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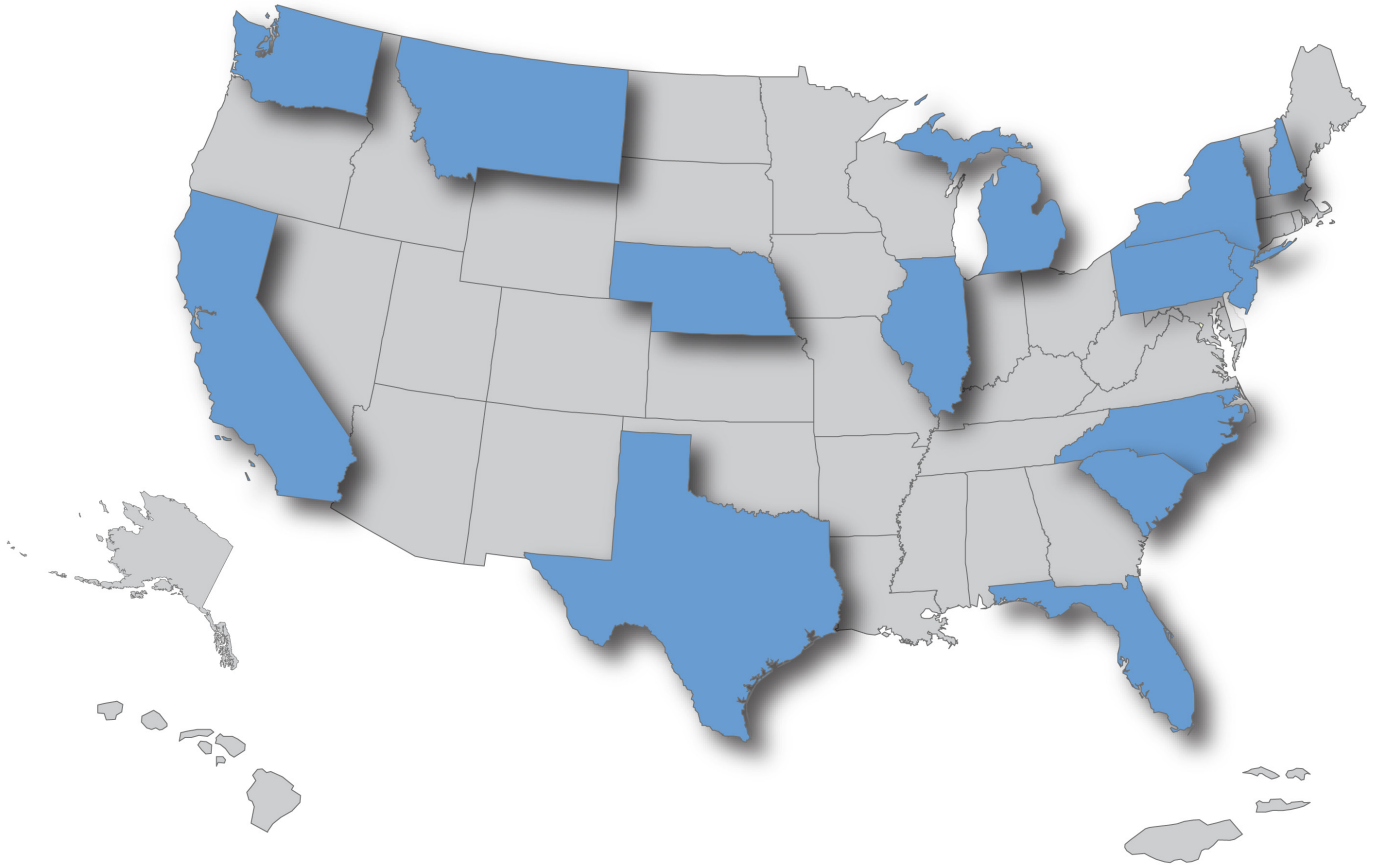
The National LUST Cleanup Backlog:
A Study of Opportunities



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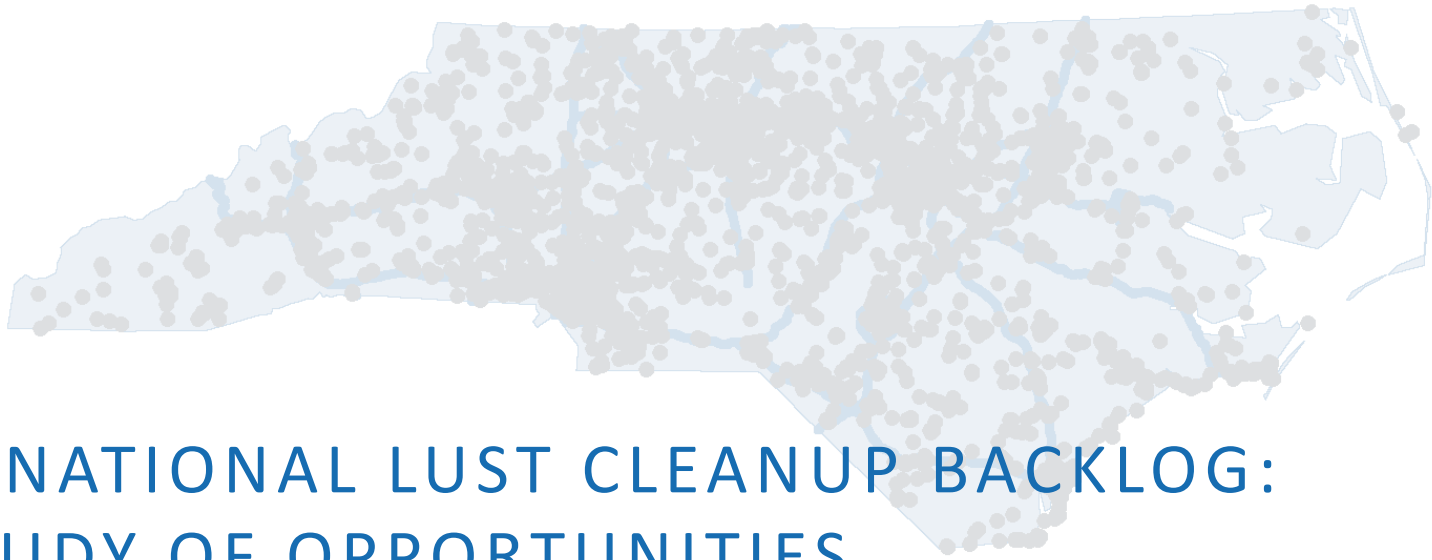


THE NATIONAL LUST CLEANUP BACKLOG: A STUDY OF OPPORTUNITIES

STATE SUMMARY CHAPTER: NORTH CAROLINA

Office of Solid Waste and Emergency Response
Office of Underground Storage Tanks
September 2011

LIST OF ACRONYMS

DENR	North Carolina Department of Environment and Natural Resources
EPA	United States Environmental Protection Agency
ESA	Expedited Site Assessment
FY	Fiscal Year
GCL	Gross Contamination Level
LUST	Leaking Underground Storage Tank
MNA	Monitored Natural Attenuation
MSA	Multi-Site Agreement
MSCC	Maximum Soil Contaminant Concentration
MTBE	Methyl Tertiary Butyl Ether
NFA	No Further Action
RBCA	Risk-Based Corrective Action
RP	Responsible Party
RUST	Regional Underground Storage Tank
UST	Underground Storage Tank

EXECUTIVE SUMMARY

Leaks from underground storage tanks (USTs) threaten America's groundwater and land resources. Even a small amount of petroleum released from a leaking underground storage tank (LUST) can contaminate groundwater, the drinking water source for nearly half of all Americans. In surveys of state water programs, 39 states and territories identified USTs as a major source of groundwater contamination.[1] As the reliance on our resources increases due to the rise in population and use, there is a correspondingly greater need to protect our finite natural resources.

From the beginning of the UST program to September 2009, more than 488,000 releases were confirmed from federally-regulated USTs nationwide. Of these confirmed releases needing cleanup, over 100,000 remained in the national LUST backlog. These releases are in every state, and many are old and affect groundwater. To help address this backlog of releases, the United States Environmental Protection Agency (EPA) invited 14 states to participate in a national backlog characterization study.

ANALYSIS OF NORTH CAROLINA DATA

North Carolina's Department of Environment and Natural Resources (DENR) has made significant progress toward reducing its LUST cleanup backlog. As of March 2009, DENR had completed 18,469 LUST cleanups, which is 74 percent of all known releases in the state. At the time of data collection, there were 6,343 releases remaining in its backlog.[4] To most effectively reduce the national cleanup backlog, EPA believes that states and EPA must develop backlog reduction strategies that can be effective in states with the largest backlogs. EPA invited North Carolina to participate in its national backlog study because North Carolina has one of the ten largest backlogs in the United States.

In this chapter, EPA characterized North Carolina's releases that have not been cleaned up, analyzed these releases based on categories of interest, and developed potential opportunities for DENR and EPA to explore that might improve the state's cleanup progress and reduce its backlog. Building on the potential cleanup opportunities identified in the study, EPA will continue to work with DENR to develop backlog reduction strategies.

In North Carolina, as in every state, many factors affect the pace of cleaning up releases such as the availability and mechanisms of funding, statutory requirements, and program structure. To manage its limited resources for the program, North Carolina has statutes and rules requiring DENR to address the highest risk releases first and prohibits working on lower risk releases

North Carolina LUST Data
By the Numbers[2]

National Backlog Contribution	5.7%
Cumulative Historical Releases	24,812
Closed Releases[3]	18,469/74%
Open Releases	6,343/26%
Stage of Cleanup	
Confirmed Release	1,936/31%
Site Assessment	1,976/31%
Remediation	2,431/38%
Media Contaminated	
Groundwater	4,619/73%
Soil	1,616/25%
Unknown[5]	108/2%
Median Age of Open Releases	14.1 years

1 EPA, *National Water Quality Inventory: 2000 Report*, pp. 50-52. www.epa.gov/305b/2000report/chp6.pdf.

2 Data were provided in March 2009 by DENR staff and are not identical to the UST performance measures reported on EPA's website, available at: www.epa.gov/oust/cat/camarchv.htm.

3 The North Carolina Regional Underground Storage Tank (RUST) database does not track 8,966 of these releases and they are not included in this analysis. For further discussion see the Stage of Cleanup section.

4 EPA tracks individual releases rather than sites in its performance measures. Therefore, the analyses in this report account for numbers of releases, not sites.

5 Unknown media releases include those releases where the media is unknown as well as those releases where, based on available data, it was not possible to identify the media contaminated.

until all higher risk releases have been addressed. The recent economic downturn has also had an impact on the ability of many states to make progress on cleanups.

EPA included potential cleanup opportunities in this report even though current circumstances in North Carolina, such as North Carolina's statutory requirements, might make pursuing certain opportunities challenging or unlikely. Also, in some cases, DENR is already using similar strategies as part of its ongoing program. The findings from the analysis of DENR's data and the potential cleanup opportunities are summarized below in eight study areas: stage of cleanup, media contaminated, state regional backlogs, release priority, cleanup financing, number of releases per responsible party (RP), geographic clusters, and data management.

Stage of Cleanup *(see page NC-12 for more details)*

North Carolina Finding	Potential Opportunity	Releases
41 percent of releases are either: • 5 years old or older and site assessment has not started; or • 10 years old or older and are still in site assessment.	• Expedite site assessments at old releases to identify releases that can be closed with minimal effort or moved toward remediation and closure. • Implement enforcement actions at stalled releases.	2,625
32 percent of releases are: • 10 years old or older; and • in remediation.	Use a systematic process to explore opportunities to accelerate cleanups and reach closure, such as: • periodic review of release-specific treatment technologies; • review of site-specific cleanup standards where applicable; • continued use of institutional or engineering controls; and • implement enforcement actions if cleanup has stalled.	2,007

Releases in North Carolina are taking a long time to move through the cleanup process, and while DENR has statutory restrictions on where it can spend state fund money, some of these older releases were classified by the program as high priority. There are several reasons why many releases in the backlog are old including: many releases are technically complex and therefore take a long time to clean up; the majority of releases are state fund eligible and state funding is currently limited; and many releases remain unaddressed because of a low priority ranking. EPA recognizes DENR's requirement to address high priority releases first. Nevertheless, EPA believes it is important for DENR to explore opportunities to accelerate cleanups at older releases in case more resources become available and to consider potential opportunities while maintaining compliance with statutory thresholds. EPA encourages DENR to continue to work toward bringing old, high priority releases to closure.

Media Contaminated *(see page NC-15 for more details)*

North Carolina Finding	Potential Opportunity	Releases
26 percent of releases: • contaminate groundwater; and • are 10 years old or older.	Systematically evaluate cleanup progress at old releases with groundwater impacts and consider alternative cleanup technologies or other strategies to reduce time to closure.	1,636
9 percent of releases: • impact soil only; • have not finished site assessment; and • are 10 years old or older.	• Continue to use targeted backlog reduction efforts to close old releases with soil contamination with minimal effort. • Encourage RPs to use expedited site assessments to move releases more quickly into remediation.	570

Releases contaminating groundwater have always been the largest part of the national backlog and 73 percent of releases in North Carolina are documented as contaminating groundwater. In general, groundwater contamination is considered more technically complex to remediate and also takes longer to clean up than soil contamination. For old, complex cleanups where long-term remediation is underway, EPA believes it is important for DENR to have a system in place for periodic re-evaluation of cleanup progress and to reconsider whether the cleanup technology being used is still optimal.

Even though soil contamination is easier to remediate than groundwater contamination, many releases with soil-only impacts are still unaddressed or are in the early stages of cleanup. Many of these releases remain unaddressed because they are lower priority according to DENR's ranking system. Nevertheless, as resources become available, EPA believes DENR should continue to make progress toward closure for all of its LUST releases.

State Regional Backlogs *(see page NC-18 for more details)*

North Carolina Finding	Potential Opportunity	Releases
• Two DENR regions have relatively high proportions of releases not undergoing remediation; and • three DENR regions have relatively high proportions of releases impacting groundwater.	Develop region-specific strategies for moving releases toward remediation and closure.	Variable number of releases[6]

EPA identified differences in the distribution of the backlog among DENR's seven regions including differences in stage of cleanup and type of media contaminated. Differences in the management and administration of remedial actions might be causing some of the differences in cleanup outcomes. Other external factors such as geologic and geographic differences might also contribute to the difference in the backlog. For example, areas of higher population usually result in areas of larger backlogs. Property transfers provide incentives for cleanup, particularly in urban areas. Differences in geology and terrain can make releases in one part of the state more difficult to clean up than releases in other parts of the state. These differences might reveal opportunities for region-specific backlog reduction. DENR should work with its regions to address their specific backlog issues and facilitate the sharing of information and best practices among the regions.

Release Priority *(see page NC-20 for more details)*

North Carolina Finding	Potential Opportunity	Releases
Only 49 percent of releases are above the Risk Rank and Abatement threshold.	• Encourage RP-led cleanups for releases with priority scores below the action threshold and use enforcement actions when necessary. • Encourage RPs and stakeholders to examine public and private funding options such as petroleum brownfields grants.	3,149
41 percent of state fund eligible releases: • are high risk; and • have not begun remediation.	Explore ways to move more state-funded cleanups toward closure, such as: • expediting site assessment of all releases to ensure that: ○ all releases are appropriately ranked; ○ releases with immediate risk are actively being worked on; and ○ all releases make progress toward closure.	363

North Carolina has a statutory requirement to address the highest priority releases first. DENR cannot spend resources at lower priority releases. Consequently, North Carolina's low priority releases tend to be old and remain in the backlog. In addition, DENR re-prioritizes releases as work progresses or new information becomes available, so work stops at high priority releases once they are no longer categorized as higher risk releases. With North Carolina's statutory requirements in mind, EPA will work with DENR to explore options and develop strategies to move releases toward closure, such as supporting local governments and other stakeholders in using the petroleum brownfields program to move relatively low priority releases forward. EPA also believes it is important to ensure that there are no immediate risks to human health and the environment from the higher priority releases that have not been addressed.

6 Opportunities marked as "variable number of releases" relate to programmatic opportunities and affect an unknown number of releases potentially including all open releases.

Cleanup Financing *(see page NC-22 for more details)*

North Carolina Finding	Potential Opportunity	Releases
RPs for 75 percent of releases have not requested state fund eligibility.	• Continue to encourage RPs to apply for eligibility in a timely manner so as to determine the number and risk level of state fund eligible releases. • Systematically track these releases in the RUST database to facilitate the evaluation of funding needs. • Consider enforcement for stalled releases.	4,726
6 percent of state fund eligible releases: • have a designated priority ranking; • have not begun site assessment; and • are below the priority threshold.	• Explore opportunities to address more releases with the state fund such as: ○ examine cost savings measures; and ○ consider other funding sources including public/private funding options such as petroleum brownfields grants for low priority releases or financing claim payments. • Encourage RPs to move forward with state fund eligible releases. • Provide information and technical assistance to RPs or initiate enforcement actions at stalled releases.	89

EPA and state programs are interested in exploring successful financing strategies for completing cleanups quickly. EPA acknowledges that the recent economic downturn has impacted cleanup financing. EPA also believes the availability of funding for cleanup is essential to reducing the backlog, so in addition to this study, EPA is increasing its focus on oversight of state funds as well as conducting a study of private insurance.

The structure of state funds can potentially create incentives or disincentives for prompt cleanup. For example, a high deductible would provide a different incentive for owners than a low deductible. The deductibles in North Carolina can range from $20,000 to $75,000 and must be expended before a RP can apply to the state fund. This process might be preventing RPs from performing cleanup activities. In addition, DENR's current budget situation does not allow DENR to fund all cleanups expeditiously. North Carolina has a statutory requirement to address its worst sites first. As these cleanups tend to be the most costly, DENR has only been able to fund 25 percent of its backlog. EPA will continue to work with DENR to explore how incentives affect the pace of cleanup and how the use of effective incentives can support program implementation.

All state programs are experiencing resource limitations and progress is dependent upon their ability to apply existing resources to their backlogs. Encouraging RPs to move state fund eligible cleanups forward might be a way to continue cleanup progress while operating within current resource availability. In addition, if more cost-effective remedial plans could be implemented at state-funded cleanups in remediation, or other funding sources found for those not in remediation, such savings would free up funding to address more releases in the early stages of cleanup.

Number of Releases per RP *(see page NC-24 for more details)*

North Carolina Finding	Potential Opportunity	Releases
11 percent of releases are associated with 31 RPs each with 10 or more releases.	Explore possibilities for multi-site agreements (MSAs) or enforcement actions with parties associated with multiple open releases.	707

EPA analyzed the number of releases per RP to identify the RPs that are the largest potential contributors to North Carolina's cleanup backlog. EPA was able to identify groups of 10 or more releases associated with 31 RPs. These 31 RPs account for 11 percent of the backlog. Taking into account any statutes or rules that restrict the use of MSAs, DENR and EPA could use this information to identify possible participants for multi-site strategies to clean up groups of releases.

Geographic Clusters *(see page NC-24 for more details)*

North Carolina Finding	Potential Opportunity	Releases
75 percent of releases are clustered within a one-mile radius of five or more releases.	Target releases within close proximity for resource consolidation opportunities.	Targeted number of releases[7]

Another multi-site approach DENR could use is targeting cleanup actions at geographically-clustered releases. This approach could offer opportunities for new community-based reuse efforts, using economies of scale, and addressing commingled contamination. EPA believes that highlighting geographic clusters of releases and working with state and local governments and communities in an area-wide planning context can facilitate the remediation of additional releases. EPA recognizes that state laws and regulations might present implementation challenges. EPA intends to work with the states to conduct further geospatial analyses on clusters of releases

7 Opportunities marked as "targeted number of releases" relate to geographic opportunities that will address a limited number of releases within select designated geographic areas.

in relation to RPs, highway corridors, local geologic and hydrogeologic settings, groundwater resources, and/or communities with environmental justice concerns. These analyses might reveal additional opportunities for backlog reduction.

Data Management *(see page NC-25 for more details)*

North Carolina Finding	Potential Opportunity	Releases
Several key data fields are not included, consistently maintained, or routinely tracked in the RUST database.	Improve RUST database to enhance program management and backlog reduction efforts.	Variable number of releases

Multiple data management limitations prevent a full assessment of the backlog and associated strategies for backlog reduction. For example, the RUST database does not include the stage of cleanup data or track state fund eligibility. Additional improvements to data management could allow for easier overall program management within North Carolina as well as provide an improved tool for developing strategies to reduce the cleanup backlog.

CONCLUSION

This chapter contains EPA's data analysis of North Carolina's LUST cleanup backlog and identifies potential opportunities to reduce the backlog in North Carolina. EPA discusses the findings and opportunities for North Carolina, along with those of 13 additional states, in the national chapter of this report. EPA will work with states to develop potential approaches and detailed strategies for reducing the backlog. Development of strategies could involve targeted data collection, reviewing particular case files, analyzing problem areas, and sharing best practices. Final strategies could involve EPA actions such as using additional program metrics to show cleanup progress, targeting resources for specific cleanup actions, clarifying and developing guidance, and revising policies. EPA, in partnership with states, is committed to reducing the backlog of confirmed UST releases and to protecting the nation's groundwater, land, and communities affected by these releases.

PROGRAM SUMMARY

North Carolina LUST Program At a Glance

Cleanup Rate
In fiscal year (FY) 2009, DENR confirmed 234 releases and completed 574 cleanups.[8]

Cleanup Financing
Of open releases, 25 percent (1,616 releases) are state fund eligible. RPs have not yet applied for eligibility for the remaining 75 percent of open releases (4,726 releases), so these releases are expected to be state funded, but eligibility of these releases is unknown.[11]

Cleanup Standards
The type of cleanup standards required is based on risk classification.

Priority System
Releases are allocated state resources based on risk classification.

Releases Per Project Manager
On average, each project manager is responsible for 275 open releases.[13]

Administrative Spending (FY 2006-2007)
$4.1 million[14]

State LUST Program Organization and Administration

North Carolina Department of Environment and Natural Resources (DENR) Underground Storage Tank (UST) Section staff oversee the assessment and cleanup of leaking underground storage tank (LUST) releases, conduct field work, monitor consultants' work, provide technical assistance to responsible parties (RPs) and consultants, pre-approve trust fund claims, and review technical reimbursement requests.

Cleanup Financing

The Commercial and Noncommercial Cleanup Funds reimburse tank owners, operators, and landowners for costs associated with LUST cleanups. These funds provide reimbursements up to $1.5 million for remediation and third-party liability costs in excess of deductibles with a 20 percent copayment for costs greater than $1 million. Deductibles for releases from commercial tanks range between $20,000 and $75,000 depending on the date of release.[9] Releases discovered on or after June 30, 1988 from registered and compliant commercial tanks for which annual operating fees have been paid are eligible for the Commercial Trust Fund.[10]

State fund eligibility for either fund is not determined until an RP applies for state funding, which it will do only after exceeding the amount of its deductible. State fund eligibility approval has been requested and received for 25 percent of open releases (1,616 releases). Eligibility approval has not yet been requested for the remaining 75 percent of releases (4,726 releases). DENR estimated that only 25 releases to date have been denied eligibility. Therefore, most releases with unknown state fund eligibility might be approved for state funding once the state receives applications for funding. In 2007, the General Assembly of North Carolina passed House Bill 2498 enacting a statute of limitations that applies to the filing of eligibility applications and reimbursement claims.[12] Claims must be submitted prior to January 1, 2010 for all tasks completed prior to January 1, 2009; for tasks completed after January 1, 2009, claims must be submitted within one year of task completion. Despite this newly-enacted statute of limitations, as of December 2009 DENR had not received a notable increase in claims applications.

Release Prioritization

DENR prioritizes releases in Risk Classification rankings of High, Intermediate, or Low based on the results of a Limited Site Assessment. DENR is required by statute to address the highest risk releases before adding other releases.[15] A threshold

8 Based on FY 2009 *UST Performance Measures End of Year Activity Report*.
9 For more information, see DENR's Leaking Petroleum UST Cleanup Funds brochure, available online at: portal.ncdenr.org/c/document_library/get_file?uuid=82504138-4585-4492-abe4-7208bfe9371f&groupId=38361.
10 There are no registration requirements or release date restrictions associated with Noncommercial Trust Fund eligibility for noncommercial tanks.
11 Only one open release has a record of eligibility denial.
12 For more information on Section 2 of House Bill 2498, see DENR's November 2009 memorandum, available online at: portal.ncdenr.org/c/document_library/get_file?p_l_id=38491&folderId=540393&name=DLFE-14202.pdf.
13 Estimate provided by DENR staff.
14 This is the administrative budget for North Carolina's state-funded UST program, derived from the state's Commercial and Noncommercial Funds.
15 SL352, Section 10 - Prioritization of Remediation Work Bill, available online at: www.wastenotnc.org/ust/2004_124Law.html.

Risk Rank and Abatement score is used to identify releases for active cleanup. The threshold Risk Rank and Abatement score for cleanup actions can be adjusted depending on how much money the state has available in a given year. DENR defines the threshold Risk Rank and Abatement score as the number of releases for which claims can be paid within 90 days of determining the amount of eligible reimbursement. Section 10 of Session Law 2003-352 allows RPs to continue work on their own until the point that North Carolina can reimburse them, but RPs will not be directed to perform work until they can be reimbursed by the fund. According to the state database, RPs performed non-directed work at 30 percent of 1,271 open releases (380 releases). These cleanups are likely driven by interest in redevelopment. All releases are assigned a Risk Rank and Abatement score, but work must continue at all ineligible releases regardless of risk. Cleanup of releases that are not financed by the state fund is also overseen by DENR staff.

At releases initially classified as High Risk that are subsequently re-calculated to have a lower risk score, work will stop. For example, the state statute requires the classification of a release located within 1,000 feet of a well as a High Risk release. If the well was later identified as up-gradient from the release or if the well could be closed once receptors were connected to a municipal water supply, the release would be reclassified as Intermediate Risk and the work would stop.

Cleanup Standards

Releases classified as High Risk must be cleaned up to North Carolina Groundwater Quality Standards or Maximum Soil Contaminant Concentrations (MSCCs; Table 1 to the right). Intermediate Risk releases with groundwater contamination must be remediated to Gross Contamination Levels (GCLs), which are calculated from risk-based corrective action (RBCA) standards, and Intermediate Risk releases with soil contamination must be remediated to the appropriate MSCCs.[16] However, DENR must allow the use of RBCA standards at Intermediate Risk releases if requested by the RP. Site-specific RBCA standards can also be used at Low Risk releases.[17] DENR places land use restrictions, or institutional and engineering controls, on sites when contaminant levels do not meet unrestricted use requirements for soil or groundwater. Out of 3,480 releases closed between 2002 and 2008, 31 percent (1,094 releases) were closed with institutional or engineering controls (Figure 1 to the right).

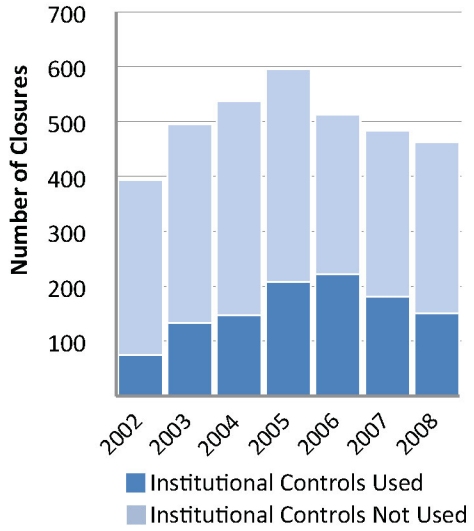
State Backlog Reduction Efforts

DENR has undertaken several activities to reduce the state's backlog. The program is currently investigating opportunities to address approximately 60 releases identified between December 2007 and January 2008 that lie within North Carolina Department of Transportation right of ways. Site assessments and sampling activities required for release closure are restricted at these locations. These release files will be reviewed to identify releases where No Further Action (NFA) letters can be issued. RBCA might be applied at some of the releases and institutional controls used for release closure. As with all NFAs in North Carolina, the cases could be reopened and remediated in the future if needed. In addition, EPA Region 4 provided supplemental funding to address easy-to-close, low priority releases where RPs were either not viable or could not be located. Of these releases, 88 percent have been addressed. A legislative allowance to allocate state funds to address additional easy-to-close, low priority releases would impact as many as 321 additional releases that have been identified by DENR. Although DENR has a statutory mandate to address the highest priority releases first, the North Carolina General Assembly designated funding in 2008 for the removal of free product at LUST cleanup sites regardless of priority.[18] Finally, DENR directed American Recovery and Reinvestment Act funds to address 175 non-RP-lead releases.

Table 1. DENR Cleanup Standards, by Risk Level

Risk Level	Media	Standard
High	Groundwater	Groundwater Quality Standards
High	Soil	MSCCs
Intermediate	Groundwater	GCLs or RBCA standards
Intermediate	Soil	MSCCs or RBCA standards
Low	Soil	RBCA standards

Figure 1. Use of Institutional Controls Over Time



16 DENR's *Guidelines for Assessment and Corrective Action for UST Releases* is available online at: www.wastenotnc.org/ust/docs/aca_body.pdf.

17 Releases with groundwater contamination cannot be classified as Low Risk releases.

18 SL352, Section 10 - Prioritization of Remediation Work Bill. Available online at: www.wastenotnc.org/ust/2004_124Law.html.

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ANALYSIS AND OPPORTUNITIES

In this study, EPA analyzed North Carolina's federally-regulated releases that have not been cleaned up (open releases). First, EPA conducted a multivariate analysis on DENR's data.[19] This technique provided an objective analysis of multiple release characteristics and allowed EPA to highlight the traits most commonly associated with older releases. Next, EPA divided the open releases into groups that might warrant further attention. EPA used descriptive statistics to examine the distribution of releases by age of release and stage of cleanup and highlighted findings based on DENR's data.[21] EPA then identified potential opportunities for addressing particular groups of releases in the backlog. Many releases are included in more than one opportunity listed. These opportunities describe actions that EPA and DENR might use as a starting point for collaborative efforts to address the backlog. Although EPA's analysis covered all releases in North Carolina, there are 148 releases that are not included in any of the subsets identified in the findings or opportunities due to the way EPA structured the analysis. These releases might also benefit from some of the suggested opportunities and strategies.

EPA's analyses revealed eight areas of North Carolina's backlog with potential opportunities for its further reduction:

- Stage of cleanup
- Media contaminated
- State regional backlogs
- Release priority
- Cleanup financing
- Number of releases per RP
- Geographic clusters
- Data management

LUST Data Source

Electronic data for LUST releases occurring between March 1979 and February 2009 were compiled with DENR staff in 2008 and 2009.[20] Data were obtained from DENR's Regional Underground Storage Tank (RUST) database and selected based on quality and the ability to address areas of interest in this analysis.

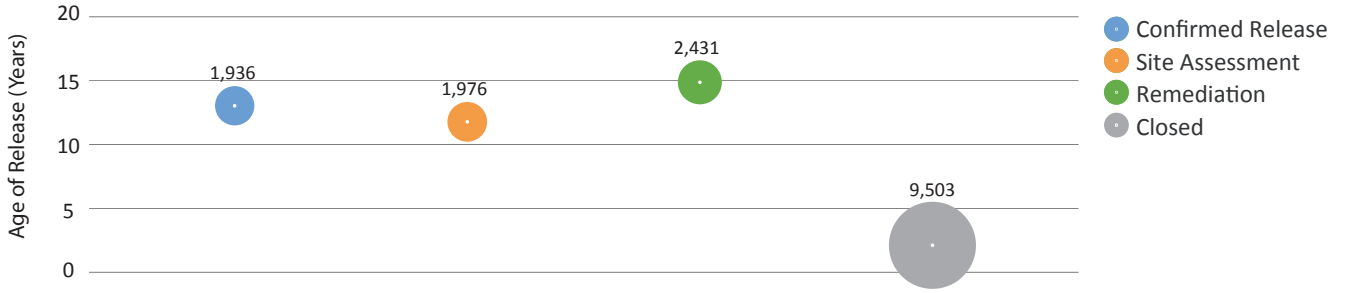
19 For a detailed description of the analytic tree method, see Appendix A.
20 For a detailed description of the North Carolina data used in this analysis, see the Chapter Notes section.
21 For a detailed description of release stages, see the Chapter Notes section (Stage of Cleanup Reference Table).

STAGE OF CLEANUP

As of March 6, 2009, the North Carolina backlog consisted of 6,343 open releases. EPA analyzed the age of these LUST releases and their distribution among the stages of cleanup. To facilitate analysis, EPA classified North Carolina's open releases into three stages of cleanup: the Confirmed Release stage (releases where assessments have not begun), the Site Assessment stage (releases where assessments have begun), and the Remediation stage (releases where remedial activities have begun).[22] While EPA grouped the releases into linear stages for this analysis, EPA recognizes cleanups might not proceed in a linear fashion. Cleanup can be an iterative process where releases go through successive rounds of site assessment and remediation. However, ultimately, this approach might be both longer and more costly. Acquiring good site characterization up front can accelerate the pace of cleanup and avoid the extra cost of repeated site assessment.

Since North Carolina's LUST program began, DENR has closed 18,469 releases, including 8,966 releases closed by 1992.[23] Releases closed after 1992 include both "clean" closures and closures that required remedial activities. The data displayed in Figure 2 below encompass the 9,503 releases closed after 1992. Half of the 9,503 closed releases tracked in the RUST database were closed in fewer than 1.9 years (Figure 2 below). The young median age of closed LUST releases might be attributable to the closure of relatively easy to remediate releases.

Figure 2. Age of Releases Among Stages of Cleanup



The white dot at the center of each circle represents the median age of releases. Each circle is labeled with, and scaled to, the number of releases within each stage. Included in the release counts and size of circles are 247 closed releases and 13 open releases for which it was not possible to calculate age. These releases are not part of the median age calculation. The 8,966 closed releases that are not tracked in the RUST database do not appear in this or subsequent graphics.

DENR's backlog reduction efforts have focused on identifying releases that could be closed with minimal effort, including those located in North Carolina Department of Transportation right of ways as well as low priority releases without viable

22 Releases were classified into stages based on available data and discussion with DENR staff. For more information, see the Chapter Notes section.

23 Since North Carolina's LUST program began, DENR has closed 18,469 releases. In 1992, North Carolina UST Section Management determined that 49 percent of these releases (8,966 releases) had been closed at tank removal without requiring more formal corrective action. National program policy allows states to report confirmed releases as cleanup completed if they require no further action at the time of confirmation. The RUST database does not track these 8,966 closures and therefore they are not analyzed in this report.

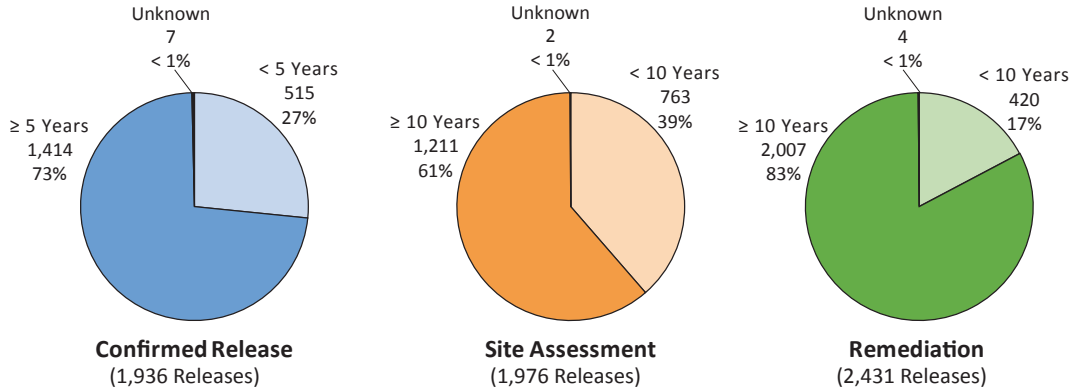
RPs.[24] States might find opportunities for closure with minimal effort at lower risk releases where little or no remedial work is required to reach closure standards or at releases that have met closure standards but have not finished closure review.

North Carolina has many old LUST releases not in remediation. North Carolina law requires RPs to take initial abatement action and pursue initial site assessment activities without direction from DENR. Following initial site assessment activities, DENR might determine that a release is low risk and might not require the RP to immediately continue with a comprehensive site assessment. Doing so allows DENR to use state funds at higher risk cleanups, but also leads to not initiating comprehensive site assessments or remedial activities at old releases.

Figure 3 below shows the backlog of open releases by age and stage of cleanup and allows for the identification of older releases by stage. Figure 3 breaks out the 1,414 older releases in the Confirmed Release stage (22 percent of the backlog) that have not been assessed five years or more after the releases were confirmed. It also shows the 1,211 older releases in the Site Assessment stage (19 percent of the backlog) have not entered the Remediation stage 10 years or more after the releases were confirmed. This subset of older releases in the early stages of cleanup accounts for 41 percent of North Carolina's total backlog. DENR's data indicate that these releases have not moved into remediation quickly.

EPA encourages states to streamline the corrective action process, improve data collection, reduce the overall cost of remediation, and move releases more rapidly toward remediation and closure. To assist states and regulators in implementing these objectives, EPA developed its *Expedited Site Assessment* (ESA) guide.[25] The guide explains the overall ESA process as well as specific site assessment tools and methods. The ESA process rapidly characterizes site conditions to help support cost-effective corrective action decisions. ESAs can identify releases that can be closed with minimal effort or will provide all the information needed to move a release into remediation. Conducting site assessments efficiently and quickly can help reduce the backlog by accelerating the pace of cleanup and ultimately decrease overall project costs.

Figure 3. Release Age Distribution among Stages of Cleanup



North Carolina Finding

41 percent of releases are either:

- 5 years old or older and site assessment has not started; or
- 10 years old or older and are still in site assessment.

Potential Opportunity	Releases
• Expedite site assessments at old releases to identify releases that can be closed with minimal effort or moved toward remediation and closure. • Implement enforcement actions at stalled releases.	2,625
Releases 5 years old or older in the Confirmed Release stage	*1,414*
Releases 10 years old or older in the Site Assessment stage	*1,211*

24 See State Backlog Reduction Efforts in the Program Summary.

25 EPA's 1997 guidance document, *Expedited Site Assessment Tools For Underground Storage Tank Sites: A Guide For Regulators* (EPA 510 B-97-001), is available online at: www.epa.gov/OUST/pubs/sam.htm.

North Carolina Finding
32 percent of releases are: • 10 years old or older; and • in remediation.

Potential Opportunity	Releases
Use a systematic process to explore opportunities to accelerate cleanups and reach closure, such as: • periodic review of release-specific treatment technologies; • review of site-specific cleanup standards, where applicable; • continued use of institutional or engineering controls; and • implement enforcement actions if cleanup has stalled.	2,007

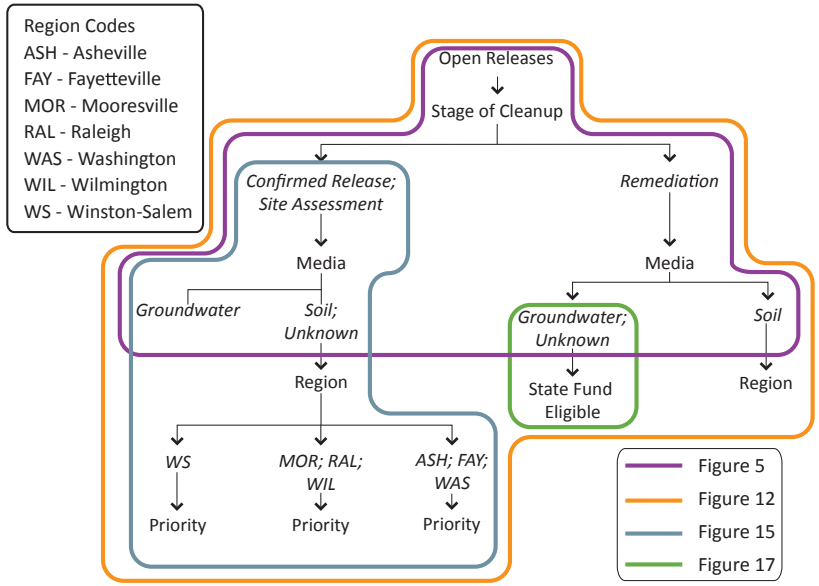
North Carolina also has many old releases in the Remediation stage. Thirty-two percent of North Carolina's releases (2,007 releases) are in remediation and are 10 years old or older (Figure 3, page 13). This older group of releases represents 83 percent of the releases in remediation (Figure 3). Because EPA only has the date that a release was confirmed but not when it moved from one stage to the next (e.g., from assessment to remediation), EPA can calculate the overall age of the release but not the actual time spent in the Remediation stage. It is possible that some of these releases might have only recently begun remediation. DENR should consider establishing a systematic process to evaluate existing releases in remediation and optimize cleanup approaches, including choice of technology and site-specific risk-based decision making, where applicable. This process might save DENR resources and bring releases to closure more quickly. DENR can also continue to use institutional or engineering controls in conjunction with risk-based decision making to reduce the time to closure by eliminating exposure pathways and allowing for less stringent cleanup standards where protective and appropriate.

MEDIA CONTAMINATED

Groundwater is an important natural resource at risk from petroleum contamination. Old releases impacting groundwater make up the majority of North Carolina's backlog. In general, groundwater contamination takes longer and is more expensive to clean up than soil contamination. In this study, EPA examined media as a factor contributing to the backlog. The analysis classified media contamination into three categories: groundwater (4,619 open releases), soil (1,616 open releases), and "unknown" media, which includes releases with no media specified (108 open releases).[26]

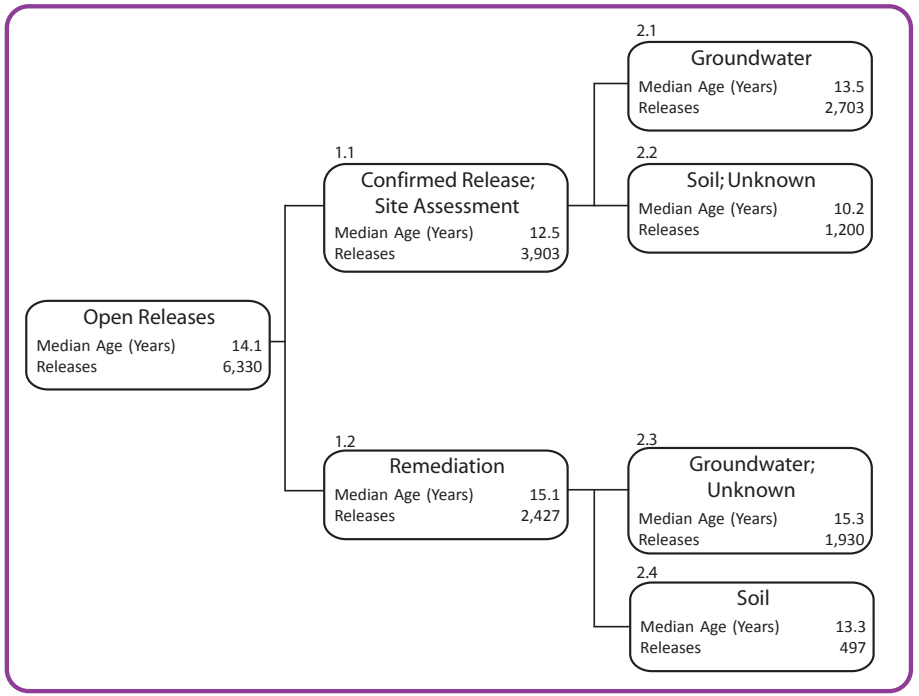
EPA performed an analytic tree analysis of all releases with a known release date (6,330 releases). This analysis determined that North Carolina's releases within the Remediation stage are significantly older than releases within the Confirmed Release or Site Assessment stages (Figure 4 and Figure 5, Nodes 1.1 and 1.2, below). Within each of these groupings, releases with groundwater contamination tend to be significantly older than releases with soil contamination (Figure 5, Nodes 2.1 – 2.4). That groundwater releases tend to be older than soil releases supports the idea that groundwater contamination takes longer to remediate than soil contamination. Under North Carolina's prioritization system, work and reimbursement at a High Risk release can pause indefinitely when risk falls below the state's Risk Rank and Abatement threshold. Thus, many old releases might not be progressing due to their priority scores or funding limitations. At releases initially classified as High Risk that are subsequently re-calculated to have a lower risk score, work will stop. For example, the state statute requires a release to be classified as High Risk if it is located within 1,000 feet of a water well. If the well was later identified as up-gradient from the release or if the well could be closed once receptors were connected to a municipal water supply, the release would be reclassified as Intermediate Risk and the work would stop. Like most state programs, DENR faces challenges in addressing backlog releases and the North Carolina state legislature requires DENR to focus on the highest priority releases first.

Figure 4. Complete Tree Outline



A simplified outline of the analytic tree structure is shown above. Specific branches are shown in greater detail in Figures 5, 12, 15, and 17. For additional information on the analytic tree method, see Appendix A.

Figure 5. Tree Analysis of Open Release Age – Media Focus[27]



26 For a detailed description of media contamination classifications, see the Chapter Notes section.

27 Node 2.2 includes 85 releases with unknown media and Node 2.3 includes 23 releases with unknown media.

North Carolina Finding
26 percent of releases: • contaminate groundwater; and • are 10 years old or older.

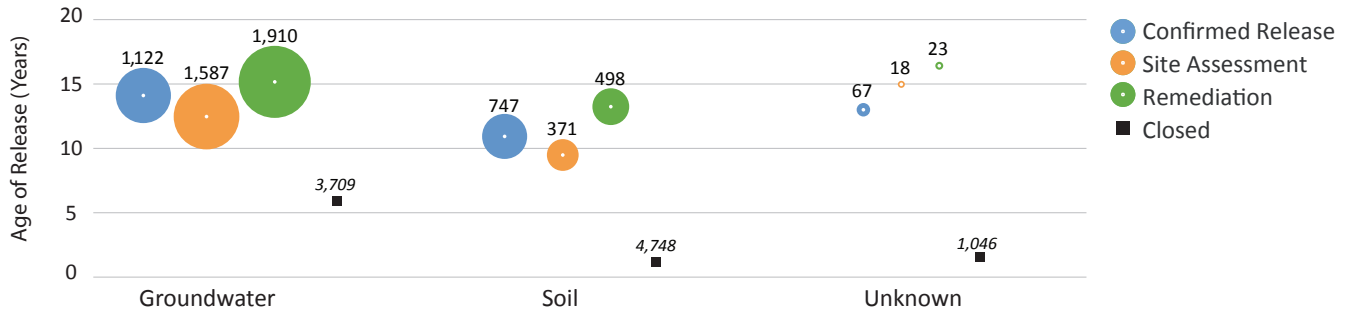
Potential Opportunity	Releases
Systematically evaluate cleanup progress at old releases with groundwater impacts and consider alternative cleanup technologies or other strategies to reduce time to closure.	1,636

North Carolina's current backlog has a much higher percentage of groundwater cleanups that are significantly older than the median age of closed sites at closure. In North Carolina, 73 percent of open releases (4,619 releases) involve groundwater contamination and have a median age of 14.5 years (Figure 6 below). In contrast, only 39 percent of closed releases (3,709 releases) involved groundwater contamination. These closed releases have a significantly younger median age of 5.7 years compared to the median age of open releases (Figure 6). Seventy-three percent of closed releases with groundwater impacts were closed in less than 10 years (Figure 7, page 17).

Of the total number of groundwater cleanups in the Remediation stage, 86 percent (1,636 releases) are 10 years old or older (Figure 7). This subset of older releases that contaminate groundwater and are in remediation makes up 26 percent of North Carolina's total backlog (Figure 8, page 17). Groundwater contamination is typically more complex and difficult to remediate. However, if DENR could identify opportunities to improve cleanup efficiencies, it might be able to accelerate the pace of cleanups. For example, using a systematic process to evaluate cleanup progress, current contaminant levels, and treatment technologies might move releases through cleanup and to closure faster. In addition, evaluation of the cleanup progress of releases with groundwater impacts might identify releases where monitored natural attenuation (MNA) could be applied. In these cases, treatment times need to remain reasonable compared to other methods. DENR's cleanup costs might be reduced by applying MNA at active cleanups.

DENR is required to use institutional or engineering controls at lower risk releases that are cleaned up to less stringent standards than unrestricted use. These cleanups must meet appropriate risk-based standards. Institutional controls occurred at 31 percent (1,094 releases) of closures in North Carolina between 2002 and 2008.

Figure 6. Age of Releases by Media Contaminated and Stage of Cleanup[28]



Squares indicating closed releases are not scaled to the number of releases in that stage.

28 This graphic does not include 8,966 clean closures.

Figure 7. Age of Closed Releases with Groundwater Impacts

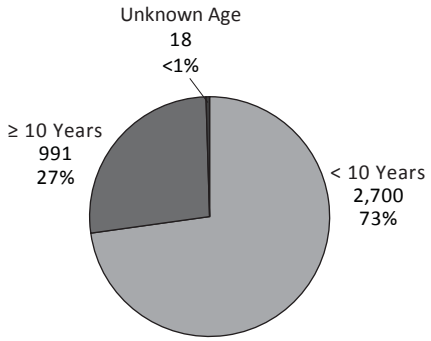
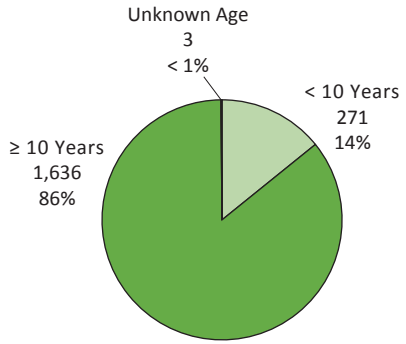


Figure 8. Age of Remediation Stage Releases with Groundwater Impacts



Releases that contaminate soil only are of concern because they represent a potential threat to groundwater resources and contaminate properties in neighborhoods and communities. Although contaminated soil can typically be cleaned up faster than contaminated groundwater, approximately half of the 1,116 Confirmed Release/Site Assessment stage soil cleanups in North Carolina are 10 years old or older (570 releases; Figure 9 below left). This group of older releases in the early stages of cleanup that contaminate soil only makes up 9 percent of North Carolina's backlog. In many cases, DENR defers the cleanup of soil contamination for higher priority groundwater contamination. Of the 420 soil cleanups with recorded risk, 76 percent (321 releases) are classified as Intermediate or Low Risk releases (Figure 10 below right). However, it appears that 99 High Risk releases 10 years or older that impact soil only are not in remediation. In general, encouraging site assessment and moving forward with remediation could help DENR gather more information about difficult releases and move all releases toward closure, thereby reducing the backlog.

Figure 9. Age of Pre-remediation Releases with Soil Contamination[29]

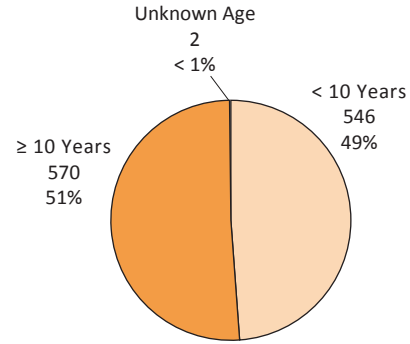
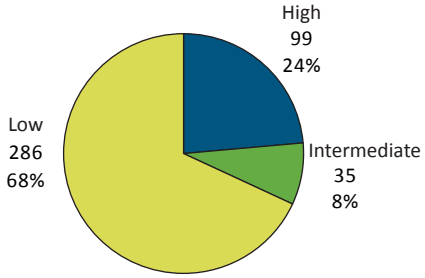


Figure 10. Risk Level of Releases 10 Years Old or Older with Soil Impacts[30]



North Carolina Finding

9 percent of releases:

- impact soil only;
- have not finished site assessment; and
- are 10 years old or older.

Potential Opportunity	Releases
• Continue to use targeted backlog reduction efforts to close old releases with soil contamination with minimal effort. • Encourage RPs to use expedited site assessments to move releases more quickly into remediation.	570

29 Pre-remediation refers to releases in the Confirmed Release or Site Assessment stages.

30 There are 284 releases that are 10 years old or older for which risk is not recorded that are not presented in this graphic.

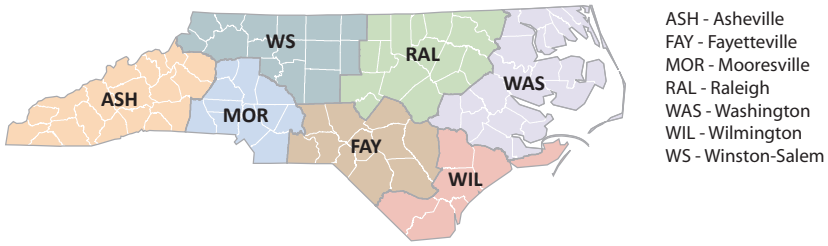
STATE REGIONAL BACKLOGS

North Carolina Finding
Two DENR regions have relatively high proportions of releases that are not undergoing remediation; and three DENR regions have relatively high proportions of releases that impact groundwater.

Potential Opportunity	Releases
Develop region-specific strategies for moving releases toward remediation and closure.	Variable number of releases[31]

EPA analyzed cleanup backlogs within DENR's seven regions to identify patterns and opportunities for targeted backlog reduction strategies within each DENR region. There are significant differences in the size of backlog, stage of cleanup, and media types among the seven regions (Figure 11 and Table 2 below). The Mooresville, Raleigh, and Winston-Salem regions have approximately twice as many releases as each of the other regions (18, 20, and 21 percent of all releases, respectively, compared with the other regions, which range from 9 to 11 percent of all releases; Table 2). The number of releases in these regions is likely due to the large number of USTs located in the densely populated urban centers of Charlotte (Mooresville region), Raleigh and Durham, and Winston-Salem. These urban areas with greater populations might also create greater financial incentives for cleanup due to property transfers.

Figure 11. Map of DENR Regions



Several regional backlogs include a large proportion of pre-remediation releases. For example, 77 percent of releases in the Asheville region (497 releases) and 78 percent of releases in the Fayetteville region (530 releases) have not entered the Remediation stage. In addition, over half of the releases in the Asheville region (342 releases) remain in the Confirmed Release stage, which is the highest percentage of any region. In contrast, 62 percent of releases (855 releases) in the Winston-

Table 2. North Carolina Backlog by DENR Region

	ASH	FAY	MOR	RAL	WAS	WIL	WS
State Backlog Contribution	10%	11%	18%	20%	11%	9%	21%
Cumulative Historical Releases	1,824	1,359	3,394	2,941	1,649	1,275	3,404
Closed Releases	1,175/64%	684/50%	2,241/66%	1,688/57%	958/58%	730/57%	2,027/60%
Open Releases	649/36%	675/50%	1,153/34%	1,253/43%	691/42%	545/43%	1,377/40%
Stage of Cleanup							
Confirmed Release	342/53%	259/38%	432/37%	312/25%	145/21%	174/32%	272/20%
Site Assessment	155/24%	271/40%	366/32%	486/39%	284/41%	164/30%	250/18%
Remediation	152/23%	145/22%	355/31%	455/36%	262/38%	207/38%	855/62%
Media Contaminated							
Groundwater	403/62%	536/80%	796/69%	853/68%	656/95%	447/82%	928/67%
Soil	246/38%	137/20%	349/30%	332/27%	35/5%	93/17%	424/31%
Unknown	0/0%	2/<1%	8/1%	68/5%	0/0%	5/1%	25/2%
Median Age of Open Releases	12.8 years	13.6 years	13.7 years	14.7 years	14.4 years	13.5 years	13.6 years

31 Opportunities marked as "variable number of releases" relate to programmatic opportunities and affect an unknown number of releases potentially including all open releases.

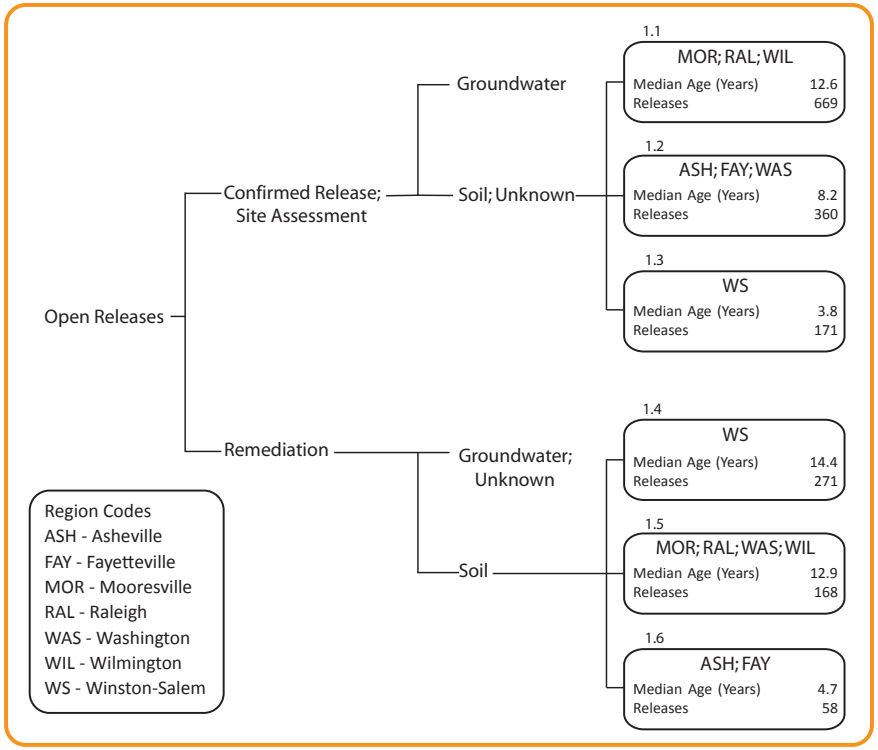
Salem region are in the Remediation stage. This finding suggests that some regions might be more effective than others in starting and completing site assessments or that there might be geologic variations or other exogenous variables that impact the regions differently.

The distribution of releases among media types also varies between regions. The total number of releases in the Washington region is similar to the Asheville region, although the Washington region has a high incidence of groundwater impacts at releases (95 percent, 656 releases), while only 62 percent of releases in the Asheville region (403 releases) impact groundwater (Table 2). This difference is possibly due to hydrogeologic variation between the two regions; the Washington region includes coastal areas and the Asheville region is more mountainous. Interestingly, the median ages of releases in these two regions are similar (Table 2), although nationally, releases contaminating groundwater tend to take longer to clean up than releases contaminating soil. This might again reflect hydrogeologic variation or might be due to differences in priority ranking of these releases between the two regions.

Within the stages of cleanup, the age of releases with soil-only impacts is significantly different among DENR regions. For example, Remediation stage releases contaminating soil in the Winston-Salem region tend to be older than the same subset of releases in other regions (Figure 12 to the right, Node 1.4). Despite this pattern, the Winston-Salem region's releases with soil or unknown media impacts in the Confirmed Release and Site Assessment stages tend to be the youngest of all of the DENR regions (Figure 12, Node 1.3). This might indicate the Winston-Salem region has been more efficient in assessing and assigning risk to releases. These releases might have been determined to pose little risk to this densely populated urban area because it uses a municipal water source, therefore, these low risk releases may have been allowed to remain unaddressed in the Remediation stage.

Another regional pattern is releases with soil-only impacts in the Remediation stage located in the Asheville and Fayetteville regions tend to be younger than those in other regions (Figure 12, Node 1.6). Although DENR takes geologic variation into account when planning remedial strategies and balances the workloads of regional offices on a regular basis, this trend might be the result of the Asheville and Fayetteville regions focusing on completing soil cleanups, and suggests that variations in regional backlogs warrant further exploration by DENR. Additional analysis might find specific differences in geologic settings, risk to receptors, or administrative and data management policies that could be used by DENR to develop region-specific strategies to reduce the North Carolina backlog. EPA encourages DENR to look for opportunities to share best practices among its regions and with other states.

Figure 12. Tree Analysis of Open Release Age – Region Focus[32]



32 Node 2.2 includes 85 releases with unknown media and Node 2.3 includes 23 releases with unknown media. Identification of the media contaminated at these releases could potentially alter the tree structure.

RELEASE PRIORITY

North Carolina Finding

Only 49 percent of releases are above the Risk Rank and Abatement threshold.

Potential Opportunity	Releases
• Encourage RP-led cleanups for releases with priority scores below the action threshold and use enforcement actions when necessary. • Encourage RPs and stakeholders to examine public and private funding options such as petroleum brownfields grants.	3,149

North Carolina Finding

41 percent of state fund eligible releases:
- are high risk; and
- have not begun remediation.

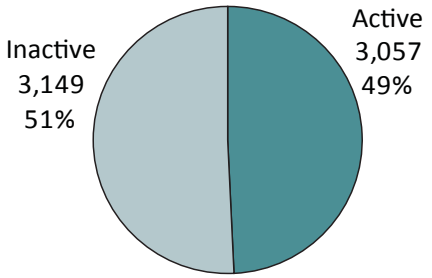
Potential Opportunity	Releases
Explore ways to move more state-funded cleanups toward closure, such as: • expediting site assessment of all releases to ensure that: ○ all releases are appropriately ranked; ○ releases with immediate risk are actively being worked on; and ○ all releases make progress toward closure.	363

Many state programs employ prioritization systems to decide how to best allocate state resources to LUST cleanups. States approach cleanup priority differently and there might be opportunities to use DENR's prioritization system to increase the number of closures. DENR is required by statute to focus resources on the highest risk releases and unconfirmed risk releases. DENR is prohibited from financing lower priority releases unless resources have already been made available to address all higher priority releases.

DENR categorizes releases in Risk Classification rankings of High, Intermediate, or Low, based on the results of a Limited Site Assessment. DENR is required by statute to address the highest risk releases and uses a threshold Risk Rank and Abatement score to identify releases for active cleanup.[33] RPs with releases above the risk threshold are directed to proceed with cleanup. At the time of data collection, only 49 percent of releases (3,057 releases) were above the November 2009 Risk Rank and Abatement threshold (Figure 13 below right).[34] The remaining 51 percent of releases (3,149 releases) were scored below the threshold and the RPs have therefore not been directed to proceed with remedial activities. State funding may be limited, but DENR could potentially spur the cleanup of low priority releases by encouraging RPs to move forward on lower priority cleanups. DENR should also encourage RPs and communities to look at other funding options such as petroleum brownfields grants and other public and private funding sources to facilitate assessment, cleanup, and reuse.

Even with North Carolina's requirement to address the highest priority releases first, not all high priority releases are in remediation. Site assessments have not been completed for 41 percent of High Risk releases (363 releases) approved for state fund eligibility, half of which are 10.4 years old or older (Figure 14, page 21). In addition, of the 4,726 releases that have not yet applied for eligibility, 1,494 are High Risk and 483 of these are still in the Confirmed Release stage. To the extent possible with available funding, expediting the completion of these site assessments to move High Risk releases into remediation and closure could help reduce the backlog. With North Carolina's statutory requirements in mind, EPA will work with DENR to develop strategies to move all releases toward closure and to ensure that there are no immediate risks to human health and the environment from the High Risk releases that have not been addressed.

Figure 13. Open Releases Above and Below the 2009 Risk Rank and Abatement Threshold[35]



Within the 1,616 releases approved for state funding, site assessments have not begun at many Low Risk releases (24 percent; 61 releases) when compared with High Risk releases (9 percent; 83 releases.) These Low Risk releases are also significantly older (14.7 year median age) than the High Risk releases (4.7-year median age; Figure 14). Low Risk releases tend to be older within other subgroups of releases as well (Figure 15, page 21, Nodes 1.1, 1.5, 2.1, and 2.4, highlighted in yellow). The age of these releases reflects DENR's policy of prohibiting the expenditure of resources on Low Risk releases.

33 Active and inactive are terms employed by DENR to define releases above or below the Risk Rank and Abatement threshold.

34 DENR's Commercial and Noncommercial Cleanup Funds have different priority score thresholds for funding and only releases categorized as High Risk and above these thresholds receive funding. The thresholds were adjusted on November 2, 2009 to permit work on all High Risk commercial releases. For current information on DENR priority thresholds, see www.wastenotnc.org/ust/FundLevel.html.

35 Not included in this graphic are 157 releases for which sufficient data were not available for comparison to the action threshold.

Figure 14. Age of State Fund Eligible Releases by Confirmed Risk Classification and Stage of Cleanup

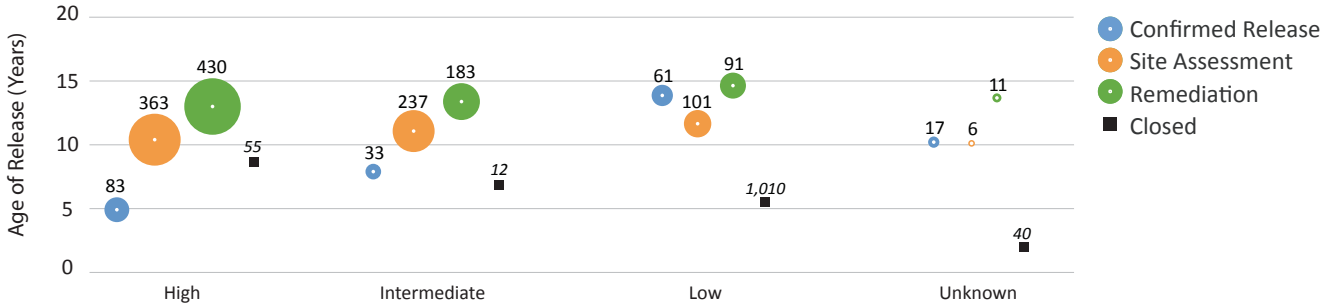
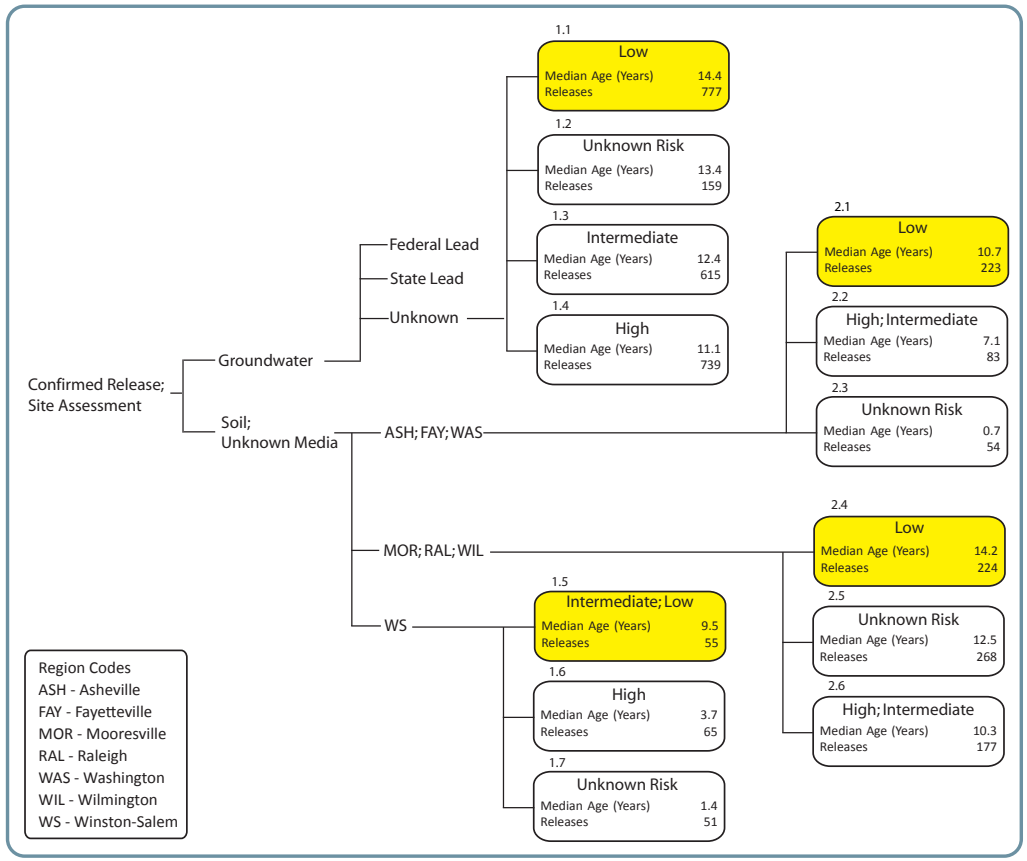


Figure 15. Age of Releases by Confirmed Risk and Stage of Cleanup



North Carolina Finding
RPs for 75 percent of releases have not requested state fund eligibility.

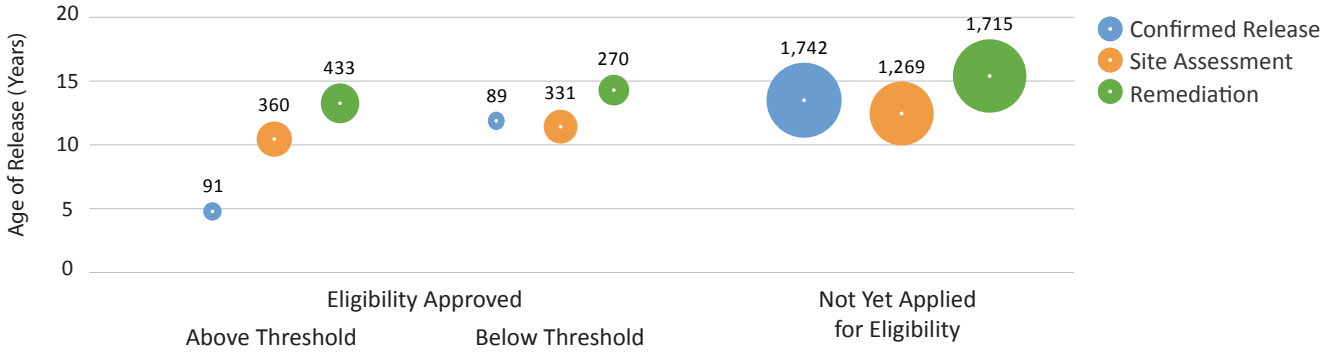
Potential Opportunity	Releases
• Continue to encourage RPs to apply for eligibility in a timely manner so as to determine the number and risk level of state fund eligible releases. • Systematically track these releases in the RUST database to facilitate the evaluation of funding needs. • Consider enforcement for stalled releases.	4,726

CLEANUP FINANCING

EPA and state programs are interested in exploring successful financing strategies for completing cleanups quickly. EPA acknowledges that the recent economic downturn has impacted cleanup financing. EPA also believes the availability of funding for cleanup is essential to reducing the backlog, so in addition to this study, EPA is increasing its focus on oversight of state funds as well as conducting a study of private insurance.

DENR staff does not determine eligibility for state funds until an RP submits an application for approval. According to available data, only 25 percent of releases (1,616 releases) have been approved for state funding (Figure 16 below). Applications for eligibility have not been submitted for the remaining 75 percent (4,726 releases) even though some level of assessment or cleanup up has proceeded at 63 percent (2,984 releases) of these releases.

Figure 16. Age of Releases by State Fund Eligibility, Priority Threshold, and Stage of Cleanup[36]



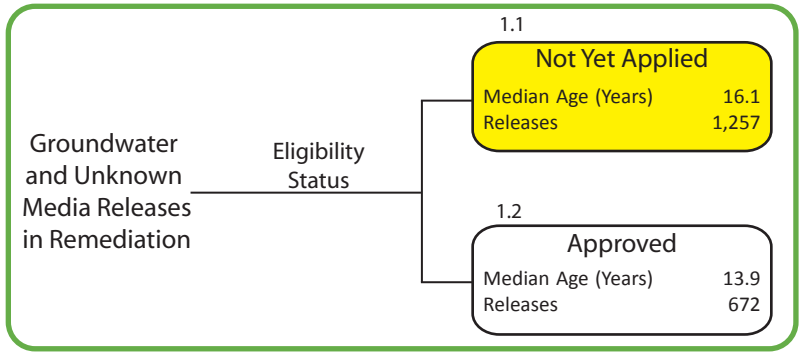
Until recently, nearly all LUST cleanups in North Carolina were likely to be funded by the state. Now, eligibility depends on the promptness of application following task completion. In 2007, the General Assembly of North Carolina passed House Bill 2498 enacting a statute of limitations that applies to the filing of eligibility applications and reimbursement claims. In North Carolina, eligibility application and filing of an initial reimbursement claim happens at the same time. Under the new bill, claims must be submitted prior to January 1, 2010, for all tasks completed prior to January 1, 2009; for tasks completed after January 1, 2009, claims must be submitted within one year of task completion. As of December 2009, DENR had not received a notable increase in claims applications but DENR expects this law to assist the state in estimating the future financial obligations of the state fund.

North Carolina has 1,929 releases (30 percent of the backlog) in the Remediation stage that impact groundwater and unknown media (Figure 17, page 23). Of these releases, there are twice as many releases where applications for state funding have not been submitted as releases that are approved for state funding. In addition, these Remediation stage releases where the RPs have not applied for state funding are significantly older than those releases that have been approved for state funding (Figure 17, node 1.1, highlighted in yellow, and node 1.2).

36 One release that has been denied eligibility and 42 releases that have been approved for state funding but have unknown priority do not appear in this graphic (14 Confirmed Release stage releases, 16 Site Assessment stage releases, and 12 Remediation stage releases).

One reason RPs might not have submitted a claim and applied for state fund eligibility at so many releases where they have already begun work is North Carolina requires the RP to pay a deductible ranging from $20,000 to $75,000 before DENR determines eligibility. If the RP has not reached the limit of the deductible then DENR can deny eligibility. Determining and tracking the eligibility status of all releases and continuing to encourage RPs to apply for eligibility in a timely manner will facilitate DENR's evaluation of funding needs. If some of the releases are ineligible for the state fund, then DENR can consider options such as enforcement to help move these cleanups toward remediation and closure.

Figure 17. Tree Analysis of Open Release Age – State Fund Eligibility Focus



Like most state programs, DENR does not have the resources to address all releases at once. In addition, North Carolina state law requires DENR to focus on the highest priority releases first. Of the 1,616 releases approved for state funding (25 percent of the backlog), 12 percent (194 releases) remain in the Confirmed Release stage (Figure 16, page 22). Only 47 percent of these releases in the Confirmed Release stage (91 releases) have priority scores above the Risk Rank and Abatement threshold. This funding threshold depends on the amount of funding available. The state does not require the RP to conduct cleanup activities for the remaining 49 percent of releases in the Confirmed Release stage (89 releases) that are below the threshold. The median age of the 91 releases above the threshold is 4.7 years, and the median age for those releases below the threshold is 11.8 years. This illustrates North Carolina's financial limitations significantly slows the progress of cleanups (Figure 16).

DENR should consider exploring opportunities to address more releases with the state cleanup fund such as employing cost cutting measures to increase the amount of funds available per cleanup. Another opportunity DENR could investigate is the availability of additional funding sources through public/private partnerships such as petroleum brownfields grants for low priority releases without a viable RP. In addition, some states have started financing claims through public/private partnerships. Encouraging RPs to move state fund eligible releases forward might be a way to continue cleanup progress while operating with current resource availability.

North Carolina Finding

6 percent of state fund eligible releases:
- have a designated priority ranking;
- have not begun site assessment; and
- are below the priority threshold.

Potential Opportunity	Releases
• Explore opportunities to address more releases with the state fund such as: ○ examine cost savings measures; and ○ consider other funding sources including public/private funding options such as petroleum brownfields grants for low priority releases or financing claim payments. • Encourage RPs to move forward with state fund eligible releases. • Provide information and technical assistance to RPs or initiate enforcement actions at stalled releases.	89

Number of Releases per RP

North Carolina Finding
11 percent of releases are associated with 31 RPs each with 10 or more releases.

Potential Opportunity	Releases
Explore possibilities for multi-site agreements (MSAs) or enforcement actions with parties associated with multiple open releases.	707

EPA analyzed the number of releases per RP to identify the RPs that are the largest potential contributors to the state's cleanup backlog.[37] A total of 31 RPs are responsible for 10 or more releases each and account for 11 percent of the North Carolina backlog (707 releases; Table 3 to the right). Of these, 19 gasoline retail, distribution, and refining businesses are the RPs for 409 releases (6 percent of the backlog), and four convenience store chains are responsible for 133 releases (2 percent of the backlog). Focused efforts engaging these RPs in collaborative cleanup agreements or enforcement actions might expedite the closure of many of these releases.

Table 3. RPs with 10 or More Open Releases

Type of RP	Number of Releases	Number of RPs
Gasoline Retail/ Distribution/Refining	409	19
Convenience Store Chain	133	4
Government – State	109	4
Government – Federal	33	2
Government – Local	13	1
Utility	10	1
Total	**707**	**31**

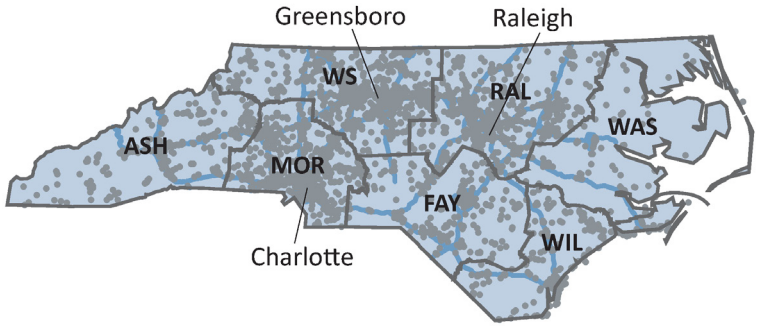
Geographic Clusters

North Carolina Finding
75 percent of releases are clustered within a one-mile radius of five or more releases.

Potential Opportunity	Releases
Target releases within close proximity for resource consolidation opportunities.	Targeted number of releases[38]

EPA performed a geospatial analysis to look for alternative ways to address the backlog. While releases in geographic clusters might not have the same RP, they tend to be located in densely populated areas and might present opportunities to consolidate resources and coordinate efforts. Geographic proximity can call attention to releases in areas of interest such as redevelopment, environmental justice, or ecological sensitivity.

Figure 18. Map of All Open Releases by DENR Region



State and local governments can utilize geographic clusters for area-wide planning efforts. EPA's analysis identified 1,840 releases (29 percent of releases) located within a one-mile radius of five or more other releases (Figure 18 above, right). Of these releases, 977 (15 percent of releases) are located within a one-mile radius of 10 or more other releases. Approaching the assessment and cleanup needs of an area impacted by LUSTs can be more effective than focusing on individual sites isolated from the adjacent or surrounding area. Considering geographically-clustered releases might pave the way for new community-based revitalization efforts, utilize economies of scale to yield benefits such as reduced equipment costs, and present opportunities to develop multi-site cleanup strategies, especially at

37 DENR tracks the RP company, the entity considered responsible for cleanup.

38 Opportunities marked as "targeted number of releases" relate to geographic opportunities that will address a limited number of releases within select designated geographic areas.

locations with commingled contamination. EPA encourages states to look for opportunities for resource consolidation and/or area-wide planning but also recognizes that this approach is best geared to address targeted groups of releases as opposed to a state-wide opportunity for every cluster of releases. EPA also recognizes that state laws and regulations might present implementation challenges. EPA intends to conduct further geospatial analyses on clusters of releases in relation to RPs, highway corridors, local geologic and hydrogeologic settings, groundwater resources, and/or communities with environmental justice concerns. These analyses might reveal additional opportunities for backlog reduction.

DATA MANAGEMENT

Multiple database limitations prevent a full assessment of the backlog and associated strategies for backlog reduction. DENR's RUST database does not track several important pieces of open and closed release-related information. DENR correspondence records were queried to assign stage of cleanup and state fund eligibility to releases for this analysis because the RUST database does not contain data fields that track this information. In addition, information on state fund eligibility and risk is not complete for all releases. The absence of data for 8,966 clean closures (49 percent of closed releases) in the RUST database results in an overestimation of closed release age and the percentage of historical releases already closed by region in this analysis, but does not yield any clear implications for program administration. Routine tracking of important release data would allow DENR staff to determine which releases to target with enforcement efforts and which releases are delayed due to a lack of available state funds. Additional improvements to database management could allow for easier overall program management as well as provide an improved tool for developing strategies to reduce the cleanup backlog.

North Carolina Finding
Several key data fields are not included, consistently maintained, or routinely tracked in the RUST database.

Potential Opportunity	Releases
Improve RUST database to enhance program management and backlog reduction efforts.	Variable number of releases

North Carolina LUST Program Contact Information

North Carolina Department of Environment & Natural Resources
Division of Waste Management
Underground Storage Tank Section
1637 Mail Service Center
Raleigh, NC 27699-1637

Phone: 919-733-1300
Fax: 919-733-9413

wastenotnc.org/ust/ust_main.html

CONCLUSION

In this state chapter, EPA presented the analysis of LUST data submitted by DENR and highlighted information on the North Carolina LUST program. Based on the analytic results, EPA identified potential opportunities that could be used to address specific backlog issues in North Carolina. Over the course of the entire study, EPA also analyzed data from 13 other states. Findings and opportunities that apply to all 14 states are discussed in the national chapter of the report. Each opportunity represents one potential approach among many to address the backlog. Discussion of the opportunities as a whole is intended as a starting point for further conversations among EPA, North Carolina, and the other states on strategies to reduce the backlog. EPA will work with our partners to develop the backlog reduction strategies. Development of the strategies might include targeting data collection, reviewing particular case files, analyzing problem areas, and sharing best practices. The strategies could also involve actions from EPA, such as using additional program metrics, targeting resources for specific cleanup actions, clarifying and developing guidance, and revising policies. EPA, in partnership with the states, is committed to reducing the backlog of confirmed UST releases and to protecting the nation's groundwater and land and the communities affected by these releases.

CHAPTER NOTES

NORTH CAROLINA DATA BY ATTRIBUTE

The following table provides details on the data elements of interest in this analysis. Data were provided by DENR staff in 2008 and 2009 for use in this analysis. Several data elements of interest could not be addressed with the information available. All available data elements were analyzed and only those data elements that revealed informative patterns of interest were included in the report.

Data Element	North Carolina Data	Use in Analysis
Administrative Cost	Data were obtained from "Annual Report to the Environmental Review Commission: North Carolina General Assembly," available at http://www.wastenotnc.org/ust/docs/AnnualReport2007.pdf.	Included in the "Program Summary" section and in the national chapter.
Age	Age was calculated for closed releases by subtracting the confirmed release date from the closure date and dividing by 365. Age was calculated for open releases by subtracting the confirmed release date from the data date and dividing by 365. Any values less than -.1 were left blank. Values between -.1 and 0 were counted as 0. All dates were rounded to one decimal point. Ages of releases with insufficient or invalid data were left blank.	Variable in all analyses.
Cleanup Standards	Site-specific data were obtained from the "RBCA" and "RBCA_GW" fields in the "tblUST_DB" file. These are the cleanup standards at the time of closure.	State-wide standards examined in the national chapter.
Closure Date	Data were obtained from the "CloseOut" field in the "tblUST_DB" file.	Included in the calculation of release age.
Confirmed Release Date	Data were obtained from the "DateReported" field in the "tblUST_DB" file.	Included in the calculation of release age.
Data Date	March 6, 2009, is used for all records. This is the date the data were obtained.	Included in the calculation of release age.
DENR Region	Data were obtained from the "ROCode" field in the "tblUST_DB" file. This field indicates the DENR regional office handling the incident.	Examined in "Regional Differences" section.
Easy to Close	Data were obtained from the "catcode" field in the "tblUST_DB" file. Category 1 indicates releases that are close to closure and category 2 indicates releases in the North Carolina Department of Transportation right of way where samples needed for closure cannot be collected. According to DENR, these data are not up to date.	Examined in the "State Backlog Reduction Efforts" section.
Federally-Regulated LUST Releases	Data were obtained from the "Reg" field in the "tblUST_DB" file. Only releases with either an "R," "B," or blank value are included. Only releases with both an USTNum and IncidentNumber are included.	Identifies the appropriate universe of releases for analysis.
Free Product	Data were obtained from the "InterCons" field in the "tblUST_DB" file. An "F" in this field would indicate the presence of free product at some point during the history of the release. Because it cannot be determined from these data whether free product is currently present, these data are not examined in this analysis.	Data not suitable for analysis.
Institutional and Engineering Controls	Data were obtained from the "LURFiled" field in the "tblUST_DB" file. A date in this file indicates the date an institutional or engineering control was put in place.	Examined in the "Cleanup Standards" section and in the national chapter.
Latitude and Longitude	Data were obtained from the "LatDec," "Latitude," "LongDec," and "Longitude" fields in the "tblUST_DB" file. Where possible, coordinates for releases without existing latitude and longitude values were obtained by EPA staff by geocoding address and street locations.	Used in geospatial analysis calculating the number of open releases within a one-mile radius of other open releases.
Lead	Data were obtained from the "Mgr" field in the "tblUST_DB" file. A "STF" entry indicates that a release is state-lead and an "FTF" entry indicates that a release is federal-lead.	No informative patterns were identified.

Data Element	North Carolina Data	Use in Analysis
Media	Data were obtained from the "Contamination" field in the "tblUST_DB" file (see Media Reference Table). Releases with groundwater contamination marked (in addition to any other media) were counted as "groundwater." Releases with only soil contamination marked were counted as "soil." "Unknown" releases might include releases at which the media contaminated is truly unknown and releases for which there are no data available in the RUST database, but for which information is available in other files.	Examined in the "Media Contaminated" section.
Monitored Natural Attenuation (MNA)	Data were obtained from the "TypeCAP" field in the "tblUST_DB" file. An "N" in this field indicates a release addressed by natural attenuation.	No informative patterns were identified.
Methyl Tertiary Butyl Ether (MTBE)	Data were obtained from the "MTBE" and MTBE1" fields in the "tbleUST_DB" file.	No informative patterns were identified.
Non-Directed Work	Data were obtained from the "DND" field in the "DirNonDir" file. This field identifies releases where non-directed work is taking place, and work might be driven by interest in redevelopment. Releases occurring prior to July 1, 2004, when DENR started directing work, are counted as "not applicable."	Examined in the "Program Summary" section.
Number of Releases per RP	Calculated as the total number of open releases associated with a unique RP name.	Examined in the "Number of Releases per RP" section.
Orphan	No data available.	Not applicable
Proximity	Geospatial analysis performed by EPA revealed the number of other open releases located within a one-mile radius of each open release.	Examined in the "Geographic Clusters" section.
Public Spending	Data were obtained from the "SumOfTtl" field in the "SpentBySite" file. Because this number is an aggregate total for each release and cannot be adjusted for inflation, it is not examined in this analysis.	Data not suitable for analysis.
Release Priority	Data were obtained from the "ConfRisk" field in the "tblUST_DB" file and the "RRARank" and "RRA Date" fields in the "tblRRA" file.	Examined in "Release Priority" section.
RP	Data were obtained from the "RP/Company" field in the "tblUST_DB" file.	Used to calculate the number of releases associated with each unique RP.
RP Recalcitrance	Data were obtained from the "Enforcement" file. RPs with releases with multiple records in this file are considered to be recalcitrant.	No informative patterns were identified.
Staff Workload	Estimated by DENR staff.	Examined in the "Program Summary" section and in the national chapter.
Stage of Cleanup	Data were obtained from the "Appvd" and "ReptType" fields in the "tblRepts" file. A two-tiered assignment of cleanup stage first assigned stage based on reports associated with the most recent approval date for each release. For releases without approval dates, all reports (regardless of date) were examined (see Stage of Cleanup Reference Table).	Variable in all analyses.
State Fund Eligibility	Data were obtained from the "Type" and "Status" fields in the "Eligibility" file (see Eligibility Reference Table).	Examined in the "Cleanup Financing" section.
Status	Data were obtained from the "CloseOut" field in the "tblUST_DB" file. All releases with a CloseOut date were counted as "Closed" and the other releases were counted as "Open."	Identifies the appropriate universe of releases for tree analysis.
Voluntary Cleanup Program	No data available.	Not applicable.

Eligibility Reference Table

Each release has multiple records in the "Eligibility" file, and only those records with a status of "Complete" were considered as the status indicates that relevant documents have been finalized. The "Type" field was used to identify state fund eligible releases and those where eligibility had been denied.

Type	State Fund Eligible
DEDUCTIBLE ADJUSTMENT	Yes
ELIG. RE-EVALUATION	Yes
ELIGIBILITY	Yes
ELIGIBILITY	Yes
ELIGIBILITY	Yes
ELIGIBILITY RE-REVIEW	Yes
ELIGIBILITY-RESUBMISSION	Yes
ELIGIBILITY	Yes
ELIGIBILITY	Yes
ELIGIBILITY - DENIAL	No
ELIGIBILITY/DENIAL	No

Media Reference Table

Code	Media Type
GW	Groundwater
SL	Soil
NO	None

Stage of Cleanup Reference Table

Each release has multiple report records. A two-tiered assignment of cleanup stage first assigned stage based on reports associated with the most recent approval date for each release. For releases without approval dates, all reports (regardless of date) were examined. The analysis used only those reports that clearly indicated a stage of cleanup; remaining reports were not considered. Open releases with no records relevant to the Site Assessment or Remediation stages were assigned to the Confirmed Release stage.

Report Name	Stage
(No relevant records)	Confirmed Release
Comprehensive Site Assmt - Addendum	Site Assessment
Comprehensive Site Assmt - Soil - Hi & Int	Site Assessment
Comprehensive Site Assmt - Soil & Groundwater	Site Assessment
Limited Site Assmt Phase 1	Site Assessment
Limited Site Assmt Phase 1 & 2	Site Assessment
Monitoring Report (Pre-Corrective Action Plan)	Site Assessment
Monitoring Report (Pre- Corrective Action Plan) Initial	Site Assessment
Soil Assessment Report - Low only	Site Assessment
Closure Report	Remediation
Corrective Action Plan - Natural Attenuation	Remediation
Corrective Action Plan – Soil	Remediation
Corrective Action Plan - Soil & Groundwater	Remediation
New Technology Cleanup Report	Remediation
Remediation Monitoring Report	Remediation
Remediation Monitoring Report (Initial)	Remediation
Site Cleanup and Site Closure Report (Low)	Remediation
Site Closure Report	Remediation
System Enhancement Recommendations	Remediation