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Superfund Record of Decision:

D'Imperio Property, NJ

D'IMPERIO PROPERTY, HAMILTON TOWNSHIP, NEW JERSEY

Record of Decision
Abstract

The D'Imperio Property site is an inactive waste disposal dump located in a semi-rural region of Atlantic County within the New Jersey Pinelands Reserve. The site is relatively flat with slopes ranging from one to three degrees. Two wetlands are located to the north and south of the site, approximately 2000 and 4000 feet away, respectively. The site lies in a cleared area with wastes deposited randomly on the surface and some wastes partially buried. The exact period of disposal activities at the D'Imperio site is unknown. However, it is believed that unauthorized dumping took place from the late 1960's to 1976. A limited field investigation was conducted in the fall of 1980 which indicated that the ground water underlying the site was contaminated with volatile organics. The site was subsequently included on the EPA Interim Priorities List.

The selected remedial alternative for the D'Imperio site includes excavation and transportation of 3900 cubic yards of contaminated waste and soil and surface drums to a RCRA-regulated disposal site; construction of a RCRA cap following completion of the excavation; and pumping and treating contaminated ground water from two affected aquifers prior to reinjection or surface discharge. The treatment process is estimated to take 17 months and will provide for the removal of both organic and inorganic contaminants. After 17 months an evaluation will be made to determine the effectiveness of the cleanup program as well as the need to continue pumping and treating the contaminated ground water. The estimated capital cost of this selected remedial alternative is $4,251,551, with operations and maintenance costs estimated to be 1,169,449.

Record of Decision
Remedial Alternative Selection

Site

D'Imperio Property, Hamilton Township, New Jersey

Documents Reviewed

I am basing my decision primarily on the following documents describing the analysis of cost-effectiveness of remedial alternatives for the D'Imperio Property site.

- D'Imperio Property Remedial Investigation and Feasibility Study Report, NUS Corporation, February 1985.
- Staff summaries and recommendations.
- Responsiveness Summary dated March 1985.

Description of Selected Remedy

1. Excavation of 3900 cubic yards of surface drums, contaminated waste and soil, and transportation of these materials to a RCRA approved hazardous waste disposal site.

2. Construction of a RCRA cap following the excavation of the dump area.

3. Pumping of contaminated groundwaters from the Upper Cohansey and Middle Cohansey aquifers, and treating such groundwaters prior to reinjection or surface discharge (to be determined during design of remedy). The treatment process will provide for the removal of both organic and inorganic contaminants. At the currently estimated rates of groundwater extraction and treatment, it will take about 17 months to clean up the aquifers to levels which are consistent with appropriate RCRA, SDWA, and State drinking water quality standards. At that time, an evaluation will be made to determine the effectiveness of the cleanup program as well as the need to continue pumping and treatment or establish alternate concentration limits.

Declarations

Consistent with the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERLCA), and the National Contingency Plan (40 CFR Part 300), I have determined that the excavation of contaminated materials for disposal at a RCRA approved hazardous waste facility in conjunction with capping the site, and pumping and treatment of contaminated groundwater is the selected remedial alternative for the D'Imperio site.

It has been determined that the implementation of this alternative will provide adequate protection of public health, welfare and the environment. The State of New Jersey has been consulted and agrees with the proposed remedy.

I have also determined that the action being taken is appropriate when balanced against the availability of Trust Fund monies for use at other sites. In addition, the removal of contaminated materials to a secure hazardous waste facility, capping the site, and pumping and treating contaminated groundwater is cost-effective, implementable and technically sound when compared to other remedial action alternatives, and is necessary to protect public health, welfare and the environment.

March 27, 1995

Date

Christopher J. Daggett

Christopher J. Daggett
Regional Administrator

SUMMARY FOR REMEDIAL ALTERNATIVE SELECTION

D'Imperio Property Site
Hamilton Township, New Jersey

Site Location and Description

The D'Imperio Property Site is an inactive waste disposal dump in Hamilton Township, Atlantic County, New Jersey (See Figure 1) The location of the site is within a triangle formed by the intersections of U.S. Route 322 (Blackhorse Pike), Route 40, and Cologne Road (See Figure 2). The boundary of the site generally follows the treeline bordering an open disposal area.

The D'Imperio Property Site is located in a semi-rural region of Atlantic County within the New Jersey Pinelands Reserve. The National Parks and Recreation Act of 1978 mandated the protection of the Pinelands Area. The Act established the Pinelands National Reserve, encompassing all or part of 56 municipalities in southern New Jersey. It also authorized the establishment of a planning entity responsible for preparing a Comprehensive Management Plan.

To comply with the federal statute, Governor Byrne issued an Executive Order on February 8, 1979, providing for the establishment of the Pinelands Planning Commission and making most development in the Pinelands area subject to Commission approval. In June 1979, the State Legislature passed the Pinelands Protection Act, thereby endorsing the designation of the Pinelands Commission as the regional planning entity. The Pinelands Comprehensive Management Plan sets out the strategy to achieve the goals of preserving, protecting and enhancing the significant values of the land and water outlined in the state and federal legislation.

The Comprehensive Management Plan of the Pinelands Protection Act designates the site area land classification as a "Regional Growth Area". This designation allows for commercial, industrial and moderately high residential development.

The site itself is relatively flat with slopes ranging from one to three percent. The nearest surface water are two wetlands to the north and south of the site, approximately 2,000 and 4,000 feet away, respectively. The north wetland is named Babcock Swamp and is drained by Babcock Creek which is tributary to the Great Egg Harbor River. The southern wetland is unnamed and is drained by Gravelly Run, which is also tributary to the Great Egg Harbor River.

The site vegetation is predominantly indigenous mixed pine and deciduous trees with thick herbaceous ground cover. The site lies in a cleared area with wastes deposited randomly on the surface and partially buried.

Site History

Little is known of waste disposal activities at the D'Imperio Site. The exact period of disposal activities is unknown. However, it is believed that the unauthorized dumping took place from the late 1960's to 1976. In the late 1970's, the Atlantic County Public Health Department informed the New Jersey Department of Environmental Protection (NJDEP) of the existence of the site. A limited field investigation was conducted by the consulting firm Woodward-Clyde Associates for a potential developer of the site in the Autumn of 1980. The results of this investigation indicated that the groundwater underlying the site was contaminatied with volatile organics. Subsequently, the D'Imperio Site was ranked on the EPA Interim Priorities List. A Remedial Action Master Plan was completed for the site in June 1982.

A State Superfund Contract between the USEPA and NJDEP was signed in September 1982 and provided for the funding of a Remedial Investigation and Feasibility Study (RI/FS) and the installation of a security fence. EPA's consultant NUS has undertaken the work necessary to complete the RI/FS.

Site Geology

The D'Imperio Property Site is situated in the Atlantic Coastal Plain Physiographic Province. This is a lowland region where elevations are usually less than 100 feet above mean sea level and local relief is minimal. The drainage pattern is poorly developed and low swampy areas are common.

In overall geologic character, the coastal plain can be described as a wedge of semi-consolidated, Cretaceous and Tertiary sedimentary deposits that overlap older crystalline rocks of the Piedmont Province to the west. This wedge dips less than one degree eastward, and thickens toward the Atlantic coast. It includes strata of sand, silt, clay and occasional beds of marl, gravel and peat.

Below the Cohansey Sand is the Kirkwood Formation. It is not exposed in the eastern part of the Coastal Plain, but it is known to be an extensive subsurface unit, lithologically similar to the Cohansey, and in places hydrologically continuous with it.

The Cohansey Sand unit occurs throughout most of the New Jersey Coastal Plain and underlies the D'Imperio Site. The Cohansey Sand includes beds of sand, gravelly sand, and subordinate clay. The sands are typically fine to medium-grained with scattered lenses of gravel. The sands are generally unconsolidated, but in places are cemented by iron oxides. Inter-beds of clay, usually less than 10 feet thick, occur in most sections of the Cohansey Sand. Individual beds within the Cohansey are lenticular; stratigraphic contacts are often gradational and interfingering. Thickness of the Cohansey Sand ranges from more than 200 feet near the coast, to about 50 feet in parts of Cumberland County, approximately 20 miles west of the site.

Most of the site area is directly underlain by unconsolidated sediment of the Cohansey Sand. A small area skirting the southern edge of the site is underlain by a gravelly sand, probably belonging to the Bridgeton Formation.

Strata at the site is primarily sand, however, two extensive intervals of clay are predominant. For purposes of reference, these units are named the upper and lower clay. The sands are subdivided on the basis of their position relative to the lower clay; the Upper-Cohansey and Mid-Cohansey are above and below the lower clay, respectively. All of the stratigraphic units exhibit some degree of variability. The clay units include distinct lenses of silt and sand, and grade into silty and sandy clays. Sandy intervals are likewise variable. Thin lenses of clay and silt occur in the sand units, and variable amounts of interstitual silt and clay are also present.

The upper clay is well defined with sharp contacts above and below. It usually is 5 feet thick or less, and is located at a depth of about 10 to 15 feet. Although designated a clay unit for stratigraphic purposes, in many areas silt or clayey fine sand is the predominant grain size.

The lower clay interval is of more concern because of its influence on the groundwater regime. The top of the clay is at a depth of about 30 to 45 feet and the thickness ranged from 6 to 17 feet. The clay thins rapidly in a northwesterly direction. Contacts between the clay and the units above and below are gradational and interfingering. Consequently, the thickness variations may reflect lithofacies changes rather than thinning or thickening of a well defined bed.

The sand strata below the lower clay (Mid-Cohansey) is quite distinct throughout the site, unlike the other sand zones, which would be difficult to correlate without the clay marker beds. This lower sand is coarser grained and contains less silt and clay than upper sands. It is distinctly colored a deep brown, yellow, or brownish red.

REMEDIAL INVESTIGATION ACTIVITIES AND RESULTS

Remedial Investigation Activities:

The remedial investigation of the D'Imperio Site included the following activities:

- Electromagnetic resistivity and magnetometer surveys
- Collection of eighteen surface soil samples from sixteen test pits and analyses via gas chromatograph (GC) screening (13 samples) and priority pollutant analyses (15 samples)
- Collection of twelve waste samples and analyses via GC screening
- Drilling of fifteen monitoring wells in the Upper Cohansey and Middle Cohansey aquifers
- Collection of thirty-eight groundwater samples from new and existing monitoring wells and priority pollutant analyses of all samples
- Collection of twelve potable water samples from private wells ranging from 1400 to 3200 feet downgradient of the site and priority pollutant analyses of all samples
- Collection of six air samples and organic analyses of all samples

The results of these investigative activities indicate that the wastes disposed of at the D'Imperio site have resulted in the contamination of the underlying groundwater in the Upper and Middle Cohansey Aquifers. In addition, the soil adjacent to and underlying the disposal area was found to be contaminated.

Laboratory analyses of groundwater samples obtained from existing and newly constructed monitoring wells indicated significant levels of volatile organics. Contaminant plumes were mapped in both the Upper Cohansey and Middle Cohansey Aquifers. The Upper Cohansey has significantly greater levels of contaminants than the Middle Cohansey. Organic compounds detected in high concentrations in groundwater samples taken from the upper aquifer included: 2-butanone (MEK), 1,2-dichloroethane, ethylbenzene, trichloroethylene and toluene. Appendix A includes a list of concentration ranges for critical contaminants detected in on-site monitoring wells as well as the established acceptable daily intakes (ADI) and preliminary protective concentration limits (PPCL) for these contaminants. An isocontour map of the contaminants in the shallow aquifer indicates that the bulk of the contaminants are within 200 feet of the site and the forward

edge of the plume is moving in a southwesterly direction and is approximately 800 feet from the site. A similar map of the Middle Cohansey indicates that the aquifer also flows in a southwesterly direction and the center of the plume is approximately 400 feet from the site.

The laboratory results of twelve potable water samples obtained 1400 to 3200 feet downgradient of the site indicated that none of the wells were affected by the contaminants detected at the D'Imperio site.

The results of laboratory tests on soil samples obtained during the remedial investigation indicated that organic base neutral, acid compounds and volatile organics exist at the ground surface to depths of ten feet. The highest concentration of contaminants included; acetone, 2-butanone (MEK), bis (2-ethylhexyl) phthalate and di-n-butyl phthalate.

The current condition of scattered drums at the ground surface and surface waste material pose a serious threat to the public and the environment. The priority pollutant contamination contained in these items provides a potential for harm for those who come in direct contact with these materials. Detrimental impacts to the local environment may also result from the release of contaminants from those containers which may be intact. The migration of pollutants into the underlying groundwater has resulted in the contamination of the Upper Cohansey and Middle Cohansey Aquifers. The removal of the remaining highly contaminated source material will lessen potential for further contamination.

Screening of Remedial Action Technologies

The evaluation of the results of the remedial investigation provided the basis for the clean-up goals and objectives for site remediation. The clean-up goals and objectives established for the D'Imperio Site include the following:

- Eliminate the future risk of contaminated groundwater ingestion by present and potential users in the vicinity of the site.
- Miminize the risk to the public from exposure to wastes and contaminated soils in the site area.
- Prevent the migration of contaminants from wastes left on the site.
- Protect the public and on-site workers from health impacts resulting from the implementation of the remedial action.

The initial step in the evaluation of remedial alternatives is the screening of potential remedial technologies. The screening procedure was used to eliminate those technologies which were technically infeasible and environmentally unacceptable. The procedure used consists of the five steps as follows:

- Identify site problems and pathways of contamination.
- Identify general response actions that properly address site problems and meet clean-up goals and objectives.
- Screen the technologies implied by each response action to eliminate inappropriate and infeasible technologies.
- Assembly of the remaining technologies into operable remedial alternatives.
- Screen the remaining alternatives eliminating those which do not adequately protect the public health, welfare and environment as well as those alternatives whose cost are significant when compared with the benefits provided to the public health and/or environment.

A comprehensive list of remedial technologies was screened in accordance with established procedures. The results of the screening procedures identified the feasible remedial action components which when integrated would result in establishing remedial alternatives.

REMEDIAL ALTERNATIVE COMPONENTS

Source Control/Removal & Disposal

Excavation and removal of waste materials and highly contaminated soils is a component of a remedial alternative which would reduce the source of groundwater contamination. Final disposal of the wastes could be either in an on-site landfill or off-site in a permitted Hazardous Waste Management Facility (HWMF).

The material proposed for excavation include, the waste containers, bulk sludges, and highly contaminated soils adjacent to the containers and sludges. The intent of the excavation is to remove the most contaminated source material and minimize the total volume of excavation.

The excavation area is shown in Figure 3. The area corresponds to the general location of the waste containers and sludges identified during the field investigation. The average excavation depth of 5 feet, is based upon visual observations of waste materials made during the digging of test pits and laboratory results of soil samples.

Excavation of the waste containers and soils would be performed with conventional earthmoving equipment, including dozers, loaders, backhoes, and clamshells. The remedial alternatives for final disposal of the excavated material are discussed below.

1. On-Site Landfill

An on-site landfill was sized to accomodate waste containers, sludges and contaminated soils excavated from the D'Imperio Site. A typical landfill section is shown in Figure 4. A plan view location of the proposed on-site landfill area required is illustrated in Figure 5. The average waste thickness would be ten feet with the bottom of the landfill at three feet below the existing grade.

The landfill incorporates a two-liner design with both leachate collection and leak detection zones. Synthetic membranes of polyvinyl chloride (PVC) were chosen as the liner material because of their compatability with the dominately volatile organic carbon character of the wastes. A 5,000 gallon underground storage tank would be used to collect liquids from the leachate collection and detection zones.

A double-layer cap is used consisting of a 50 mil PVC membrane and a 2 foot clay layer beneath a 1 foot sand drainage layer. Additional soil with a vegetative cover is on top of the drainage layer. A geotextile filter fabric is used between the vegetative cover and drainage layer to reduce clogging of the drainage layer with soil fines and to add a physical barrier to provide further protection for the cap.

The proposed on-site landfill location as shown on Figure 5 was selected because of it's proximity to the D'Imperio Site and it's accessibility for post-closure maintenance and monitoring. The landfill must also be excluded from work areas associated with any groundwater recovery system.

The Pinelands Commission has informed us in a letter dated March 13, 1985 that the disposal of hazardous and toxic waste is prohibited in the Pinelands.

The State of New Jersey has also adopted regulations governing the siting of new hazardous waste facilities. The proposed on-site landfill will violate the following portions of these regulations:

1. For the purpose of protecting the population of the State:

   No land emplacement or impoundment type of new major commercial hazardous waste facility shall be sited within 2,000 feet of any structure which is routinely occupied by the same person or persons more than 12 hours per day, or by the same person or persons under the age of 18 for more than two hours per day;

2. For the purpose of protecting environmentally sensitive areas, no new hazardous waste facility shall be sited in or on:

   The Pinelands Area as established by NJSA 12:18A-11A of the Pinelands Protection Act, NJSA 13:18 A-1 et seq.

3. For the purposes of protecting groundwater:

   Land emplacement and impoundment type of new major commercial hazardous waste facilities shall be prohibited in the following areas:

   a. In areas within one mile of a water supply well or well field producing over 100,000 gallons per day, unless it can be demonstrated to satisfaction of the Department or Commission, as appropriate, that natural hydrologic barriers isolate the site from the aquifer being pumped;

2. Off-Site Disposal

The excavation and removal from the site of waste materials and highly contaminated soils is a feasible alternative. These materials would be manifested for transport from the site to a secure hazardous waste disposal facility in accordance with RCRA requirements.

Capping

A surface cap can be constructed to prevent precipitation and surface runoff from infiltrating into any areas containing contaminated materials. Capping of the D'Imperio Site would be performed after the excavation of source material and grading of the area. Figure 3 shows the area which would be capped.

A cap will consist of low permeability clay (hydraulic conductivity $\leq 10^{-7}$ cm/sec) and a flexible membrane. The cap would be a double layer RCRA cap as shown in Figure 6.

The clay barrier would be constructed with clay brought in from off-site borrow areas and compacted in 6 to 8 inch lifts to meet compaction requirements. Total clay thickness would be 24 inches. On top of the clay barrier would be a 50 mil synthetic liner and a minimum 12-inch sand drainage layer which will act as a conduit for any water that infiltrates the topsoil. A geotextile fabric would be placed on top of the drainage layer to minimize clogging. A minimum 24-inch cover layer of uncompacted topsoil, loam or organic humus material capable of supporting vegetation would be placed over the geotextile fabric.

Groundwater Recovery and Treatment

The goal of any groundwater pumping and treatment option is to restore the groundwater in the underlying aquifers to drinking water quality in accordance with EPA's Draft Groundwater Protection Strategy so as to protect the aquifer for future drinking water usage. Groundwater restoration is also being considered to comply with the requirements of RCRA. Based upon a literature search it was learned that sorption coefficients for similar organic compounds, to those found in the groundwater were in the range 7 to 10 ug/g of clay material. Using the values and the average levels of 2-butanone and the aquifer clay content of the site, it was calculated that the groundwater contaminants exceed the sorption capacity of the soil by nine times. This indicates that within the recovery well boundary, natural renovation of the groundwater is not practical and removal is mandatory because little attenuation would occur. Theoretically, if contaminant transport to the wells moves as quickly as the water front, the aquifer would be cleaned by removing one pore volume. However, rather than plug flow, a conservative estimate of three pore volumes was used as the estimate of the quantity of the groundwater to be treated to cleanse the aquifer. After pumping and treating three pore volumes, the effectiveness of this remedial action will be evaluated and the need to pump and treat an additional quantity of groundwater will be determined.

Contaminated groundwater pumped from the confined and unconfined aquifers underlying the site will require treatment for metals and organics prior to disposition. The effluent from the treatment system can be discharged to off-site surface water via piping to Adams Branch or injected on-site into the underlying recovery systems. The groundwater recovery systems were designed

by utilizing the computer optimization model "Best wells", which determined the optimium number and location of recovery wells to maximize production from the aquifers. Maximization of groundwater extraction rates results in reduction of the pumping and treatment system operation and maintenance duration. It is noted that the reinjection alternatives are estimated to be able to operate at more than twice the pumping and treatment rates than the surface water discharges (i.e. 750 gpm vs 350 gpm). These rates would be further refined during design.

1. Treatment and Discharge to Adams Branch

The results of modeling the aquifer production for the off-site discharge resulted in a maximum recovery of 350 gpm. Groundwater treatment would begin with the removal of suspended particles and soluble inorganics. The adjustment of pH in conjunction with precipitation, floculation, and sedimentation would remove soluble substances and suspended solids. The next phase of treatment would involve the reduction of organic contaminants. The use of the air stripping process would effectively remove the organic contaminants with the exception of MEK. The effluent from the treatment process would be discharged to Adams Branch via construction of 3,100 foot discharge pipe.

This alternatives will require obtaining a NJPDES permit from the New Jersey Department of Environmental Protection. In addition, use of the air stripping process will require compliance with New Jersey's air emission requirements.

2. Treatment and On-Site Injection

The results of modeling the aquifer production and the influence of injecting the treated effluent into the unconfined aquifer would result in a maximum recovery of 750 gpm. Groundwater treatment would begin with the removal of suspended particles and soluble inorganics. The adjustment of pH in conjunction with precipitation, floculation, and sedimentation would remove soluble substances and suspended solids. The next phase of treat ment would involve the reduction of organic contaminants. The use of the air stripping process would effectively remove the remaining organic contaminants with the exception of MEK. The effluent from the treatment process would be reinjected into the underlying unconfined aquifer via use of a pressurized injection system. Operational problems have been encountered in similar injection systems when bacterial iron has clogged the injection well screens. Fine tuning of extraction and recharge rates to optimize

system performance would also be an operational disadvantage. This alternative will require obtaining a NJPDES permit from the New Jersey Department of Environmental Protection. In addition, use of the air stripping process will require compliance with New Jersey's air emission requirements.

Methyl Ethyl Ketone (MEK) Treatment

MEK is a common solvent that may enter the body via ingestion, inhalation, or skin absorbtion on direct contact. It is a volatile organic contaminant found in high concentrations (up to 260,000 ppb) in the underlying aquifer. These concentrations exceed the acceptable daily intake (ADI) of 700 ppb for MEK. This contaminant is not effectively removed via carbon adsorption or air stripping. MEK can be effectively removed via use of a steam stripping unit. However, in order to achieve removal efficiencies in the 90 percent range, it would be necessary to preheat the influent to approximately 120°F.

The entire treatment scheme would include; removal of metals, soluble substances and suspended solids via pH adjustment in conjunction with precipitation, floculation, and sedimentation, heating the influent prior to steam stripping and effluent disposal.

Use of the steam stripping process will also require compliance with New Jersey air emission requirements. In view of the limited carbon adsorption efficiency for MEK, New Jersey air emission requirements for the process at the proposed treatment rates may be violated. During design, limiting of pumping and treatment rates would be considered so as to not result in air emission violations.

Evaluation of Remedial Alternatives

The following evaluation of the seven remedial action alternatives will consider their present worth cost as well as their effectiveness in minimizing the risk posed by the site.

A comprehensive list of remedial technologies was screened in accordance with established procedures. The results of the screening procedure identified the feasible remedial alternatives as outlined in Table No 1.

Table No. 1
Remedial Alternatives for Evaluation

1. Excavate approximately 3900 cubic yards of contaminated material and dispose of this material in an on-site RCRA landfill. Provide RCRA cap over dump and surrounding area. Pump and treat groundwater (except MEK) on-site and inject effluent into underlying aquifer.

2. Excavate approximately 3900 cubic yards contaminated material and dispose of this material in an on-site RCRA landfill. Provide RCRA cap over dump and surrounding area. Pump and treat groundwater (except MEK) on-site and discharge off-site to Adams Branch.

3. Excavate approximately 3900 cubic yards of contaminated material and dispose of this material in an off-site RCRA approved facility. Provide RCRA cap over dump and surrounding area. Pump and treat groundwater (except MEK) on-site and inject effluent into underlying aquifer.

4. Excavate approximately 3900 cubic yards of contaminated material and dispose of this material in an off-site RCRA landfill. Provide RCRA cap over dump and surrounding area. Pump and treat groundwater (except MEK) on-site and discharge off-site to Adams Branch.

5. No Action-Continue Monitoring

6. Excavate approximately 3900 cubic yards of contaminated material and dispose of this material in an on-site RCRA landfill. Provide RCRA cap over dump and surrounding area. Pump and treat groundwater (including MEK) on-site and discharge off-site to Adams Branch.

7. Excavate approximately 3900 cubic yards of contaminated material and dispose of this material in an off-site RCRA landfill. Provide RCRA cap over dump and surrounding area. Pump and treat groundwater (including MEK) on-site and discharge off-site to Adams Branch.

Alternative No. 1

This alternative includes groundwater recovery (750 gpm) from both the Upper Cohansey and Middle Cohansey aquifers, treatment via precipitation, floculation and sedimentation for the removal of metals, and air stripping for removal of organics (except MEK). The effluent from the treatment process will be injected into the unconfined aquifer. In addition, the remaining drums and contaminated soil (approximately 3900 cubic yards) will be excavated and disposed in an on-site landfill constructed in accordance with current RCRA requirements. The dump area will then be backfilled and graded prior to the construction of a RCRA approved cap. A groundwater monitoring program will be designed to evaluate the performance of the capped dump site and on-site landfill for a thirty year period.

The goals and objectives established for site remediation will be met through the implementation of this alternative. The groundwater quality will be restored to meet all of the current State guidelines for drinking water (100 ppb total volatile organics and 50 ppb any individual organic constituent). MEK removal would not achieve these guidelines. The proposed cap will prevent the migration of contaminants off-site as well as minimize the risk to the public from exposure to the waste left on the site.

It should be noted that this alternative will violate provisions of the New Jersey Pinelands Comprehensive Management Plan with regard to the landfilling of toxic wastes. Also, the proposed on-site landfill will violate the New Jersey regulations for siting new hazardous waste facilities. This alternative will require obtaining a NJPDES permit from the NJDEP for the groundwater injection of the treated effluent.

Alternative No. 2

This alternative includes groundwater recovery (350 gpm) from both the Upper Cohansey and Middle Cohansey aquifers, treatment via precipitation, floculation and sedimentation for the removal of metals, and air stripping for removal of organics (except MEK). The effluent from the treatment process will be discharged to Adams Branch. In addition, the remaining drums and contaminated soil (approximately 3900 cubic yards) will be excavated and disposed in an on-site landfill constructed in accordance with current RCRA requirements. The dump area will then be backfilled and graded prior to the construction of a RCRA approved cap. A groundwater monitoring program will be designed to evaluate the performance of the capped dump site and on-site landfill for a thirty year period.

The goals and objectives established for site remediation will be met through the implementation of this alternative. The groundwater quality will be restored to meet all of the current State guidelines for drinking water (except for MEK removal). The proposed cap will prevent the migration of contaminants off-site as well as minimize the risk to the public from exposure to the waste left on-site.

It should be noted that this alternative will violate provisions of the New Jersey Pinelands Comprehensive Management Plan with regard to surface water discharges and the landfilling of toxic wastes. As previsouly indicated, the proposed on-site landfill will violate the New Jersey regulations for siting new hazardous waste facilities.

Alternative No. 3

This alternative includes groundwater recovery (750 gpm) from both the Upper Cohansey and Middle Cohansey aquifers, treatment via precipitation, floculation and sedimentation for the removal of metals, and air stripping for removal of organics (except MEK). The effluent from the treatment process will be injected into the unconfined aquifer. In addition, the remaining drums and contaminated soil (approximately 3900 cubic yards) will be excavated and transported off-site to a RCRA approved hazardous waste disposal site. The dump area will then be backfilled and graded prior to the construction of a RCRA approved cap. A groundwater monitoring program will be designed to evaluate the performance of the capped dump site and the on-site landfill for a thirty year period.

The goals and objectives established for site remediation will be met through the implementation of this alternative, The groundwater quality will be restored to meet all of the current State guidelines for drinking water (except for MEK removal). The proposed cap will prevent the migration of contaminants off-site as well as minimize the risk to the public from exposure to the waste left on the site.

This alternative will require obtaining a NJPDES permit from the NJDEP for the groundwater injection of the treated effluent.

Alternative No. 4

This alternative includes groundwater recovery (350 gpm) from both the Upper Cohansey and Middle Cohansey aquifers, treatment via precipitation, floculation and sedimentation for the removal of metals, and air stripping for removal of organics (except MEK). The effluent from the treatment process will be discharged to Adams Branch. In addition, the remaining drums and contaminated soil (approximately 3900 cubic yards) will be excavated and transported off-site to a RCRA approved hazardous waste disposal site. The dump area will then be backfilled and graded prior to the construction of a RCRA approved cap. A groundwater monitoring program will be designed to evaluate the performance of the capped dump site and on-site landfill for a thirty year period.

The goals and objectives established for site remediation will be met through the implementation of this alternative. The groundwater quality will be restored to meet all of the current State guidelines for drinking water (except for MEK removal). The proposed cap will prevent the migration of contaminants off-site as well as minimize the risk to the public from exposure to the waste left on the site.

It should be noted that this alternative will violate provisions of the New Jersey Pinelands Comprehensive Management Plan with regard to surface water discharges.

Alternative No. 5

No Action - Continue Monitoring

This alternative would not meet the goals and objectives for site remediation. The potential future risk of ingesting contaminated groundwater by users in the vicinity of the site would remain. Also, the migration of contaminants from wastes remaining on site and the exposure to the public from these contaminants at, and near ground level will not be eliminated.

Alternative No. 6

This alternative includes groundwater recovery (350 gpm) from both the Upper Cohansey and Middle Cohansey aquifers, treatment via precipitation, floculation and sedimentation for the removal of metals, and steam stripping for removal of organics (including MEK). The effluent from the treatment process will be discharged to Adams Branch. In addition, the remaining drums and contaminated soil (approximately 3900 cubic yards) will be disposed in an on-site landfill constructed in accordance with current RCRA requirements. The dump area will then be backfilled and graded prior to the construction of a RCRA approved cap. A groundwater monitoring program will be designed to evaluate the performance of the capped dump site and on-site landfill for a thirty year period.

The goals and objectives established for site remediation will be met through the implementation of this alternative. The groundwater quality will be restored to meet the all of current State guidelines for drinking water. The proposed cap will prevent the migration of contaminants off-site as well as minimize the risk to the public from exposure to the waste left on-site.

It should be noted that this alternative will violate provisions of the New Jersey Pinelands Comprehensive Management Plan with regard to surface water discharges and landfilling of toxic wastes. The proposed on-site landfill will violate the New Jersey regulations for siting new hazardous waste facilities.

Alternative No. 7

This alternative includes groundwater recovery (350 gpm) from both the Upper Cohansey and Middle Cohansey aquifers, treatment via precipitation, floculation and sedimentation for the removal of metals, and steam stripping for removal of organics (including MEK). The effluent from the treatment process will be discharged to Adams Branch. In addition, the remaining drums and contaminated soil (approximately 3900 cubic yards) will be excavated and transported off-site to a RCRA approved hazardous waste disposal site. The dump area will then be backfilled and graded prior to the construction of a RCRA approved cap. A groundwater monitoring program will be designed to evaluate the performance of the capped dump site and on-site landfill for a thirty year period.

The goals and objectives established for site remediation will be met through the implementation of this alternative. The groundwater quality will be restored to meet all of the current State guidelines for drinking water. The proposed cap will prevent the migration of contaminants off-site as well as minimize the risk to the public from exposure to the waste left on the site.

It should be noted that this alternative will violate provisions of the New Jersey Pinelands Comprehensive Management Plan with regard to surface water discharges. In addition, operation of the steam stripping unit will require obtaining an air emission permit from the NJDEP.

Community Relations

A public meeting was held on December 14, 1982 at the Atlantic County Community College to discuss the work to be undertaken by EPA's consultant as part of the RI/FS. Notices of the meeting were sent to all local officials and interested parties as outlined in the D'Imperio Property Community Relations Plan. At this meeting, EPA officials provided an overview of the Superfund program. They also discussed the RI/FS activities which were to be performed as part of the D'Imperio project. Following this presentation, the meeting was concluded with a question and answer session.

A second public meeting was held on November 19, 1984 at the Hamilton Township Municipal Building to discuss the work conducted as part of the remedial investigation and the results obtained from this work. Letters were sent to local and county officials and other interested parties notifying them of the meeting. A copy of the draft remedial site investigation report was transmitted to the township clerk's office for public review. An EPA fact sheet was made available to the public at the meeting. Approximately 35 persons attended. EPA officals and their consultant discussed the results of the remedial investigation and answered questions related to the work being performed at the D'Imperio site.

A third public meeting was held on March 6, 1985 at the Hamilton Township Municipal Building to discuss the remedial alternatives. An information package including an agenda and fact sheet were provided to the approximately 40 people who attended. Copies of the draft feasibility study and notification of the public meeting were sent to local officials and other interested parties for public review. EPA officials and their consultant discussed the remedial alternatives and responded to the concerns and questions raised by the public.

More detailed information regarding the Community Relations Program is included in the attached Responsiveness Summary.

Enforcement

The EPA had initially identified two landowners as potential responsible parties (PRP's). Notice Letters were transmitted to these parties in March 1982. One landowner indicated that the dumping did not occur on his property and, therefore, declined to undertake any cleanup action. The other party responded by saying that he could not undertake any remedial actions due to the lack of financial resources. In August 1982, a Notice Letter was sent to a third landowner. This party responded by indicating that he had no responsibility for the dumping. However, he did offer to cooperate fully in EPA activities.

In March 1985, EPA sent notice letters to the three potential responsible parties. To date, none of these parties have offered to implement the remedial design or cleanup. Currently, the EPA is continuing to search for additional responsible parties.

Recommended Alternative

According to the CFR Part 300.68 (J), cost-effective is described as the lowest cost alternative that is technically feasible and reliable and which effectively mitigates and minimizes damages to and provides adequate protection of public health, welfare and the environment. A cost comparison of the remedial alternatives is presented in Appendix B. The evaluation of the seven remedial alternatives leads to the conclusion that Alternative #7 is the appropriate cost-effective alternative which achieves the recommended cleanup goals. The alternative includes the excavation and disposal of waste materials at an off-site RCRA facility, the treatment of contaminated groundwater including MEK removal via steam stripping, and the discharge of the treated groundwater to a surface stream.

In general, the alternatives evaluate various combinations of three major cleanup components. They include the method of disposal of the waste materials (on vs off-site), the level of groundwater pumping and treatment with particular emphasis on the degree of MEK removal, and the location of the discharge of the extracted groundwater after treatment (injection vs. surface stream).

It was determined that disposal of source materials was more appropriate at an off-site RCRA facility than in a facility to be constructed at the site. The reasons for ruling out on-site disposal are as follows. The State of New Jersey has established and recently adopted siting criteria for hazardous waste facilities. These criteria which are used in connection with the delegation of the RCRA program to the State would discourage the siting of a hazardous waste landfill in the Pinelands area. In addition, the Pinelands Comprehensive Management Plan prohibits the construction of a RCRA landfill in the environmentally sensitive Pinelands.

Furthermore, as a matter of policy, it is not efficient and therefore not effective to construct and operate a small hazardous waste containment system in such an environmenally sensitive area. In fact, there would be some concern about the technical reliability of an on-site landfill in the event of a system failure. Rather than having a number of small landfill sites scattered about, it is more efficient and thus more effective to operate and maintain a fewer number of larger, properly sited and comprehensively monitored disposal facilities.

A second component of the recommended alternative involves the level of groundwater cleanup including the degree of MEK removal required. The RCRA goal is to clean up groundwater to background conditions. With the exception of MEK, the application of standard treatment technology is expected to reduce contaminant levels to a point which will approach background. It is estimated that it will take 17 months to achieve this goal. After that time, an evaluation will be made to determine whether alternate concentration limits are appropriate.

Since the levels of MEK in the groundwater (up to 260 ppm) are significantly higher than the acceptable daily intake concentration (700 ppb), EPA has determined that MEK removal is required. Unlike the volatile organic compounds, a steam stripping process must be utilized to effectively remove MEK from the groundwater. In order to minimize the operation and maintenance costs associated with the steam stripping operation, an evaluation will be made during the design phase to identify the most appropriate operational conditions (pumping locations and stripping duration periods). In essence, the unit would be used only when necessary as opposed to steam stripping the entire plume potentially resulting in substantial cost savings.

A third component of Alternative #7 is the discharge of the treated groundwater to Adams Branch. The Pinelands Commission has notified-EPA that the Pinelands Comprehensive Management Plan prohibits the direct discharge of wastewater into any surface body of water. A summary of the appropriate regulations contained in the Pinelands Comprehensive Management Plan, including waiver procedures is included as Appendix C.

On March 20, 1985, EPA officials met with representatives of the NJDEP and Pinelands Commission to discuss the surface water discharge issue. Both EPA and NJDEP feel that the surface discharge is more reliable and environmentally sound than groundwater injection. Thus, it has been decided that a waiver of the surface discharge rule be requested from the Pinelands Commission.

Agency officials and representatives of the NJDEP are scheduled to meet with the Pinelands Commission to present their argument for a temporary surface water discharge. EPA feels that the waiver may be obtained in the near future. However, if the waiver is denied, Alternative #7 would be modified to include injection of the treated groundwater to the unconfined aquifer. Although not as preferable, reinjection of the treated groundwater is an acceptable alternative.

Based upon the above discussion, the Agency and the State of New Jersey recommend the implementation of Alternative #7. This Alternative is cost-effective, reliable and best achieves the established cleanup goals.

The following listed figures represent a cost estimate for the proposed remedial actions. The EPA will be responsible for paying 100% of the cost of project design. Cost sharing for project implementation is 90% Federal and 10% State of the cost to implement the remedial action as well as the cost of conducting the groundwater recovery treatment plan which is expected to continue for about 17 months. The remaining monitoring costs will be borne by the State of New Jersey.

Cost Summary for Remedial Alternative No. 7

Remedial Measure Components	Capital Cost	Present Worth of O&M	Total Cost Present Worth
1. Excavation and Offsite Disposal	$2,153,639	$ 0	$2,153,639
2. Cap Site, Monitoring and Post Closure Maintenance	620,906	330,670	951,576
3. Groundwater Recovery	236,522	157,846	394,368
4. Treatment Plant and Operation	1,053,084	680,933	1,734,017
5. Discharge Line	187,400	0	187,400
TOTAL	$4,251,551	$1,169,449	$5,421,000

Consistency With Other Environmental Laws

The final recommended remedial alternative for the D'Imperio Site will require the removal of 3900 cubic yards of surface drums, waste material and contaminated soil. These materials will be manifested for transport from the site to a secure facility in accordance with RCRA requirements. If the Agency recommended the less costly alternative of on-site disposal of source material, it would have violated the State regulations and Pinelands Comprehensive Management Plan for siting hazardous waste facilities.

Constructing a cap over the dump and surrounding area is another component of the recommended remedial alternative. The cap will be constructed in accordance with current RCRA requirements. Also part of the recommended remedial alternative is the recovery, treatment and discharge to surface waters (or the aquifer) of contaminated groundwater. In accordance with RCRA, groundwater must be cleaned up to background concentrations or appropriate alternate concentration limits or maximum contaminant levels. The cleanup program is expected to achieve these RCRA requirements. A New Jersey Pollutant Discharge Elimination System Permit will be obtained for the effluent discharge to Adams Branch. In addition, the operation of the steam stripping unit will require an air emission permit from the NJDEP.

Although the Pinelands Commission currently prohibits any new surface discharge in its jurisdictional area, the Agency feels that the temporary discharge of the treated groundwater would not result in any long term detrimental impacts and would be environmentally preferable to groundwater reinjection. As previously discussed, EPA feels that a waiver of the Pinelands Commission rule prohibiting a surface discharge may be obtained in the near future. If the waiver is not approved, the treated groundwater will be reinjected in accordance with NJDEP permit requirements. An Environmental Assessment which addresses the impacts of the discharge to Adams Branch is included in the Responsiveness Summary.

Operable Units

Since the recommended remedial alternative includes numerous individual components, it is expected that the remedial measures will proceed in a phased manner. The initial phase would include the excavation of source material, backfilling and grading. The next component of the cleanup would be to cap the site area. Following this work, a discharge line would be constructed from the site to Adams Branch (if the surface discharge is approved). Finally, a groundwater recovery system and treatment units would be constructed and operated until the contaminants in the underlying aquifers are reduced to acceptable RCRA and State drinking water quality levels.

Operation and Maintenance

Upon completion of the recommended remedial action, monitoring of the site will be necessary to evaluate the quality of the local groundwater.

Future Actions

Schedule	Date
- Final Record of Decision	March 1985
- Obligate Design Funds	March 1985
- Amend State Superfund Contract	April 1985
- Continue search for responsible parties	March-September 1985
- Initiate Design	April 1985
- Complete Design (for first phase excavation)	September 1985

APPENDIX A

CRITICAL CONTAMINANTS AND ADI AND PPCL LEVELS

Compound	Media	Concentration Range[1]	ADI[2]	PPCL[3]
Benzene	Monitoring Wells	1-70 µg/l	NA	0.673
2-Butanone (methyl ethyl ketone)	Monitoring Wells	6-260,000 µg/l	700	NA
1,2-Dichloroethane	Monitoring Wells	14-3,200 µg/l	NA	0.94
Ethylbenzene	Monitoring Wells	3-1,100 µg/l	4,750	4,750
Tetrachloroethylene	Monitoring Wells	2.6-20,000 µg/l	ND	1.0
Toluene	Monitoring Wells	1-29,000 µg/l	15,000	15,000
Trichloroethylene	Monitoring Wells	5-5,700 µg/l	ND	1.84
Xylene	Monitoring Wells	6-4,725 µg/l	80,000	NA
Arsenic	Monitoring Wells	20-900 µg/l	NA	NA
Chromium	Monitoring Wells	20-2,110 µg/l	63,000	5.0
Lead	Monitoring Wells	10-5,000 µg/l	ND	5.0

1 Range of low to high concentrations in micrograms per liter (µg/l)

2 ADI - Acceptable Daily Intake Level, µg/l
Reference (USEPA, May 1984)

3 PPCL - Preliminary Protective Concentration Limit, µg/l
Reference (USEPA, Memo, 1984)

APPENDIX B

REMEDIAL ALTERNATIVES PRESENT COST COMPARISON

REMEDIAL ALTERNATIVE	CAPITAL	TOTAL PRESENT WORTH INCLUDING O&M
1. Source removal, dispose on-site and cap site. Pump groundwater, air strip and inject effluent.	$3,044,014	$3,656,000
2. Source removal, dispose on-site and cap site. Pump groundwater, air strip and off-site discharge.	2,836,514	3,631,000
3. Source removal, dispose off-site and cap site. Pump groundwater, air strip and inject effluents.	4,354,668	4,439,782
4. Source removal, dispose off-site and cap site. Pump groundwater, air strip and off-site discharge.	4,147,168	4,416,000
5. No Action- Continue Monitoring.	50,000	357,000
6. Source removal, dispose on-site and cap site. Pump groundwater, steam strip and off-site discharge.	2,940,897	4,635,000
7. Source removal, dispose off-site and cap site. Pump groundwater, steam strip and off-site discharge.	4,251,551	5,421,000

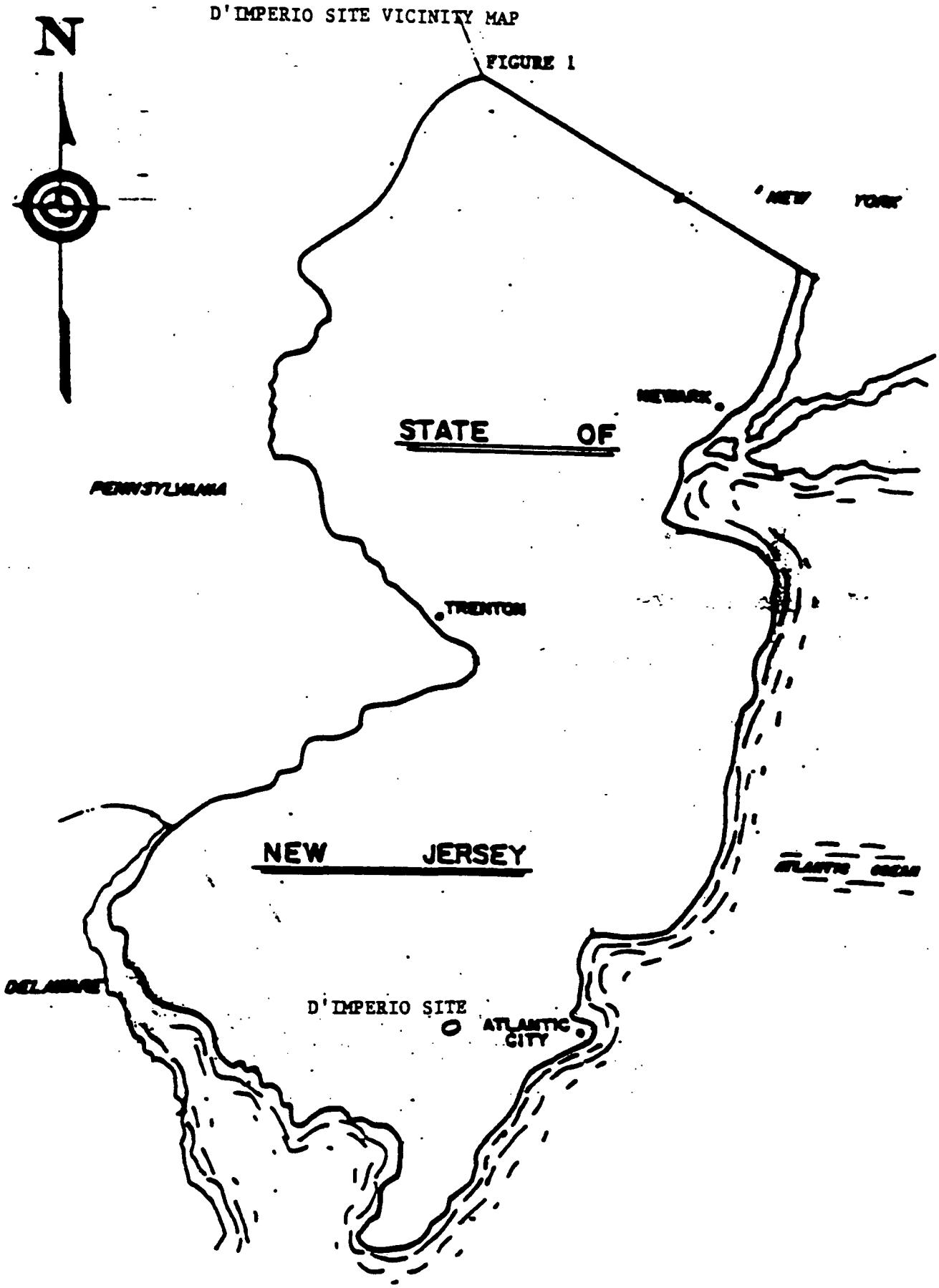
APPENDIX C

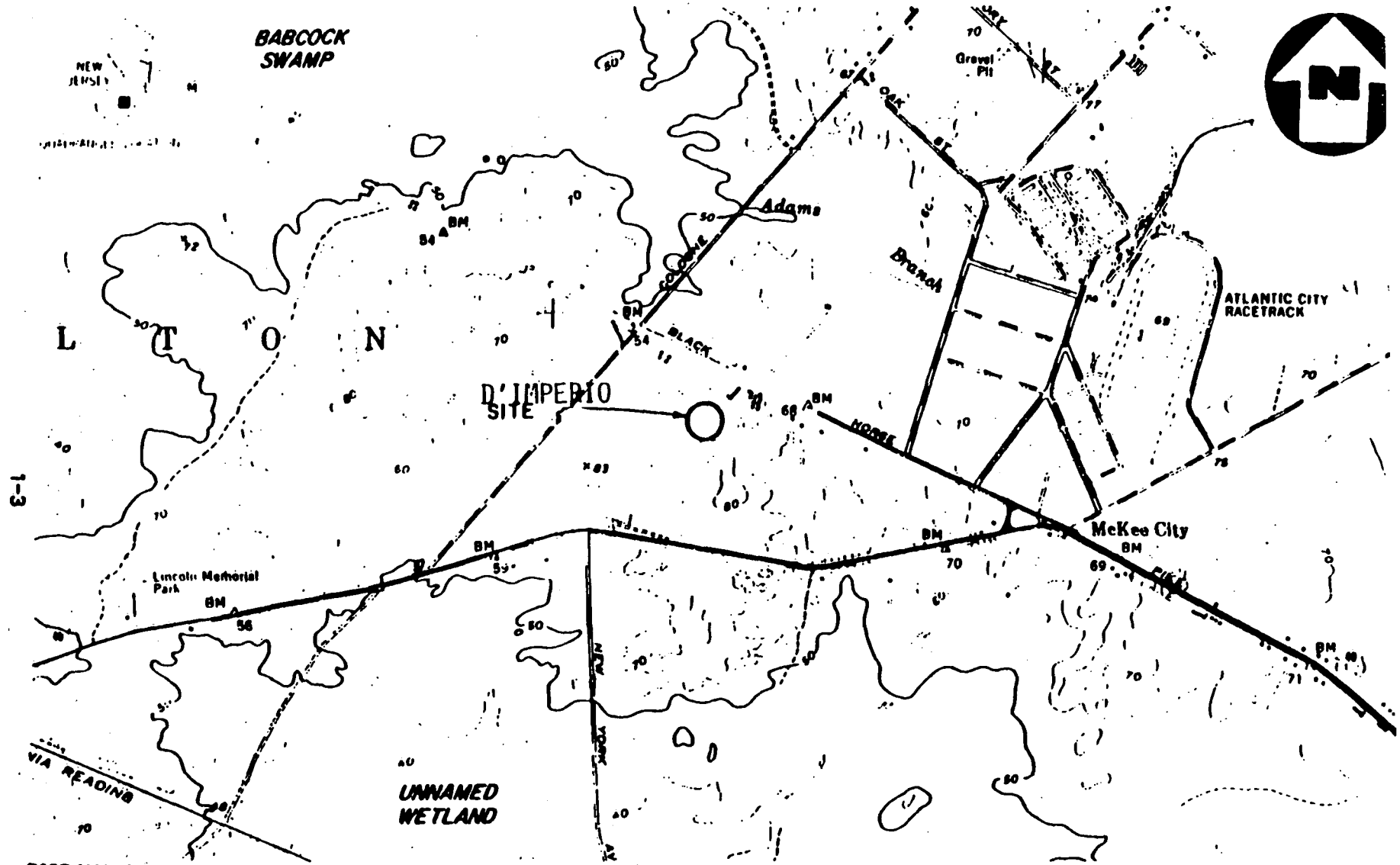
The Pinelands Protection Act, N.J.S.A. 13:18A-1 et seq. (L. 1979, c.111), will impact on the selection of a remedial alternative. The Comprehensive Management Plan, ("CMP"), adopted by the Pinelands Commission pursuant to N.J.S.A. 13:18A-8, provides the framework for the coordination of all governmental programs affecting the natural and cultural resources of the pinelands area. No State approval, certificate, license, consent, permit, or financial assistance for the construction of any structure or the disturbance of any land within the pinelands area shall be granted unless such approval or grant conforms to the provisions of the CMP; however, the Pinelands Commission is authorized to waive strict compliance with the CMP upon a finding that such waiver is necessary to alleviate extraordinary hardship or to satisfy a compelling public need, is consistent with the purposes and provisions of the Pinelands Protection Act and the National Parks and Recreation Act of 1978, 16 U.S.C. 46i et seq., and would not result in substantial impairment of the resources of the pinelands area. N.J.S.A. 13:18A-10c. The waiver procedures are set forth in Sections 4-501 to 4-507 of the CMP and are also found in N.J.A.C. 7:50-4.51to 4.60. Based on the procedures set forth therein, it is not likely that a waiver would be granted for on-site disposal of the 3900 cubic yards of contaminated material; however, it appears that a waiver based on compelling public need would be granted for the discharge of treated groundwater to the Adams Branch.

Susan Savoca
March 25, 1985

D'IMPERIO SITE VICINITY MAP

FIGURE 1





BASE MAP IS A PORTION OF THE U.S.G.S. MAYS LANDING, NJ QUADRANGLE (7.5 MINUTE SERIES, 1955, PHOTOREVISED 1972). CONTOUR INTERVAL = 10'.

FIGURE #2

SITE LOCATION MAP

D'IMPERIO SITE, HAMILTON TOWNSHIP, NJ

SCALE 1" = 2000'

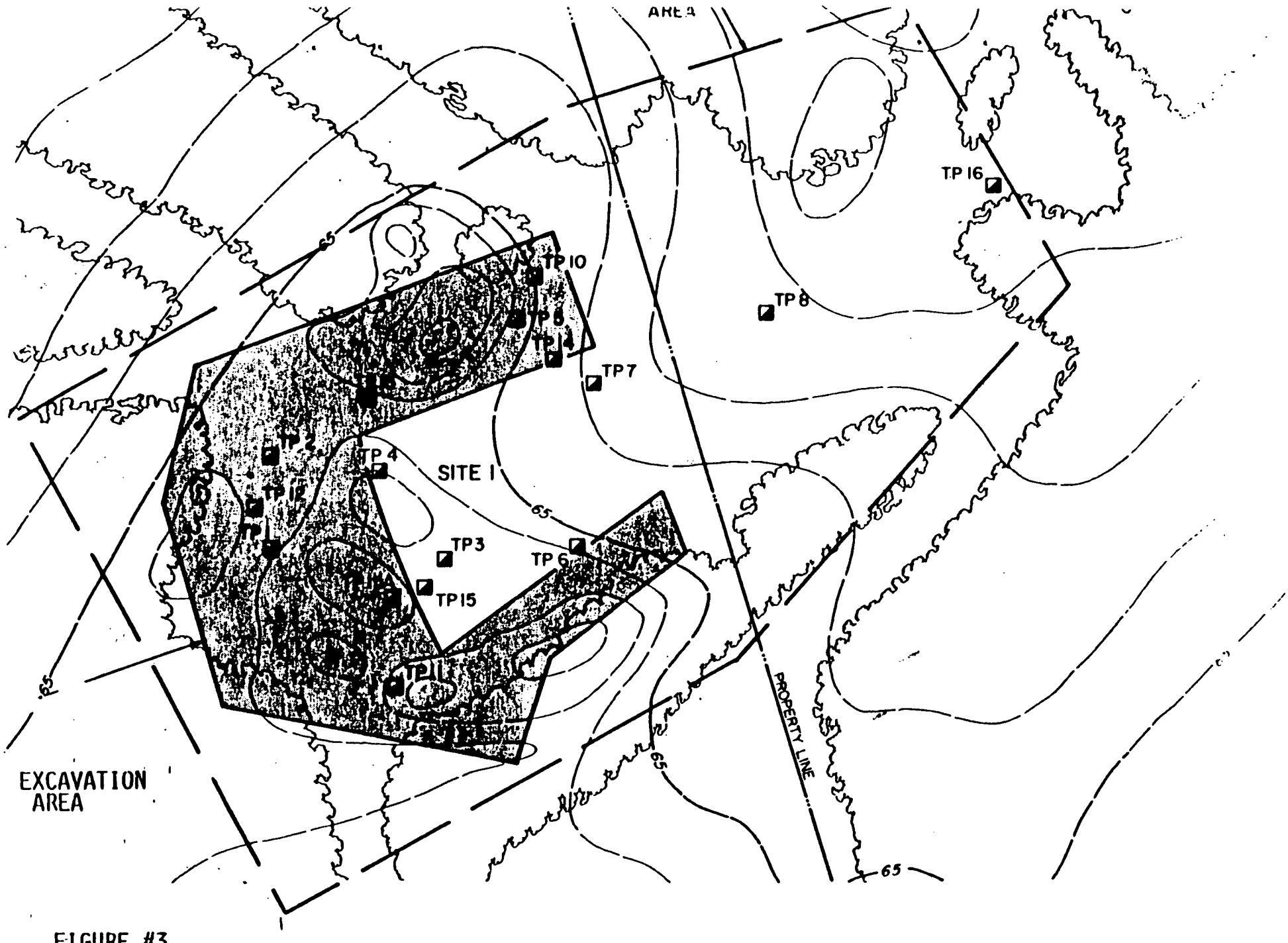


FIGURE #3

EXCAVATION AND CAPPING LIMITS

D'IMPERIO SITE, HAMILTON TOWNSHIP, NJ

0 50 100

SCALE IN FEET

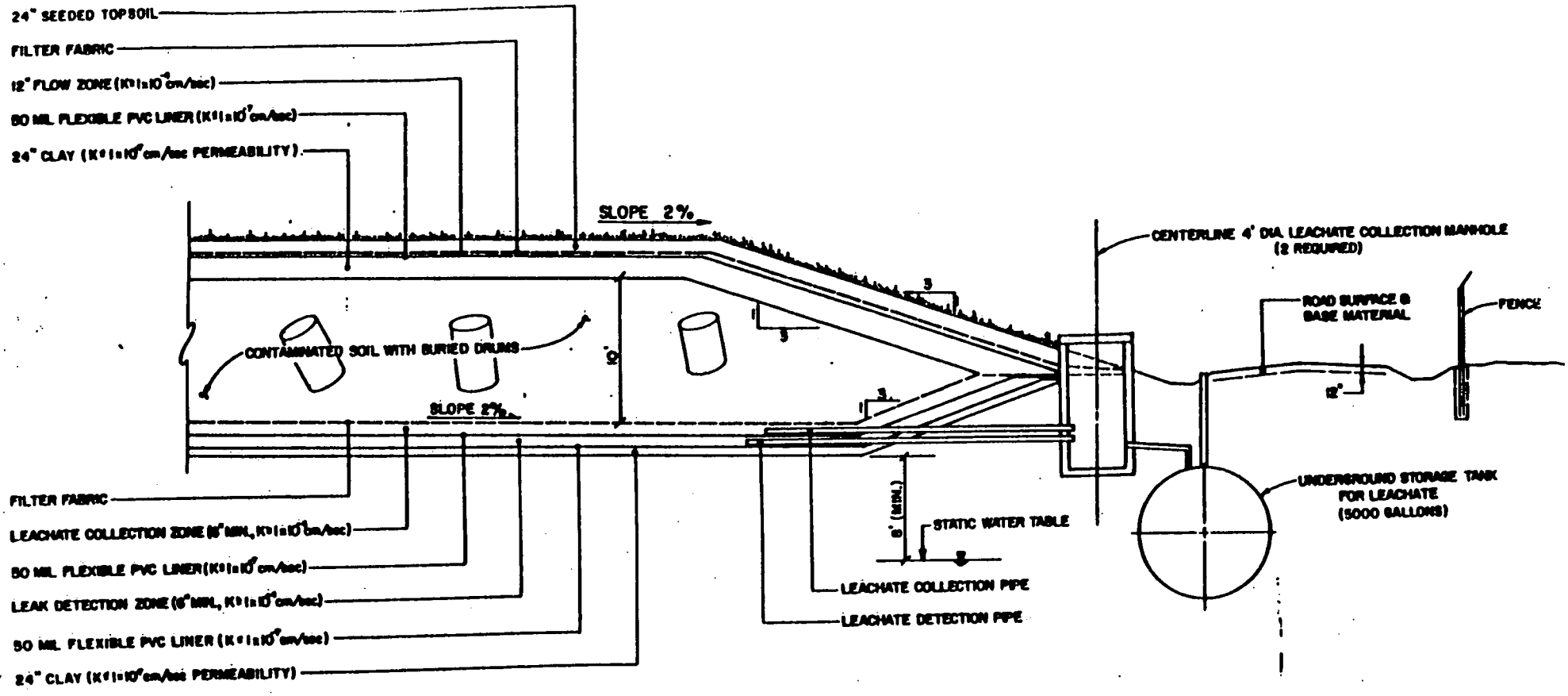


FIGURE #4
TYPICAL RCRA LANDFILL CROSS SECTION

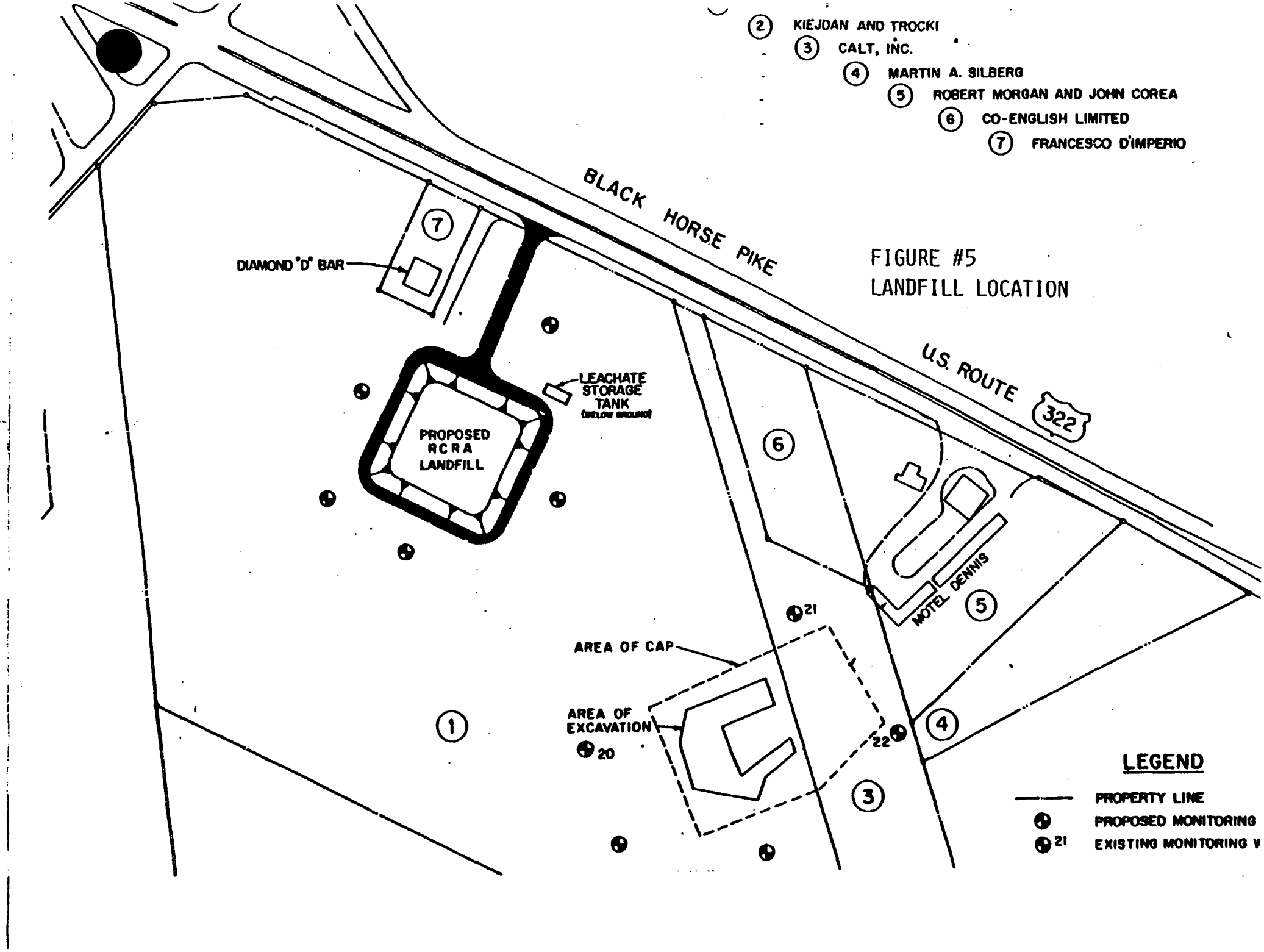
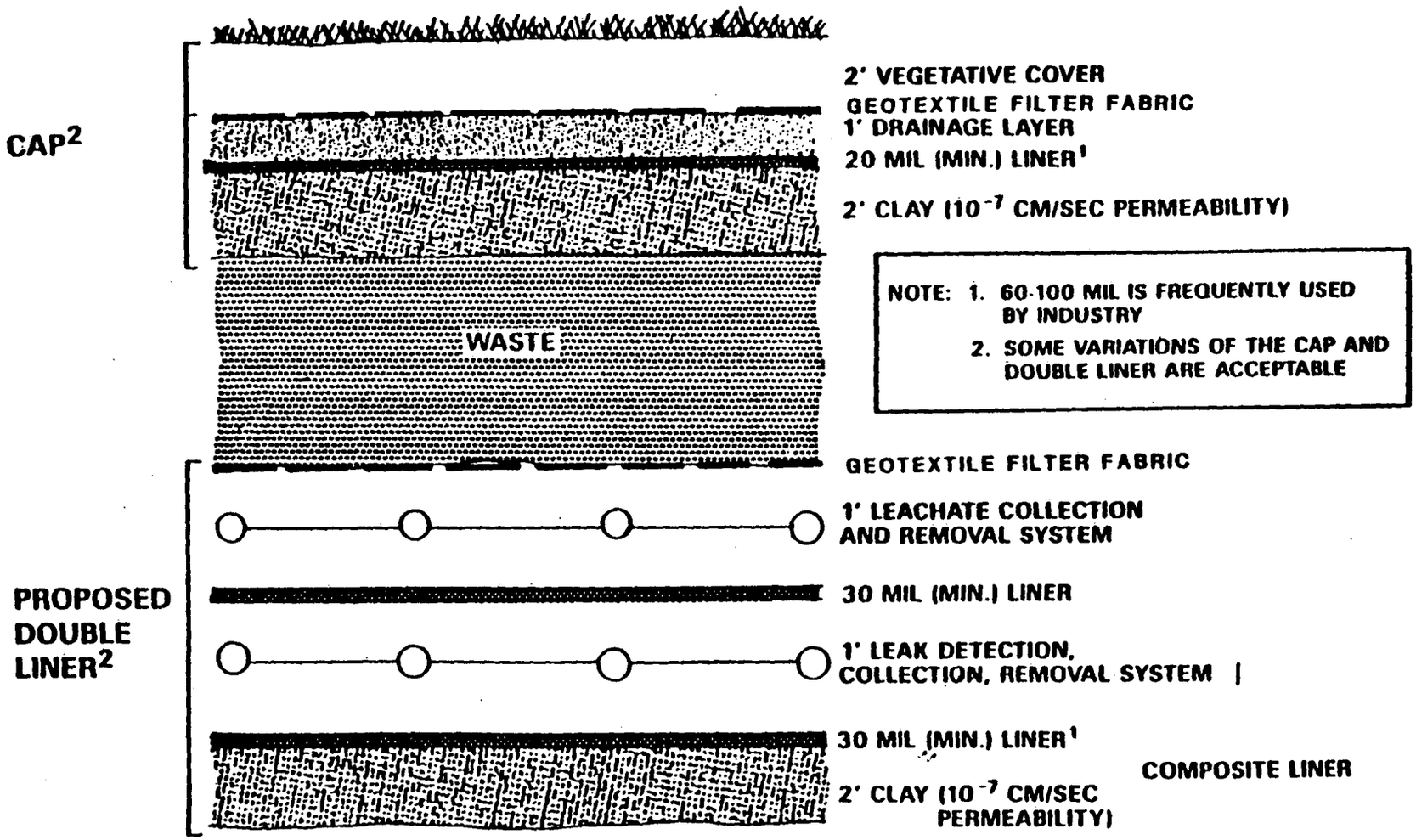


FIGURE #5
LANDFILL LOCATION



SOURCE: HSCD 1/85

FIGURE #6

RCRA CAP AND DOUBLE LINER

D'IMPERIO SITE, HAMILTON TOWNSHIP, NJ

NOT TO SCALE

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
RESPONSIVENESS SUMMARY

FOR

D'IMPERIO PROPERTY SITE
NEW JERSEY

BASED ON COMMENTS FROM
PUBLIC MEETING
MARCH 6, 1985

LEACHATE COLLECTION

Issue: What will you do with the leachate water collected from the site? Where will you take it?

Discussion: The leachate collected from the proposed onsite landfill is expected to be minimal. That which is collected will be drained into a 5000 gallon tank, monitored, and periodically pumped. The pumped liquid will be taken to an approved treatment facility. The choice will depend on the type of contaminants in the leachate. The facility must meet all Federal and State regulations.

ONSITE LANDFILL

Issue: It looks like the liner will be approximately 10 feet below the surface. What is the depth to the water table in the area? Will the groundwater in the area drain into the tank? This tank will fill very quickly then.

Discussion: There is a high water table in south New Jersey--approximately 15 feet below the surface. The Federal regulation requires that the liner from the landfill be 8 feet above the water table. We do not expect a problem with groundwater getting into the tank because of the placement of the tank.

Issue: Why are you requiring an 8 foot buffer between the liner and the water table? Is this a standard?

Discussion: We don't want the water table to affect the integrity of the site. The 8 foot standard is contained in the Resource Conservation and Recovery Act and the cleanup of all Superfund sites must meet all RCRA standards.

Issue: How long do you actually think the bottom liner will hold?

Discussion: The systems that EPA installs are designed for approximately a 30-year life. During this period, ongoing monitoring would provide early warning of potential groundwater contamination.

Issue: The state-of-the-art landfills of 20 years ago are our problems of today. These new sites are the problems of our future. You can't keep digging up these sites every 30 years.

Discussion: That is a problem with landfilling hazardous material. Today's technology is much more advanced than 20 years ago. Based on what we know today, this is the best we can do. Hopefully 10 to 20 years from now we will not look back on this as a problem.

Issue: You say the liners last for 30 years. How long have you had experience with liners? Are the liners designed for the seasonal temperature differences we have in south New Jersey? These liners do not last even seven years. Would it not be better to just remove the material now instead of digging it up every few years? To protect the quality of life for the people in the future and the Pinelands Commission designated growth area, I am opposed to onsite disposal for this site.

Discussion: We are here tonight to get just that information from you. I hear you saying you do not want onsite disposal of the waste.

MONITORING PROGRAM

Issue: Who will be overseeing the monitoring program?

Discussion: The New Jersey Department of Environmental Protection (NJDEP) will be overseeing the monitoring program for this site.

Issue: The monitoring plan is currently set up for 30 years. What prevents the agency from deciding to walk away from the site?

Discussion: The money has already been earmarked for this site. The State of New Jersey will have the money for this monitoring program in the bank at the time of cleanup. This money will be used to cover the cost of monitoring the program.

Issue: What happens if the State decides not to follow through for the full 30 years?

Discussion: The intent is for the State to follow through in monitoring this site. The State will agree to monitor this site for 30 years. It passed a $100 million bond issue in 1981 that is set aside for operation costs, which include monitoring.

Issue: Will there be an insurance policy on this site in the event the State decides to not follow through with the monitoring program?

Discussion: In order to get the construction money for cleaning up the site, the State must also obligate funds for operation and maintenance of the system. NJDEP has agreed to this stipulation. If NJDEP--or EPA--does not fulfill its contract, then the citizens should take action to ensure that the proper work is done.

Issue: Why 30 years of monitoring?

Discussion: That number is contained in RCRA.

Issue: What happens after 30 years?

Discussion: That's a good question. Nothing we build will last forever.

Issue: What happens if NJDEP decides to not use the money to clean up the site?

Discussion: The State has signed an agreement with EPA to implement this cleanup. They must use the funds for this site.

Issue: Is there a timetable when the State must start and finish the work?

Discussion: The State will operate and maintain whatever program is put into place. The Federal Government will actually hire the contractor to design and construct the chosen alternative for this site.

SURFACE WATER IMPACTS

Issue: You mentioned Adams Branch. What is it? Where is it?

Discussion: It is a stream that begins near the racetrack and flows west.

Issue: What are you intending to put into Adams Branch?

Discussion: The treated water from the site could, according to one of the options, be drained into Adams Branch. The other option would be to re-inject the water back into the ground.

Issue: The Adams Branch is an open body of water. Would treated water be flowing into this open area? In looking at what to do with the water, keep in mind that the people here do not want a surface discharge.

Discussion: Yes. Remember that the water would be treated to New Jersey water quality standards.

Issue: Once you remove most of the contaminated soil, would this help cleanup the groundwater?

Discussion: Yes. We do believe that once the wastes are removed, we will have to pump the groundwater and strip the volatiles for two years and either drain it into the Adams Branch or pump it back into the ground.

Issue: What really filters the groundwater in New Jersey now? It's sand. The State continues to allow companies to remove sand from all over this state. This should be stopped.

Discussion: The State believes there is more than enough sand and gravel.

Issue: Does anyone know where Adams Branch goes?

Discussion: Under Cologne Road into Babcock Creek, then into the bay and eventually into the ocean.

Issue: Has anyone walked and surveyed the Adams Branch? In 1980 portions of the stream were dredged, and areas along the river were logged. There are also some log roads that have dammed parts of this creek. Because of these past practices, I am opposed to discharging into the Adams Branch.

Discussion: We have looked at portions of the Branch but have not looked at the entire stream as yet. This information is helpful to us. Subsequent to the meeting, we performed an onsite investigation of Adams Branch and have prepared an environmental assessment for potential surface water discharge to Adams Branch.

Issue: What route would you take to discharge into Adams Branch?

Discussion: A preliminary alignment being considered would follow the Blackhorse Pike, then cross under the highway somewhere near Cologne Road, and continue along Cologne Road prior to discharge to Adams Branch.

Issue: Who gives you the right to discharge wastewater to the stream?

Discussion: The State DEP issues the permit.

AIR QUALITY

Issue: Can you explain air stripping to me?

Discussion: In this particular case, air stripping is pumping the water and spraying it into a packed column where air is used to volatilize the contaminants.

Issue: Will all these contaminants be stripped by pumping the water into the air?

Discussion: Not exactly, this will be done in a controlled situation such as in a packed column. The nature of these contaminants is such that they volitilize easily and can be stripped by air.

Issue: When the contaminated water is pumped into the air, we have air pollution.

Discussion: The volatilized material will be discharged to the air; however, we will constantly monitor the air to ensure that all air regulations are adhered to. I can assure you that this will be a restrictive permit and appropriate controls to limit air emissions will be implemented.

Issue: Will the air we breath have all these organics in it?

Discussion: The air will be monitored continuously so there will be no risk to the general public.

REMEDIAL INVESTIGATION FINDINGS

Issue: Exactly what is in this pit (landfill)?

Discussion: Mainly the contaminants are toluene and acetone--primarily solvents. The contaminant listing is included in the study results. These studies are available at the municipal building (Mays Landing).

Issue: What has gone into this study that would ensure that the treatment--oxidation or incineration--is safe?

Discussion: First of all, we are not considering incineration for this site. We believe that pumping the groundwater and treating it along with excavation of source material will correct the problem here.

Issue: How long did it take to contaminate the two zones?

Discussion: We believe about 10 years. The zones are the Upper Cohansey and Lower Cohansey Aquifer--a total of about 85 feet in depth.

PINELANDS COMMISSION ISSUES

Issue: Most of the land in Atlantic County is in the Pinelands. When the Pinelands Commission prohibits a landfill in the area, how can you even suggest to dispose of this material on this site?

Discussion: We are currently checking into the Pinelands Commission regulations to determine how feasible this option is. This information will be verified prior to the record of decision (ROD).

Issue: Does the Pinelands Commission have the last word?

Discussion: The EPA and NJDEP will sit down and discuss the various alternatives with the Commission. A mutually agreeable solution will become the recommended alternative. The chosen alternative must be acceptable to all the parties that have authority over health and environment.

Issue: What will be the input from the Pinelands Commission?

Discussion: The Pinelands Commission's concern is for water and the environment. The Commission will have to approve the recommended alternative for this site.

Issue: Since the Pinelands Commission stipulated that there be no toxic dumps within the Pinelands, why even consider the onsite landfill unless you feel you can override the Commission's plan?

Discussion: It may be that the Pinelands Commission will not allow an onsite landfill. It still must be determined whether the Pinelands Commission's rules are appropriate.

Issue: What are "appropriate rules"?

Discussion: There are some local ordinances that can be overruled by the State and Federal Government for the good of the citizens. The Pinelands Commission's ordinances may have been approved and adopted by the State in accordance with federal law establishing the Pinelands. If that is true, then onsite disposal would not occur.

POLICY ISSUES

Issue: Are you considering bringing toxic wastes from other areas to the D'Imperio Property? I read this in the newspaper.

Discussion: No. This has never been considered nor will it be.

Issue: You did say this is a small site and that small sites may not receive the priority ranking to get the work done.

Discussion: There are 95 sites currently in New Jersey. This site is ranked 15. This is partly due to the fact that the site is so close to people. This site may be small in size but is not a low priority site; therefore the work will get done.

Issue: You said the site is number 15 on the New Jersey list. What is the site's number on the national list?

Discussion: I'm not sure. I don't know if it is in the top 100 out of over 800 sites. The number is not the most critical component on this site because the study of the problem is now finished, and design and implementation will begin this year.

Issue: My concern is not the number but rather the time frame when this site will be cleaned up.

Discussion: Within the next 30 days, EPA will select the method for cleaning up this site. The document is called the record of decision (ROD). It will take 3 to 6 months to design the implementation plan. Our goal is by September 30 to obligate money for the cleanup of this site.

Issue: In the study, there is a section on incineration. It appears to be dismissed from further consideration because an incinerator is not available. You should know that many people are concerned about incinerators and would not like to see one used here. What are our options if we do not like the alternative chosen?

Discussion: The EPA will notify you of the decision. We came here tonight to receive your input. Your concerns will be part of the information used in making the final decision.

Issue: What is the chain of command in this state? Who reports to whom--EPA, DEP, Pinelands Commission?

Discussion: In looking at any waste solution, we must look at the applicable State and Pinelands Commission rules and regulations. The EPA and State must agree on the solution. The solution must comply as fully as possible with all applicable regulations. Certainly, we will need to look at the Pinelands Commission's regulations and determine the applicable standards for this area.

Issue: After the cleanup, the land will be a dead area, won't it? I mean, no houses could be built on it.

Discussion: The area within the fence--1 to 2 acres--will be controlled, but the area outside the fence, after the cleanup, will not have any restrictions placed on its use.

Issue: How did the government let us get into this mess? Who wasn't doing his job?

Discussion: Many of the sites on the Superfund list were here before the environmental agencies were formed. The common practice for disposal of wastes was to deposit them in dumps.

Issue: Don't EPA rules forbid the building of a landfill over an aquifer?

Discussion: No. The EPA regulations under RCRA do not forbid the practice but the design must include precautions to prevent contamination of the aquifer. The Pinelands Commission's regulations, however, may forbid the locating of a landfill over an aquifer.

Issue: Do these suggested alternatives follow DEP's criteria for disposal of waste?

Discussion: Yes. The suggested alternatives could be accepted by DEP. The DEP will, of course, be involved in the final decision.

Issue: Who bears the responsibility if you discharge toxics into this Branch and problems develop in the future?

Discussion: The EPA does.

Issue: The State of New Jersey Hazardous Waste Siting Commission is intending to build a treatment facility somewhere in the state. Could it be here? Or, could the wastes from this site be taken there?

Discussion: The site will not be the D'Imperio Property Site. However, if the State had a treatment facility, EPA would certainly consider using that site. It would be preferable to sending it across several states.

Issue: Could we not contain the D'Imperio material now and then dispose of it when the new site is opened? That would be preferable to 30 years on the site.

Discussion: Those are very good suggestions that we will consider.

Issue: What is the possibility of the no-action alternative?

Discussion: Because of the potential for future impact on water supplies, the no-action alternative has been eliminated.

Issue: How can we prevent these problems from occurring again? The government should stand up to industry and refuse to let them make this material if they cannot reuse it.

Discussion: The Resource Conservation and Recovery Act (RCRA) now regulates landfills and hazardous chemicals.

SITE RESPONSIBILITY

Issue: Has the owner of this site paid anything to clean up this site?

Discussion: The potential responsible parties (PRP) are contacted to determine their financial capability and liability as part of the Superfund program.

the Woodlands condominium

March 11, 1985

Mr. Christopher J. Daggett, Reg. Administrator
U. S. Environmental Protection Agency
Region 11
26 Federal Plaza
New York, NY 10278

RE: D'Imperio Property Hazardous Waste Site

Dear Mr. Daggett:

I attended the public information hearing regarding the D'Imperio Property hazardous waste site in Mays Landing, N.J. on March 6, 1985. I appreciated the opportunity to listen to your agency's proposals as well as to state my views and have my questions answered.

As President of the Woodlands Condominium Homeowners, I represent over 650 homeowners. By this time next year, or sooner, there will be approximately 750 homeowners at the Woodlands. After hearing the presentation, listening to others' comments and opinions and having my own questions answered, I am absolutely convinced that establishing an onsite landfill is NOT in the best interests of the environment or of the many, many residents in the surrounding area. I am opposed to alternatives 1A and 1B. I am also opposed to any form of incineration should a "mobile incinerator" become available at a later date, as mentioned in your agency's report, pages 2-19 through 2-21.

I favor Alternative 2B, Groundwater treatment and offsite discharge with a cap and offsite landfill. This would include excavation of 3,900 cubic yards of hazard waste (as well as all drums and containers), capping of 1.5 acres of contaminated soil remaining after excavation, and withdrawal of contaminated

groundwater treatment by air stripping. It is my opinion that Alternative 2B offers the most efficient, safe, and cost effective solution. I urge you to select this alternative and move into action as soon as is practicable.

Thank you,
Sincerely,

George S. R. Gross, Jr.
Assoc. Pres.

GSRG/dpb

cc: William Gormley, State Senator
Robert Hughey, Commissioner, N.J. Dept. Environmental Protection
William J. Hughes, Congressman
John Frisco, Chief, N.J. Remedial Action Branch
John H. Rosenberger, Esq.
Woodlands Condominium Association Board Members

The Pinelands Commission

P.O. Box 7, New Lisbon, N.J. 08064 (609) 894-9342

March 13, 1985

Mr. Donald Lynch, P.E., Project Manager
Southern New Jersey Remedial Action Section
New Jersey Remedial Action Branch
U.S. Environmental Protection Agency
Region II
26 Federal Plaza
New York, New York 10278

Re: D'Imperio Property
Superfund Site

Dear Mr. Lynch:

Thank you for providing us with a copy of "Feasibility Study of Alternatives - D'Imperio Property Site, Township of Hamilton, Atlantic County, New Jersey."

There are a number of items in the Pinelands Comprehensive Management Plan (CMP) which affect the list of alternatives and which we would like to bring to your attention. Section 6-804 of the CMP prohibits the direct discharge of wastewater into any surface body of water; Section 6-705 permits new landfills only if a stringent set of conditions is met and only if the landfill is phased out by 1990; and, Sections 6-706 and 6-807 of the CMP prohibit the disposal of hazardous or toxic wastes in the Pinelands.

Given these circumstances it would appear that the only feasible option is Alternative 2A. It should also be noted that any of the clean-up activities on the site will require an application to the Pinelands Commission.

If you have any questions concerning this response, please feel free to contact me.

Sincerely,

Terrence D. Moore
Executive Director

TDM/scb
cc: Michael F. Catania, Director,
Office of Regulatory Services
N.J. DEP
Dr. Jorge Berkowitz - N.J. DEP
Ms. Joan Anderson - Clerk - Hamilton Twp.

DRAFT

ENVIRONMENTAL ASSESSMENT FOR THE D'IMPERIO PROPERTY SITE

SURFACE DISCHARGE OF TREATED EFFLUENT TO ADAMS BRANCH AND SURROUNDING WETLAND AREA

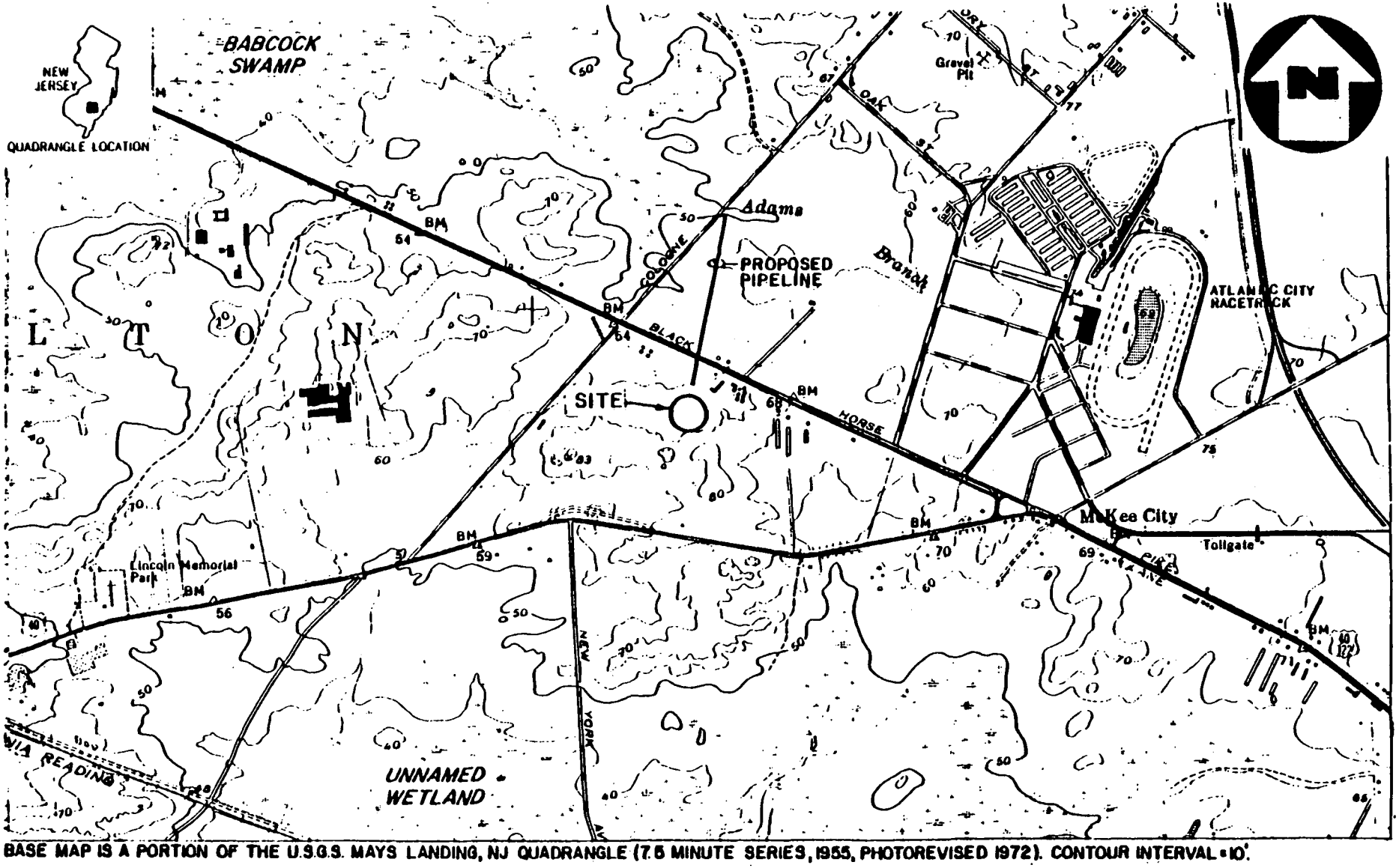
1.0 INTRODUCTION

This environmental assessment of the D'Imperio Property Site addresses the potential effects associated with the surface discharge of treated groundwater to Adams Branch and the surrounding wetland area. The following sections will evaluate the various impacts associated with the proposed discharge of a maximum treatment plant effluent of 400 gallons per minute (gpm). The effects of such a discharge were assessed as to the potential toxicological, ecological, and hydrological impacts of such an action.

One proposed remedial measure for the D'Imperio Property Site is the recovery and treatment of contaminated groundwater identified beneath the site. The alternative proposed for site remediation involves the construction of a recovery well system to extract approximately 350 gallons per minute (gpm) from two contaminated groundwater plumes (the upper and lower aquifers). The water obtained will be treated on site and then be discharged off site into a tributary of Babcock Creek known as Adams Branch.

Figure 1 shows the site and the location of the proposed drainageway. The outfall to Adams Branch, which discharges into the wetland designated as Babcock Swamp, is also shown.

Two options are proposed for the treatment of the groundwater. These two options are designed to meet different objectives, which will be discussed in depth in a later section. The basic difference, however, involves the use of one treatment system (option 1) that will be designed to remove contaminants to below New Jersey State unofficial drinking water criteria with the exception of Methyl Ethyl Ketone (MEK), or another (option 2) which will be designed to remove MED to below the New Jersey State drinking water limit.



BASE MAP IS A PORTION OF THE U.S.G.S. MAYS LANDING, NJ QUADRANGLE (7.5 MINUTE SERIES, 1955, PHOTOREVISED 1972). CONTOUR INTERVAL = 10'.

FIGURE 1

SITE LOCATION MAP

D'IMPERIO SITE, HAMILTON TOWNSHIP, NJ

SCALE: 1" = 2000'

NUS CORPORATION

A Halliburton Company

Each of the treatment options consists of a two-phase treatment system. Phase one, which is common to both options is the inorganics treatment phase. Suspended solids and inorganic contaminants will be removed by precipitation and settling. Phase two, organics removal, will be accomplished by one of two processes. The first option is designed to remove the volatile organic compounds with the use of an air stripping unit. Option two will remove the volatile organics and MEK with the use of a steam stripping unit.

The effluent from either of these treatment steps will be directed into a gravity flow drainageway, which will discharge into Adams Branch. This drainageway will be approximately 3,000 feet long and will carry the treated water under Black Horse Pike.

The two treatment system options proposed for groundwater treatment will result in different effluent quality levels. Option one, the air stripping option, was designed so that the effluent meet New Jersey State drinking water criteria with the exception of MEK. This criteria provides that volatile organic contaminants be removed to an effluent concentration of 50 µg/l of any one contaminant and 100µg/l of total volatile organics. Option two was designed to meet this same criteria but, in addition, includes measures for MEK removal.

An initial assessment of the impacts associated with the discharge of the treatment plant effluent to Adams Branch indicates that no adverse environmental impacts should be observed. The increased flow is not expected to alter wetland areas. In addition, treatment effluent quality for either option is not expected to adversely affect benthic aquatic communities or wetland wildlife. As such the proposed treatment methods would satisfactorily treat the groundwater and would not require modification to further protect the wetland environment.

2.0 AQUATIC TOXICITY ASSESSMENT

Table 1 lists the maximum discharge concentrations of any one contaminant in either option in comparison to the Ambient Water Quality Criteria (AWQC) for the

TABLE 1

AQUATIC TOXICITY DATA FOR D'IMPERIO PROPERTY SITE

CAS Number	Contaminant (PP No.)	Maximum Treated Effluent Discharge Concentration µg/l	Ambient Water Quality Criteria, Freshwater Aquatic Life		Ambient Water Quality Criteria, Saltwater Aquatic Life		Aquatic Toxicity Rating TLM 96 mg/l
			Acute µg/l	Chronic µg/l	Acute µg/l	Chronic µg/l	
75-09-2	Methylene Chloride (44V0	50	11,000*		12,000*	6,400*	-
67-64-1	Acetone	50	NA	NA	224,000	NA	-
75-35-4	1,1-Dichloroethene (28V)	50	11,600	NA	NA	NA	1000-100
75-34-3	1,1-Dichloroethane (13)	50	NA	NA	NA	NA	NA
67-66-3	Chloroform (23V)	50	28,900	1,240	NA	NA	-
107-06-2	1,2-Dichloroethane (10V)	50	118,000	20,000	113,000	NA	-
78-93-3	2-Butanone (Methyl ethyl ketone)	500	NA	NA	NA	NA	Over 1000
71-55-6	1,1,1-Trichloroethane (11V)	50	18,000	NA	31,200	NA	
78-87-5	1,2-Dichloropropane (32V)	50	NA	NA	NA	NA	100-10
79-01-6	Trichloroethene (87V)	50	45,000	21,900	2,000	NA	-
71-43-2	Benzene (4V)	50	5,300	NA	5,100	700	-
108-10-1	4-Methyl-2-Pentanone (Methyl isobutyl ketone)	50	NA	NA	NA	NA	Over 1000
127-18-4	Tetrachloroethene (85V)	50	5,280	840	10,200	450	-
108-88-3	Toluene (86V)	50	17,500	NA	6,300	5,000	-
108-90-7	Chlorobenzene (7V)	50	250	50**	160	129	-
100-41-4	Ethylbenzene (38V)	50	32,000	NA	430	NA	-
	Total Xylenes	50	NA	NA	NA	NA	100-10

*Ambient Water Quality Criteria for Halomethanes
**Fish species exposed for 75 days.
NA - Data not available

protection of freshwater aquatic life and saltwater aquatic life (USEPA, 1980). Acute (short-term exposure) and chronic (long-term exposure) criteria are provided for volatile organic contaminants in Table 1. Maximum discharge concentrations are not listed for the inorganic contaminants since they were not identified as "critical" contaminants. Inorganics treatment was included in the design as a provisional measure for a worst case groundwater contamination.

In the absence of an Ambient Water Quality Criteria, the Aquatic Toxicity Rating, TLM_{96} (concentration that will kill 50 percent of the exposed organisms within 96 hours), is provided in Table 1 (Sax, 1984). A range of concentrations is provided to reflect the variety of different organisms and test conditions used to determine the TLM_{96}. The TLM_{96} values give a relative indication of acute toxicity. Additional acute aquatic toxicity data for methyl ethyl ketone is shown in Table 2.

In comparison to the maximum expected concentration of any volatile organic contaminant in the effluent, these data indicate that acute and chronic toxic effects to freshwater aquatic life and saltwater aquatic life would not be expected.

Chronic toxic effects from chlorinated benzenes have been reported at concentrations as low as 50 µg/l for a single species of fish exposed for 7.5 days (USEPA, 1980). However, chlorobenzene was found in only two groundwater samples (monitoring well sample MW-03 at a concentration of 110 µg/l, 20 percent dilution only, and residential well sample PW-01 at a concentration of 5.3 µg/l). It is expected that the chlorobenzene concentration in the treated effluent discharge will be significantly less than 50 µg/l. Chronic toxic effects to aquatic life due to chlorobenzene would not be expected.

Chronic toxicity criteria or data are not available for some contaminants. However, because the contaminants would in all probability, mix with the stream water and be diluted, chronic toxic effects would be unlikely.

TABLE 2

AQUATIC TOXICITY DATA - METHYL ETHYL KETONE[3]
D'IMPERIO PROPERTY SITE

Concentration mg/l	Exposure (Hours)	Species	Toxic Effect*	Test Environment	Reference
5640	24	Sunfish	TLM	Phila. Tap Water 20°C	CWQPAV 0001
5640	48	Sunfish	TLM	Phila. Tap Water 20°C	CWQPAV 0001
5600	24, 48, and 96	Mosquito Fish	TLM	Turbid	CWQPAV 0001
5640	96	Sunfish	TLM	---	A1 0001
1950	24	Brine Shrimp**	TLM	Static	JWPFA5 0024

* TLM - Concentration that will kill 50 percent of the organisms exposed.
** Saltwater organism

These estimates do not address sensitive species, synergestic effects, or additional environmental stresses to aquatic life resulting from temperature changes, increased flow rates, total dissolved solids, biological oxygen demand, and so forth.

Normally, the presence of volatile organic constituents at the concentrations expected in the effluent from the proposed treatment plant will not have any noticeable effects on the variability and numbers of biota in the ecological community.

3.0 ECOLOGICAL EVALUATION

A limited ecological examination of Adams Branch was conducted between Cologne Avenue and the stream's confluence with Babcock Creek. This reach of stream is approximately 2 miles in length and drains into the area surrounding Babcock Creek and known as Babcock Swamp, as shown on Figure 1. The entire area is designated as a wetland; however, Adams Branch was dredged in 1980, and this action resulted in lowering the local water table. The area surrounding Adams Branch has since become gradational between swampland and upland.

An initial reconnassiance of the area revealed that Adams Branch was well channelized as a result of the dredging operation. This action has severely disrupted the original streambed. The excavation of this channel has also affected the riparian area (land adjacent to the stream) for an average of 30 feet from either bank. Dredge spoils from the excavation of the streambed were deposited within this riparian area. The fact that grasses were the only vegetation growing on the spoils confirmed that dredging was a recent event.

The channelized stream bed has a width ranging from 8 to 12 feet along its entire length, including the steep, almost vertical side slopes. Average water depth along this reach was approximately 10 inches. The channel depth increased uniformly from 3 feet at Cologne Avenue to approximately 6 feet at the Babcock Creek confluence.

Stream flow measurements were conducted for Adams Branch near Cologne Avenue, the planned location of the treatment plant outfall. The velocity of the stream at this point was approximately 0.2 feet per second (fps), which is a flow of about 375 gallons per minute (gpm). The dredging operation has completely altered and natural stream conditions below this point. The stream is now a channelized pool with occasional fast water (riffle) areas spanning slight changes in stream bed elevation.

The stream substrate now consists of small diameter (1-2 inches), white gravel with a finely graded sand intermixed. Inspection of the substrate indicated that favorable conditions exist for bethic community growth; however, none were clearly visible. The dredging activity has apparently interrupted the growth of the natural benthic macroinvertebrate community in Adams Branch.

A small variety of aquatic macroinvertebrates was observed during the site reconnaissance. Leeches were found in the branches of a fallen tree submerged in the stream. Water striders were present on the water's surface the entire length of the stream, while water boatmen were present only in the pooled areas.

Changes in the fish population have also occurred as a result of the dredging. The only fish observed were sculpin, and these were inhabiting only an undredged tributory of Adams Branch. No fish were observed in Adams Branch.

The recovery of Adams Branch to a point where aquatic life is firmly established is expected to take a number of years. Downstream invertebrate drift, along with airborne deposition of eggs, will enhance recovery of streambed life. The physical changes to the stream, however, will persist, while the aquatic community structure shifts to organisms which favor this type of habitat.

The projected addition of 400 gpm of treated water, a volume which effectively doubles the flow observed during the survey, would be noticeable near the point of

discharge. However, the additional flow is not expected to affect the current streambed conditions. The additional flow should not retard the recovery of Adam Branch. By the time this flow reaches Babcock Creek and Babcock Swamp, the impact of the addition of 400 gpm upstream cannot be adequately determined, although the size of Babcock Creek is such (in excess of 4 times the present flow of Adams Branch) that any effect would be minimal.

Although the ecological community was not examined in detail, the study area is likely to contain a wide variety of wildlife species. Deer tracks were found in numerous areas along the length of Adams Branch. Numerous bird species were also observed in this area. Of particular note was the observation of a Great Blue Heron in this area. This Heron has been identified as a sensitive species by the Pinelands commission.

Considering the influences of dredging Adams Branch, natural fluctuations in stream flow, climate variations, and the large volume of water in Babcock Creek and Swamp, current assessment techniques would be expected to show little if any significant variation in the ecological community structure within the Adams Branch area. Any differences observed would probably be assigned to the natural variability of the system.

4.0 HYDROLOGIC IMPACT ASSESSMENT

The wetland of concern in this assessment covers a region including Babcock Swamp and the area in between the Black Horse Pike and Route 40. Babcock Creek is the main stream flowing through this region. The extent of the wetland covered by the water impoundments depends on the flow of Babcock Creek and the water table elevation. Babcock Creek has three more tributaries, i.e., Man Killer Branch, Jack Pudding Branch, and Adams Branch. Until Adams Branch was dredged, the other two tributaries had much better defined channels in comparison to Adams Branch.

Soil properties in this area are highly variable. However, they are primarily sand and sandy loams. Thus, this area has high precipitation infiltration rate and subsurface water movement capability. The vegetation growth in this wetland area is prosperous. Tall trees and branches are interwoven. Surface of the woodland is covered with tree leaves and other organic litters. In addition, the surface of the land is relatively flat. Because of the high infiltration capability, flat topography, and good surface protection, the soil erosion rate caused by the overland flow is presumably low.

As mentioned earlier, Adams Branch has been dredged to lower the water table. The newlydredged channel is geometrically well-defined. Average width of the channel is from 8 feet to 15 feet, and the depth measured from the bottom to the bank ranges from 3.5 feet to 6 feet. The sinuosity of the channel is low. Thus, generally speaking, the Adams Branch Channel is relatively straight and uniform. The flow at about 100 feet downstream of the bridge at Cologne Avenue was measured to be 377 gpm on March 12, 1985. This flow was observed to gradually increase with increasing distance downstream because of the distributed inflow along the channel caused by the subsurface seepage at the bank. In addition, there are several upland gullies draining surface water and shallow groundwater toward the channel. Therefore, the magnitude of the distributed inflow is expected to be greater during the spring runoff and the high precipitation seasons.

Based on the measurement of the channel cross-section at distances of about 20 feet, 100 feet, and 3,200 feet below the Cologne Avenue Bridge, the power function relationships between the depth and the area for those three cross-sections were individually determined to be as follows:

$A = 3.47D^{1.56}$ @ 20 ft
$A = 6.96D^{1.15}$ @ 100 ft
$A = 5.52D^{1.34}$ @ 3200 ft

Where:

A is the cross-sectional area in $feet^2$
D is the maximum depth in feet

It is noteworthy that the channel geometry is relatively uniform with the coefficients ranging from 3.47 to 6.96 and the power from 1.15 to 1.56. Similar relationships between the water depth and the wetted perimeter were also determined. Since the flow observed in the channel was relatively uniform, Manning's formula was used to calculate the depth of the flow under various potential discharges. If the treated groundwater of 400 gpm is discharged directly into Adams Branch under the current conditions (i.e., flow of 377 gpm), the calculated water depth under the combined flow will be 1.1 feet, which is 0.3 feet above the current flow surface. The current flow condition does not represent the high flow season of the year. However, assuming maximum flow to be 950 gpm, the water surface will be elevated to 1.5 feet, which is 0.7 feet above the current condition. Mannings "n" value was selected to be 0.045 to represent the dredged channel. The bed slope was calibrated using the measured flow velocity (0.2 fps) at a distance of 100 feet below the Cologne Avenue Bridge.

Peak discharge of the overland flow under a 100 year, 24-hour rainfall was also determined based on a rainfall event of 7.5 inches and the selected 550-acres drainage basin for Adams Branch. The Soil Conservation Service (SCS) Curve Number method was used. Because of the high variability of the soil properties, curve numbers of 70 and 77, representing the hydrologic soil classification of types C and D and the woodland with good cover, were selected. The calculated

peak discharges were 93 cubic feet per second (cfs) and 121 cfs corresponding to soil types C and D. These values are high compared with other river basins in New Jersey because the selected soil types C and D have lower infiltration capacity.

Flow in Adams Branch is shallow (maximum depth from 5 to 12 inches). However, the flow velocity was measured to be only 0.1 to 0.2 fps at the 100 feet cross-section because of the flatness of the channel bed. Therefore, the oxygen reaeration rate was not high. This assumption was based on the water color and the growth of the aquatic organisms in the channel. The increased flow resulting from the 400 gpm discharge is not expected to increase the reaeration rate significantly because of the flatness of the channel. Moreover, scouring of the channel will not be greatly increased when compared to the suspended sediment released from overland flows and the inputs from the other tributaries.

The areas surrounding Adams Branch have no impounded water even though the degree of saturation of the soil is high. There are however, a significant amount of standing water around the confluence of Adams Branch and Babcock Creek. Obviously, flow from Babcock Creek is much higher than that of Adams Branch. The large drainage basin of Babcock Creek and the inflows from Man Killer Branch and Jack Pudding Branch indicate that the discharge from Adams Branch is relatively small in comparison to Babcock Creek. This conclusion is supported by the observation of large channel width and flow rate observed downstream at the Black Horse Pike Bridge over Babcock Creek.

The average evaluation of the area close to Black Horse Pike and the region and in between Route 40 and Black Horse Pike is about 30 feet, mean sea level (msl), which is the lowest portion of the entire Babcock Creek drainage basin. Because of the topography and the soil properties of these areas, the characteristics of the wetland are, therefore, more prominent at the downstream portion below the confluence of Babcock Creek and Adams Branch.

In summary, the increase of the water elevation in Adams Branch due to the addition of 400 gpm discharge was determined based on the current and the

presumed high flow conditions. The additional discharge will not induce any flood over the bank. Also, there will not be any significant change in the current dissolved oxygen and suspended sediment condition in the Adams Branch. The impact cause by the additional discharge at the downstream portion of the Babcock Creek will also be insignificant because of the comparatively high flow inputs from the Man Killer Branch, Jack Pudding Branch, and the headwater drainage basin of the Babcock Creek.

REFERENCES

1. United States Environmental Protection Agency, November 28, 1980. "Water Quality Criteria Documents; Availability". 45 Federal Register FR 793.18

2. Sax, N. Irving, 1984. Dangerous Properties of Industrial Materials, 6th edition. Van Nostrand Reinhold Company.

3. Oil and Hazardous Wastes Technical Assistance Program, Oil and Hazardous Waste Technical Assistance Data System, 1985.