# RECORD OF DECISION FOR THE WAYNE INTERIM STORAGE SITE

## WAYNE, NEW JERSEY

**APRIL 27, 2000**

U.S. Army Corps of Engineers
New York District Office
Formerly Utilized Sites Remedial Action Program

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*prepared by:*

U.S. Army Corps of Engineers, New York District Office, Formerly Utilized Sites Remedial Action Program

# I. DECLARATION

## Site Name and Location

W.R. Grace and Co., Inc./Wayne Interim Storage Site (WISS)
Wayne, New Jersey

## Statement of Basis and Purpose

This decision document presents the selected remedial action for the Wayne Interim Storage Site, in Wayne, New Jersey, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and the National Contingency Plan (NCP). This decision is based on information contained in the Administrative Record for this site and was made by the U.S. Army Corps of Engineers (USACE), with the concurrence of the U.S. Environmental Protection Agency (EPA), and in consultation with the New Jersey Department of Environmental Protection (NJDEP).

## Assessment of the Site

Actual or threatened releases of contaminants from this site, if not addressed by implementing the remedial action selected in the Record of Decision (ROD), may present a current or potential threat to public health, welfare, or the environment.

## Description of the Selected Remedial Action

The Wayne site consists of the 6.5-acre Wayne Interim Storage Site and several vicinity properties. WISS is located at the former W.R. Grace and Company thorium processing facility in Wayne, New Jersey, which is now owned by the Federal government.

Vicinity properties, privately owned properties in the vicinity of WISS, were also contaminated as a result of rare earth and thorium processing operations at the W.R. Grace facility. These vicinity properties have been cleaned up by prior actions. In addition, portions of the contaminated materials at WISS have been addressed under a CERCLA removal action and documented in the Engineering Evaluation/Cost Analysis (EE/CA) dated March 1998. Contaminated media present at the site include soil, rare earth/thorium processing waste, bulk wastes, and contaminated portions of a building on WISS. Burial pits present at the site contain thorium and rare earth processing wastes and building debris. Groundwater present within the burial pits is contaminated.

The remedy presented in this document addresses the radioactively and chemically contaminated wastes that have been disposed of at WISS. These wastes are buried, and a generally distinct clay

layer separates the wastes from the lower aquifer and forms the bottom or base of the radioactive waste burial pits. However, in some areas, the burial pits were excavated into the clay layer. The remedy presented in this document addresses the radioactively and chemically contaminated wastes remaining at WISS and is intended to be the final remedy for all contaminated media on the 6.5 acre WISS, including the soil, groundwater, debris, and the building.

The major components of the selected remedy include:

- Excavation and disposal of the remaining contaminated subsurface materials to an average concentration of 5 picoCuries/gram (pCi/g) of radium 226 (Ra-226) and thorium-232 (Th-232), combined above naturally occurring background concentrations at WISS, and an average concentration of 100 pCi/g of total uranium above naturally occurring background as determined by surveys consistent with the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). Remediating the site to these levels eliminates risks above the CERCLA risk threshold for unrestricted use scenarios, which meets the substantive requirements of the applicable or relevant and appropriate requirement (ARAR) 10 CFR 20.1402.

- Excavation and disposal of chemically contaminated soils above levels calculated to be protective of groundwater or above levels protective for unrestricted uses of the property (with regard to chemicals of concern) as specified in Table 8 of this ROD.

- Implementation of a five-year groundwater monitoring program to establish groundwater quality after contaminated soil has been removed.

- Decontamination and demolition of the building on WISS, removal and offsite disposal of demolition debris, removal and offsite disposal of contaminated materials under the building.

- Removal and treatment of groundwater encountered during excavation to meet discharge criteria for contaminants of concern (COCs) specified in the New Jersey Pollutant Discharge Elimination System Equivalency Permit (NJPDES), or the pre-treatment standards of the receiving publicly owned treatment works (POTW) prior to release.

- It is anticipated that cleanup to the criteria stated above may require excavation into the clay layer which acts as a barrier protecting the lower aquifer. The selected alternative will ensure the integrity of the clay layer. Contaminated waste will be disposed of at an appropriate commercial disposal facility.

Compliance with soil cleanup criteria for radionuclides will be established by methods that are compatible with the MARSSIM. Final compliance will be demonstrated through a post-excavation survey. A representative number of samples obtained from the excavation areas also will be subject to chemical analysis and comparison to chemical COCs criteria.

In accordance with the Federal Facility Agreement, executed between EPA and the U.S. Department of Energy (DOE) (April 1991), and as amended by an Interagency Agreement

between EPA and USACE, (March 1998), EPA may conduct a five-year review at the Wayne Site five years after the start of the remedial action. If the post-excavation survey demonstrates the cleanup levels are achieved, and the five-year groundwater monitoring portion of the remedial action demonstrates that site COCs are not present above levels established in either the Safe Drinking Water Act (SDWA) as found in 40 CFR141, the New Jersey Ground Water Quality Standards (New Jersey Administrative Code (N.J.A.C. 7:9)), or the New Jersey Maximum Contaminant Levels (N.J.A.C. 7:10-1), the site will have met the criteria for unrestricted use. No additional five-year reviews will be necessary.

In the event that the groundwater monitoring portion of the remedial action indicates the presence of COCs at concentrations exceeding levels established in either SDWA 40 CFR 141, N.J.A.C. 7:9, or N.J.A.C. 7:10-1, an evaluation of potential response actions would be conducted and an appropriate response would be implemented. The potential exists that residual contamination above the cleanup criteria established in this ROD might be inaccessible due to the clay layer. If residual contamination must remain in order to protect the natural clay barrier, and contaminants are found to exceed the cleanup levels using appropriate averaging methods, then a risk assessment will be conducted to evaluate risks from the residual materials and to determine if the remedial action is protective for unrestricted use of the property. If this residual risk evaluation indicates that risks from residual materials will not allow for unrestricted uses, then appropriate use restrictions will be established to limit the type of exposures that could present an unacceptable risk to human health. Five-year reviews of the remedy would be implemented in accordance with CERCLA 121 (c).

**Statutory Determinations**

The selected remedial action is protective of human health and the environment, complies with Federal and State laws and regulations that are applicable or relevant and appropriate to the remedial action, and is cost effective. This remedial action will utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. However, because treatment of the principal threats of the site was not found to be practicable, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy for the soils and waste. The principal contaminants at WISS are radioactive; therefore, the toxicity cannot be reduced by stabilization. As a result, stabilization and other technologies that reduce the mobility of contaminants in a soil matrix were not considered for this site.

This remedial action will result in the removal of hazardous substances at the site above health based levels for direct exposures or impact to groundwater. Groundwater will be monitored for five years following excavation of contaminated soil to establish groundwater quality. If a post-excavation survey or risk assessment demonstrates protectiveness of the remedial action and groundwater monitoring demonstrates that site COCs are not present above levels established in either SDWA 40 CFR 141, N.J.A.C. 7:9, or N.J.A.C. 7:10-1, the site will have met the criteria for unrestricted use. In accordance with the Federal Facility Agreement, executed between EPA and the DOE (April 1991), and as amended by an Interagency Agreement between EPA and USACE (March 1998), EPA may conduct a five-year review at the Wayne site five years after the start of the remedial action. No additional five-year reviews will be necessary.

28 April 00
Date

MG Hans A. Van Winkle
Deputy Commander for Civil Works

May 15, 2000
Date

Jeanne M. Fox,
Regional Administrator
U.S. Environmental Protection Agency

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## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AEC | Atomic Energy Commission |
| ARAR | applicable or relevant and appropriate requirement |
| ATSDR | Agency for Toxic Substances and Disease Registry |
| BRA | Baseline Risk Assessment |
| CEA | Classification Exception Area |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| COC | contaminant of concern |
| COPC | contaminants of potential concern |
| DOE | U.S. Department of Energy |
| EE/CA | Engineering Evaluation/Cost Analysis |
| EPA | U.S. Environmental Protection Agency |
| EQ | ecological quotient |
| FFA | Federal Facility Agreement |
| FS | Feasibility Study |
| ft | feet |
| FUSRAP | Formerly Utilized Sites Remedial Action Program |
| ha | hectare |
| km | kilometer |
| MARSSIM | Multi-Agency Radiation Survey and Site Investigation Manual |
| mrad/hr | millirad per hour |
| m | meter |
| mi | mile |
| mrem/yr | millirem/year |
| NCP | National Contingency Plan |
| N.J.A.C. | New Jersey Administrative Code |
| NJDEP | New Jersey Department of Environmental Protection |
| NJDOH | New Jersey Department of Health |
| NPDES | National Pollutant Discharge Elimination System |
| NRC | Nuclear Regulatory Commission |
| O&M | operation and maintenance |
| pCi/g | picoCuries per gram |
| PRP | potentially responsible party |
| Ra | Radium |
| RAO | remedial action objective |
| RCRA | Resource Conservation and Recovery Act |
| RfD | reference dose |
| RI | Remedial Investigation |
| RME | reasonable maximum exposure |
| Rn | Radon |
| ROD | Record of Decision |
| SARA | Superfund Amendments and Reauthorization Act |
| SDWA | Safe Drinking Water Act |
| TBC | to be considered |

| | |
|---|---|
| Th | Thorium |
| U | Uranium |
| USACE | U.S. Army Corps of Engineers |
| WISS | Wayne Interim Storage site |
| $yd^3$ | cubic yard |

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# II. DECISION SUMMARY

## 1. SITE NAME, LOCATION, AND DESCRIPTION

The Wayne site is in a highly developed area of northern New Jersey, approximately 32 kilometers (km) (20 miles [mi]) north-northwest of Newark, New Jersey, and approximately 60 km (36 mi) northwest of New York City (Figure 1). The site consists of the Federally owned Wayne Interim Storage Site (WISS), in the Township of Wayne in Passaic County, and several vicinity properties that were remediated during previous actions conducted between 1985 and 1987 and in 1993. Only the WISS property is addressed in this document. Properties previously remediated are described in the section on site history. WISS was formerly owned by Rare Earths, Inc., and later by W.R. Grace and Company. The WISS is a roughly rectangular 2.6 hectare (ha) (6.5-acre) site, located at the intersection of Black Oak Ridge Road and Pompton Plains Cross Road in the Township of Wayne. The only building remaining at WISS is a commercial, two-story masonry structure 43 meters (m) (142 feet) long and 15 m (50 ft) wide. Approximately 16 burial pits of various sizes, where processing wastes and contaminated building rubble were buried, were located onsite (Figure 2). The U.S. Army Corps of Engineers (USACE) completed a Removal Action in 1999 to remove these processing wastes. The wastes were excavated and transported to a commercial disposal facility. Residual contamination in soils adjacent to the former waste pits are addressed in this Record of Decision (ROD).

## 2. SITE HISTORY AND PREVIOUS INVESTIGATIONS

### 2.1 SITE HISTORY

From 1948 through 1957, Rare Earths, Inc., processed monazite sand at the site to extract thorium and rare earth metals. In 1954, after the Atomic Energy Act was passed, Rare Earths received an Atomic Energy Commission (AEC) license to conduct these operations. The Davison Chemical Division of W.R. Grace and Company acquired the facility in 1957, and processing activities continued until July 1971. During this time, some process wastes from the thorium operations were buried on the site. The approximate locations of the burial areas are provided in Figure 2.

The process, which was used to extract the rare earths and thorium from the monazite in solution, involved controlling the pH and selectively precipitating and separating desired products. Wastes and residues from the processing operations, which typically contained less than 5 percent of the original thorium concentration, included ore tailings, yttrium sludges, and sulfate precipitates. Liquid effluents were treated to existing effluent standards in an onsite wastewater treatment plant, neutralized, and discharged through storm drains into Sheffield Brook. Sheffield Brook often flooded during periods of heavy rainfall, causing contamination to spread to nearby low-lying properties. Residues from the wastewater treatment operation were disposed of in an onsite sludge dump.

In 1974, W.R. Grace closed the facility and decontaminated the site. Several buildings were demolished, and the building debris was buried onsite. The waste disposal areas on the site were covered with clean fill to reduce gamma radiation levels to below 0.2 millirad per hour (mrad/hr). The Nuclear Regulatory Commission released the site for unrestricted use in 1975, with the provision that a notation be recorded on the property deed that radioactive material was buried at the site.

In 1980, radiological surface contamination was discovered at the processing facility site and in areas west of the plant. In Fiscal Year 1984 legislation, Congress assigned the DOE responsibility for conducting a decontamination research and development project to address radioactive contamination at the Wayne site. DOE assigned the site to their Formerly Utilized Sites Remedial Action Program (FUSRAP), and, in 1984, DOE acquired this property from W.R. Grace & Company. DOE then began investigating the site, and between 1984 and 1987, several vicinity properties were cleaned up. Because there were no disposal facilities available that were licensed or permitted to accept the radiological wastes from this site, the excavated soils and cleanup debris were stored in an interim storage pile on the property where the processing operations occurred; hence the name, Wayne Interim Storage Site.

The Wayne site was listed by the U.S. Environmental Protection Agency (EPA) on the National Priorities List (NPL) in 1984 as W.R. Grace and Co./Wayne Interim Storage Site, CERCLIS ID# NJ 1891937980. In early 1991, DOE and EPA signed a Federal Facility Agreement (FFA) that established the cleanup responsibilities for each agency under the National Contingency Plan (NCP). FUSRAP was transferred from DOE to the USACE by the 1998 Water and Energy Appropriations Act (PL 105-62). USACE is designated the Lead Federal Agency. An Interagency Agreement between USACE and EPA dated March 6, 1998, outlines the USACE's responsibilities for the Wayne site and EPA's oversight role for the remedial action process. NJDEP's input was also sought and incorporated into the ROD.

## 2.2 PREVIOUS INVESTIGATIONS

The 1992 Remedial Investigation (RI) report for WISS summarized the historical investigations and Remedial Investigation data to evaluate the nature and extent of radioactive and chemical contaminants. However, because of the placement of the interim storage pile at the site, limited information was obtained on the subsurface materials. Following removal of the pile from the site as part of a CERCLA Removal Action, an additional characterization effort that focused on the waste burial area was conducted by the USACE in 1998.

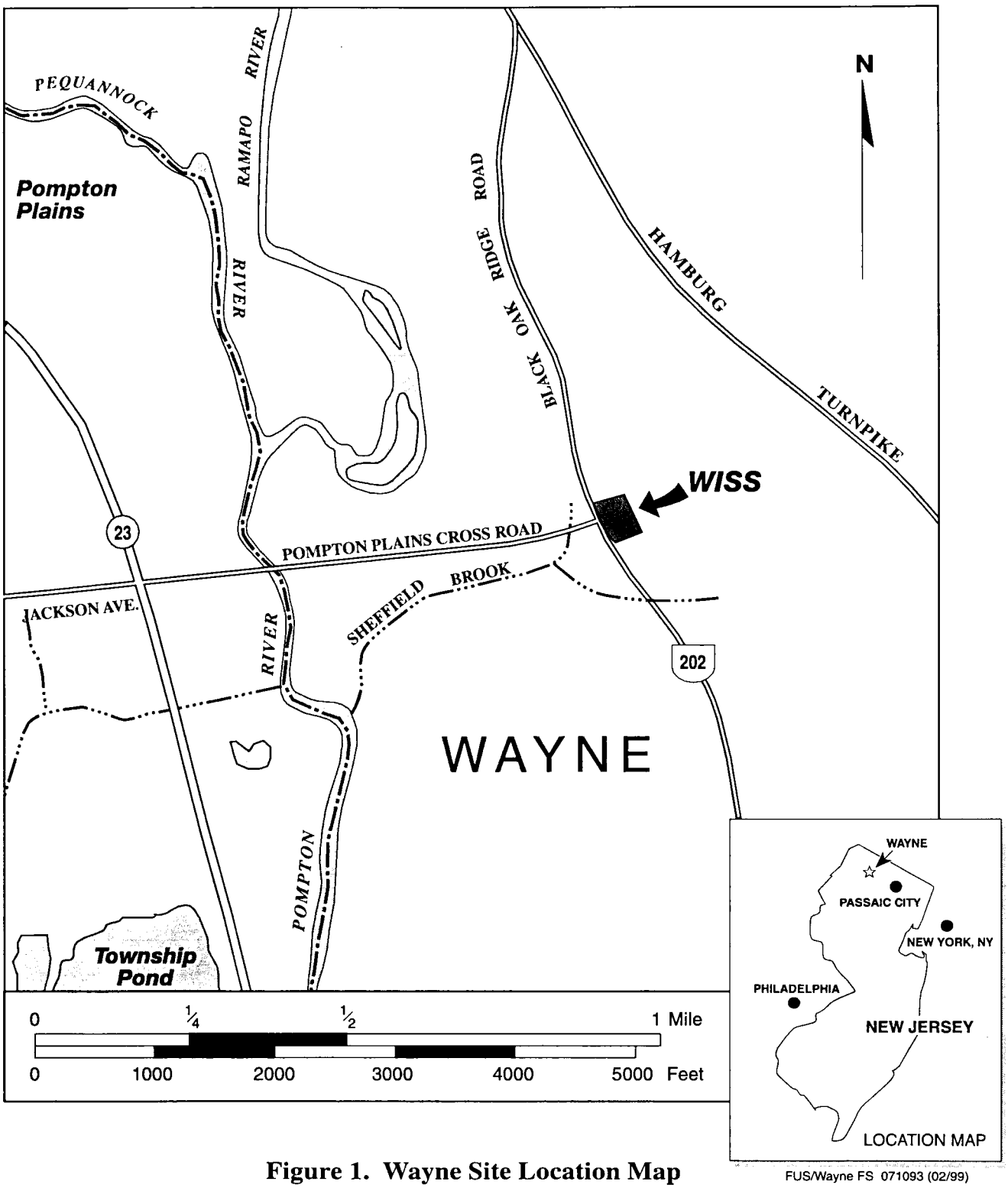
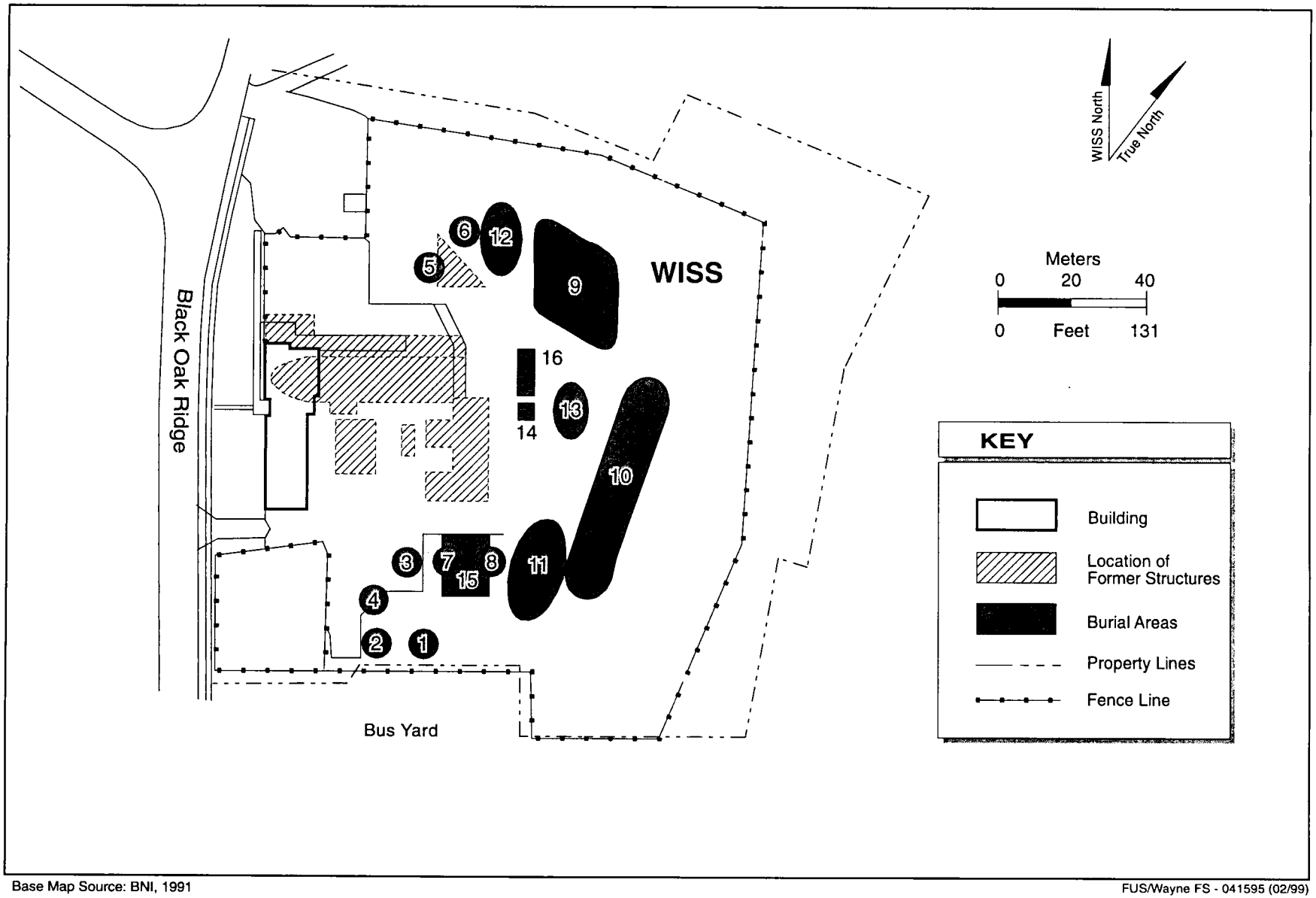



**Figure 1. Wayne Site Location Map**

FUS/Wayne FS 071093 (02/99)

FUS044P/082799




Base Map Source: BNI, 1991

FUS/Wayne FS - 041595 (02/99)

**Figure 2. Approximate Waste Burial Site Locations at WISS**

FUS044P/082799

## 2.3 Summary of Results

The contaminated area at WISS consists of burial pits containing rare earth and thorium processing wastes intermixed with contaminated soil, fill material, and contaminated building debris. During the rare earth and thorium processing period at the site, the waste pits were generally excavated to the top of a clay layer that underlies the majority of the site. However, it appears that the clay layer may have been breached in at least one area by the placement of wastes. The presence of this clay layer and the underlying bedrock formations provide a natural barrier between the wastes and the lower sole-source drinking water aquifer. The natural artesian conditions of the confined lower aquifer across the site prevent migration of contamination below the clay layer. The underlying clay layer occurs at depths ranging from 10 to 18 feet below grade. It is generally continuous across the site with the exception of the upper northeast corner of the site where it thins out naturally and at least one area along the western edge of contamination where the clay layer appears to have been breached by the placement of waste. The despositional thickness of the clay layer varies from 6 feet in the southern part of the site to between 1.5 feet to fifteen (15) feet in the northern part of the site.

Elevated levels of radionuclides are generally confined within distinct waste pit boundaries and consist of gray sandy silt and fine yellow-brown sands, consistent with onsite process waste disposal practices. Waste materials generally extend vertically down to the top of the clay, which has resulted in radioactive contamination of the upper portion of the clay layer in some areas (Figure 3). However, based on soil sampling results, it appears that the contaminated waste materials remain in the area of the original waste pits and fill material and have not migrated significantly into the surrounding soils.

Based on the 1998 characterization data, thorium-232 (Th-232) found in the soils, buried waste, and debris at a maximum concentration of 9,246 picoCuries per gram (pCi/g) has been identified as the principal contaminant at WISS. Radium-226 (Ra-226) (maximum concentration of 8,805 pCi/g), uranium-238 (U-238) (maximum concentration of 1,608 pCi/g), rare earth metals, and other non-radioactive metals also were found in the waste materials. Figure 4 depicts contaminant distribution at successive depths at WISS. The non-radioactive COCs found at the site were antimony, arsenic, chromium, lead, mercury, molybdenum, and thallium. These metals are found primarily in the same locations as the radioactive contaminants.

The highest levels of contamination at WISS are in the rare earth and thorium extraction process waste pits. However, much lower levels of contaminated materials also exist around the perimeter of the burial pit areas. This lower level contamination resulted from general activities associated with the waste processing, such as spillage, not from waste disposal practices. This contamination is generally at levels between background concentrations and 15 pCi/g. Other contaminated materials at the site include debris and processing equipment from buildings demolished and buried on site by W.R. Grace, as well as some of the fill material and site soils. Portions of the remaining office building also are radioactively contaminated.

Elevated concentrations of site-related contaminants have not been detected consistently in groundwater samples collected from the perimeter network of monitoring wells. However, groundwater in the immediate vicinity of the waste pit materials has been impacted and requires treatment during excavation of waste materials. Surface water and sediment sampling results,

obtained during ongoing site environmental monitoring, indicate that contaminants are not moving offsite.

## 3. COMMUNITY PARTICIPATION

Community participation activities provide the public with an opportunity to express its views on the preferred remedial action. USACE and EPA considered public input from the community participation activities in selecting the remedial alternative to be used for WISS. Community participation was provided in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA).

The Remedial Investigation/Feasibility Study (RI/FS) and Proposed Plan for the Wayne Interim Storage Site were released to the public in June, 1999. These two documents were made available to the public in both the administrative record and information repository maintained at the main libraries in Wayne and Pequannock townships. The notice of availability for these two documents was published in *The Record*, *Wayne Today*, the *New Jersey Herald & News*, *Star Ledger*, and the *Federal Register*. A public comment period was held from June 17, 1999 through August 16, 1999. In addition, a public meeting was held on June 30, 1999. At this meeting, representatives from USACE and EPA provided information about contamination at the site and the remedial alternatives under consideration. Responses to the comments received during this period are included in the Responsiveness Summary, which is part of this ROD.

This decision document presents the selected remedial action for WISS in Wayne Township, New Jersey, chosen in accordance with CERCLA, as amended by SARA and the NCP. The decision for this site is based on information contained in the administrative record.

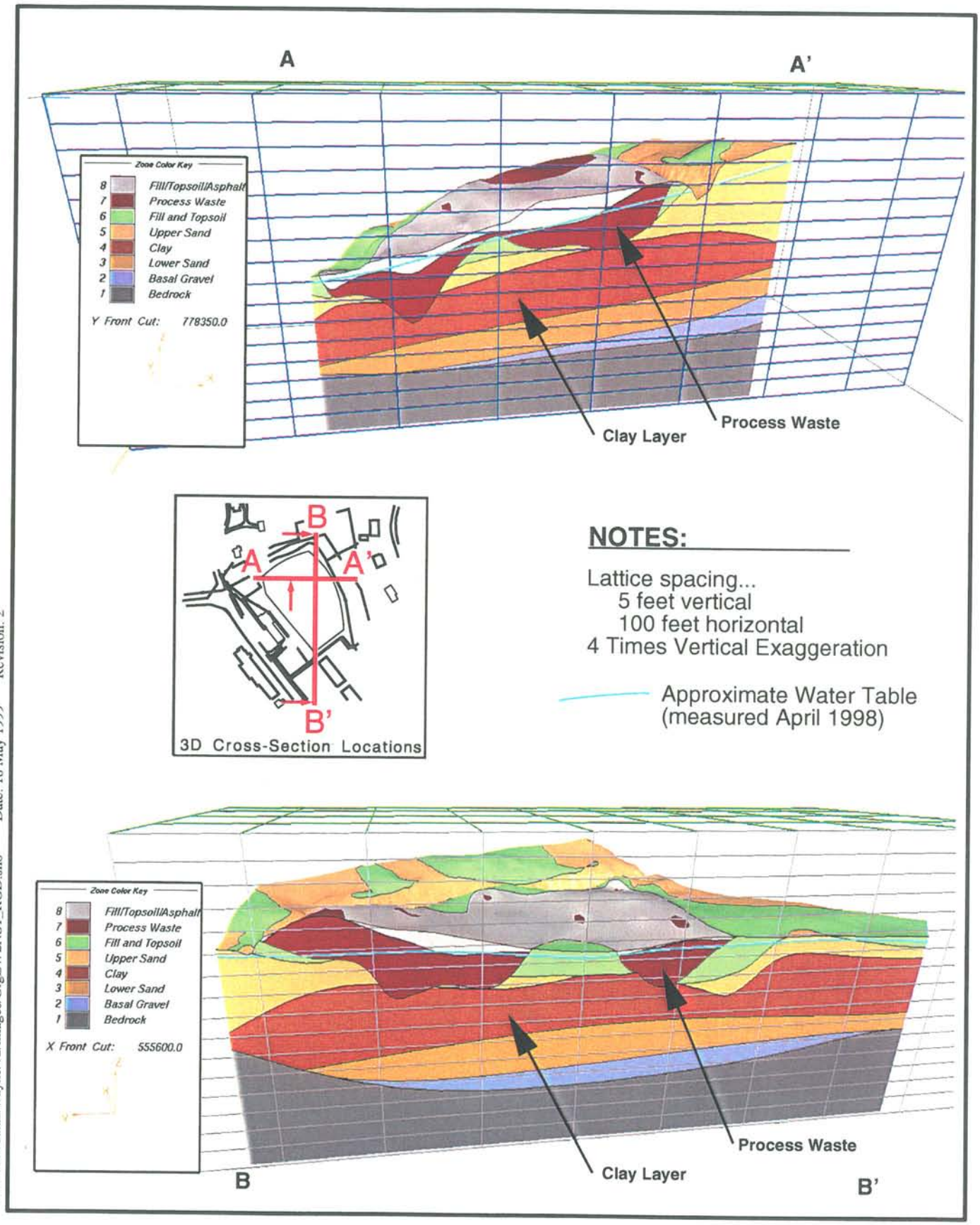



**Figure 3. Geologic Cross–Sections Displaying Relationship between Process Waste and Clay Layer**

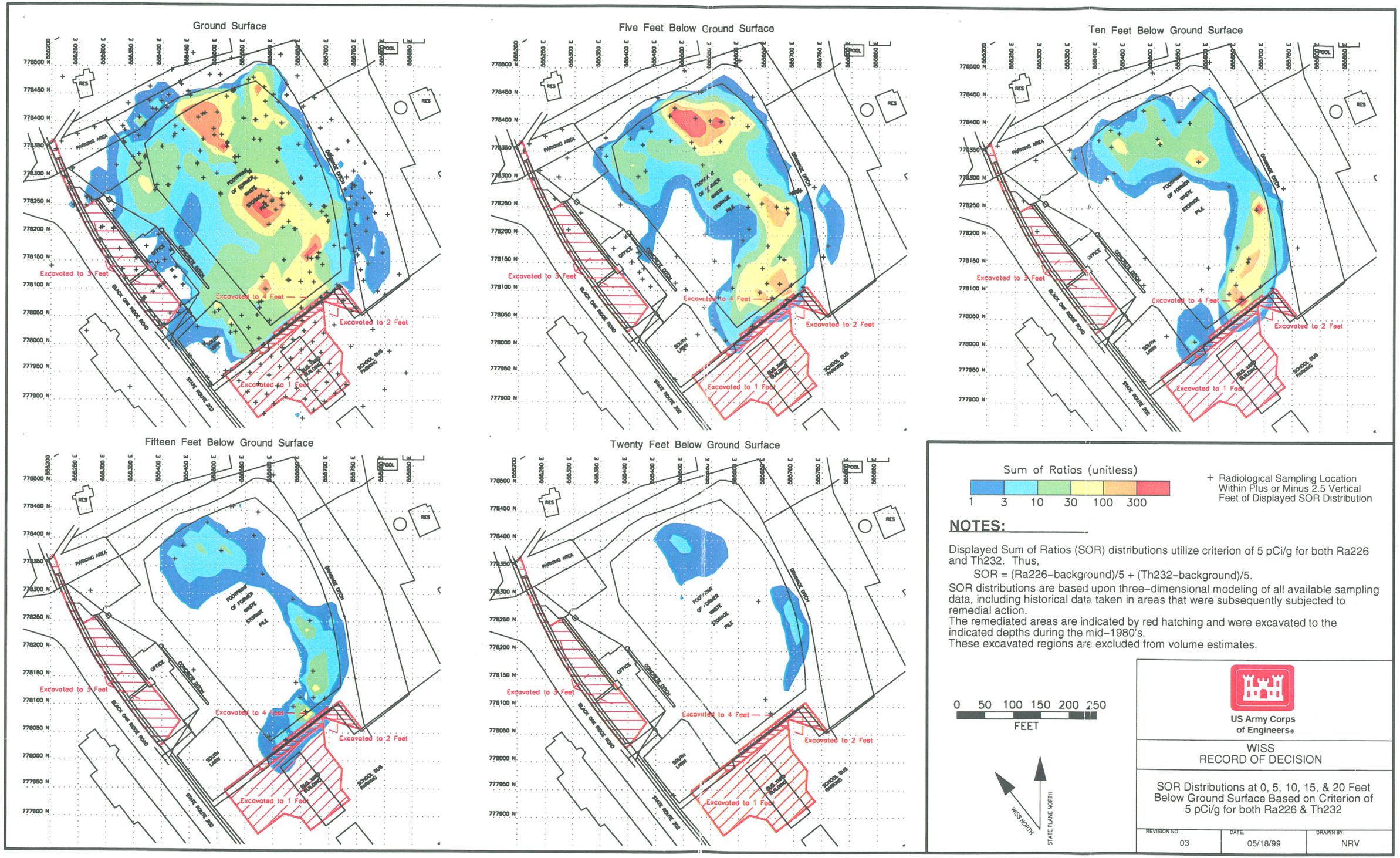



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**Figure 4. Radionuclide Distribution at Surface, 5, 10, 15, and 20 Feet Below Ground Surface Based on Criterion of 5 pCi/g for Ra–226 and Th–232 Combined**

## 4. SCOPE AND ROLE OF REMEDIAL ACTION WITHIN SITE STRATEGY

In accordance with CERCLA requirements, implementation of the selected remedy addresses the contaminated media at WISS including soil, groundwater, debris, and the building. This remedial action will result in removal of soils and waste containing hazardous substances above health-based levels for direct exposure (including external gamma) and protection of groundwater. In addition, groundwater in the excavation area will be removed, site COCs identified in the water will be treated to meet discharge criteria specified in the New Jersey Pollutant Discharge Elimination System Equivalency Permit (NJPDES), or the pre-treatment standards of the receiving publicly owned treatment works (POTW) prior to release.

Compliance with site specific soil cleanup criteria for radionuclides will be established by methods that are compatible with MARSSIM. A representative number of samples obtained from the excavation areas also will be subject to chemical analysis and comparison to chemical COC criteria listed in Table 8.

It is expected that the removal of the contaminated source media and dewatering during remedial action will eliminate all contaminated groundwater in the waste pit areas. Following excavation and treatment of groundwater in the excavation area, groundwater will be monitored for five years to establish groundwater quality. It is anticipated that contaminant levels in groundwater will decrease to levels at or below those consistent with background within the five-year monitoring portion of the remedial action. No restrictions or controls will be necessary at the site following the monitoring period. In the event that groundwater monitoring indicates the presence of COCs at concentrations exceeding levels established in either the Safe Drinking Water Act (SDWA) 40 CFR 141, the New Jersey Administrative Code (N.J.A.C.) 7:9, or the N.J.A.C. 7:10-1, an evaluation of potential response actions would be conducted and an appropriate response would be implemented.

If the post-excavation survey demonstrates the cleanup levels are achieved and the groundwater monitoring portion of the remedial action demonstrates that site COCs are not present above levels established in either the SDWA 40 CFR 141, the N.J.A.C. 7:9, or the N.J.A.C. 7:10-1, the site will have met the criteria for unrestricted use. In accordance with the Federal Facility Agreement, executed between EPA and the DOE (April 1991), and as amended by an Interagency Agreement between EPA and USACE (March 1998), EPA may conduct a five-year review at the Wayne Site five years after the start of remedial action. No additional five-year reviews will be necessary. The potential exists that residual contamination, above the cleanup criteria established in this ROD, might be inaccessible due to the clay layer. If residual contamination must remain in order to protect the natural clay barrier, and results are found to exceed the cleanup levels using appropriate averaging methods, then a risk assessment will be conducted to evaluate risks from the residual materials and to determine if the remedial action is protective for unrestricted use of the property. If this residential risk evaluation indicates that risks from residual materials will not allow for unrestricted uses, then appropriate use restrictions will be established to limit the type of exposures that could present an unacceptable risk to human health.

## 5. TREATABILITY STUDIES

Limited laboratory scale characterization and testing of the Wayne site soils were conducted by DOE. Treatability testing was conducted to determine if physical separation methods could result in reducing the volume of radiologically contaminated soil. These studies indicated that certain soils may be suitable for treatment by soil washing. (In soil washing, contaminants that are associated with a certain particle size are concentrated and separated from the clean soil.) However, the soils that were used in the tests were taken from accessible areas of limited contamination and did not include processing waste materials. Subsequent characterization activities indicate that the majority of the waste at the site is fine-grained material containing high concentrations of radionuclides. Site characterization indicated that waste material has an average of 51 percent fines (silt- and clay-size material). This high percentage of fine material suggests that soil washing is not feasible, because radionuclides are typically associated with the fine particles. A high percentage of fine particles would lead to poor separation of radionuclides from the remainder of the soil matrix. In addition, fine soil particles are difficult to remove from washing fluids and would result in radiologically contaminated wastewater. Based on the treatability studies, the site characterization data, and USACE review of current literature on available technologies; treatment of the soil and waste materials was eliminated from consideration at this site.

## 6. REMOVAL ACTIONS

In Fiscal Year 1984 legislation, Congress assigned the DOE responsibility for conducting a decontamination research and development project to address radioactive contamination at the Wayne site. DOE assigned the site to their Formerly Utilized Sites Remedial Action Program (FUSRAP), and, in 1984, DOE acquired this property from W.R. Grace & Company. DOE then began investigating the site, and between 1984 and 1987, several vicinity properties were remediated. These prior actions were documented by DOE in the administrative record .

In the fall of 1986, a small area at Wayne Township Park and a small area along the fence between WISS and the school bus maintenance facility were decontaminated. The yard in front of the office building at WISS was decontaminated and restored, and a small quantity of contaminated material was removed from the right-of-way of Pompton Plains Cross Road across the street from WISS. Also in 1986, the Pompton River was tested for contamination at its confluence with Sheffield Brook. Assessments of characterization data indicated that the contamination was confined to the mouth of the brook and did not extend into the river or downstream. During 1986, contaminated soil in the stream channel and floodplain of Sheffield Brook was removed from the area southwest of Pompton Plains Cross Road (see Figure 1). A New Jersey Department of Environmental Protection (NJDEP) stream encroachment permit and a USACE wetland restoration permit were obtained for this work.

In 1987, an excavation along the brook was completed in the area between Farmingdale Road and the Pompton River. To perform this work, it was necessary to excavate through the roadbed

at Farmingdale Road. Cleanup of the mouth of the brook involved construction of a cofferdam to permit excavation into the backwaters of the Pompton River. Waste material from these cleanups formed a storage pile at the WISS. The interim storage pile at WISS contained approximately 29,400 $m^3$ (38,500 $yd^3$) of radioactively contaminated soil and building debris generated during the 1986 and 1987 cleanup actions. The storage pile was approximately 6 m (19.7 ft) high and covered approximately 1.1 ha (2.7 acres). These actions were outlined in the *Action Description Memorandum, Proposed FY 1984 Remedial Actions at Wayne, New Jersey*, prepared for the DOE, Oak Ridge Operations, Oak Ridge, TN, July 1984, as prepared by Argonne National Laboratory.

The remaining Wayne site vicinity properties were cleaned up in 1993 under the *Engineering Evaluation/Cost Analysis for the Proposed Removal of Contaminated Materials from Vicinity Properties at the Wayne Site, U.S. Department of Energy*, August 1993. The majority of the waste from the 1993 cleanups was shipped directly to a commercial disposal facility. A small amount of contaminated soil from the 1993 cleanups was added to the interim storage pile due to offsite waste disposal constraints in effect at the time. Over the next several years, the commercial disposal capacity for radiological waste increased. Offsite disposal of the interim storage pile was initiated and completed in 1997. An estimated 40,000 $yd^3$ of buried contaminated materials were removed and shipped offsite for disposal under a separate CERCLA removal action that began in 1998. This action is documented in the *Engineering Evaluation/Cost Analysis for the Removal of Subsurface Materials at the Wayne Site, Wayne, New Jersey*, USACE, March 1998. This removal action constitutes the final action for the 40,000 cubic yards of contaminated soils and is consistent with the remedial action described in this ROD.

## 7. SUMMARY OF SITE RISKS

CERCLA requires that human health and the environment be protected from risks due to current and potential future exposure to hazardous substances released at, or from, a site. In 1994, a Baseline Risk Assessment (BRA) was prepared to evaluate the risk to human health and the environment from radioactive materials and chemicals at WISS. As additional data became available, the risk was reassessed in the Feasibility Study (FS) that was published in 1999. The risk assessment evaluated the potential future risk following cleanup for each of the remedial alternatives. The results of the risk evaluation are discussed in the remainder of this section. Additional information on how the risks were calculated is available in Appendix C of the FS.

### 7.1 POTENTIAL HUMAN HEALTH RISKS

The risks to humans were assessed for both cancer and toxic (noncancer) health effects. The risk assessment consisted of an exposure assessment, a toxicity assessment, a risk characterization, and an uncertainty evaluation.

### 7.1.1 Exposure Assessment

The risk assessment presents the estimated risk from exposure to the principal radiological constituents at the site (Th-232, Ra-226, and U-238), as well as the chemical contaminants at the site. The primary concern with radionuclide contaminants is their potential to cause cancer. Of the radioactive contaminants present at the site, only uranium is believed to present any noncancer toxicity. However, the levels of uranium found in the soil at this site are not sufficient to pose a potentially significant noncancer threat. Chemical contaminants were evaluated for both cancer and non-cancer risks.

Lifetime risks were calculated using reasonable maximum exposure conditions that conservatively represent potential exposures, so that risks are not likely to be underestimated. The assessment evaluated how people could be exposed to contaminants from the soil and from buried waste under current conditions. The assessment also evaluated exposure under possible future land uses at the site, such as residential development.

The BRA (DOE 1994) assumed that people at the site could be exposed to contaminants by inhaling or ingesting soil particles, by consumption and other household uses of groundwater, by consuming produce grown at the site, and by direct skin contact with chemicals. In addition, direct gamma radiation exposure was estimated. In the subsequent FS risk assessment, no exposures from contaminated groundwater were evaluated because monitoring of perimeter wells since 1984 has not shown contamination migrating offsite above health based standards. In addition, groundwater will be monitored for 5 years after completion of soil excavation to verify that site groundwater meets criteria established in 40 CFR 141, N.J.A.C. 7:9, and N.J.A.C. 7:10-1. EPA risk assessment guidance was used for specific exposure assumptions.

### 7.1.2 Toxicity Assessment

The purpose of the toxicity assessment is to evaluate the potential for radionuclides and chemicals to cause adverse health effects in exposed individuals. Where possible, it provides an estimate of the relationship between the extent of exposure to a particular chemical and the increased likelihood or severity of adverse health effects as a result of that exposure, relative to a baseline. The toxicity assessment generally involves two steps. The first step is to determine whether exposure to a chemical can cause an increase in the incidence of a particular health effect (and whether that health effect will occur in humans). The second step is to characterize the relationship between the received dose of the contaminant and the incidence of adverse health effects in exposed populations.

Noncarcinogenic effects are evaluated by comparing an exposure experienced over a specified time period (e.g., 30 years) with a reference dose (RfD) derived for a similar exposure period. This information is used to calculate the Hazard Index. The EPA, NJDEP and USACE agree that a Hazard Index less than one (1) indicates that there is little or no potential for toxic, noncancer, health effects to occur at the levels of exposure assumed.

For radionuclides, both doses and cancer risks are calculated. Doses are calculated in millirem/year (mrem/yr) so that compliance with applicable and relevant and appropriate requirements (ARARs) can be demonstrated. All radionuclides are considered human carcinogens

because they emit ionizing radiation. For both radionuclide and chemical carcinogens, cancer risk is calculated as the incremental possibility of cancer incidence over a lifetime resulting from exposure to the carcinogens. Cancer risk is expressed as excess cancer risk incurred in a population in addition to normally expected rates of cancer incidence. For example, an excess cancer risk of $1.0 \times 10^{-6}$, or 1/1,000,000 (which are the same) indicates that, for an exposed population of one million, one additional cancer case would occur from that exposure.

Toxicity values used to estimate risks for the baseline risk assessment were collected from the *Integrated Risk Information System* (EPA 1998) and *Health Effects Assessment Summary Tables* (HEAST) (EPA 1995). Although HEAST has been updated since 1995, none of the slope factors for those radionulcides which are COCs for this site, have changed since 1998.

### 7.1.3 Risk Characterization

7.1.3.1 Radionuclides

The radiological risks to a resident on WISS in the absence of remediation were estimated to be $5 \times 10^{-2}$. The risk to a future industrial worker was estimated to be $1 \times 10^{-2}$ from exposure to site soils alone. If exposure to building material were included, the risk would be greater than $1 \times 10^{-2}$. These risks exceed the risk range of $1 \times 10^{-4}$ to $1 \times 10^{-6}$ as protective in the NCP.

7.1.3.2 Chemicals

The chemical risks for Alternative 1, No Action, were calculated to determine risks in the absence of remediation. The total cancer risk to a residential receptor from exposure to chemical contamination was $2.1 \times 10^{-4}$. The total hazard index for the receptor was 6. The total cancer risk to an industrial receptor (assuming future industrial use of the site) in the absence of remediation was estimated to be $6.5 \times 10^{-5}$, with an associated hazard index of 2.

7.1.3.3 Risk Drivers

The most significant contributors to the cancer risk were external gamma radiation from Ra-226 (cancer risk of $7.8 \times 10^{-3}$), Ra-228 (cancer risk of $1.3 \times 10^{-2}$) and Th-228 (cancer risk of $2.5 \times 10^{-2}$). Cancer risk from chemicals was much lower, with a total cancer risk for all chemicals for the residential scenario of $2.1 \times 10^{-4,}$ with most of that risk ($1.6 \times 10^{-4}$) coming from ingestion of arsenic in soil. The most significant contributors to the noncancer hazard index of 6 for the residential scenario came from thallium with a hazard quotient of 1.9 for soil ingestion and 2.0 for dermal exposures to thallium in soil. For the complete list of chemicals evaluated, refer to Table C-12 of the *Feasibility Study for the Wayne Interim Storage Site*, USACE, June 1999.

### 7.1.4 Uncertainty Evaluation

Results of the risk evaluation conducted for the WISS indicate that exposure to site contaminants under potential future use scenarios predicts risks above the CERCLA human risk threshold of $1 \times 10^{-4}$ and NJDEP's target risk of $1 \times 10^{-6}$, unless site remediation is undertaken.

The procedures and inputs used to assess risks in these evaluations, as in all such assessments, are subject to a wide variety of uncertainties. In general, the main sources of uncertainty include:

- environmental sampling and analysis,
- fate and transport assessment and modeling,
- exposure estimation, and
- toxicological data.

These uncertainties are addressed by making conservative assumptions concerning risk and exposure parameters throughout the risk assessment. As a result, the risk assessment provides an upperbound estimate of the potential risks to populations that could be exposed to radiological or chemical constituents, and is likely to overestimate actual risk-related exposure.

## 7.2 POTENTIAL ENVIRONMENTAL RISKS

An ecological risk assessment was prepared as part of the BRA (DOE 1994) based primarily on published toxicity data, information on the nature and extent of contamination at the site taken from the 1993 Remedial Investigation Report, previous historical reports, and a qualitative site-specific survey of habitats and potential receptors. A qualitative assessment using an "ecological quotient" (EQ) was used to characterize the relative risk of the potential ecological COC's at WISS. The EQ compares the environmental concentration of a contaminant to its toxicity threshold concentration. Any quotient greater than or equal to one indicates that there is the potential for adverse ecological effects. The highest EQs for the Wayne site soils (surface and subsurface) and surface water were associated with metals. For sediments from the drainage swale around the perimeter of the site, the highest EQs were caused by polycyclic aromatic hydrocarbons (PAHs) and lead. Barium, copper, and lead had EQs with reasonable maximum exposure (RME) concentrations in WISS property soils between 10 and 100. Cerium in WISS subsurface soil, and mercury in WISS surface soil, had RME EQs of less than 10. Because the mercury mean EQ is less than 1, the cerium mean EQ only slightly exceeds 1, and cerium was not a problem in surface soil; adverse ecological impacts are not expected from these metals. The EQs for all of the organic compounds in the surface and subsurface soil had either an unknown risk or an EQ of less than 1 indicating no potential adverse effects are predicted.

With several metals in soils at the Wayne site having EQs greater than 1, there could be a potential risk to ecological receptors at or near the Wayne site. However, the site is located in a heavily urbanized area and is not managed for ecological purposes. The site does not contain any sensitive ecological entities or sensitive habitat. Further action or investigation (such as bioaccumulation studies) to address ecological risk is not warranted for the minimal ecological habitat present at the WISS. Further, though barium, copper, and lead show the potential for ecological impact, their concentrations are well below New Jersey proposed guidelines. In addition, it is expected that these metals are commingled with other site COCs such that they will be removed with the remediation of the radionuclide contaminated soils.

# 8. SUMMARY OF ALTERNATIVES

## 8.1 REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs), as summarized in Table 1, were developed to address the contaminated soil and debris at WISS, while considering the long-term goals of protecting human health and the environment, and meeting ARARs.

The site-specific risk analysis demonstrated that soil cleanup levels of an average concentration of 5 pCi/g of Th-232 and Ra-226 combined, above naturally occurring background concentrations of 2.1 pCi/g for residential use, and an average concentration of 15 pCi/g of Th-232 and Ra-226 combined, above naturally occurring background concentrations for recreational use will result in a cleanup that eliminates risks above the CERCLA risk threshold and meets the substantive requirements of 10 CFR 20, Subpart E. (see Appendix C in the *Feasibility Study for the Wayne Interim Storage Site*, USACE, June 1999). In addition to cleanup levels for radium and thorium, uranium cleanup levels were developed on a site-specific basis. The levels are an average concentration of 50 pCi/g above background for U-238 and an average concentration of 100 pCi/g above the background of 4.2 pCi/g for total uranium (U-234 and U-238).

**Table 1. Remedial Action Objectives**

| Environmental Media | Remedial Action Objectives |
|---|---|
| Source Media (soil, process residues, and bulk waste), and groundwater | To eliminate or minimize the potential for humans to ingest, come into dermal contact with, or inhale particulates of radioactive constituents, or to be exposed to external gamma radiation to achieve the level of protection required by the NCP ($10^{-4}$ to $10^{-6}$ risk range), and meet the substantive requirements of 10 CFR 20, Subpart E.<br>To reduce chemical COC levels in impacted media to levels that would be protective based on site-specific risk and groundwater impact evaluations.<br>To return impacted groundwater to conditions consistent with groundwater ARARs.<br>To protect the integrity of the clay layer in order to ensure protection of the lower groundwater aquifer.<br>To reduce potential exposure to radium and thorium in soil to levels that would be protective for the intended land use as established by site-specific risk analysis.<br>To reduce exposure to uranium to levels that would be protective for the intended land use.<br>To eliminate or minimize toxicity, mobility, and/or volume of impacted soils.<br>To eliminate or minimize the potential migration of contaminants into stream and storm drain sediments by surface water runoff, or by infiltration or percolation that would result in contamination of the groundwater.<br>To comply with chemical- and action-specific ARARs. |
| Buildings/Structures | To prevent exposures from radioactivity in buildings and structures greater than the guideline limits.<br>To access and address the contaminated soils beneath the building.<br>To eliminate or minimize potential exposure to external gamma radiation.<br>To eliminate or minimize toxicity or mobility, and/or volume of contaminants.<br>To comply with chemical- and action-specific ARARs. |

An ARAR that establishes chemical cleanup criteria for soil was not identified for the site. The New Jersey residential soil criteria are not considered to be an ARAR, but rather a "to be considered" (TBC) guideline. These standards were taken into consideration in the development of cleanup goals and were proposed by the USACE as TBCs.

Establishing cleanup criteria for metals in soil that are protective of groundwater resources minimizes the potential for migration of contaminants in the future. Site-specific soil cleanup levels have been developed to be protective of groundwater so that estimated impacts to groundwater will not exceed standards established for the contaminants. The soil cleanup levels that were derived, based on protection of groundwater, are different than the direct contact cleanup levels because each chemical and radionuclide varies in its potential to leach into groundwater. Therefore, where two cleanup levels were identified, the more restrictive was selected as the cleanup criteria. (See Table 8, superscript c, for the soil cleanup levels for the selected alternative.)

## 8.2 ALTERNATIVE DESCRIPTIONS

Five site-wide alternatives were developed to address the RAOs. The alternatives were evaluated in detail in the *Feasibility Study for the Wayne Interim Storage Site*, USACE, June 1999. The following sections describe these five alternatives. The FS provides greater detail for each alternative.

### 8.2.1 Alternative 1 – No Action

The no-action alternative was considered in accordance with CERCLA guidelines and provided a baseline for comparison with other alternatives. Under this alternative, no further action would have been taken to remediate WISS. Institutional controls currently in place at the site (e.g., access restriction) would not be maintained.

### 8.2.2 Alternative 2 – Monitoring and Institutional Controls

Alternative 2 involved monitoring and maintaining existing institutional controls. Under this alternative, no action would have been taken to remediate WISS; however, monitoring of groundwater, surface water, sediment, and ambient air to determine contaminant migration would have been conducted for a minimum of 30 years.

Groundwater monitoring for Alternative 2 included sampling selected wells of the current network of perimeter wells, and new wells installed within and downgradient (onsite) of the waste pit area. Evidence of groundwater contamination would have been detected along the downgradient pathway by routine sampling of wells. The details of the monitoring and containment actions implemented in the case where contaminant migration occurred would be included in a long-term groundwater monitoring plan. Figure 5 shows the major components of this alternative, and Table 2 shows the estimated costs.

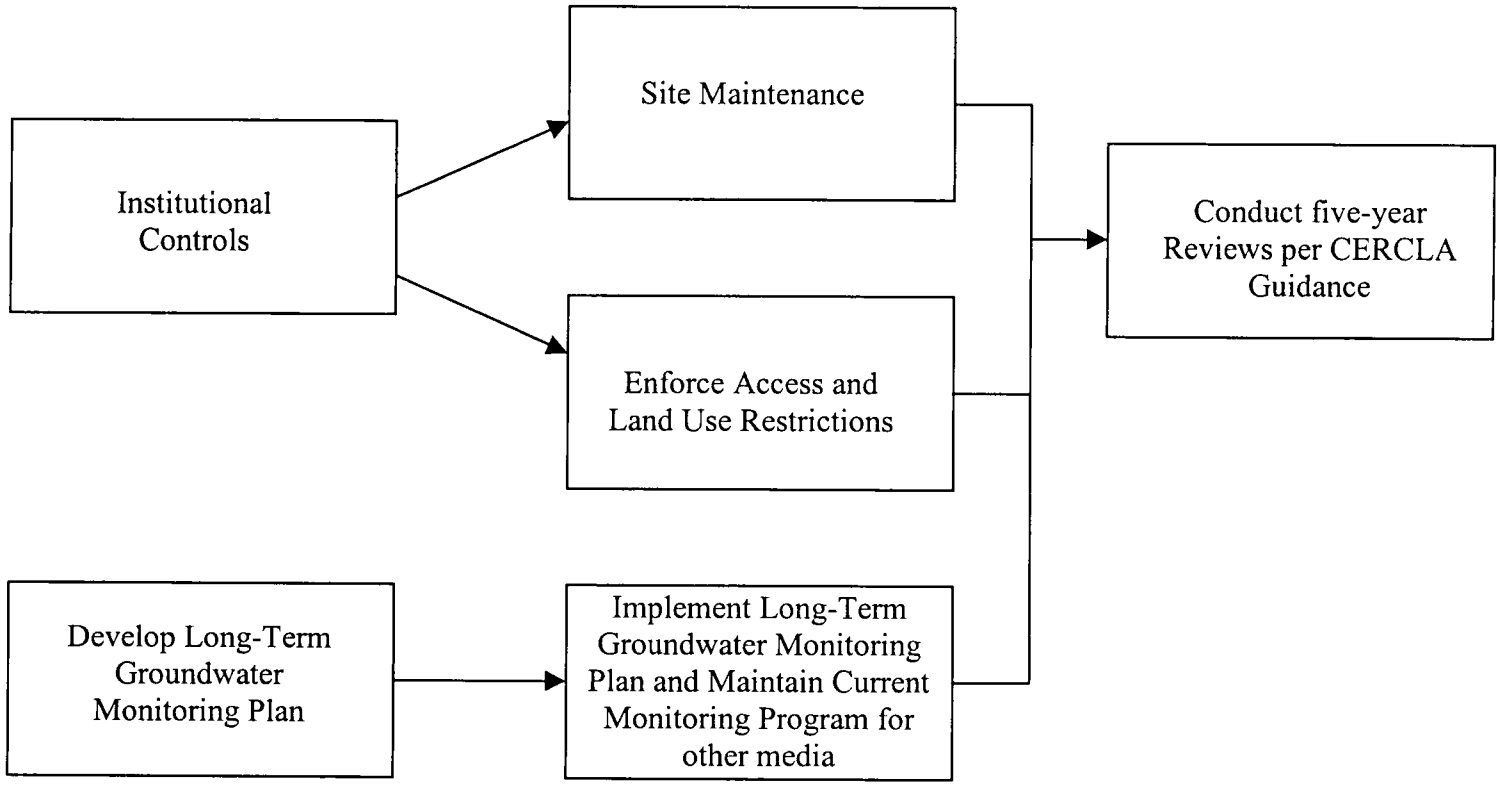


**Figure 5. Major Components of Alternative 2, Monitoring and Institutional Controls**

**Table 2. Estimated Costs for Alternative 2, Monitoring and Institutional Controls**
(30-year cost, 1999, $in thousands)

| Activity | Remedial Action | O&M | Total |
|---|---|---|---|
| **Excavation & Backfill** | $0 | $0 | **$0** |
| **GW Treatment** | $0 | $0 | **$0** |
| **Transportation & Disposal** | $0 | $0 | **$0** |
| -Transportation | $0 | $0 | **$0** |
| -Disposal | $0 | $0 | **$0** |
| **Construction & Sampling** | $0 | $1,402 | **$1,402** |
| -Monitoring, Sampling & Analysis | $0 | $1,370 | **$1,370** |
| -Site Development | $0 | $0 | **$0** |
| -Building & Services | $0 | $0 | **$0** |
| -Other Collection & Control (Monitoring Well Installation) | $0 | $32 | **$32** |
| -Demolition & Decontamination | $0 | $0 | **$0** |
| -Post RA Reports | $0 | $0 | **$0** |
| **Other** | $0 | $204 | **$204** |
| -Site Inst. Controls, Surv. & Maint. | $0 | $204 | **$204** |
| -Field Support | $0 | $0 | **$0** |
| **Total Remedial Action and O&M** | $0 | $1,607 | **$1,607** |
| Project Management | | | $7,637 |
| Remedial Design {10% × (Total RA – Trans. & Disp.)} | | | $0 |
| **Total Project Support** | | | **$9,244** |
| Contingency (25% of Total Project Support) | | | $2,311 |
| **Subtotal Project Cost** | | | **$11,555** |
| Program Support (10% of Subtotal Project Cost) | | | $1,155 |
| **Total Project Cost** | | | **$12,710** |

### 8.2.3 Alternative 3 – Containment and Institutional Controls

This alternative involved covering the burial area of WISS with a 1.5 m (5 ft) multi-layer cap (see Section 5.2.1 in the *Feasibility Study for the Wayne Interim Storage Site*, USACE, June 1999, for description). The uppermost layer of the cap would have been covered with topsoil and seeded with grass. The contaminated areas of the building at WISS would have been decontaminated to prevent the spread of any removable contamination, and the building would have been demolished. Debris from decontamination, and the clean building rubble, would have been disposed onsite under the cap.

A passive hydrologic barrier consisting of a slurry wall would have been installed around the perimeter of the entire site to minimize the horizontal flow of groundwater in the upper groundwater system through the burial pits, and to prevent any future offsite migration of contamination in groundwater.

Groundwater monitoring for Alternative 3 would have included sampling selected wells, of the current network of perimeter wells, and new monitoring wells installed downgradient of the slurry wall. Evidence of contaminated groundwater bypassing the slurry wall would have been detected by routine sampling. The details of the monitoring actions that would be implemented would have been included in a long-term groundwater monitoring plan.

Institutional controls would have been an important component of this alternative and would have included continuation of federal government ownership of the site, continuation of access restrictions, continuation of an environmental monitoring program for all media, land use restrictions, and a five-year review, as required by CERCLA 121(c), to evaluate protectiveness. For cost estimation purposes, these activities were included for a 30-year period following remediation.

Figure 6 shows the major components of this alternative, and Table 3 shows the estimated costs.

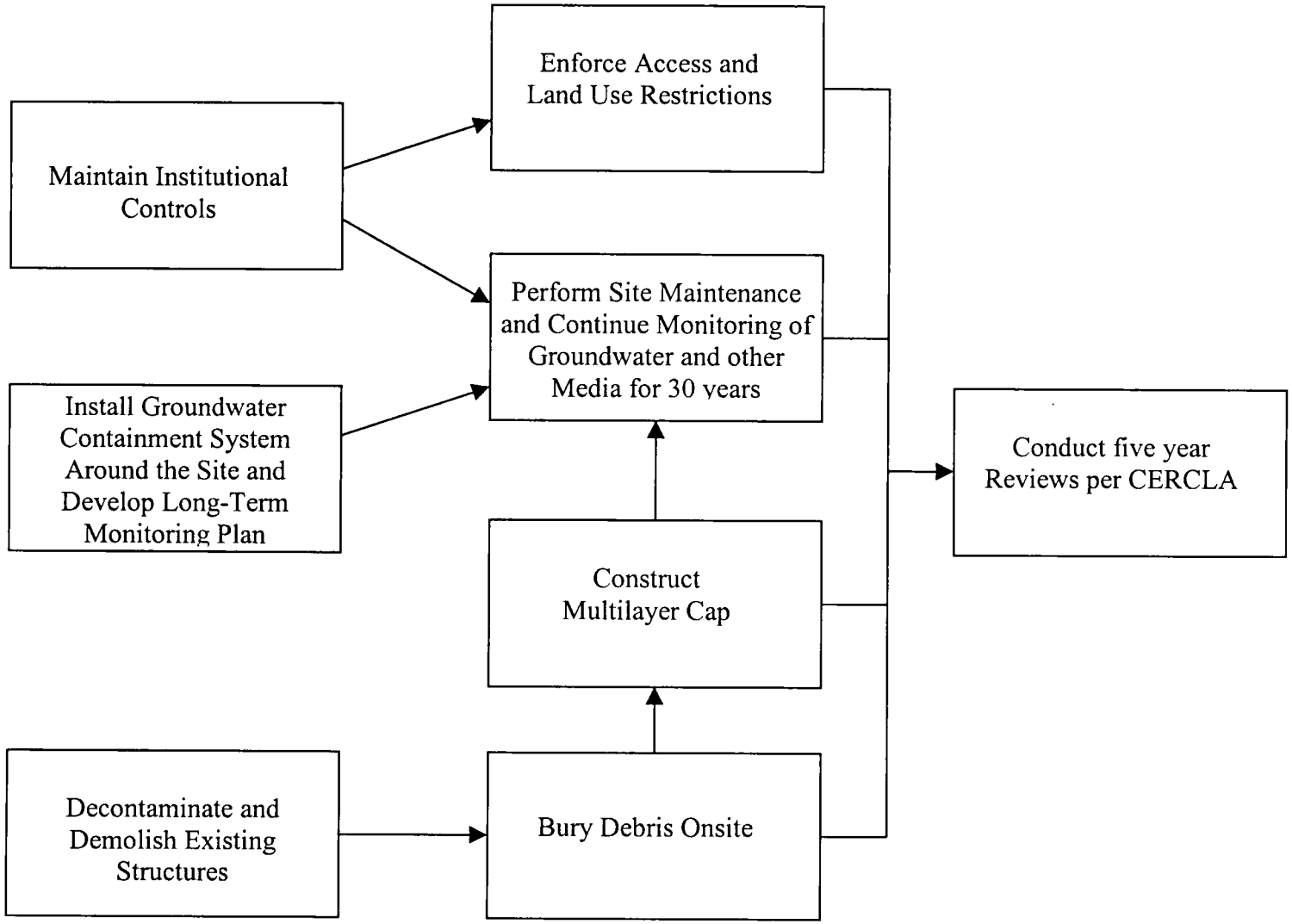


**Figure 6. Major Components of Alternative 3, Containment and Institutional Controls**

**Table 3. Estimated Costs for Alternative 3, Containment and Institutional Controls**
(30-year cost, 1999, $ in thousands)

| Activity | Remedial Action | O&M | Total |
|---|---|---|---|
| **Excavation & Backfill** | $0 | $0 | **$0** |
| **GW Treatment** | $0 | $0 | **$0** |
| **Transportation & Disposal** | $0 | $0 | **$0** |
| -Transportation | $0 | $0 | **$0** |
| -Disposal | $0 | $0 | **$0** |
| **Construction & Sampling** | $1,300 | $893 | **$2,192** |
| -Monitoring, Sampling & Analysis | $120 | $861 | **$981** |
| -Site Development | $54 | $0 | **$54** |
| -Building & Services | $12 | $0 | **$12** |
| -Other Collection & Control (Containment., Mon. Well Install.) | $843 | $32 | **$875** |
| -Demolition & Decontamination | $271 | $0 | **$271** |
| -Post RA Reports | $0 | $0 | **$0** |
| **Other** | $1,446 | $196 | **$1,642** |
| -Site Inst. Controls, Surv. & Maint. | $8 | $196 | **$204** |
| -Field Support | $1,438 | $0 | **$1,438** |
| **Total Remedial Action and O&M** | $2,746 | $1,089 | **$3,834** |
| Project Management | | | $8,447 |
| Remedial Design {10% × (Total RA & O&M - Trans. & Disp.)} | | | $383 |
| **Total Project Support** | | | **$12,665** |
| Contingency (25% of Total Project Support) | | | $3,166 |
| **Subtotal Project Cost** | | | **$15,831** |
| Program Support (10% of Subtotal Project Cost) | | | $1,583 |
| **Total Project Cost** | | | **$17,414** |

### 8.2.4 Alternative 4 – Excavation to Residential Use and Disposal

Alternative 4 involves the demolition and disposal of building materials, excavation of contaminated soil, processing waste, and bulk waste on WISS and assumes future land use to be residential. Contaminated areas of the building will be decontaminated to prevent the spread of any removable contamination, and the building will be demolished. Demolition is expected to allow access to contaminated soils underneath the building. Contaminated material and bulk waste will be separated using gross separation techniques and transported to an appropriate commercial disposal facility for radiological or mixed waste, hazardous waste (RCRA Subtitle C), or solid waste (RCRA Subtitle D).

Excavation will be based on site-specific unrestricted use cleanup levels (5 pCi/g of combined Ra-226 and Th-232 above naturally occurring background activity). It is anticipated that cleanup to the criteria stated above may require excavation into the clay layer. This alternative will ensure the integrity of the clay layer. Contaminated waste will be disposed of at an appropriate commercial disposal facility. Groundwater encountered during excavation activities will be removed and if any site COCs are present the water will be treated to meet applicable discharge criteria specified in the NJPDES equivalency permit or the pre-treatment standards of the receiving POTW prior to release.

Compliance with soil cleanup criteria for radionuclides will be established by methods that are compatible with MARSSIM. A representative number of samples obtained from the excavation areas also will be subject to chemical analysis and comparison to chemical COC criteria.

The potential exists that residual contamination above the cleanup criteria established in this ROD may be inaccessible due to the clay layer. If residual contamination must remain in order to protect the natural clay barrier, and contamination levels are found to exceed the required cleanup levels using appropriate averaging methods, then a risk assessment will be conducted to evaluate risks from residual materials, and to determine if the remedial action is protective of unrestricted use of the property. If not protective, then appropriate use restrictions will be established to limit the type of exposures that could present an unacceptable risk to human health.

Following removal of contaminated soil, the site groundwater will be monitored to establish groundwater quality. New onsite monitoring wells near the former waste pits will be installed. Periodic sampling of the site wells will be performed for a five-year period following completion of the source removal. The results of this monitoring will be assessed after the five-year period. It is anticipated that contaminant levels in groundwater will decrease to levels established in the SDWA 40 CFR 141, the N.J.A.C. 7:9, and the N.J.A.C. 7:10-1, and that no restrictions or controls will be necessary at the site following the monitoring. However, in the event that groundwater monitoring indicates the presence of site COCs above levels established in either the SDWA 40 CFR 141, the N.J.A.C. 7:9, or the N.J.A.C. 7:10-1, an evaluation of potential response actions will be conducted, and an appropriate response will be taken.

If residual contamination must remain in order to protect the natural clay barrier, and contamination levels are found to exceed the cleanup levels using appropriate averaging methods; then a risk assessment will be conducted to evaluate risks from the residual materials, and to determine if the remedial action is protective for unrestricted use of the property. If this residential risk evaluation indicates that risks from residual materials will not allow for unrestricted uses, then appropriate use restrictions will be established to limit the type of exposures that could present an unacceptable risk to human health. If the post-excavation survey demonstrates that the cleanup levels are achieved or, if required, a risk assessment demonstrates

protectiveness of the remedial action and groundwater monitoring demonstrates that site COCs are not present above levels established in the SDWA 40 CFR-141, the N.J.A.C. 7:9, and the N.J.A.C. 7:10-1, the site will have met the criteria for unrestricted use. In accordance with the Federal Facility Agreement, executed between EPA and the DOE (April 1991), and as amended by an Interagency Agreement between EPA and USACE (March 1998), EPA may conduct a five-year review at the Wayne Site five years after the start of the remedial action. No additional five-year reviews will be necessary. Figure 7 shows the major components of this alternative, and Table 4 shows the estimated costs.

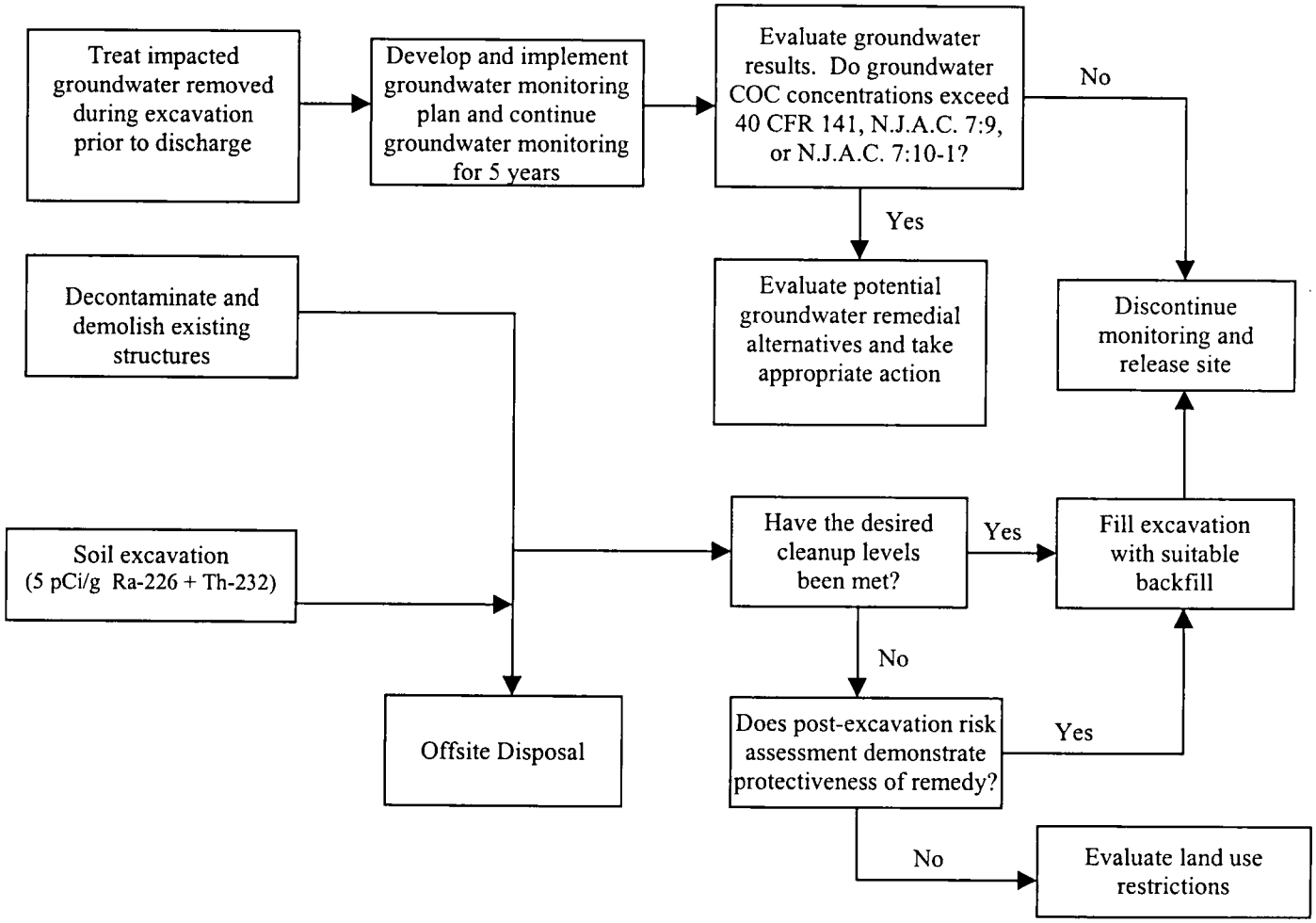


**Figure 7. Major Components of Alternative 4, Excavation to Residential Use and Disposal**

**Table 4. Estimated Costs for Alternative 4, Excavation to Residential Use and Disposal**
(30-year cost, 1999, $ in thousands)

| Activity | Remedial Action | O&M | Total |
|---|---|---|---|
| **Excavation & Backfill** | $3,174 | $0 | **$3,174** |
| **GW Treatment** | $281 | $0 | **$281** |
| **Transportation & Disposal** | $14,458 | $0 | **$14,458** |
| -Transportation | $6,899 | $0 | **$6,899** |
| -Disposal | $7,560 | $0 | **$7,560** |
| **Construction & Sampling** | $743 | $167 | **$910** |
| -Monitoring, Sampling & Analysis | $322 | $135 | **$457** |
| -Site Development | $94 | $0 | **$94** |
| -Building & Services | $24 | $0 | **$24** |
| -Other Collection & Control (Monitoring Well Installation) | $0 | $32 | **$32** |
| -Demolition & Decontamination | $271 | $0 | **$271** |
| -Post RA Reports | $32 | $0 | **$32** |
| **Other** | $1,897 | $0 | **$1,897** |
| -Site Inst. Controls, Surv. & Maint. | $16 | $0 | **$16** |
| -Field Support | $1,882 | $0 | **$1,882** |
| **Total Remedial Action and O&M** | $20,554 | $167 | **$20,722** |
| Project Management | | | $3,400 |
| Remedial Design {10% × (Total RA & O&M - Trans. & Disp.)} | | | $626 |
| **Total Project Support** | | | **$24,748** |
| Contingency (25% of Total Project Support) | | | $6,187 |
| **Subtotal Project Cost** | | | **$30,935** |
| Program Support (10% of Subtotal Project Cost) | | | $3,093 |
| **Total Project Cost** | | | **$34,028** |

Note: Disposal costs are based on a LLW facility. Cost savings may be realized during implementation of this remedial action if some of the material with low concentrations of radionuclides can be segregated and disposed of at a Subtitle C or Subtitle D facility.

### 8.2.5 Alternative 5 – Excavation to Recreational Use and Disposal

This alternative is similar to Alternative 4, except that the future use of the land at the site was assumed to be recreational. Based on this land use, the cleanup level for radionuclides would have been an average concentration of 15 pCi/g above naturally occurring background for Th-232 and Ra-226, combined, and 100 pCi/g above background concentrations for total uranium. The cleanup level for chemicals would have been based on non-residential (recreational) use scenarios.

Groundwater encountered during excavation activities would have been removed and if site COCs were present the water would have been treated to meet discharge criteria specified in the NJPDES equivalency permit or the pre-treatment standards of the receiving POTW and then released. Following excavation, the site would have been covered by a minimum of two feet of suitable soil. As described in Alternative 4, precautions would have been taken to ensure the integrity of the clay layer during remediation. Institutional controls, in the form of land use restrictions to prohibit residential land use, would have been implemented as part of the remedial action. Following excavation, post-remedial sampling using a method comparable to MARSSIM would have been conducted to ensure the

remedy has obtained cleanup levels. If determined necessary based upon MARSSIM site surveys, a risk evaluation would have been conducted to determine whether the remedial action implemented is protective. Groundwater monitoring would have been conducted for 30 years following excavation of the soils and waste, using existing and newly installed wells. A monitoring plan would have been developed to measure contaminants in groundwater and to evaluate the potential for migration of contaminants following remediation. In the event that groundwater monitoring indicated the presence of COCs above levels established in the SDWA 40 CFR 141, the N.J.A.C. 7:9, and the N.J.A.C. 7:10-1, an evaluation of potential remedial actions would have been conducted and an appropriate response would have been implemented. Five-year reviews would have been conducted as required by CERCLA 121(c).

Figure 8 shows the major components of this alternative, and Table 5 shows the estimated costs.

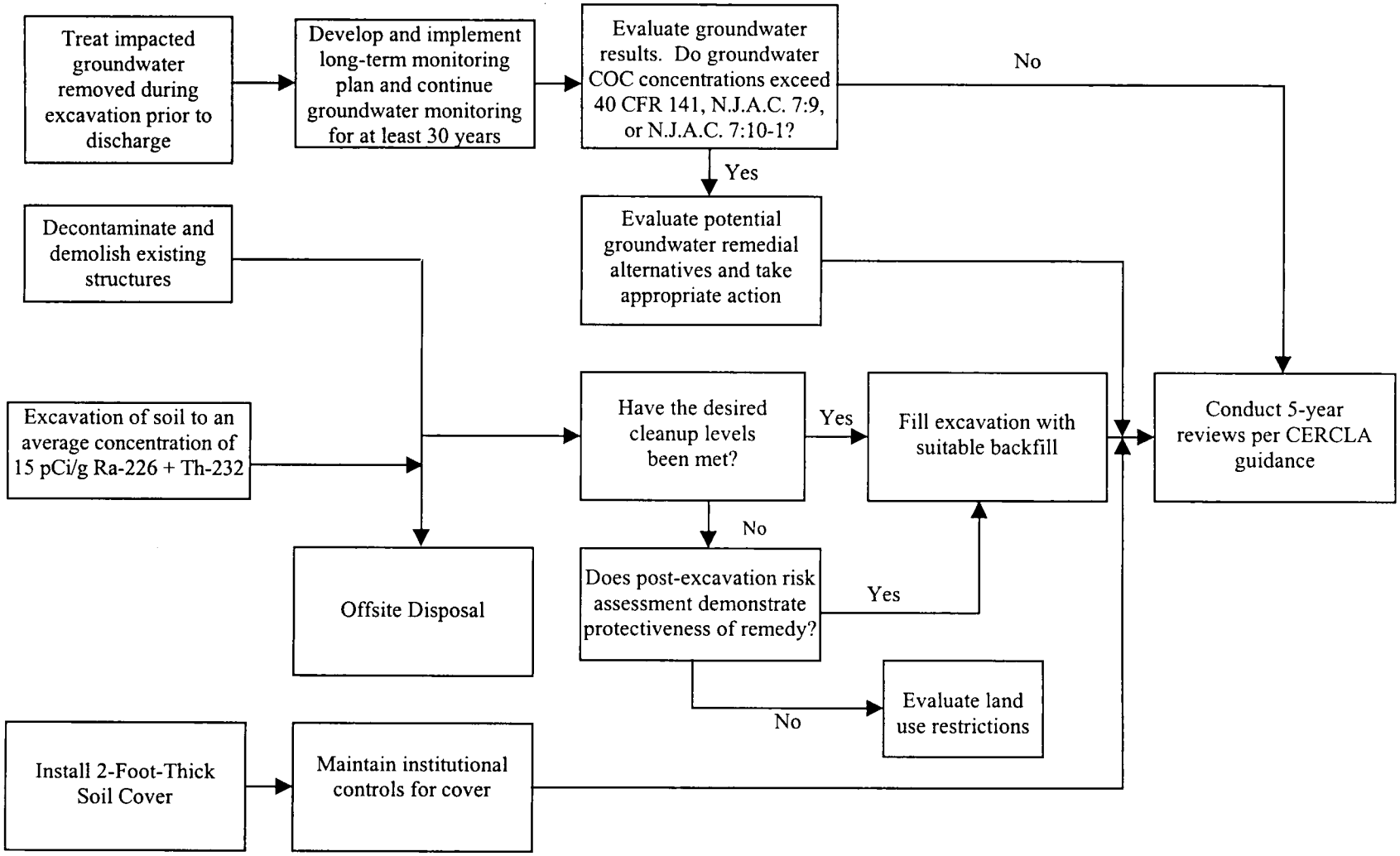


**Figure 8. Major Components of Alternative 5, Excavation to Recreational Use and Disposal**

**Table 5. Estimated Costs for Alternative 5, Excavation to Recreational Use and Disposal**
(30-year cost, 1999, $ in thousands)

| Activity | Remedial Action | O&M | Total |
|---|---|---|---|
| **Excavation & Backfill** | $1,581 | $0 | **$1,581** |
| **GW Treatment** | $188 | $0 | **$188** |
| **Transportation & Disposal** | $5,719 | $0 | **$5,719** |
| -Transportation | $2,745 | $0 | **$2,745** |
| -Disposal | $2,974 | $0 | **$2,974** |
| **Construction & Sampling** | $575 | $895 | **$1,470** |
| -Monitoring, Sampling & Analysis | $166 | $863 | **$1,029** |
| -Site Development | $94 | $0 | **$94** |
| -Building & Services | $12 | $0 | **$12** |
| -Other Collection & Control (Monitoring Well Installation) | $0 | $32 | **$32** |
| -Demolition & Decontamination | $271 | $0 | **$271** |
| -Post RA Reports | $32 | $0 | **$32** |
| **Other** | $1,351 | $0 | **$1,351** |
| -Site Inst. Controls, Surv. & Maint. | $8 | $0 | **$8** |
| -Field Support | $1,343 | $0 | **$1,343** |
| **Total Remedial Action and O&M** | $9,414 | $895 | **$10,309** |
| Project Management | | | $2,314 |
| Remedial Design {10% x (Total RA & O&M - Trans. & Disp.)} | | | $459 |
| **Total Project Support** | | | **$13,082** |
| Contingency (25% of Total Project Support) | | | $3,270 |
| **Subtotal Project Cost** | | | **$16,352** |
| Program Support (10% of Subtotal Project Cost) | | | $1,635 |
| **Total Project Cost** | | | **$17,987** |

Note: Disposal costs are based on a LLW facility. Cost savings may be realized during implementation of this remedial action if some of the material with low concentrations of radionuclides can be segregated and disposed of at a Subtitle C or Subtitle D facility.

# 9. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

## 9.1 INTRODUCTION

EPA has established nine criteria against which the alternatives are to be evaluated. The nine criteria are divided into: 1) threshold criteria that must be met, 2) balancing criteria which identify the major tradeoffs among the alternatives, and 3) modifying criteria which evaluate state and public acceptance. To fulfill the threshold criteria, an alternative that is protective of human health and the environment and attains ARARs must be selected. The balancing criteria are evaluated to balance technical and cost considerations and to identify and utilize permanent solutions and treatment technologies to the maximum extent practicable in determining the most appropriate remedy for a site. Public acceptance of the selected remedy are formally evaluated following the public comment period. The criteria, as set forth in the NCP [40 CFR 300.430(e)(9)(iii)], are as follows.

**Threshold Criteria**

1. **Overall Protection of Public Health and the Environment** addresses how the alternative reduces the risk from potential exposure pathways through treatment, engineering, or institutional controls (i.e., the long-term effectiveness). It also examines whether alternatives pose any short-term or cross-media impacts outside the CERCLA risk range of $10^{-4}$ to $10^{-6}$.

2. **Compliance with Applicable or Relevant and Appropriate Requirements** (ARARs) addresses the ability of each alternative to meet its respective ARARs, or provides the justification for invoking a waiver.

**Balancing Criteria**

3. **Long-term Effectiveness and Permanence** refers to the ability of an alternative to maintain reliable protection of human health and the environment over time, after the RAOs have been met. Alternatives that afford greater long-term effectiveness and permanence are those that minimize volumes of waste at the site, minimize long-term maintenance and monitoring, and minimize institutional controls.

4. **Short-term Effectiveness** considers the ability to protect workers and the community during the remedial action and before RAOs are met. Environmental impacts (both short-term and long-term) from implementing the action also are considered, as well as the time to achieve cleanup goals.

5. **Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment** addresses the anticipated performance of the technologies that may be employed in achieving these treatment goals. This criterion includes the amount of waste treated or destroyed; the reduction in toxicity, mobility, or volume; the irreversibility of the treatment process; and the type and quantity of residuals resulting from the treatment process.

6. **Implementability** deals with the technical and administrative feasibility of implementing the alternatives, as well as the availability of goods and services.

7. **Cost** evaluation includes the estimated capital and operations and maintenance costs.

**Modifying Criteria**

8. **State Acceptance** indicates whether the state agency concurs with, opposes, or has no comment on the preferred remedial action alternative at the present time.

9. **Community Acceptance** is based on comments received from the public during the public comment period. These comments are assessed in the Responsiveness Summary attached to this ROD.

## 9.2 COMPARISON OF ALTERNATIVES

The nine criteria have been separated into three groups (threshold, balancing, and modifying criteria) for evaluation based on the function of each criteria as outlined in the NCP. The five alternatives were compared in the FS with respect to the seven threshold and balancing criteria. (The two modifying criteria are evaluated in Section 9.2.3 of this chapter and in Chapter 3.)

### 9.2.1 Threshold Criteria

Threshold criteria are "Overall Protection of Human Health and the Environment" and "Compliance with ARARs". These are statutory requirements that must be satisfied by the action for it to be eligible for further detailed evaluation in the FS and subsequent selection as the preferred alternative.

9.2.1.1 Overall Protection of Human Health and the Environment

Alternative 1, No Action, and Alternative 2, Monitoring and Institutional Controls, are not considered protective because unacceptable exposures could result, since site contaminants remain in place without engineering controls. Under these scenarios, future risks at the site would have been above the CERCLA cancer risk threshold of $10^{-4}$. Alternative 3 would have been protective, but the level of protectiveness is uncertain over the long term because the longevity of the slurry wall relative to the long half-lives of the radionuclides is uncertain. Alternatives 4 and 5 remove contaminants above cleanup levels for unrestricted residential or recreational use and result in a cleanup that eliminates risks outside the CERCLA risk threshold (while ensuring the integrity of the clay layer). Waste materials would be disposed of at an offsite licensed or permitted commercial disposal facility, thereby providing long-term protection.

9.2.1.2 Compliance with ARARs

Alternatives 1 and 2 do not meet ARARs.

Alternative 3 would have met ARARs because the site contaminants would have been contained and risks would have been reduced to meet the substantive requirement of 10 CFR 20.

Alternatives 4 and 5 meet ARARs because contamination exceeding the 10 CFR 20 decommissioning requirements, for use without radiological or chemical restrictions or for restricted (recreational) use, would be removed and permanently isolated in a disposal facility.

### 9.2.2 Balancing Criteria

Five balancing criteria were used to assess trade-offs between alternatives. These trade-offs were ultimately used to identify a preferred alternative and to select the final remedy. Alternatives 1 and 2 did not meet the threshold criteria and were rejected. For this reason they are not included in the discussion that follows.

The five balancing criteria are:

- Long-term Effectiveness and Permanence,
- Short-term Effectiveness,
- Reduction of Toxicity, Mobility, or Volume through Treatment,
- Implementability, and
- Costs.

9.2.2.1 Long-term Effectiveness and Permanence

The long-term effectiveness of the three action alternatives at the site vary. Alternatives 4 and 5 remove waste above the cleanup levels developed in site-specific risk analyses, assuming residential land use for Alternative 4 and recreational land use for Alternative 5. The removed waste materials are then isolated in an offsite disposal facility. However, long-term institutional controls are required for Alternative 5 to preclude future residential development of the property. Land use restrictions would be reliable only if they could be effectively enforced. Land use restrictions are considered reliable for the WISS as long as the federal government owns the property. However, a long-term management strategy would need to be developed to ensure the property was maintained for recreational use. In addition to requiring institutional controls, Alternative 3 would have committed the property to continued use as a radioactive waste storage site and required significant long-term maintenance and management and reviews every 5 years to ensure long-term effectiveness. Five-year reviews are required for all alternatives that leave contaminants above levels for unrestricted use. The five-year review requirement would be eliminated for Alternative 4 if the cleanup criteria are met and the groundwater monitoring portion of remedial action indicates the concentrations of COCs for the site are not present above levels established by either the SDWA 40 CFR 141, N.J.A.C. 7:9, or N.J.A.C. 7:10-1. Risks would be below the EPA upper risk limit of ($10^{-4}$) for Alternatives 3, 4, and 5. Estimated doses for Alternatives 3, 4, and 5 are all below the substantive requirements of 10 CFR 20, Subpart E.

9.2.2.2 Short-term Effectiveness

All action alternatives would have the potential to generate dust, noise, and increased traffic during remedial activities. Alternative 4 involves the greatest potential short-term risks to workers during implementation, primarily due to the potential for radiological exposure and exposure to routine construction hazards associated with soil excavation. The potential short-term risks are estimated to be higher because Alternative 4 will take longer than any other alternative to implement. Implementation times for each of the alternatives are presented in Table 6. Short-term risks to workers and the public are considered low and easily controlled for all the action alternatives because only excavation, hauling, and routine construction activities would be involved. The highest risks for all the action alternatives are related to offsite transportation of waste materials or borrow soils and the associated potential for transportation accidents. The design and implementation of all the action alternatives will be completed in a manner that minimizes worker and public exposure, to the practical limits of technology, to ensure that all risks are minimized and are within acceptable limits.

**Table 6. Implementation Times for the Wayne Site Alternatives**

| Alternative | Time to Implement[1,2,3] |
|---|---|
| 1 | 0 |
| 2 | 0 |
| 3 | 14 months |
| 4 | 27 months |
| 5 | 13 months |

[1]An alternative's implementation time is the time it takes from mobilization of facilities and equipment to demobilization and does not include post-remedial operations and maintenance activities, such as environmental monitoring.
[2]Implementation times are estimated for each alternative based on +50 percent to –30 percent level of accuracy.
[3]Implementation time assumes appropriate funding in place throughout project

9.2.2.3 Reduction of Toxicity, Mobility, or Volume through Treatment

None of the alternatives include treatment as a major element. The principal contaminants at WISS are radioactive; therefore, the toxicity cannot be reduced by stabilization. As a result, stabilization and other technologies that reduce the mobility of contaminants in a soil matrix were not considered for this site. Gross separation techniques could be implemented under Alternatives 4 and 5 to separate large boulders and pieces of debris from soils. Soils with low levels of radioactivity can also be separated from the waste pit materials using standard construction equipment and techniques. The separated materials will be evaluated for appropriate commercial disposal options. Based on treatability studies and site characterization data and USACE review of current literature and available technologies, treatment of the soil and waste materials was eliminated from consideration at the site. Site characterization indicated that waste material has an average of 51 percent fines (silt- and clay-sized material). This high percentage of fine material suggests that soil washing is not feasible, because radionuclides are typically associated with the fine particles and are difficult to removed from washing fluids. The process would result in radiologically contaminated wastewater. Groundwater removed during excavation activities in Alternatives 4 and 5 would be treated to remove radiological and chemical contaminants prior to discharge.

9.2.2.4 Implementability

Alternative 3 is the most implementable because the construction related activities (landfill construction and hauling) are readily available. Alternatives 4 and 5 will be more difficult to implement than Alternative 3. Because potential groundwater problems may be encountered during excavation (portions of the site groundwater are under artesian conditions), Alternatives 4 and 5 also involve excavation of waste material above a natural clay barrier. This may require precision excavation techniques to protect the integrity of the clay layer. However, both equipment and specialists are available. All action alternatives except Alternative 4 involve land use restrictions to control future use of the site property (if the residential cleanup levels are met). Although the Federal government currently owns the WISS property, it is uncertain how this property will be managed in the long-term.

9.2.2.5 Costs

Alternatives were evaluated in terms of estimated capital and operation and maintenance (O&M) cost. Estimated costs are based on a +50 percent to –30 percent level of accuracy. Costs are based on the remediation activities specified in each alternative. The insitu remediation volumes for excavation Alternatives 4 and 5 were 26,000 $m^3$ (34,000 $yd^3$) and 10,000 $m^3$ (13,000 $yd^3$) respectively. (Note: actual volume of material excavated under the removal action was 40,000 $yd^3$.) Table 7 presents a summary of the estimated cost for each alternative.

**Table 7. Cost of Alternatives**

| Alternative | Description | FY 99 (million $) |
|---|---|---|
| 1 | No Action | 0 |
| 2 | Monitoring and Institutional Controls | 13 |
| 3 | Containment and Institutional Controls | 17 |
| 4 | Excavation to Residential Use and Disposal[a,b] | 34 |
| 5 | Excavation to Recreational Use and Disposal[a,b] | 18 |

[a] For cost purposes, all contaminated soil under this alternative is assumed to require Low Level Waste disposal. If a portion of the waste materials containing low concentrations of radionuclides and chemicals can be disposed at a RCRA Subtitle C disposal facility, the potential cost savings for disposal would be up to $483,000.

[b] If COC contaminants are found in perimeter monitoring wells during the groundwater monitoring program, potential groundwater remedial alternatives will be evaluated and appropriate action will be taken. This provision has not been estimated in the cost for these alternatives. For Alternative 3, the groundwater containment system is estimated to cost $412,000.

### 9.2.3 Modifying Criteria

Modifying criteria are evaluated following comments on the proposed plan. The two modifying criteria are:

- State Acceptance, and
- Community Acceptance.

9.2.3.1 State Acceptance

State Acceptance refers to technical and administrative issues and concerns the New Jersey Department of Environmental Protection (NJDEP) may have regarding any of the alternatives for this site.

The NJDEP was provided copies of draft and final documents (RI report, FS, and proposed plan) leading to the development of this ROD. The selection of the final remedy for the WISS has been made by the USACE with the concurrence of the EPA and in consultation with the NJDEP.

Comments were provided by NJDEP during the public comment period for consideration by USACE and EPA in selection of the final remedy for WISS. NJDEP also provided general and specific comments on the FS and Proposed Plan. These comments primarily addressed the use of New Jersey regulations and guidelines as ARARs for the clean up. Comments provided by

NJDEP during the public comment period have been evaluated, placed in the administrative record, and considered in selecting the final remedy for the site.

USACE agreed that the New Jersey Ground Water Quality Standards (N.J.A.C. 7:9-6), Maximum Contaminant Levels (N.J.A.C. 7:10-1), Surface Water Quality Standards (N.J.A.C. 7:9B), and Pollutant Discharge Elimination System (N.J.A.C. 7:14A) are ARARs for the purpose of implementing the remedial action. USACE will comply with the New Jersey Ground Water Quality Standards.

The NJDEP has developed a draft regulation concerning the remediation of radiologically contaminated soil (N.J.A.C. 7:28-12.1 et. seq.). USACE consulted with NJDEP regarding the application of this proposed regulation to the Site. NJDEP agreed with the overall strategy chosen for the site remediation, to clean up the site to meet the unrestricted use criteria.

9.2.3.2 Community Acceptance

Community Acceptance addresses the issues and concerns the public had regarding each of the alternatives. This criterion is evaluated formally following the public comment period.

Public comments on the Proposed Plan for cleanup of WISS were received by USACE at a public meeting held on June 30, 1999. In addition, written comments were received during the comment period, which extended from June 16 to August 16, 1999. Both written and oral comments are addressed in the Responsiveness Summary, which is attached to this ROD. In general, commentors supported the remedial alternative recommended in the Proposed Plan, Alternative 4, which included cleaning up soil contamination to levels that would be protective of human health even if the land use became residential. Alternative 4 is selected as the remedial action for this site in this ROD.

## 9.3 SUMMARY

Based on the nine criteria, Alternatives 1 and 2 would not be protective of human health and the environment. Therefore, they do not meet the threshold criteria for selection.

Alternative 3 would have been protective of human health and the environment and would have attained ARARs. However, protection over the long-term was uncertain because high concentrations of radioactive contamination would have been left onsite requiring long-term management and maintenance.

Alternative 5 would have required long-term institutional controls to preclude future residential development of the WISS property. Alternative 5 would have been protective of human health and the environment and complied with pertinent environmental regulations.

Alternative 4 is protective of human health and the environment, complies with ARARs, and added the highest level of community acceptance. Moreover, this alternative allows release of the WISS property for unrestricted future use.

## 10. THE SELECTED REMEDIAL ACTION

Alternative 4 has been selected because it is protective of human health and the environment; cost effective; complies with all Federal and State environmental requirements that are ARARs to the hazardous substances, pollutants, or contaminants at the site; utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; addresses community concern by removing radioactive materials and chemicals from the site; and allows unrestricted use of the property. This alternative is believed to provide a reasonable balance among the alternatives. The selected alternative outlined in this ROD is intended to be the final remedy for all contaminated media on the 6.5 acre Wayne Interim Storage Site, including soil and waste, groundwater, debris, and the building.

The major components of the selected remedy include:

- Excavation and disposal of the remaining contaminated subsurface materials to an average concentration of 5 picoCuries/gram (pCi/g) of radium 226 (Ra-226) and thorium-232 (Th-232) combined above naturally occurring background concentrations at WISS and an average concentration of 100 pCi/g of total uranium above naturally occurring background as determined by surveys consistent with the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). Remediating the site to these levels eliminates risks above the CERCLA risk threshold for unrestricted use scenarios, and meets the substantive requirements of the applicable and relevant and appropriate requirement (ARAR) 10 CFR 20.1402.

- Excavation and disposal of chemically contaminated soils above levels calculated to be protective of groundwater or above levels protective for unrestricted uses of the property (with regard to chemicals of concern) as specified in Table 8 of this ROD.

- Implementation of a five-year groundwater monitoring program to establish groundwater quality after contaminated soil has been removed.

- Decontamination and demolition of the building on WISS, removal and offsite disposal of demolition debris, removal and offsite disposal of contaminated materials under the building.

- Removal and treatment of groundwater encountered during excavation if site COCs are identified in the water to meet discharge criteria specified in the NJPDES equivalency permit, or the pre-treatment standards of the receiving POTW prior to release.

- It is anticipated that cleanup to the criteria stated above may require excavation into the clay layer which acts as a barrier protecting the lower aquifer. The selected alternative will ensure the integrity of the clay layer. Contaminated waste will be disposed of at an appropriate commercial disposal facility.

Compliance with soil cleanup criteria for radionuclides will be established by methods that are compatible with MARSSIM. A representative number of samples obtained from the excavation areas will also be subject to chemical analysis and comparison to chemical COC criteria.

Following excavation and treatment of groundwater in the excavation area, groundwater will be monitored for five years following soil removal to establish groundwater quality. It is anticipated that contaminant levels in groundwater will decrease to levels at or below those consistent with background within the five-year monitoring portion of the remedial action, and no restrictions or controls will be necessary at the site following the monitoring period. In the event that groundwater monitoring indicates the presence of contaminants at concentrations exceeding levels established in the SDWA 40 CFR 141, N.J.A.C. 7:9, and N.J.A.C. 7:10-1, an evaluation of potential response actions will be conducted and an appropriate response will be taken.

If the post-excavation survey demonstrates the cleanup levels are achieved and groundwater monitoring demonstrates that site COCs are not present above levels established in the SDWA 40 CFR-141, N.J.A.C. 7:9, and 7:10-1, the site will have met the criteria for unrestricted use. In accordance with the Federal Facility Agreement, executed between EPA and the DOE (April 1991), and as amended by an Interagency Agreement (March 1998) between EPA and USACE, EPA may conduct a five-year review at the Wayne Site five years after the start of the remedial action. No additional five-year reviews will be necessary. The potential exists that residual contamination above the cleanup criteria established in this ROD may be inaccessible due to the clay layer. If residual contamination must remain in order to protect the natural clay barrier, and results are found to exceed the cleanup levels using appropriate averaging methods, then a risk assessment will be conducted to evaluate risks from residual materials and to determine if the remedial action is protective of unrestricted use of the property. If this residual risk evaluation indicates that risks from residual materials will not allow for unrestricted uses, then appropriate use restrictions will be established to limit the type of exposures that could present an unacceptable risk to human health. Five-year reviews of the remedy would be implemented in accordance with CERCLA 121 (c).

Table 8 presents the radiological and chemical cleanup levels that have been identified for WISS based on all pathways, including protection of groundwater resources. Soil cleanup levels that are protective of groundwater were developed because groundwater located within the waste pit materials is contaminated above the SDWA MCLs, New Jersey MCLs, and the New Jersey Ground Water Quality Criteria that have been identified as ARARs for this site. By developing and implementing soil cleanup levels that protect groundwater, the source of the contamination that could potentially leach from the soil to the groundwater would be reduced to levels that would no longer impact groundwater above concentrations identified as safe for drinking water. The soil cleanup criteria presented in Table 8 are protective for both surface contamination where direct contact is possible, and subsurface contamination where leaching of contaminants to groundwater could occur.

## Table 8 Soil Cleanup Levels

| Metals | Groundwater Criteria Lower of N.J.A.C. 7:10-1, N.J.A.C. 7:9-6.7 or 40 CFR 141 (μg/L) | Selected Criteria Residential Soil Cleanup (mg/kg) | Soil Background[c] (mg/kg)[a] |
|---|---|---|---|
| Antimony | 6 | 5.4[c] | NA |
| Arsenic | 8 | 20[b] | 7.6 |
| Chromium | 100 | 38.4[c] | 21.1 |
| Lead | 10 | 400[b] | 173 |
| Mercury | 2 | 2[c] | 0.32 |
| Molybdenum | No available criteria | 72[c] | NA |
| Thallium | 2 | 2[b] | 0.9 |
| **Radionuclides** | **Groundwater Criteria Lower of N.J.A.C. 7:10-1, N.J.A.C. 7:9-6.7 or 40 CFR 141 (pCi/L)** | **Selected Criteria Residential Soil Cleanup (pCi/g)** | **Soil Background[c] (pCi/g)[a]** |
| Ra 226 + Ra 228 Combined | 5 | N/A | N/A |
| Th-232 + Ra-226 Combined | N/A | 5[d,e] | Th-232 – 1.1<br>Ra-226 – 1.0 |
| Total Uranium | No available criteria | 100 | 4.2 (U-238, U-234)[f] |
| Gross Alpha (excluding Rn and U) | 15 | N/A | N/A |

[a] Source: *Subsurface Characterization Study for the Wayne Interim Storage Site* (1988)
[b] New Jersey Residential and Non-Residential Soil Cleanup Criteria (Revised May 3, 1999), (N.J.A.C. 7:26D)
[c] Soil cleanup values for direct contact exposure are less restrictive for this contaminant. The more stringent protection of groundwater levels is being proposed as cleanup levels. Concentration protective of groundwater using a dilution-attenuation factor of 20 (Ref: Technical Memorandum for the Determination of Chemical Soil Cleanup Values for Protection of Groundwater for the Wayne Interim Storage Site, June 1999).
[d] Th-232 is substituted for Ra-228 based on assumed equilibrium.
[e] Cleanup level based on site specific risk assessment. Ra-226 + Th-232 = an average concentration of 5 pCi/g above background concentrations for unrestricted residential land use.
[f] U-234 assumed to be in secular equilibrium with U-238.

# 11. STATUTORY DETERMINATIONS

CERCLA Section 121 requires that the selected remedy must comply with all Federal and State environmental requirements that are applicable or relevant and appropriate (i.e., ARARs) to the hazardous substances, pollutants, or contaminants at the site or to the activities at the site. The remedy must be protective of human health and the environment; be cost effective; utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and satisfy the preference for treatment that reduces toxicity, mobility, or volume as a principal element, or explain why this preference is not satisfied.

## 11.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy will protect human health and the environment by removing contaminated materials that are above the unrestricted use levels for permanent offsite disposal. This will eliminate the pathways and risks associated with exposure to radioactively and chemically contaminated soils, including direct exposure as well as potential exposure through groundwater. The site-specific risk analysis demonstrated that soil cleanup levels of an average concentration of 5 pCi/g of Th-232 and Ra-226 combined and total uranium concentrations of 100 pCi/g above naturally occurring background concentrations will result in a cleanup that eliminates risks outside the CERCLA risk threshold (post remedial cancer risk of $2 \times 10^{-4}$) for unrestricted residential reuse. Cleanup of chemical COCs will result in a post remedial cancer risk that is several orders of magnitude lower ($1 \times 10^{-8}$), and is below the CERCLA risk threshold. Chemical non-carcinogenic hazard index will be .07 for unrestricted residential reuse, and will be below the CERCLA hazard index threshold of 1.

## 11.2 COMPLIANCE WITH ARARS

The selected remedy will be designed to comply with all ARARs.

<u>Federal ARARs</u>

**Nuclear Regulatory Commission; Standards for Protection against Radiation; Radiological Criteria for License Termination**

<u>10 CFR 20 Subpart E</u>

This rule provides standards for determining the extent to which lands must be remediated before decommissioning of a site can be considered complete and the license terminated. Standards are based on doses from all pathways as shown in Appendix C of the Wayne Interim Storage Site Feasibility Study. Although no license is in effect at Wayne, this regulation is considered relevant and appropriate to the protection of human health and the environment.

**Environmental Protection Agency; National Emission Standards for Hazardous Air Pollutants; National Emission Standard for Asbestos**

40 CFR 61 Subpart M (1992) (40 CFR 61.145 and 61.150)

This rule is applicable to the demolition of the building. The rule establishes standards for demolition and renovation including procedures for asbestos emission control and disposal requirements.

**Environmental Protection Agency; National Pollutant Discharge Elimination System (NPDES); Permit Application and Special NPDES Program Requirements**

40 CFR 122 Subpart B

This rule is applicable to the discharge of pollutants from any point source into waters of the United States. The act defines a point source as any discernible conveyance from which pollutants are or may be discharged. Stormwater discharges associated with construction and other industrial activity require an NPDES permit. This regulation will apply to discharges of treated groundwater and stormwater runoff. A permit is not required for onsite CERCLA response actions, but the substantive requirements apply.

**Environmental Protection Agency; Safe Drinking Water Act**

40 CFR 141

Primary drinking water standards consist of Federally enforceable maximum contaminant levels and, in the case of multiple contaminants at CERCLA sites, non-zero maximum contaminant level goals, as appropriate.

**State ARARs**

**New Jersey Groundwater Quality Criteria**

N.J.A.C. 7:9-6.6 et seq.

Groundwater contamination standards in this regulation would be used to establish criteria by which contaminated groundwater will be evaluated.

**New Jersey Surface Water Quality Standards**

N.J.A.C. 7:9B et seq.

Establishes standards, procedures for establishing water quality-based effluent limitations, and procedures for classifying surface water bodies.

**New Jersey Maximum Contaminant Levels**

N.J.A.C. 7:10-1 et seq.

New Jersey drinking water standards consist of enforceable maximum contaminant levels.

**New Jersey Pollutant Discharge Elimination System**

N.J.A.C. 7:17A-1 et seq.

This rule is applicable to the discharge of pollutants from any point source into waters of the State of New Jersey. This regulation will apply to discharges of treated groundwater and stormwater runoff. A permit is not required for onsite CERCLA response actions, but the substantive requirements apply.

**To Be Considered (TBC) Criteria**

**New Jersey Cleanup Standards for Contaminated Sites**

New Jersey Soil Cleanup Criteria for residential and non-residential cleanups NJSCC (May 3, 1999), N.J.A.C. 7:26D

These standards establish residential and non-residential direct contact cleanup standards for regulated chemicals and other hazardous substances in soil based on an additional cancer risk of one in a million for carcinogens, a Hazard Index not to exceed one for non-carcinogens, or based on natural background levels. In addition, impact to groundwater standards have been established for some chemicals. Though not a formally promulgated regulation, these standards were taken into consideration in the development of cleanup goals. The New Jersey residential soil criteria for arsenic, lead, and thallium were identified in this ROD in consideration of them being: 1) readily available and developed with consideration of background levels specific to the state of New Jersey; 2) based on published methodologies which are generally consistent with relevant EPA and USACE risk assessment guidance; and 3) acceptable by State and Federal regulators. Additionally, implementing these criteria at the Wayne Site has little impact on the quantity of soil requiring excavation because nearly all of the chemically contaminated soil is co-located with the more significant radiological contamination and will be removed in achieving the radionuclide clean criteria.

The selected remedy is designed to comply with the identified ARARs. USACE will comply with the pertinent USACE health and safety requirements and work practices outlined in USACE technical requirement guidance documents.

## 11.3 COST EFFECTIVENESS

The selected remedy is cost effective because it provides overall protectiveness proportional to its cost. The estimated cost of the selected remedy is greater than other alternatives, yet provides a higher degree of overall protection and does not rely on long-term management for the maintenance of institutional controls or long-term monitoring to ensure protectiveness.

## 11.4 UTILIZATION OF PERMANENT SOLUTIONS AND INNOVATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

The selected remedy will be effective in the long-term because the contamination above residential risk-based levels will be removed for permanent offsite disposal in a licensed or permitted disposal facility. Treatment was found to be impracticable for the radiological contaminants that are the principal contaminants of concern at WISS. Because the contaminant levels in groundwater monitored by a series of permanent wells are not above criteria found in either 40 CFR 141, N.J.A.C. 7:9-6, or N.J.A.C. 7:10-1, only groundwater in contact with waste pit material will be addressed. Groundwater that has been in contact with the waste pits will be removed from the excavation area and if site COCs are present the water will be treated to meet discharge criteria specified in the NJPDES equivalency permit, or the pre-treatment standards of the receiving POTW prior to release. Following soil excavation and disposal, groundwater will be monitored and assessed for 5 years to evaluate groundwater quality.

## 11.5 PREFERENCE FOR TREATMENT THAT REDUCES TOXICITY, MOBILITY, OR VOLUME

The selected remedy does not utilize source material treatment as a principal element because treatment of the source media at the site was not found to be practicable. Therefore, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. The principal threats on the site are from radioactive contaminants that cannot be treated to reduce their toxicity. Treatment to reduce the volume or mobility of contaminants was found to be technically impracticable. However, groundwater within the waste pit areas will be removed, treated to required discharge limits, and released.

# III. RESPONSIVENESS SUMMARY

## 1. OVERVIEW

In June 1999, the USACE and the EPA released the Proposed Plan for the Wayne Site. A public comment period was open between June 17, 1999, and August 16, 1999. The USACE and the EPA hosted a public meeting on June 30, 1999, during which the preferred alternative was presented and explained to the public and questions and comments were taken for the record. A number of oral and written comments were received on the remedial alternatives evaluated in the Proposed Plan, and are addressed below.

The preferred alternative for the Wayne site that was proposed by the EPA and the USACE in the Proposed Plan, and presented during the related public sessions, was excavation of buried waste to unrestricted use cleanup criteria, decontamination and demolition of contaminated building, off-site commercial disposal, and monitoring of groundwater at the site to verify that site COCs are below criteria established in ARARs. Buried wastes include process wastes and debris and associated native soils that contain radioactivity above the cleanup goals established in the feasibility study (FS).

In general, the public is supportive of the preferred alternative (No. 4) identified in the Proposed Plan, which is selected as the remedial action for this site in this ROD.

## 2. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

Community interest in the Wayne Interim Storage Site dates to the 1980s when it was disclosed that radioactive contamination had migrated from the site onto surrounding properties, many of which were residential. Congress assigned the site to FUSRAP in 1983.

Contamination at the site and on several vicinity properties originated from commercial rare earth and thorium processing, which began in 1948 by Rare Earths, Inc. The Davison Chemical Division of W.R. Grace and Company acquired the site in November 1956. Processing activities continued until the plant permanently closed in July 1971.

From 1967 to 1984, Electro-Nucleonics, Inc., leased and occupied the site. The DOE acquired the site in 1984, at which time the agency was managing FUSRAP. Management of FUSRAP was transferred to USACE in October 1997. The Wayne Interim Storage Site is listed on the EPA's National Priorities List, and is being remediated under CERCLA under a negotiated IAG between USACE and EPA.

The government began conducting environmental monitoring on and around the site in 1984 and publishes the data in an annual report that is made available to the public. In 1985, the DOE conducted a community assessment and then prepared a Community Relations Plan describing how stakeholders would be kept informed of site activities. The Community Relations Plan was updated periodically under DOE and is being updated again in 1999 by the USACE. The most

current plan was prepared in 1995. DOE also established three administrative record file and information repositories for the site.

## 2.1 COMMUNITY PROFILE

The Wayne Township government consists of a mayor, a nine-member council, and a business administrator who manages the various township departments. The land surrounding the Wayne Site is zoned for agricultural, commercial, and residential use. The WISS is zoned for residential use. The population of Wayne Township is approximately 47,000 people.

A remediated portion of the Wayne Site, the Pompton Plains Railroad Spur, is located in Pequannock Township in Morris County. The Pequannock Township government consists of a five-member council, one member of which serves as mayor. A town manager, who reports to council, is responsible for the administration of the township government. Although this ROD addresses only the WISS, the Pequannock Township remains an interested stakeholder in the remediation process at this site.

## 2.2 CHRONOLOGY OF COMMUNITY INVOLVEMENT

Before DOE was assigned responsibility for the Wayne Site, citizens and officials showed a great deal of concern about contamination from the former W.R. Grace facility, particularly regarding the Sheffield Brook, which carried some of the contamination off site.

Beginning in 1983, representatives of DOE met with Wayne Township officials and the public to explain plans for the site and solicit input. These opportunities included:

- a briefing for the mayor in November 1983;
- a public meeting with the mayor, council, and then-Congressman Robert Roe in May 1984;
- a public meeting with the mayor and council in August 1984;
- a meeting with the mayor, council, and affected Sheffield Brook property owners in March 1986;
- a public workshop on evaluating cleanup alternatives for the Wayne Site in February 1994;
- a visit by then-Congressman Martini in June 1996; and
- a briefing in November 1997 at the site to discuss the transfer of FUSRAP to the USACE.

USACE held a public comment period from November 23 to December 22, 1997, on an Engineering Evaluation/Cost Analysis (EE/CA) for a non-time-critical removal action for some of the subsurface soils at the site. Copies of the EE/CA were mailed to key stakeholders for the Wayne Site. There was also news media coverage of the proposed removal action described in the EE/CA. The final EE/CA, with its responsiveness summary, was mailed to the EPA and New Jersey Department of Environmental Protection and key elected officials and placed in the administrative record and information repository locations.

The USACE held two meetings for interested parties at the Wayne Site in January 1998 and December 1998. Fact sheets and newsletters were developed for each meeting and mailed to interested parties. USACE also has held several meetings with local elected officials of Wayne and Pequannock townships to discuss specific concerns about evaluating a rail spur in Pequannock for possible use in the shipment of Wayne Site wastes and monitoring air emissions from the site.

Ongoing and regular community relations activities for the Wayne Site include:

- Issuing community updates on progress at the site approximately once a year;
- Maintaining Administrative Record files and Information Repositories in Wayne and Pequannock townships;
- Conducting public comment periods for proposed cleanup actions at the site;
- Distributing news releases about site activities and meetings, as appropriate;
- Responding to media inquiries;
- Coordinating a speakers bureau about the site as requested by community groups;
- Developing fact sheets to inform the public on issues such as radiation, risk assessment, and CERCLA;
- Creating and maintaining information about FUSRAP and the Wayne Site on the World Wide Web;
- Creating and maintaining a mailing list of interested and affected parties for the site; and
- Regular interaction with regulators, community leaders, and Congressional representatives.

In addition to the meetings and semi-annual newsletters reporting progress at the site, there was considerable coordination from 1984 through 1987 among DOE, its' prime contractor and various township officials regarding detailed planning for removal actions at the vicinity properties. DOE and its' contractor also met with individual property owners and provided information to real estate agents and other individuals who had questions about the Wayne Site.

Finally, the government also provided a grant to Wayne Township for technical consultation in 1996. The USACE continues to provide information about the site to Wayne Township as requested.

## 3. SUMMARY OF PUBLIC COMMENTS AND AGENCY RESPONSES

Both the local and state representatives expressed a strong preference for cleaning up the site to levels consistent with Alternative 4, allowing for unrestricted use following remedial action. Residential land uses are a reasonable future land use for the site, in part, because the property is zoned residential, because there are residences near and adjacent to the site, and because the Township of Wayne has indicated that land use planning indicates the property might be used as residential in the future.

The following comments were received as either written comments or oral comments during the public meeting. Those comments that were similar were grouped together. Each comment is

followed by a response to that comment. A key to specific commentors is located at the end of this section.

1. COMMENT: A commentor noted that the EPA's recommendation for a cleanup consistent with residential land uses appeared to have been instrumental in the consideration afforded the remedial action alternative (No. 4) which had been recommended in the Proposed Plan. (A, B, C)

   RESPONSE: The USACE agrees that EPA input was an important factor in the consideration of the remedial alternatives considered. The comment was supportive of Alternative 4, residential cleanup, which was also the alternative recommended in the Proposed Plan.

2. COMMENT: A representative of local government reported that the data on air monitoring at and around the site has not been provided, as promised. (B)

   RESPONSE: The commentor has subsequently agreed that the air monitoring data at issue had been provided to him a few days before the public meeting.

3. COMMENT: Several commentors, including a representative of local government, thanked USACE and EPA for agreeing to extend the initial 30-day comment period. It was noted that the extension was requested in order that a hydrogeologist recently involved in the site review the documents on which comments are being requested. (B, H)

   RESPONSE: The initial 30-day comment period would have closed on July 16, 1999. It was requested that the comment period be extended. USACE agreed to extend the comment period to August 16, 1999, because the additional time was thought to have been useful in the consideration of the remedial alternatives presented in the Proposed Plan, and the development and submission of constructive comments.

4. COMMENT: Several commentors stated that, of the five remedial alternatives evaluated in the Feasibility Study (FS) and Proposed Plan (PP), only Alternative 4, excavation of contaminated soil to residential land use levels, was acceptable. (A, B, D, G, H, J, L)

   RESPONSE: USACE and EPA agreed with the commentor, in part because much of the land around and near the site is used as residential, that a remedial action which would be protective for residential land uses was appropriate, and was consistent with the remedy selection criteria found in Sections 300.400(e) and (f) of the National Contingency Plan (NCP).

5. COMMENT: A commentor noted that the area has been zoned residential for many years. Also there are already many homes located within one-half mile of the site. These facts support the selection of Alternative 4, cleanup to residential land

uses more clearly than any of the other four alternatives evaluated in the FS and PP. (A, B, H)

RESPONSE: Once again, USACE and EPA agreed with this commentor that a remedial action which would be protective for residential land uses was appropriate and consistent with the remedy selection provisions of the NCP in sections 300.430(e) and (f). Furthermore, the specific information on the number of residences near the site was supportive of Alternative 4, cleanup to residential land uses.

6. COMMENT: A commentor noted that the community in which this site is located has been dealing with, or suffering the consequences of, this contamination for many years, going back to mid to late 1950s. In view of this, several commentors asked that the cleanup of this site be expedited to the extent possible. Another commentor made similar comments, noting that the existence of this site had a variety of negative impacts on the community in which it was located, not just human health effects, but societal or socioeconomic impacts. (B, C, D, G, J)

RESPONSE: The USACE agrees that the cleanup should occur as expeditiously as possible. To the extent that this comment was relevant to remedy selection, it supported the remedial alternatives in the Proposed Plan that would include site cleanup (i.e. Alternatives 3, 4 and 5) as opposed to no action (no. 1) or monitoring and institutional controls (no. 2). USACE agrees that the baseline risk assessment documented that the risks associated with the reasonable maximum exposures (RME) assumed for the site could result in a cancer risk above the threshold identified as protective in the NCP. Although these risks may not be large when compared to natural exposures to carcinogens, and these exposures primarily only occur for land uses which do not currently exist, they are nonetheless sufficient to warrant remedial action under CERCLA.

7. COMMENT: A commentor stated that the contamination of the site appeared to have occurred primarily from a one and a half year period in the late 1950s, during which some dumping on the site occurred, for which there was no permit. Continuing, a reference was made to a $32 million settlement between the DOE (a predecessor to USACE for addressing this site) and W.R. Grace under which W.R. Grace agreed to pay this amount as a consequence of its actions and responsibilities for contamination at the site. The commentor stated that the amount of this settlement was not enough, but understood that this matter was beyond the control of USACE. An additional and related concern was that taken together the funding from the W.R. Grace settlement and federal funding might together still be insufficient complete the implementation of the Alternative (No. 4) recommended in the PP. (B, F, H)

RESPONSE: The United States believes that the amount W.R. Grace agreed to pay under the settlement is appropriate given the facts of the case. The amount of money recovered from W.R. Grace under the settlement will have no bearing

on the nature or magnitude of the cleanup of the Site. The remedy was selected by the USACE and EPA in consultation with NJDEP. The alternative selection in this ROD was in accordance with an administrative process, established by the National Contingency Plan (NCP) without consideration of the amount of money that the United States may collect from potentially responsible parties (PRPs). This process for selecting remedial actions on CERCLA sites, from among the proposed cleanup alternatives presented in the Proposed Plan, is based upon nine remedy evaluation criteria from the NCP, including overall protection of human health and the environment and long-term effectiveness and permanence. The cost of the cleanup alternative is one of these nine criteria, but there is no consideration under this criterion (or any of the other criteria) of the amount of money which might be recovered by the United States from PRPs.

8. COMMENT: Once again referencing a settlement between DOE and W.R. Grace (funds from which can now be put toward the remediation of this site, once the Record of Decision, "ROD", is signed) a commentor noted that federal funding is provided one year at a time. In case funding is not provided in a year before this remedial action is completed, the commentor recommended that funding from the W.R. Grace settlement be used last, so that it could then allow remediation at the site to continue even if federal funding were not provided in a year. (B)

RESPONSE: The availability of the funding from the W.R. Grace settlement will allow the USACE to complete remediation at the Wayne site in accordance with the most efficient schedule. The Interagency Agreement (IAG) between EPA and USACE makes half the settlement funds available to USACE prior to the issuance of this ROD. The balance will be available once both EPA and USACE have signed the ROD. USACE believes that funds already appropriated for the Wayne site or included in the House and Senate Energy and Water Development Appropriation bills for FY 00, together with the settlement funds will be sufficient to complete the project.

9. COMMENT: A commentor was concerned that funding of $8.7 million for fiscal year (FY) 2000 for this site might not be enough, and might constrain how quickly this site could be remediated. Also, some technical considerations about the site, including the need for water treatment, and protections required to protect the aquitard (a clay layer inhibiting the vertical flow of groundwater) beneath the site, might require more funding for FY 2000 than had been allocated. (B, C)

RESPONSE: The USACE will utilize funds appropriated for the Wayne site together with the settlement funds to ensure that the most efficient schedule to complete the project is maintained. The USACE believes that these funds together with funds included in the Energy and Water Appropriation bills for FY 00 will be sufficient to complete the project, even if there was a cost increase connected with protecting the aquitard. As envisioned, the implementation costs of Alternative 4 should not significantly increase because of the need to protect

the aquitard. Although field work related to the excavation might slow the excavation down some, and therefore slightly increase costs, the principal effect upon the implementation of the alternative would be to stop the excavation before any significant damage is done to the clay aquitard (a clay layer inhibiting the vertical flow of groundwater). This should not increase costs much, if any.

10. COMMENT: Another criticism of the settlement with W.R. Grace was that the implementation of the remedial action might cost more than planned. However, the amount of the W.R. Grace settlement is fixed and will not increase even if the costs of the remedial action increase. (B)

RESPONSE: The United States believes that the amount W.R. Grace agreed to pay under the settlement is appropriate given the facts of the case.

11. COMMENT: A commentor noted that other properties in the area, related to this site, had already been cleaned up, and was thankful for that. Furthermore, the commentor was appreciative of USACE's attempts and efforts to keep the community around this site apprised of planned and ongoing activities. (C, D)

RESPONSE: The USACE agrees that it is important to keep the community apprised of relevant developments on this site. Providing the community and interested parties with all of the information and documents that are being considered in the selection of remedial actions, allows meaningful input consistent with the community acceptance criteria from the NCP (section 300.430(e)(9)(iii)(I) for selecting remedial actions.

12. COMMENT: A comment was offered which was generally supportive of those remedial alternatives under which contamination would be disposed at offsite disposal facilities. (C)

RESPONSE: This comment was supportive of either of the two alternatives (no. 4 and 5) which would involve offsite disposal. Because Alternative 4 is being selected, this comment is supportive of the remedial alternative selected. Alternative 3 would have provided for capping the contamination on the site. This alternative was rejected for a variety of reasons, including but not limited to community acceptance, and including also human health protectiveness and long-term effectiveness and permanence.

13. COMMENT: An official from a nearby community stated that there had been an attempt to locate a thorium disposal site in that community, and that the city council had passed a resolution opposing that proposal (this is believed to be a reference to an erroneous media report on the possible use of a nearby transfer station on a rail line by the USACE to transfer contaminated site soils from trucks onto railcars.) A local concern about such a transfer station was that it would negatively impact a nearby bicycle path being developed. Another commentor specifically objected to any transfer of radioactive soil from

trucks to railcars in Pequannock Township. Several commentors expressed concern about, and objected to, any consideration of shipping contaminated soil from this site via a railspur, which had been discussed in local newspaper stories in Pequannock Township. (D, K)

RESPONSE: To the best of USACE's knowledge, there was never any consideration by anyone of locating a thorium processing or disposal site in or near Pequannock. USACE does realize that there was local media coverage about a potential transfer station but USACE had no plans to use or support such station, and USACE still has no such plans.

14. COMMENT: A commentor noted that a nearby property had been rezoned from residential to commercial, and asked whether rezoning more property near the site as other than residential might cause Alternative 4 (which assumed future residential land use for the site) to not be selected as the remedial action for the site. (E)

RESPONSE: The zoning of nearby property is certainly relevant to the selection of remedial actions, but it is not generally the sole determinant of the land uses to be assumed in the future. The existence of so many occupied residences near and adjacent to the site means that even if several properties were rezoned as nonresidential, that residential land use would still be reasonable for the WISS. The potential rezoning of some land near the site as nonresidential was not sufficient to warrant the selection of a remedial action assuming only industrial, or at least nonresidential, land uses. The existence of a number of occupied residences near the site warranted future land use assumptions as residential, and as a basis for the remedial action.

15. COMMENT: The USACE is addressing several other sites with radioactive contamination near the Wayne site. The public meeting was only addressing what remedial action would be selected for the Wayne site, but a commentor stated that a remedial action with soil excavation which would be protective for residential land uses would also be expected for one of the other nearby sites. (F)

RESPONSE: This comment was not relevant to the selection of a remedial action at WISS, but would be if offered as a comment when a remedial action is selected for the other site (Maywood Interim Storage Site).

16. COMMENT: A commentor stated that the DOE orders referenced in the FS and other USACE documents released for comment only establish internal policy for DOE actions, and that these orders are not promulgated federal regulations. If such DOE orders established a DOE policy to clean up soil to 15 picoCuries/gram (pCi/g) that is not binding upon USACE remedial actions such as for this site. (F)

RESPONSE: USACE conducted a site-specific risk analysis to determine cleanup criteria. This assessment is included as Appendix C to the FS. USACE agrees that DOE orders are not legally applicable requirements for the remedy.

17. COMMENT: A commentor noted that some of the contaminated soil now at this site, which was stored in a pile, originally came from other locations (and was brought to this site and stored here by DOE). The commentor implied that once the site is cleaned up its monitoring and maintenance should be the responsibility of the company who generated the contamination. Furthermore, that company should probably have been required to have remediated this site without delay (rather than the federal government having to fund this). (F)

RESPONSE: Under the terms of the settlement, the United States released W.R. Grace from further liability for environmental response action at the site in return for W.R. Grace's payments of the amounts specified in the settlement agreement. The United States believes that the settlement terms were appropriate, given the facts of the case. Monitoring and maintenance for this site, to the extent necessary, will therefore be initially conducted by USACE, until the site is turned back over to DOE, at which time it will become the responsibility of DOE.

18. COMMENT: Noting some of the uncertainty for long-term funding a commentor noted that a nearby site in another New Jersey community being addressed by USACE under its Formerly Used Remedial Action Program (FUSRAP) apparently had quite a lot of funding for the USACE contractor ($300 million) and wondered whether some of that funding could be used to clean up the Wayne site, if funding for the Wayne site is constrained. (F)

RESPONSE: $300 million is a total maximum contract ceiling over a 10-year period and does not represent current funding. Actual annual funding for the Maywood site will be based on annual needs and nationwide FUSRAP program requirements.

19. COMMENT: A commentor thought that it was important that offsite monitoring be continued, especially for the Sheffield Brook area, and felt that there might be a resident in that area who was suffering adverse health effects which were the result of exposures to contamination from this site. (G)

RESPONSE: The comment reflected a concern that contaminants might be released from the site and flow via a ditch and storm sewer near the site and reach Sheffield Brook and cause human health problems near Sheffield Brook. Sheffield Brook is less than 500 feet south of the site. Water does not flow directly from the site to Sheffield Brook because the brook is too far from the site. Surface water leaves the site via a ditch, flows into a storm sewer and then into Sheffield Brook about 500 feet south of the site. Surface water and sediments, as well as groundwater near the ditch are regularly monitored by USACE, and will continue to be monitored until the remedial action has been completed. Contaminants have *not* been found in the ditch above health-based concentrations, including but not limited to just upstream of Sheffield Brook, so it does not appear possible that this site is contaminating Sheffield Brook. Since contamination has not, based upon the available data, been released from

the site to Sheffield Brook, USACE cannot undertake actions which cannot be justified as responses to releases (of contamination) from the WISS.

20. COMMENT: While agreeing that Alternative 4 from the Proposed Plan should be selected, a commentor stated that the soil cleanup level of 5 pCi/g for radium 226 (Ra-226) plus thorium 232 (Th-232), should actually be presented as 5 pCi/g for Ra-226 and radium 228 (Ra-228), and that the cleanup level should be less than 5 pCi/g. The commentor stated that the wastes at this site should be considered to be subject to the regulatory requirements of Subparts B and E of the Uranium Mine Tailings Radiation Control Act ("UMTRCA") found in 40 CFR Section 192. Although Th-232 and Ra-228 may be in secular equilibrium, Ra-228, which is actually determined by measuring actinium 228, is much easier to detect than Th-232. When measured, the Ra-228 concentrations will be greater than Th-232 because Ra-228 is easier to detect, not because it is present in higher concentrations. Using Th-232 as a surrogate for Ra-228 tends to under report the contamination because Th-232 is harder to measure. For example, some federal regulations including 40 CFR Part 192, Subpart E specify Ra-228, not Th-232. Cleanups of other similar radioactive sites in New Jersey and Illinois have established a soil cleanup level for Ra- 228, but not Th-232. (H)

RESPONSE: The cleanup criteria does sum Ra-226 and Th-232, and in doing so also controls Ra-228. The intent of stating the criteria as Th-232 instead of Ra-228 is to ensure control of the parent radionuclide, since Th-232 will generate Ra-228 in equal activity in approximately 40 years. The USACE acknowledges that Ra-228 is easier to measure than Th-232 at activity levels above the cleanup criteria, and that other sites may have specified Ra-228 in their cleanup criteria. Current laboratory measurement procedures such as alpha spectrometry for Th-232 are better than methods to detect Ra-228 at low activity (at or below our criteria). Demonstrating compliance with the selected remedy will be discussed in design documents, but as currently envisioned both Th-232 and Ra-228 will be measured and the greater of the two measurements will be used to demonstrate compliance. Measuring both Th-232 and Ra-228 reduces potential laboratory method bias and associated uncertainty. The use of 40 CFR 192 was included in the USACE evaluation of potential ARARs. USACE believes that the designated ARAR, 10 CFR 20, Subpart E, is more appropriate to the hazardous substances and the circumstances of their release at this site.

21. COMMENT: A commentor felt that the state of New Jersey's requirements (NJSA 58:10B-12d(1) should also have been listed as a relevant and appropriate requirement. This requirement requires 1 foot of clean cover above the residual contamination at the end of the remedial action and requires that the combined radium/thorium concentrations not exceed 4 pCi/g, and not exceed 5 pCi/g with a 2-foot cover. (H)

RESPONSE: The regulation cited by the commentor has been proposed by the state of New Jersey, but it is not a promulgated regulation at this time, and therefore under the NCP cannot be an ARAR. The state's draft regulation allows a residual soil level of 5 pCi/g, which is the same as Alternative 4 in the Proposed Plan. The proposed state regulation would then require that soil containing 5 pCi/g be covered with one foot of clean fill. As presently envisioned, the implementation of Alternative 4, which cleans up to 5 pCi/g would actually provide more than one foot of clean cover, which would be consistent with the proposed state requirement. Also, although the proposed state requirement is not identified as an ARAR, state acceptance was considered as one of the NCP's remedy selection criteria, and was a factor in selecting Alternative 4 as the remedial action.

22. COMMENT: At least two commentors noted that the cleanup to 5 pCi/g was conditioned to not require excavation into or damage to the underlying clay layer ("aquitard"). The commentors felt that this was not appropriate that no soil containing more than 5 pCi/g should be left on the site, even if that meant excavating into or beneath the clay, because if the contamination has already gone through the clay it is already contaminating the groundwater beneath the clay. There are technical solutions, which allow excavations and removal of contamination beneath the clay without causing or increasing groundwater contamination. The commentors also felt that what additional data or information which would be relevant to assessments of excavating into the clay had not been identified. (A, B, H, M)

RESPONSE: It should be recognized that the thickness of the clay aquitard (a subsurface layer of clay inhibiting the vertical flow of groundwater) is not uniform across the site. It is generally thicker on the south end of the site than the north end, and may occasionally be absent on part of the north end. On some parts of the site, there should be little difficulty in achieving a cleanup level of 5 pCi/g while still leaving in place a functional aquitard. In other areas of the site, the aquitard will likely be thinner and attempts to excavate contaminated soil near the top of the clay could excavate through the clay, and thus provide an avenue of contamination of groundwater under the clay. In theory, technologies exist which could be used to dewater the lower aquifer and reduce the potential for damage to the aquitard, or allow excavation even if the aquitard is penetrated. But these technologies are very difficult to manage and use, and might not be completely successful in protecting the aquitard and the groundwater below. In terms of groundwater protection, it is safer to not to attempt to excavate through the aquitard. The data which would be relevant to excavating into the clay would be how far into the clay the contamination extends, how thick the clay aquitard is beneath the zone of contamination, and whether the upward pressure of artesian aquifer might be sufficient at that point to breach the clay layer. In terms of assessing the risk to human health from residual contamination, if any, above 5 pCi/g Ra-226/ Th-232 which might have to be left in portions of the clay, the contaminant concentrations and the quantities and locations of the contamination would be relevant to such

a residual risk assessment. If the risk assessment indicates that residual concentrations are not protective, then appropriate use restrictions will be established to limit the type of exposures that could present an unacceptable risk to human health.

23. COMMENT: A commentor noted that the remedial action recommended in the Proposed Plan is essentially limited to the "footprint" of the original disposal area. Noting that DOE had completed a removal action at the bus parking lot immediately south of the site, the commentor nonetheless noted that contamination above the proposed cleanup exists beneath the depth of the DOE removal at the bus parking lot, and stated that the remedial action for the WISS should address that remaining contamination. (H)

RESPONSE: This remedial action addresses only the Wayne Interim Storage Facility (WISS). The bus parking facility was cleaned up by DOE is not on the WISS, and is therefore not addressed in this ROD. Under the terms of a Memorandum of Understanding (MOU) between USACE and DOE, the DOE is responsible for all properties previously remediated by the DOE. Therefore, DOE retains responsibility for the bus parking facility.

24. COMMENT: A commentor stated that in general the risk assessment was conservative (e.g. using conservative exposure assumptions protective of human health), but there were a few areas where it was not conservative, as follows: Cancer risk to radioactive contaminants was calculated using the RESRAD model. The RESRAD groundwater pathway was turned off. Therefore, no additional contamination of groundwater was assumed in the future. Nor was any human exposure to such additional groundwater contamination calculated. A related point made was that even if the groundwater beneath the clay remains uncontaminated, groundwater above the clay is or might become contaminated, and that groundwater could also be used for drinking. (H)

RESPONSE: Cancer risk to radionuclides was calculated using a computer model called RESRAD. RESRAD contains a pathway for calculating intakes from (predicted) groundwater contamination. This pathway was "turned off" because radionuclides have not been found in the groundwater leaving the site and is not currently impacting any receptors. It is expected that the removal of the contaminated source medial and dewatering during the remedial action will eliminate all contaminated groundwater in the waste pile area. While radionuclides have been found in the groundwater directly in the disposal areas, the fact that radionuclides have not migrated to the perimeter of the site in groundwater some 40 to 50 years after the original disposal indicated that contamination was not likely to migrate in the groundwater in the future, once the source of the contamination (i.e., the contaminated soil) is removed from the site. USACE determined that RESRAD's groundwater assumptions were excessively conservative, in view of the fact that groundwater contamination is not migrating from the site many years after the original

disposal. Additionally, USACE evaluated the potential that any contaminants left in the soil at the cleanup criteria to pose a continuing threat of groundwater contamination. This evaluation of potential leaching of contamination from soils to groundwater was used in establishing soil cleanup criteria for the site. Groundwater will be monitored after contaminated soil have been removed to verify that the remedy is protective of groundwater.

25. COMMENT: No cancer risk was calculated from the formation of radon. The commentor stated that radon could be formed and human exposure could occur in the future if contaminated materials are brought up near the surface and if a house or apartment building with a basement into the subsurface were built in or near such contamination. (H)

RESPONSE: It is true that no cancer risk related to the formation of and exposure to radon was calculated or explicitly considered in the development of the soil cleanup levels. Radon exposures are a concern inside buildings. The existing onsite building will be demolished as part of the remedial action. Although the ROD assumes future land uses may include residential, there are currently no onsite residential buildings that could be tested for radon. Additionally, the natural background concentration of radon adds significant difficulty in determining the radon levels from residual contamination at the cleanup level. The construction of buildings is a significant variable in the potential for radon to enter the building. It would have required the use of many highly speculative assumptions about building construction in order to calculate potential risk for radon exposure, which would have lead to an unacceptable level of uncertainty.

26. COMMENT: A commentor felt that the costs of the alternative recommended (No. 4, for excavation for residential land use) were not comparable to some of the other alternatives such as No. 2 (institutional controls and monitoring) or No. 3 (capping) because the costs of monitoring associated with alternatives No. 2 and 3, would eventually exceed the costs for Alternative 4, which would have higher initial costs but fewer monitoring costs. (H)

RESPONSE: USACE agrees that the monitoring and maintenance associated with Alternatives 2 (institutional controls and monitoring), 3 (capping) and 5 (cleanup to recreational land uses) would be needed for longer than the 30 years assumed. USACE also agrees that the costs, especially associated with monitoring, for these alternatives are therefore understated. A period of 30 years for monitoring and maintenance was used because that is standard in EPA's guidance on FS and estimating the costs of remedial alternatives on Superfund sites. Since Alternative 4 (cleanup to residential land uses) was recommended in the Proposed Plan and selected in the ROD, this comment is supportive of the alternative recommended and selected. Although Alternative 4 had several advantages over the other alternatives, causing USACE to recommend it in the Proposed Plan, an additional advantage for

Alternative 4 is now the community acceptance for this alternative. Community acceptance is one of the nine criteria provided in Sections 300.430(e) and (f) of the NCP, which is now reflected in Section 9.2.3.2 of the ROD selecting the remedial action for this site.

27. COMMENT: A commentor was concerned about the impacts of this site on the community, and asked for more detail as to what is the risk (to human health)? Another commentor made many of the same points, asked specifically about cancer risk, and also asked how community health might be impacted after the reports. (I, J)

RESPONSE: Like many other Superfund sites, it should be noted that most of the risk to human health which warrants the need for a remedial action relates to future, rather than current, land uses and exposures. Under current conditions access to the site is controlled and environmental monitoring is conducted annually. In order to reduce potential exposures to contaminated soil, the site was covered with a plastic tarp by the DOE in 1987. However, leaving a covered pile in place was not an acceptable long-term solution. The need for remedial action was based upon future land uses and assumptions that the cover might not be maintained.

Contaminants contributing the greatest health risks at this site are Ra-226 and Th-232. The human health effect of concern for these contaminants is their potential to cause cancer. Available scientific data do not indicate that human exposure to these radionuclides would result in toxic, noncancer effects. Cancer risk on Superfund sites is presented as "excess lifetime cancer risk". This means the cancer risk predicted for the exposures assumed for the site, over and above background. Generally the cancer risk for Superfund sites is quite small compared to background, because there are exposures to many natural as well as anthropogenic (man-made) carcinogens. In the United States, approximately 1 in 3 of our population will have a cancer sometime in the course of their lifetime. (Note that some people get cancer more than once; so they would be counted twice in such statistics.) This is the background risk of cancer to which the "excess" risk at a Superfund site is compared.

If the site were not cleaned up, if the cover were allowed to deteriorate, and if homes were to be built on the site and used as residences the excess cancer risk (above background) might be as high as 5 in 100 (5E-2). This risk is sufficient under CERLCA and the NCP to require cleanup. The implementation of Alternative 4 would ensure that cancer risks related to exposures to the site, even if the site were used for residences, would not exceed 3 in 10,000 (3E-4).

Because significant exposures are not currently occurring, it is not expected that the site is currently causing any human health problems such as cancer. The implementation of the remedial action will therefore not necessarily

reduce the cancer incidence in this community, but rather is intended to minimize the potential for cancer to occur even if the land is used for residences.

Although less significant than the Ra-226 and Th-232, some of the soil at the site also contained thallium above levels that are generally considered protective for a residential land use. Since the pile was covered, there again were no current exposures to significant contamination. Thallium is not a potential carcinogen, and the concern about exposures to thallium relate to its toxicity, principally relating to the potential to alter blood chemistry. Although exposures to potentially significant levels of thallium are not occurring while the pile is covered, if the pile were uncovered and uncontrolled, and if the land were used for residences, a hazard index as high as 6 might be predicted. Although hazard indexes are not directly related to the potential incidence to produce a toxic effect (i.e. a hazard index of 4 is not necessarily twice as likely to produce a toxic effect as 2), in general, a hazard index above 1 indicates some potential for toxic effects for the exposures assumed. The remedial action was selected to be protective for future land uses as residential, and would reduce the potential for both cancer and noncancer risks in populations which might have been exposed at the site.

28. COMMENT: A commentor stated that although the documents released for comment contained a lot of detail, they did not answer some of the questions, which are relevant to members of the community around this site. While the commentor found some information on cancer risk for individual contaminants, the commentor wanted to know, and had not found in the documents, how much the site as a whole might increase the risk of cancer to people at or near the site. The commentor asked whether fruit and vegetables grown near the site might have been contaminated, and if consumed might have contributed to a family member's death from cancer. The commentor asked whether school children in buses parked next to the site (before the contamination was covered with a tarp) might have been exposed to contaminants from the site. (K)

RESPONSE: Some of the issues raised in this comment are the same as in the previous comment. So, to some extent that response is relevant to both comments. This comment raised a few additional issues, which are addressed in this response. With respect to the potential for fruits and vegetables to have been contaminated by the site, in terms of current exposures that would not have occurred once the soil pile was covered. Before the pile was covered there may have been some minimal potential for wind-blown dust to contain some contamination which might have had some potential to contaminate nearby gardens. The potential would have been minimal because the site is not large enough, nor was it likely to have generated significant volumes of dust. However, exposure modeling for potential air releases under the National Emissions Standards for Hazardous Air Pollutants accounts for potential exposures related to the settling of dust onto nearby produce. When

operation ceased in 1976, the site was covered with soil, which would have precluded the release of contaminated dust.

Similarly, once the pile was covered there would have been no potential for children in nearby school busses to have been exposed to contaminants from the site. Before the pile was covered, there may have been some minimal potential for windblown dust to have carried low levels of contaminants off the site. Like the concern over fruits and vegetables, this site was not large and did not have operations that would have generated a lot of dust, so the potential for contaminant release via dust would have been minimal.

29. COMMENT: A commentor noted that some of the documents released for comment had been prepared a number of years ago, and had not been updated. The commentor felt that more recent developments and information should have been considered and used to update those documents. An example of a recent development which was not discussed was the completion of Route 287. (K)

RESPONSE: The commentor is correct in that USACE used a risk assessment prepared for DOE in 1994 as one of the bases for the need for this remedial action. However, USACE determined that the baseline risk assessment, although dated, still demonstrated that (if the land uses or conditions at the site were to change) the level of risk was sufficient under the NCP and CERCLA to warrant a remedial action. USACE felt that it would not have been a good use of government funds to redo the baseline risk assessment, and that this would also have caused additional delay in implementing site cleanup. However, in recognition that the baseline risk assessment was dated, USACE did update the calculations of cleanup levels in Appendix C of the FS to ensure that the remedial action and the cleanup levels were both protective and also not excessively costly.

30. COMMENT: A commentor specifically objected to transporting contaminated soil from this site through other communities (again mentioning the Pequannock rail line). That commentor felt that the community in Wayne had benefited from the operations at this site (i.e. employment and local taxes) and that the site should therefore be remediated or cleaned up within that community, and that the contamination should not be taken to other communities (who did not benefit from the jobs and taxes). (I, K)

RESPONSE: See response to comment no. 15. USACE has not been considering shipping soil from this site via a transfer station in or near Pequannock Township.

31. COMMENT: A commentor agreed with the groundwater standard proposed for Alternative 4: 40 CFR 141.15 (< 5 pCi/liter Ra-226 plus Ra-228 and gross alpha/gamma < 15 pCi/liter). (H)

RESPONSE: The comment agreed with the alternative recommended in the Proposed Plan. Since the recommended alternative, which included this ARAR, is selected for the remedial action, no change was suggested or made.

32. COMMENT: A commentor stated that some of the alternatives evaluated in the Proposed Plan were not acceptable to the community, because they involved the use of institutional controls. Specifically, Alternative 5, cleanup to recreational land use, would require site and land use restrictions. When included as components of remedial actions selected at other sites, such institutional controls have sometimes not been enforced, which can then render such remedies not protective. (H)

RESPONSE: As reflected in the Feasibility Study, the use and effectiveness of institutional controls (land use restrictions) was considered in evaluations of the remedial alternatives.

33. COMMENT: A commentor was concerned about the Proposed Plan's discussion of an additional risk assessment if the cleanup criteria cannot be met. (H)

RESPONSE: USACE will ensure that any contamination remaining on the site at the end of the remedial action does not pose unacceptable risk. The consideration of how to address potential problems associated with the clay aquitard is prudent because it is very important that contamination not be introduced into the groundwater beneath the aquitard in the implementation of this remedial action. Nonetheless, it should not be inferred that USACE believes that the cleanup levels cannot be achieved.

34. COMMENT: A commentor stated that the burial of thorium wastes at this site was a violation of regulations at the time it was buried. (H)

RESPONSE: USACE is responsible for environmental remediation of the site in consultation with the EPA. The former Atomic Energy Commission and the Nuclear Regulatory Commission would be responsible for determining if past practices were consistent with laws and regulations in existence from the 1940's to the 1970's when operations took place at this site. The USACE with consultation with the EPA will be remediating the site as outlined in the ROD under the authority of CERCLA.

35. COMMENT: A commentor stated that after learning about the burial of thorium at this site, the Township of Wayne conducted an epidemiological study and found that the rate of cancer death in the population living near this site was twice that of a similar population living farther from the site. (H)

RESPONSE: This study was conducted prior to the involvement of USACE on this site. The study was reviewed by the U.S. Agency for Toxic Substances and Disease Registry (ATSDR), a federal agency charged with evaluating human health effects on CERCLA sites. The ATSDR had some questions about the

methods used in the study. Nonetheless, the USACE will be remediating this site, based largely upon the potential that, if uncontrolled, releases from this site have the potential to cause cancer.

36. COMMENT: A commentor stated that the existence of this site has been a burden to the surrounding community, and that nearby residents have not been able to sell their homes. (H)

RESPONSE: The National Contingency Plan (NCP) does not identify the depreciation of nearby property values as a consideration in selecting remedial actions on CERCLA sites. This remedial action was selected based upon the 9 criteria for selecting remedial actions found in Section 300.430(e)(9)(iii) of the NCP. However, community acceptance of remedial actions is a criterion, and was considered.

37. COMMENT: A commentor stated that the duration of the institutional controls required for Alternatives 2 (Institutional Controls and Monitoring) and 3 (Capping) would render these alternatives ineffective. Such institutional controls have not been effectively maintained at other sites. (H)

RESPONSE: USACE agrees that the need for institutional controls was a consideration which made Alternatives 2 and 3 less attractive than Alternative 4, which would not require such controls. This was among the factors which lead to the selection of Alternative 4 as the remedial action.

38. COMMENT: A commentor stated that the artesian conditions present at the site were a limitation on the effectiveness of capping the site (Alternative 3). The artesian conditions cause groundwater under the clay aquitard to flow upward. Since groundwater would be flowing into the subsurface contamination, it would also have to flow out, and this would allow the continued release of contaminated groundwater from the site. (H)

RESPONSE: Alternative 3 was not selected as the remedial action. The amount of groundwater migrating upward through the clay aquitard into the contaminated soil would not have been great because the clay is relatively impermeable and would not allow much water to move through it.

39. COMMENT: A commentor stated that USACE had not explained how the human health risk associated with contamination above 5 pCi/g Ra-226/Th-232 in the clay aquitard would be assessed or evaluated for protectiveness. The commentor asked if the excavation(s) would remain open for extended periods of time while such assessments were being completed, and while additional analytical data, which might be needed for such assessments, were collected. (H)

RESPONSE: The risks would be assessed using relevant EPA guidance, principally Risk Assessment Guidance for Superfund (RAGS), and other guidance accepted by USACE and EPA. Consistent with the Feasibility Study, RESRAD (a

computer code developed for the DOE for assessing doses and risk to radionuclides) would also be used. If a residual risk assessment becomes necessary because contaminant concentrations above the cleanup levels cannot be removed from the clay aquitard, it is not expected that the excavation would have to remain open for a significantly longer amount of time. The analytical data necessary for such an assessment would already be available, and it would just be a matter of calculating the risk and evaluating the necessary and appropriate action, in consultation with EPA. All reasonable efforts will be made to achieve the cleanup levels throughout the site.

40. COMMENT: While supporting Alternative 4 as the remedial action, a commentor stated that the cleanup level of 100 pCi/g uranium was not protective. A cleanup level of 100 pCi/g uranium would allow a dose as high as 100 mrem/year, which is much greater than a dose of approximately 15 mrem/year associated with 5 pCi/g Ra-226/Th-232. The dose from uranium concentrations will increase over time. As an example if 50 pCi/g uranium 234 (U-234) and 50 pCi/g U-238 were present, eventually Ra-226 would in secular equilibrium with U, and the concentrations of Ra-226 could then approach 50 pCi/g , far above the Alternative 4 cleanup level of 5 pCi/g. Although it may be true that removing all soil containing more than 5 pCi/g Th-232 will also remove the significant U contamination, because the contaminants are collocated, establishing a cleanup level of 100 pCi/g U is not of itself protective and establishes an unacceptable precedent for other sites. (H)

RESPONSE: The cleanup levels for Alternative 4, which is selected as the remedial action for this site in the ROD, were evaluated in Appendix C of the FS, and were found to be protective of human health.

41. COMMENT: A commentor made several points regarding the hydrogeologic setting and characterization of the site, leading to the overall conclusion that flow within, into and from the lower aquifer (beneath the clay aquitard) is not well enough understood to select a remedial action which addresses potential releases into that aquifer. This comment relates to whether groundwater in the deeper aquifer flows upward (which would minimize potential contaminant releases from this site into that aquifer) or not, and therefore whether it is prudent to leave the clay intact if contamination above the cleanup level cannot be removed without causing further damage to the clay. (M)

RESPONSE: The available data indicate to USACE that, in general the deeper aquifer does have an upward gradient, and that the clay aquitard does provide some protection against contamination of the groundwater beneath the clay from surface contamination. USACE will be installing and monitoring additional monitoring wells in both upper and lower aquifers in order to confirm the upward gradient, better define the site conceptual model, and to monitor conditions during de-watering operations.

## LIST OF COMMENTORS, WITH KEY TO WHO PROVIDED WHICH COMMENTS

A. Rep. William J. Pascrell, Member of Congress, 8th District, New Jersey
B. David Waks, 58 BrandyWine Road, Mayor, Wayne, New Jersey
C. Paul Hollick, Mayor, Pequannock Township, New Jersey
D. Edward Engelbart, Deputy Mayor, Pequannock Township, New Jersey
E. Sol Masters, 56 Sturbridge Circle, Wayne, New Jersey
F. Michael Nolan, Maywood New Jersey
G. Alan Purcel
H. Martin Resnikoff, Ph.D., (consultant to Township of Wayne, New Jersey)
I. Thomas Shivey, M.D., councilman, Pequannock Township, New Jersey
J. Karen Straub, 13 Lucas Lane, Wayne, New Jersey
K. Linda Wilson, 260 Sunset Road, Pompton Plains, New Jersey
L. Township of Pequannock
M. Andrew Michalski, Ph.D., CGWP, Michalski & Associates, Inc.