
*North Carolina Department of Environment and
Natural Resources*

Remediation Process Plan

2000



Department of Environment and Natural Resources
Remediation Process Plan -- Executive Summary

Rationale and Vision

Potable groundwater is one of North Carolina's most valuable natural resources, with over 50% of the State's population dependent on groundwater for its drinking water. The continued growth of North Carolina increases demand for clean drinking water, and safeguarding groundwater quality will help to ensure the prosperity and health of our citizens, now and into the future. The Department of Environment and Natural Resources (DENR) proposes this Remediation Process Plan to provide common guidance to its programs on critical processes for remediating contaminated sites. It is the vision of DENR that through implementation of this plan new releases of contamination to the environment and the number of contaminated sites across North Carolina will be minimal in the future.

Spill Prevention and the Groundwater Standard

DENR puts a premium on prevention of future releases of contamination into the environment. Should such releases occur, DENR cleanup programs use rules, technical assistance, enforcement actions, and other means to require the responsible party to cleanup the contamination. If contamination impacts groundwater, the 2L standard requires the responsible party to remediate to the levels that protect groundwater for all uses, including use as drinking water. DENR holds that all contaminated sites should stay in the regulatory system until a site achieves the 2L standard.

Technical Impracticability

DENR recognizes that once groundwater is contaminated, it is at times technically impracticable to clean the groundwater to levels safe for drinking. Similarly, it is not always practicable to remediate contaminated soils to levels protective for all uses. Neither the private nor public sector should expend additional resources when no additional benefits to public health, soil quality, or groundwater quality would result. When it is not technically practicable to clean up soils or groundwater to levels protective for all uses, the State shall require additional regulatory oversight, institutional controls, and/or engineering controls in order to prevent public exposure and additional environmental damage.

Risk Analysis

The 2L standards are based on potential risk to public health, and they are based on the assumption that all groundwater in North Carolina to be potential drinking water. DENR believes that, in general, there should be no alternative cleanup standards based on non-drinking water risk levels.¹ However, DENR should use risk levels as a tool to acknowledge progress by a responsible party in remediating a site. Such risk levels also provide DENR with data to prioritize sites, so its limited resources can, in general, be focussed on the highest risk sites first.

Remediation Process Plan

This plan is the culmination of over a year of intensive work by the DENR remediation programs (Superfund, Hazardous Waste, Groundwater, Underground Storage Tanks, and Solid Waste along with the Occupational and Environmental Epidemiology Branch of the Department of Health and Human Services). The plan recommends the adoption of a series of policies and guidance documents to provide a common framework for the DENR cleanup programs as they work to prevent future releases and remediate past contamination. The plan should allow for the adoption and the appropriate use of a revised version of the Risk Analysis Framework first drafted in 1996. With this adoption of the Remediation Process Plan, DENR will resolve many long-standing ambiguities, and put in place a process for providing a consistent approach to resolving issues that have yet to be addressed.

The Recommendations called for by the plan are as follows:

- **Recommendation #1.** *DENR should approve the Remediation Policy Statement.*
- **Recommendation #2.** *DENR should approve Process Flow Charts for Groundwater and Soil.*
- **Recommendation #3.** *DENR should recognize risk assessment threshold values as a milestone on the way to restoration and programs should use them as one of the criteria to prioritize allocation of staff resources.*
- **Recommendation #4.** *DENR should adopt a revised version of the Risk Assessment Framework as a guidance document for responsible parties to determine risk threshold values.*
- **Recommendation #5.** *DENR should contract to update the draft Risk Assessment Framework to assure that all values reflect the latest scientific consensus data. Funding*

¹ This statement excludes underground storage tank and drycleaner sites which do set alternative cleanup standards in accordance with General Statutes.

for such an effort should be divided among the remediation programs.

- **Recommendation #6.** *DENR should work with DHHS to establish a system to update the RAF on a biennial basis.*
- **Recommendation #7.** *DENR should adopt the following document as guidance for ecological risk assessment for DENR: US Environmental Protection Agency (USEPA).1997." Ecological Risk Assessment for Superfund: Process for Designing and Conducting Ecological Risk Assessments". Interim Final. Washington DC: Office of Solid Waste and Emergency Response, EPA 540-R-97-006. Other updated documents may be adopted by the Remediation Advisory Committee.*
- **Recommendation #8.** *DENR should employ Technical Impracticability as a basis for modifying cleanup requirements and it should adopt the Technical Impracticability Guidance as its method for determining TI. Technical impracticability should only be allowed in instances where the environmental results which can be achieved through continued cleanup are grossly outweighed by the costs.*
- **Recommendation #9.** *DENR should adopt the Institutional Control and Reopener Guidance documents. See draft documents in Appendix I: "Generic Provisions for Reopening Partial Cleanups" and "DENR Land Use Restrictions Guidance".*
- **Recommendation #10.** *DENR should establish a fee for technical impracticability implementation to cover the cost of institutional and engineering control oversight. Additionally, there should be \$1000 technical impracticability application fee.*
- **Recommendation #11.** *The Division of Pollution Prevention should create a set of user friendly fact sheets on spill prevention to provide focus and guidance to DENR customers on prevention of chemical releases through spills. Such fact sheets could complement the many regulatory and technical assistance efforts already underway in DENR.*
- **Recommendation #12.** *The Division of Pollution Prevention should continue efforts to develop a searchable database on types and quantities of chemicals stored at facilities. Such data should then be used to target educational efforts.*
- **Recommendation #13.** *Increase enforcement for violations. Specifically, DENR should do the following:*
 - *Assess significant penalties for willful or repeat violations, and where appropriate, make full use of each program's maximum penalty authority.*
 - *Assess significant penalties when releases are not reported in a timely fashion.*
 - *Where appropriate, assess a penalty for the initial release of contaminants to the environment.*

- **Recommendation #14.** *DENR should adopt a set of principles to guide public participation for its remediation programs.*
- **Recommendation #15.** *The DENR Assistant Secretary for Environmental Protection should sponsor a cross-divisional Remediation Advisory Committee to facilitate the understanding and implementation of the Remediation Process Plan.*
- **Recommendation #16.** *DENR remediation programs should continue to develop and use measures that will accurately track progress and aid in making optimal decisions.*

I. Vision	2
II. Background.....	2
Challenges in Overseeing Remediation	3
History for Development of the Remediation Processs Plan	3
Contaminated Site Cleanup Process and Groundwater Standards	5
III. Strategy.....	6
Goals of DENR Remediation Process Plan.....	6
Overview of Remediation Process Plan.....	6
Applicability.....	8
Role of Risk Analysis in Groundwater Remediation	8
Role of Risk Analysis in Soil Remediation.....	11
Risk Assessment Framework	11
Technical Impracticability (TI)	12
Use of Institutional Controls and Reopeners	13
Institutional Control Fee.....	14
Prevention of Future Releases.....	15
Public Participation	18
Environmental Justice	20
DENR Remediation Committee and Consistency	20
Use of Data.....	20
Appendix I. Policies and Guidance Documents.....	22
Remediation Policy	23
Cleanup Process for Groundwater Contamination.....	24
Cleanup Process for Soil Contamination	28
Technical Impracticability Policy	32
DENR Land Use Restrictions Guidance	39
Generic Provisions for Reopening Partial Cleanups	44
Remediation Advisory Committee.....	45
Appendix 2. Background Information	46
Public Comments on Draft DENR Risk Assessment Framework	47
Public Participation	51
DENR Organizational Chart	Error! Bookmark not defined.
Water Supply and Contamination Incident Maps	Error! Bookmark not defined.

Department of Environment and Natural Resources

Remediation Process Plan

I. Purpose

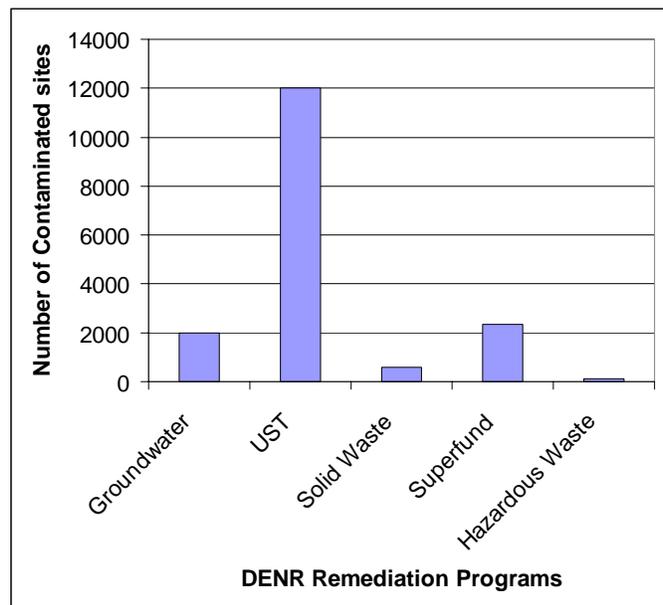
The Department of Environment and Natural Resources (DENR) proposes this Remediation Process Plan to provide common guidance to its programs on critical processes for remediating contaminated sites. It is the vision of DENR that through implementation of this plan new releases of contamination to the environment and the number of contaminated sites across North Carolina will be minimal in the future.

II. Background

DENR has five major program areas that oversee the cleanup of contaminated sites: Groundwater, Underground Storage Tanks (UST), Solid Waste, Hazardous Waste, and Superfund. The quantity of sites managed by each program area is presented in Figure 1. It is estimated that it will require 30 – 50 years for responsible parties to properly cleanup the currently known contaminated sites.

Figure 1.
Number of Contaminated Sites Managed by Program

These contaminated sites pose threats to both humans and ecosystems. Once contamination migrates to the groundwater, it becomes extremely difficult and expensive to remediate. In North Carolina, over 50% of all people get their drinking water from groundwater, which makes groundwater one of the most valuable natural resources in this State. The North Carolina maps at the end of Appendix II show the extensive network of groundwater intakes for public water supply versus the known contamination groundwater incidents. Running efficient and effective remediation programs will help to minimize threats of exposure from contamination and facilitate the restoration of groundwater to its natural state.



Challenges in Overseeing Remediation

DENR cleanup programs – Superfund, Hazardous Waste, Solid Waste, Underground Storage Tanks, Groundwater – need departmental guidance to improve consistency among programs and provide guidance in establishing cleanup policies.² Key opportunities for improvement with DENR’s current remediation system are as follows:

- **Consistency.** An system to guide the cleanup of contaminated sites may lead to increased understanding by DENR customers and enhance cleanup efforts.
- **Prioritization.** It is often in the best interest of the public welfare for the worst contaminated and riskiest sites to be cleaned up first. There is currently no departmental guidance on site prioritization. Each program uses its own system to prioritize contaminated sites. Prioritization allows for efficient allocation of staff resources.
- **Public Participation Process.** DENR frequently uses public hearings as required by law as its opportunity for public input. Early public involvement in a cleanup process allows for discussion on options before decisions are made, and it builds trust among DENR, the responsible party, and the community.
- **Lack of Action by Responsible Parties on Contaminated Sites.** There may be hundreds of known contaminated sites across North Carolina (not including USTs) which are not being managed or cleaned up at all due to costs of cleanup, unwillingness by the responsible parties, and/or a lack of resources for regulatory oversight.
- **Jurisdictional Overlap.** A clearer understanding of the jurisdictional overlap between the DENR remediation programs will increase efficiency within DENR and maximize the cleanup of contaminated sites.
- **Proliferation of Cleanup Frameworks by Industry Type.** Petroleum underground storage tanks and dry cleaners work under a different regulatory scheme than the rest of contaminated sites. A lack of an DENR plan encourages the regulated communities to advocate for unique frameworks specific to their industry. Further splintering of cleanup frameworks has the potential to create great inefficiencies for DENR.

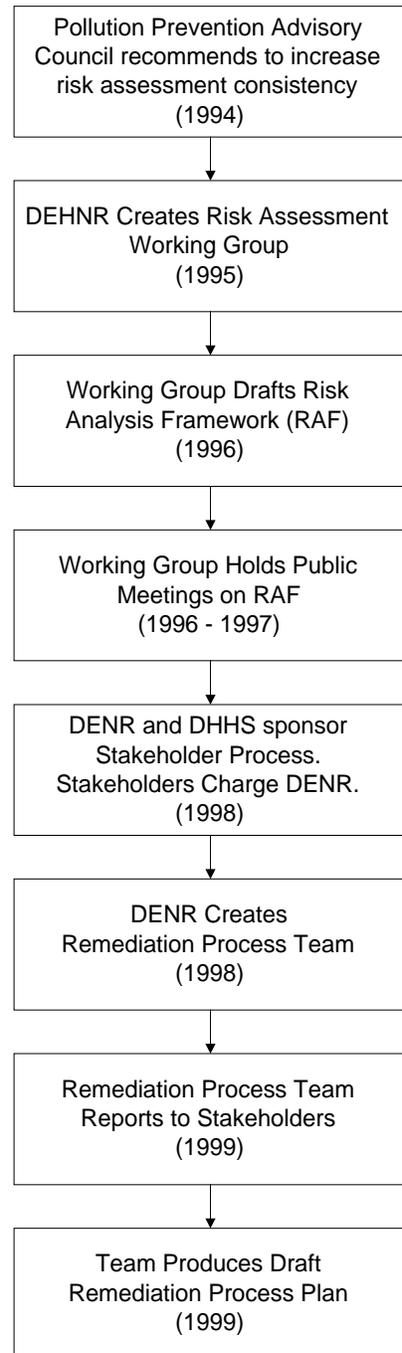
History of the Remediation Process Plan

² The UST program may find some benefits from this DENR Remediation Process Plan. However, as laws and rules governing the UST program are already very prescriptive, this Plan does not directly apply to the UST program. Also, the Dry Cleaning program is currently reviewing its enabling legislation to determine how this Plan may apply to dry cleaning sites. Similarly, the Brownfields program is outside the scope of the Plan. More discussion on the applicability of the plan and the roles of various agencies are included in the section on Applicability below.

In 1994, the broadly represented Pollution Prevention Advisory Council (PPAC) recommended that a working group be established in the then Department of Environment, Health, and Natural Resources (DEHNR) to “review and approve consistent risk assessment protocols” (see page III-3 of the PPAC final report). In June of 1995, a DEHNR team was founded to meet the charge from PPAC, and the Team created a draft North Carolina Risk Analysis Framework (NCRAF) in November of 1996. The framework provided technical methodologies to evaluate risk in a consistent way across DEHNR programs. The NCRAF was developed with the understanding that critical policy decisions would need to be made at the departmental level of DEHNR. Before such decisions were made, the Department held public hearings on the NCRAF. These public hearings raised several issues (see Appendix II for summary of public concerns). Due to the lack of consensus, DEHNR’s adoption of the NCRAF was put on hold.

In early 1998, DENR revisited the issues raised in the public hearings by holding a series of stakeholder meetings with representation from both business and environmental interests. Although no consensus was reached, the stakeholder group charged DENR with reevaluating and clarifying its proposed remediation policy. DENR used the input of the stakeholder group to charter a Remediation Process Team in the summer of 1998 under the sponsorship of the Assistant Secretary for Environmental Protection. The team was represented by members of all cleanup programs and the Occupational and Environmental Epidemiology Branch of the Department of Health and Human Services (DHHS). The Remediation Process Team drafted this Remediation Process Plan, including the policies and procedures which are presented in this document.

Figure 2. Step-by-Step History



Contaminated Site Cleanup Process and Groundwater Standards

Cleanup of environmental contamination is usually the responsibility of the person who caused the contamination and the person who owns or controls the property where the contamination occurred. These responsible parties may include, but are not limited to, private individuals, corporations, municipal or state governments, or any other legal entity.

Regardless of the contamination type or location, responsible parties must take immediate and long-term actions to address and clean up the contamination at the site. While there are differences in the various statutes and rules which govern the different DENR remediation programs, these statutes and rules generally require that responsible parties: (1) report the release to DENR; (2) take immediate action to control the release and minimize the damage to the environment; (3) assess the site and any soil or groundwater contamination; and (4) develop and implement a plan to remediate the site. For information about reporting responsibilities and referral to the appropriate remediation program, responsible parties can call the DENR hotline at (877) 623-6748.

The standards for environmental cleanup that must be met for groundwater in North Carolina are found in Environmental Management Commission rules codified in Title 15A of the N. C. Administrative Code, Subchapter 2L. These standards establish that the goal of groundwater cleanup is to return the quality of the water to a level that will allow it to be used safely for drinking water, without using additional treatment, or as close to this goal as possible. Eighty-eight groundwater quality standards have been established as of August 1999 and additional interim standards are also in effect. If a standard for a contaminant has not been established for groundwater, then the standard is the naturally occurring concentration for that substance unless the contaminant does not occur naturally, in which case the standard is the practical quantitation limit.

Soil contamination must be cleaned up to a level which: (1) will not result in contamination of the groundwater; and (2) is protective of human health.

III. Strategy

The following strategy is proposed by the DENR and DHHS Remediation Process Team to the Senior Staff of DENR as well as the Directors of Waste Management and Water Quality. This strategy is designed to address many of the challenges in overseeing remediation of contaminated sites listed above. The strategy is based on input from (1) all affected programs within DENR and DHHS and (2) interested parties outside of DENR through a long term stakeholder process.

Goals of DENR Remediation Process Plan

The goals of developing an DENR Remediation Process Plan are as follows:

- Remediate contaminated groundwater to the 2L standards since all groundwater is considered a potential drinking water source
- Protect groundwater for its potential future use as drinking water.
- Maximize number of contaminated sites remediated
- Focus state cleanup efforts on the most contaminated and highest risk sites first.
- Do not require the remediation of contaminated sites beyond a point of technical impracticability
- Minimize new discharges to the environment by (1) creating an expectation in the regulated community that sites must be remediated to the 2L standards and (2) maintaining high economic incentives for companies to act responsibly and diligently.
- Provide a consistent, clear, and stream-lined approach for determining cleanup levels.

Overview of Remediation Process Plan

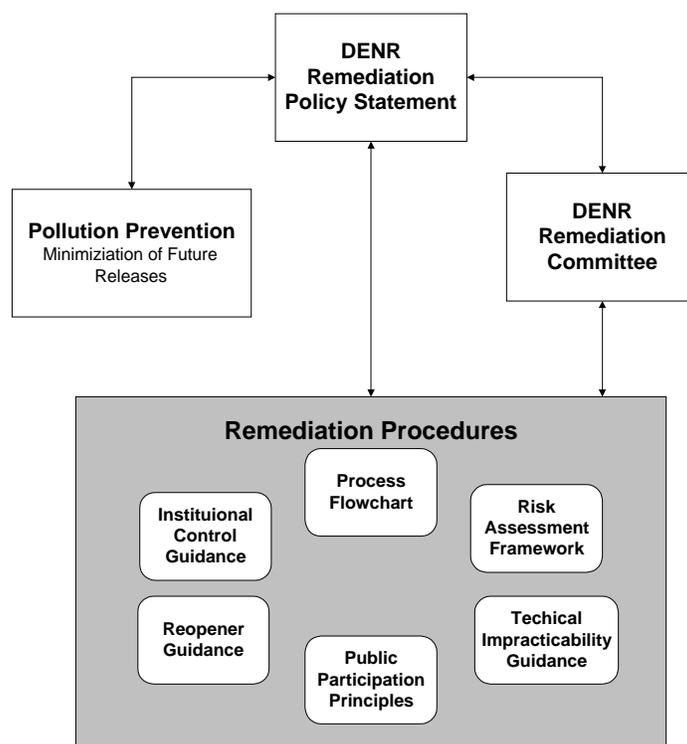
To meet the goals listed above, the Remediation Process Team has drafted a Remediation Policy Statement (see Appendix 1) which is the foundation for all components of this Remediation Process Plan. Figure 3 represents how this policy statement is related to other components of the Remediation Process Plan. This policy statement affirms that (1) the best way to protect public health and the environment from risks of contamination is to prevent new releases to the environment, (2) the State of North Carolina considers that all groundwater in North Carolina to be potential drinking water, (3) responsible parties should be required to clean up contaminated sites and (4) it is sometimes technically impracticable to fully remediate a site. The policy statement provides the basis for many recommendations presented in this plan, including the following:

- Remediation Process Flow Charts for Groundwater and Soil
- Technical Impracticability Guidance Document
- Risk Analysis Framework
- Institutional Controls Guidance

- Reopeners Guidance
- Public Participation Plan and Principles.

Each of these procedures is discussed in the body of this report. The longer guidance documents and policies for each are included in Appendix I except for the Risk Assessment Framework which is itself a long document. The Appendix I flowcharts and their keys for groundwater and soil provide an excellent starting point for understanding this Remediation Process Plan. Implementation of the plan will be the responsibility of the applicable DENR remediation programs and DHHS Occupational and Environmental Epidemiology Branch. The Remediation Advisory Committee will provide an avenue for communication among programs to facilitate the goals of the plan

Figure 3. Relationships Among Remediation Process Components



- **Recommendation #1.** DENR should approve the Remediation Policy Statement.
- **Recommendation #2.** DENR should approve charts for groundwater and soil.

Applicability

Locations at which this protocol may be used include, but are not limited to, hazardous waste sites, sites with hazardous substance contamination, and inactive and active municipal solid waste sites. The DENR programs that will adhere to the policies and guidance documents presented in this plan are as follows: groundwater, hazardous waste, superfund, solid waste, and non-petroleum underground storage tank sites. Petroleum sites that fall under the jurisdiction of the Underground Storage Tank program are not included in the procedures laid out in this document as that program already has detailed risk based cleanup requirements set forth in legislation and rules. Similarly, sites qualifying as brownfields fall outside of the scope of this Plan. The Dry Cleaning program also must have alternative cleanup levels defined for it by GS 143-215.104. However, the UST, Brownfields, and Dry Cleaning programs may still use the TI Guidance, the NCRAF to determine risk levels for soils, and other components of this plan where it deems appropriate.

The Department of Health and Human Services' (DHHS) Occupational and Environmental Epidemiology Branch (OEEB) also plays a critical role in implementation of this Remediation Process Plan. OEEB reviews groundwater quality standards, calculates soil cleanup levels, reviews risk assessments, provides risk evaluation of remediation options, provides technical assistance, and will continue to be involved in future revisions of the Risk Analysis Framework. The Risk Assessment Framework does not apply to the Division of Air Quality as air-related risk assessments are of a different nature than cleanup assessments. Parties responsible for sites with radiation contamination must first contact the Division of Radiation Protection.

Role of Risk Analysis in Groundwater Remediation

The foundation of DENR's current cleanup programs is risk to public health. The target risk for cancer-causing substances, or carcinogens, is one in a million over a 70-year life span. In other words, if 1,000,000 people are exposed to a carcinogen, no more than one additional incident of cancer is expected to occur. For substances that may cause other chronic effects, such as liver or kidney disease, but not suspected to cause cancer (non-carcinogens), the health criteria are expressed as a chronic reference dose. In other words, for each non-carcinogen there is a threshold of exposure below which no adverse health effects are expected over a 70-year life span. DENR considers both of these health-based thresholds in its cleanup programs and when establishing numerical groundwater standards (2L standards). Remediation to these health-based thresholds is considered a successful restoration.

It is also possible to take the concept of risk a step beyond only considering the health-based thresholds described in the previous paragraph. Exposure pathways and the use of a site are components of a risk. For example, the potential for exposure, and therefore risk, is usually greater at residential versus industrial sites due to the types of people who use the site the amount

of time they spend at the site. By restricting the use of a contaminated property and preventing exposure to contaminated environmental media, the risk or potential for adverse health effects is significantly reduced or eliminated. Risk analysis can identify alternate threshold values at which public health is still protected, even though groundwater, or other environmental media, may not be fully restored. Therefore, the results of a risk analysis can be valuable in determining the best course of action for managing a contaminated site.

The use of risk analysis varies by program. The Remediation Process Team has identified two mutually exclusive options (presented in the table below) for using risk analysis thresholds for groundwater restoration. Option #1 does not require full restoration of groundwater to the 2L standards when the groundwater is not currently being used as a drinking water source and is not likely to be used as a drinking water source in the future. Option #1 is currently being used by the UST program and will likely be used by the Dry Cleaner program. Option #2 requires full restoration of groundwater to the 2L standards regardless of its current use so that it is protected as a future drinking water source. Option #2 is more protective of the environment and the Remediation Process Team has chosen Option #2 as the framework for the proposed Remediation Process Plan.

In Option #2 groundwater must still be restored to 2L standards; however, once the groundwater has been remediated to non-drinking water risk levels, DENR will recognize this partial cleanup as a milestone. Once a responsible party (RP) meets this milestone, a program may choose to direct resources to sites that pose a greater risk (where groundwater is currently being utilized or is slated to be utilized in the future). DENR acknowledges that such a reallocation of resources may change the rate at which the site is remediated, as indicated in Figure 4.

<p>Option #1: Alternative Standards <i>Set alternative cleanup standards based on risk assessment threshold values</i></p>	<p>Option #2: Milestone <i>Recognize non-drinking water risk analysis threshold values as a milestone on the way to restoration and use them to prioritize sites and allocate staff resources.</i></p>
<p>Advantages:</p> <ul style="list-style-type: none"> • Moves sites out of the regulatory system sooner • Least costly for responsible parties • Lower resistance by responsible parties for starting cleanup process (i.e., more sites would be cleaned up, but to a lesser degree) 	<p>Advantages:</p> <ul style="list-style-type: none"> • Emphasizes restoration of groundwater to 2L standards • Recognizes potential future use of groundwater • Provides highest comfort level to affected public • Acknowledges the milestone of meeting risk levels which may help responsible parties with land transactions • Provides DENR basis for prioritizing sites and allocating resources
<p><i>Note that the DENR has chosen Option #2 as the basis for its remediation policies and procedures presented in this Plan.</i></p>	

If a responsible party has adequately demonstrated that non-drinking water risk levels have been achieved through the reduction of concentrations of the contamination in the groundwater, the responsible party may request a letter from DENR that states that non-drinking water risk levels at the site have been achieved. The DENR letter would also state that the site has not yet been fully restored to drinking water levels or 2L standards and that the RP is still responsible for restoration of groundwater to the 2L standards. In addition, the site must be managed through institutional and/or engineering controls to prevent exposure to contaminated groundwater until it is fully restored. To obtain a letter, the RP must be actively engaged in remediating the groundwater.

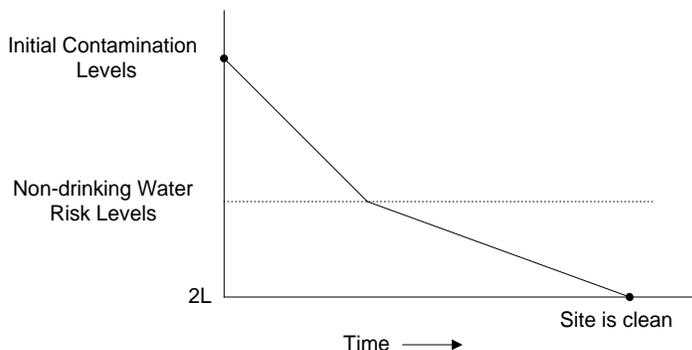


Figure 4. Rate of Remediation Given Prioritization by Risk

- **Recommendation #3.** *DENR should recognize risk assessment threshold values as a milestone on the way to restoration and programs should use them as one of the criteria to prioritize allocation of staff resources.*

Role of Risk Analysis in Soil Remediation

Unlike groundwater, numeric cleanup standards do not exist for soils. Soil cleanup levels must be calculated according to target risk and potential exposure levels. The state has deemed one excess cancer case in a million persons and a hazard index of one for non-cancer effects are the risk targets for determining soil cleanup levels.³ While the risk target does not change, exposure can change. If exposure changes, the actual risk to receptors changes. For example, an industrial property may be an environment where exposure is of shorter duration than would occur on residential property. Therefore, one could have higher concentrations of contaminants on the industrial property and still achieve the same risk target due to the shorter exposure duration. Management of soil contamination may require a combination of controlling for exposure and site cleanup.

With groundwater, controlling exposure can be more difficult since it migrates underground. This very characteristic makes contaminated groundwater a threat to neighboring properties. Delay can cause the area of contamination to be much larger in the future. In general, contaminated groundwater is unusable for most common purposes. Soil contamination can often be easily controlled with the use of land use restrictions which would prevent unacceptable exposure. When setting a site-specific cleanup standard for soil, two cleanup criteria must be met: (1) concentrations must be safe for direct contact and safe, based on the expected use of the property and (2) the contamination must not pose a threat to groundwater through leaching from soil. Appendix I describes the soil cleanup level determination process in more detail.

Risk Assessment Framework

If risk assessment threshold levels are to be used according to Recommendation #3 above, then DENR must determine the methods allowed for determining risk assessment threshold values. The traditional method to determine these threshold values is to conduct a site specific risk assessment. In order to make risk value more affordable to obtain and more accessible across DENR programs, DENR drafted a Risk Analysis Framework (NCRAF). The draft NCRAF describes a range of procedures for determining risk threshold values from “look-up” tables to site specific risk assessments. The NCRAF focuses on risks to public health. However, DENR

³ The federal Superfund Program allows a cumulative site risk range of one in one million to one in ten thousand, with one in one million being the point of departure for risk management decisions. By state statute, this risk range approach must also be taken by the State Inactive Hazardous Sites Program.

recognizes that risks to flora, fauna, and ecosystems must be considered in evaluating the risks posed by contaminated sites, and there is a need for guidance on ecological risk assessment.

- **Recommendation #4.** *DENR should adopt a revised version of the Risk Assessment Framework as a guidance document for responsible parties to determine risk threshold values.*
- **Recommendation #5.** *DENR should contract to update the draft Risk Assessment Framework to assure that all values reflect the latest scientific consensus. Funding for such an effort should be divided among the remediation programs.*
- **Recommendation #6.** *DENR should work with DHHS to establish a system to update the NCRAF on a biennial basis.*
- **Recommendation #7.** *DENR should adopt the following document as guidance for ecological risk assessment for DENR: US Environmental Protection Agency (USEPA).1997. " Ecological Risk Assessment for Superfund: Process for Designing and Conducting Ecological Risk Assessments". Interim Final. Washington DC: Office of Solid Waste and Emergency Response, EPA 540-R-97-006. Other updated documents pertaining to ecological risk assessment may be adopted by the Remediation Advisory Committee.*

Technical Impracticability (TI)

As stated in the DENR Remediation Policy (see Appendix I), the State of North Carolina considers all groundwater in North Carolina to be potential drinking water. In areas where the groundwater has been contaminated, the goal is to remediate the groundwater to the background concentrations or the State's groundwater quality standard for each constituent of concern.

The agency recognizes that it is not always technically practicable to fully remediate all sites. For example, if contamination has leaked into fractured bedrock it may not be possible to remove such contamination, no matter how much money is spent. Or, although it may be theoretically possible to remove the contents of a large leaking landfill, the costs may be unjustifiably large compared to the benefits of removal of this contamination source, and engineering controls to manage the contamination and risks may be the most appropriate action.⁴ In instances where it is technically impracticable to fully remediate the site, a responsible party can focus its resources towards minimizing exposure and risks to human and environmental receptors instead of cleanup. In other words, money that would otherwise be spent on ineffective cleanup could be focused on site management and the use of institutional and/or engineering controls. It is anticipated that only a small number of sites will qualify for modified cleanup requirements based a showing of technical impracticability. Most sites will be required to clean up to current

⁴ Note that fractured bedrock and large landfills are only used here as examples. Such sites may or may not be eligible for a TI exception.

standards. The benefits and disadvantages of a technical impracticability exception are presented in the table below. Technical Impracticability Guidance (see Appendix I) has been prepared to assist in the preparation of a technical impracticability demonstration. If a responsible party makes a technical impracticability showing, it will not receive a closure letter or a “no further action” status.

The following data should be considered in determining if it is technically practicable to remediate a site: identification of contaminants, source identification, source removal or remediation, site characterization. A number of methods may be used to demonstrate that it is technically impracticable to remove or remediate the contaminant source and/or remediate the ground water to background concentrations or the 2L standard. TI application can be supported through the following: data from ongoing remediation, pilot tests, site models and simulations, and/or a literature review. The precise combination of necessary supporting information will be based on site-specific conditions.

Advantages of Technical Impracticability	Disadvantages of Technical Impracticability.
<ul style="list-style-type: none"> • Provides financial relief where continued cleanup of contaminated sites provides little to no benefit versus the cost of cleanup 	<ul style="list-style-type: none"> • A site is only partially cleaned up. • Responsible parties may be relieved of their obligation to restore a site to 2L standards.

➤ **Recommendation #8.** *DENR should employ Technical Impracticability as a basis for modifying cleanup requirements and it should adopt the Technical Impracticability Guidance as its method for determining TI. Technical impracticability should only be allowed in instances where the environmental results which can be achieved through continued cleanup are grossly outweighed by the costs.*

Use of Institutional Controls and Reopeners

Institutional Controls (ICs) are non-engineered measures used to prevent unsafe exposure to contamination. ICs include measures such as recorded land use restrictions, restrictions embodied in unilateral or consensual administrative or judicial orders and permits, and zoning restrictions. For example, a restriction of land use to industrial purposes only will be placed on property where a partial cleanup makes the site safe only for industrial uses. ICs are often used in conjunction with engineering controls likewise intended to prevent unsafe exposure to residual

contamination. Examples of common engineering controls are capping, monitoring, fencing, signage and provision of alternate water supplies. Institutional and/or engineering control may also be required for site that are in the process of being cleaned up, and may complement remediation strategies.

In 1997, provisions intended to remove common law obstacles to enforcement of ICs were included in the statutes governing four of the state's cleanup programs. Those statutes are the ones involving inactive hazardous sites, brownfields and dry-cleaning sites, and oil spills. In 1999, land use restrictions authority was given to other cleanup programs in DENR through passage of SB 1159.

A partial cleanup is only as protective as the ICs that are established, and they must be supported by an oversight system to be effective. Without database tracking systems, technical assistance efforts, and adequate oversight resources, partial cleanups of contaminated sites may not be protective of public health and the environment. Specific oversight actions include the following: a database and tracking system, unannounced site inspections and documentation audits, periodic reviews of land use restrictions, periodic certifications from regulated parties. The potential for enforcement, including fines, must outweigh any perceived advantage of violating ICs.

See Appendix I for a model "Declaration of Perpetual Land Use Restriction" document that provides the basis for an institutional control contract between DENR and owners of contaminated property.

Reopeners are the triggers that would require RPs to perform further cleanup at a partially cleanup site. As long as a site has not achieved 2L, it is subject to being "reopened" for active regulatory oversight due to factors such as changes in groundwater use, land use, exposure routes, receptors, scientific understanding of a site, development of new technologies, or other parameters. A draft list of reopeners is presented in Appendix I.

- **Recommendation #9.** *DENR should adopt the Institutional Control and Reopener Guidance documents. See draft documents in Appendix I: "Generic Provisions for Reopening Partial Cleanups" and "DENR Land Use Restrictions Guidance".*

Institutional Control Fee

As additional agency resources will be needed to monitor institutional and engineering controls at partially cleaned up sites, it is necessary to establish a fee in connection with a technical impracticability showing. The fee could be assessed based on the magnitude of the environmental damage remaining at the site and the complexity of the anticipated institutional control oversight. It is difficult to estimate the amount of such fees at this point, but initial estimates show that they may range from \$20,000 to \$100,000. For example, a simple site with

soil contamination may only need an eight hour day to audit (i.e. a drive to the site to make sure site activities are in compliance with the land use restrictions and to the register of deeds office to verify the land use restrictions instrument is still in place). A site having a multi-acre plume of chlorinated solvents with 20 boundary wells may take more time because the audit may also involve reviewing the monitor well data, as well as the status of any new drinking water wells in the area. Fees would be calculated before approval of a TI application based on projected costs over a 30-year period. Fees could be paid up front or they could be calculated on an annual basis based on the preference of the responsible party. If paid annually, a technical impracticability showing will only retain approved status as long as institutional control fees are paid. In addition to the fee for monitoring controls, there should be a \$1000 technical impracticability application fee.

- **Recommendation #10.** *DENR should establish a fee for technical impracticability implementation to cover the cost of institutional and engineering control oversight. Additionally, there should be a \$1000 technical impracticability application fee.*

Prevention of Future Releases

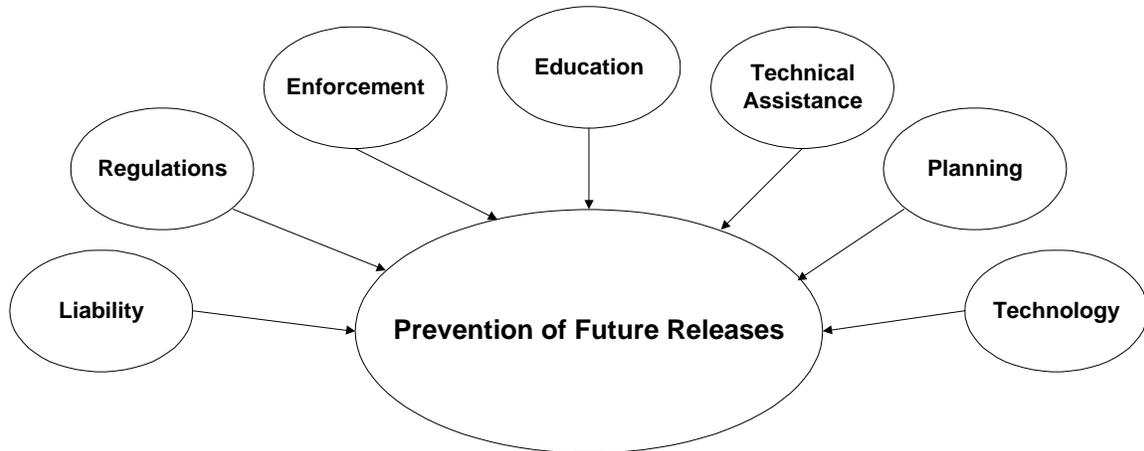
An ounce of prevention is worth a pound of cure. Potable groundwater is one of North Carolina's most valuable resources. In the long run, protection of groundwater quality depends on the prevention of future releases to the environment. As presented in Figure 5, there are a number of drivers that could help minimize future releases. Liability for the cost of cleanup and for damages to affected third parties are strong incentives for responsible management and for ensuring pollutants are not released to the environment.

Regulations provide guidance to the regulated community for managing hazardous substances. For example, the Hazardous Waste program operates under strict minimum management practices (MMP) rules which regulate every aspect of the management of hazardous waste from the time of generation up to and including the ultimate disposition of the waste in a permitted treatment, storage, or disposal facility. The UST program has rules regarding tank construction and performance standards, spill and overflow equipment and leak detection. New landfills have tightened planning, operating and closure requirements.. The Division of Water Quality requires Storm Water Pollution Prevention Plans for facilities at risk. The primary objectives of the plan are to identify potential sources of pollution and to document the methods by which the facility will reduce the amount of pollutants carried in discharged storm water. While there are differences in the various statutes and rules which govern the DENR remediation programs, DENR has the authority to compel compliance with best management practices and to require the cleanup of contaminated sites. Moreover, for some programs, a penalty may be assessed for the initial release of contaminants to the environment.

Education and technical assistance are critical to ensure that the regulated community manages hazardous materials responsibly. Direct technical assistance from DENR to explain standards, new technologies, and management practices is often the most cost-effective way for the State to

ensure compliance with regulations and thus prevent new releases. The DENR Division of Pollution Prevention and Environmental Assistance conducts site audits and provide written guidance on preventing spills and pollution. The Division of Water Quality, Groundwater Section, and the Division of Waste Management provide groundwater pollution technical assistance and regulatory implementation assistance upon request.

Figure 5. Drivers for Prevention of Future Releases



As can be seen by Figures 6 and 7, the rate of new reported releases to the environment is decreasing. For UST releases, the downward trend has been significant. New non-UST releases seem to be decreasing but not as consistently. Despite ongoing extensive remediation needs, DENR must continue to invest resources in the prevention of new releases to continue the downward trends presented in these graphs.

Figure 6: New UST Incidents

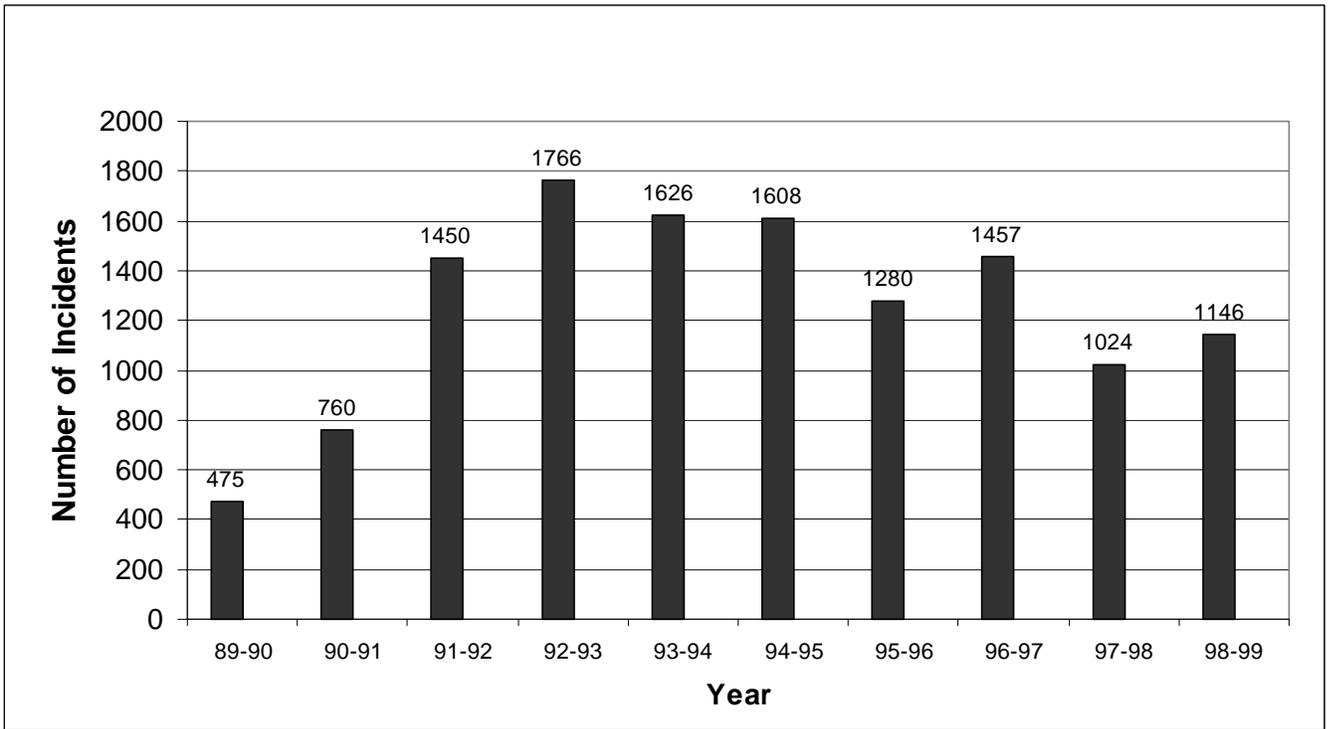
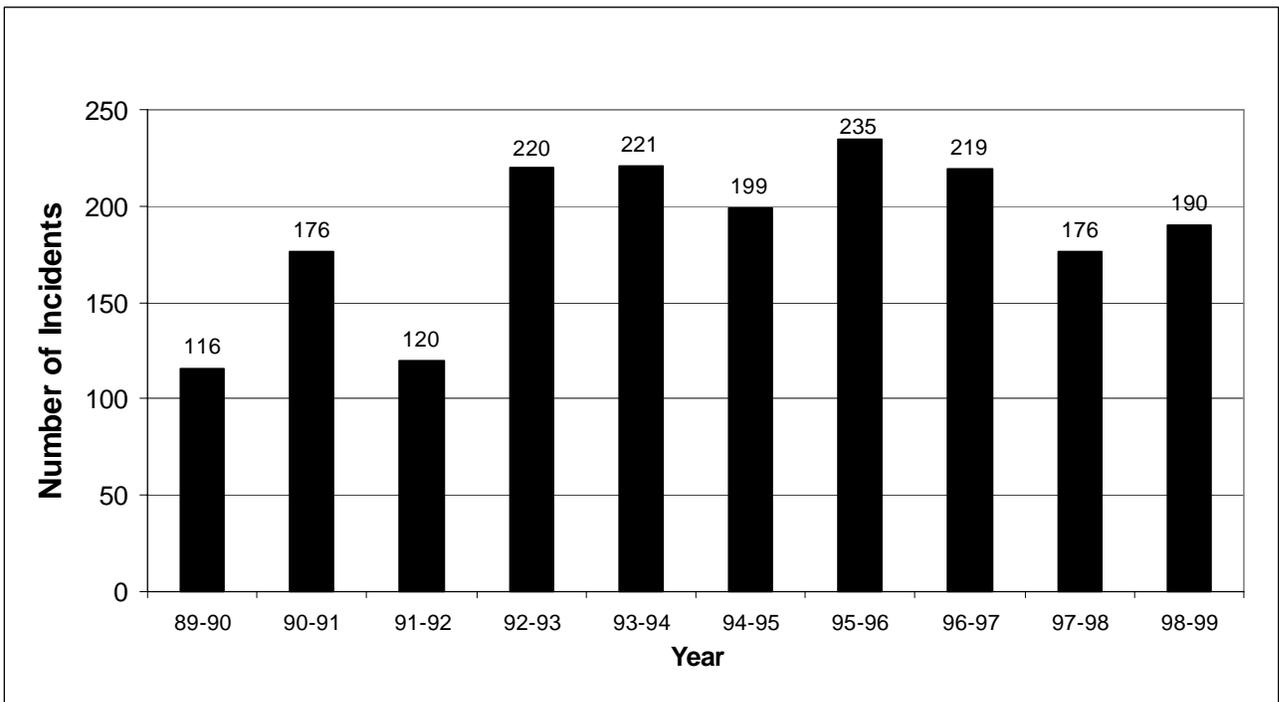


Figure 7. New Non-UST incidents



- **Recommendation #11.** *The Division of Pollution Prevention should create a set of user friendly fact sheets on spill prevention to provide focus and guidance to DENR customers on prevention of chemical releases through spills. Such fact sheets could complement the many regulatory and technical assistance efforts already underway in DENR.*
- **Recommendation.** *The Division of Pollution Prevention should continue efforts to develop a searchable database on types and quantities of chemicals stored at facilities. Such data should then be used to target educational efforts.*
- **Recommendation #13.** *Increase enforcement for violations. Specifically, DENR should do the following:*
 - *Assess significant penalties for willful or repeat violations, and where appropriate, make full use of each program's maximum penalty authority.*
 - *Assess significant penalties when releases are not reported in a timely fashion.*
 - *Where appropriate, assess a penalty for the initial release of contaminants to the environment.*

Public Participation

Public participation programs inform affected communities and other interested parties about environmental contamination and involve them in the regulatory process. Such public involvement enable DENR and RPs to respond to community concerns related to environmental contamination. Some of the typical public participation tools are as follows:

- **Public Notices.** Public notices may be considered the least formal type of public participation program. These notices are generally letters that are sent directly to potentially affected parties (e.g., local government officials, neighboring property owners and occupants). Alternatively, or in addition to direct mailings, they can be published in local newspapers with wide distribution in the community. Public notices provide general information regarding the cleanup activities, a telephone contact for questions and where to obtain additional information. They also specify to whom comments should be directed and within what time frame. A period of at least 30 days is generally provided and may be extended upon request. Public notices are also used to announce the time and place of a public meeting or public hearing.
- **Public Meetings.** Public meetings are held to provide information to interested parties, answer questions and hear concerns. They are sometimes required by federal or state statute or rule. Even when not required, as is often the case, public meetings may be called by the regulatory agency when there is sufficient public interest to warrant an open forum

for dialogue. In some cases, a facility or responsible party may call a public meeting regarding a site.

- **Public Hearings.** A public hearing is the most formal component of a public participation program. Hearings are generally taped and transcribed, with all statements becoming a matter of public record. A hearing officer presides, and speakers must identify themselves and keep their comments to a specified amount of time. Like public meetings, hearings may be required by federal or state statute or rule. They may also be called when justified by significant public interest regarding a contaminated site or a controversial agency decision.
- **Ongoing Community Communication.** At some sites, the public would like ongoing updates on the status of a remediation project. Keeping an interested community continuously updated can be very time-consuming. It is sometimes possible to identify a community leader who can be kept informed and act as a liaison with the rest of the community, or community organization which can fill that role. E-mail also facilitates communication for those who have access. Additionally, web page postings can be used to provide information and updates on specific sites.

Baseline public participation requirements are listed in a table in Appendix II. Extending public participation beyond the minimum requirements may be useful in some cases to continue to build trust between DENR and communities and to help DENR understand public viewpoints early in the process. DENR remediation programs should embrace the following principles to guide their public participation efforts:

- The public has the right to know the potential risks to their health and the environment, especially where contaminants have migrated.
- The public should be involved early in a clean up process and interested parties should be provided accurate and timely information regarding environmental contamination and actions
- An informed public can help DENR and responsible parties make better remediation decisions
- The public should be given the opportunity to provide input regarding technical and management decisions related to cleanup and other response actions.

Before approval of a TI application, responsible parties must notify the local community, offer the public an opportunity for a local meeting, and comply with any other applicable public participation requirements. DENR should consider local input in its TI review process.

- **Recommendation #14.** *DENR should adopt a set of principles to guide public participation for its remediation programs.*

Environmental Justice

Although not a focus of the Remediation Process Team, this team does acknowledge that environmental justice considerations may be a part of remediation decisions. It is a great challenge to address environmental justice issues. These issues will continue to be explored by DENR as it looks to future federal guidance and studies the experience of other states.

DENR Remediation Committee and Consistency

Adoption of this Remediation Process Plan will create the first, departmentwide guidance for the DENR remediation programs. However, this plan may be open to varying interpretations. A Remediation Advisory Committee comprised of representatives from each of DENR's remediation programs will provide an avenue for direct and ongoing communication and guidance to the programs as they implement the plan.

- ***Recommendation #15.*** *The DENR Assistant Secretary for Environmental Protection should sponsor a cross-divisional Remediation Advisory Committee to facilitate the understanding and implementation of the Remediation Process Plan.*

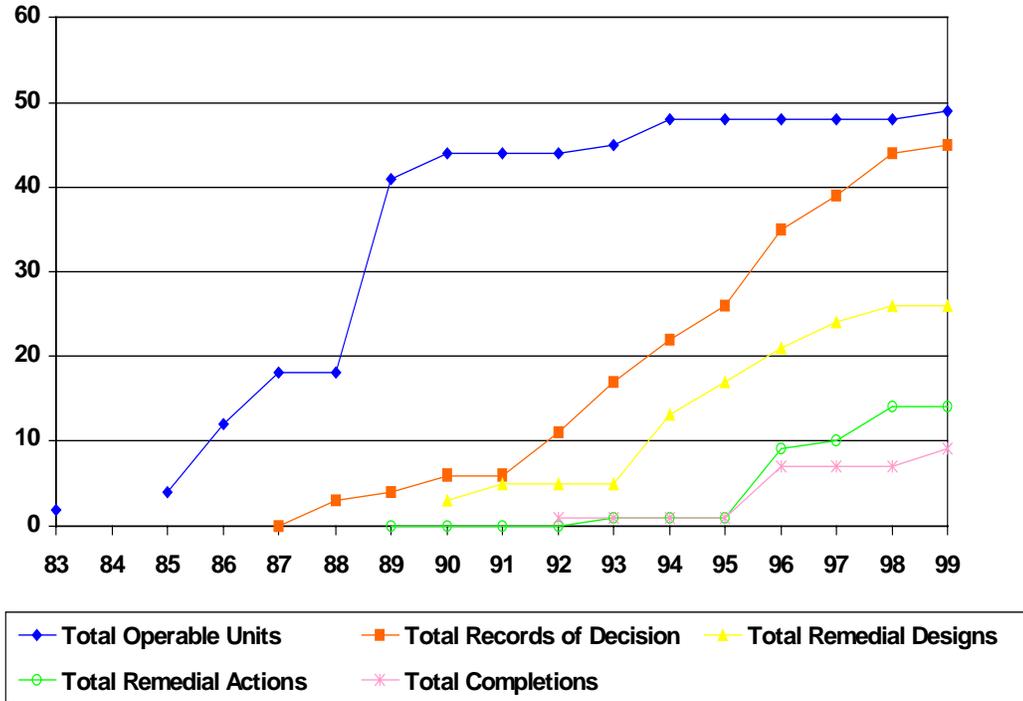
Use of Data

Periodic evaluation of data associated with DENR's cleanup programs is critical for understanding the progress those programs are making in remediating contaminated sites. For example, Figure 8 provides a sense of progress in remediating National Priorities List from the point of identification to completion of the cleanup process. Such trend data can be useful to program managers as they explain their program and evaluate where best to use limited resources. Data presented in GIS map format can also be useful for making management decisions regarding program priorities.

- ***Recommendation #16.*** *DENR remediation programs should continue to develop and use measures that will accurately track progress and aid in making optimal decisions.*

Figure 8

National Priorities List Sites Status



Appendix I. Policies and Guidance Documents

Remediation Policy	23
Cleanup Process for Groundwater Contamination.....	24
Cleanup Process for Soil Contamination	28
Technical Impracticability Policy	32
DENR Land Use Restrictions Guidance	38
Generic Provisions for Reopening Partial Cleanups	43
Remediation Advisory Committee.....	44

Remediation Policy

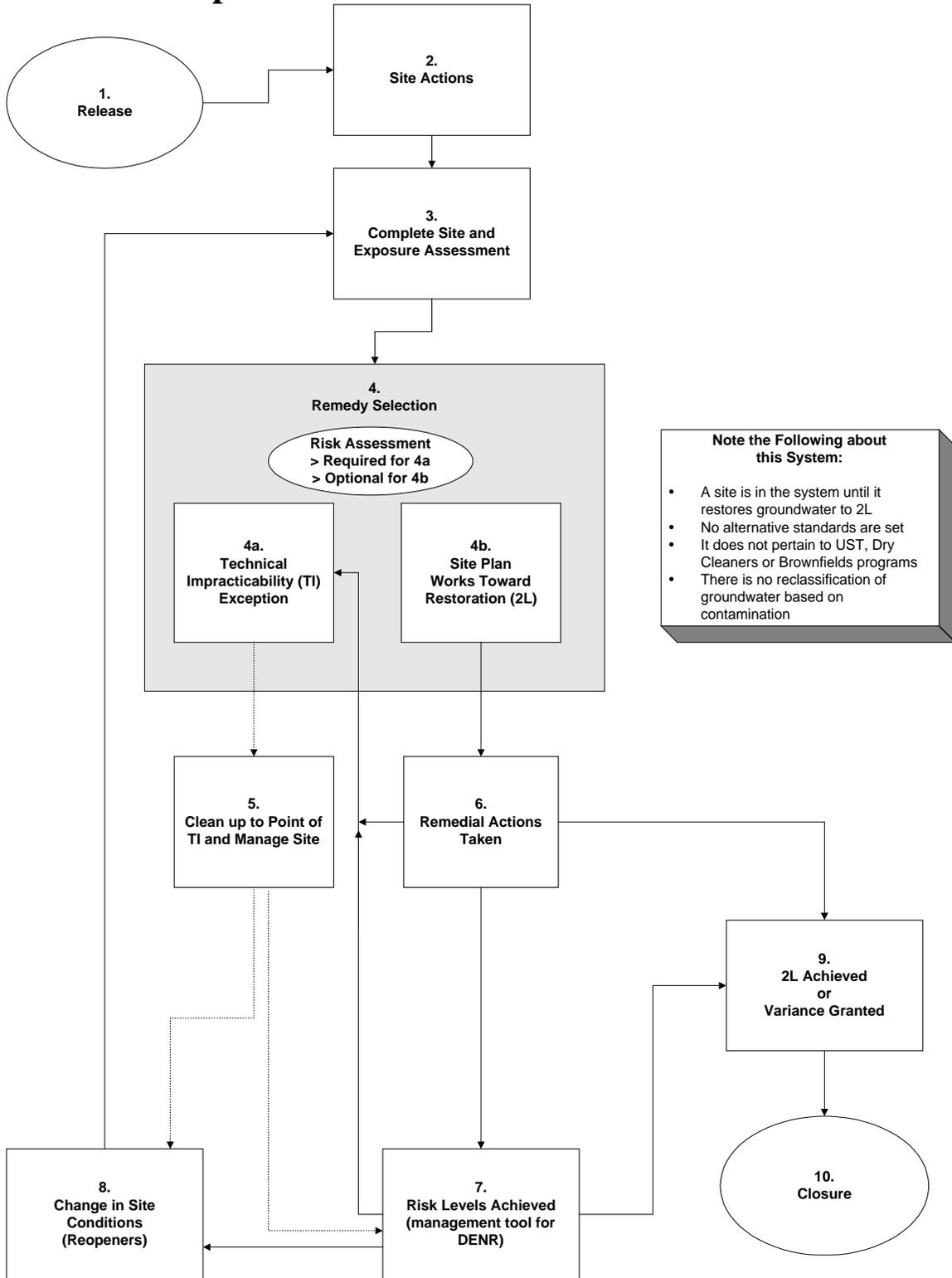
For Cleanup of Contaminated Groundwater and Soil

The State of North Carolina shall protect human health and the environment from harmful effects caused by releases of contaminants to groundwater, soil, and surface water. The best way to achieve this goal is to prevent new contaminant releases into the environment. Prevention of new releases both preserves the environment and avoids costly cleanups of contaminated sites.

If contaminants are released into the soil or groundwater, it is the policy of the State that the sites should be restored to levels protective for all uses. Potable groundwater is one of North Carolina's most valuable natural resources. The continued growth of our State increases demand for clean drinking water, and safeguarding groundwater quality will help to ensure the prosperity and health of our citizens, now and into the future. Thus, the State of North Carolina considers that all groundwater in North Carolina to be potential drinking water.

At the same time, the State of North Carolina recognizes that once groundwater is contaminated, it is at times technically impracticable to clean the groundwater to levels safe for drinking. Similarly, the State of North Carolina recognizes that it is not always practicable to remediate contaminated soils to background levels. Neither the private or public sector should expend additional resources when no additional benefits to public health, soil quality, or groundwater quality would result. When it is not technically practicable to clean up soils or groundwater to levels protective for all uses, the state shall require additional regulatory oversight, institutional controls, and/or engineering controls in order to prevent public exposure and additional environmental damage.

Cleanup Process for Groundwater Contamination



Key to Cleanup Process for Groundwater Contamination

(see previous page)

The following facts should be noted when reviewing the flowchart and key:

- The flowchart pertains only to groundwater, not soil
 - Petroleum UST contaminated sites are excluded from this system
 - No alternative standards are set
 - Groundwater restoration (i.e. meeting 2L) is the primary goal of this system
 - Groundwater is not to be reclassified based on risk
 - Sites that fail to meet 2L may still be eligible for DENR's brownfields program to encourage the appropriate use of partially cleaned up sites.
-

Each number corresponds to a box in the accompanying flowchart.

1. **Release.** Contamination is released into the environment. DENR's highest priority is to prevent the releases of contamination to the environment in the first place, and DENR's efforts to prevent pollution and reduce future releases into the environment are listed in a fact sheet.
2. **Site Actions.** Initial actions are taken to contain the release and mitigate obvious risks, and initial evaluations are conducted.
3. **Complete Site and Exposure Assessment.** The full extent of contamination at the site is assessed in terms of all environmental parameters, including soil type, ground and surface water, receptors, and potential exposure levels. For this flowchart, assume groundwater has been contaminated.
4. **Remedy Selection.** The responsible party uses information gathered in Boxes 1-4 to propose a remedy that both restores groundwater to the 2L standards in the long run and protects public health and the environment by minimizing exposure in the short run.

DENR programs, working with the Responsible Party, approve a site remedy. For the vast majority of sites, remedy selection will be based on Box 4b. In some cases, the exception in Box 4a may apply. For all cases, the appropriate DENR program must approve a cleanup plan. The "**Risk Assessment**" oval represents that a site specific risk assessment or risk levels identified through DENR's Risk Assessment Framework may provide valuable information before a remedy is selected. If a responsible party desires to make a technical impracticability showing, it must determine risk levels. Although risk levels are often valuable for remedy selection of box 4b, the state of the science and DENR experience may allow approval of a remediation plan without risk assessment information. Note that the DENR Risk Assessment Framework is designed to enable responsible parties to determine risk

levels without necessarily making the high investment in a site specific risk assessment. The NCRAF allows a responsible party to focus its monetary resources on actual site cleanup.

For any remedy selection, the following criteria should be considered:

- The effectiveness of the remedy in protecting human health and the environment
- The reliability of the remedial action in achieving the standards
- Any short-term risk to the affected community, those engaged in the remedial action effort, and to the environment posed by the implementation of the remedial action
- Long-term effectiveness
- The acceptability of the remedial action to the affected community
- Ability to meet standards
- The implementability and technical practicability of the remedial action from an engineering perspective

4a. Technical Impracticability Exception. Eligibility for this exception may be considered up front during the initial remedy selection process or it may be considered after a different remedial option has been attempted (see Box 6). The cleanup plan demonstrates, using a DENR guidance document, that it is technically impracticable to clean up the site to 2L standards. Technical impracticability exceptions must be approved by DENR. The responsible party must still clean up to the point of technical practicability. Also, unless 2L is achieved a site stays in the regulatory system. DENR programs will approve or reject TI proposals based on DENR and EPA guidance documents. *[Intention: DENR will not force cleanup beyond a point of where it is not possible to clean up the site, or costs are excessive relative to the benefits which can be achieved. Although a TI site cannot reach closure, the responsible party can focus its resources on site management as opposed to remediation].*

4b. Site Plan Works Towards Restoration (2L). The vast majority of sites should fall into this box. The site cleanup plan must be designed to restore groundwater to the 2L standard. The TI exception is the only avenue (besides a variance – see Box 9) for allowing a partial cleanup of a contaminated site.

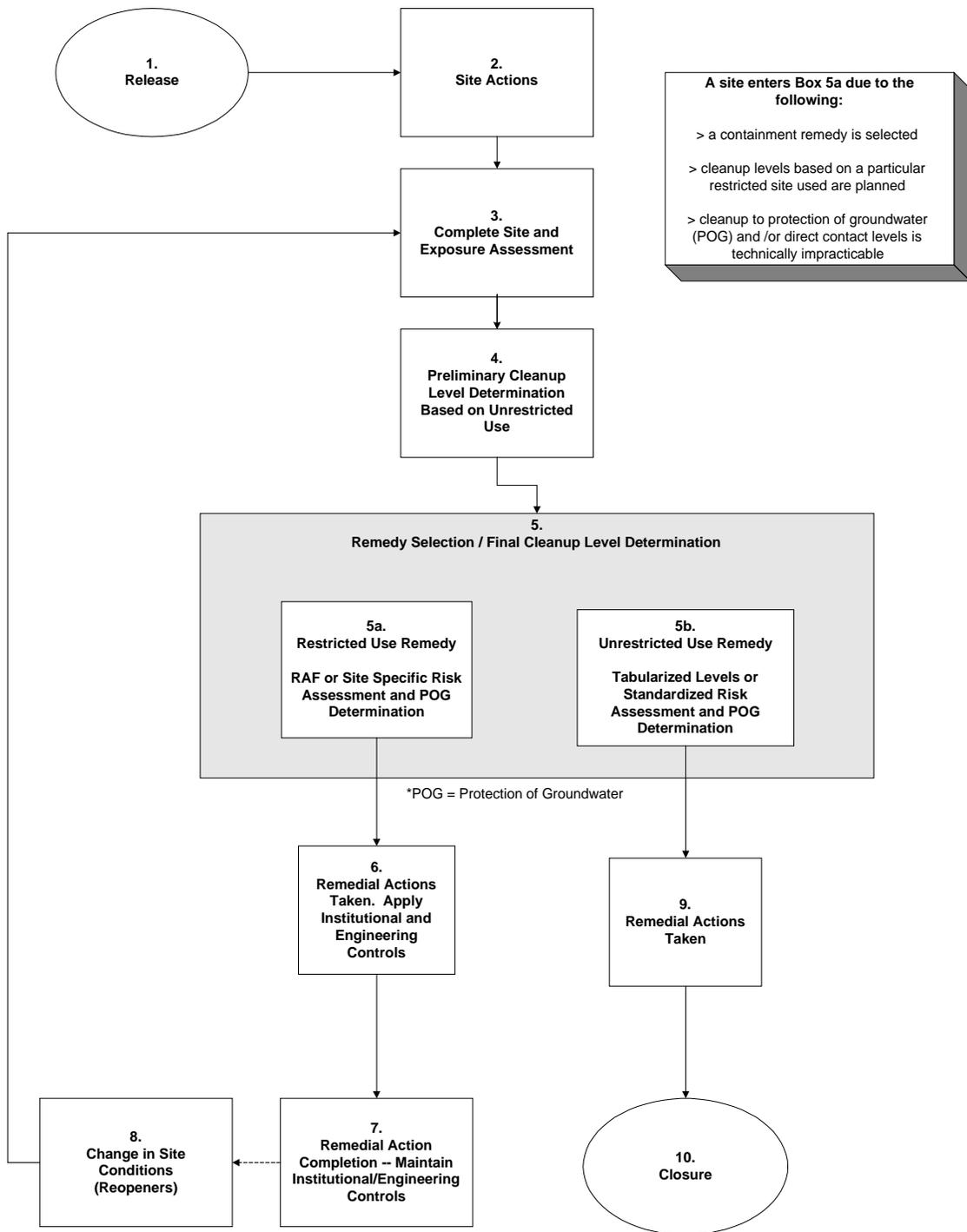
5. Cleanup to Point of TI and Manage Site. The Responsible Party implements the remedial action plan approved in Box 4. The site is cleaned up to the point of technical practicability, and the site is managed to minimize risks to public health and the environment. Institutional controls will typically be required, and engineering controls may be required. The TI exception will need to be reassessed at least annually and it may be reconsidered (reopened) according to Box 8.

6. Remedial Actions Taken. The responsible party implements the cleanup plan approved in Box 5. Sites may stay in this box for the foreseeable future. Immediate

abatement of current exposure is required regardless of any overall remedy to be implemented.

- 7. Non-drinking Water Risk Levels Achieved.** Sites may be moved into this box if risk levels (determined through a site specific assessment or the NCRAF) are approved and met. Box 7 is a management tool for DENR to help allocate its resources. According to program needs, sites at which risk levels have been achieved may be less actively regulated than sites at which non-drinking water risk levels have not been achieved. In other words, sites which have NOT achieved risk levels may have a higher priority in terms of regulatory oversight. The specific cleanup programs determine prioritization and regulatory oversight strategies. If a responsible party has adequately demonstrated that risk levels have been achieved through the reductions of concentrations of the contamination in the groundwater, the Responsible Party may request a letter from DENR that states that risk levels at the site have been achieved. The DENR letter would also state that the site has not yet been restored all the way to 2L standards. Unless a site has been approved for an Exception identified in Box 4a, work on the site must still continue to restore groundwater to 2L, and the site will remain in the regulatory system.
- 8. Change in Site Conditions and other Reopeners.** As long as a site has not achieved 2L, the remedy selection is subject to be “reopened” for consideration due to, for instance, changes in groundwater use, land use, exposure routes, receptors, scientific understanding of a site, development of new technologies, or other parameters. See the section on Reopeners in Appendix I for specific criteria that could trigger reopening of a site. If site conditions change, the responsible party must go back to Box 4 to reevaluate potential exposures and then seek a modification of the remedy in Box 5 accordingly.
- 9. 2L Achieved or Variance Granted.** If 2L is achieved, DENR’s primary goal of groundwater restoration will have been met. A responsible party may also receive a variance from the 2L requirements from the Environmental Management Commission. If such a variance is granted the site could be closed out (see Box 10) even if it has not achieved the 2L thresholds.
- 10. Closure.** Assuming 2L is achieved (or a variance is granted) and that soil issues are resolved, DENR closes the regulatory file, and the site and groundwater are available for all uses, or for uses based on a variance.

Cleanup Process for Soil Contamination



Key to Cleanup Process for Soil Contamination

(see previous page)

The following issues should be noted when reviewing the flowchart and key:

- The flowchart pertains only to soil (including sediment in intermittent streams) and not groundwater.
- Remedy selection and cleanup goals can be affected by the presence of sensitive environments (i.e. an endangered plant species or wetland is present in the contaminated area).
- Two cleanup criteria must be met at every site with soil contamination: (1) a soil concentration determined safe for direct contact exposure and (2) a soil concentration which would not pose a threat to groundwater through leaching of the contaminants from the soil.
- Alternate cleanup levels may be set by using the NCRAF or conducting a risk assessment based on a proposed restricted use of the property. The responsible party must still also meet a soil concentration which protects groundwater from leaching of contaminants from soil. Property use restrictions would also apply where a containment remedy which bars exposure is approved. In such instances, direct exposure cleanup levels would not apply, but protection of groundwater criteria may apply if the containment does not involve complete encapsulation.
- Technical impracticability (TI) demonstrations may be made for soils. As with groundwater, appropriate institutional controls and engineering controls would apply. Since restricted use direct contact cleanup levels are available for soils regardless of whether it is technical practicable to achieve unrestricted use levels, TI will apply mainly in instances when the protection of groundwater criteria cannot be met.
- UST contaminated sites are excluded from this system.

Each number corresponds to a box in the accompanying flowchart.

1. **Release.** Contamination is released into the environment. DENR's highest priority is to prevent the releases of contamination to the environment in the first place. DENR's efforts to prevent pollution and reduce further releases into the environment are listed in a separate Department fact sheet.
2. **Site Actions.** Initial actions are taken to contain the release, mitigate obvious risks, and conduct initial evaluations.
3. **Complete Site and Exposure Assessment.** An assessment is conducted which not only includes determining the nature and extent of the contaminant release, but also the potential for exposure to contaminated soil or waste due to uncontrolled access, the location of public and private wells and surface water intakes for water supply in the immediate area, and the location of other environmental receptors on site.

- 4. Preliminary Cleanup Level Determination Based on Unrestricted Use.** The purpose of this step is to compare the concentrations of contaminants identified during the site assessment to unrestricted use numbers and protection of groundwater criteria to determine if site possibly requires no further action or if contaminant concentrations are sufficiently minor as to be mitigated without property use restrictions.
- 5 Remedy Selection/ Final Cleanup Level Determination.** At this stage possible remedies for contaminated soils are evaluated. A responsible party may evaluate use of property use restrictions as part or all of a remedy.
Note: POG refers to Protection of Groundwater cleanup criteria. This criteria can be met through several means: use of precalculated soil concentration targets based on generic predictive modeling, use of soil concentration targets derived from site-specific predictive modeling, use of laboratory predictive models which simulate leachate concentrations, or use of soil concentration targets based on soil/water partition coefficients derived from site soil and groundwater samples. Extensive time passed since the time of the release coupled with a demonstration that groundwater is free of contaminants and that unrestricted use direct contact numbers have been achieved can also be a means of demonstrating that POG criteria have been met.
- 5a. Restricted Use Remedy.** A restricted use remedy would apply where:
- a containment remedy is selected;
 - the site will be used for limited purposes (industrial only, park only, etc.) and alternate direct contact cleanup levels are being sought; or
 - unrestricted use cleanup levels or protection of groundwater levels are technically impracticable to meet.
- In all three cases, institutional controls (ICs) will be necessary. Engineering controls may also be necessary. The ICs must be designed to prevent access to contained waste or contaminated soils, to limit the site for a particular use, and/or to support the maintenance of the necessary engineering controls.
- 5b. Unrestricted Use Remedy.** Site cleanup proceeds to unrestricted use direct contact cleanup levels and to POG criteria.
- 6. Remedial Actions Taken. Apply Institutional and Engineering Controls.** Implementation of a remedy involving site use restrictions requires the use of ICs (institutional controls) and possibly ECs (engineering controls). At a minimum, site ICs must include restrictive covenants which will be recorded at the local register(s) of deed office(s).
- 7. Remedial Action Completion - Maintain ICs and ECs.** ICs have been put into effect, ECs have been installed, and any planned active remediation has been conducted. Maintenance of the ECs, inspection of site use and IC recorded instruments, and submittal of certified reports of such continues in accordance with the approved plan.

8. **Change in Site Conditions (Reopeners).** For sites implementing remedies under box 5a., any changes in site use, exposure routes, receptors, or the discovery of new information or that information previously provided was false or incomplete will cause a reopening of the site for evaluation and revocation of remedial action approval.
9. **Remedial Actions Taken.** Remedy which will achieve unrestricted use direct contact levels and POG criteria is implemented.
10. **Closure.** Assuming all other media have completed remedial action, DENR closes the regulatory file, and soil and groundwater have no DENR-required restrictions.

Technical Impracticability Policy

I. Introduction

As stated in the DENR Remediation Policy, the State of North Carolina considers that all groundwater in North Carolina to be potential drinking water. In areas where the ground water has been contaminated the treatment goal is to remediate the ground water to the background concentrations or the State's ground water quality standard for each constituent of concern.

DENR recognizes that it is not always technically practicable to completely remediate a site. Sites with dense non-aqueous phase liquids in fractured bedrock and 100+ acre solid waste landfills are examples that may fall into this category. In instances where it is technically impracticable to remediate the site, institutional, and possibly engineering, controls will be required to protect human and environmental receptors. This guidance has been prepared to assist in the preparation of a technical impracticability application. The types of information that the State will consider in determining if it is technically practicable to remediate a site are set forth below.

II. Definition of Technical Impracticability (TI)

Technical impracticability is the inability to remove or remediate to the applicable standard without expenditures grossly disproportionate to the benefit.

Note: It is important to be aware that a technical impracticability (TI) application may be approved for some, but not all, of the contaminants that are present at a site. For example, a non-volatile contaminant which occurs in a large volume of soil may be determined to be technically impracticable to remove, while a volatile contaminant in the same soil may be readily removable by vapor extraction.

Similarly, a TI request may be granted for only part of a site. For example, a contaminant may be easily removed from the soil on most of a site by excavation and treatment. However, some of the soil contamination may exist under buildings or other structures that would be so costly to remove that the benefit to the environment would not justify the expense. In addition, a TI request may, in some cases, be granted for one contaminated medium or aquifer at a site but not for others. For instance, a TI request may be granted for the remediation of contaminated groundwater in a deeper, fractured bedrock aquifer while cleanup of the unconfined aquifer would still be required.

III. Components of a Technical Impracticability Application

A TI determination may be made when it is not practicable to remove or remediate contamination to the applicable standard without expenditures grossly disproportionate to the benefit. A complete remedial investigation and feasibility study must be completed before a TI proposal is made. Each of the items below must be addressed in a TI application.

A. Identification of Contaminants

The following information must be provided:

- Description of the contaminants released
- Estimate of the volume and concentration of the release(s)
- The time the release(s) occurred
- A description of how the contaminant(s) is/are projected to move in the environment
- Any by-products that may be formed as a result of degradation or reaction with the environment
- The effect of other identified contamination from other sources in the plume on its predicted path

B. Source Identification

A description of the source(s) must be included in a TI application. The procedures used to identify the source(s) must also be provided. An example of a source identification procedure is continuously sampled borings advanced in areas where DNAPL is suspected to be present.

In the case of a site with a large contaminated area, such as a municipal solid waste landfill, source identification must include a determination of the waste boundary and the area covered by the waste. Types of waste, to the extent known, must also be specified.

C. Source Removal or Remediation

Approval of a TI application is contingent on the sources being removed or controlled in a manner that protects human and environmental receptors. Source removal could include excavation of contaminated media and removal to an offsite location licensed and/or permitted to accept the waste. Remediation of the source could include treatment of the contaminants to a level that would allow unrestricted use of the property.

D. Site Characterization

Site characterization includes the development of a site conceptual model. In the case of a site with ground water contamination, site characterization includes aquifer characterization and definition of the plume boundary. These elements are discussed below:

1. Site Conceptual Model

The site conceptual model includes: a description of the source(s) (see Section III. A & B above); a description of the location of the source(s); contaminant migration pathways; underlying soil/rock type(s); and in the case of sites with ground water contamination, the hydrogeology. The site conceptual model should be presented in narrative form and may be accompanied by a flowchart, diagram, cross sections, maps, etcetera.

It is anticipated that the site conceptual model will continue to be developed and refined until the site assessment has been completed. The site conceptual model will be a useful tool in identifying what is known about the site as well as where additional data may be needed. The data gathered during the assessment will also be used in the evaluation of remedial alternatives.

2. Aquifer Characterization

For sites with ground water contamination, the conceptual model must include a description of the hydrogeology of the affected aquifer(s). Characterization of the aquifer(s) must include: ground water flow direction and rate; porosity; hydraulic conductivity; hydraulic gradient; seasonal variations in ground water flow and depth to the water table; and tidal influences (if applicable). Also included in the aquifer characterization is a description of the soil and/or rock type(s), the orientation of any preferential flowpaths, and other lithologic features that may influence ground water movement or contaminant transport.

3. Plume Characterization

For sites with ground water contamination, the TI application must include a description of the plume geometry, including the plume boundary and the distribution of contaminant concentrations. The plume description should also describe how the contaminants move within the aquifer(s), the interaction between the contaminants and the aquifer matrix/matrices, and any by-products that may be formed by contaminant degradation.

IV. Methods of Supporting a Technical Impracticability Application

To demonstrate that it is technically impracticable to remove contamination or remediate it to the applicable standard a number of methods may be used. Methods of supporting are as follows:

A. Full Scale Field Demonstration

Installing and operating a remediation system at the site is the most effective way of determining if a particular technology is practicable for a site. Operation of a remediation system will provide direct evidence regarding the effectiveness of the system and allow for fine-tuning of the system.

B. Pilot Study

Pilot studies are one method of evaluating whether a remediation technology will work. This can be a cost effective way of evaluating a technology without going to the expense of installing and operating a remediation system that addresses the entire site. A pilot study commonly involves a field application of a remediation technology on a small portion of the site.

C. Predictive Analyses/Modeling

Predictive analyses and computer modeling can be effective tools in evaluating the potential for contaminant migration and remediation to occur at a site. As with all predictive analyses or modeling, the results are only as reliable as the data used to perform the analyses. Therefore, the more weight one places on a model to support a TI application, the more site-specific data one must use to construct the model and the more sophisticated and conservative the model must be. Modeling alone will not be sufficient to support a TI application.

D. Literature Review/Case Studies

Research papers and case studies may also be used to support a TI application. If case studies are used to support the TI application, then the proponent must demonstrate that the hydrogeological and environmental conditions of the sites in the literature closely match the specific conditions of the site being evaluated. For example, a case study from a site in the piedmont of South Carolina may be applicable to a site in the piedmont of North Carolina with the same waste stream and waste disposal practices. In contrast, a case study from a site with the same waste stream and waste disposal practices located in the desert of southern California may not be applicable. The environment at the site in California would

be significantly different. Specifically, the rainfall would be greater at the North Carolina site, the depth to ground water would most likely be different, and the soil type and amount of organic matter in the soil would probably be different.

In the event that a research study is used to support a TI application, the proponent must ascertain whether conditions at the site that allowed the remedial technology to be effective, or ineffective, are similar to those at the site being evaluated. In most cases, a literature review alone will not be sufficient to support a TI application.

V. Content of a Technical Impracticability Application

The exact content of a TI application will vary from site to site. The applicant must "build a case" to support the TI application using appropriate evidence. Obviously, direct evidence that a technology is not practicable is the most convincing. The Agency also realizes that it is not always necessary to implement a technology to prove that it will not remediate the site. The specific types of information to include in a TI application will depend upon the types of contaminants, extent of contamination, the environmental conditions at the site, and the methods used to support the application. In evaluating the applications, the agency should err on the side of environmental and public health protection.

The TI application must include a description of each applicable remedial option that has the potential to reduce the risk posed by the site and explain why it did not work or why it was or would be technically impracticable. For each remedial option considered, a predictive analysis must be performed as to the time it would take to realize a significant reduction in risk or reach the remediation goal.

Note: Although it may be technically possible to clean up a site using demonstrated technologies, the effort and expense may not be warranted considering the relative potential benefit. A responsible party may apply for a TI determination by developing and submitting verifiable documentation that demonstrates that the incremental cost to clean up contamination versus the cost of partial cleanup and controlled closure is grossly disproportionate to the incremental benefit that would be derived from a cleanup to applicable standards. This documentation must be developed in accordance with generally accepted accounting, engineering, and geologic principles, practices, and methods.

VI. Criteria for Evaluating Technical Impracticability

TI can only be demonstrated if it is not practicable to remove or remediate contamination to the applicable standard without expenditures grossly disproportionate to the benefit. The potential for future use of groundwater as drinking water as determined through local water supply plans and other information sources should be considered before approval of a TI application.

Technical impracticability will have to be evaluated on a site by site basis; DENR is unable to develop a specific formula or rating system to determine technical impracticability. As DENR gains more experience in evaluating technical impracticability and IC applications, more detailed criteria and other guidance may be developed. Some of the criteria that may be considered during this analysis are listed below.

- Areas of groundwater contamination that persist or recur after the source has been removed to the maximum extent practicable, the best available technologies have been used, and it can be demonstrated that further remediation will not result in a significant reduction in contaminant concentrations.
- Areas of soil contamination located beneath permanent structures that cannot be remediated without undermining the integrity of the structure or that would be so costly to remediate that the benefit to the environment would not justify the expense. Note in some cases removal of a building may be warranted.
- Areas of soil contamination located at such depths or such locations that it cannot be removed using most reasonably available excavation equipment and which cannot be remediated using any other standard technologies.
- Areas of groundwater contamination located in fractured bedrock or other complex geologic terrain where it is difficult (and costly) to determine the extent of the contamination and to recover/control it effectively.
- Areas of groundwater contamination caused by expansive landfills where removal of the entire contents of the landfill would (1) cause undo environmental risks or (2) be so costly that the benefit to the environment would not justify the expense. Note for some landfills (even large landfills) the environmental and public health benefits of remediation may outweigh the expense.

If contamination migrates off parcel, a TI waiver can only be granted if the RP can get off-parcel owners to agree to appropriate land use restrictions.⁵

⁵ Even if a technical impracticability argument can be made, DENR would not sanction leaving contamination if a property owner does not consent. The RP may likely need to compensate a landowner to reach such consent. This issue of off-parcel contamination is being considered by DENR, and a policy to clarify DENR's position may be developed at a future time.

References: Detailed guidance in developing the site conceptual model, characterizing the aquifer, and defining the contaminant plume is available from many sources. These sources include the US Environmental Protection Agency, the National Ground Water Association, and numerous other organizations. Examples of publications include: EPA's Interim Final "Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration"; EPA's RCRA Ground-Water Monitoring Technical Enforcement Guidance Document; EPA's Seminar Publication "Transport and Fate of Contaminants in the Subsurface"; EPA's Seminar on Site Characterization for Subsurface Remediations; Draft "North Carolina Risk Analysis Framework"; EPA's "Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites; Groundwater Section Guidelines for the Investigation and Remediation of Soil and Groundwater; Alternatives for Ground Water Cleanup, Journal of Policy Analysis and Management, and Ground Water Contamination, Groundwater Use and Value Determination Guidance, and The Role of Cost in the Superfund Remedy Selection Process.

DENR Land Use Restrictions Guidance

A. Approval Process for Use of Land Use Restrictions in the Remedy

Pursuant to N.C.G.S.143B-279.9, land use restrictions approved by DENR are required in conjunction with any remediation of a contaminated site that will not meet current standards, as defined in N.C.G.S. 130A-310.31.

Approved land use restrictions must be recorded and indexed to the property deed in the grantor index in the appropriate Register of Deeds office(s). A “Notice of Contaminated Site” must also be prepared and recorded in accordance with N.C.G.S. 143B-279.10 for sites where land use restrictions are to be used in place of any portion of remediation to applicable standards.

A remediating party proposing use of land use restrictions must follow the steps below:

1. As part of its proposed Remedial Action Plan (RAP) the remediating party submits a land use restriction proposal to the DENR cleanup program containing:
 - a. A proposal as to what activities and uses should be restricted at the site. Examples of possibly precluded activities are:
 - (i) Construction of buildings and other man-made structures.
 - (ii) Excavating, dredging or otherwise removing soils and sediments at all, or below specified depths.
 - (iii) Planting or removal of vegetation including edible varieties, trees and shrubs.
 - (iv) Limitations on site use (e.g., preclusion of all uses other than industrial/commercial).
 - (v) Limitations on the use of groundwater at all, or at least of
 - b. The deed book and page numbers for the property(ies) where the restrictions will apply if approved.
 - c. The plat book and page numbers for any “Notice of Contaminated Site,” or other plat reflecting contamination on the property(ies), that is already recorded in relation to the property(ies).

- d. A summary of the proposed remedy, including any proposed active remediation and engineering controls to be applied in conjunction with the proposed land use restrictions.
 - e. Proposed alternate use re. The remediating party may contact DENR for standard industrial/commercial remediation goals. If, however, a site-specific exposure scenario and remediation goals are being proposed, supporting risk and exposure assessment calculations must be provided.
 - f. Written consent by the owner(s) of the property(ies) to the imposition of land use restrictions, using the form provided in section 2 below.
 - g. A proposed inspection plan for the site to verify the recorded land use restrictions instruments are still in place and activities at the site are in compliance with these restrictions. The owner or remediating party shall conduct an inspection of the site no less than annually and submit a signed and notarized statement that the land use restrictions are still in effect and that conditions at the site are not in violation of the land use restrictions. DENR may later supply a form for such purposes. Owners, operators and other responsible parties are required under N.C.G.S. 143B-279.9 to enforce the land use restrictions and are expected to notify DENR and take action immediately upon discovery of a violation of the land use restrictions. Failure to do so is grounds for revocation of DENR approval of the RAP. mediation goals. The responsible party is also expected to perform a receptor survey.
2. DENR approves the proposal as to what activities and uses should be restricted, rejects it or communicates with the remediating party regarding changes. If agreement is reached on the proposal, DENR transmits to the remediating party the land use restriction document as it is to be recorded. If the document is acceptable to the remediating party, that party shall, within the time period specified by DENR, proceed with public notice of the RAP (including the land use restrictions document) in accordance with the requirements of the relevant DENR program. After DENR issues written approval of the RAP, the remediating party shall record the land use restrictions document within the time period specified by DENR. DENR will not issue approval until the relevant public notice period has ended and all DENR and public concerns have been addressed to DENR's satisfaction.
 3. The remediating party submits to DENR for approval a draft "Notice of Contaminated Site" (Notice) if such a Notice has not already been recorded for the site. The Notice takes the form of a site survey plat prepared in accordance with N.C.G.S. 143B-279.10 and any applicable guidance issued by the relevant

DENR program. The remediating party may prepare and submit the Notice plat to DENR during the remedial action public notice period.

4. Once the public notice period concludes, if DENR gives written approval to proceed, the remediating party must, within the time period specified by DENR, deliver its land use restrictions document to the appropriate Register of Deeds office(s) for recordation and indexing in the grantor index under the names of the owners of all affected property. DENR will not issue approval to proceed with recordation of the land use restrictions until DENR has received a draft Notice that DENR concludes is complete (with the exception of the recorded land use restrictions book and page number references, as such book and page numbers will not be assigned until recordation of the restrictions occurs).
5. The remediating party submits to DENR a copy of the land use restrictions document, certified by the appropriate Register(s) of Deeds as having been recorded, a copy of the relevant grantor index page(s), and the finalized copy of the “Notice of Contaminated Site” ready for recordation. The numbers of the book and page(s) where the land use restrictions document is recorded must be referenced on the Notice.
6. Once the Notice is approved by DENR, the remediating party must, within the time period specified by DENR, deliver the Notice to the Register of Deeds office in the county(ies) where the property(ies) is(are) located for recordation. The Register(s) of Deeds must record the Notice and index it in the grantor index under the name(s) of the owner(s) of all affected property.
7. The remediating party must, within the time period specified by DENR, submit to DENR a copy of the Notice, certified by the appropriate Register of Deeds as having been recorded, along with a copy of the relevant grantor index page(s).

Note: Failure of the remediating party to comply with deadlines issued by DENR for submittal of the above-referenced documents is grounds for revocation of DENR approval of the RAP.

B. Land Use Restrictions Consent Form

The following is the form required to be submitted (see 1.f above) indicating provisional consent of the site’s owner to the imposition of land use restrictions, subject to later withdrawal when the owner reviews the land use restrictions document.

VOLUNTARY CONSENT TO IMPOSITION OF LAND USE RESTRICTIONS

_____ Contaminated Site, _____ County, North Carolina

I, _____, owner in fee simple of real property located at _____ [street address] _____, _____ [town or city], _____ County, North Carolina which includes the _____ contaminated site (the "Site"), am agreeable to the imposition of Land Use Restrictions ("Restrictions") partially or completely in lieu of actual remediation of hazardous substances at the Site. I understand that I will be required to document any agreement to the actual Restrictions approved for the Site by the North Carolina Department of Environment and Natural Resources, and that I may refuse to consent upon review of the actual Restrictions.

IN WITNESS WHEREOF, _____ has caused these presents to be executed in its name by _____ [name of atty. or other agent if the is one], its _____ [title], this day of _____, _____.

_____ [name of owner if agent is signing]

By: _____ [signature of atty. or other agent if there is one]

Signatory's name typed or printed:

**STATE OF NORTH CAROLINA
COUNTY OF**

I, _____, a Notary Public, do hereby certify that personally appeared before me this day and acknowledged that he/she is the _____ [title] of _____ [owner] and that by authority duly given, and as the act of _____ [owner], the foregoing instrument was signed in its name by such _____ [title].

WITNESS my hand and official seal this _____ day of _____, _____.

Notary Public

My commission expires _____.

C. Cancellation of Land Use Restrictions

At a subsequent date, should the owner believe that all hazards have been removed and that hazardous substances are no longer present at the site above unrestricted use remediation goals, the owner may request DENR approval to cancel the land use restrictions. Canceling land use restrictions other than through the process set forth in N.C.G.S. 143B-279.10(f) will cause automatic revocation of approval of the RAP and will subject the party taking such action to enforcement

Generic Provisions for Reopening Partial Cleanups

Following approval of a Remedial Action Plan (RAP) providing for partial cleanup of a particular site, DENR may require one or more responsible parties to implement additional remedial measures under any of the following circumstances:

(1) The responsible parties fail to timely record, or violate, a land use restriction that is part of the approved RAP.

(2) A responsible party knowingly or recklessly provided false information that formed a basis for DENR's approval of the RAP, provides false information to demonstrate compliance with the RAP, or failed or fails to disclose relevant information about contamination at the site.

(3) New information indicates the existence of previously unreported contaminants or an area of previously unreported contamination on or associated with the site that has not been remediated to applicable standards.

(4) The level of risk to public health or the environment from contaminants is unacceptable at or in the vicinity of the site due to changes in exposure conditions, including (i) a change in land use that increases the probability of exposure to contaminants at or in the vicinity of the site, or (ii) the failure of any active remediation required to achieve objectives included in the RAP.

(5) DENR obtains information about a contaminant associated with the site or exposures at or around the site that indicates increased risk to public health or the environment associated with the site beyond an acceptable range and in a manner or to a degree not anticipated in the RAP.

(6) New technology can practicably remediate contaminants at the site to applicable standards.

Remediation Advisory Committee

Purpose

The DENR Remediation Advisory Committee (RAC) has three main functions. The first is to act as a resource for project managers throughout the Department who are charged with the oversight of environmental assessment/cleanup projects and implementing institutional controls (ICs). The second is to help achieve consistency across DENR regulatory programs in the review of Technical Impracticability applications and implementation of institutional controls. Third, the RAC will provide a forum for programs to share information and provide a forum for ongoing evaluation and continual improvement. The RAC is not an appeals committee and it cannot overrule a programmatic decision.

Activities

The RAC will perform its function by providing written guidance, training, and technical assistance to project managers within DENR. The initial guidance will, most likely, be general in nature. As the RAC and project managers gain more experience in evaluating technical impracticability and IC applications, more detailed guidance will be developed.

During the initial startup of the RAC, project managers from each of the DENR cleanup programs will present to the RAC sites for which the responsible party has requested a TI. Once a small number of such presentation are complete, the RAC and the project manager will discuss the evidence used to support the TI application and any proposed ICs. Through these discussions the RAC and program representatives will gain a better understanding of what should reasonably be submitted to support a technical impracticability application. This experience will also allow program representatives to bring first-hand experience back to his/her program. Once the RAC has gained some experience and developed more detailed policies and guidance, the RAC will act primarily as an advisory committee. Also, the Advisory Committee can make recommendation to update remediation guidance documents.

After the initial startup period, the RAC will meet on a regularly scheduled basis to assist project managers in their review of TI and IC applications on specific projects, update guidance as needed, provide consistent guidance to programs, and take care of other issues that may arise.

Membership

The Advisory Committee would work under the authority of the Assistant Secretary for Environmental Protection. The membership of the committee will include the following: senior technical staff from each of the DENR cleanup programs; the project manager of the site being evaluated; and, where an IC is being considered, a representative from the Attorney General's office. The senior technical staff will have experience in the assessment and remediation of contaminated sites. The terms of the RAC members will be staggered such that there will be only one "new" member (with less than 6 months of committee experience) at any time. Based upon the current structure of DENR, the makeup of the RAC will include one representative from each of the following programs: Ground Water Section, Hazardous Waste, Inactive Hazardous Sites, Federal Remediation, Special Remediation, UST, and Solid Waste. Each term will last two years.

Appendix 2. Background Information

Public Comments on Draft DENR Risk Assessment Framework	46
Public Participation Table	49
DENR Organizational Chart (not available in electronic version)	51
Water Supply and Contamination Incident Maps (not available in electronic version)	52

Public Comments on Draft DENR Risk Assessment Framework

August 6, 1997

MEMORANDUM

TO: Linda Rimer, Assistant Secretary for Environmental Protection
Richard Whisnant, General Counsel

FROM: Ruth Strauss, Chairman
Risk-Based Protocol Working Group

SUBJECT: Policy Issues Arising from Public Comment on the draft NC Risk Analysis Framework

I have listed below the policy issues that were raised in the public comments received on the draft North Carolina Risk Analysis Framework (the "RAF"). Some of the issues pertain to risk-based decision-making in general and some are specific to the RAF. The text in italics represents some of the Working Group's thoughts on these issues. Please review the issues and let me know if you have any questions or comments.

(1) PUBLIC PARTICIPATION

A. Public Participation in Cleanup Decisions

Reviewers have indicated that in the draft Risk Analysis Framework there is no mention of community involvement in the decision-making process for cleanup of contaminated sites. It appears that the decision-making process is left up to the responsible party and the regulator. There needs to be a means for those who may be most affected (those living near the contamination) to participate.

This is the perception of many community activists; however, you should be aware that the programs already have requirements (see attached table) for providing notification to a community and allowing for the consideration of public comment prior to approving or initiating certain corrective actions. The policy group will need to consider what is already being done by the programs and whether additional requirements are needed. For consideration of additional requirements, the policy group must take into account the number and type of contamination incidents and the costs and time involved to increase the level of public participation.

B. Outside Stakeholder Participation in Forward Development of RAF

Reviewers have indicated that a work group composed of selected internal and external technical persons involved in risk assessment and risk management should be formed to fine tune the RAF prior to finalization.

(2) GROUNDWATER PROTECTION

There appear to be two parts to this issue. First, risk-based decision-making will allow groundwater in certain areas of the state to be “written off” forever. It is not possible to accurately predict whether it will be necessary to use this groundwater 30 or more years into the future. Therefore, we shouldn’t take the risk of leaving uncontrolled contaminated groundwater behind now when it will be more difficult and costly to cleanup in the future if needed.

Second, reviewers have indicated that there is an inequity issue here. It is the right of the citizens of North Carolina to have clean air, water and land. It is unfair that polluters do not have to clean up to pre-existing conditions. Polluters are infringing upon the rights of the citizens of the state.

(3) POLLUTION PREVENTION

Because the RAF allows responsible parties to cleanup to alternate less conservative levels, there will be less incentive for industry not to pollute. The state should be encouraging environmental awareness and compliance among industries, not “letting them off the hook.”

(4) ACCEPTABLE TARGET RISK

The RAF bases its target concentration for each carcinogenic chemical on a 10^{-6} excess cancer risk (the probability that one person out of one million exposed persons may develop cancer). The use of 10^{-6} is overly conservative. Initially, this risk factor was part of the Delaney Amendment of the Food, Drug and Cosmetic act, as amended and was intended to limit exposure to carcinogens in the food supply. In 1970, the Delaney Amendment was brought under the jurisdiction of the USEPA with the transfer of the pesticide regulations (FIFRA) from USFDA. Application of a 10^{-6} risk management standard to environmental chemicals other than pesticides in food was a policy decision that may no longer be appropriate given the progress that has been made over the past 20 years in understanding cancer and risk.

Certain assumptions are used to estimate cancer risk. Each assumption by itself is very conservative. When all of the assumptions are considered together, the over estimate of the cancer risk could be 15 to over 10,000 fold. Therefore, a higher risk level of 10^{-5} or 10^{-4} can be used without jeopardizing protection of human health.

EPA recommends the use of 10^{-6} as a target risk for each carcinogen. However, under certain circumstances (e.g., technical impracticability), EPA may permit cleanup to a cancer risk as high as 10^{-4} . Currently all DEHNR programs that deal with cleanup

of contaminated soil and groundwater use 10^{-6} for each individual carcinogen and a range of 10^{-4} to 10^{-6} for multiple chemical exposures.

(5) MAINTAINING THE SCIENTIFIC BASIS OF THE RAF

Reviewers have expressed concern regarding DEHNR's plans for keeping abreast of emerging findings in human health risk assessment and for updating and revising the RAF including the target concentrations (Method I tables) based on these findings.

The RBPWG has recommended establishing an "Evergreen Committee" of technical persons from the programs to be responsible for reviewing recent toxicological data and updating the target concentrations on an annual (?) basis. The Evergreen Committee would also be responsible for keeping abreast of new findings, models and other significant changes related to human health and ecological risk assessment as well as for incorporating any changes to the RAF based on what is found from implementing it. There needs to be an ongoing commitment from the Department for resources to accomplish this.

(6) LAND USE

A. Depth of Soil Cleanup

The RAF specifies that for residential and industrial/commercial exposures, the soil cleanup goals must be met throughout the entire soil column (from land surface to the depth of a water table). This approach is overly conservative since deeper soils (greater than two feet below land surface) would not be available for routine direct contact exposure unless invasive activities were performed. Even if construction activities were undertaken, risk-based levels protective of construction workers would be much less stringent than those for residential or industrial/commercial direct contact exposures. Therefore, residential or industrial/commercial soil cleanup levels should only be applicable to the uppermost two feet of soil.

B. Land Use Restrictions

The RAF specifies that for sites where soil and groundwater contamination are not cleaned up to the most stringent standards, land use restrictions may be required. What types of restrictions are needed and to what situations should they be applied?

Issues A and B will be somewhat program-specific. However, it would be helpful for consistency across programs as well as for increasing the comfort level of regulators and outside stakeholders with regard to using the RAF or risk-based decision-making and lessening the regulated community's distrust of the use of agency discretion, if the policy group formulates some general guidelines.

C. Engineering Controls

The RAF should allow for the use of engineering controls such as constructing a cap on top of contaminated soil to eliminate a potential exposure pathway.

Due to lack of assurances that engineering controls will be sufficient to limit exposure and will be adequately maintained and monitored over time, the programs do not allow for this option as a permanent remedy at an unpermitted site.

Public Participation
Summary of Requirements for Site Cleanup
Table A

PROGRAM ELEMENTS	Groundwater Section (DWQ)	Hazardous Waste Section, RCRA Facilities (DWM)	Solid Waste Section (DWM)
LAW & RULE	Title 15A NCAC 2L under: 1. 2L.0106(k), (l) & (m) ("Alternative" CAPs) 2. 2L.0113 (Variances)	40 CFR 124 40 CFR 270.42	Title 15A NCAC 13A under .1635(d) (Assessment of Corrective Measures)
REQUIRED ELEMENTS	1. "Alternative" CAPs: Direct notification to potentially effected parties and local officials. Community notice via newspaper publication. 2. Variances: Public notice and public hearing, followed by 30-day comment period. Public notice includes newspaper publication and direct mailing.	Public notice via newspaper publication and direct mailing to contact list for site, sometimes followed by a public meeting but always followed by a public hearing prior to final remedy selection.	Public notice via newspaper publication and public meetings prior to selecting corrective action remedy for municipal landfills in operation after October 9, 1993.
OPTIONAL ELEMENTS			The Department may, at its discretion, give public notice and hold public meetings on proposed remedial actions at municipal landfills closed prior to October 9, 1993.

**Public Participation
Summary of Requirement for Site Cleanup
Table B**

PROGRAM ELEMENTS	Inactive Hazardous Sites Branch, Superfund Section (DWM)	Underground Storage Tank Section (DWM)	Federal Superfund Sites & Federal Facilities (DWM)
LAW & RULE	NCGS 130A-310	1. 40 CFR 280.67, adopted by reference in Title 15A NCAC 2N.0708 2. Title 15A NCAC 2L.0115(Risk-Based Rules)	The Comprehensive Response and Liability Act of 1980 as amended by The Superfund Amendments and Reauthorization Act of 1986 section
REQUIRED ELEMENTS	1. For voluntary remedial actions, written notices of draft Orders of Consent and proposed Remedial Action Plans (RAPs) are mailed to interested parties on the site contact list. 2. For state-funded or enforcement RAPs, notice is done via newspaper and mail to the contact list. RAP copies are sent to the health director, register of deeds, and libraries. .	1. Public notice (by newspaper publication) of all Corrective Action Plans and a 30-day comment period prior to approval. 2. Written notice provided directly to potentially effected parties for risk-based cleanup plans. The same parties are notified of No Further Action letter.	Public notice (newspaper publication at minimum) under Section 117 for proposed Remedial Action Plans. Public notice (newspaper publication at minimum) for approval of Final Remedial Action Plans.
OPTIONAL ELEMENTS	1. A public meeting or hearing may be held at the Department's discretion prior to approving a Remedial Action Plan. 2. The Department may use public meetings or other methods to involve the public in state-lead or enforcement remedial actions.	1. A public meeting may be held regarding a corrective action plan if there is sufficient public interest. 2. A public meeting may be held regarding a proposed risk-based cleanup if there is sufficient public interest.	Public meetings may be held at the Department's discretion if there is sufficient public interest. At some federal sites, advisory boards comprised of stakeholders participate in the decision making process.