediation of contaminated surface water	
Surface water Remedy Differences:	
2002 Remedy	**2007 Remedy**
Transportation off-site	No transportation
Treatment and disposal at off-site facility	Treatment on-site; Discharge treated water on-site, preferably back into excavated ponds
14 samples for analysis	14 samples for analysis
Volume Estimate: 500,000 gallons	Volume Estimate: 344,000 gallons
*Updated Estimated Cost: $125,570	Estimated Cost: $116,509

Why change Surface Water remedy?

- Three Primary Reasons:
  - Equally Effective Treatment Process
  - Less Truck Traffic through Community
  - Putting treated water back into cleaned ponds will speed up wetland restoration process
- Results in approximately $10,000 cost savings

Surface Water Cleanup Goals

Chemical of Concern	Cleanup Goal	Basis for Cleanup Goal	Risk at Cleanup Goal
Media: Surface water			
Copper	7 µg/L	NC Water Pollution Control Regulations	HQ = 1
Iron	1000 µg/L	NC Water Pollution Control Regulations, Clean Water Act	HQ = 1
Lead	25 µg/L	Clean Water Act	HQ = 1
Zinc	50 µg/L	NC Water Pollution Control Regulations	HQ = 1

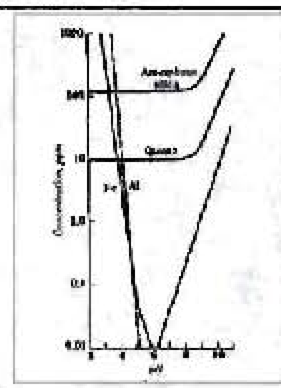
Groundwater

Example of a Monitoring Well

Groundwater Remedy Similarities:	
Institutional Controls	
Annual Groundwater monitoring	
Five-Year Reviews	
Groundwater Remedy Differences:	
2002 Remedy	**2007 Amended**
No treatment initially	Treat by application of alkaline substance near MW-7S/7D
Contingency pump & treat remedy	No contingency treatment remedy
Annual sampling of 11 (expanded to 13) wells	Annual sampling of 2 wells
Analyze samples for VOCs, SVOCs, metals, and dioxin	Analyze for pH, turbidity, and aluminum
Thallium and Aluminum are COCs	Eliminates Thallium from COC list
*Updated Estimated Cost [illegible] - $1,894,848	Estimated Cost: [illegible]

Why change Groundwater Remedy?

- 2002 ROD speculated "false positives" related to thallium, which was confirmed during Remedial Design sampling
- Only one well pair (MW-7S and MW-7D) has concentrations of contaminants above cleanup goals
- Impacted wells have acidic water. Water pH influences metal concentrations.
- "Pump and Treat" is not an efficient method for treating an isolated area



Groundwater Cleanup Goals

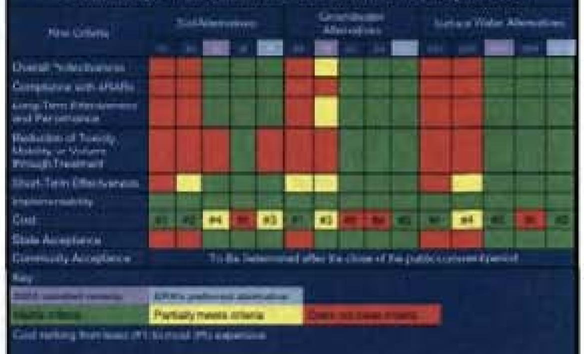
Chemical of Concern	Cleanup Goal	Basis for Cleanup Goal	Risk at Cleanup Goal
Media: Groundwater			
Aluminum	16,000 ug/L	BHHRA	HQ = 1
~~Thallium~~	~~2 ug/L~~	~~Federal MCL~~	[illegible]

Note: Thallium is being removed from list of Contaminants of Concern based on questionable RI data related to thallium and no detections during the Remedial Design.

List of Alternatives Evaluated

Media	Designation	Description
Soil and Sediment	S1	No Action
	S2	Institutional Controls
	S3	Excavation and Off-Site Disposal
	S4	Excavation and On-Site Stabilization/Solidification
	S5	Excavation and Off-Site Disposal (modified)
Groundwater	G1	No Action
	G2	Institutional Controls with Monitoring
	G3	Extraction and Treatment Using Chemical Precipitation
	G4	Extraction and Treatment Using Constructed Wetlands
	G5	Application of Alkaline Substance, Institutional Controls with Monitoring (modified)
Surface Water	SW1	No Action
	SW2	Institutional Controls with Monitoring
	SW3	Off-Site Treatment/Disposal
	SW4	On-Site Treatment through Constructed Wetlands
	SW5	On-Site Treatment/Disposal

Summary of Alternative Evaluation Comparison



Schedule

- May 6, 2007
  - End of Public Comment Period
- June 1, 2007
  - ROD Amendment finalized on or before this date
- June 4, 2007
  - Apex Environmental, LLC begins cleanup activities
- September 30, 2007
  - Construction Completed
- 2008, 2009, 2010, 2011, and 2012
  - Annual Groundwater Monitoring

Property Uses after Cleanup

- Cleanup Goals are based on Residential use
- After cleanup, property may be used for Residential, Industrial, Commercial, Parks, Mixed Use, etc.
- However, groundwater shall not be used until groundwater cleanup goals are reached.

Questions?

Samantha Urquhart-Foster
Remedial Project Manager
US EPA – Superfund Division
61 Forsyth St. SW
Atlanta, GA 30303-8960
Phone: (404) 562-8760
E-mail: URQUHART-FOSTER.SAMANTHA@EPA.GOV

APPENDIX D

PUBLIC MEETING TRANSCRIPT
MAY 3, 2007

ORIGINAL

AMENDED PROPOSED PLAN

PUBLIC MEETING

WILMINGTON, NORTH CAROLINA

MAY 3, 2007

REASOR CHEMICAL COMPANY

SUPERFUND SITE

APPEARANCES:

ANGELA MILLER
USEPA - REGION 4
PUBLIC RELATIONS SPECIALIST
61 Forsyth Street, SW
Atlanta, GA 30303-8960

SAMANTHA URQUHART-FOSTER
REMEDIAL PROJECT MANAGER
USEPA - SUPERFUND DIVISION
61 Forsyth Street, SW
Atlanta, GA 30303-8960

BONNIE SAWYER
USEPA - REGION 4
ASSOCIATE REGIONAL COUNSEL

DAVID MATTISON
NCDENR
PROJECT MANAGER

INDEX

MS. SAMANTHA URQUHART-FOSTER 3
QUESTION AND ANSWERS 21
REPORTER'S CERTIFICATE 35

(6:07 p.m.)

MS. MILLER: All right. I guess we'll go ahead and get started. I expected a couple of more people, but maybe they'll come in here in a little bit. I want to thank you for coming out. My name is Angela Miller. I'm Community Involvement Coordinator with the Environmental Protection Agency. And in just a few minutes, Sam is going to be talking about an amended proposed plan that we have for the Reasor Chemical site, but after the presentation, we have question and answer, so I would ask, unless you need Samantha to clarify something, if you could just hold your question until the end.

Unfortunately, the facility does close at 8:00, so we have to be out of here by 8:00. But again, if you need her to clarify something that she's talking about, please, you know, feel free to speak, but if you have a question, if you could hold it until the end.

I have a court reporter that's going to transcribe the meeting, as well as the question and answers, so when you do have a question, if you will state your name, and if it's kind or unique or an awkward spelling, if you could spell it for her too, please. With that I'll turn it over to Samantha.

MS. URQUHART-FOSTER: Hi, thanks for coming. Some of you in the room have a long history with the site, and others this may be knew to you, I'm not sure how much involvement you have with it. The Reasor Chemical Company site is located at 5100 College Road in Castle Hayne. If you're driving by down the street you won't see anything that looks like a former treatment facility. All you'll see is this sign, and a little yellow gate blocking your access to it. As I mentioned, it's at 5100 College Road in Castle Hayne. This is the site right here. If you're familiar with the area, this is King Castle. Prince George Creek runs along this side of it. Holly Shelter Road is up here. It's north of Wilmington.

I'm just going to do a brief history of the site. The main purpose of tonight's meeting is to talk about the changes we're making to the cleanup plan that was established in 2002. In 1959, Reasor Chemical Company operated a stump rendering facility at the plant, and during their operations they produced several compounds, camphor, charcoal, pine oil, pine risen, pine tar, pitch, toluol and turpentine.

They went out of business in 1972, and at that time the property was purchased by Martin Marietta Materials. Martin Marietta Materials owned the property until 1986, at which time it was sold to Jane Cameron and Hilda Cameron. The Camerons have since married and are now known as Jane Sullivan and Hilda Dill. Jane and Hilda still own the property right now.

Several environmental assessments were conducted by parties other than EPA through the years. It started in 1989 with a preliminary environmental liability assessment, which was conducted by someone who was interested in purchasing the property. When they did that assessment, they took some soil samples, and some groundwater samples, and they found some contamination at the site. So then two years later, the state of North Carolina did a preliminary assessment at the site. They went out to the site, drove around, and then they -- they found some drums that were decaying, and they contacted EPA's Emergency Response Branch, and requested that an emergency response evaluation be conducted.

EPA's Emergency Response group went out and evaluated the site, but found the drums were empty. They were deteriorating. There weren't any containers of hazardous chemicals left there that would cause an immediate threat to your life or health. The key there is immediate. So, the Emergency Response decided there was no further action needed by them at that point, but that doesn't mean nothing else was needed for the site.

So then in 1985, the state of North Carolina conducted a site assessment, and in site assessment they went out and collected some more samples, and confirmed that there was contamination at the site, so they recommended that EPA conduct further action under CERCLA.

CERCLA is a Comprehensive Environmental Response Compensation Liability Act commonly known as Superfund. It was created in 1980, or enacted in 1980 by Congress, and then was amended in 1986, and that amendment is known as Superfund Amendments and Reauthorization Act or SARA. That act authorizes EPA to conduct emergency removal actions or also longer term cleanups of releases of hazardous substances.

EPA has been involved with this site since 1991. As I mentioned before, there was an emergency response evaluation. Then the state did a couple of actions in 1995 when they referred it back to EPA. So then in 1996, EPA's contractor Roy F. Westin conducted the remedial investigation. And in that investigation they went out and collected hundreds of soil samples and sediment samples from the ponds, surface water samples, and groundwater samples. And in doing so, they took all that data and plugged it into a human health risk assessment to determine, does this site pose a risk to your health.

At the same time -- well Westin conducted the first few steps of the ecological risk assessment, but then EPA took over the role of doing the ecological risk assessment, while Westin was completing the feasibility study. All that was completed in 2002, which is when the site was finalized on the National's priorities list. For sites to receive clean up money from the federal government, from Superfund, it has to be ranked on the national priorities list.

About the same time, EPA wrote the Record of Decision for the site, which is the cleanup plan, or the remedy for the site. After that was approved, the next year was Roy F. Westin conducted the remedial design designing how the cleanup plan should be implemented. The risk assessment -- and the risk assessments determined several areas of the site that needed cleaning up, so during the remedial design they went and collected more data, better measurements to determine accurate volumes, et cetera. Collected more groundwater samples to confirm some things that were questionable during the RI.

For the past several years after that, EPA negotiated with the current property owners, as well as a former property owner, Martin Marietta Materials. And after several years of negotiations, we finally came to an agreement with them for them to conduct and pay for the remedial action that was needed at the site. That was memorialized in what's called a consent decree, which is an agreement that was signed by all the parties in September, and was entered by the courts in December of 2006.

So during the remedial design process, we collected more data, and also through the years we learned more information about what we have at the site, and realized that several things really needed to be changed to make it a better cleanup for the site. So that's why we're here tonight to talk about the ROD amendment, Record of Decision is what ROD stands for, which is just basically changing the cleanup plan formally.

The original ROD for the site, as well as this amendment included addressing three different areas. It has a surface soil and a sediment component. The current volume estimated for soil and sediment is 1,420 cubic yards. Surface water is currently estimated at 344,000 gallons, and ground water, the area affected is just one small area with two wells.

The soil and sediment areas of concern, the Human Health Risk Assessment, the members came out and found three areas that had contamination above human health standards or -- standards that would be acceptable for someone to live on the property. Those three areas are the drum disposal area, the pipe shop area, and the scrap copper area. Because the ponds had water in them, the risk assessment, Human Health Risk Assessment showed that -- or didn't evaluate the sediments, but the ecological risk assessment did. They evaluated the sediments in the ponds, and found that the concentrations in the ponds were high enough that it could cause problems to wildlife, so we added a remedy for those ponds as well.

This is a figure of the site, give you an idea. This is College Road up here, Prince George Creek runs along the side. The small area right here, the small square is the pipe shop area. It's about a 20 by 40 foot area. This area is a scrap copper area, and this small area is the drum disposal area. Then we have four ponds. That's four, three, two and one, and you can see there or other features at the site. As I mentioned before, hundreds of samples were collected all over the entire site. These are -- this is a dirt access road that runs around the approximate 25 acres. This may be easier to see with the lights off. Do you mind if I turn the lights off? Any objections.

This is the drum disposal area, just so you have an idea. As you can tell, they're old, rusted drums. They've been there for -- from decades now. There's nothing left in them. They're just rusted drums. This sediment underneath is contaminated. It's about -- the area is about 120 feet long by 50 feet wide.

This is a picture of the scrap copper area. It's a kind of barren area. It's got chips in it. We think that wire was burned to reclaim the copper at some point in time. It's about 50 feet by 50 feet. I mentioned earlier about the pipe shop area. I didn't have a picture of it, but it's just -- it's an even smaller area, 20 foot by 40 foot.

There are four ponds that are contaminated. Pond one is the largest. It's about 110 feet by 60 feet. Pond two is slightly smaller, about 80 feet by 50 feet. Pond three and Pond four rarely have had water in it when we've been out to the site. They're the smaller ones, 70 feet by 40 feet, and 70 by 60 feet.

The cleanup plan selected in 2002 for soil and sediment was to excavate the contaminated soiled and sediment from those seven areas I mentioned earlier, to collect samples from those excavation areas to make sure we got all the contamination, and then to backfill all of those areas with soil or crushed stone or -- well, one of the other. The remedy also included off site disposal. The waste that was excavated will be put in trucks and hauled off to a landfill.

Shortly after the Record of Decision in 2002 was approved, the Fish and Wildlife Service became more involved with the site, and they really would prefer that the ponds, instead of being backfilled and brought up to the same grade as the rest of the land on the property, they preferred that the ponds be returned to a wetland habitat. It provides valuable ecological resource for the wetland -- for the wildlife.

So, the change we're proposing includes backfilling all of the soil areas, but not the ponds, allowing them to return as ponds and become wetland habitats. The drum disposal area we're proposing, instead of putting soil in that area, we're proposing putting in lime or a similar alkaline substance, because we have -- the groundwater problem at the site is because the water is too acidic. And the drum disposal area is slightly up gradient from those wells that are affected, and if you put in lime, we're hoping that will raise the pH of the groundwater, and I'll talk more about that in a few slides from now.

The volume estimate in the remedial investigation was 1,600 cubic yards. That was just a rough estimate. During the remedial design they went out to the property, took better measurements, and that's why the volume was decreased. Of course, that, you know, may change plus or minus when you're out there digging. It usually increases when you're out there excavating.

The cost estimate of the proposed change is about $30,000 less, and that primarily comes from not having to bring in a lot of backfill for those four ponds.

So the reason, as I mentioned, for changing the soil and sediment remedy is primarily to create a valuable wetland habitat, instead of refilling those ponds and making a land surface, and also to improve the groundwater quality.

The soil and sediment cleanup goals. In the 2002 Record of Decision we set cleanup goals for six contaminates for the soil. Those were based on the baseline Human Health Risk Assessment for residential standards, so we used very conservative values for the cleanup goals. So once the soil is excavated, samples will be collected and analyzed to make sure the results are below these numbers.

Because we're wanting to change, return the ponds to ponds we needed sediment cleanup goals to make sure that the concentration isn't too high to affect wildlife. So we're taking the Ecological Risk Assessment values they found were acceptable for wildlife, and we're adding that to -- we're adding those cleanup goals to the remedy.

For surface water, the surface water areas of concern are the water in the four ponds, typically just the two ponds. The original in the RI it estimated 500,000 gallons. When they went out in the RD and realized time and after time had gone out there and the other two ponds were empty, they recalculated, so most times there's three -- or estimated 344,000. Of course, that number can change up or down depending on whether a hurricane comes through.

The remedy for surface water is in the 2002 remedy was to pump all of the surface water out of the ponds, load it into tanker trucks, and then for those tanker trucks to transport it off site to a disposal facility. So based on the volume, that would take about 30 to 50 tanker trucks that will be driving through the community.

An option we didn't really look at when we were -- when we came up with a remedy in 2002 was to treat the water on site. During our negotiations with the property owner -- current and formal property owners, they requested that they be able to treat the water on site. The treatment method that they would use to treat the water on site is equally effective as shipping it off site. To treat the water on site, they would have to collect a lot more samples to do it. They have to run it through the treatment process, take a sample, and make sure it's clean before they discharge it, so that the proposed remedy is to treat the water on site and to discharge it back on site.

I recently had received one public comment from someone who was concerned about the volume of surface water being discharged back on site. She was stating that Prince George Creek when it floods, it backs up into her yard, and there's a big concern with that, so that was a very important thing for us to know. So, to the maximum extent practicable, what we're going to do instead of just discharging it into the creek, we're going to clean out the currently empty ponds first. Once they're confirmed clean, then we'll pump the water as it's treated back into the ponds. So we hope for the maximum extent practicable, we can put the treated water back into the ponds rather than it going to the creek.

As I mentioned earlier, the reasons for the change, it's an equally effective treatment process. It provides much less truck traffic going through the community, and also in recent talks with the Fish and Wildlife Service, they were saying that putting the treated water back into the ponds will speed up the wetland restoration process as well, and it results in about a $10,000 cost savings.

The surface water cleanup goals are the same as they were in the 2002 Record of Decision, so that won't be changed. These are based on state and federal surface water criteria.

I didn't have a picture of a monitoring well from the site but this is an example from another site. For groundwater, the 2002 remedy called for annual monitoring for five years, because there was some questions about the data that we had, and uncertainties about whether a treatment system was needed for the site. It also called for institutional controls, which are restrictions on being able to use the groundwater at the site, and five-year reviews. EPA conducts five-year reviews at sites at a lot of Superfund sites any time waste is left on site, or it takes more than five years to clean up a site. So those items are staying the same. We're going to do the institutional controls, we're going to do annual monitoring, and five year reviews.

The 2002 remedy didn't call for any type of treatment. Initially it was going to be monitoring, and then it had a contingency remedy of pump and treat if we found that groundwater truly was a problem at the site.

We found during the remedial design that there's only one well cluster in one area just down gradient of the drum disposal area that has contaminates above the cleanup goal, and that well cluster has very acidic water. And if you have highly acidic water, it increases the concentration of metals in your water sample. So the change we're talking about is adding lime in the soil, upgrading of that well to hopefully bring up the pH. The groundwater is very shallow. It's like three to twelve feet. So if we've got lime up there, it will hopefully raise the pH of the groundwater to lower the metals concentrations. Pump and treat systems are great for larger contamination plumes, but what we have here is a very small area.

The 2002 ROD called for annual sampling of the 11 wells that were at the site at the time. During the remedial design we constructed two more wells, so that would leave the total of 13. But then when we went out and sampled, we only -- again, we narrowed it down there's only two wells with a problem.

So in 2002 the remedy called for analyzing for a large list of contaminate or chemicals that aren't contaminates of concern at the site. The only problem in the groundwater at the site is the acidity and metals, particularly aluminum. So the change being proposed is to only analyze, only sample the two wells, and analyze for pH, which will tell you if it's acidic or not, the turbidity which also plays a factor in your metals concentrations, and aluminium.

In 2002, the remedy only set cleanup goals for two contaminates of concern. There are only two ponds that had concentrations that were high enough above the federal maximum contaminate level concentration or human health risk assessment. Thallium was detected at estimated concentrations above a maximum contaminate level during the remedial investigation. Shortly afterwards, the report came out saying that that analytical procedure that was used during that time, they have found that it had false positives for thallium, arsenic, and I believe lead. I can't remember the third compound. But so that made us wonder, is this thallium data real. We couldn't think of any source of thallium at the site or what would be causing it.

During the remedial design, we went back out, and we tested all of the wells using a different analytical technique, and had no concentrations of thallium above cleanup, or maximum contaminate levels, federal drinking water levels. So, the revised remedy calls for eliminating thallium as a contaminate of concern for groundwater. The cost estimate changes drastically because we're not sampling as many wells, and we're not analyzing for as many chemicals. And I think I went through most of this already.

Here is a slide from a textbook that kind of shows the concentration of chemicals or -- well, four different items. We have amorphous silica, quartz, but of interest here is aluminum. AL stands for aluminum. This is a pH curve. Liquids range from zero to 14 in pH, seven is neutral. You know, it won't burn your skin, it won't hurt you. It's normal drinking water. Anything below say six is considered -- especially below two is considered acidic, and anything greater than 10 or 12 is considered basic.

What we have at the site in those two wells is between two and four. As you can kind of see on this curve, the stash line is the curve for aluminium, and they came from a textbook, and found that the concentration of aluminum increases the more acidic the water is. At one -- at pH of about five you have -- it's about one part per million, but if you make that water more acidic, bring it closer to two or three, it jumps up to 1000, so we think that's what's the cause of the aluminum being so highly concentrated or such high concentrations in those two wells.

It's hard to see this slide. I know it's small, but the thing I wanted to point out from this is we have pH, and these are the two wells 7S and 7D that have the concentrations that are really elevated. You can see we have pH of 2.3, 3.1, and then in one sampling event we had an 8.7 in this well, which is, you know, more of your natural range. What's highlighted in black, although it was red on my computer screen, are concentrations which were greater than our cleanup goal of 16,000 parts per million. And what's in yellow is greater than a safe drinking water standard, but we didn't set a cleanup goal for it. As you can see, what I wanted to illustrate is in this well where we had a pH of 8.7, the aluminium was 850. You drop the pH down to three, we're getting, you know, 100,000. Drop it down to two, you get in the 200,000 range.

For groundwater, the cleanup goals that we set in the 2002 ROD were for thallium and aluminum. Aluminum, there is no federal or state maximum Clean Water Act maximum contaminate level, so the concentration chose for the remedy was based on the baseline Human Health Risk Assessment. And we're proposing eliminating thallium because it just -- we truly believe it was false positive data during the remedial investigation.

For Superfund cleanups for remedial process, you evaluate several different alternatives for cleanups. When the original remedy was chosen, we evaluated four alternatives for each medium, which are the first four -- the first two are no action and institutional controls, and then different items for the others. For soil it's excavation and off site disposal is one option we looked at. Another was excavation and on site stabilization, and we just added a fifth alternative for each of these, which is the remedy that we would like to change to. For soil and sediment it would be excavation, off site disposal modified. The only, you know, changes really are changing how we backfill.

For groundwater it's application of alkaline substance, institutional controls with monitoring modified. You know, we're reducing the number of wells we're going to sample. And for surface water, changes on site treatment disposal, whereas during the 2002 ROD it was off site treatment disposal.

Well, this didn't turn out very well at all. If you had a handout from the proposed plan, these are really in green and yellow and red. During the remedy selection process, we evaluate each remedy against nine criteria, which is in the national contingency plan. So we evaluated each criteria against each cleanup alternative against the criteria. Most of them -- for soil it's -- for the soil and sediment alternatives, S3 was the remedy selected in 2002 and S5 is the remedy selected we're proposing to select now.

Whether they meet the criteria or not for each of the nine criteria are identical with the exception of cost. The proposed remedy is slightly less expensive than the original remedy, but it -- they're both protective of human health and environment. They both comply with state and federal laws. They both have long and short term effectiveness, and they're equally implementable. The state is acceptable. The state agrees with conducting any of the three actually.

For groundwater and surface water -- let me skip to surface water first. S3 is the remedy that was selected in 2002, and S5 is the one that we're proposing changing. Again, the same, they're equally effective, equally protective. They both comply with the state and federal laws. The only difference is cost, as far as comparison with the nine criteria.

Groundwater is the biggest change, because we're actually including a treatment component, the application of the lime to increase the pH. That makes a difference and it's overall long term protectiveness, as well as compliance with state and federal regulations for cleanup goals.

The schedule, tonight we're having this meeting. The public comment period for the proposed plan, this change in the cleanup plan ends on May 6, 2007. Once all of the comments are received, we will -- I will incorporate those comments into the revised Record of Decision, and hope to get that ROD amendment finalized by the end of the month.

The PRPs, potentially responsible parties, which are the current and past property owners, they have a consulting group that is ready to get started and conduct the cleanup. They're ready to start the first week of June. The cleanup schedule calls for six weeks of active work. That could be delayed if, you know, a hurricane comes through, or if they run into some problems out there, so that's why I included the September 30th for the completion day.

Every year we'll be back at the site monitoring, collecting groundwater samples. As I mentioned, there's also going to be institutional controls on the property, land use restrictions that will prevent anyone from putting a ground water -- putting a well on the property, and using it to drink out of, or for any reason until the sampling shows that groundwater is no longer a problem. EPA and the property owners, and the state have been talking the past few months, negotiating language, exact language that will go on that restricted land use restriction.

The cleanup goals, as I mentioned, are based on residential use. Once we finish with the cleanup, it will be clean enough to build a house on and live for 30 years. We've used very conservative values for our cleanup goals, but it could be used for other purposes too. I mean, it's very conservative. The most conservative is for residential for you to be able to live there all your life on it, but it can be used for industrial purposes, commercial, parks, anything you can think of. But as I mentioned earlier, the groundwater shall not be used until we've determined it's no longer a problem. Do we have any questions? Turn the lights back on.

MR. DARROW: I don't know if you consider it a question. My name is Doug Darrow. I live in Castle Lakes which is on Marathon Avenue. It's actually just a few 100 yards from the Reasor spot in a direct line, even though you have to go up 132 and then come down 117 to get to my house. My understanding is and I only became aware about this when you had your notice in the paper. 1972 Reasor gets rid of the site, Martin Marietta buys it. They subsequently sell it to two ladies in 1986. 1991 we find out that it's a Superfund site, and needs to be cleaned up more or less, with contaminates on the property.

MS. URQUHART-FOSTER: Right.

MR. DARROW: Now, 16 years later we'll sitting here talking about finally getting it cleaned up, even though the present owners knew that they had a site like that. And I -- from what I read in the paper recently, part of this is because, I guess, the site is being prepared to be sold again or something, I don't know.

This is my concern. We've been sitting there living there, and four of the long-term residents of Castle Lakes have now developed cancer. All right. Three different types of cancer, but cancer nonetheless. We live right off the Prince George Creek. This property has been sitting there, contaminates have been leaching into Prince George, however else those contaminates leach down into the aquifer or whatever, and I want to know what can be done and want to find out what kind of impact, or if these cancers were caused by the possible contamination from Reasor or what.

My wife is one of them, and I want to know what the heck is going on. And we've lived at -- these were all long-term residents. It's not like somebody moved in and then developed cancer. Ms. O'Bryan had breast cancer. She lived there for 12, 13 years before she was diagnosed with the cancer, Arlene O'Bryant has developed cancer. They subsequently moved away, but they lived there for 10, 12 years. Ms. Blank has lived there for 16 years, I believe it is, and just developed Hodgkin's. My wife is being treated, we've lived there for 10 years, and that's my concern.

And, you know, to be honest, you drive through there all the time, you don't even notice the site, for as long as I've been living there. I became aware of this when you had your notification in the paper, and then didn't pay any attention to it. I think I wrote you an e-mail addressing the contamination problem that occurred on Holly Shelter Road, which I didn't -- I don't even know what the contamination was there or whether it was related, but I just want to know, you know, number one, why wasn't anything done back in '91 to get of rid of the contaminates right away once it was discovered that it was out there. Why was it allowed to continue to leach for 35 years into our groundwater, and all of the areas around it being developed. That's, I guess, what I want to know.

I don't know any of those people from Adam. You know, I don't know Martin Marietta, I don't know the people that bought the property. I do know the people that have developed cancer, and it's a real concern. Plus, you know, I don't know the people in the property across the road on College Road to the south of Prince George, what kind of situation we've got there. If we started look into it, are we going to find that there's a high incidence of cancer in this area because of this situation? That's what I would like to know, and is this something that EPA does, or do we have to go out and, you know, landfill, start knocking on doors and saying, hey, do you know anybody that's developed cancer that has been living there for 10, 15 years. You know what I'm saying?

MS. URQUHART-FOSTER: Yeah, I know what you're saying.

MR. DARROW: It's a real concern for me, especially when it's -- when you're confronted with it. You know, your wife comes home and tells you, hey, I've got this problem, you say what the hell. And then you find out about this, and then you start looking around at your neighbors and saying -- we've only got 30 homes in Castle Lakes and four of the residents.

MS. URQUHART-FOSTER: The Agency for Toxic Substances and Disease Registry, they're part of the Center for Disease Control, CDC. In 2003 they came out and did a Public Health Assessment. They looked at all the data from the site, and they evaluated it, and they went around, knocked on doors, talked to people who lived nearby, and they didn't find any major problems. They would be the ones who would research the cancer rates, and how it's -- you know, is there a high cancer rate in the area.

MR. DARROW: Well, are they the ones that are going to tell us the toxins that you found in 1991 or in your studies between 1991 and 1999, whenever it was, are those toxins that they discovered in the ground that Reasor left there, are those contaminates cancer causing, and what types of cancer -- what incidence of cancer is caused by each of those toxins.

MS. URQUHART-FOSTER: Some of them are cancer causing. Now, whether they're at high enough concentrations at the site or in the community to cause cancer in your neighborhood, in the public health assessment that they did, they didn't find that.

MR. DARROW: I realize it's all about money, and I presume because they are selling the property now probably only concerned with this now because now they're going to sell the property, and, you know, at today's prices, they're going to probably make a windfall. What I'm asking is -- I'm angry. Why wasn't something done back in '91. If you know the site is there and the Superfund money is there, why didn't the owners avail of themselves of that then? And again, maybe that's a naive question. You know, I don't know how the Superfund works. I don't know --

MS. SAWYER: Let me clarify one thing. The private owners wouldn't be able to avail themselves to the Superfund money. I mean, that's money that the federal government can use, but private land owners can't really avail themselves to that money.

MR. DARROW: Okay. Then why didn't the federal government come in '91 or whenever they finally discovered you have all these contaminates in the ground, and do something about cleaning it up, instead of letting it stay there leaching into the soil year after year after year, you know.

MS. URQUHART-FOSTER: In '91 we did come out and look at it and said, you know, it's not an immediate threat. It's not an emergency situation. It's not something that has to be handled right away. It can sit here, and so we did the remedial investigation, and found -- I mean, the concentrations that we find aren't screaming high. They're high enough to, at the site, we needed to do the cleanup, if you wanted to build a house on top of it, but they're not high enough to affect the neighborhood, you know, that far down.

Part of the Superfund, as you may know, the trust fund was not re-authorized, and so the monies in Superfund have dwindled significantly. So for EPA to spend money on cleaning up this site, we have to go through a ranking process. They evaluate your site against other sites throughout the nation, and how bad those are, and they evaluate them. And this site was not getting -- it was pretty low in the list for getting federal funding. So we increased our talks with the current property owners, and the ones before them who didn't actually -- they weren't Reasor, but they have agreed to conduct the cleanup.

MR. DARROW: I guess your concern of the immediacy for cleaning up this heightened if you're living there, number one. Number two, I guess if you take a look at it and see that Prince George Creek runs from there, and runs all through these neighborhoods, what kind of situation were you in, particularly with comments that you made that that lady had written you an e-mail stating that Prince George Creek -- it doesn't take a hurricane for it to overflow. It just takes a good rain.

MS. URQUHART-FOSTER: Yeah, that's what she was saying that it floods regularly.

MR. DARROW: You know, we have flooding fairly -- you know on all our properties. It's just a real concern right now, you know, on what we're dealing with, and again, I haven't done any knocking on doors. I haven't done any studies. I just wanted to know what can be done to find out if this is what's causing it.

MS. URQUHART-FOSTER: Well, I can get you in touch with the Center for Disease Control. We did do groundwater sampling in houses during the remedial investigation, you know, I think in the next neighborhood, and we didn't find any contaminates confirmed.

MR. DARROW: Were you able to check into what the contaminates were in the pond that I alerted you to in Holly Shelter Road?

MS. URQUHART-FOSTER: No, I haven't been able to find that.

MR. DARROW: I mean, that's literally right across -- the property too is right up Holly Shelter between 140 and 132.

MS. URQUHART-FOSTER: Do you know who owns the property or who has that information?

MR. DARROW: Blossom Ferry.

MS. URQUHART-FOSTER: What is Blossom Ferry?

MR. DARROW: It's a neighborhood, and folks were unable to use their water for a long period of time because the water is contaminated. And, you know, again, you don't -- I guess until you get slapped in the face with it, you don't think anything about it, because you don't even know it was there. You drive by it every day and say, you know, what the heck did I know, but now it's a real concern.

MS. OLSEN: Has that contamination continued to seep into the ground? You said you found it in '95, didn't do anything, but has it continued to seep into the ground since then, and how far down does it seep, and how far down when you go through the neighbors' yards, how far down in the ground do you go in and check?

MS. URQUHART-FOSTER: In the neighbors' yards we just tested the water, the wells, the drinking water wells, what they were drinking, and we didn't find any contaminates there.

There were toluene, which is another -- it's volatile organic compound, and we found that initially in the early sampling at really low concentrations like two parts per billion in some of the wells on site, but it hasn't been there for years. It's very volatile. So, we've sampled -- I'm sorry, we've sampled at the site when we did the remedial investigation, did extensive sampling from 1996 to 1999, and we only found these areas, these two areas that are contaminated.

MR. DARROW: Well, I can hope you can appreciate the concern only because when I started looking at it, and realizing that each of these individuals was a long-term resident, and Castle Lakes has really only been there since 1989. I think the first house was built in '89. This one lady died and, you know, a gentleman is going through chemical therapy now, and the other lady has since moved away.

MS. OLSEN: But you have a guarantee that when this is, quote, cleaned up, it's going to be cleaned up, and it won't come back and bite us later.

MS. URQUHART-FOSTER: No. We're cleaning up to residential standards, and we'll be conducting sampling, and so, I mean, we'll have all that data. You're more than welcome. It will be public documents. You're welcome to come look at it.

MR. DARROW: Do you have any idea what they are going to do with the property? Is it residential or what's being --

MS. URQUHART-FOSTER: It could be. I don't know. I read in the paper like you probably did about proposed rezoning it for residential standards or residential mixed use. I've heard talks that it may be converted to a park. You know, until the property is sold, I can't really say. The New Hanover County zoning, Planning Department contacted me and asked about the cleanup plan. The coincidence of the timing of this and the selling of the property from our end, you know, we're just -- we finally have come to an agreement, and they're ready to move forward with the cleanup. When the cleanup is complete, then, of course, you know, it can be used for more purposes than it can right now.

MS. MILLER: And truly you can't ask for a better residential standard, residential standard -- cleaning up to residential standard.

MR. DARROW: I'm not questioning what kind of cleaning you're going to do. I'm questioning why it took to 2007 to get it done when you knew that there were contaminates sitting out here. You know, I'm looking at it and saying I know that the federal government moves slowly, but 1991 we discovered this problem, and I'm not saying that the folks that own the property should get stuck with it, but I think that the federal government had some type of responsibility there to take care of it, instead of allowing the contaminates there on the property to leach into the ground for 16 years later, and then, you know, it's nothing -- I'm grasping at straws. I'm just saying, you know, it's quite a coincidence there of, you know, this stuff leaching into the ground and the incidence of cancer, and I guess, and I'm just talking about a small little neighborhood. What about the rest of the neighbors in the area, you know, Blossom Ferry, and I can't think of the place on 132.

MS. SHIVER: Prince George.

MR. DARROW: What is it?

MS. SHIVER: Prince George.

MR. DARROW: Prince George, yeah, and you know all through there there's tons of homes in there, tons of homes along Parmalee Road. We're all along Prince George Creek. It's a beautiful place to live. We love living there, but now all of a sudden you look at this and say what's going on, you know, and I would just like to know. It's not like I want somebody sued, to sue somebody. I just want to know why it's not done.

MS. SAWYER: Well, I think it was in 1996 when the funding mechanism for the Superfund expired, so, I mean, it was back that far that the funding mechanism that we had expired, and it was never reinstated, so since that time, we've been going through a process, and it's nationwide, you know, with limited dollars each year determining which sites we should allocate the funding that we have to --

MS. URQUHART-FOSTER: Those with higher concentrations of chemicals or, you know, higher risk to people are the ones that are getting it. And this site, I mean, the only risk is if you were living there right now. It's not a risk to the surrounding area.

MR. DARROW: I understand it. Now, you look at breast cancer and say that the studies they're doing on people lived near a high wire, high voltage wire and everything else. I just think -- I'm just venting. I don't know. Very disturbed, that's all, and I'm not pointing a finger. I'm just asking why wasn't it done, and if it wasn't done properly, or it wasn't done in a timely fashion, people have gotten sick over it, let's prevent the next group of people, hopefully, from getting sick, and find out if there is some kind of a relationship. Let's check and make sure, and let's check in Castle Estates, and let's check and see what kind of incidence we have.

MS. URQUHART-FOSTER: Yeah, and that's why ATSDR did their public health assessment, and they went to talk to people, but that was a few years ago, and if can get back in contact with them, I'll be happy to give you that.

MR. DARROW: I would appreciate it.

MS. BEVERLY SHIVER: We had a meeting at the library at Landfall back in, I don't know, maybe 2002, I came to that. But I heard that about the CDC going around, and nobody in my neighborhood knew anything about them coming around, and we're right there. And I've talked to many people, they had never heard of the place, so nobody came around and knocked on doors. There's quite a few people that don't work. I work but nobody knew anything about somebody knocking on doors finding out if people, you know, is sick, and we have a pretty large neighborhood.

MS. URQUHART-FOSTER: Well, in addition to doing that, they also had a public meeting that was announced in the newspaper that was held at the library at the Military Cutoff Road, and I was there, and there were a few people who came in and talked to them.

MS. BEVERLY SHIVER: Well, that's where I was. That was down there, and I was there at that meeting, but most of the neighbors knew nothing about it, you know, when I asked them, what meeting? So a lot of people don't get the paper. You have to get the word out somehow other than -- I don't know how, on TV or something, because a lot of people don't get the paper. I don't get it. Somebody stuck something in my mail box.

MS. URQUHART-FOSTER: So you did get something in your mail box?

MS. BEVERLY SHIVER: Yeah, but all my neighbors did not.

MS. SAWYER: For this meeting or for that previous meeting?

MS. SHIVER: For both of them. I guess it was somebody that knew me that put it in my box, but a lot of my neighbors I talked to didn't get anything.

MS. URQUHART-FOSTER: Well, we have a mailing list for the area that we sent things out, and maybe we just don't have the current, correct addresses. We did get a lot of returns, so --

MS. BEVERLY SHIVER: I gave my -- back in 2002 I gave me mail address. I have not moved, and I have never gotten anything in the mail.

MS. URQUHART-FOSTER: But we also did the original ROD proposal and mailing, and so if we're missing anybody's name or address on our mailing list, you know, please let us know and we'll add it to it.

MS. MILLER: They can e-mail it to me and I'll be glad to add it.

MS. BEVERLY SHIVER: Well, I did send an e-mail.

MS. MILLER: Any other questions or comments? If you didn't sign in, I would like for you to, that way you could be added to the EPA's mailing list, and we'll be sure to get somebody to contact you.

MR. DARROW: I appreciate it.

MS. MILLER: Thank you guys for coming. If you ever have any questions, don't hesitate to call. (6:59 p.m.)g

STATE OF NORTH CAROLINA)
COUNTY OF NEW HANOVER)

C E R T I F I C A T E

I, Tracy F. Schell, a Notary Public in and for the State of North Carolina, do hereby certify that the preceding public hearing was reduced to typewriting under my direction, and the public hearing is a true record to my best ability to hear and understand the proceedings.

I further certify that I am neither attorney or counsel for, nor related to or employed by, any attorney or counsel employed by the parties hereto or financially interested in the action, this the__ day of _________, 2007.

TRACY F. SCHELL
Notary Public #19942240029

STATE OF NORTH CAROLINA)
COUNTY OF NEW HANOVER)

C E R T I F I C A T E

I, Tracy F. Schell, a Notary Public in and for the State of North Carolina, do hereby certify that the preceding public hearing was reduced to typewriting under my direction, and the public hearing is a true record to my best ability to hear and understand the proceedings.

I further certify that I am neither attorney or counsel for, nor related to or employed by, any attorney or counsel employed by the parties hereto or financially interested in the action, this the 7 day of May, 2007.

Tracy Schell

TRACY F. SCHELL
Notary Public #19942240029