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EPA Superfund
Record of Decision Amendment:

BOG CREEK FARM
EPA ID: NJD063157150
OU 02
HOWELL TOWNSHIP, NJ
09/29/2005

RECORD OF DECISION AMENDMENT

DECISION SUMMARY

Bog Creek Farm Superfund Site

Howell Township, Monmouth County, New Jersey

United States Environmental Protection Agency

Region II

New York, New York

September 2005

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<u>RECORD OF DECISION AMENDMENT</u>

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DECLARATION STATEMENT

SITE NAME AND LOCATION

Bog Creek Farm Superfund Site (EPA ID#NJD063157150)
Howell Township, Monmouth County, New Jersey

STATEMENT OF BASIS AND PURPOSE

This decision document presents the Amended Remedy for the contaminated groundwater at the Bog Creek Farm Superfund Site (the Site) located in Howell Township, Monmouth County, New Jersey. The original Record of Decision addressing contaminated groundwater at the Bog Creek Farm Superfund Site was signed on June 28,1989.

The Amended Remedy was selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan. This decision is based on the Administrative Record file for the Site.

The State of New Jersey concurs with the amended remedy.

ASSESSMENT OF THE SITE

The response action selected in this Record of Decision Amendment is necessary to protect public health or welfare or the environment from actual or threatened release of hazardous substances from the Site into the environment.

DESCRIPTION OF THE SELECTED REMEDY

The Amended Remedy described in this document involves the remediation of groundwater at the Site, which is contaminated with volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, and metals. The Amended Remedy calls for a modified groundwater extraction and treatment system, followed by re-injection of the treated water into the aquifer. Unlike the groundwater treatment system currently in place, the Amended Remedy allows for placement and pumping of the groundwater recovery wells to match the post-excavation Site conditions and to actively pump the most highly contaminated areas at the Site. In addition, if it is determined that residual hot spots in soils remain after the current excavation phase is completed, the Amended Remedy allows for *in situ* treatment of the remaining hot spots. The Amended Remedy will treat and restore groundwater at the Site so that it meets New Jersey Groundwater Quality Standards for Class HA Aquifers (see Appendix n, Table 1) and will reduce Site cleanup time and life-cycle costs compared with the 1989 ROD remedy.

The major components of the Amended Remedy follow:

- Groundwater extraction and *ex situ* treatment to maintain hydraulic plume control and to facilitate contaminant mass removal and aquifer flushing via focused pumping and effluent re-injection/recharge within plume areas;

- It may also include one of the following *in situ* technologies if it is determined that residual hot spots remain after the current excavation phase is completed: soil vapor extraction/air sparging (SVE/AS), enhanced anaerobic bioremediation (EAB), or *in situ* chemical oxidation (ISCO); and

- Appropriate maintenance and performance monitoring to ensure the effectiveness of the remedy. A performance monitoring program for the Amended Remedy is to be developed which evaluates the effectiveness, optimizes the operation parameters, determines the parameters for remedy closure, and confirms compliance with the cleanup goals.

The groundwater remedy selected in 1989, which consists of groundwater extraction, on-site treatment, and reinjection to the underlying aquifer(s), will be modified by this Record of Decision Amendment.

DECLARATION OF STATUTORY DETERMINATIONS

Part 1: Statutory Requirements

The Amended Remedy is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate to the remedial action; is cost-effective, and utilizes permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable.

Part 2: Statutory Preference for Treatment :

The Amended Remedy satisfies the statutory preference for treatment as a principal element of the remedy.

Part 3: Five Year Review Requirements

Because this remedy will not result in hazardous substances, pollutants, or contaminants, remaining on-site above levels that allow for unlimited use and unrestricted exposure, but may take more than five years to attain the remedial action objectives and cleanup levels for the groundwater, a policy review may be conducted within five years of construction completion for the Site to ensure that the remedy is, or will be, protective of human health and the environment.

ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this Record of Decision Amendment. Additional information can be found in the Administrative Record file for the Site, the index of which can be found in Appendix III of this document.

- Chemicals of concern and their respective concentrations may be found in the "Summary of Site Characteristics" section.
- A discussion of source materials constituting principal threats may be found in the "Principal Threat Waste" section.
- Current and reasonably anticipated future land use assumptions are discussed in the "Current and Potential Future Site and Resource Uses" section.
- Estimated capital, annual operation and maintenance, and total present worth costs are discussed in the "Description of Remedial Alternatives" section.
- Key factors that led to selecting the remedy (i.e., how the Amended Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, emphasizing criteria key to the decision) may be found in the "Comparative Analysis of Alternatives" and "Statutory Determinations" sections.

George Pavlou, Director
Emergency and Remedial Response Division
Region II

Date 9/29/05

SITE NAME/LOCATION AND DESCRIPTION

The Bog Creek Farm Superfund Site is located in a rural, agricultural and recreational area of Howell Township, Monmouth County, New Jersey at 579 County Road 547 (see Appendix II, Figure 1-1). The Site is bordered by two residences to the west, open fields to the south and east, and the north branch of Squankum Brook to the north. Several farms raising horses, nursery stock, vegetables, grain, sod, and flowers are situated nearby. Allaire State Park, used by golfers, fisherman, hunters, and equestrians, is located approximately one half mile east of the Site. There are approximately 900 people living within one mile of the Site.

The Site soil and groundwater are contaminated with volatile organic compounds (VOCs) and a variety of other contaminants. In addition, nearby Squankum Brook is designated as a New Jersey Department of Environmental Protection (NJDEP) Category 1 (Cl) Surface Water body, which eventually discharges to the Manasquan River (also Category 1). Category 1 is a special level of protection that targets water bodies that provide drinking water, habitat for Endangered and Threatened species and popular recreational and/or commercial species, such as trout or shellfish. Waterways cab be designated Category 1 because of exceptional ecological significance, exceptional water supply significance, exceptional recreational significance, exceptional shellfish resource, or exceptional fisheries resource. The Category 1designation provides additional protections that help prevent water quality degradation and discourage development where it would impair or destroy natural resources and environmental quality.

An existing groundwater treatment building and plant are currently located on the Site, as part of an ongoing EPA remediation (see Appendix II, Figure; l-2).

SITE HISTORY AND ENFORCEMENT ACTIVITIES

Site Operations

VOC contamination in Site soil and groundwater reportedly resulted from the dumping of chemical wastes associated with the former property owner’s paint manufacturing operations. During 1973 and 1974, various wastes, including organic solvents, paint residues, lacquer thinners, animal carcasses and residential debris, were dumped in open areas and excavated pits on the eastern part of the 12-acre farmland property. Subsequent investigations revealed two primary waste areas at the Site. The major area was a Former Waste Trench located approximately 300 feet south of Squankum Brook in the Eastern end the Site. The trench, filled with chemicals and debris, was approximately 150 feet long, 40 feet wide and 10 feet deep. A smaller waste area, containing several buried drums, was found approximately 130 feet east of the trench in the Former Disposal Area.

Site Discovery, State and Federal Response Actions

In July 1977, NJDEP, together with the U.S. Environmental Protection Agency (EPA) and the Howell Township Health Department excavated several test pits and trenches at the Bog Creek Farm Site and tested the surface water, sediments and residential wells. In 1979, five monitoring wells were installed on-site by NJDEP and the Howell Township Health Department. In 1983, air sampling was conducted by NJDEP.

The Site was added to the National Priorities List (NPL) in 1983. In 1984, EPA conducted field investigations at the Site. In 1985, EPA issued a Record of Decision (ROD) for the Site to address these verified sources of contamination. In 1989 and 1990, contaminated soils and sediments were excavated and incinerated on-site in accordance with the 1985 ROD. In addition, contaminated water from a former pond and bog were collected and treated in an aqueous waste treatment system at the Site.

A second ROD was issued in 1989 in which EPA selected a remedy to address the remaining groundwater contamination. To protect against contaminated groundwater discharges to the north branch of Squankum Brook, a slurry wall was constructed along the brook. In addition, a pump and treat system was constructed to extract and treat the contaminated groundwater before re-injecting it back into the groundwater. This treatment system began full operation in August 1995, and is currently in its 10th year of operation. However, despite the source control excavation and ongoing groundwater treatment, chemicals of concern in the groundwater persist at concentrations exceeding current maximum contaminant levels (MCLs).

EPA has conducted numerous tests and investigations to determine the most effective method of extracting additional contaminants from the contaminated aquifer. The objective of the tests and investigations was to evaluate methods for attaining the groundwater cleanup goals (established in the Operable Unit (OU) 2 ROD, 1989) so as to reduce the number of years the NJDEP would have to operate the pump and treatment system after assuming operation and maintenance responsibilities for the Site. Based upon the results of the tests and investigations, EPA confirmed that the existing treatment plant (which is performing up to design specifications) would have to operate for many years (decades) to attain the cleanup goals because significant sub-surface soil contamination remains at the Site.

In May 2004, EPA and the U.S. Army Corps of Engineers (COE) completed an analysis which provided six alternatives/cost estimates for additional contaminated soils cleanup, including both on-site and off-site soil treatment and disposal options. The May 2004 analysis also included optimization alternatives for the groundwater treatment plant, and *in situ* cleanup alternatives for the hard to reach soils/groundwater contaminants.

In response to the COE's report and other groundwater and soil investigations, EPA issued an Explanation of Significant Differences (ESD) in January 2005. The ESD established that an estimated 21,000 cubic yards of VOC-contaminated soil would need to be excavated in order for the groundwater treatment remedy to reach its cleanup objectives within a reasonable period of time. EPA began implementing the scope of work outlined in the ESD in May 2005. Full implementation includes the excavation and off-site shipment of contaminated soils, backfilling, and final restoration of the excavated areas. These activities are scheduled for completion by May 2006.:

HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Post-Decision Proposed Plan and supporting documentation for the contaminated groundwater were released to the public on August 15,2005. These documents were made available to the public at the EPA Administrative Record File Room, 290 Broadway, 18th Floor, New York, NY; the Town Clerk's Office and at the Howell Library, 318 Old Tavern Road, Howell, NJ.

On August 16, 2005, EPA issued a notice in the Asbury Park Press, which contained information relevant to the public comment period for this Site, including the duration of the comment period, the date of the public meeting and the availability of the administrative record. The. public comment period began on August 15,2005 and ended on September 13,2005. A public meeting was held on August 31,2005, at the Howell Township Municipal Building Council Chambers located at 251 Preventorium Road, Howell Township, Monmouth County, New: Jersey. The purpose of the meeting was to inform local officials and interested citizens about the Superfund process, to discuss the Post-Decision Proposed Plan, to receive comments on the Post-Decision Proposed Plan, and to respond to questions from area residents and other interested parties. In general, the public supported the Agency's proposed amended remedy, Alternative 3; Groundwater Extraction and Treatment with *In Situ* Treatment. Responses to comments received at the public meeting and in writing during the public comment period are included in the Responsiveness Summary (Appendix V).

CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

Land Use:

The Site is located in a rural, agricultural and recreational area in Howell Township, New Jersey. In 2000, the population density of Howell Township was 803 people per square mile (US Census Bureau 2005). Based on the EPA Site Fact Sheet, there are approximately 900 people living within one mile of the Site.

The property is zoned for A.R.E. meaning "Agricultural, Residential and Estate." There is no future use planned for the Site under present ownership; however, the Town has recently acquired the adjacent property to construct recreational facilities.

Groundwater Uses:

The primary groundwater users in the region are private well owners. The private and public wells located near the Site tap the Kirkwood-Cohansey Aquifer. Groundwater from this aquifer is Class IIA, with a primary designated use as potable water and conversion via treatment to potable water. Secondary uses of Class HA water include agricultural and industrial use. Two wells, less than 50 feet in depth, are located on the western portion of the property (upgradient from the contamination) providing water to the residences and a stable area west of the Site. Another well of similar depth is located approximately 0.3 mile east of the Site and hydraulically isolated from the contamination by Squankum Brook. The remaining wells are over 350 feet below ground surface and are hydraulically isolated from potentially Site-related contamination.

Site groundwater discharges to surface water at Squankum Brook, classified by NJDEP as FW2-NT[C1]. As noted earlier, Squankum Brook is also a Category 1 groundwater-fed stream from a sole-source aquifer. Designated uses of FW2 waters include both primary and secondary contact recreation. Primary contact recreation means recreational activities where the human body may be completely submerged in the water (e.g., swimming, water skiing), while secondary contact recreation means recreational activities where contact with the water is minimal and where ingestion of the water is not probable (e.g., fishing and boating). In addition, FW2-NT is the classification for non-trout waters: waters not considered suitable for trout, but may be suitable for many other fish species.

Squankum Brook flows into the Manasquan River about 5,000 feet downstream of the Site. The Manasquan River is designated for use as a drinking water supply.

SUMMARY OF SITE CHARACTERISTICS

As part of the recent Focused Feasibility Study, groundwater modeling was performed to better understand the existing hydrogeologic conditions at the Site. A conceptual site model was also developed to summarize the contamination sources, contaminant transport and fate, and exposure pathways. In addition, EPA recently completed more soil and groundwater sampling. Soil sampling around and underneath the existing groundwater treatment buildings was conducted to delineate the nature and extent of residual soil contamination. Groundwater sampling was performed to determine the magnitude of remaining groundwater contamination. The following sections are based on all of the recent sampling and the modeling completed as part of the FFS.

Groundwater

The Site is underlain by the Kirkwood formation, which is subdivided into the Upper Kirkwood and Lower Kirkwood. Site contamination has only been identified in the Upper Kirkwood, and it is believed that the Lower Kirkwood behaves as an aquitard, bounding the depth of, and preventing downward migration of, contamination. The depth to water across the Site ranges from 0 feet at the Squankum Brook to approximately l0 feet. The hydraulic conductivity is estimated at approximately 1 to 6 ft/day within the contaminated area.

Beneath the Kirkwood formation is the Manasquan formation, which is predominantly clayey silt and acts as a confining layer. Previous investigations have found. that contamination is limited to the Upper Kirkwood; therefore the stratigraphy of the Manasquan formation is not discussed.

Upper Kirkwood

The thickness of the Upper Kirkwood unit varies, increasing from10 feet thick near the north branch of Squankum Brook to approximately 30 feet thick near the former disposal areas. The upper unit is predominantly very fine to fine sand with some silty sands and coarser materials. The predominant flow of groundwater in the Upper Kirkwood is in a northeasterly direction in the area of the Bog Creek Site toward the previous waste trenches and then toward the north branch of Squankum Brook. The groundwater then discharges into the north branch of Squankum Brook, which serves as a barrier for groundwater in the Upper Kirkwood. Any groundwater contaminants derived from the Site will flow into the north branch of the Squankum Brook. This is confirmed by groundwater sampling data.

Lower Kirkwood

The Lower Kirkwood is relatively uniform in thickness, and is estimated to be approximately 30 feet thick across the entire Site. The lower unit consists of silty sands, silts, and clays. Groundwater flow in the Lower Kirkwood is to the east with discharge into the Manasquan River (over a mile to me northeast).

Nature and Extent of Groundwater Contamination

Based on 2003 groundwater sampling results, the Site remains significantly contaminated with a variety of VOCs, including chlorinated VOC and petroleum hydrocarbon contaminants. In particular, the following compounds and maximum concentrations were detected: 1,2-dichloroethane (DCA) 30,000 micrograms per liter (µg/l), vinyl chloride 590 µg/l, benzene 8,800 µg/l; trichlorethene (TCE) 520 µg/l, cis-1,2-dichloroethane (DCE) 8,300 µg/l, l,2,4-trimethylbenzene 1,600 µg/l, toluene 5,800 µg/l, tetrachloroethene (PCE) 590 µg/l, l, l,2-trichloroethane (TCA) 640 µg/l, l, l, l-trichloroethane 260 µg/l, 2,4-methylphenol 3,900 µg/l, phenol 1900 µg/l, and lead 25 µg/l. Table 2 presents a summary of 2002 groundwater data which is characteristic of groundwater contamination at the site.

The groundwater contamination within the Upper Kirkwood appears to be centralized in two “lobes" (see Appendix II, Figures 1-3 and 1-4). The west lobes is centered approximately 120 feet west of the treatment plant. This lobe is roughly 150 feet across and extends north to the brook. The east lobe is located just east of the treatment plant. This lobe is roughly 120 feet across and is more elongated than the west lobe. Sample results also indicate there are a few smaller hot spots present in addition to the primary lobes. The presence light-non-aqueous-phase liquid (LNAPL) appears likely in some areas. This is based on a comparison of VOC concentrations in groundwater relative to the saturation concentrations, primarily for benzene and toluene. The vertical extent of groundwater contamination in both lobes is estimated to be less than 30 feet below ground surface.

In addition, the results show that several chemicals of potential concern (COPCs) have been detected in the vicinity of Squankum Brook, north of the existing slurry wall. The slurry wall was installed as part of the ongoing groundwater remediation selected in the 1989 ROD to protect discharge to the Brook. It is believed that this contamination was already present prior to construction of the slurry wall.

HUMAN HEALTH RISK ASSESSMENT

A streamlined Human Health Risk Assessment (HHRA) was performed as part of the recent FFS. It supplements the 1988 baseline risk assessment prepared for the Bog Creek Site. The objective of the streamlined HHRA was to assess whether chemicals in addition to the compounds identified in the 1989 ROD are a potential threat to human health and need to be addressed by the cleanup remedy.

As part of the streamlined risk assessment, COPCs were identified through a tiered screening process. In the first tier of screening, the maximum detected concentrations of COPCs in the groundwater, surface water, and sediment were compared to risk-based screening values. Risk-based screening values were used (Region 9 Preliminary Remediation Goals), which are health protective and equivalent to a cancer risk of $1x10^{-6}$ or a hazard index of 0.1. Chemicals retained as COPCs from Tier I were evaluated further in Tier n with refined assumptions to reduce uncertainty in the screening process and help prioritize COPCs to be addressed in the cleanup remedy.

Tier I identified 52 COPCs in groundwater, 5 COPCs in sediment, and 4 COPCs in surface water. These are chemicals that were detected at least once at a concentration above the EPA Region 9 PRGs for tap water or residential soil (cancer risk = $1x10^{-6}$ or hazard quotient of 0.1). Tier n considered the frequency of detection, background concentrations, and screening levels adjusted to a cancer risk of $1x10^{-5}$ and a non-cancer hazard of 0.1. Tier n identified 43 COPCs in groundwater and no COPCs in sediment or surface water.

Of the COPCs determined to be the risk drivers (those that trigger the need for cleanup) for groundwater in the 1989 ROD, trans-1,2-dichloroethene, copper and zinc are no longer chemicals of potential concern for human health. While most of the COPCs identified by the streamlined risk assessment are VOCs, several SVOCs, pesticides, and metals have also been identified. The VOCs determined to be of greatest concern in the 2005 streamlined HHRA (ranked by ratio of concentration to screening value) and their corresponding detected concentration ranges are:

l, 2-dichloroethane (DCA)	1.1 - 30,000 µg/l
vinyl chloride	1.7 - 590 µg/l
benzene	1.9 - 8,800 µg/l
trichloroethene (TCE)	1.0 - 520 µg/l
cis-l,2,-dichloroethene (DCE)	1.7 - 8,300 µg/l
1,2,4-trimethylbenzene	1.1 - 1,600 µg/l
toluene	1.2 - 58,000 µg/l
tetrachloroethene (PCE)	1.3 - 590 µg/l
1,1,2-trichloroethane (TCA)	1.1 - 640 µg/l

The risk drivers that were identified in the 1989 ROD and were retained as COPCs in the streamlined risk assessment are: 1,1,1-trichloroethane, toluene, 2,4-methylphenol, phenol, and lead.

A complete list of COPCs retained as a result of the Tier II screening process can be located in Appendix E, Table 1. The results of Tier I and II screening process for groundwater are summarized in Appendix II, Table 3.

EXISTING REMEDY

Groundwater

The existing groundwater remedy is a pump and treat system that is a modification of the plant originally used to treat water generated during the excavation of the trench, pond, and bog in 1990. The system called for in the 1989 ROD consists of an extraction system, treatment plant (*ex situ* treatment), and re-injection gallery. The extraction system operates continuously at a rate of 25 to 30 gallons per minute (gpm), and the treatment plant is operated in batch mode on weekdays.

The extraction; system is comprised of:

- Slurry wall aligned along the Squankum Brook's southern bank
- 33 extraction wells aligned inside (upgradient) of the slurry wall
- One common manifold attached to all wells
- Vacuum extraction pump
- Influent tank

The treatment plant is comprised of:

- pH adjustment
- Metals removal
- Sand filtration
- Two packed-tower air strippers in series
- Liquid-phase and vapor-phase granular activated carbon (LPGAC and VPGAC)
- Effluent tanks

Soil

EPA recently completed soil sampling around and underneath the existing treatment buildings and former disposal areas to delineate the extent of remaining soil contamination. Based on these investigations, EPA has undertaken the removal of up to 21,000 cubic yards of VOC-contaminated soil. This activity is scheduled for completion by May 2006.

The Site background information and remedial alternative analyses contained in this Record of Decision are based on the Site conditions prior to the completion of the soil removal action currently underway. Because this action will result in significant removal of groundwater contaminant source materials from the Site, future investigations (post excavation evaluations) will be necessary before full implementation of an alternative to expedite cleanup of the remaining groundwater contamination.

SCOPE AND ROLE OF RESPONSE ACTION

The contaminated groundwater at the Bog Creek Farm Site has been the focus of an ongoing groundwater extraction and treatment remedy since 1995. However, annual monitoring data and evaluations indicated that the existing remedy would not reach groundwater cleanup standards in the ten-year time frame projected in the 1989 ROD. Accordingly, a Focused Feasibility Study (FFS) was performed to develop a better understanding of current Site conditions and groundwater contamination, and to evaluate alternative remedies to expedite Site cleanup. The Post-Decision Proposed Plan released in August 2005 focused on the persisting groundwater contamination and described the cleanup alternatives evaluated as part of the FFS, as well as EPA's preferred alternative. The preferred remedy will use a groundwater pump and treat system, and, if determined to be effective, *in situ* groundwater treatment to expedite the removal of residual hotspots if they remain after the excavation is completed.

BASIS FOR REMEDY MODIFICATION

Based on recent groundwater sampling, the Site remains significantly contaminated with a variety of volatile organic contaminants, including chlorinated VOCs and petroleum hydrocarbon contaminants. Select semi-volatile organic compounds (SVOCs), metals, and pesticides have also been detected at some sampling locations. The groundwater contamination appears to be centralized in two areas on the Site with a few smaller hot spots present. The presence of light non-aqueous-phase liquid appears likely in some areas.

The existing groundwater remedy is a pump and treat system. The remedy consists of an extraction system, treatment plant (*ex situ* treatment), and re-injection gallery. The design and configuration of the pumping wells does not allow for flexibility in pumping rates or pumping selected wells, and therefore does not address the centralized areas of groundwater contamination efficiently. Continuation of this system will extend the need for treatment for a significant period of time and increase overall life-cycle costs.

Conversely, the Amended Remedy will allow for placement and pumping of the groundwater recovery wells to match the expected, post-excavation Site conditions and to actively pump in the most highly contaminated areas of the Site. If it is determined that residual hot spots in soils remain after the current excavation phase and post excavation evaluation is completed, the Amended Remedy provides for *in situ* treatment of the remaining hot spots as needed. In addition, the Amended Remedy will treat and restore groundwater at the Site so that it meets New Jersey Groundwater Quality Standards for Class IIA Aquifers (see Appendix n, Table 1). The Amended Remedy will reduce Site cleanup tune and life-cycle costs compared with the 1989 ROD remedy.

REMEDIAL OBJECTIVES

Remedial action objectives (RAOs) are specific goals to protect human health and the environment.) These objectives are based on available information and standards such as applicable or relevant and appropriate requirements (ARARs) and appropriate criteria, advisories, and guidance (i.e. To Be Considered or "TBCs") and risk-based action levels established based on the risk assessment. Remedial action objectives developed for the groundwater considers all identified Site concerns and contaminant pathways, and are listed below:

- Prevent exposure to contaminated groundwater.

- Prevent/minimize contaminated groundwater discharge to the north branch of Squankum Brook.

- Reduce Site cleanup time and life cycle costs.

- Restore contaminated groundwater to drinking water standards within a reasonable time-frame.

The ARARs identified in the 2005 FFS are the New Jersey Groundwater Quality Standards for Class DA Aquifers (See Appendix II, Table 1). The designated use of all Class II groundwater is to provide potable water using conventional treatment. Both existing and potential potable water uses are included. Class IIA criteria specify the highest level of contaminant that is allowed in drinking water. These standards are promulgated, apply to public water systems, and are intended to protect human health by limiting the levels of contaminants in drinking water. These drinking water standards are appropriate cleanup goals since Squankum Brook flows into the Manasquan River, which is designated as a drinking water supply. The 1988 Baseline Risk Assessment for the Site concluded that none of the exposure pathways evaluated was considered, significant. There was initial concern that nearby residents could be exposed to groundwater contamination via local wells. Upon further analysis, the pathway was riot considered to be significant, because the contaminated portion of the aquifer is not used for drinking purposes, and Site conditions indicate that the groundwater contamination is confined by the Lower Kirkwood and the north branch of Squankum Brook, as described in the Summary of Site Characteristics section above. However, the contaminant levels in groundwater are above ARARs, and the NJDEP Groundwater Protection Strategy requires the protection of this natural resource against adverse impacts to the environment as well as to potential future users. In addition, historic discharge of the Upper Kirkwood to the north branch of the Squankum Brook is partially responsible for environmental degradation. The complete restoration of groundwater is the primary objective of the Amended Remedy.

DESCRIPTION OF REMEDIAL ALTERNATIVES

Based upon the results of the Focused Feasibility Study, EPA evaluated three cleanup alternatives that address the groundwater contamination at the Bog Creek Farm Superfund Site. These alternatives are summarized below and are described in detail in the Focused Feasibility Study

Report. The screening process through which these alternatives were developed is also described in the FFS report. The time frames below for construction do not include the time for remedial design or the time to procure contractors.

Alternative 1 : No Action

Estimated Capital Cost:	$0
Estimated Annual Operation and Maintenance (O&M) Cost:	$0
Total Estimated Present Worth:	$0

CERCLA and the National Contingency Plan (NCP) require the evaluation of No Action as a baseline to which other alternatives are compared. No remedial actions or institutional controls would be implemented as part of this remedy. While there is an on-going EPA remediation at the Site, the No Action alternative evaluated in the FFS assumes the existing groundwater remedy would be terminated.

Because this alternative would result in hazardous substances, pollutants, or contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure, EPA would review such action at least every five years.

Alternative 2: Groundwater Extraction and Treatment

Estimated Capital Costs:	$1,612,000
Estimated Annual O&M Years 1-2	$613,000/year
Estimated Annual O&M Years 3-10	$403,000/year
Estimated Annual O&M Years 11-30	$298,000/year
Total Estimated Present Worth	$6,400,000
Construction Time	2 years

Alternative 2 relies on hydraulic control of the contaminated groundwater, *ex situ* treatment of the extracted groundwater, and subsequent re-injection/recharge of the treated groundwater to the aquifer via the existing re-injection trenches upgradient of the contaminant areas. This configuration relies on a continual (flushing of the contaminated zone to achieve Site cleanup levels.

Groundwater extraction would be accomplished by the installation of multiple new extraction wells within the contaminated plume areas, upgradient of the existing extraction wells and Squankum Brook (see Appendix II, Figure 1-5). A total of 17 new extraction wells were estimated for evaluation purposes; well numbers and locations will be finalized during the remedial design.

Due to the extent of contamination and presence of BTEX (benzene, toluene, ethylbenzene, and xylenes), chlorinated VOC, and SVOC contaminants, the extracted groundwater would be subject to a variety of treatment options prior to re-injection. The exact components of the new treatment train would be finalized during the remedial design, based on the results of pilot testing and treatability study data collected at that time. For the purposes of this Record of Decision, it was assumed that the groundwater treatment system would consist of the following steps, from start to finish: 1) influent flow equalization; 2) metals and particulate treatment by green sand filtration; 3) air stripping; 4) off-gas treatment by vapor-phase carbon and potassium permanganate zeolite; and 5) groundwater polishing for SVOCs by liquid-phase carbon treatment. The purpose of each of these steps is summarized below. It is estimated that construction and initial startup of Alternative 2 could be completed within two years.

The equalization tank would serve to stabilize the combined influent flow rate and water quality to the treatment plant, so that consistent operational settings can be generally maintained for treatment. The green sand filter unit would serve to remove dissolved and suspended metals and total suspended solids via filtration and oxidation. This pretreatment step would reduce O&M requirements associated with air stripping. Air strippers would serve to reduce the groundwater VOC concentrations to levels acceptable for groundwater discharge. Off-gas treatment of the air stripper effluent would be required until total off-gas VOC emissions from all components decrease below NJDEP air discharge criteria. A maximum VOC emissions rate of 2.2 lbs per day was assumed for evaluation purposes based on guidance provided by NJDEP. Liquid-phase granular activated carbon (LPGAC) would be used to remove SVOC contaminants from the groundwater effluent after the air stripper, prior to discharge back into the aquifer via the existing upgradient re-injection trenches. LPGAC treatment would eventually become unnecessary during the course of remediation as the SVOC concentrations decline.

The remedy duration for this alternative is dependent on influent groundwater quality concentrations! at the time the remedy is implemented. As mentioned previously, the ongoing soil cleanup should significantly reduce contaminant concentrations entering the groundwater. However, based on the 2003 concentrations assumed in the FFS, it is expected that Alternative 2 may take up to 30 years to remediate the Site.

For cost evaluation purposes, it was assumed that long-term monitoring of groundwater for COPCs will be performed semi-annually for the first three years after the system is operating. After three years of semi-annual monitoring, EPA would conduct an evaluation in consultation with NJDEP to either continue with semi-annual monitoring or to develop a more appropriate routine monitoring schedule. The purpose of the monitoring is to confirm achievement of RAOs and track progress of the remedial action until cleanup goals are achieved. The long-term monitoring program will be finalized during the remedial design.

Because this remedy will not result in hazardous substances, pollutants or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure after implementation of the remedy, a statutory five-year review is not required.

Alternative 3: Groundwater Extraction and Treatment with *In Situ* Treatment

Estimated Capital Costs:	$2,272,000
Estimated Annual O&M Years 1-2	$811,000/year
Estimated Annual O&M Years 3-10	$543,000/year
Estimated Annual O&M Years 11-30	$298,000/year
Total Estimated Present Worth	$8,200,000
Construction Time	2 years

Alternative 3 includes Groundwater Extraction and Treatment, as described under Alternative 2, along with *in situ* treatment to augment contaminant mass removal. *Ex situ* treatment provides reduction in toxicity, mobility, and/or volume of contaminants following extraction of the contaminated groundwater from the subsurface. In situ treatment takes place below the ground, within the contaminated area, destroying or converting groundwater and soil contaminants to less toxic compounds or forms. Multiple *in situ* technologies were retained during the screening process for this alternative based upon their potential to facilitate achievement of remedial action objectives when applied individually or in sequential combination. Bench and/or pilot testing of these technologies are required to better assess their site-specific feasibility. Such testing is often performed during the remedial design phase and is used to support detailed design decisions for full-scale implementation. The *ex situ* pump and treat system implemented under Alternative 3 may differ slightly depending upon which *in situ* technology is selected since each may alter the chemistry of the groundwater in different ways.

For cost evaluation purposes, it was assumed that long-term monitoring of groundwater for COPCs will be performed semi-annually for the first three years after the system is operating. After three years of semi-annual monitoring, EPA will conduct an evaluation in consultation with NJDEP to either continue with semi-annual monitoring or to develop another appropriate routine monitoring schedule. The purpose of the monitoring is to confirm achievement of RAOs and track progress of the remedial action until cleanup goals are achieved. The long-term monitoring requirements will be finalized during the remedial design.

Multiple design configurations were developed in the FFS to illustrate how groundwater extraction and treatment may be combined with each *in situ* technology retained for consideration under this alternative. The cost analysis, however, is based upon the assumption that Soil Vapor Extraction/Air Sparging (SVE/AS) would be used alone for *in situ* treatment. Under this assumption, it is estimated that construction of Alternative 3 could be completed within two years. All of the retained technologies are summarized below.

SVE/AS

SVE/AS would be used to expedite reduction of groundwater contaminants below cleanup criteria via physical and aerobic biological processes. All VOC contaminants would be subject to enhanced physical vapor-phase extraction and recovery associated with SVE/AS. SVE would occur at the groundwater extraction wells to minimize construction costs. Approximately 25 AS wells would be installed within the plume area using a grid system (see Appendix II, Figure 1-6). AS would be performed using an air compressor Contaminated vapors recovered by SVE wells would be subjected to *ex situ* treatment to reduce VOC contaminant concentrations below NJDEP air discharge criteria before discharge to the atmosphere.

Groundwater monitoring would be performed prior to initiating SVE/AS treatment to establish the baseline conditions for comparison. Subsequent rounds of groundwater monitoring would be performed to assess the performance and progress of the technology and to support future decisions regarding SVE/AS system operation and optimization.

EAB (Enhanced Anaerobic Bioremediation)

EAB would be used to expedite the reduction of groundwater contaminants below cleanup criteria via anaerobic biodegradation processes. This technology would predominantly target chlorinated ethane and ethene contaminants, including 1,1,1-TCA, TCE, cis-l,2-DCE, 1,1-DCE, and vinyl chloride. Implementation of EAB would involve multiple injections of amendments (e.g., electron donor, nutrients, and/or microbes) into the contaminated aquifer. The initial injection event would use a grid system with approximately 44 injection points (see Appendix II, Figure 1-7). Subsequent injection events would roughly occur every 0.5 to 3 years; depending upon the type of substrate used, and would target areas where groundwater contaminants persist above cleanup goals.

Groundwater monitoring would be performed prior to the initial EAB injection to establish the baseline conditions for comparison. Subsequent rounds of groundwater monitoring would be performed after each EAB injection to assess the performance arid progress of the technology and to support decisions regarding subsequent EAB injection events.

ISCO (In situ Chemical Oxidation)

ISCO would be used to expedite reduction of groundwater contaminants below cleanup criteria. This technology would primarily target dissolved-phase chlorinated VOCs and petroleum hydrocarbon contaminants. ISCO would involve multiple injections of a chemical oxidant, such as Fenton's Reagent, into the contaminated aquifer. This reagent has been shown to be effective for oxidizing the contaminants present at this Site. The initial injection event would be completed using a grid system with multiple injection points. A total of 155 points were estimated for evaluation purposes (see Appendix II, Figure 1-8). It is expected that subsequent injection events would occur every 6 to 12 months and would target areas where groundwater contaminants persist above cleanup goals.

Groundwater monitoring would be performed prior to the initial ISCO injection to establish the baseline conditions for comparison. Subsequent rounds of groundwater monitoring would be performed after each ISCO injection to assess the performance and progress of the technology and to support decisions regarding subsequent ISCO injection events.

Because this remedy will not result in hazardous substances, pollutants or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure after implementation of the remedy, a statutory five-year review is not required.

COMPARATIVE ANALYSIS OF ALTERNATIVES

In selecting a remedy, EPA considers the factors set out in Section 121 of CERCLA, 42 U.S.C. § 9261, by conducting a detailed analysis of the viable remedial alternatives pursuant to the NCP, 40 CFR § 300.430(e)(9) and Office of Solid Waste and Emergency Response (OSWER) Directive 9355.3-01. The detailed analysis consists of an assessment of the alternatives against each of nine evaluation criteria and comparative analysis focusing upon the relative performance of each alternative against those criteria. The results of this analysis are summarized in Appendix II, Table 4.

Threshold Criteria - *The first two criteria are known as "threshold criteria" because they are the minimum requirements that each response measure must meet in order to be eligible for selection as a remedy.*

1. Overall Protection of Human Health and the Environment

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

Alternative 1, The No Action Alternative, would not provide protection of human health or the environment, because contamination would persist in the groundwater, and potential exposure to contaminated groundwater would not be restricted. Alternative 2 would provide protection of human health and the environment, as the contaminated plume would be under hydraulic control, contaminant concentrations would reduce over time, and aquifer flushing would help to restore groundwater quality. Alternative 3 would also provide protection of human health and the environment. In addition to providing hydraulic control and aquifer flushing, concentrations; of contaminants could be significantly reduced during the initial years of operation if *in situ* treatment proves applicable. However, groundwater extraction and treatment may still be required for up to 30 years of operation in order to meet the groundwater cleanup criteria.

2. Compliance with applicable or relevant and appropriate requirements (ARARs)

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

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

other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site. Only those State standards that are identified in a timely manner and are more stringent than Federal requirements may be relevant and appropriate.

Compliance with ARARs addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of Federal and State environmental statutes or provides a basis for invoking a waiver.

Actions taken at any Superfund site must meet all ARARs of federal and state law, or provide grounds for invoking a waiver of these requirements. These include chemical-specific, which are health- or risk-based concentration limits; location-specific, which are based on the geographical location of the site and its surroundings; and action-specific, which are controls on particular types of remedial activities.

Alternative 1 will not meet chemical-specific ARARs for contaminated groundwater discharge to surface water or groundwater quality.

Under Alternatives 2, contaminant concentrations are expected to decrease over time; however, chemical-specific ARARs for groundwater quality may not be met within the estimated 30-year time frame.

Under Alternative 3, contaminant concentrations are expected to decrease significantly during the initial years of the remedial action as a result of *in situ* treatment. Groundwater extraction and treatment may be required for up to 30 years to meet the chemical-specific ARARs. Under both Alternatives 2 and 3, long-term monitoring would be conducted to assess the degree of compliance achieved over time. Treatment plant and well construction would meet location-specific ARARs protective of wetlands and floodplains for Alternatives 2 and 3. Vapor and groundwater effluent discharges from the *ex situ* treatment system would meet corresponding NJDEP action-specific ARARs for both Alternatives 2 and 3. Under Alternative 3, *in situ* treatment would be conducted to meet action-specific ARARs. NJDEP and/or local permit equivalencies may potentially be required for the following: 1) well installation, 2) general construction, 3) groundwater allocation, 4) discharge of treated groundwater effluent to aquifer, and 5) off-gas discharge to ambient air for Alternatives 2 and 3.

Primary Balancing Criteria - *The next five criteria, criteria 3 through 7, are known as "primary balancing criteria." These criteria are factors with which tradeoffs between response measures are assessed so that the best option will be chosen, given the site-specific data and conditions.*

3. Long-term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup levels have been met. This criterion includes the consideration of residual risk that will remain on site following remediation and the adequacy and reliability of controls.

Alternative 1 would not reduce risk in the long term, since the contaminants would not be controlled or destroyed. Since both Alternatives 2 and 3 would be effective for hydraulic control, both mitigate risks of off-site migration of contaminants. It is expected that Alternative 2 would provide a gradual reduction in contaminant concentrations and the associated residual risks. Alternative 3 would reduce contaminant concentrations and the associated risks more significantly during the initial years of operation.

Both Alternatives 2 and 3 are considered adequate and reliable, since both consist of a groundwater extraction and treatment component, which is a proven technology, to maintain hydraulic control of the groundwater contamination. Long-term groundwater monitoring would be performed over the course of the remedy implementation to assess the degree of remedy effectiveness over time. The *in situ* component of Alternative 3 may provide further reliability to the remedy, as it more aggressively targets contamination within the aquifer. However, due to uncertainty associated with *in situ* treatment, pilot testing would be required prior to remedy installation to determine the most appropriate treatment technologies/approach.

4. Reduction of Toxicity, Mobility or Volume (TMV) of Contaminants Through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

Alternative 1 would not reduce TMV through treatment, as no active treatment of contaminated groundwater occurs. Alternative 2 would reduce contaminant mobility by providing hydraulic control. Gradual reduction in toxicity and volume of contamination is expected through *ex situ* treatment. Alternative 3 would also reduce contaminant mobility via hydraulic plume control. In addition, it could significantly reduce contaminant toxicity and volume via *in situ* treatment if Site conditions prove favorable.

5. Short-term Effectiveness

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

For Alternative 1, protection of the community and workers is not applicable, since no remedial action occurs. Alternatives 2 and 3 would require well installation and treatment plant construction, but impacts to the community would not be significant as the surrounding area is predominantly rural. Workers would be protected through the use of air monitoring, engineering controls, and appropriate personal protective equipment.

6. Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such . as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

Since it requires no action, Alternative 1 is technically and administratively the easiest to implement. Alternative 2 is the second easiest to implement, as the technical feasibility of pump and treat systems is well established. Alternative 3 is implementable as well, as *in situ* treatment of groundwater has received widespread use. Alternative 3 would require pilot studies to support detailed design decisions. Regulatory/permitting requirements for Alternatives 2 and 3 are not expected to be unduly burdensome.

7. Cost

Includes estimated capital and O&M costs, and net present worth value of capital and O&M costs.

Alternative 1 has no cost. The total estimated present worth cost is $6,400,000 for Alternative 2 and $8,200,000 for Alternative 3.

Modifying Criteria - *The final two evaluation criteria, criteria 8 and 9, are called "modifying criteria " because new information or comments from the state or the community on the Proposed Plan may modify the preferred remedy and cause another response measure to be considered.*

8. State/Support Agency Acceptance

Indicates whether, based on its review of the RI/FS reports and the Proposed Plan, the state supports, opposes, and/or has identified any reservations with the selected response measure.

The State of New Jersey concurs with the Selected Remedy, Alternative 3.

9. Community Acceptance

Summarizes the public's general response to the proposed alternative and other information described in the Proposed Plan and the RI/FS reports. This assessment includes determining which of the response measures the community supports, opposes, and/or has reservations about.

During the public comment period, the community expressed no disagreement with the selection of Alternative 3. The attached Responsiveness Summary summarizes the community comments on the Post-Decision Proposed Plan.

PRINCIPAL THREAT WASTE

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP Section 300.430(a)(l)(iii)(A)). Identifying principal threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Conversely, non-principal threat wastes are those source materials that generally can be reliably contained and that would present only a low risk in the event of exposure. The manner in which principal threats are addressed generally will determine whether the statutory preference for treatment as a principal element is satisfied.

EPA considers the residual VOC soil contamination, and the benzene and toluene LNAPL groundwater contamination at the Site to meet the definition of "principal threat wastes," since both constitute source materials that continue to release toxic and mobile VOC contaminants to groundwater. As previously stated, EPA is in the process of removing up to 21,000 cubic yards of VOC-contaminated soil from the Site. The action chosen in this ROD Amendment, together with the on-going soil removal action, will meet the "principal threat" waste expectation described above.

SELECTED REMEDY

Based upon consideration of the results of the Site investigation, the requirements of CERCLA, the detailed analysis of the response measures, and public comments, EPA and the State of New Jersey have determined that Alternative 3, Groundwater Extraction and Treatment with the potential to use *In Situ* Treatment as needed, is the appropriate Amended Remedy for addressing the contaminants in Site groundwater. The selected alternative, Alternative 3, for cleanup of the contaminated groundwater consists of the following components.

- Design and construction of a new groundwater extraction and treatment system to maintain hydraulic plume control and to facilitate contaminant mass removal and aquifer flushing via focused pumping and effluent re-injection/recharge;

- It may also include one of the following *in situ* technologies: soil vapor extraction/air sparging (SVE/AS), enhanced anaerobic bioremediation (EAB), or chemical oxidation (ISCO), if it is determined that residual hot spots remain after the current soil excavation phase is completed; and

- Appropriate maintenance and performance monitoring to ensure the effectiveness of the remedy. A performance monitoring program for the Amended Remedy is to be developed which evaluates the effectiveness, optimizes the operation parameters, determines the parameters for remedy closure and confirms compliance with the cleanup goals.

Along with Alternative 2, Alternative 3 is protective of human health and the environment while the *in situ* option holds the advantage of more significantly reducing contaminant levels during the initial years of operation. Alternative 3 provides long-term effectiveness and reliability by maintaining hydraulic control. Alternative 3 also complies with chemical-, location-, and action-specific ARARs for the Site. The primary advantage of Alternative 3 is its flexibility. If the results of the groundwater pre-design investigation, to be performed following completion of the on-going soil excavation, indicate that *in situ* treatment, such as SVE/AS, will appreciably shorten the cleanup time for the pump and treat, that option will be available without the need for an ESD or ROD amendment.

The estimated cost of Alternative 3 is $8,200,000. A summary of the estimated remedy cost for Alternative 3 is included as Table 5 of this ROD Amendment. The information in the cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in a memorandum in the Administrative Record file, an Explanation of Significant Differences, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

Following the determination that the groundwater extraction and treatment system is operational and functional, there will be a ten-year long term remedial action (LTRA) period.

EPA will evaluate the need for an institutional control, such as a Classification Exception Area, Deed Notice, or designation of a Well Restriction Area. 4

Based on information currently available, EPA believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. EPA expects the Preferred Alternative to satisfy the statutory requirements of CERCLA § 121 (b), as discussed below.

STATUTORY DETERMINATIONS

As previously noted, Section 121(b)(l) of CERCLA mandates that a remedial action must be protective of human health and the environment, be cost effective, and utilize permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable. Section 121(b)(l) also establishes a preference for remedial actions which employ treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, or contaminants at the Site. Section 121(d) of CERCLA further specifies that a remedial action must attain a degree of cleanup that satisfies ARARs under federal and state laws, unless a waiver can be justified pursuant to section 121(d)(4) of CERCLA. As discussed below, EPA has determined that the Amended Remedy meets the requirements of Section 121 of CERCLA.

Protection of Human Health and the Environment

The Amended Remedy, Alternative 3, will adequately protect human health and the environment through removal of contaminants from Site groundwater via *ex situ* and *in situ* treatment. EPA will evaluate the need for an institutional control such as a Classification Exception Area, Deed Notice, or designation of a Well Restriction Area.

Compliance with ARARs

At the completion of the response action, the Amended Remedy will have complied with all applicable ARARs, including, but not limited to:

Chemical-Specific ARARs

Chemical-specific ARARs are defined as those that specify achievement of a particular cleanup level for specific chemicals or classes of chemicals. These standards usually take the form of health- or risk-based numerical limits that restrict concentrations of various chemical substances to a specified level. Because groundwater in the immediate vicinity of the Site is currently used as a source of drinking water, chemical-specific ARARs and TBCs generally address drinking water standards and protection of groundwater quality. The chemical-specific ARARs/TBCs for the modified remedy are summarized in Appendix II, Table 6-1.

Location-specific ARARs and TBCs

Location-specific ARARs are those which are applicable or relevant and appropriate due to the location of the Site or area being remediated. For this Site, these consist of regulations applicable to wetlands, flood plains, endangered species, and wildlife habitats. The location-specific ARARs/TBCs for the modified remedy are summarized in Appendix II, Table 6-2.

Action-specific ARARs and TBCs

Action-specific ARARs are those which are applicable or relevant and appropriate to particular remedial actions, technologies, or process options. These regulations do not define site cleanup levels but do affect the implementation of specific types of remediation. For example, although outdoor air has hot been identified as a medium of concern, air quality ARARs are listed below, because some potential remedial actions may result in. air emissions of toxic or hazardous substances. These action-specific ARARs are considered in the screening and evaluation of various technologies arid process options in subsequent sections of this report. The action-specific ARARs/TBCs for the modified remedy are summarized in Appendix II, Table 6-3.

Cost Effectiveness

EPA has determined that the Selected Remedy is cost effective in mitigating the principal threat posed by residual VOC soil contamination and benzene and toluene NAPL groundwater contamination. The overall effectiveness of the Selected Remedy has been determined to be proportional to the costs. The Selected Remedy therefor represents a reasonable value for the money to be spent.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

EPA has determined that the Amended Remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable, and provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and considering State and community acceptance.

Of those alternatives considered to address the groundwater contamination at the Site, the Amended Remedy is a permanent remedy that extracts and treats the groundwater. The *in situ* component of the remedy has the advantage of significantly reducing contaminant levels during the initial years of operation, which may in turn shorten the life-cycle period. Only Alternative 3 allows for this (greater flexibility. If the results of the pre-design investigation, to be performed after completion of the on-going soil excavation, indicate that *in situ* treatment, such as SVE/AS, could appreciable shorten the cleanup time for the pump and treat, that option will be available without the need for an ESD or ROD amendment.

Preference for Treatment as a Principal Element

By using a combination of *ex situ* treatment processes, as well as the option for *in situ* treatment, the Amended Remedy satisfies the statutory preference for remedies that employ treatment as a principal element.

Five-Year Review Requirements

Because this remedy will not result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, but may take more than five years to attain the remedial action objectives and cleanup levels for the groundwater, a policy review may be conducted within five years of construction completion for the Site to ensure that the remedy is, or will be, protective of human health and the environment.

DOCUMENTATION OF SIGNIFICANT CHANGES

The Post-Decision Proposed Plan for the Bog Creek Farm Superfund Site was released for public comment on August 15, 2005 and the public comment period ran from that date through September 13,2005. The Post-Decision Proposed plan identified Alternative 3, Groundwater Extraction and Treatment with *In Situ* Treatment, as the Preferred Alternative.

All written and verbal comments submitted during the public comment period were reviewed by EPA. Upon review of these comments, EPA has determined that no significant changes to the remedy, as it was originally identified in the Post-Decision Proposed Plan, were necessary.

APPENDIX I

Figures

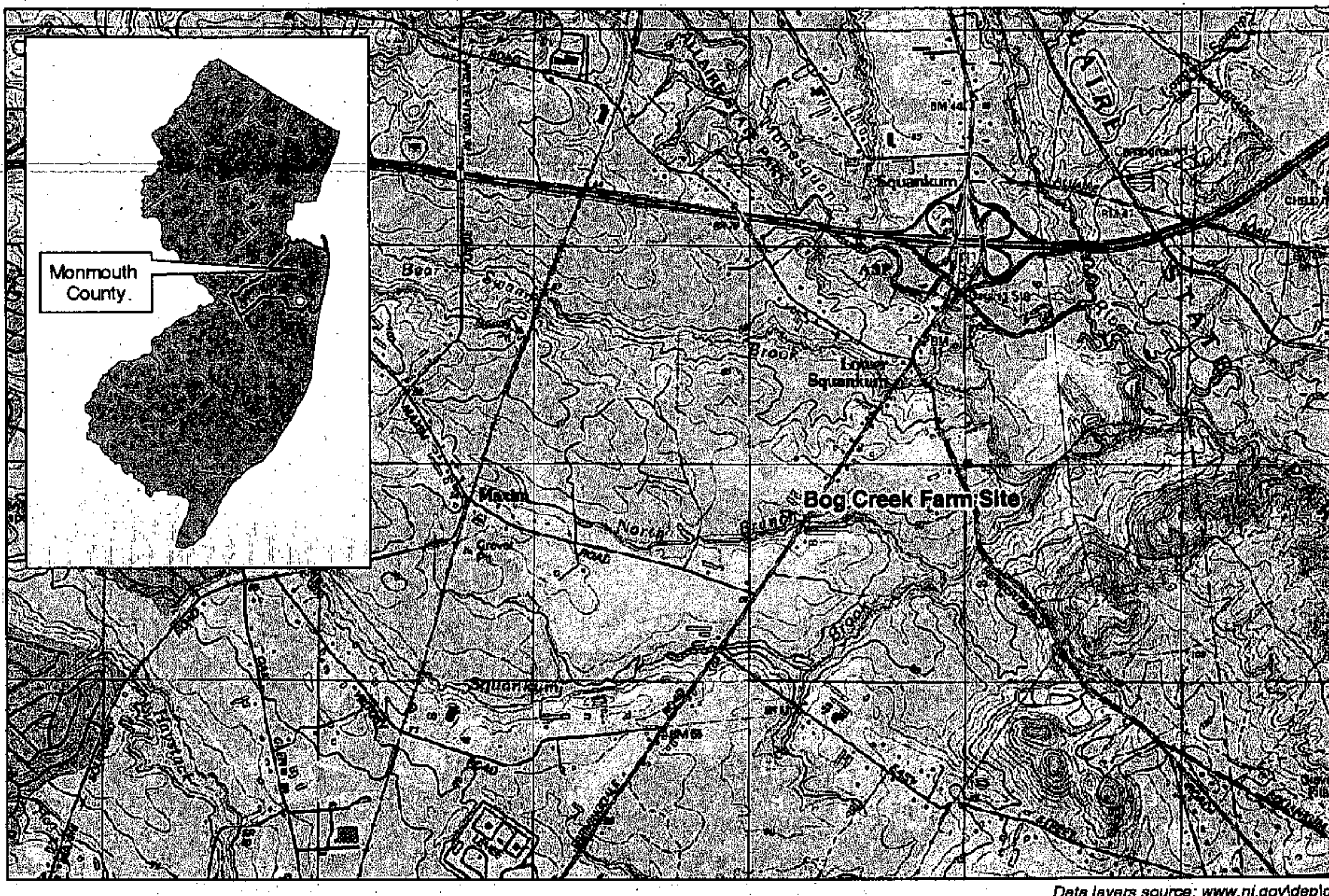
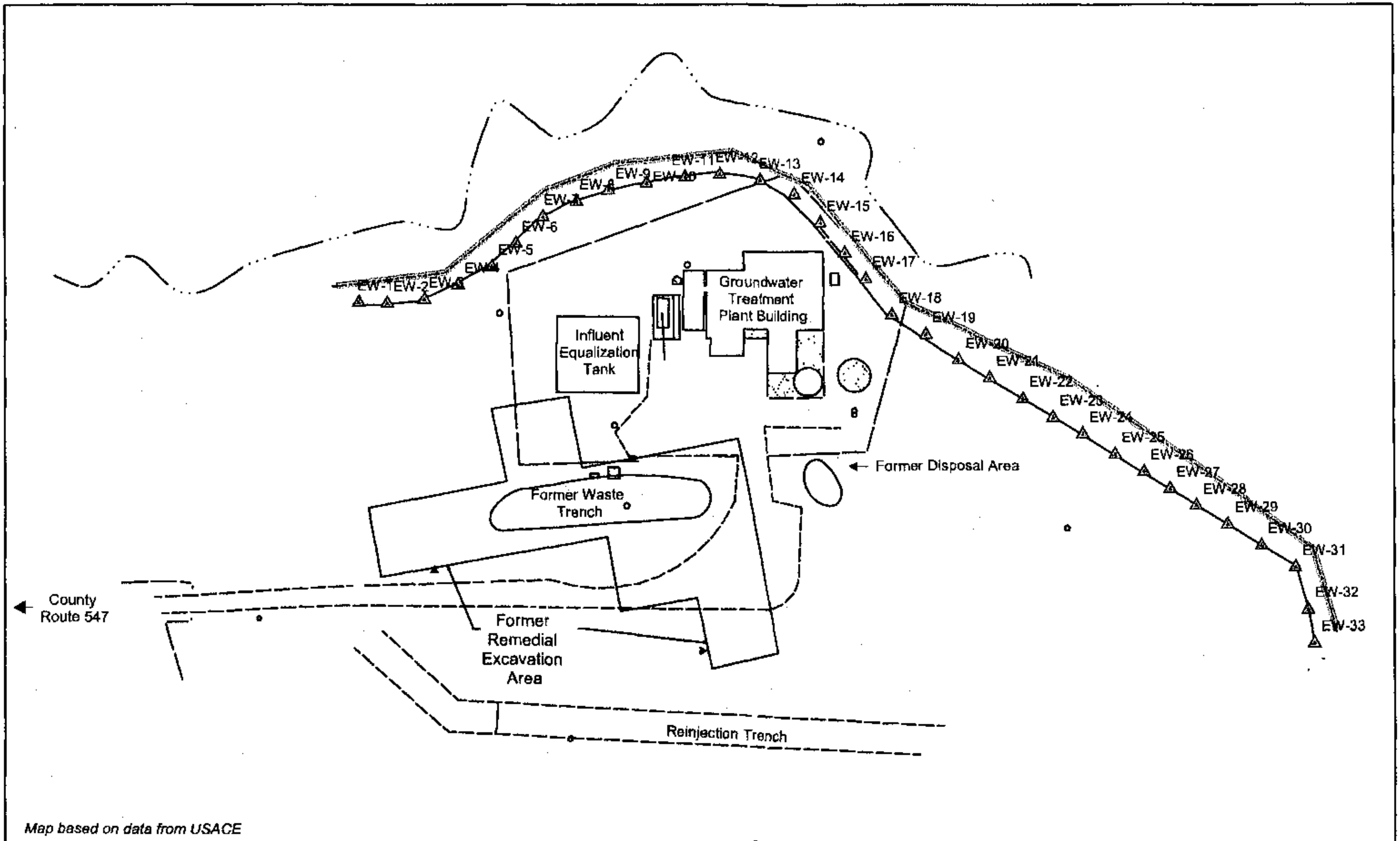


Figure 1-1
Site Location Map
Bog Creek Farm Site
Howell Township, Monmouth County, New Jersey

CDM



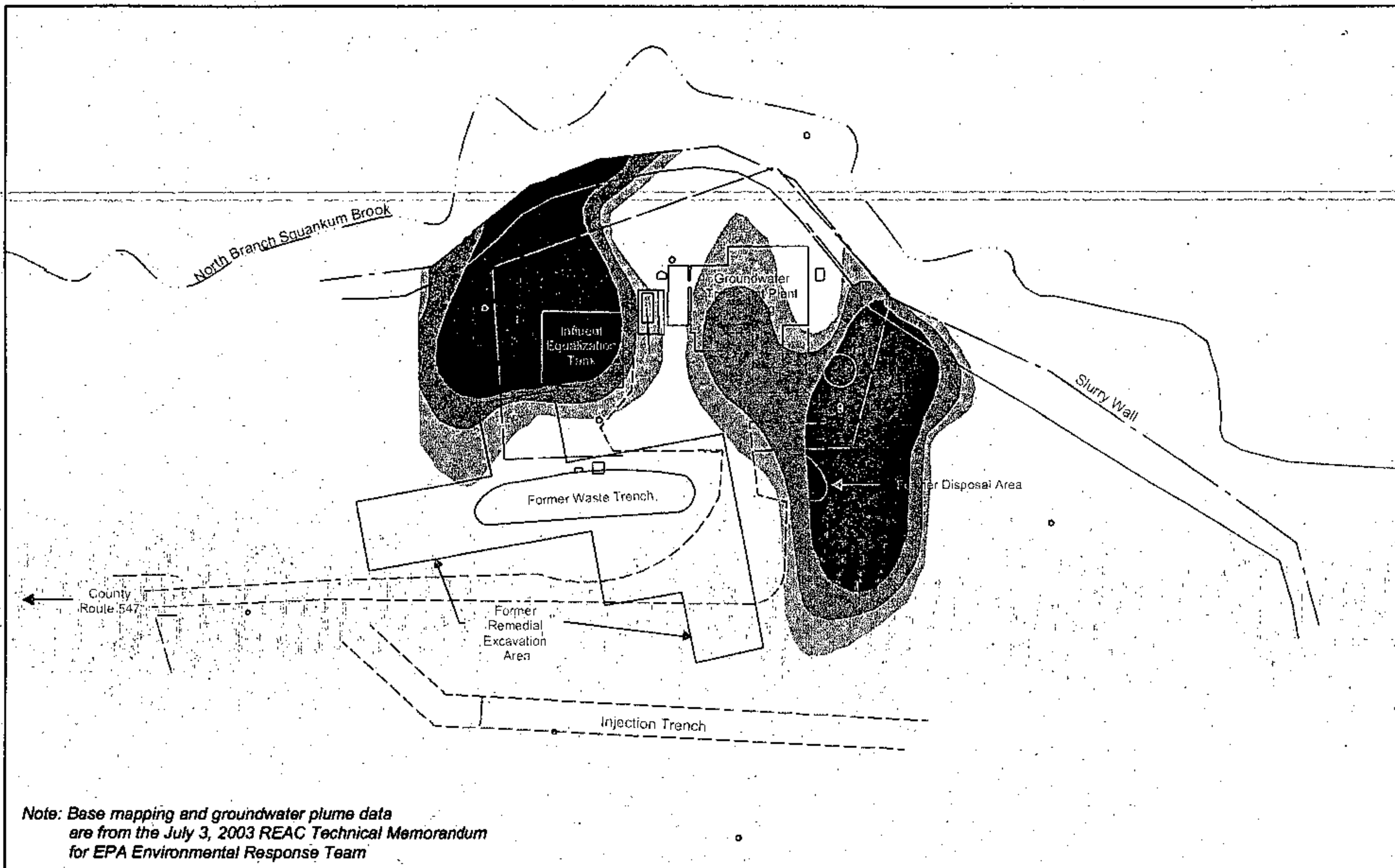
Squankum Brook
Fence
Extraction Wells
Slurry Wall

N W E S

0 25 50 100 150 Feet

CDM

Figure 1-2
Site Map
Bog Creek Farm Site
Howell Township, Monmouth County, New Jersey



Note: Base mapping and groundwater plume data are from the July 3, 2003 REAC Technical Memorandum for EPA Environmental Response Team

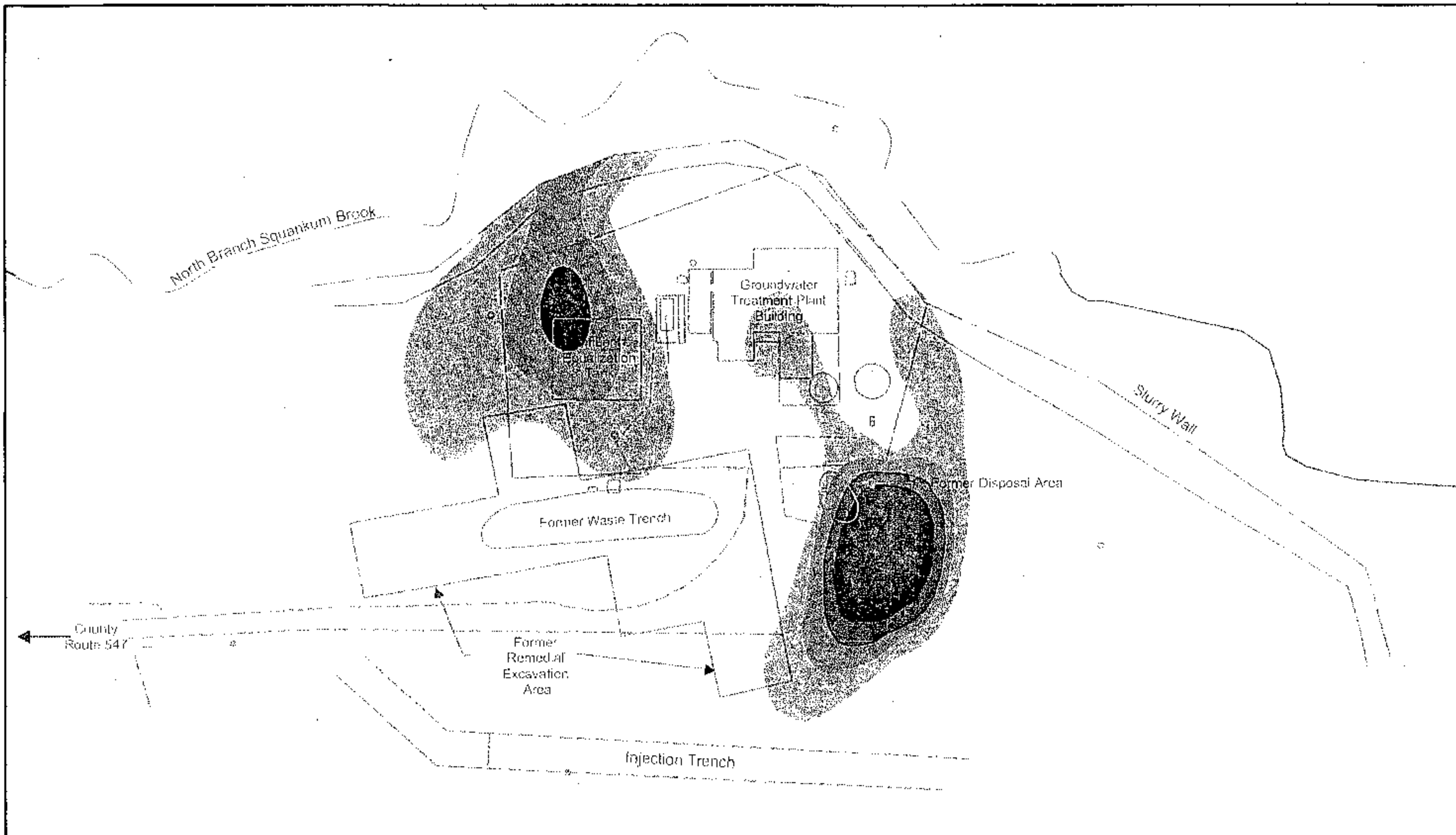
Benzene, Toluene, Ethylene, Xylene (BTEX)

- 2-10 mg/L BTEX
- 10-25 mg/L BTEX
- 25-50 mg/L BTEX
- > 50 mg/L BTEX

0 20 40 80 120 160 Feet

CDM

Figure 1-3
BTEX Plume
Bog Creek Superfund Site
Howell Township
Monmouth County, New Jersey



Note: Base mapping and groundwater plume data are from the July 3, 2003 REAC Technical Memorandum for EPA Environmental Response Team

Total Chlorinated Compounds

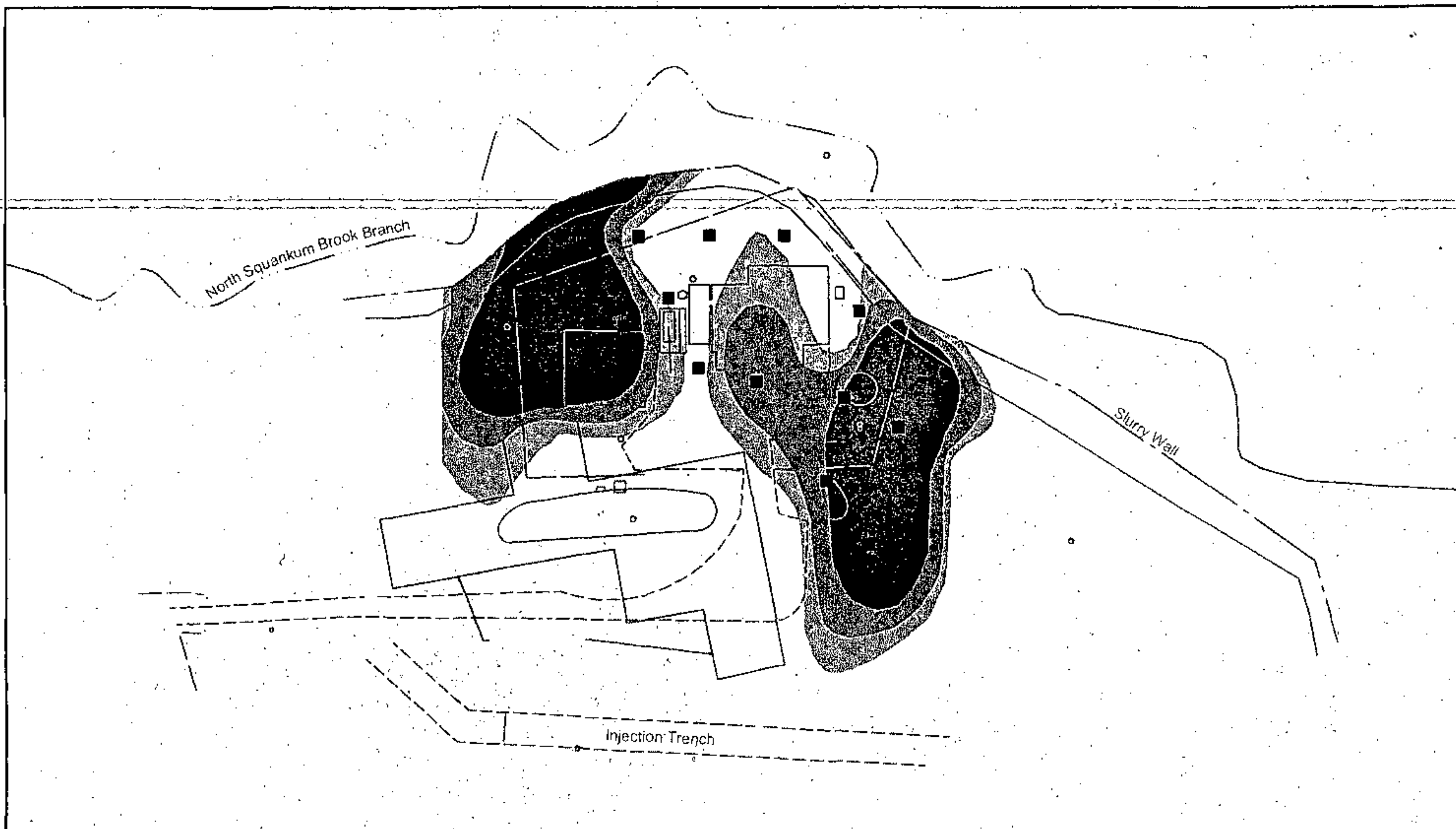
- 1-5 mg/L
- 5-10 mg/L
- 10-15 mg/L
- 15-25 mg/L
- >25 mg/L

N W E S

0 20 40 80 120 160 Feet

CDM

Figure 1-4
CVOC Plume
Bog Creek Superfund Site
Howell Township
Monmouth County, New Jersey



Note: Base mapping and groundwater plume data are from the July 3, 2003 REAC Technical Memorandum for EPA Environmental Response Team

■ Groundwater Extraction Well (Extraction rates of 0.5 gpm to 1 gpm, 10.5 gpm total)

Benzene, Toluene, Ethylene, Xylene (BTEX)

- 2-10 mg/L BTEX
- 10-25 mg/L BTEX
- 25-50 mg/L BTEX
- >50 mg/L BTEX

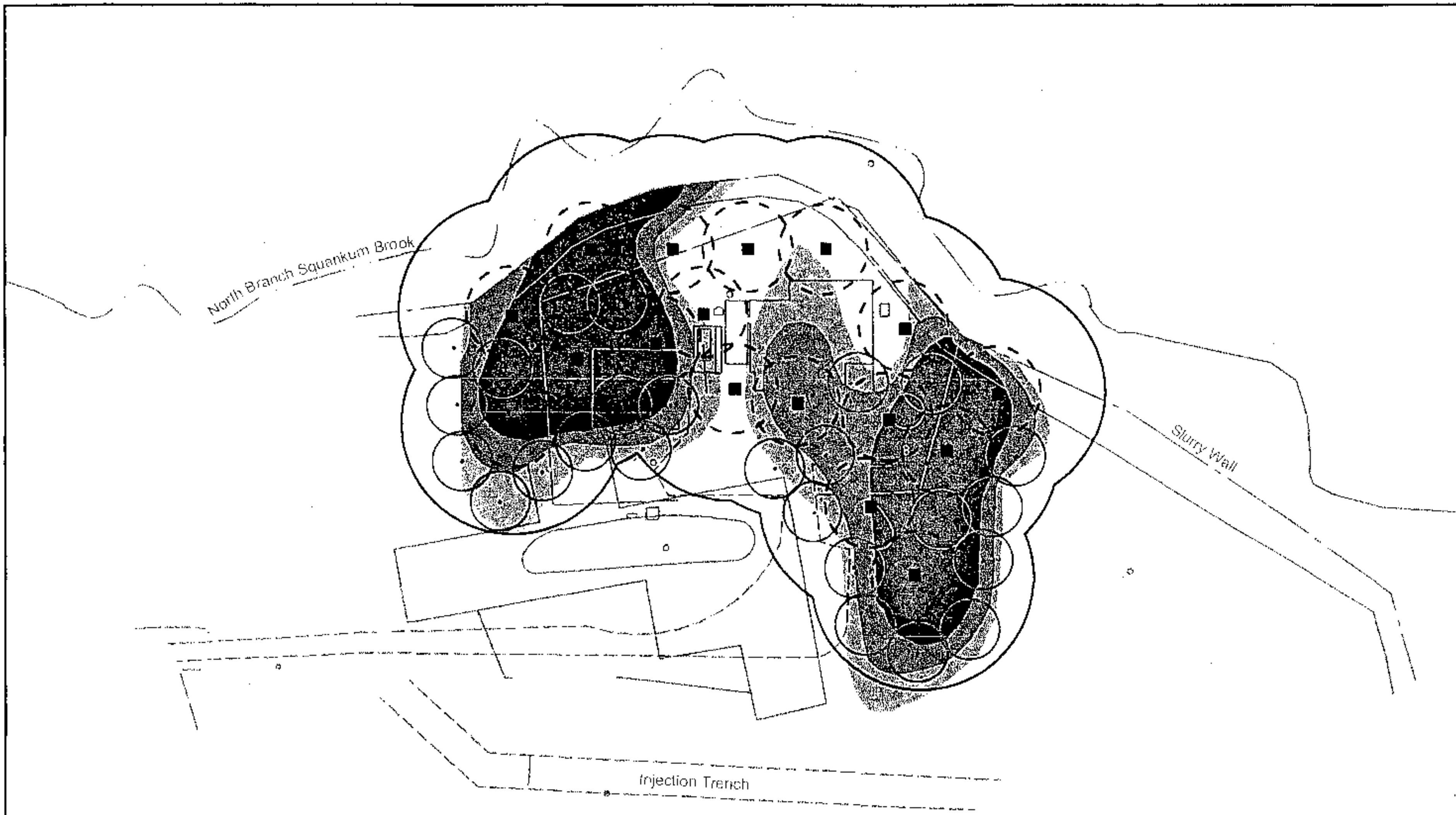
N W E S

0 20 40 80 120 160 Feet

CDM

Figure 1-5

Conceptual Site Layout for RA Alternative 2 - GWP&T
Bog Creek Superfund Site
Howell Township
Monmouth County, New Jersey



Note: Base mapping and groundwater plume data are from the July 3, 2003 REAC Technical Memorandum for EPA Environmental Response Team

Dual-Phase Extraction (DPE) Well (17 wells, 30' DPE radius of influence)

Air Sparge Well (25 wells, assumes 20' radius of influence)

Limit of SVE vacuum influence (75' radius of influence centered on each of the 17 DPE wells)

Benzene, Toluene, Ethylene, Xylene (BTEX)

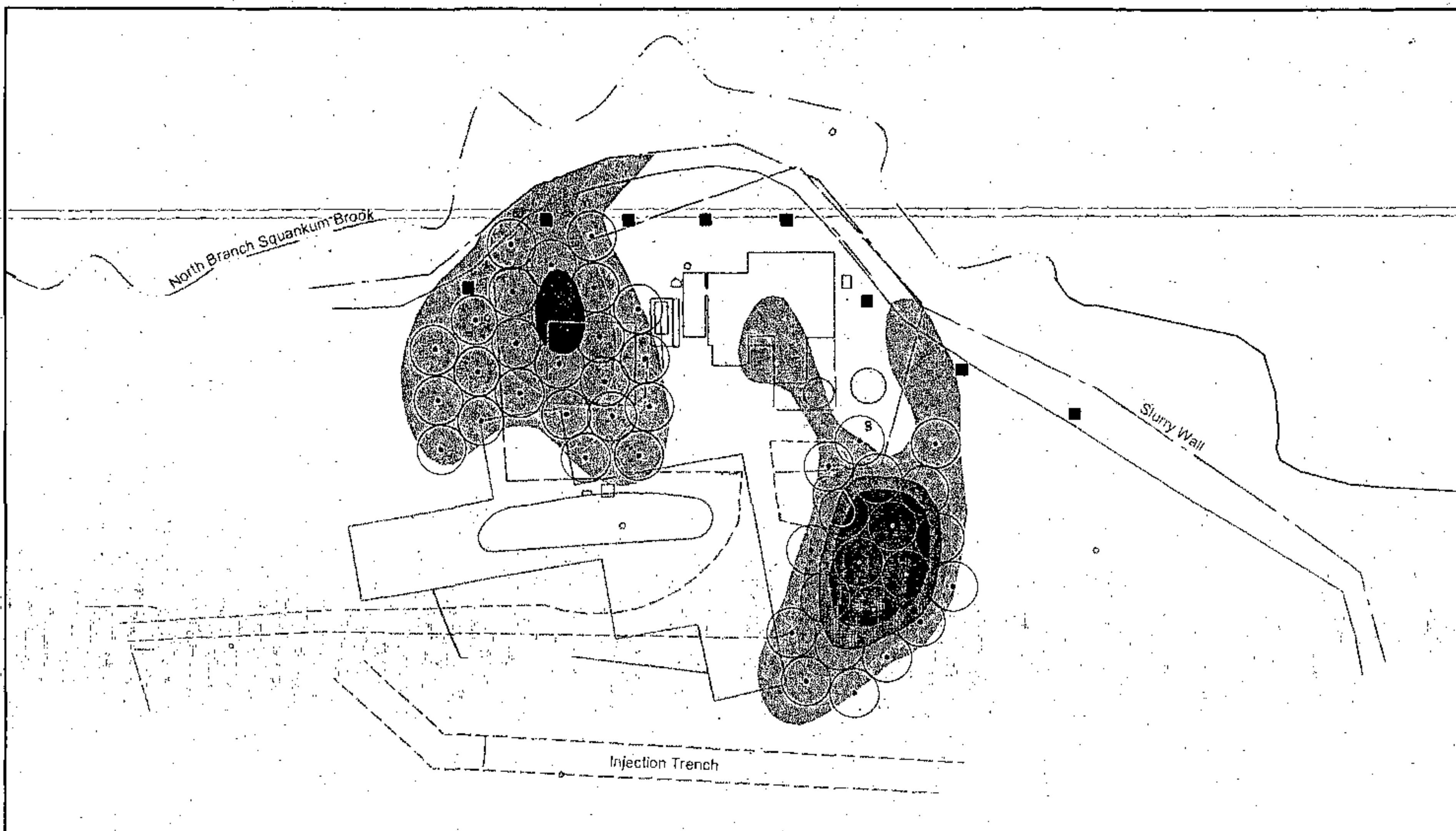
- 2-10 mg/L BTEX
- 10-25 mg/L BTEX
- 25-50 mg/L BTEX
- >50 mg/L BTEX

0 20 40 80 120 160 Feet

CDM

Figure 1-6

Conceptual Site Layout for RA Alternative 3 - GWP&T with SVE/AS
Bog Creek Superfund Site
Howell Township
Monmouth County, New Jersey



Note: Base mapping and groundwater plume data are from the July 3, 2003 REAC Technical Memorandum for EPA Environmental Response Team

■ Groundwater Extraction Well (Extraction rates of 0.5 to 1 gpm, 5 gpm total)

◉ Electron Donor Injection Point (44 injection points, assumes 15' radius of EAB influence)

Total Chlorinated Compounds

- 1-5 mg/L
- 5-10 mg/L
- 10-15 mg/L
- 15-25 mg/L
- >25 mg/L

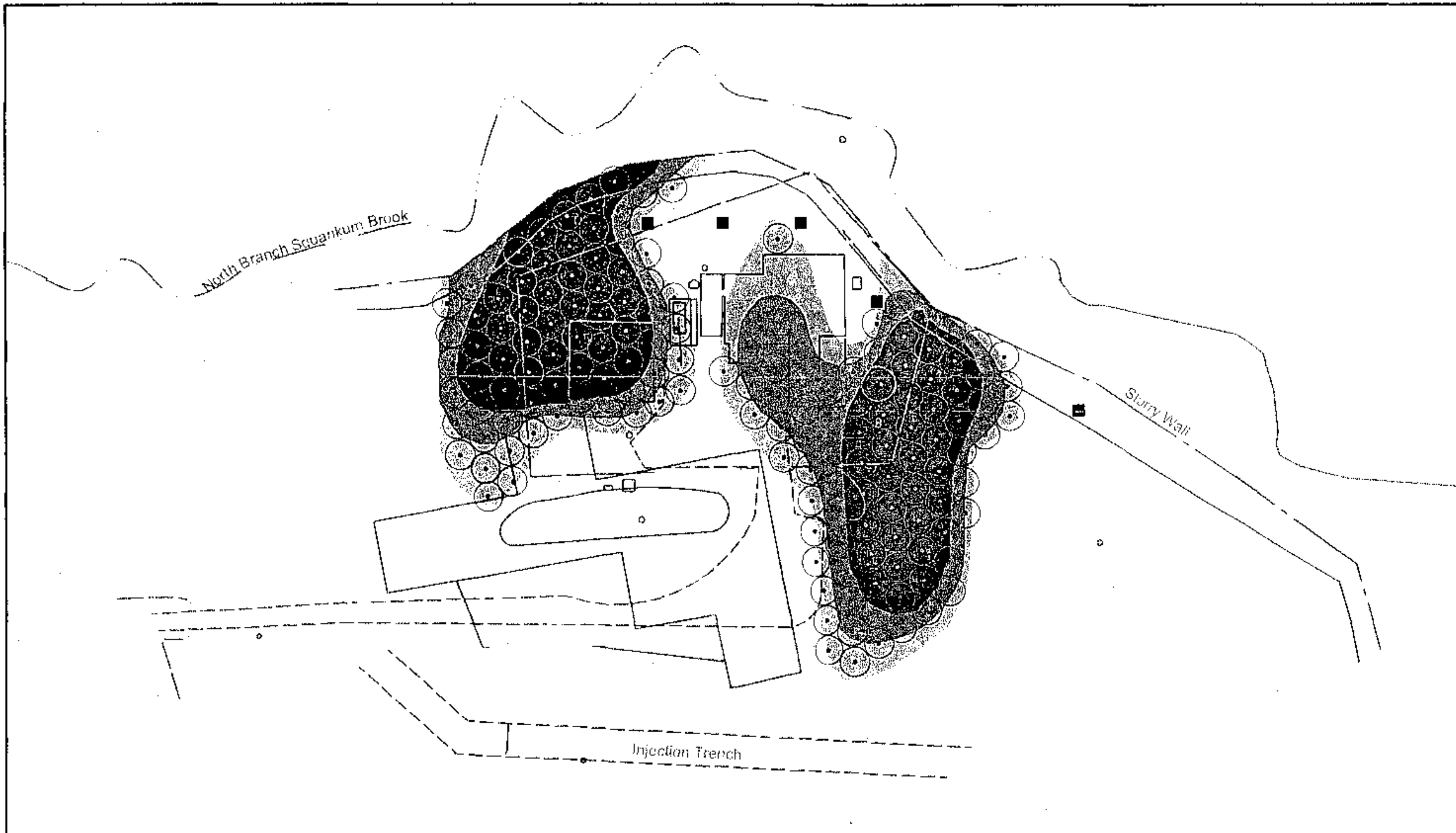
N / W / E / S

0 20 40 80 120 160 Feet

CDM

Figure 1-7

Conceptual Site Layout for RA Alternative 3 - GWP&T with EAB
Bog Creek Superfund Site
Howell Township
Monmouth County, New Jersey



Note: Base mapping and groundwater plume data are from the July 3, 2003 REAC Technical Memorandum for EPA Environmental Response Team

■ Groundwater Extraction Well (extraction rates of 0.5 to 1 gpm, 5 gpm total)

⊙ Chemical Oxidation Reagent Injection Point (155 injection points, assumes 10' radius of ISCO influence)

Benzene, Toluene, Ethylene, Xylene (BTEX)

- 2-10 mg/L BTEX
- 10-25 mg/L BTEX
- 25-50 mg/L BTEX
- > 50 mg/L BTEX

N W E S

0 20 40 80 120 160 Feet

CDM

Figure 1-8

Conceptual Site Layout for Alternative 3 - GWP&T with ISCO
Bog Creek Superfund Site
Howell Township
Monmouth County, New Jersey

APPENDIX II

Tables

Table 1

NJDEP Groundwater Quality Criteria for Class IIA Aquifers for Site COPCs

Bog Creek Farm Superfund Site, Howell, NJ

CAS #	Compound	NJDEP Groundwater Quality Criteria (Class IIA)	
		ug/l	Criteria note[1]
Volatile Organic Compounds (VOCs)			
71-55-6	1,1,1-Trichloroethane	30	s
79-00-5	1,1,2-Trichloroethane	3	s
75-34-3	1,1-Dichloroethane	50	ism
75-35-4	1,1-Dichloroethene	2	PQL
95-63-6	1,2,4-Trimethylbenzene	100	ignc
95-50-1	1,2-Dichlorobenzene	600	s
107-06-2	1,2-Dichloroethane	2	PQL
108-67-8	1,3,5-Trimethylbenzene	100	ignc
106-46-7	1,4-Dichlorobenzene	75	s
108-10-1	4-Methyl-2-pentanone	400	s
67-64-1	Acetone	700	s
71-43-2	Benzene	1	PQL
108-90-7	Chlorobenzene	50	is
75-00-3	Chloroethane	100	ignc
67-66-3	Chloroform	6	s
156-59-2	cis-1,2-Dichloroethene	70	is
100-41-4	Ethylbenzene	700	s
98-82-8	Isopropylbenzene	800	is
103-65-1	n-Propylbenzene	100	ignc
127-18-4	Tetrachloroethene	1	PQL
108-88-3	Toluene	1000	s
79-01-6	Trichloroethene	1	s

Table 1

NJDEP Groundwater Quality Criteria for Class IIA Aquifers for Site COPCs

Bog Creek Farm Superfund Site, Howell, NJ

CAS #	Compound	NJDEP Groundwater Quality Criteria (Class IIA)	
		ug/l	Criteria note[1]
75-01-4	Vinyl Chloride	5	PQL
1330-20-7	Xylenes (total)	1000	is
Semi-Volatile Organic Compounds (SVOCs)			
105-67-9	2,4-Dimethylphenol	100	s
95-48-7	2-Methylphenol	100	ignc
106-44-5	4-Methylphenol	100	ignc
117-81-7	bis(2-Ethylhexyl) phthalate	30	PQL
87-68-3	Hexachlorobutadiene	1	s
78-59-1	Isophorone	100	s
91-20-3	Naphthalene	300	ism
86-30-6	n-Nitrodiphenylamine	20	PQL
108-95-2	Phenol	4000	s
Pesticides/PCBs			
309-00-2	Aldrin	0.04	PQL
319-84-6	alpha-BHC	0.02	PQL
1024-57-3	Heptachlor epoxide	0.2	PQL
Metals			
7440-36-0	Antimony	20	PQL
7440-38-2	Arsenic	8	PQL
7440-47-3	Chromium	100	s
7439-89-6	Iron	300	s
7439-92-1	Lead	10	PQL

Table 1 NJDEP Groundwater Quality Criteria for Class IIA Aquifers for Site COPCs Bog Creek Farm Superfund Site, Howell, NJ			
CAS #	**Compound**	**NJDEP Groundwater Quality Criteria (Class IIA)**	
		ug/l	**Criteria note[1]**
7439-96-5	Manganese	50	s

Notes:

1) NJDEP Groundwater Quality Criteria Notes

s specific
is interim specific
ism interim specific (MCL based)
ignc interim general non-carcinogenic
PQL Practical Quantitation Limit

Table 2
Summary of Groundwater Data[1]
Groundwater FFS
Bog Creek Superfund Site, Howell, New Jersey

CAS #	Compound	Average Detected Concentration (µg/L)	Concentration Range (µg/L)	Detections versus Wells Sampled[3]	NJDEP Groundwater Quality Criteria (Class IIA)	
					ug/L	Criteria note[2]
Volatile Organic Compounds (VOCs)						
71-55-6	1,1,1-Trichloroethane	332.7	1.5 - 2200	21 of 32	30	s
79-00-5	1,1,2-Trichloroethane	54.2	1.4 - 260	6 of 32	3	s
75-34-3	1,1-Dichloroethane	88.6	1.1 - 640	20 of 32	50	ism
75-35-4	1,1-Dichloroethene	68.5	37 - 100	2 of 32	2	PQL
95-63-6	1,2,4-Trimethylbenzene	452.2	1.1 - 1600	24 of 32	100	Ignc
95-50-1	1,2-Dichlorobenzene	79.1	1.1 - 230	18 of 32	600	s
107-06-2	1,2-Dichloroethane	3054.0	1.1 - 30000	10 of 32	2	PQL
78-87-5	1,2-Dichloropropane	15.0	15 - 15	1 of 32	1	PQL
108-67-8	1,3,5-Trimethyl Benzene	159.9	1.4 - 500	20 of 32	100	ignc
106-46-7	1,4-Dichlorobenzene	4.9	1.7 - 14	4 of 32	75	s
78-93-3	2-Butanone	54.5	46 - 63	2 of 32	300	s
591-78-6	2-Hexanone	587.0	74 - 1100	2 of 32	100	ignc
108-10-1	4-Methyl-2-pentanone	3471.4	97 - 16000	5 of 32	400	s
67-64-1	Acetone	97.8	2.1 - 750	13 of 32	700	s
71-43-2	Benzene	1808.1	1.9 - 8800	23 of 32	1	PQL
108-86-1	Bromobenzene	1.7	1.7 - 1.7	1 of 32		
108-90-7	Chlorobenzene	51.8	1.3 - 290	15 of 32	50	is
75-00-3	Chloroethane	52.2	2.3 - 94	6 of 32	100	ignc
67-66-3	Chloroform	246.0	1 - 1500	10 of 32	6	s
156-59-2	cis-1,2-Dichloroethene	948.7	1.7 - 8300	23 of 32	70	is
99-87-6	Cymene	12.7	1.2 - 29	12 of 32	100	ignc
100-41-4	Ethylbenzene	1738.8	1.8 - 6900	25 of 32	700	s
87-68-3	Hexachlorobutadiene	20.0	17 - 23	3 of 32	1	s
98-82-8	Isopropylbenzene	44.9	2.2 - 140	14 of 32	800	is
75-09-2	Methylene Chloride	1295.8	14 - 5100	4 of 32	2	s
91-20-3	Naphthalene	78.5	2.8 - 190	16 of 32	300	ism
103-65-1	n-Propylbenzene	207.0	2.8 - 1300	19 of 32	100	ignc
100-42-5	Styrene	1600.0	1500 - 1700	2 of 32	100	s
127-18-4	Tetrachloroethene	91.1	1.3 - 590	12 of 32	1	PQL
108-88-3	Toluene	10794.0	1.2 - 58000	25 of 32	1000	s
79-01-6	Trichloroethene	59.8	1 - 520	14 of 32	1	s
75-01-4	Vinyl Chloride	139.2	1.7 - 590	12 of 32	5	PQL
	m & p-Xylene	4457.7	4.5 - 13000	24 of 32		
95-47-6	o-Xylene	1772.0	2.8 - 6000	26 of 32		
1330-20-7	Xylenes (total)	1603.4	1 - 8800	26 of 32	1000	is
Semi-Volatile Organic Compounds (SVOCs)						
95-50-1	1,2-Dichlorobenzene	70.3	3.9 - 150	6 of 9	600	s
106-46-7	1,4-Dichlorobenzene	3.9	3.9 - 3.9	1 of 9	75	s
105-67-9	2,4-Dimethylphenol	2395.8	33 - 6200	4 of 9	100	s
91-57-6	2-Methylnaphthalene	8.3	5.4 - 13	4 of 9	100	ignc
95-48-7	2-Methylphenol	1316.3	13 - 3900	4 of 9	100	ignc
106-47-8	4-Chloroaniline	4.1	4.1 - 4.1	1 of 9	30	is
106-44-5	4-Methylphenol	2912.0	36 - 6700	3 of 9	100	ignc
100-51-6	Benzyl Alcohol	36.2	3.3 - 69	2 of 9	2000	s
117-81-7	bis(2-Ethylhexyl) phthalate	190.0	190 - 190	1 of 9	30	PQL
85-68-7	Butylbenzylphthalate	15.0	15 - 15	1 of 9	100	s
84-66-2	Diethylphthalate	21.8	6.3 - 66	4 of 9	5000	s
131-11-3	Dimethylphthalate	11.3	5.5 - 17	2 of 9	100	ignc
84-74-2	Di-n-butylphthalate	39.3	4.9 - 180	6 of 9	900	s
87-68-3	Hexachlorobutadiene	10.4	9.7 - 11	2 of 9	1	s
78-59-1	Isophorone	915.0	230 - 1600	2 of 9	100	s
91-20-3	Naphthalene	92.2	26 - 150	6 of 9	300	ism
86-30-6	n-Nitrosodiphenylamine	78.6	12 - 180	5 of 9	20	PQL
108-95-2	Phenol	583.3	13 - 1900	4 of 9	4000	s
Metals						
7429-90-5	Aluminum	787.5	200 - 2100	8 of 9	200	s
7440-36-0	Antimony	3.1	3.1 - 3.1	1 of 9	20	PQL
7440-38-2	Arsenic	4.8	2.3 - 11	9 of 9	8	PQL
7440-39-3	Barium	26.6	2.3 - 140	9 of 9	2000	s
7440-70-2	Calcium	34411.1	8700 - 71000	9 of 9		

Table 2
Summary of Groundwater Data[1]
Groundwater FFS
Bog Creek Superfund Site, Howell, New Jersey

CAS #	Compound	Average Detected Concentration (µg/L)	Concentration Range (µg/L)	Detections versus Wells Sampled[3]	NJDEP Groundwater Quality Criteria (Class IIA)	
					ug/L	Criteria note[2]
7440-47-3	Chromium	5.2	2.3 - 22	9 of 9	100	s
7440-50-8	Copper	54.0	54 - 54	1 of 9	1000	s
7439-89-6	Iron	31811.1	2100 - 140000	9 of 9	300	s
7439-92-1	Lead	17.2	7.7 - 25	3 of 9	10	PQL
7439-95-4	Magnesium	5211.1	2400 - 15000	9 of 9		
7439-96-5	Manganese	183.6	11 - 750	9 of 9	50	s
7439-97-6	Mercury	0.3	0.33 - 0.33	1 of 9	2	s
7440-02-0	Nickel	15.8	5.6 - 26	2 of 9	100	s
7440-09-7	Potassium	3566.7	1700 - 7300	9 of 9		
7782-49-2	Selenium	2.2	2.2 - 2.2	1 of 9	50	s
7440-23-5	Sodium	13566.7	4900 - 30000	9 of 9	50000	s
7440-66-6	Zinc	176.4	11 - 720	7 of 9	5000	s
Pesticides						
72-54-8	4,4'-DDD	0.11	0.11 - 0.11	1 of 9	0.1	s
309-00-2	Aldrin	0.09	0.05 - 0.11	3 of 9	0.04	PQL
319-84-6	alpha-BHC	0.15	0.15 - 0.15	1 of 9	0.02	PQL
5103-71-9	alpha-Chlordane	0.03	0.03 - 0.03	1 of 9	0.5	F, PQL
33213-65-9	Endosulfan II	0.09	0.09 - 0.09	1 of 9	0.4	s
72-20-8	Endrin	0.07	0.02 - 0.11	2 of 9	2	s
58-89-9	gamma-BHC (Lindane)	0.09	0.09 - 0.09	1 of 9	0.2	s
76-44-8	Heptachlor	0.10	0.1 - 0.1	1 of 9	0.4	PQL
1024-57-3	Heptachlor epoxide	0.12	0.07 - 0.17	2 of 9	0.2	PQL

NOTES

1) December 2002 Sampling Event, as summarized in the July 3, 2003 REAC ERT Report by Lockheed Martin.

2) NJDEP Groundwater Quality Criteria Notes
- s specific
- is interim specific
- ism interim specific (MCL based)
- ignc interim general non-carcinogenic
- pql practical quantitaiton limit
- F value applies to the sum of alpha-and gamma- chlordane

3) Does not include duplicate samples.

4) Average is based on detected concentrations. Non-detect results excluded from consideration.

TABLE 3
Screening of Chemicals Detected in Groundwater
Bog Creek Superfund Site - Howell Township, NJ

Scenario Timeframe:	Future
Medium:	Groundwater
Exposure Medium:	Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier) (1)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Tier I Screening Value (nc/ca) (2)	Tier I COPC Flag (Y/N)	Rationale for Selection or Deletion (3)	Ratio of Max Conc. to Tier I Screening Value	Tier II Screening Value (nc/ca) (4)	Tier II COPC Flag (Y/N)	Rationale for Selection or Deletion (3)	Ratio of Max Conc. to Tier II Screening Value
Tap Water		VOCs														
	71-55-6	1,1,1-Trichloroethane	0.22 J	2200	ug/L	PZ-34	41 / 85	1 - 1000	3.2E+02 nc	YES	ASL	7	3.2E+02 nc	YES	ASL	7
	79-00-5	1,1,2-Trichloroethane	0.72 J	260	ug/L	PZ-24	7 / 85	1 - 1000	2.0E-01 ca	YES	ASL	1303	2.0E+00 ca	YES	ASL2	130
	75-34-3	1,1-Dichloroethane	0.3 J	640	ug/L	PZ-8	43 / 85	0.2 - 1000	8.1E+01 nc	YES	ASL	8	8.1E+01 nc	YES	ASL	8
	75-35-4	1,1-Dichloroethene	0.34 J	100	ug/L	PZ-34	8 / 85	1 - 1000	3.4E+01 nc	YES	ASL	3	3.4E+01 nc	YES	ASL	3
	87-61-6	1,2,3-Trichlorobenzene	1.16 J	1.16 J	ug/L	BC-MW-9	1 / 85	1 - 1000	NA	NO	No Screen					
	120-82-1	1,2,4-Trichlorobenzene	0.98 D	5.8 J	ug/L	BC-MW-9	2 / 85	1 - 1000	7.2E-01 nc	YES	ASL	8	7.2E-01 nc	NO	IFD	
	95-63-6	1,2,4-Trimethylbenzene	0.28 J	1600	ug/L	PZ-16	62 / 85	1 - 2	1.2E+00 nc	YES	ASL	1298	1.2E+00 nc	YES	ASL	1298
	95-50-1	1,2-Dichlorobenzene	0.71 J	230	ug/L	PZ-31	59 / 85	1 - 500	3.7E+01 nc	YES	ASL	6	3.7E+01 nc	YES	ASL	6
	107-06-2	1,2-Dichloroethane	0.29 J	30000	ug/L	PZ-24	22 / 85	1 - 1000	1.2E-01 ca	YES	ASL	243620	1.2E+00 ca	YES	ASL2	24362
	78-87-5	1,2-Dichloropropane	15	15	ug/L	PZ-34	1 / 85	1 - 1000	1.6E-01 ca	YES	ASL	91	1.6E+00 ca	NO	IFD	
	108-67-8	1,3,5-Trimethylbenzene	0.41 J	500	ug/L	PZ-16	51 / 85	1 - 500	1.2E+00 nc	YES	ASL	406	1.2E+00 nc	YES	ASL	406
	541-73-1	1,3-Dichlorobenzene	5.07 J	5.07 J	ug/L	BC-MW-9	1 / 85	1 - 1000	1.8E+01 nc	NO	BSL					
	106-46-7	1,4-Dichlorobenzene	0.61 J	22.39	ug/L	BC-MW-9	6 / 85	1 - 1000	5.0E-01 ca	YES	ASL	45	5.0E+00 ca	YES	ASL2	4
	78-93-3	2-Butanone	46	63	ug/L	PZ-10	2 / 85	1 - 1000	7.0E+02 nc	NO	BSL					
	591-78-6	2-Hexanone	74	1100	ug/L	PZ-24	2 / 85	1 - 1000	NA	NO	No Screen					
	135-98-8	2-Phenylbutane	0.71 J	19.67 J	ug/L	BC-EW-5	8 / 85	1 - 1000	NA	NO	No Screen					
	108-10-1	4-Methyl-2-pentanone	97	16000	ug/L	PZ-24	7 / 85	1 - 1000	2.0E+02 nc	YES	ASL	80	2.0E+02 nc	YES	ASL	80
	67-64-1	Acetone	2.1 J	750 J	ug/L	PZ-24	22 / 85	0.32 - 3200	5.5E+02 nc	YES	ASL	1	5.5E+02 nc	YES	ASL	1
	71-43-2	Benzene	0.42 J	8800	ug/L	PZ-34	67 / 85	1 - 100	3.5E-01 ca	YES	ASL, TOX	24868	3.5E+00 ca	YES	ASL2	2487
	108-86-1	Bromobenzene	0.3 J	45.66 J	ug/L	BC-EW-36	3 / 85	1 - 1000	2.0E+00 nc	YES	ASL	22	2.0E+00 nc	NO	IFD	
	75-27-4	Bromodichloromethane	46.92 J	61.51 J	ug/L	BC-EW-15	2 / 85	1 - 1000	1.8E-01 ca	YES	ASL	340	1.8E+00 ca	NO	IFD	
	108-90-7	Chlorobenzene	0.3 J	290	ug/L	PZ-17	44 / 85	1 - 1000	1.1E+01 nc	YES	ASL	27	1.1E+01 nc	YES	ASL	27
	75-00-3	Chloroethane	2.3	200 JD	ug/L	BC-EW-15	13 / 85	1 - 1000	4.6E+00 ca	YES	ASL	43	4.6E+01 ca	YES	ASL2	4
	67-66-3	Chloroform	1	1500	ug/L	PZ-24	12 / 85	1 - 1000	1.7E-01 ca	YES	ASL	9035	1.7E+00 ca	YES	ASL2	904
	156-59-2	cis-1,2-Dichloroethene	0.21 J	8300	ug/L	PZ-34	58 / 85	1 - 100	6.1E+00 nc	YES	ASL	1364	6.1E+00 nc	YES	ASL	1364
	99-87-6	Cymene	0.71 J	29	ug/L	PZ-10	26 / 85	1 - 1000	NA	NO	No Screen					
	100-41-4	Ethylbenzene	0.26 J	6900	ug/L	PZ-17	65 / 85	1 - 10	1.3E+02 nc	YES	ASL	51	1.3E+02 nc	YES	ASL	51
	98-82-8	Isopropylbenzene	0.27 J	140	ug/L	PZ-10	50 / 85	1 - 500	6.6E+01 nc	YES	ASL	2	6.6E+01 nc	YES	ASL	2
	1634-04-4	Methyl tert-Butyl Ether	0.41 J	0.41 J	ug/L	BC-MW-11	1 / 85	1 - 1000	6.2E+00 ca	NO	BSL					
	75-09-2	Methylene Chloride	14	5100	ug/L	PZ-24	4 / 85	1 - 1000	4.3E+00 ca	YES	ASL	1193	4.3E+01 ca	NO	IFD	
	m+p xylene	m-Xylene and p-Xylene	0.34 J	911 D	ug/L	BC-EW-35	42 / 51	2 - 2	2.1E+01 nc	YES	ASL	43	2.1E+01 nc	YES	ASL	43
	104-51-8	n-Butylbenzene	5.03 J	5.03 J	ug/L	BC-MW-9	1 / 85	1 - 1000	2.4E+01 nc	NO	BSL					
	103-65-1	n-Propylbenzene	0.24 J	1300	ug/L	PZ-8	54 / 85	1 - 500	2.4E+01 nc	YES	ASL	53	2.4E+01 nc	YES	ASL	53
	95-47-6	o-Xylene	0.28 J	6000	ug/L	PZ-8	67 / 85	1 - 2	2.1E+01 nc	YES	ASL	286	2.1E+01 nc	YES	ASL	286
	100-42-5	Styrene	1500	1700	ug/L	PZ-34	2 / 85	1 - 1000	1.6E+02 nc	YES	ASL	10	1.6E+02 nc	NO	IFD	
	98-06-6	tert-Butylbenzene	6.24 J	73.6 JD	ug/L	BC-MP-1	3 / 85	1 - 1000	2.4E+01 nc	YES	ASL	3	2.4E+01 nc	NO	IFD	
	127-18-4	Tetrachloroethene	0.35 J	590	ug/L	PZ-34	18 / 85	1 - 1000	1.0E-01 ca	YES	ASL	5660	1.0E+00 ca	YES	ASL2	566
	108-88-3	Toluene	0.22 J	58000	ug/L	PZ-34	61 / 85	1 - 50	7.2E+01 nc	YES	ASL	802	7.2E+01 nc	YES	ASL	802
	156-60-5	trans-1,2-Dichloroethene	0.29 J	0.29 J	ug/L	BC-EW-24	1 / 85	1 - 1000	1.2E+01 nc	NO	BSL					
	10061-02-6	trans-1,3-Dichloropropene	577.79 J	577.79 J	ug/L	BC-EW-35	1 / 85	1 - 1000	4.0E-01 ca	YES	ASL	1444	4.0E+00 ca	NO	IFD	
	79-01-6	Trichloroethene	0.21 J	520	ug/L	PZ-24	25 / 85	1 - 1000	2.8E-02 ca	YES	ASL	18561	2.8E-01 ca	YES	ASL2	1856
	75-01-4	Vinyl Chloride	0.27 J	590	ug/L	PZ-23	28 / 85	1 - 1000	2.0E-02 ca	YES	ASL, TOX	29809	2.0E-01 ca	YES	ASL2	2981

TABLE 3
Screening of Chemicals Detected in Groundwater
Bog Creek Superfund Site - Howell Township, NJ

Scenario Timeframe:	Future
Medium:	Groundwater
Exposure Medium:	Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier) (1)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Tier I Screening Value (nc/ca) (2)	Tier I COPC Flag (Y/N)	Rationale for Selection or Deletion (3)	Ratio of Max Conc. to Tier I Screening Value	Tier II Screening Value (nc/ca) (4)	Tier II COPC Flag (Y/N)	Rationale for Selection or Deletion (3)	Ratio of Max Conc. to Tier II Screening Value
		SVOCs														
	123-91-1	1,4-Dioxane	2.2	2.2	ug/L	IFF-1	1 / 5	2 - 2	6.1E+00 ca	NO	BSL					
	105-67-9	2,4-Dimethylphenol	3.46 J	6200	ug/L	PZ-24	9 / 18	10 - 10.4	7.3E+01 nc	YES	ASL	85	7.3E+01 nc	YES	ASL	85
	91-57-6	2-Methylnaphthalene	5.4 J	13	ug/L	PZ-31	5 / 18	1.35 - 10.3	NA	NO	No Screen					
	95-48-7	2-Methylphenol	4.01 J	3900	ug/L	PZ-24	9 / 18	10 - 10.4	1.8E+02 nc	YES	ASL	21	1.8E+02 nc	YES	ASL	21
	106-47-8	4-Chloroaniline	4.1 J	4.46 J	ug/L	BC-MP-1	2 / 18	10 - 10.4	1.5E+01 nc	NO	BSL					
	106-44-5	4-Methylphenol	36	6700	ug/L	PZ-24	3 / 18	10 - 10.4	1.8E+01 nc	YES	ASL	367	1.8E+01 nc	YES	ASL	367
	100-51-6	Benzyl Alcohol	3.3 J	69	ug/L	PZ-24	4 / 18	10 - 10.4	1.1E+03 nc	NO	BSL					
	111-91-1	bis(2-Chloroethoxy)methane	4.09 J	4.09 J	ug/L	BC-MP-1	1 / 18	10 - 10.4	NA	NO	No Screen					
	117-81-7	bis(2-Ethylhexyl) phthalate	1.29 J	190	ug/L	PZ-31	2 / 18	10 - 10.4	4.8E+00 ca	YES	ASL	40	4.8E+01 ca	YES	ASL2	4
	85-68-7	Butylbenzylphthalate	1.64 J	15	ug/L	PZ-31	2 / 18	10 - 10.4	7.3E+02 nc	NO	BSL					
	84-66-2	Diethylphthalate	1.36 J	66	ug/L	PZ-34	9 / 18	10 - 10.4	2.9E+03 nc	NO	BSL					
	131-11-3	Dimethylphthalate	5.5 J	17	ug/L	PZ-24	2 / 18	10 - 10.4	3.6E+04 nc	NO	BSL					
	84-74-2	Di-n-butylphthalate	2.24 J	180	ug/L	PZ-31	11 / 18	10 - 10.3	3.6E+02 nc	NO	BSL					
	87-68-3	Hexachlorobutadiene	9.7 J	12.46	ug/L	BC-MW-9	3 / 18	10 - 10.4	8.6E-01 ca	YES	ASL	14	8.6E+00 ca	YES	ASL2	1
	78-59-1	Isophorone	230	1600	ug/L	PZ-24	2 / 18	10 - 10.4	7.1E+01 ca	YES	ASL	23	7.1E+02 ca	YES	ASL2	2
	91-20-3	Naphthalene	14.14	150	ug/L	PZ-31	12 / 18	10 - 10.3	6.2E-01 nc	YES	ASL	242	6.2E-01 nc	YES	ASL	242
	86-30-6	n-Nitrosodiphenylamine	12	180	ug/L	PZ-31	5 / 18	10 - 10.4	1.4E+01 ca	YES	ASL	13	1.4E+02 ca	YES	ASL2	1
	108-95-2	Phenol	13	1900	ug/L	PZ-24	4 / 18	10 - 10.4	1.1E+03 nc	YES	ASL	2	1.1E+03 nc	YES	ASL	2
		P/PCBs														
	72-54-8	4,4'-DDD	0.11	0.11	ug/L	PZ-8	1 / 9	0.02 - 0.02	2.8E-01 ca	NO	BSL					
	309-00-2	Aldrin	0.05	0.11	ug/L	PZ-31	3 / 9	0.02 - 0.02	4.0E-03 ca	YES	ASL	28	4.0E-02 ca	YES	ASL2	3
	319-84-6	alpha-BHC	0.15	0.15	ug/L	PZ-24	1 / 9	0.02 - 0.02	1.1E-02 ca	YES	ASL	14	1.1E-01 ca	YES	ASL2	1
	5103-71-9	alpha-Chlordane	0.03	0.03	ug/L	PZ-24	1 / 9	0.02 - 0.02	1.9E-01 ca	NO	BSL					
	33213-65-9	Endosulfan II	0.09	0.09	ug/L	PZ-8	1 / 9	0.02 - 0.02	2.2E+01 nc	NO	BSL					
	72-20-8	Endrin	0.02 J	0.11	ug/L	PZ-8	2 / 9	0.02 - 0.02	1.1E+00 nc	NO	BSL					
	58-89-9	gamma-BHC (Lindane)	0.09	0.09	ug/L	PZ-31	1 / 9	0.02 - 0.02	5.2E-02 ca	YES	ASL	2	5.2E-01 ca	NO	BSL2	
	76-44-8	Heptachlor	0.1	0.1	ug/L	PZ-31	1 / 9	0.02 - 0.02	1.5E-02 ca	YES	ASL	7	1.5E-01 ca	NO	BSL2	
	1024-57-3	Heptachlor epoxide	0.07	0.17	ug/L	PZ-8	2 / 9	0.02 - 0.02	7.4E-03 ca	YES	ASL	23	7.4E-02 ca	YES	ASL2	2
		Metals														
	7429-90-5	Aluminum	200	2100	ug/L	PZ-13	8 / 9	20 - 20	3.6E+03 nc	NO	BSL					
	7440-36-0	Antimony	3.1	3.1	ug/L	PZ-13	1 / 9	2.2 - 2.2	1.5E+00 nc	YES	ASL	2	1.5E+00 nc	YES	ASL	2
	7440-38-2	Arsenic	2.3	11	ug/L	PZ-31	9 / 9	NA - NA	4.5E-02 ca	YES	ASL, TOX	245	4.5E-01 ca	YES	ASL2	25
	7440-39-3	Barium	2.3	140	ug/L	PZ-8	9 / 9	NA - NA	2.6E+02 nc	NO	BSL					
	7440-70-2	Calcium	8700	71000	ug/L	PZ-31	9 / 9	NA - NA	NA	NO	NUT					
(5)	7440-47-3	Chromium	2.3	22	ug/L	PZ-24	9 / 9	NA - NA	1.1E+01 nc	YES	ASL	2	1.1E+01 nc	YES	ASL	2
	7440-50-8	Copper	54	54	ug/L	PZ-24	1 / 18	0.45 - 5	1.5E+02 nc	NO	BSL					
	7439-89-6	Iron	2100	140000	ug/L	PZ-8	9 / 9	NA - NA	1.1E+03 nc	YES	ASL	128	1.1E+03 nc	YES	ASL	128
(6)	7439-92-1	Lead	7.7	25	ug/L	PZ-13	3 / 18	0.132 - 2.2	1.5E+01 (6)	YES	ASL	2	1.5E+01 (6)	YES	ASL	2
	7439-95-4	Magnesium	2400	15000	ug/L	PZ-34	9 / 9	NA - NA	NA	NO	NUT					

TABLE 3
Screening of Chemicals Detected in Groundwater
Bog Creek Superfund Site - Howell Township, NJ

Scenario Timeframe:	Future
Medium:	Groundwater
Exposure Medium:	Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier) (1)	Unit	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Tier I Screening Value (nc/ca) (2)	Tier I COPC Flag (Y/N)	Rationale for Selection or Deletion (3)	Ratio of Max Conc. to Tier I Screening Value	Tier II Screening Value (nc/ca) (4)	Tier II COPC Flag (Y/N)	Rationale for Selection or Deletion (3)	Ratio of Max Conc. to Tier II Screening Value
	7439-96-5	Manganese	11	750	ug/L	PZ-8	9 / 9	NA - NA	8.8E+01 nc	YES	ASL	9	8.8E+01 nc	YES	ASL	9
	7439-97-6	Mercury	0.33	0.33	ug/L	PZ-24	1 / 9	0.2 - 0.2	1.1E+00 nc	NO	BSL					
	7440-02-0	Nickel	5.6	26	ug/L	PZ-24	2 / 9	5 - 5	7.3E+01 nc	NO	BSL					
	7440-09-7	Potassium	1700	7300	ug/L	PZ-31	9 / 9	NA - NA	NA	NO	NUT					
	7782-49-2	Selenium	2.2	2.2	ug/L	PZ-34	1 / 9	2.2 - 2.2	1.8E+01 nc	NO	BSL					
	7440-23-5	Sodium	4900	30000	ug/L	PZ-31	9 / 9	NA - NA	NA	NO	NUT					
	7440-66-6	Zinc	11	720.00	ug/L	PZ-24	7 / 18	0.04 - 14.04	1.1E+03 nc	NO	BSL					

(1) Maximum detected concentration used for screening.
(2) Screened against EPA Region 9 Preliminary Remediation Goals (PRGs) for tap water, adjusted to cancer benchmark = 1E-6 and HQ = 0.1. http://www.epa.gov/region09/waste/sfund/prg/
(3) Rationale Codes:
Selection Reason: ASL = Above Tier I Screening Level
ASL2 = Above Tier II Screening Level
TOX = Chemical is a Group A carcingogen for pathways relevant to this medium
Deletion Reason: BSL = Below Tier I Screening Level
BSL2 = Below Tier II Screening Level
NUT = Essential Nutrient
No Screen = No Screening Value Available
IFD = Infrequently detected. Detected in fewer than 5% of samples.
Note that noncancer screening values did not change for Tier II. See text for refinement of noncarcinogenic COPCs.
(4) Screened against EPA Region 9 Preliminary Remediation Goals (PRGs) for tap water, adjusted to cancer benchmark = 1E-5 and HQ = 0.1. http://www.epa.gov/region09/waste/sfund/prg/
(5) Screening value for hexavalent chromium was conservatively applied to total chromium concentration. Total chromium concentrations do not exceed the screening value for trivalent chromium (5.5E+3 ug/L).
(6) In absence of a Region 9 PRG for lead in drinking water, the Federal Action Level for lead in drinking water was used.

Definitions: NA = Not Available
nc = Screening Toxicity Value is based on noncancer effects
ca = Screening Toxicity Value is based on cancer effects
COPC = Chemical of Potential Concern
VOCs - Volatile organic compounds
SVOCs - Semi-volatile organic compounds
P/PCBs - Pesticides/polychlorinated biphenyls

J = Estimated Value
D = Result represents diluted sample analysis.

Table 4
Summary of Remedial Alternative Evaluation Results
Groundwater FFS
Bog Creek Superfund Site, Howell, New Jersey

Alternative	1. Overall Protection of Human Health and Environment	2. Compliance with ARARs	3. Long-Term Effectiveness and Permanence	4. Reduction of Toxicity, Mobility, or Volume through Treatment	5. Short-term Effectiveness	6. Implementability	7. Cost
1. No Action	• Discharge of contaminated groundwater would occur to Squankum Brook and may significantly impact water and sediment quality, which may pose unacceptable risks to human health and the environment • Brook discharges to the Manasquan River, which is used for drinking water supply • **Overall: Low**	• Chemical-specific ARARs for groundwater and surface water quality would not be met. • There are no location- or action-specific ARARs • **Overall: Low**	• Would not provide long-term effectiveness or permanence • Groundwater contamination will tend to persist and discharge to Squankum Brook • RAOs would not be met • **Overall: Low**	• Would not reduce waste TMV • **Overall: Low**	• Remediation workers would not be exposed to any exposure risks • There would be no impact to the community, since no action is taken • **Overall: High**	• Readily implementable, since no additional work is required • **Overall: High**	$0
2. Groundwater extraction and treatment	• Hydraulic control would prevent contaminated groundwater discharge to Squankum Brook. • Effluent discharges from the *ex situ* treatment system would meet NJDEP discharge criteria. • Groundwater extraction would facilitate aquifer flushing and reduction of contaminant concentrations. • **Overall: High**	• Chemical-specific ARARs for treated groundwater may not be met within the 30 year time frame. • Well construction, treatment plant construction, and vapor and groundwater effluent discharges from the *ex situ* treatment system would meet corresponding NJDEP action- and location-specific ARARs. • **Overall: Medium**	• Groundwater extraction and treatment has been widely and effectively used to achieve hydraulic plume control. • Based upon pore volume flushing estimates, cleanup time is estimated to take approximately 13 to 83 years to restore the aquifer to meet NJDEP groundwater quality criteria, assuming no residual contamination sources. • **Overall: Medium**	• Groundwater extraction will reduce mobility. • *Ex situ* treatment will provide limited reductions in toxicity and volume. • **Overall: Medium**	• Exposure risks to remediation workers during well installation will be managed by implementing standard engineering controls and health and safety practices. • No significant community impacts; site is rural and primarily bordered by undeveloped property. • Construction and initial startup could be completed in 4 to 6 months. • **Overall: High**	• Can be readily implemented using conventional construction and wastewater treatment equipment/ services. • Regulatory/permitting requirements for this alternative are not administratively intensive. • NJDEP permit equivalencies likely required for well installation, treatment system construction, and groundwater and air discharge • **Overall: High**	$6.4 million (present value)

Table 4
Summary of Remedial Alternative Evaluation Results
Groundwater FFS
Bog Creek Superfund Site, Howell, New Jersey

Alternative	1. Overall Protection of Human Health and Environment	2. Compliance with ARARs	3. Long-Term Effectiveness and Permanence	4. Reduction of Toxicity, Mobility, or Volume through Treatment	5. Short-term Effectiveness	6. Implementability	7. Cost
3. Groundwater extraction and treatment with *in situ* treatment	• Hydraulic control would prevent contaminated groundwater discharge to Squankum Brook. • Effluent discharges from the *ex situ* treatment system would meet NJDEP discharge criteria. • More aggressive contaminant reduction and aquifer restoration during the initial years of the remedy via *in situ* treatment. • **Overall: High**	• It is expected that the chemical-specific ARARs for treated groundwater would be met within the 30 year time frame. • Well construction, treatment plant construction, and vapor and groundwater effluent discharges from the *ex situ* treatment system would meet corresponding NJDEP action- and location-specific ARARs. • EAB/ISCO – NJDEP action-specific ARARs for amendment injection would be met. • **Overall: Medium**	• Groundwater extraction and treatment has been widely and effectively used to achieve hydraulic plume control. • Possibility for more aggressive contaminant reduction and aquifer restoration during the initial years of the remedy via *in situ* treatment, but long term groundwater extraction and treatment still necessary to meet final groundwater quality criteria. • Pilot testing is required to determine the most appropriate and effective *in situ* treatment technology. • EAB – EAB effectiveness would be limited to CVOCs. Could be improved by using EAB in sequence with air sparge/SVE. • **Overall: High**	• Groundwater extraction will reduce mobility. • Significant TMV reduction is expected initially as a result of *in situ* degradation processes, which destroy contaminants. • AS/SVE - Additional contaminant mass will be recovered and treated through the *ex situ* off-gas treatment system as a result of AS/SVE, resulting in toxicity and volume reduction. • **Overall: High**	• Construction workers will be on site longer based upon the increased drilling and pipe installation effort; however, added risk is considered minimal • Construction could be completed within 6 to 9 months • **Overall: High**	• Can be readily implemented using conventional construction and wastewater treatment equipment/ services. • Regulatory/permitting requirements for this alternative are not administratively intensive. • NJDEP permit equivalencies likely required for well installation, treatment system construction, and groundwater and air discharge • Pilot-scale testing recommended to support detailed design decisions for *in situ* treatment and *ex situ* treatment system. • EAB - may mobilize iron and other inorganics, which may impact O&M requirements and uptime for the groundwater extraction and treatment system. • **Overall: High**	$8.2 million (present value)

Table 5
Present Value Cost Estimate for Alternative 3
Groundwater FFS
Bog Creek Superfund Site, Howell, New Jersey

PRESENT VALUE COSTS					
LINE ITEM	UNIT COST	UNITS	QUANTITY	ACTUAL $	NPV
Construction	$2,272,000	LS	1	$2,272,000	$2,272,000
OM&M Years 1-2	$811,000	Year	2	$1,622,000	$1,466,000
OM&M Years 3-10	$543,000	Year	8	$4,344,000	$2,832,000
OM&M Years 11-30	$298,000	Year	20	$5,960,000	$1,605,000
TOTAL COST				$14,198,000	**$8,200,000**

Notes:
1. Discount rate = 7%
2. Line item unit costs were rounded to the nearest $1000.
3. Total net present value was rounded to the nearest $100,000.

Construction Cost Estimate				
LINE ITEM	UNIT COST	UNITS	QUANTITY	COST
General Conditions				
Project Administration	$89,000	LS	1	$89,000
Temporary Facilities	$23,000	LS	1	$23,000
Surveying	$20,000	LS	1	$20,000
Construction QA/QC	$22,000	LS	1	$22,000
H&S and Engineering Controls	$22,000	LS	1	$22,000
RA Report/As-built Drawings	$32,000	LS	1	$32,000
OM&M Manual	$32,000	LS	1	$32,000
SUBTOTAL				**$240,000**
Treatability Study				
Pilot Study Design and Execution	$40,000	LS	1	$40,000
SUBTOTAL				**$40,000**
Drilling and Well Installation				
Mob/demob	$10,000	LS	1	$10,000
Drilling and Well Installation	$130,000	LS	1	$130,000
SUBTOTAL				**$140,000**
Site/Civil Construction				
Mobilization/Demobilization	$20,000	LS	1	$20,000
Yard Trenching and Piping	$53,000	LS	1	$53,000
Existing System Demolition and Building Modification	$200,000	LS	1	$200,000
SUBTOTAL				**$273,000**
Treatment System Construction and Startup				
Treatment System	$374,000	LS	1	$374,000
Startup Verification Testing	$60,000	LS	1	$60,000
SUBTOTAL				**$434,000**
SUBTOTAL COST				**$1,127,000**
Engineering				$300,000
Construction Inspection (15%)				$169,000
Contractor OH&P (30%)				$338,000
Contingency (30%)				$338,000
TOTAL COST				**$2,272,000**

Table 5
Present Value Cost Estimate for Alternative 3
Groundwater FFS
Bog Creek Superfund Site, Howell, New Jersey

Annual Operations and Maintenance Cost Estimate - Year 1 and 2				
LINE ITEM	**UNIT COST**	**UNITS**	**QUANTITY**	**COST**
O&M Labor	$78,000	Year	1	$78,000
Electric	$11,000	Mo	12	$132,000
Chemicals/Consumbles	$1,000	Mo	12	$12,000
LPGAC Changeout	$19,000	Year	1	$19,000
VPGAC Changeout	$96,000	Year	1	$96,000
PPZ Changeout	$48,000	Year	1	$48,000
Miscellaneous Equipment Replacement	$10,000	Year	1	$10,000
Compliance Sampling	$4,000	Mo	12	$48,000
System Performance Sampling/Analysis	$10,000	Year	1	$10,000
Environmental Monitoring	$35,000	Event	4	$140,000
OM&M Reports	$14,000	EA	4	$56,000
SUBTOTAL COST				$649,000
Contingency (25%)				$162,000
TOTAL COST				**$811,000**

Annual Operations and Maintenance Cost Estimate - Years 3 to 10				
LINE ITEM	**UNIT COST**	**UNITS**	**QUANTITY**	**COST**
O&M Labor	$47,000	Year	1	$47,000
Electric	$11,000	Mo	12	$132,000
Chemicals/Consumbles	$1,000	Mo	12	$12,000
LPGAC Changeout	$10,000	Year	1	$10,000
VPGAC Changeout	$48,000	Year	1	$48,000
PPZ Changeout	$24,000	Year	1	$24,000
Miscellaneous Equipment Replacement	$10,000	Year	1	$10,000
Compliance Sampling	$4,000	Mo	12	$48,000
System Performance Monitoring	$5,000	Year	1	$5,000
Environmental Monitoring	$35,000	Event	2	$70,000
OM&M Reports	$14,000	EA	2	$28,000
SUBTOTAL COST				$434,000
Contingency (25%)				$109,000
TOTAL COST				**$543,000**

Annual Operations and Maintenance Cost Estimate - Years 11 to 30				
LINE ITEM	**UNIT COST**	**UNITS**	**QUANTITY**	**COST**
O&M Labor	$31,000	Year	1	$31,000
Electric	$7,000	Mo	12	$84,000
Chemicals/Consumbles	$1,000	Mo	12	$12,000
LPGAC Changeout	$3,000	Year	1	$3,000
VPGAC Changeout		Year		$0
PPZ Changeout		Year		$0
Miscellaneous Equipment Replacement	$10,000	Year	1	$10,000
Compliance Sampling	$4,000	Mo	12	$48,000
System Performance Monitoring	$1,000	Year	1	$1,000
Environmental Monitoring	$35,000	Event	1	$35,000
OM&M Reports	$14,000	EA	1	$14,000
SUBTOTAL COST				$238,000
Contingency (25%)				$60,000
TOTAL COST				**$298,000**

Notes:
1. SVE/AS system shutdown in Year 10. GWTS continues to operate to Year 30.
2. Offgas treatment shutdown in Year 10, emissions below NJDEP discharge limits.

Table 6-1
Potential Chemical-specific ARARs/TBCs
Groundwater FFS
Bog Creek Superfund Site, Howell, New Jersey

Act/Authority	Criteria/Issues	Citation	Status	Brief Description	FS Consideration
Federal Safe Drinking Water Act	National Primary Drinking Water Standards-Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs)	40 CFR 141	Relevant and Appropriate	Establishes health- and technology-based standards for public drinking water systems. Also establishes drinking water quality goals set at levels at which no adverse health effects are anticipated, with an adequate margin of safety.	The MCLs will be considered in developing preliminary remediation goals.
Federal Safe Drinking Water Act	National Secondary Drinking Water Standards-Secondary MCLs	40 CFR 143	To Be considered	Establishes standards for public drinking water systems for those contaminants which impact the aesthetic qualities of drinking water.	The Secondary MCLs will be considered in developing preliminary remediation goals.
Federal Resource Conservation and Recovery Act	Groundwater Protection Standards and Maximum Concentration Limits	40 CFR 264, Subpart F	To Be considered	Establishes standards for groundwater protection.	The promulgated values are compared to the maximum levels to determine the magnitude of contamination.
State of New Jersey Statutes and Rules	Drinking Water Standards-Maximum Contaminant Levels (MCLs)	N.J.A.C. 7:10 Safe Drinking Water Act	Relevant and Appropriate	Establishes MCLs that are generally equal to or more stringent than Federal MCLs.	The MCLs will be considered in developing preliminary remediation goals.
State of New Jersey Statutes and Rules	National Secondary Drinking Water Standards-Secondary MCLs	N.J.A.C. 7:10-7 Safe Drinking Water Act	Relevant and Appropriate	Establishes standards for public drinking water systems for those contaminants which impact the aesthetic qualities of drinking water.	The Secondary MCLs will be considered in developing preliminary remediation goals.
State of New Jersey Statutes and Rules	Groundwater Quality Standards	N.J.A.C. 7:9-6 Groundwater Quality Standards	Applicable	Table 1 and Table 2 establish standards for the protection of groundwater quality.	Used as the primary basis for setting numerical criteria for groundwater cleanups.
State of New Jersey Statutes and Rules	Surface Water Quality Standards	N.J.A.C. 7:9B Surface Water Quality Standards	Relevant and Appropriate	Establishes standards for the protection and enhancement of surface water resources.	Remedy must consider protection of Squankum Brook.

Table 6-2
Potential Location-specific ARARs/TBCs
Groundwater FFS
Bog Creek Superfund Site, Howell, New Jersey

Act/Authority	Criteria/Issues	Citation	Status	Brief Description	FS Consideration
Federal National Environmental Policy Act (NEPA),	Statement of Policy on Floodplains/ Wetlands Assessments for CERCLA Actions	40 CFR 6, Appendix A	Applicable	Establishes EPA policy and guidance for carrying out Executive Order 11988 - Protection of Floodplains and Executive Order. Action must avoid adverse effects, minimize potential harm and restore and preserve natural and beneficial values of the floodplain.	The potential effects of any action will be evaluated to ensure that the planning and decision-making reflect consideration of flood hazards and floodplains management, including restoration and preservation of natural, undeveloped floodplains.
Federal (Non-Regulatory)	Floodplains Management Executive Order (EO 11988)	EO 11988	To Be Considered	Federal agencies are required to provide leadership and take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains.	The potential effects of any action will be evaluated to ensure that the planning and decision-making reflect consideration of flood hazards and floodplains management, including restoration and preservation of natural, undeveloped floodplains.
Federal (Non-Regulatory)	Wetlands Executive Order (EO 11990)	EO 11990	To Be Considered	Federal agencies are required to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance natural and beneficial values of wetlands.	Remedial alternatives that involve construction must include all practicable means of minimizing harm to wetlands. Wetlands protection considerations must be incorporated into the planning and decision-making about remedial alternatives.
Federal Clean Water Act	Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredge or Fill Material; Section 404(c) Procedures; 404 Program Definitions; 404 State Program Regulations	40 CFR 230 - 233	Applicable	Restricts the disposal of dredged or fill materials to wetlands or waters of the United States, unless no other practicable alternative is available. Provides permit guidelines for situations where no other alternative is available in order to mitigate wetland impacts.	Potentially applicable for construction activities performed in the vicinity of a wetland or waterway. Permits may be required for certain remedial alternatives.

Table 6-2
Potential Location-specific ARARs/TBCs
Groundwater FFS, Bog Creek Superfund Site, Howell, New Jersey

Act/Authority	Criteria/Issues	Citation	Status	Brief Description	FS Consideration
Federal Endangered Species Act	Protection of threatened and endangered species	16 USC 1531 et seq.; 40 CFR 400	Applicable	Statute regarding the special preservation and protection of threatened and endangered species of fish and wildlife.	The potential effects of any action will be evaluated to ensure that any endangered or threatened species would not be affected.
Federal Fish and Wildlife Conservation Act	Statement of Procedures for Non-game Fish and Wildlife Protection	16 USC 2901 et seq.	Applicable	Establishes EPA policy and guidance for promoting the conservation of non-game fish and wildlife and their habitats. Action must protect fish or wildlife.	Applicable for construction activities which may potentially impact non-game fish and wildlife and their habitats.
Federal National Historic Preservation Act	Procedures for preservation of historical and archeological data	16 USC 469 et. seq.; 40 CFR 6301(c)	Applicable	Establishes procedures to provide for preservation of historical and archeological data that might be destroyed through alteration of terrain as a result of a federal construction project or a federally licensed activity or program.	If historical or archeological data could potentially be encountered during remediation.
New Jersey Endangered and Non-Game Species Conservation Act	Protection of threatened and endangered species	N. J. S. A. 23:2A-1 to -13	Applicable	Standards for the protection of endangered, non-game and exotic wildlife.	The potential effects of any action will be evaluated to ensure that any endangered or threatened species would not be affected.
New Jersey Endangered Plant Species List Act	Endangered Plant Species Program	N.J.S.A. 13.1B-15.151 to -15.158; N.J.A.C. 7:5B	Applicable	Standards for the protection of native plant species.	The potential effects of any action will be evaluated to ensure that any endangered or threatened species would not be affected.
New Jersey Flood Hazard Area Control Act	Floodplain Use and Limitations	N. J. A. C. 7:13	Applicable	State standards for activities within flood plains	Floodplain use and limitations must be considered during remediation.
New Jersey Freshwater Wetland Protection Act	Freshwater Wetlands Protection Act Rules	N. J. S. A. 13:9B-1; N. J. A. C. 7:7A	Applicable	Establish requirements for the protection of freshwater wetlands. Requires permits for construction within wetland areas.	Applicable for construction activities performed in the vicinity of a wetland or waterway.

Table 6-3
Potential Action-specific ARARs/TBCs
Groundwater FFS
Bog Creek Superfund Site, Howell, New Jersey

Type	Act/Authority	Criteria/Issues	Citation	Status	Brief Description	FS Consideration
General Remediation	Federal Resource Conservation and Recovery Act	Identification and Listing of Hazardous Waste	40 CFR 261	Applicable	Identifies solid wastes which are subject to regulation as hazardous wastes.	Generation of hazardous wastes possibly includes spent carbon or contaminated soil. Hazardous wastes must be handled and disposed of in accordance with RCRA. Chemical testing and characterization of waste required.
	Federal Resource Conservation and Recovery Act	Standards Applicable to Generators of Hazardous Waste	40 CFR 262	Applicable	Establishes requirements (e.g., EPA ID numbers and manifests) for generators of hazardous waste.	Standards will be followed if any hazardous wastes are generated on-site.
	Federal Resource Conservation and Recovery Act	Standards Applicable to Owners and Operators of Treatment, Storage, and Disposal Facilities	40 CFR 264	Relevant and Appropriate	Establishes the minimum national standards which define acceptable management of hazardous waste and standards for hazardous waste generators.	Standards will be followed if any hazardous wastes are generated on-site.
	Federal Occupational Safety and Health Act	Worker Protection	29 CFR 1904	Applicable	Requirements for recording and reporting occupational injuries and illnesses	Under 40 CFR 300.38, requirements of OSHA apply to all activities which fall under jurisdiction of the National Contingency Plan.
	Federal Occupational Safety and Health Act	Worker Protection	29 CFR 1910	Applicable	Specifies minimum requirements to maintain worker health and safety during hazardous waste operations. Includes training requirements and construction safety requirements.	Under 40 CFR 300.38, requirements of OSHA apply to all activities which fall under jurisdiction of the National Contingency Plan.
	Federal Occupational Safety and Health Act	Worker Protection	29 CFR 1926	Applicable	Safety and health regulations for construction.	Under 40 CFR 300.38, requirements of OSHA apply to all activities which fall under jurisdiction of the National Contingency Plan.

Table 6-3
Potential Action-specific ARARs/TBCs
Groundwater FFS
Bog Creek Superfund Site, Howell, New Jersey

Type	Act/Authority	Criteria/Issues	Citation	Status	Brief Description	FS Consideration
General Remediation (continued)	New Jersey Statutes and Rules	Technical Requirements for Site Remediation	N.J.A.C. 7:26E	Applicable	Established minimum regulatory requirements for investigation and remediation of contaminated sites in New Jersey.	Operation of the treatment facility must comply with the regulation.
	New Jersey Statutes and Rules	Hazardous Waste Regulations	N.J.A.C. 7:26G-5, -8, -11	Applicable	Establish hazardous waste regulations by adopting Federal regulations on identification and listing of hazardous waste, standards for owner and operators of hazardous waste treatment, storage and disposal facilities, and land disposal restrictions.	Alternative development must consider the regulatory requirements.
	New Jersey Soil Erosion and Sediment Control	Soil Erosion and Sediment Control Standards	N.J.A.C. 16.25A	Applicable	Requires erosion mitigation during construction activities.	Requires erosion control consideration during construction activities.
	New Jersey Noise Control Act of 1971	Noise Control	N.J.A.C. 7:29	Applicable	Limits the noise generated from any industrial, commercial, public service or community service facility.	Limits the noise that can be generated during remedial activities.
	New Jersey Uniform Construction Code	New Construction and Renovation	N.J.A.C. 5:23	Applicable	Establishes the standards for all new construction and renovation.	This may be an ARAR to the extent that new construction falls within the standards.

Table 6-3
Potential Action-specific ARARs/TBCs
Groundwater FFS
Bog Creek Superfund Site, Howell, New Jersey

Type	Act/Authority	Criteria/Issues	Citation	Status	Brief Description	FS Consideration
Discharge of Groundwater, Wastewater, or Surface Water	Federal Clean Water Act	National Pollution Discharge Elimination System (NPDES)	40 CFR 100, 122 and 125	Relevant and Appropriate	Issues permits for discharge into navigable waters. Establishes criteria and standards for imposing treatment requirements on permits.	Water treatment will need to consider discharge requirements.
	Federal Clean Water Act	Effluent Guidelines and Standards for the Point Source Category	40 CFR 414	Relevant and Appropriate	Requires specific effluent characteristics for discharge under NPDES permits.	Water treatment will need to consider discharge requirements.
	Federal Clean Water Act	Ambient Water Quality Criteria	40 CFR 131.36	To Be Considered	Establishes criteria for surface water quality based on toxicity to aquatic organisms and human health.	May take into consideration of the criteria when discharging treated groundwater to surface water.
	Federal Safe Drinking Water Act	Underground Injection Control Program	40 CFR 144 and 146	Applicable	Establishes performance standards, well requirements, and permitting requirements for groundwater reinjection wells.	Must comply with requirements for reinjection of treated groundwater.
	New Jersey Statutes and Rules	The New Jersey Pollutant Discharge Elimination System	N.J.A.C. 7:14A	Applicable	Establishes standards for discharge of pollutants to surface water and groundwater	Disposal of treated groundwater to surface water will require a NJPDES permit.

Table 6-3
Potential Action-specific ARARs/TBCs
Groundwater FFS
Bog Creek Superfund Site, Howell, New Jersey

Type	Act/Authority	Criteria/Issues	Citation	Status	Brief Description	FS Consideration
Disposal of Hazardous Wastes	Federal Resource Conservation and Recovery Act	Standards Applicable to Transporters of Hazardous Waste	40 CFR 263	Applicable	Establishes standards which apply to persons transporting and manifesting hazardous waste within the United States.	Any company contracted to transport hazardous material from the site will be required to comply with this regulation.
	Federal Resource Conservation and Recovery Act	Land Disposal Restrictions	40 CFR 268	Applicable	Identifies hazardous wastes which are restricted from land disposal. All listed and characteristic hazardous waste or soil or debris contaminated by a RCRA hazardous waste and removed from a CERCLA site may not be land disposed until treated as required by LDRs.	Waste disposal must comply with LDRs.
	Federal Hazardous Material Transportation Act	Hazardous Materials Transportation Regulations	49 CFR 107, 171-177	Applicable	Regulates transportation of hazardous materials.	Transportation of hazardous wastes must comply with the regulation.
	New Jersey Statutes and Rules	Transportation of Hazardous Materials	N.J.A.C. 16:49	Applicable	Regulates shipping/transports of hazardous materials.	Must comply with requirements in off-site transport of hazardous materials.

Table 6-3
Potential Action-specific ARARs/TBCs
Groundwater FFS
Bog Creek Superfund Site, Howell, New Jersey

Type	Act/Authority	Criteria/Issues	Citation	Status	Brief Description	FS Consideration
Off-Gas Management	Federal Clean Air Act	National Ambient Air Quality Standards	40 CFR 50	Applicable	Provides standards for ambient air quality that is protective of human health.	Need to meet requirements when discharging off-gas.
	Federal Clean Air Act	Standards of Performance for New Stationary Sources	40 CFR 60	Applicable	Provides emissions requirements for new stationary sources.	Need to meet requirements when discharging off-gas.
	Federal Clean Air Act	National Emission Standards for Hazardous Air Pollutants	40 CFR 61	Applicable	Provides emission standards for 8 contaminants including benzene and vinyl chloride. Identifies 25 additional contaminants, as having serious health effects but does not provide emission standards for these contaminants.	Need to meet requirements when discharging off-gas.
	Federal Directive	Control of Air Emissions from Superfund Air Strippers	OSWER Directive 9355.0-28	To Be Considered	Provides guidance on the use of controls for Superfund site air strippers as well as other vapor extraction techniques in attainment and non-attainment areas for ozone.	Applicable to remediation alternatives which involve air stripping and vapor extraction process.
	New Jersey Air Pollution Control Act	Air Permits and Certificates	N.J.A.C. 7:27-22	Applicable	Describes requirements and procedures for obtaining air permits and certificates.	Applicable to remediation alternatives which involve discharge of vapor.
	New Jersey Air Pollution Control Act	Standards for Hazardous Air Pollutants	N.J.A.C. 7:27	Applicable	Rule that govern the emitting of and such activities that result in the introduction of contaminants into the ambient atmosphere.	Need to meet requirements when discharging off-gas.

APPENDIX III

Administrative Record Index

BOG CREEK FARM SUPERFUND SITE
OPERABLE UNIT 2
ADMINISTRATIVE RECORD FILE UPDATE
INDEX OF DOCUMENTS

5.0 RECORD OF DECISION

5.2 Amendment to the Record of Decision

P. 500001 - 500002
Letter to Mr. Ed Finnerty, Project Manager, U.S. EPA, Region 2, from Ms. Jeanette Abels, State of New Jersey, Department of Environmental Protection, re: Bog Creek Farm Superfund Site, Howell. New Jersey. Review of Remediation System Evaluation Draft Report. July 18, 2002.

P. 500003 - 500051
Report: Remediation System Evaluation. Bog Creek Farm Superfund Site, Howell Township, Monmouth County. New Jersey. Report of the Remediation System Evaluation. Site Visit Conducted at the Bog Creek Farm Superfund Site, April 16-17. 2002. Final Report, prepared by GeoTrans, Inc. and the U.S. Army Corps of. Engineers, prepared for United States Environmental. Protection Agency, September 30, 2002.

P. 500052 - 500054
Letter to Mr. Ed Finnerty, Project Manager, U.S. EPA, . Region 2, from Ms. Jeanette. Abels, State of New Jersey, Department of Environmental Protection, re: Bog Creek Farm Superfund Site. Howell. New Jersey. Selection of Remediation Technology for Additional Contamination Removal. October 29, 2002.

P. 500055 - 500058
Memorandum (w/attachment) for EC-ED (File), re: Bog Creek Contaminant Reduction Recommendations. November 15, 2002.

P. 500059 - 500190
Report: Data Report, December, 2003, Bog Creek Farm Superfund Site, Long-term Groundwater Monitoring, Howell, New Jersey, prepared by U.S. Army Corps of Engineers, prepared for United States Environmental Protection Agency, Region II, March 2004.

P. 500191 - 500198
Memorandum (w/attachment) to PM-E (Daniels), from EC-ED (Bales), re: Bog Creek Alternatives and Estimate Evaluations, May 4, 2004

P. 500199 - 500204
Memorandum (w/attachment) to Mr. Bill McCabe, Acting Director, Emergency and Remedial Response Division, U.S. Environmental Protection Agency, Region II, from Ms. Carole Petersen, Chief, New Jersey Remediation Branch, U.S. Environmental Protection Agency, Region II, re: Explanation of Significant Differences (ESD) for the Bog Creek Farm Superfund Site, Howell Township, Monmouth County, New Jersey, January 3, 2005.

P.	500205 - 500433	Report: Final Groundwater Focused Feasibility Study (FFS) Report, Bog Creek Superfund Site, Howell. New Jersey, prepared by CDM Federal Programs Corporation, prepared for U.S. Army Corps of Engineers, Kansas City District, June 2005.
P.	500434 - 500559	Report: Streamlined Human Health Risk Assessment, Focused Feasibility Study, Bog Creek Farm Superfund Site, Howell Township, New Jersey, prepared by CDM Federal Programs Corporation, prepared for U.S. Army Corps of Engineers, Kansas City District, June 2005.
P.	500560 - 500693	Report: Screening Level Ecological Risk Assessment, Focused Feasibility Study, Bog Creek Farm Superfund Site, Howell Township, New Jersey, prepared by CDM Federal Programs Corporation, prepared for U.S. Army Corps of Engineers, Kansas City District, June 2005.
P.	500694 - 500818	Report: Final Data Summary Report, Focused Feasibility Study, Bog Creek Superfund Site, Howell Township New Jersey, prepared by CDM Federal Programs Corporation, prepared for U.S. Army Corps of Engineers, Kansas City District, August 2005.
P.	500819 - 500832	Report: Superfund Program Post-Decision Proposed Plan, Bog Creek Farm Superfund Site, prepared by U.S. Environmental Protection Agency, Region II, August 2005.

APPENDIX IV

State Concurrence Letter

State of New Jersey

Department of Environmental Protection

Richard J. Codey
Acting Governor

Bradley M. Campbell
Commissioner

SEP 2 0 2005

Honorable Alan J. Steinberg, Regional Administrator
United States Environmental Protection Agency Region II
290 Broadway
New York, NY 10007-1866

Re: Record of Decision (ROD) Amendment for Operable Unit #2
Bog Creek Farm Superfund Site
Howell Township, Monmouth County, New Jersey

Dear Mr. Steinberg:

The New Jersey Department of Environmental Protection (Department) has completed its review of the September 2005 Draft Record of Decision (ROD) for Operable Unit #2 (OU2) which addresses, the contaminated groundwater aquifer. We are pleased to concur with the chosen remedial alternative.

Groundwater at the Site is contaminated with volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, and metals. A groundwater extraction and treatment system has been in operation since August 1995 as an interim remedial measure for OU2. The system consists of extracting contaminated groundwater, treating it at an on-site treatment facility, and re-injecting the treated water at the up-gradient end of the plume.

The Amended Remedy, Alternative 3, described in this ROD Amendment calls for a modified groundwater extraction and treatment system, followed by re-injection of the treated water into the aquifer. Unlike the groundwater treatment system currently in place, the Amended Remedy allows for placement and pumping of the groundwater recovery wells to match the post-excavation Site conditions and to actively pump the most highly contaminated areas at the Site. In addition, if it is determined that residual hot spots in soils remain after the current excavation phase is completed, the Amended Remedy allows for *in situ* treatment of the remaining hot spots. The Amended Remedy will treat and restore groundwater at the Site so that it meets New Jersey Groundwater Quality Standards for Class IIA Aquifers (see Appendix II, Table 1) and will reduce Site cleanup time and life-cycle costs compared with the 1989 ROD remedy.

We appreciate the opportunity to participate in the remedial decision making process and the efforts of USEPA to address this contaminated site.

If you have any questions, please do not hesitate to call me at (609) 292-1250.

Sincerely,

Joseph J. Seebode, Assistant Commissioner
Site Remediation and Waste Management Program

cc: Edward Finnerty, USEPA
Thomas K. O'Neill, NJDEP BOMM
Jeanette Abels, NJDEP BOMM
David Kaplan, NJDEP BGWPA
John Prendergast, NJDEP BEERA
Craig Wallace, NJDEP BDC
Frank Cardiello, DOL

APPENDIX V

Responsiveness Summary

BOG CREEK FARM
SUPERFUND SITE
HOWELL TOWNSHIP, MONMOUTH COUNTY, NEW JERSEY

RESPONSIVENESS SUMMARY

A. Overview

As a part of its public participation responsibilities, the U.S. Environmental Protection Agency (EPA) held a public comment period from August 15, 2005 to September 13, 2005, for interested parties to comment on EPA's Post-Decision Proposed Plan to amend the remedy which addresses the contaminated groundwater at the Bog Creek Farm Site in Howell Township, New Jersey. In addition, on August 31, 2005, EPA conducted a public meeting to receive oral comments on the Post-Decision Proposed Plan. The Post-Decision Proposed Plan described the alternatives that EPA considered, including EPA's Preferred Alternative 3: Groundwater Extraction and Treatment with In Situ Treatment. EPA did not receive any written comments during the public comment period, but by judging by the comments received at the public meeting, the community supports EPA's preferred alternative.

The responsiveness summary contains the following sections:

A. Overview
B. Background of Community Involvement
C. Summary of Oral Comments Received During the Public Comment Period and Agency Responses

Appendix A contains the Post-Decision Proposed Plan that was distributed to the public for review and comment;
Appendix B contains the public notice which appeared in the Asbury Park Press; and
Appendix C contains the transcript of the public meeting.

B. Background of Community Involvement

Before the release of the Post-Decision Proposed Plan for the Operable Unit 2 (OU2) cleanup of the contaminated groundwater at the Bog Creek Farm Site, EPA held a public meeting on June 1, 2005 to discuss the status of work at the Site including the on-going excavation of contaminated soils, the development of the Focused Feasibility Study and the Post-Decision Proposed Plan leading to the development of the ROD Amendment for contaminated groundwater.

The FFS Report, Post-Decision Proposed Plan and supporting documentation were made available to the public in the Administrative Record file at the Superfund Document Center in EPA- Region II, 290 Broadway, 18th floor, New York, New York 10007 and at the information repository at the Howell Library, 318 Old Tavern Road, Howell, New Jersey 07731. The notice of availability for the above-referenced documents were published in the Asbury Park Press on August 16, 2005. On

August 31, 2005, EPA conducted a public meeting in Howell Township to inform local officials and interested citizens about the Superfund process, to review proposed remedial activities at the Site and receive comments on the Post-Decision Proposed Plan, and to respond to questions from area residents and other interested parties. The public meeting was held at the Howell Township Municipal Building 251 Preventorium Road in Howell Township. Comments on the preferred remedy were only received during the public meeting. No written comments were submitted. The oral comments received from the public and EPA's written responses can be found in the next section of this summary.

C. Summary of Oral Comment Received During the Public Comment Period and Agency Responses

1. One attendee asked about the removal efficiency of the recommended air stripper and carbon system.

- EPA explained that the details of the treatment system will be determined during the design phase, but that contaminants can be removed via air stripping, carbon polishing, or vapor treatment. Further evaluations are conducted to make the necessary design decisions. Air strippers usually have a removal efficiency of greater than 99 percent.

2. The questioner also inquired about possible releases of contaminants to the atmosphere from the air stripper.

- EPA noted that before operation of the treatment system is initiated, if it is determined to be necessary, an air permit will be obtained from the New Jersey Department of Environmental Protection. Anything discharged will comply with the discharge permit. Discharge limits of the permit will not be determined until the design phase is completed.

Written Comments Received During the Public Comment Period

No written comments were received during the public comment period.

APPENDIX A

Post-Decision Proposed Plan

Superfund Program
Post-Decision Proposed Plan

U.S. Environmental Protection Agency, Region II

Bog Creek Farm Superfund Site

August 2005

EPA ANNOUNCES POST-DECISION PROPOSED PLAN

This Post-Decision Proposed Plan identifies the proposed change to the groundwater remedy selected in the 1989 Operable Unit 2 Record of Decision for the Bog Creek Farm Site (Site) located in Howell Township, New Jersey, and provides the rationale for this modification. Described below are the remedial (cleanup) alternatives that the U.S. Environmental Protection Agency (EPA) considered to remediate contaminated groundwater at the Site, and EPA's preferred alternative with the rationale for this preference. The Preferred Alternative calls for a modified system for the extraction and treatment of contaminated groundwater, followed by re-injection of the treated water into the aquifer. In addition, the preferred alternative includes a provision for simultaneous *in situ* (in place) treatment of the groundwater to hasten removal of the contamination if it is determined to be necessary following monitoring of Site conditions after the completion of the contaminated soil excavation currently underway. This Post-Decision Proposed Plan includes summaries of all cleanup alternatives evaluated for use at this Site.

This document is issued by EPA, the lead agency for Site activities, and the New Jersey Department of Environmental Protection (NJDEP), the support agency for this project. EPA, in consultation with NJDEP, will select a final remedy for the Site groundwater after reviewing and considering all information submitted during the 30-day public comment period. EPA, in consultation with the NJDEP, may modify the Preferred Alternative or select another response action presented in this Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all of the alternatives presented in this Post-Decision Proposed Plan.

EPA is issuing this Post-Decision Proposed Plan as part of its community relations program under section 117(a) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or Superfund). This Post-Decision Proposed Plan summarizes information that can be found in greater detail in the Bog Creek Farm Superfund Site Focused Feasibility Study (FFS) report and other documents contained in the Administrative Record file for this Site. EPA and NJDEP encourage the public to review these documents to gain a more comprehensive understanding of the Site and Superfund activities that have been conducted at the Site.

MARK YOUR CALENDAR

PUBLIC COMMENT PERIOD: August 15, 2005 - September 13, 2005 - U.S. EPA will accept written comments on the Post-Decision Proposed Plan during the public comment period.

PUBLIC MEETING: August 31, 2005
U.S. EPA will hold a public meeting to explain the Post-Decision Proposed Plan and all of the alternatives presented in the Focused Feasibility Study. Oral and written comments will also be accepted at the meeting. The meeting will be held at the Howell Township Municipal Building Council Chambers located at 251 Preventorium Road, Howell Township, N.J.

For more information, see the Administrative Record at the following locations:

U.S. EPA Records Center, Region II
290 Broadway, 18th Floor
New York, New York 10007-1866

Howell Library
318 Old Tavern Road
Howell, NJ 07731
(732) 938-2300
Hours: Mon, Wed: 10:00 AM - 9:00 PM; Tues, Thurs: 9:00 AM - 9:00 PM; Fri: 1:00 PM - 5:00 PM; Sat: 9:00 AM - 5:00

SITE HISTORY

The Bog Creek Farm Superfund Site is located in a rural, agricultural and recreational area of Howell Township, Monmouth County, New Jersey at 579 County Road 547. The Site is bordered by two residences to the west, open fields to the south and east, and the north branch of Squankum Brook to the north. Several farms raising horses, nursery stock, vegetables, grain, sod, and flowers are situated nearby. Allaire State Park, used by golfers, fisherman, hunters, and equestrians, is located approximately one half mile east of the Site. There are approximately 900 people living within one mile of the Site.

RESPONSE ACTIONS	DESCRIPTION AND STATUS
Initial cleanup action (1984)	The Site owner partially excavated contaminated wastes from the Site for disposal at an EPA-approved landfill.
Record of Decision (ROD) - Operable Unit (OU) 1 (1985)	Contaminated soils and sediments were excavated and incinerated on-site in 1989 and 1990 in accordance with the 1985 ROD. Contaminated water from a former pond and bog were collected and treated in an aqueous waste treatment system.
ROD - OU2 (1989)	A slurry wall was constructed along Squankum Brook to protect against a contaminated groundwater discharge to the Brook's northern branch. A groundwater pump and treat system was constructed to extract and treat contaminated groundwater. Full operation of the treatment system began in 1995 and remains ongoing.
Explanation of Significant Differences (ESD) (2005)	EPA is currently removing additional VOC-contaminated soil. The excavation, off-site shipment of contaminated soil, backfilling and final restoration of contaminated areas are scheduled to be completed by May 2006.
ROD - modification of OU2 ROD (2005, the subject of this Post-Decision Proposed Plan)	Expedited remediation of remaining groundwater contamination. Preferred remedy includes a modified groundwater pump and treat system, along with an *in situ* (in place) groundwater treatment technology if needed.

The Site soil and groundwater are contaminated with volatile organic compounds (VOCs) and a variety of other contaminants. In addition, nearby Squankum Brook is designated as a New Jersey Department of Environmental Protection Category 1 (C1) Surface Water body, which eventually discharges to the Manasquan River (also Category 1). Category 1 is a special level of protection that targets water bodies that provide drinking water, habitat for Endangered and Threatened species, and popular recreational and/or commercial species, such as trout or shellfish. Waterways can be designated Category 1 because of exceptional ecological significance, exceptional water supply significance, exceptional recreational significance, exceptional shellfish resource, or exceptional fisheries resource. The Category 1 designation provides additional protections that help prevent water quality degradation and discourage development where it would impair or destroy natural resources and environmental quality.

An existing groundwater treatment building and plant are currently located on the Site, as part of an ongoing EPA remediation. See Figures 1 and 2 for Site maps.

VOC contamination in Site soil and groundwater reportedly resulted from the dumping of chemical wastes associated with the former property owner's paint manufacturing operations. During 1973 and 1974, various wastes, including organic solvents, paint residues, lacquer thinners, animal carcasses, and residential debris, were dumped in open areas and excavated pits on the eastern part of the 12-acre farmland property. Subsequent remedial investigations (RI) revealed two primary waste areas at the Site. The major area was a Former Waste Trench located approximately 300 feet south of Squankum Brook in the center of the Site. The trench, filled with chemicals and debris, was approximately 150 feet long, 40 feet wide and 10 feet deep. A smaller waste area, containing several buried drums, was found approximately 130 feet east of the trench in the Former Disposal Area.

The Site was added to the National Priorities List (NPL) in 1983. In 1984, EPA conducted field investigations at the Site. In 1985, EPA issued a Record of Decision (ROD) for the Site to address these verified sources of contamination. In 1989 and 1990, contaminated soils and sediments were excavated and incinerated on-site in accordance with the 1985 ROD. In addition, contaminated water from a former pond and bog were collected and treated in an aqueous waste treatment system at the Site.

A second ROD was issued in 1989 in which EPA selected a remedy to address the remaining groundwater contamination. To protect against contaminated

Data layers source: www.nj.gov\dep\gis

Feet
0 500 1,000 2,000 3,000 4,000

Figure 1-1
Site Location Map
Bog Creek Farm Site
Howell Township, Monmouth County, New Jersey

CDM

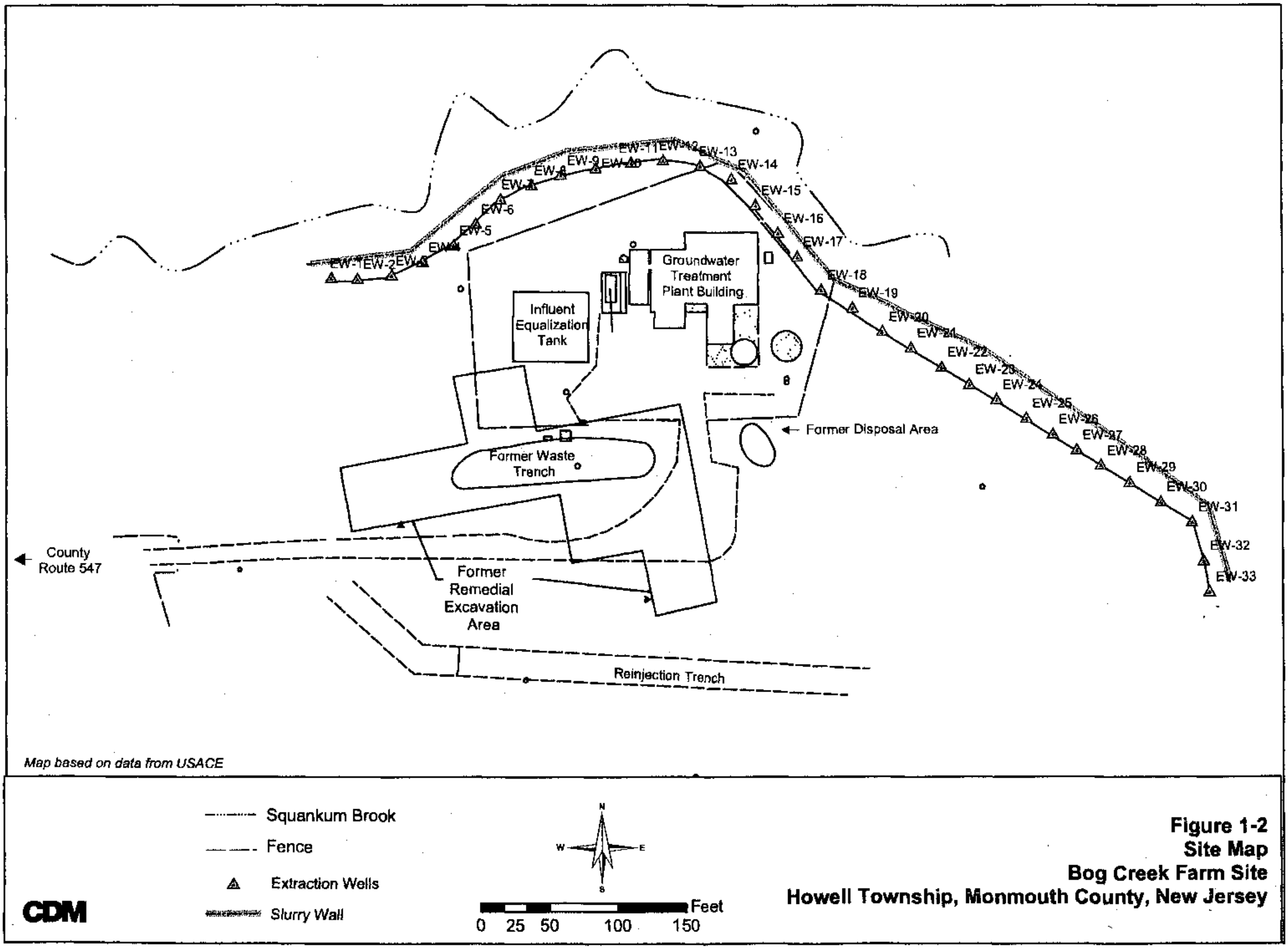


Figure 1-2
Site Map
Bog Creek Farm Site
Howell Township, Monmouth County, New Jersey

groundwater discharge to the north branch of Squankum Brook, a slurry wall was constructed along the brook. In addition, a pump and treat system was constructed to extract and treat the contaminated groundwater before re-injecting it back into the groundwater. This treatment system began full operation in August 1995, and is currently in its 10[th] year of operation. However, despite the source control excavation and ongoing groundwater treatment, chemicals of concern in the groundwater persist at concentrations exceeding current maximum contaminant levels (MCLs).

EPA has conducted numerous tests and investigations to determine the most effective method of extracting additional contaminants from the contaminated aquifer. The objective of the tests and investigations was to evaluate methods for attaining the groundwater cleanup goals (established in the Operable Unit (OU) 2 ROD, 1989) thereby reducing the number of years the New Jersey Department of Environmental Protection would have to operate the pump and treatment system after assuming operation and maintenance responsibilities for the Site. Based upon the results of the tests and investigations, EPA confirmed that the existing treatment plant (which is performing up to design specifications) would have to operate for many years to attain the cleanup goals because significant sub-surface soil contamination remains at the Site.

In May 2004, EPA and the U.S. Army Corp. of Engineers (COE) completed an analysis which provided six alternatives/cost estimates for additional contaminated soils cleanup, including both on-site and off-site soil treatment and disposal options. The May 2004 analysis also included optimization alternatives for the groundwater treatment plant, and *in situ* cleanup alternatives for the groundwater contaminant plume.

In response to the COE's report and other groundwater and soil investigations, EPA issued an Explanation of Significant Differences (ESD) in January 2005. The ESD established that an estimated 21,000 cubic yards of VOC-contaminated soil would need to be excavated in order for the groundwater treatment remedy to reach its cleanup objectives within a reasonable period of time. EPA began implementing the scope of work outlined in the ESD in May 2005. Full implementation includes the excavation and off-site shipment of contaminated soils, backfilling, and final restoration of the excavated areas. These activities are scheduled for completion prior to May 2006.

WHAT IS A "PRINCIPAL THREAT"?

The National Contingency Plan (NCP) establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP Section 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to groundwater, surface water or air, or acts as a source for direct exposure. Contaminated groundwater generally is not considered to be a source material; however, Non-Aqueous Phase Liquids (NAPLs) in groundwater may be viewed as source material. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of the alternatives using the nine remedy selection criteria This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

SITE CHARACTERISTICS

As part of the Focused Feasibility Study, groundwater modeling was performed to better understand the existing hydrogeologic conditions at the Site. A conceptual site model was also developed to summarize the contamination sources, contaminant transport and fate, and exposure pathways. EPA recently completed additional soil and groundwater sampling. Soil sampling around and underneath the existing groundwater treatment buildings was conducted to delineate the extent of remaining soil contamination. Groundwater sampling was performed to determine the magnitude of remaining groundwater contamination. The following sections are based on all of this recent sampling and the modeling completed as part of the FFS.

Groundwater

The Site is underlain by the Kirkwood formation, which is subdivided into the Upper Kirkwood and Lower Kirkwood. Site contamination has only been identified in the Upper Kirkwood, and it is believed that the Lower Kirkwood behaves as an aquitard, bounding the depth of, and preventing downward migration of, contamination. The depth to water across the Site ranges from 0 feet at the Squankum Brook to approximately 10 feet. The hydraulic conductivity is estimated at approximately 1 to 6 ft/day within the contaminated area.

Beneath the Kirkwood formation is the Manasquan formation, which is predominantly clayey silt and acts as a confining layer. Previous investigations have found that contamination is limited to the Upper Kirkwood; therefore, the stratigraphy of the Manasquan formation is not discussed.

Upper Kirkwood

The thickness of the Upper Kirkwood unit varies, increasing from 10 feet thick near the north branch of Squankum Brook to approximately 30 feet thick near the former disposal areas. The upper unit is predominantly very fine to fine sand with some silty sands and coarser materials. The predominant flow of groundwater in the Upper Kirkwood is in a northeasterly direction in the area of contamination of the Bog Creek Site toward the previous waste trenches and then toward the north branch of Squankum Brook. The groundwater then discharges into the north branch of Squankum Brook, which serves as a barrier for groundwater in the Upper Kirkwood. Any groundwater contaminants derived from the Site will flow into the north branch of the Squankum Brook. This is confirmed by groundwater sampling data.

Lower Kirkwood

The Lower Kirkwood is relatively uniform in thickness, and is estimated to be approximately 30 feet thick across the entire Site. The lower unit consists of silty sands, silts, and clays. Groundwater flow in the Lower Kirkwood is to the east with discharge into the Manasquan River (over a mile to the northeast).

Nature and Extent of Groundwater Contamination

Based on recent groundwater sampling, the Site remains significantly contaminated with a variety of VOCs, including chlorinated VOC and petroleum hydrocarbon contaminants. Select semi-volatile organic compounds (SVOCs), metals, and pesticides have also been detected at some sampling locations.

The groundwater contamination within the Upper Kirkwood appears to be centralized in two "lobes." The west lobe is centered approximately 120 feet south of the Former Waste Trench. This lobe is roughly 150 feet across and extends north to the brook. The east lobe is located northeast of the Former Disposal Area. This lobe is roughly 120 feet across and is more elongated than the west lobe. Sample results also indicate there are a few smaller hot spots present in addition to the primary lobes. The presence of light non-aqueous-phase liquid (LNAPL) appears likely in some areas. This is based on a comparison of VOC concentrations in groundwater relative to the saturation concentrations, primarily for benzene and toluene.

In addition, some sample results have identified contamination in the vicinity of Squankum Brook, north of the existing slurry wall that was installed as part of the ongoing groundwater remediation selected in the 1989 ROD to protect discharge to the Brook. It is believed that this contamination was already present prior to construction of the slurry wall.

Existing Groundwater Remedy

The existing groundwater remedy is a pump and treat system that is a modification of the plant originally used to treat water generated during the excavation of the trench, pond, and bog in 1990. The system consists of an extraction system, treatment plant (*ex situ* treatment), and re-injection gallery. The extraction system operates continuously at a rate of 25 to 30 gallons per minute (gpm), and the treatment plant is operated in batch mode on weekdays when operators are present.

The extraction system is comprised of:

- Slurry wall aligned along the Squankum Brook's southern bank
- 33 extraction wells aligned inside (upgradient) of the slurry wall
- One common manifold attached to all wells
- Vacuum extraction pump
- Influent tank

The treatment plant is comprised of:

- pH adjustment
- Metals removal
- Sand filtration
- Two packed-tower air strippers in series
- Liquid-phase and vapor-phase granular activated carbon (LPGAC and VPGAC)
- Effluent tank

Soil

EPA recently completed soil sampling around and underneath the existing treatment buildings and former disposal areas to delineate the extent of remaining soil contamination. Based on these investigations, EPA has undertaken the removal of up to 21,000 cubic yards of VOC-contaminated soil. This activity is scheduled for completion by May 2006.

WHAT IS RISK AND HOW IS IT CALCULATED?

Superfund baseline human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these releases under current and future land uses. A four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure scenarios.

Hazard Identification: In this step, the contaminants of concern at the site in various media (i.e., soil, groundwater, surface water, and air) are identified based on such factors as toxicity, frequency of occurrence, and fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation.

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of and dermal contact with contaminated soil. Factors relating to the exposure assessment include, but are not limited to, the concentrations that people might be exposed to and the potential frequency and duration of exposure. Using these factors, a "reasonable maximum exposure" scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment: In this step, the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response) are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or other non-cancer health effects, such as changes in the normal functions of organs within the body (e.g., changes in the effectiveness of the immune system). Some chemicals are capable of causing both cancer and non-cancer health effects.

Risk Characterization: This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site risks. Exposures are evaluated based on the potential risk of developing cancer and the potential for non-cancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a "one-in-ten-thousand excess cancer risk"; or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions explained in the Exposure Assessment. Current Superfund guidelines for acceptable exposures are an individual lifetime excess cancer risk in the range of 10^{-4} to 10^{-6} (corresponding to a one-in-ten-thousand to a one-in-a-million excess cancer risk). For non-cancer health effects, a "hazard index" (HI) is calculated. An HI represents the sum of the individual exposure levels compared to their corresponding reference doses. The key concept for a non-cancer HI is that a "threshold level" (measured as an HI of less than 1) exists below which non-cancer health effects are not expected to occur.

The Site background information and remedial alternative analyses contained in this Post-Decision Proposed Plan are based on the Site conditions prior to the soil removal action currently underway. Because this action will result in significant removal of groundwater contaminant source materials from the Site, future investigations will be necessary before full implementation of an alternative to expedite cleanup of the remaining groundwater contamination.

SCOPE AND ROLE OF THIS ACTION

The contaminated groundwater at the Bog Creek Farm Site has been the focus of an ongoing groundwater extraction and treatment remedy since 1995. However, recent monitoring data and evaluations suggest that the existing remedy will not reach groundwater cleanup standards in the ten-year time frame predicted in the 1989 ROD. Accordingly, a FFS was performed to develop a better understanding of current Site conditions and groundwater contamination, and to evaluate alternative remedies for Site cleanup. This Post-Decision Proposed Plan focuses on the persisting groundwater contamination and describes the cleanup alternatives evaluated as part of the FFS, as well as EPA's preferred alternative. The preferred remedy will use a groundwater pump and treat system, and, if determined to be beneficial, *in situ* groundwater treatment to expedite the removal of contaminants.

SUMMARY OF SITE RISKS

Human Health Risk

Baseline Risk Assessment

A baseline risk assessment was prepared for the Bog Creek Farm Site in 1988 to estimate the risks associated with current and future Site conditions. Information from the baseline risk assessment was used to develop the 1989 ROD. A baseline risk assessment is an analysis of the potential adverse human health and ecological effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these releases under current and future land uses.

An evaluation was made of all potential exposure routes which could cause exposure to chemicals of potential concern at the Site for people living or working in the area. The following exposure pathways were considered to be of potential significance in the 1988 baseline risk assessment:

- direct dermal contact with on-site soil,
- ingestion of on-site soil,
- inhalation of on-site soil as particulates,

- inhalation of volatile organics released to the atmosphere from on-site soil,
- ingestion of fish caught in the Manasaquan River, and
- ingestion of surface water from the Manasquan River.

The baseline risk assessment concluded that none of the six pathways was considered significant at the Bog Creek Farm Site. It was determined that the pathways do not present significant health threats, because the maximum detected concentrations of contaminants on-site did not exceed the acceptable soil concentrations.

Since the Bog Creek Farm Site is underlain by the Kirkwood aquifer, there was initial concern that nearby residents could be exposed to groundwater contamination via local wells. However, upon further analysis, the pathway was not considered to be significant, because the contaminated portion of the aquifer is not used for drinking purposes, and Site conditions indicate that the groundwater contamination is confined by the Lower Kirkwood and the north branch of Squankum Brook, as described in the *Site Conditions* section above.

Streamlined Human Health Risk Assessment

A streamlined Human Health Risk Assessment (HHRA) was performed as part of the recent FFS and supplements the baseline risk assessment. The intent of the streamlined HHRA was to assess whether chemicals other than the compounds identified in the 1989 ROD are a potential threat to human health and need to be addressed by the cleanup remedy. In the years since the baseline risk assessment was performed, EPA has developed additional information on the toxicity of chemicals and additional guidance regarding exposure evaluation. Therefore, chemicals may be present at the Site that contribute to human health risk that were not identified in the baseline risk assessment.

As part of the streamlined risk assessment, chemicals of potential concern (COPCs) for human health were selected through a tiered screening process. In the first tier of screening, maximum detected concentrations in recent samples (2005) from Site groundwater, surface water, and sediment were compared to risk-based screening values. The risk-based screening values used (Region 9 Preliminary Remediation Goals) are health protective and are equivalent to a cancer risk of $1x10^{-6}$ or a hazard index of 0.1. Chemicals retained as COPCs from Tier I were evaluated further in Tier II with refined assumptions to reduce uncertainty in the screening process and help prioritize COPCs to address in the cleanup remedy.

Tier I identified 52 COPCs in groundwater, 5 COPCs in sediment, and 4 COPCs in surface water. These are chemicals that were detected at least once at a concentration above the EPA Region 9 PRGs for tap water or residential soil, adjusted to a cancer risk of $1x10^{-6}$ and a hazard quotient of 0.1. Tier II considered the frequency of detection, background concentrations, and screening levels adjusted to a cancer risk of $1x10^{-5}$. Tier II identified 43 COPCs in groundwater and no COPCs in sediment or surface water.

Of the COPCs determined to be the risk drivers (those that trigger the need for cleanup) for groundwater in the 1989 ROD, trans-1,2-dichloroethene, copper and zinc are no longer chemicals of potential concern for human health. While most of the COPCs identified by the streamlined risk assessment are VOCs, several SVOCs, pesticides, and metals have also been selected. The VOCs determined to be of greatest concern in the 2005 streamlined HHRA are: 1,2-dichloroethane (DCA), vinyl chloride, benzene, trichloroethene (TCE), cis-1,2-dichloroethene (DCE), 1,2,4-trimethylbenzene, toluene, tetrachloroethene (PCE), and 1,1,2-trichloroethane (TCA). Also identified as risk drivers in the streamlined HHRA are: 1,1,1-trichloroethane, 2,4-methylphenol, phenol, and lead.

Environmental Risks

Groundwater is not a drinking water threat because it is not being used a drinking water source. However, the contaminant levels in groundwater are above applicable or relevant and appropriate requirements (ARARs), and the NJDEP Groundwater Protection Strategy requires the protection of this natural resource against adverse impacts to the environment as well as to potential future users. In addition, historic discharge of the Upper Kirkwood to the north branch of the Squankum Brook is partially responsible for environmental degradation. The complete restoration of groundwater is the primary objective of the proposed remedy presented in this Post-Decision Proposed Plan.

REMEDIAL ACTION OBJECTIVES

Section 121(d) of CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA) requires that, at a minimum, any remedial action implemented at a site achieve overall protection of human health and the environment and comply with ARARs. ARARs at a site may include both Federal and State regulations. Other criteria that do not meet the definition of an ARAR, but may also be considered when developing cleanup alternatives are known as to-be-considered criteria (TBCs). Before developing remedial action (cleanup) alternatives for a Superfund site, EPA establishes both Remedial Action

Objectives (RAOs) and Preliminary Remedial Goals (PRGs). RAOs are media-specific goals for protecting human health and the environment. PRGs are chemical-specific cleanup goals, which are used as benchmarks in the screening, development and evaluation of cleanup alternatives. RAOs and PRGs are based on the ARARs and TBCs that have been identified as applicable to the site. The RAOs established for groundwater at the Bog Creek Site include:

- Prevent exposure to contaminated groundwater.
- Prevent/minimize contaminated groundwater discharge to the north branch of Squankum Brook .
- Reduce Site cleanup time and life cycle costs.
- Restore contaminated groundwater to drinking water standards within a reasonable time-frame.

The PRGs used in the recent FFS are the New Jersey Groundwater Quality Standards for Class IIA Aquifers. The designated use of all Class II groundwater is to provide potable water using conventional treatment. Both existing and potential potable water uses are included. Class II criteria specify the levels of constituents above which the water would pose an unacceptable risk for drinking water. These drinking water standards are appropriate cleanup goals since Squankum Brook flows into the Manasquan River, which is designated as a drinking water supply.

BASIS FOR REMEDY MODIFICATION

Based on recent groundwater sampling, the Site remains significantly contaminated with a variety of VOCs, including chlorinated VOCs and petroleum hydrocarbon contaminants. Select SVOCs, metals, and pesticides have also been detected at some sampling locations. The groundwater contamination appears to be centralized in two areas on the Site with a few smaller hot spots present. The presence of light non-aqueous-phase liquid appears likely in some areas.

The existing groundwater remedy is a pump and treat system. The remedy consists of an extraction system, treatment plant (*ex situ* treatment), and re-injection gallery. The design and configuration of the pumping wells does not allow for flexibility in pumping rates or pumping selected wells, and therefore does not address the centralized areas of groundwater contamination efficiently. This will extend the need for treatment for a significant period of time and increase overall life-cycle costs.

The Post-Decision remedy will allow for placement and pumping rates of the groundwater recovery wells to match the expected, post-excavation Site conditions and to actively pump in the most highly contaminated areas at the Site. If it is determined that residual hot spots in soils remain after the current excavation phase is completed the Post-Decision remedy allows for *insitu* treatment of the remaining hot spots. In addition, the Post-Decision remedy will treat and restore groundwater at the Site so that it meets New Jersey Groundwater Quality Standards for Class IIA Aquifers. The Post-Decision Remedy will reduce Site cleanup time and life-cycle costs compared with the 1989 ROD remedy.

SUMMARY OF REMEDIAL ALTERNATIVES

Based upon the results of the Focused Feasibility Study, EPA evaluated three cleanup alternatives that address the groundwater contamination at the Bog Creek Farm Superfund Site. These alternatives are summarized below and described in detail in the Focused Feasibility Study report. The screening process through which these alternatives were developed is also described in the FFS report. The time frames below for construction do not include the time for remedial design or the time to procure contractors.

Alternative 1 : No Action

Estimated Capital Cost:	$0
Estimated Annual Operation and Maintenance (O&M) Cost:	$0
Total Estimated Present Worth:	$0

CERCLA and the National Contingency Plan require the evaluation of No Action as a baseline to which other alternatives are compared. No remedial actions or institutional controls would be implemented as part of this remedy. While there is an on-going EPA remediation at the Site, the No Action alternative evaluated in the FFS assumes the existing groundwater remedy would be terminated.

Because this alternative would result in hazardous substances, pollutants, or contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure, EPA would review such action at least every five years.

Alternative 2: Groundwater Extraction and Treatment

Estimated Capital Costs:	$1,612,000
Estimated Annual O&M Years 1-2	$613,000/year
Estimated Annual O&M Years 3-10	$403,000/year
Estimated Annual O&M Years 11-30	$298,000/year
Total Estimated Present Worth Cost	$6,400,000

Alternative 2 relies on hydraulic control of the contaminated groundwater, *ex situ* treatment of the extracted groundwater, and subsequent re-injection/recharge of the treated groundwater to the aquifer via the existing re-injection trenches upgradient of the contaminant areas. This configuration relies on a continual flushing of the contaminated zone to achieve Site cleanup levels.

SUMMARY OF REMEDIAL ALTERNATIVES

Medium	FFS Designation	Description
Site Groundwater	Alternative 1	No Action
	Alternative 2	Groundwater Extraction and Treatment - Includes groundwater extraction and treatment to maintain hydraulic plume control and to facilitate contaminant mass removal and aquifer flushing via focused pumping and effluent re-injection/recharge within plume areas. Also includes long-term monitoring.
	Alternative 3	Groundwater Extraction and Treatment with *In Situ* Treatment - Includes groundwater extraction and treatment as described under Alternative 2. It may also include one of the following *in situ* technologies: soil vapor extraction/air sparging (SVE/AS), enhanced anaerobic bioremediation (EAB), or *in situ* chemical oxidation (ISCO), if it is determined that residual hot spots remain after the current excavation phase is completed. Also includes long-term monitoring

Groundwater extraction would be accomplished by the installation of 17 new extraction wells within the contaminated plume areas, upgradient of the existing extraction wells and Squankum Brook. Due to the extent of contamination and presence of BTEX (benzene, toluene, ethylbenzene, and xylenes), chlorinated VOC, and SVOC contaminants, the extracted groundwater would be subject to a variety of treatment options prior to re-injection. The exact components of the new treatment train would be finalized during the remedial design, based on the results of pilot testing and treatability study data collected at that time. For the purposes of this Post-Decision Proposed Plan, it was assumed that the groundwater treatment system would consist of the following steps, from start to finish: 1) influent flow equalization; 2) metals and particulate treatment by green sand filtration; 3) air stripping; 4) off-gas treatment by vapor-phase carbon and potassium permanganate zeolite; and 5) groundwater polish for SVOCs by liquid-phase carbon treatment. The purpose of each of these steps is summarized below. It is estimated that construction and initial startup of Alternative 2 could be completed within two years.

The equalization tank would serve to stabilize the combined influent flow rate and water quality to the treatment plant so that consistent operational settings can be generally maintained for treatment. The green sand filter unit would serve to remove dissolved and suspended metals and total suspended solids via filtration and oxidation. This pretreatment step would reduce O&M requirements associated with air stripping. Air strippers would serve to reduce the groundwater VOC concentrations to levels acceptable for groundwater discharge. Off-gas treatment of the air stripper effluent would be required until total off-gas

VOC emissions from all components decrease below 2.2 lbs per day, based on guidance provided by NJDEP. Liquid-phase granular activated carbon (LPGAC) would be used to remove SVOC contaminants from the groundwater effluent after the air stripper, prior to discharge back into the aquifer via the existing upgradient re-injection trench. LPGAC treatment would eventually become unnecessary during the course of remediation as the SVOC concentrations drop off.

The remedy duration for this alternative is dependent on influent groundwater quality concentrations at the time the remedy is implemented. As mentioned previously, an ongoing soil cleanup should significantly reduce contaminant concentrations in groundwater. However, based on the initial concentrations assumed in the FFS, it is expected that Alternative 2 may take up to 30 years to remediate the Site.

Long-term monitoring will be performed semi-annually for the first three years after the system is operating. After three years of semi-annual monitoring, EPA in consultation with NJDEP will conduct an evaluation to either continue with semi-annual monitoring or to develop another appropriate routine monitoring schedule. The purpose of the monitoring will be to confirm achievement of RAOs and track progress of the remedial action until cleanup goals are achieved.

Because this alternative would result in hazardous substances, pollutants, or contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure, EPA would review such action at least every five years.

Alternative 3: Groundwater Extraction and Treatment with *In Situ* Treatment

Estimated Capital Costs:	$2,272,000
Estimated Annual O&M Years 1-2	$811,000/year
Estimated Annual O&M Years 3-10	$543,000/year
Estimated Annual O&M Years 11-30	$298,000/year
Total Estimated Present Worth Cost	$8,200,000

Alternative 3 includes Groundwater Extraction and Treatment, as described under Alternative 2, along with *in situ* treatment to augment contaminant mass removal. Multiple *in situ* technologies were retained during the screening process for this alternative based upon their potential to facilitate achievement of remedial action objectives when applied individually or in sequential combination. Bench and/or pilot testing of these technologies are required to better assess their site-specific feasibility. Such testing is often performed during the remedial design phase and is used to support detailed design decisions for full-scale implementation. The *ex situ* pump and treat system implemented under Alternative 3 may differ slightly depending upon which *in situ* technology is selected since each may alter the chemistry of the groundwater in different ways. Long-term monitoring will be performed semi-annually for the first three years after the system is operating. After three years of semi-annual monitoring, EPA in consultation with NJDEP will conduct an evaluation to either continue with semi-annual monitoring or to develop another appropriate routine monitoring schedule. The purpose of the monitoring will be to confirm achievement of RAOs and track progress of the remedial action until cleanup goals are achieved.

Multiple design configurations were developed in the FFS to illustrate how groundwater extraction and treatment may be combined with each *in situ* technology retained for consideration under this alternative. The cost analysis, however, is based upon the assumption that SVE/AS would be used alone for *in situ* treatment. Under this assumption, it is estimated that construction of Alternative 3 could be completed within two years. All of the retained technologies are summarized below.

SVE/AS (Soil Vapor Extraction/Air Sparging)

SVE/AS would be used to expedite reduction of groundwater contaminants below cleanup criteria via physical and aerobic biological processes. All VOC contaminants would be subject to enhanced physical vapor-phase extraction and recovery associated with SVE/AS. SVE would occur at the groundwater extraction wells to minimize construction costs. Approximately 25 AS wells would be installed within the plume area using a grid system. AS would be performed using an air compressor. Contaminated vapors recovered by SVE wells would be subjected to *ex situ* treatment to reduce VOC contaminant concentrations below NJDEP air discharge criteria before discharge to the atmosphere.

Groundwater monitoring would be performed prior to initiating SVE/AS treatment to establish the baseline conditions for comparison. Subsequent rounds of groundwater monitoring would be performed to assess the performance and progress of the technology and to support future decisions regarding SVE/AS system operation and optimization.

EAB (Enhanced Anaerobic Bioremediation)

EAB would be used to expedite the reduction of groundwater contaminants below cleanup criteria via anaerobic biodegradation processes. This technology would predominantly target chlorinated ethane and ethene contaminants, including 1,1,1-TCA, TCE, cis-1,2-DCE, 1,1-DCE, and vinyl chloride. Implementation of EAB would involve multiple injections of amendments (e.g., electron donor, nutrients, and/or microbes) into the contaminated aquifer. The initial injection event would use a grid system with approximately 44 injection points. Subsequent injection events would roughly occur every 0.5 to 3 years, depending upon the type of substrate used, and would target areas where groundwater contaminants persist above cleanup goals.

Groundwater monitoring would be performed prior to the initial EAB injection to establish the baseline conditions for comparison. Subsequent rounds of groundwater monitoring would be performed after each EAB injection to assess the performance and progress of the technology and to support decisions regarding subsequent EAB injection events.

ISCO (In situ Chemical Oxidation)

ISCO would be used to expedite reduction of groundwater contaminants below cleanup criteria. This technology would primarily target dissolved-phase chlorinated VOCs and petroleum hydrocarbon contaminants. ISCO would involve multiple injections of Modified Fenton's Reagent, which consists of an iron catalyst and hydrogen peroxide solution, into the contaminated aquifer. This reagent has been shown to be effective for oxidation of the contaminants present at this Site. The initial injection event would be completed using a grid system with approximately 155 injection points. It is expected that subsequent injection events would occur every 6 to 12 months and would target areas where groundwater contaminants persist above cleanup goals.

Groundwater monitoring would be performed prior to the initial ISCO injection to establish the baseline conditions for comparison. Subsequent rounds of groundwater monitoring would be performed after each ISCO injection to assess the performance and progress of the technology and to support decisions regarding subsequent ISCO injection events.

Because this alternative would result in hazardous substances, pollutants, or contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure, EPA would review such action at least every five years.

EVALUATING REMEDIAL ALTERNATIVES

In selecting its preferred alternative, EPA uses the nine NCP criteria below to evaluate the viable remedial alternatives developed for a site. CERCLA requires that each selected site remedy be protective of human health and the environment, be cost effective, comply with other statutory laws, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. In addition, the statute includes a preference for the use of treatment as a principal element for the reduction of toxicity, mobility, or volume of the hazardous substances.

EVALUATION CRITERIA FOR SUPERFUND REMEDIAL ALTERNATIVES
Overall Protectiveness of Human Health and the Environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
Compliance with ARARs evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.
Long-term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.
Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
Short-term Effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
Cost includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value.
State/Support Agency Acceptance considers whether the State agrees with EPA's analyses and recommendations, as described in the RI/FS and Proposed Plan.
Community Acceptance considers whether the local community agrees with EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

COMPARATIVE ANALYSIS

This section of the Post-Decision Proposed Plan profiles the relative performance of each alternative against the nine criteria described above.

1. Overall Protection of Human Health and the Environment

The No Action Alternative would not provide protection of human health or the environment, because contamination would persist in the groundwater, and potential exposure to contaminated groundwater would not be restricted. Alternative 2 would provide protection of human health and the environment, as the contaminated plume would be under hydraulic control, contaminant concentrations would reduce over time, and aquifer flushing would help to restore groundwater quality. Alternative 3 would also provide protection of human health and the environment. In addition to providing hydraulic control and aquifer flushing, concentrations of contaminants could be significantly reduced during the initial years of operation if *in situ* treatment proves applicable. However, groundwater extraction and treatment may still be required for up to 30 years of operation in order to meet the groundwater cleanup criteria.

2. Compliance with ARARs

Alternative 1 will not meet chemical-specific ARARs for contaminated groundwater discharge to surface water or groundwater quality. Alternatives 2 and 3 will comply with ARARs. However, there is some uncertainty regarding whether or not these alternatives will meet chemical-specific ARARs for groundwater quality within a 30-year time period. Alternative 3 can be expected to achieve cleanup goals within a shorter time frame than Alternative 2 if the post-excavation conditions warrant it.

3. Long-term Effectiveness and Permanence

Alternative 1 would not reduce risk in the long term, since the contaminants would not be controlled or destroyed. Since both Alternatives 2 and 3 would be effective for hydraulic control, both mitigate risks of off-site migration of contaminants. It is expected that Alternative 2 would provide a gradual reduction in contaminant concentrations and the associated residual risks. Alternative 3 would reduce contaminant concentrations and the associated risks more significantly during the initial years of operation.

Both Alternatives 2 and 3 are considered adequate and reliable, since both consist of a groundwater extraction and treatment component, which is a proven technology, to maintain hydraulic control of the groundwater contamination. Long-term groundwater monitoring would be performed over the course of the remedy implementation to assess the degree of remedy effectiveness over time. The *in situ* component of Alternative 3 may provide further reliability to the remedy, as it more aggressively targets contamination within the aquifer. However, due to uncertainty associated with *in situ* treatment, pilot testing would be required prior to remedy installation to determine the most appropriate treatment technologies/approach.

4. Reduction of Toxicity, Mobility, or Volume (TMV) of Contaminants Through Treatment

Alternative 1 would not reduce TMV through treatment, as no active treatment of contaminated groundwater occurs. Alternative 2 would reduce contaminant mobility by providing hydraulic control. Some reduction in toxicity and volume of contamination is expected through *ex situ* treatment. Alternative 3 would also reduce contaminant mobility via hydraulic plume control. In addition, it could significantly reduce contaminant toxicity and volume via *in situ* treatment if Site conditions prove favorable.

5. Short-term Effectiveness

For Alternative 1, protection of the community and workers is not applicable, since no remedial action occurs. Alternatives 2 and 3 would require well installation and treatment plant construction, but impacts to the community would not be significant as the surrounding area is predominantly rural. Workers would be protected through the use of air monitoring, engineering controls, and appropriate personal protective equipment.

6. Implementability

Since it requires no action, Alternative 1 is technically and administratively the easiest to implement. Alternative 2 is the second easiest to implement, as the technical feasibility of pump and treat systems is well established. Alternative 3 is implementable as well, as *in situ* treatment of groundwater has received widespread use. Alternative 3 would require pilot studies to support detailed design decisions. Regulatory/permitting requirements for Alternatives 2 and 3 are not expected to be administratively burdensome.

7. Cost

Alternative 1 has no cost, and Alternative 2 costs less than Alternative 3.

8. State/Support Agency Acceptance

The State of New Jersey agrees with the preferred alternative in this Post-Decision Proposed Plan.

9. Community Acceptance

Community acceptance will be assessed in the ROD and will be based on comments received during the public comment period.

SUMMARY OF THE PREFERRED ALTERNATIVE

Based upon an evaluation of the various alternatives, EPA and the State of New Jersey recommend Alternative 3 - Groundwater Extraction and Treatment with the potential to use *In Situ* Treatment as needed. Along with Alternative 2, Alternative 3 is protective of human health and the environment while the *in situ* option holds the advantage of more significantly reducing contaminant levels during the initial years of operation. Alternative 3 provides long-term effectiveness and reliability by maintaining hydraulic control. Alternative 3 also complies with all ARARs and TBCs for the Site. The primary advantage of Alternative 3 is its flexibility. If the pre-design investigation after the excavation is completed determines that *in situ* treatment, such as SVE/AS, will appreciably shorten the cleanup time for the pump and treat, that option will be available without the need for an ESD or ROD amendment. At the conclusion of the remedy, EPA will evaluate the need for an institutional control such as a Classification Exception Area, Deed Notice, or designation of a Well Restriction Area.

Based on information currently available, EPA believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. EPA expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA §121(b): 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost-effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and 5) satisfy the preference for treatment as a principal element.

COMMUNITY PARTICIPATION

EPA and the State of New Jersey provide information regarding the cleanup of the Bog Creek Farm Superfund Site to the public through public meetings, the Administrative Record file for the Site, and announcements published in local newspapers. EPA and the State encourage the public to gain a more comprehensive understanding of the Site and the Superfund activities that have been conducted at the Site.

EPA and the State of New Jersey rely on public input to ensure that the concerns of the community are considered in selecting an effective remedy for the Bog Creek Farm Site. To this end, the Post-Decision Proposed Plan and other Site documents have been made available to the public for a public comment period. A public meeting will be held during the public comment period to present the conclusions of the FFS, further elaborate on the reasons for recommending the preferred alternative, and to receive public comments. The dates for the public comment period, the date, location and time of the public meeting, and the locations of the Administrative Record files, are provided on the front page of this Post-Decision Proposed Plan.

EPA Region 2 has designated a Regional Public Liaison Manager as a point-of-contact for community concerns and questions about the federal Superfund program in New York, New Jersey, Puerto Rico and the U.S. Virgin Islands. To support this effort, the Agency has established a 24-hour, toll-free number that the public can call to request information, express their concerns or register complaints about Superfund.

For further information on the Bog Creek Farm Superfund Site, please contact:

Edward J. Finnerty
Remedial Project Manager
(212) 637-4367

Pat Seppi
Community Relations Coordinator
(212) 637-3679

U.S. EPA
290 Broadway 19th Floor.
New York, New York 10007-1866

The Regional Public Liaison Manager for EPA's Region 2 office is:

George H. Zachos
Accelerated Cleanup Manager
Toll-free (888) 283-7626 or (732) 321-6621

U.S. EPA Region 2
2890 Woodbridge Avenues, MS-211
Edison, New Jersey 08837

APPENDIX B

Public Availability Notices

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY INVITES PUBLIC COMMENT ON THE POST-DECISION PROPOSED PLAN FOR THE BOG CREEK FARM SUPERFUND SITE HOWELL TOWNSHIP, NEW JERSEY

The U.S. Environmental Protection Agency (EPA) invites you to attend a public meeting to discuss the Post-Decision Proposed Plan to amend the groundwater remedy selected in the 1989 Operable Unit 2 Record of Decision for the Bog Creek Farm Site (Site). EPA's preferred alternative calls for the extraction and treatment of contaminated groundwater, followed by reinjection of the treated water into the aquifer. In addition, the preferred alternative includes a provision for simultaneous *in situ* (in place) treatment of the groundwater to hasten removal of the contamination if it is determined to be necessary following monitoring of the Site conditions after the completion of the contaminated soil excavation currently underway. During the public meeting, EPA representatives will address all of the alternatives, present additional information supporting the recommendation of the preferred alternative and receive public comments. There will also be an update on the progress of the ongoing soil removal work.

The public meeting will be held on Wednesday, August 31st at 7:00 p.m. at the Howell Township Municipal Building Council Chambers located at 251 Preventorium Road.

To request a copy of the Proposed Plan you can:

email Pat Seppi, Community Involvement Coordinator at
seppi.pat@epa.gov
call Pat at (212) 637-3679 or 1-800-346-5009
or visit EPA's website at
http://www.epa.gov/Region2/superfund/npl/bogcreekfarmproposal2005.htm

Site-related documents are available for public review at the information repositories established for the Site at the following locations:

Township Clerk's Office, 251 Preventorium Road, (732) 938-4500 ex 2150
Howell Library, 318 Old Tavern Road, Howell Township (732) 938-2300
USEPA Region 2, Records Center, 290 Broadway, New York, NY 10007 (212) 637-4308

The public comment period for this Proposed Plan runs from August 15 to September 13, 2005. All written comments or questions should be address to:

Edward J. Finnerty, EPA Project Manager
U.S. Environmental Protection Agency
290 Broadway, 19th Floor
New York, New York 10007
Telephone (212) 637-4367 Fax (212) 637-4393
e-mail: Finnerty.Ed@EPA.GOV

APPENDIX C

Transcript of Public Meeting

HOWELL TOWNSHIP MUNICIPAL BUILDING
251 PREVENTORIUM ROAD
HOWELL TOWNSHIP, NEW JERSEY
PUBLIC MEETING
AUGUST 31, 2005

x ----------------------- x

RE: BOG CREEK FARM SUPERFUND SITE

TRANSCRIPT OF PROCEEDINGS

x ----------------------- x

A P P E A R A N C E S:

INTRODUCTION	-	PAT SEPPI, EPA
SUPERFUND OVERVIEW	-	JEFF JOSEPHSON, EPA
ONGOING SOIL EXCAVATION	-	DON GRAHAM, EPA
GROUNDWATER STUDY	-	FRANK TSANG, CDM
PROPOSED PLAN	-	ED FINNERTY, EPA

DEBRA-ANN BALSAMO
Certified Shorthand Reporter

MS. SEPPI: Why don't we get started. Thank you for coming tonight. My name is Pat Seppi. I'm a community involvement coordinator with the EPA and I'd like to ask the rest of the people here tonight who are a part of this presentation to introduce themselves, please. C.

MR. GRAHAM: My name is Don Graham. I'm the on-scene coordinator. I'm the person involved with the activities that are ongoing right now at the site.

MR. FINNERTY: I'm Ed Finnerty. I'm the project manager on Bog Creek Farm.

MS. McPHEARSON: Julie McPhearson. I'm the health risk assessor at the site.

MR. TSANG: I'm Frank Tsang. I'm from CDM. I'm the project manager.

MR. JOSEPHSON: My name is Jeff Josephson. I'm the team leader for the New Jersey project state coordination team.

MR. BRENNAN: My name is John Brennan. I work for Weston Solutions.

MS. SEPPI: We also have two gentlemen here from the Corps of Engineers who are involved in the project.

MR. KOLB: My name is Neal Kolb. I work for the Army Corps of Engineers for the environmental resident office in East Brunswick and we're overseeing the operation and maintenance of the plant.

MR. AWAD: My name is Gamal, G-A-M-A-L, last name Awad, A-W-A-D. I'm with the Corps of Engineers, same office.

MS. SEPPI: Okay. Thank you. Well, the reason that we're here tonight is to talk a little bit more about the Bog Creek Farm site. We were here in May. We had a meeting to talk about the work that Don would be doing at the site and he's going to update us on that in a couple of minutes, but now we're talking about a change to a groundwater remedy that we originally chose, I believe, in 1989. We have proposed a change to that remedy and that's what the proposed plan if you haven't received one in the mail, they are up there. Very interesting reading.

We want to talk a little bit tonight about our reasoning and rationale for our preferred alternative. There were a few different alternatives that we considered, we chose the one that we thought was most appropriate and we're in the middle, in the public comment period now. It will end on September 13th. So any comments that you make tonight regarding this plan will be part of that permanent record. And, also, if you think of any comments after you leave, you certainly have until the closing bid on September 13th to get that information into Ed. Now Ed's name, phone number and address is at the back of the proposed plan and I don't believe that his E-mail address is on there, I'm not sure, but I put it on the agenda.

MR. FINNERTY: It doesn't have the E-mail.

MS. SEPPI: You can certainly always E-mail it, too.

MR. TSANG: On the agenda you said the comment period ends on September 15th.

MS. SEPPI: I said the 15th. You know why, because that's my daughter's birthday. I'm very sorry. It's the 13th. Right, it is the 13th. Thank you.

So moving on, we have a few presentations tonight. I would like your indulgence, if you wouldn't mind, with your questions until the end of the presentation which we're going to try to keep them short. We already told everybody ten minutes is it, ten, 12 minutes. Not for everybody, but for the major presentation.

First person I would like to bring up is Jeff Josephson and he's just going to talk to you a little bit about the Superfund overview.

MR. JOSEPHSON: I am just going to provide a brief summary of the Superfund process. In 1980, Congress passed the Comprehensive Environmental Response , Compensation and Liability Act, which is more commonly known as Superfund. The Superfund law provides for the ability of federal funds to be used for the cleanup of uncontrolled and abandoned hazardous waste sites and for responding to emergencies that involve hazardous substances.

Upon discovery of a potential abandoned hazardous waste site, EPA will conduct one or more inspections and make a determination if the site should be placed onto the National Priorities List, which is the list of the nations's worst hazardous waste sites.

Once a site is place on the National Priorities List, selection of a remedy usually requires the conduct of a remedial investigation and feasibility study. The work necessary to cleanup a hazardous waste site is often complex and is frequently conducted in stages. EPA often calls the stages operable units. An operable site or unit determines the nature and extent of the contamination as well as the risks to the human health the environment posed by the contamination.

The purpose of the feasibility study is to identify and evaluate remedial alternatives to address the site contamination. Once the feasibility study is completed, EPA develops a proposed plan and presents EPA's preferred cleanup alternative to the public. Tonight's meeting will summarize the results of a feasibility study and proposed remedy. After consideration of the public comments EPA will document the selected cleanup alternative in the Record of Decision.

Once that Record of decision is final, the remedial design process begins where the specifications and plans for the selected remedy are developed. Remedial action is initiated after the design is completed and in the stage where construction and cleanup activity occur at the site. To the degree that is necessary post cleanup monitoring is conducted, and once the site no longer poses a threat to human health or the environment it is removed from the Superfund National Priorities List.

Tonight's public will review the results of the focused Feasibility Study for the modification to the groundwater remedy, and we will discuss remedial alternatives evaluated in the proposed plan. We will provide EPA's preferred alternative for the modified groundwater remedy for the Bog Creek Superfund site.

MS. SEPPI: Thank you, Jeff. If anybody is interested in researching or looking at any of the documents related to the site, they are in your library, the Howell library. I believe it's Old Tavern Road. They're also in our office in New York. Or, you know, if you go there and they're not there, give one of us a call and we'll certainly make sure that you have copies of whatever it is you'd like.

So there's been a lot of work going on at the site. Hopefully, it's been real quiet there. We haven't heard any complaints or anything. Don's done a very good job. I think Don has a few slides and a little explanation.

MR. GRAHAM: As I said before, my name is Don Graham. I'm the on-scene coordinator for the site. I'm the person responsible right now for the activities that we're undertaking under this operable unit which essentially necessitates us removing a certain volume of soil. We estimated up to twenty thousand cubic yards of contaminated soil would have to be removed. We started that work in May right around the time of the last public meeting here and as it says up here, the site's been on the NPL since '83. There was some previous work done at the site. This additional work that we're undertaking now is intended to augment whatever has been done. We completed approximately one-half of the work and we're on schedule to be done with everything under this portion of the process by the spring of 2006.

That's just an aerial photograph showing you the relative location of the site. As you can see the red and the yellow, that's the area we've already excavated. Route 547 is off to the left and you can't see it on the map, but a little bit north of here would be where 549 comes in.

Okay. As I said before, we started work in May, but we didn't actually start excavating until late June because the soil that we were excavating was actually underneath the water table. We had to draw down the water table approximately ten feet. When everything was said and done, it was the middle of August and we removed approximately 3200 yards of contaminated soil. That's on site right now. It's under cover and we'll be shipping that off-site for disposal within the next week.

You can see the piping that outlines where the guys are working, that's the dewatering systems. It's just a system of well points where we extract the groundwater. The groundwater in that area is typically at six feet and our excavation proceeded somewhere around 14 feet in depth. This excavation represents probably about the halfway point. So this, it averages about 14 feet in depth. To give you a perspective, those tanks behind the excavation, they're about 30 feet high.

That's what we call technical difficulty. One weekend we came back and there was a couple of these in the water.

MS. SEPPI: Did you see how big they were?

MR. GRAHAM: They were big. THE size of a garbage can. This is what we were chasing. Once we drew the water table down you can see the staining of the soils.

When the dumping occurred back in

1973-'74, from what I understand the farmer that owned the property at the time was dumping basically anything that people were bringing in; paints, gasoline products. Based on an analysis that we've been running, there seems to be large gasoline components: Xylene, benzine, olivine. The whole time we were out there John and the people that he's working with they've been doing constant air monitoring on the parameter of the site to make sure that a number of the neighbors haven't been impacted. We've had one owner complain recently which I think had nothing to do with the site because we haven't had any smells at all on-site for probably close to two months.

At this point, like I said, John's people, they've been running instrumentation constantly throughout the process. This picture here depicts what we've already taken out. You see the blue outline and the lighter color, that's the soils we've removed so far. That's currently stockpiled just south of the access road coming into the site and that's going to be shipped off the site starting next week. It will probably be gone within two weeks. We're getting ready to excavate the second area which is denoted in the red hash marks. That's on line for being completed by the end of this year and once that's completed, we'll backfill that area and finish everything in the spring of the 2006.

This picture here denotes a fence that we'll install when everything is said and done largely due to the fact that the Township is going to be constructing a soccer complex right nearby. This way we can eliminate access to any of the kids getting into the site itself. Everywhere you see in that yellow line that's currently unfenced, but it will be fenced when we leave.

That's pretty much it. Any questions you can ask me at the end of the meeting or I'm on-site most of the time Monday through Friday. I would be glad to give anybody my telephone number if they would like if any problems arise.

MS. SEPPI: Thank you, Don. Okay. Frank Tsang from CDM, our contractor, is going to tell you about the groundwater settings that were conducted.

MR. TSANG: In the next few minutes I will give you a summary of the focus study that we've performed during the past several months. Before getting into the feasibility study, I would like to give you some background information.

As Don pointed out earlier, the primary contaminants include BTEX and CVOCs. There are two primary plumes on site referred to as the "east and west lobes". Contamination, however, is confined to the Upper Kirkwood aquifer, which extends up to 30 feet below ground surface. The groundwater and the plume flow to the north-northeast toward the Squankum Brook.

As Patty and Jeff mentioned earlier, we have an existing groundwater remedy on site. The remedy includes a slurry wall and construction wells. We'll talk more about that a little bit later.

And you probably ask, okay, if we also have a treatment system on-site, why do we need to do another focus feasibility study. Basically, we want to have a better understanding of the current site conditions and then EPA can come up with a remedy to speed up the groundwater remediation. In the early stage of the focus feasibility study, EPA, the Army Corps of Engineers and CDM got together and developed remedial action objectives and preliminary remedial goals. The remedial action objective is for protection of human health and the environment. Among the many goals listed here, goal number one is to prevent contaminated groundwater from discharging into the Squankum Brook and then the second objective is to reduce the site cleanup time and the cost.

Preliminary remediation goals we use to measure whether we have achieved the objective or how far are we away from the objective, we selected the New Jersey groundwater quality standards as our cleanup goals we call it. The groundwater quality standard is designed for protection of human health mainly. CDM performed several major activities under the focus feasibility study. At the beginning we performed a supplemental field investigation of the groundwater surface water and sediment to have a better understanding of the current site conditions. Using information from CDM, we completed a streamlined human health and ecological risk assessment to identify the risks on-site and, also, to identify any additional we call it contaminants concerns that have not been included during the very first risk assessment that was done in the eighties.

CDM also developed a numerical groundwater flow model for the site to give us a better understanding of the groundwater conditions on-site. Using the groundwater flow model, CDM simulated various extraction scenarios for the remedial action alternatives that we developed later on. CDM then identified and screened the RA technologies and developed and evaluated RA alternatives. We developed three alternatives: Alternative number one is the no action alternative. As the name implies, no further treatment will be implemented on-site under that alternative. No action alternative required by law that we have to develop it and retain it as a baseline for comparison to the other more active treatment alternatives.

Alternative number two is groundwater extraction and treatment. Under this alternative we'll put in multiple extraction wells within the contaminant plumes to expedite the cleanup of the groundwater. You're going to ask, you know, what is the difference between alternative two and the existing remedy. I'm going to show you in the next slide.

As I mentioned earlier, there are two primary contaminant plumes here and under the existing remedy we have a slurry wall here and a line of a wells here represented by these two lines. Because the formation in the ground it takes a long time for the groundwater to flow from this point over to the plume to the extraction well to be captured by the extraction wells. Using the groundwater model we plan to put multiple extraction wells within the plume and because of the placement of the well, it will capture the plume much faster.

In addition, we're going to put extraction well plumes into each well to enable the operator on-site to concentrate the pumping on the most contaminant area. And, again, that will speed up the remediation.

This is a schematic flow diagram for alternative two. Groundwater is captured by the extraction well here and then pumped through the treatment train. The main treatment cross is here through the air stripper. The air stripper will extract the contaminant into the vapor phase of the treatment train. Before it's discharged into the atmosphere the treated groundwater is further polished by the carbon before it is injected into the ground and the process is going to go through in a close loop.

Alternative three is very similar to alternative two. Basically, alternative three is groundwater extraction and treatment with an in situ treatment component. The in situ treatment component enables removal of a significant portion of the contaminant in the early phase of the remedy.

We have identified several in situ treatment. We selected this alternative as the representative process options for the alternative development and the screening. Soil vapor extraction, (SVE)/air sparging, you compress air into the contaminant groundwater and air bubbles the contaminant out. We then apply a vacuum and catch much of the vapor before it comes to the ground surface so we then treat the vapor through the treatment train.

Soil vapor extraction and air sparging are very effective in stripping out the contaminant from the groundwater. Additionally, because we're injecting air into groundwater, we're basically increasing the oxygen concentration in the groundwater and to enhance aerobic biodegradation activities to destroy the contaminant.

So there are two mechanisms to destroy contamination. Of course we still have the pumping treatment ongoing at the same time. This is a conceptual site layout. Multiple air sparging wells is represented by the circle and the little dots here will be replaced within the treatment contaminant plumes. The vapor will be captured by the extraction well represented by the square and the dotted circle here before it escapes to the ground surface and then sent through the treatment train as I mentioned earlier. That's basically the layout for alternative three.

Again, this is a schematic flow diagram for alternative three. It's very similar to alternative two, the only difference is the soil extraction component here to the ground to capture the vapor. That's now my presentation.

MS. SEPPI: Last, but not least, EPA project manager for Bog Creek, Ed Finnerty.

MR. FINNERTY: My name is Ed Finnerty and I'm the project manager of Bog Creek Farm. I think you have heard the interesting things, all I'm going to try to say to you now is to give you some perspective of what we started with and what we're trying to do at the present time.

Back in 1985, we did the first record of decision which said we would excavate the soil where we believe the contamination was put down, the waste material was put down, and that took place under the first record of decision and then the second record of decision realized that we would have to do something about the groundwater. Normally, speaking in projects like this, it's kind of a two-part deal. You have to try to get as much as you can of contamination out of the soil so that you don't put too much of a burden on the groundwater treatment and if you don't get enough of the contamination out of the ground, the pump or the groundwater treatment operation will take a tremendously long time.

We usually use, for our purposes in doing a record of decision, we usually talk about a 30-year period of time. The first ten years the government and the EPA operates that facility. After the ten years we turn it over to the state and the state operates it for as long as necessary to achieve the goals. As far as the first operation that we had, and we're now in September will be ten years of operating the treatment plant, that treatment plant has been very successful. It's always done what it was designed to do. The only problem is that we didn't -- we weren't able to get rid of enough soil contamination so we put too much of a burden on the pump and treatment plant. A burden in the sense that it would have to operate, we believe, for a number of decades just in order to reach the goals that we've been given.

Just to say what is probably pretty

obvious, when you design this treatment plant and you have certain goals that are in a record of decision, we had about -- we had about ten contaminants of concern that we were trying to remove in the groundwater treatment and the new plant. From day one it will remove these contaminants and achieve the goals that are being asked for, but you have to do that situation day in and day out for many years because you're not finished until the groundwater that you're taking out through these extraction wells and into a tank that's called an influent tank you're only finished if finally what's going into that influent tank doesn't need treatment. It's as good as what your requirements are and sometimes that takes a hellish long period of time. So we found maybe after five or so years after the current operation that we really had a long time to go before we would ever be able to have our influent tank showing up with water that didn't really have to be treated.

So we did, I mean in recent years we've had the environmental response team do a lot of work for us and they did a large number of borings and samplings so we know much better, we know much more now, we know much more accurately where the contamination is, how deep it is and the concentration of those contaminants.

When we first did that excavation and so forth like that it was a much more limited thing. As a matter of fact, the record of decision is what we call it an interim remedy. They realize that this may not be able to make it too complex, but it was a very good try in trying to achieve the cleanup at a reasonable cost situation.

So here we are now. We're in a sense redoing the work. Don Graham is doing excavation in a much more intensive way, a much more exacting way because he knows much more accurately where the contaminants are so he will be removing those. So when he's finished we should be much closer to being able to, with the groundwater operation, to achieve the goals we want. One problem I should mention to you is the fact that nothing really stands still. In the ten years that we've been operating under the existing system maybe five years into that the state changed some of the regulations so the groundwater status that we're looking for now are much more stringent than they were before. Similarly, the requirements for Squankum Brook are much more higher than they were before. When we were working during the first ten years there were about ten contaminants of concern that we had to remove down to certain levels, now with this new one we have about 43 and so this really compounds the amount of work that we have to do after Don is finished. And after we do this amended record of decision, we'll design a new treatment system and provide the system which will take us through -- we make the projects go through 30 years, how many years it's going to take we really don't know.

As far as, and, again, as soon as the excavation is finished, what we're going to do is turn on our normal extraction wells. We have 33 extraction wells in the existing system and because of all this excavation and removal of all this stuff, we really don't know what hot spots will be left and what the concentration of these hot spots.

So we'll start operating the original extraction system, see what those contaminants look like in that groundwater and based on that we'll probably do some more modeling and so forth and based on that they would design in this case now a new highly automated plant.

One of your biggest expenses is operating costs. We have a high operating cost for the existing plant we have now. We'll build a much smaller plant which will operate continuously 24 hours a day and won't require operators on the scene taking care of the situation. So that is our objective in doing this ~~broad~~ ROD amendment. After we're finished with the excavation well study, we'll see what we have, see what we've accomplished with this excavation, find out where the new hot spots are, how concentrated they are and based on that data and some modeling, design a new plant that we'll use from here on out trying to attain the goals. And as I'm saying to you, the goals now are much more stringent than they were before and that's basically our situation.

MS. SEPPI: Thank you, Ed. So I'd like to open up the floor to any questions you may have. If I could just ask that before you ask your question if you can state your name for our Stenographer, please, so we'll have it for the record and she may ask you to spell it or if it's difficult you might just want to spell it right from the start. And you heard about the record of decision, that's a document that will be our final, legally binding document that will discuss what we are planning to do there and any of the comments that we receive, whether written or tonight, will be included in that.

Part of it is called a responsiveness summary.

So when you see the record of decision, you'll see all the comments addressed whether they were given here tonight or sent in through the mail. So I apologize for putting September 15th. The correct date for the end of the public comment is September 13th.

Sir, you had a question?

MR. GHAFFRI: My name is Mozafar, M-O-Z-A-F-A-R. Last name Ghaffri, G-H-A-F-F-R-I. The question I have about the design of the system for, I guess, one of the recommendations is the air stripper and carbon system.

MR. TSANG: Uh-huh.

MR. GHAFFRI: I want to know the removal efficiency as far as all these compounds and what will be the contaminants going through the atmosphere?

MR. TSANG: Okay. It's going to be compound specific in terms of removal efficiency for the carbon unit. Basically, it will have to go through a design to get -- we'll design a goal to get to the most efficient because we either treat it through the air stripper and treat it through the vapor treatment portion of the treatment system or have it polished by the carbon and water. So there is a design decision that will go through the evaluation and usually the air stripper we're looking for 99 plus percent, you know.

In terms of the discharge into the atmosphere, we'll need to get an air permit from New Jersey Department of Environment Protection before we can discharge anything. Anything discharged will comply with the discharge permit. I don't have a specific number because we haven't gone through a design yet.

MR. GHAFFRI ~~THE WITNESS~~: Thank you.

MS. SEPPI: Thank you. Any other questions? It can't be this easy. There must be more questions.

Well, we're going to be here for awhile. If you have any other questions, you're certainly welcome to come up and ask us.

Again, Ed's name, number and address is in the proposed plan. There is copies up there if you don't have one. If you haven't signed in, I would appreciate it if you did. We're trying to compile a little more extensive mailing list than we have now so we'll be able to notify you in the future.

I thank you very much for coming. Don't hesitate to call any of us if you have any questions as the project moves on. Thank you.

(Hearing is concluded.)

CERTIFICATE

I, DEBRA-ANN BALSAMO, a Certified Shorthand Reporter and Notary Public of the State of New Jersey, certify that the foregoing is a true and accurate Computerized Transcript of the proceedings as taken before me stenographically on the date hereinbefore mentioned.

DEBRA-ANN BALSAMO, C.S.R.

Dated: September 7, 2005
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