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Department of Environmental Conservation

Division of Hazardous Waste Remediation

Nassau County Fire Training Center

Site Number 130042
Bethpage, New York

Record of Decision

February 1993

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New York State Department of Environmental Conservation
MARIO M. CUOMO, *Governor* THOMAS C. JORLING, *Commissioner*

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NASSAU COUNTY FIRE TRAINING CENTER
RECORD OF DECISION

I. Site Location and Description

The Nassau County Fire Training Center, also known as the Fire Service Academy, is a 12-acre site used as an advanced fire-fighting training facility for Nassau County's volunteer fire fighters. The site is located on Winding Road near Round Swamp Road, and is bordered on the northwest by the Old Bethpage Landfill and on the south and west by the Bethpage State Park (Figure 1). Training exercises are conducted in three open burn areas and in three building mockups, as shown on Figure 2.

II. Site History

Currently, fuel oil and gasoline are used to ignite wooden pallets and straw for fire fighting exercises. However, between 1970 and 1980, various spent organic solvents were reportedly accepted at the site for burning. Until 1986 unburned fuel and solvents were washed out of the burn areas by high pressure hoses and collected in dry well fields across the site. Uncombustible solvents may have been disposed directly into drywells. Additional subsurface contamination may have occurred from leaking gasoline and fuel oil tanks and associated piping.

Two water supply wells located in Bethpage State Park were found to be contaminated with chlorinated solvents associated with the FTC. In 1980, one well was shut down by the Nassau County Department of Health, and the other was restricted to limited irrigation use. Several active supply wells of the Farmingdale Water District are located within a 1.5 mile radius downgradient of the site, but these have not been affected by contamination to date.

After 1980, solvent donations were no longer accepted at the site. In 1984, site improvements were made to prevent further subsurface contamination from training activities. Training areas were paved and bermed, dry well inlets were sealed, a new system of concrete drain pipes was installed, and an oil/water separator was constructed to treat runoff from the site for discharge to the sanitary sewer. Between 1985 and 1987, the Nassau County Department of Public Works (NCDPW) conducted several investigations of the site to determine the extent of dry well soil contamination, floating oil and gasoline plumes, and associated dissolved contaminants in groundwater.

Based on these previous investigations, DEC added the site to the Registry of Inactive Hazardous Waste Disposal Sites in December 1987, and upgraded the site classification to Class 2 in March 1988. In February 1989, Nassau County entered into an Order on Consent with DEC and DOL to conduct a remedial program at the site. An RI/FS work plan was approved in November 1989.

III. Enforcement Status

Date	Index No.	Subject of Order
February 11, 1988	D1-0022-88-03	Implementation of Remedial Program

The 1986 Environmental Quality Bond Act is being used to reimburse the County of Nassau for up to 75 percent of the costs for the remedial program.

IV. Current Site Status

A. Summary of Field Investigations:

The following summarizes the scope and conclusions of the field investigations performed at the site. The Remedial Investigation was conducted in accordance with plans approved by the NYSDEC in November 1989. More detailed information regarding the results of the Remedial Investigation can be found in the Remedial Investigation Report dated September 1992.

The Remedial Investigation (RI) was designed to address several data gaps that were identified in previous studies. These include:

- Full definition of the floating petroleum product bodies on site,
- Characterization of contaminated soils in these areas,
- Determining the leading edge of off-site dissolved contamination,
- Evaluating the past and present effects of water supply pumping on plume migration,

To achieve these goals, 8 new monitoring wells were installed on the FTC site, 23 off-site wells were installed in the Bethpage State Park (BSP), and one new upgradient well was installed along Round Swamp Road. The off-site wells were installed in 8 clusters of multiple wells of different depths to provide a vertical profile of contamination. These depths correspond to three distinct hydrogeologic zones designated A, B and C. These zones generally correspond to the following depths:

A - +5′ to -15 below water table
B - 180′ to 200′ below water table
C - 280′ to 300′ below water table

A single water table well was also installed in the vicinity of the BSP maintenance garage.

During the RI, groundwater samples were taken from a total of 31 on-site and 23 off-site wells and were analyzed for the full Target Compound List (TCL) of analytes. During the second sampling round, 12 additional groundwater samples were taken from off-site wells and analyzed for Volatile Organic Compounds (VOCs) only.

B. Summary of Site Conditions

Contaminated media (soil and groundwater) associated with the site have been segregated into four distinct areas for evaluation. The nature and extent of contamination in these media are presented below:

Shallow soils (0'-5')

Shallow soil contamination on-site is the result of open burn exercises in three Burn Area Fields (BAFs). Samples taken in 1985 indicated that approximately 7500 cubic yards of soil was contaminated by oil and grease and the gasoline constituents Benzene, Toluene and Xylene (BTX). These areas were paved over in 1985, and no additional soil samples were taken in this area during the RI. It is estimated that the current asphalt and concrete paving is 90% effective in reducing infiltration of water through contaminated shallow soils.

Deep Soils (10'-40')

Deep soil contamination on site is found beneath each of the dry well fields and in areas where floating product is present at the water table. The dry well fields and floating product plumes are found in three areas, as shown in Figure 2, which are designated Mock-up Field (MUF), Burn Area Field (BAF), and Corrugated Metal Building (CMB). Soils beneath the dry wells are primarily contaminated with oil and gasoline indicators, Total Petroleum Hydrocarbons (TPH) and BTX.

Floating product was measured in several on-site monitoring wells during the late 1980's in the MUF, BAF and CMB areas. These floating product bodies consisted of fuel oil (#2) in the MUF and BAF areas, and gasoline in the CMB area. Fuel oil in the BAF area is also contaminated with methyl ethyl ketone (MEK) and BTX contaminants. The water table at the site has risen up to 10 feet in 1990 and 1991, causing the oil and gasoline to be trapped in the soils below the water table. Therefore previous estimates of free product volumes are no longer valid, and this three phase (oil/water/soil) contamination is evaluated as contaminated soil for purposes of the Feasibility Study. Water levels have subsided three (3) feet during the Fall of 1992, and product was again detected in certain monitoring wells.

The estimated quantities of contaminated soil in each of the two areas are:

Dry well fields - 12,800 cu yds
Product bodies - 17,000 cu yds

On-site Groundwater

Groundwater beneath the Fire Training Center is contaminated by four general categories of chemicals:

- BTX contamination associated with fuel oil and gasoline releases,
- Chlorinated solvent and ketone contamination associated with solvent donations,
- Semivolatile contamination associated with oil and gasoline releases, and
- Inorganic landfill leachate contamination from the adjacent Old Bethpage Landfill.

Off-Site Groundwater

The plume of dissolved groundwater contamination has migrated beyond the FTC site boundary to a location approximately 4000 feet downgradient (Well BP-9B). Off-site contamination occurs primarily in the B Zone of the aquifer, and a contaminant contour map of the B zone is shown in Figure 3. Contamination in the C zone was only found in Well BP-4C, at a total VOC concentration of 20 ppb.

During the installation of monitoring wells in the RI, a relatively thick bed of dark grey clay was consistently encountered at a depth that separates the B and C zones. The thickness of this clay layer ranges from 44 feet at Site 4 to 126 feet at public supply well N-7852. The presence of this apparently continuous, thick clay layer is believed to have prevented contamination from affecting the C zone of the aquifer.

Volatile organic constituents of the off-site plume are similar to those found on-site, but semivolatile and inorganic contaminants do not exceed groundwater standards. The most contaminated off-site monitoring well is BP-4B, with a total VOC concentration of 1051 ppb, comprised of the following:

Vinyl chloride	12 ppb
Tetrachloroethylene	510 ppb
1,1 Dichloroethylene	14 ppb
1,2 Dichloroethane	357 ppb
1,1,1 Trichloroethane	56 ppb
Trichlororethylene	44 ppb
Benzene	54 ppb
Xylene	4 ppb

The off-site contaminant plume was defined based on levels of contaminants above Standards, Criteria and Guidance values for groundwater. Chemical-specific SCGs for groundwater at the site are State and Federal drinking water standards, including EPA Maximum Contaminant Levels (MCLs), 10NYCRR Part 5, and 6NYCRR Part 703 standards. The New York State MCLs for individual organic compounds are 5 ppb for Principal Organic Contaminants (POCs), 50 ppb for

Unspecified Organic Contaminants (UOCs), and 100 ppb for combined POCs and UOCs.

Water levels in the farthest downgradient monitoring wells (9B, 9C, 10B, 10C), were monitored for fluctuations in response to pumping of nearby public supply wells. The results indicate that C-Zone monitoring wells (9C, 10C) are within the radius of influence of supply wells N-07852 and/or N-11004 of the Village of Farmingdale Water District, but B-Zone wells have negligible impact from water supply pumpage. Of the four farthest downgradient wells, only Well 9B had detectable levels of contaminants, indicating that the contaminant plume has not reached the capture zone of these water supply wells.

C. Summary of Site Risks

Based upon the results of the RI, a baseline risk assessment (Endangerment Assessment) was conducted to estimate the risks associated with current and future site conditions.

Unacceptable cancer risk estimates for soil exposure to on-site receptors were calculated for the dermal contact exposure route. The majority of the increase in risk is attributable to 3,3'-Dichlorobenzidine and PCB-1254, which were each detected in only one soil sample analyzed during the RI.

Because there is no current exposure to contaminated groundwater, there is no present cancer or noncancer risk from groundwater impacts. However, based on the reasonable maximum exposure, if a hypothetical water supply were to be installed downgradient of the site within the plume, then according to the State's guidelines, an unacceptable excess cancer risk would result from ingestion of contaminated groundwater. Similarly, for dermal contact and inhalation exposure to contaminated groundwater (through showering), elevated cancer risks were also determined.

The Hazard Index, which reflects noncarcinogenic effects for a human receptor, was found to be elevated for the following routes of exposure; ingestion and dermal contact with on-site soils, and ingestion of off-site groundwater. The primary contributor to on-site soil non-cancer risk is naphthalene, which was found in several samples taken in product-saturated deep soils.

Actual or threatened exposure to hazardous substances from this site, if not addressed by the preferred alternative or one of the other active measures considered, may present a current or potential threat to public health, welfare or the environment.

Data generated during the Remedial Investigation indicate that there are no significant habitats or endangered or threatened species affected by the site.

V. Goals for the Remedial Action

The overall remedial goal for this site is to achieve a remedy that:

1. Is protective of human health and the environment,
2. Obtains compliance with State Standards, Criteria and Guidance.
3. Minimizes short-term impacts.
4. Maximizes long-term effectiveness and permanence.
5. Is technically and administratively implementable.
6. Reduces the toxicity, mobility or volume of contaminants.
7. Is cost-effective.

Based on the findings of the Remedial Investigation, the specific goals for remediating the Fire Training Center are as follows:

On-site Soils - Reduce the concentrations of, and exposure to, volatile and semivolatile organic contaminants in shallow soils so that their presence does not present an unacceptable health risk to on-site receptors. For deep soils, at a minimum, prevent uncontrolled releases from and direct human contact with contaminants. To the extent feasible, reduce the concentrations of contaminants so that they do not leach from soils at levels that would contaminate groundwater above standards.

On-site Groundwater - Minimize further off-site migration of contaminants, recover floating product to the extent feasible, significantly reduce the mass of dissolved contaminants, and ultimately to reduce contaminant concentrations to below groundwater standards.

Off-site Groundwater - Reduce the concentrations of contaminants to below drinking water standards to the extent technically feasible.

VI. Summary of the Evaluation of Remedial Alternatives

Although the site is being addressed as a single operable unit, alternatives were developed and evaluated separately for each of the four contaminated media delineated in the Remedial Investigation. The following section describes the alternatives considered in the detailed analysis. A more complete description of the alternatives and discussion of the detailed evaluation can be found in the Feasibility Study Report.

A. DESCRIPTION OF REMEDIAL ALTERNATIVES

Shallow Soils

SS-1 - No Action

The no action alternative for shallow soils is leaving the existing asphalt and concrete cap in place, which provides an estimated overall 90% reduction in water infiltration. The remaining area would continue to leach contaminants into groundwater, and the potential for human contact with contaminants would remain.

Capital Cost: $0.00 Time To Implement: 0

SS-2 - Capping and Deed Restrictions

Unpaved areas overlying contaminated soils would be paved and the existing pavement would be inspected and repaired. This would minimize further infiltration of water through, and physical contact with, contaminated soils. Restrictions would be placed on the deed to the property to prevent future uses of the site that could result in exposure to contaminated soils.

Capital Cost:	$ 150,000	Total Present Worth:	$ 246,000
Annual Costs:	$ 7,000	Time to Implement:	3 months

SS-3 Excavation and Off-Site Disposal

Shallow soils, including those under existing pavement, would be excavated and transported off site for disposal. Additional sampling would be required to determine whether the soils should be classified as hazardous or non-hazardous wastes, or subject to Land Disposal Restrictions.

Capital Cost:	$ 2,978,000	Total Present Worth:	$ 2,978,000
Annual Costs:	$ 0	Time to Implement:	6 months

SS-4 Excavation and On-Site Thermal Destruction

Shallow soils, including those under existing pavement, would be excavated and burned in a mobile low temperature thermal treatment (LTTT) unit. Soils would be heated to 500 - 800 degrees (F), and contaminants would be vaporized and destroyed. After treatment, soils would be returned to the site.

Capital Cost:	$ 2,440,000	Total Present Worth:	$ 2,440,000
Annual Costs:	$ 0	Time to Implement:	7 months

Deep Soils

DS-1 No Action

The no action alternative for deep soils is leaving the existing asphalt and concrete cap in place, which provides an estimated overall 90% reduction in water infiltration. Because some deep soils are in periodic contact with groundwater, contaminants would continue to migrate into the aquifer. The potential for human contact with contaminants would also remain.

Capital Cost:	$0.00	Time To Implement:	0

DS-2 Capping and Institutional Actions

As described in shallow soil alternative SS-2, unpaved areas would be paved and existing pavement would be improved to limit infiltration. This action would prevent additional rainfall and training washwater from entering deep soils, but would not address product-contaminated soils in contact with groundwater. In addition, restrictions would be placed on the deed to the property to prevent future uses of the site that could result in exposure to contaminated soils.

Capital Cost:	$ 150,000	Total Present Worth:	$ 246,000
Annual Costs:	$ 7,000	Time to Implement:	3 months

DS-3 Drywell Excavation and Off-Site Disposal

Deep soils located below the Mock-up Field (MUF) and Burn Area Field (BAF) dry well fields would be excavated and disposed off site. Additional sampling would be required to determine whether the soils should be classified as hazardous or non-hazardous waste, or subject to Land Disposal Restrictions. Soils associated with free product contamination would not be addressed by this remedy because it is not technically feasible to excavate the entire aerial extent of product-saturated soils.

Capital Cost:	$ 9,423,000	Total Present Worth:	$ 9,423,000
Annual Costs:	$ 0	Time to Implement:	6 months

DS-4 Vacuum Extraction

A series of vapor extraction wells would be placed in contaminated soil areas to extract volatile organic contaminants from void spaces in the soil. Vapor would be vented directly to the atmosphere or, if necessary, treated to comply with air emissions requirements. This alternative would only be effective for contaminated soil above the groundwater table, and would not remove semivolatile contaminants.

Capital Cost:	$ 524,000	Total Present Worth:	$ 1,738,000
Annual Costs:	$ 165,000	Time to Implement:	9 months

DS-5 Air Sparging

This is an innovative remediation technology involving the injection of air into the saturated zone to strip volatile organics into the vapor phase for removal by a vacuum extraction system. This alternative would be effective for all soils associated with floating product contamination, but would not address semivolatile contamination.

Capital Cost:	$ 1,390,000	Total Present Worth:	$ 3,598,000
Annual Costs:	$ 300,000	Time to Implement:	9 months

DS-6 Bioremediation

Three distinct bioremediation technologies were considered as a group for deep soils; in-situ bioremediation, bioventing and biosparging. By introducing nutrients into both drywell areas and free product-saturated soils, all areas of deep soil contamination could be addressed by this alternative. Bioventing combines biodegradation with a vacuum extraction system to provide additional physical removal of volatile contaminants at the soil/water table interface, as in Alternative DS-4. Biosparging combines biodegradation with an air sparging system to strip free product contamination from deeper in the saturated zone, as in Alternative DS-5. Bioremediation technologies would be effective in degrading both volatile and semivolatile contaminants found in deep soils at the FTC. It is uncertain whether the metals present in saturated on-site soils will inhibit the effectiveness of soil microbes in degrading these chemicals. Biosparging and bioventing are innovative technologies that have not been extensively implemented, and would require substantial treatability testing prior to implementation. The following costs are for the bioventing alternative:

Capital Cost:	$ 1,770,000	Total Present Worth:	$ 4,773,000
Annual Costs:	$ 408,000	Time to Implement:	12 months

<u>On-Site Groundwater</u>

ON-1 No Action

No action would leave on-site groundwater in an unremediated state. Contaminated groundwater and emulsified free product would continue to impact off-site groundwater quality.

Capital Cost:	$0.00	Time To Implement:	0

ON-2 CMB Pump and Treat (2 wells)

Two recovery wells would be used to extract gasoline and solvent contaminated groundwater from the combined CMB and BAF plumes. Extracted water would be treated to remove metals, and volatile and semivolatile organics. Treated water would be discharged to an on-site recharge basin for infiltration to an uncontaminated portion of the aquifer. Although skimming of free product is not technically feasible at this time due to high water levels, a contingency would be included to install skimmers and product separation devices if water levels retreat. Because contaminants from the MUF plume would not be captured by this alternative, maximum environmental protection would not be provided. However because the MUF plume contaminants are relatively immobile and have not migrated beyond the site boundary, ON-2 would effectively minimize off-site migration of site contaminants.

Capital Cost:	$ 4,266,000	Total Present Worth:	$ 20,013,160
Annual Costs:	$ 1,144,000	Time to Implement:	24 months

ON-3 CMB and MUF Pump and Treat (3 Wells)

This alternative is similar to ON-2, except that an additional extraction well would be added in the MUF plume to collect groundwater associated with the #2 fuel oil product. Product skimmers and separators would also be provided as a contingency if water levels drop sufficiently to make free product recovery feasible. Because the additional water extracted from the MUF area would exceed the storage and recharge capacity of the on-site basin, injection wells would be also required for discharge of treated water.

Capital Cost:	$ 4,362,000	Total Present Worth:	$ 21,871,080
Annual Costs:	$ 1,272,000	Time to Implement:	24 months

Off-Site Groundwater

OFF-1 No Action

The no action alternative evaluates the impacts of leaving off-site groundwater in an unremediated state. No action would not protect public health, and would not meet applicable Standards, Criteria and Guidance (SCGs).

Capital Cost: $0.00 Time To Implement: 0

OFF-2 Pump and Treat (7 Wells)

Off-site groundwater would be extracted by seven wells, two located in the most contaminated portion of the plume, and five located along the leading edge of contamination. This well configuration would provide for the maximum removal of contaminants in the short term, and long term containment of the plume to protect downgradient water supplies. It is estimated that 900 gallons per minute (gpm) would be pumped from these wells, and that one pore volume of the contaminated aquifer would be extracted in 10 years. Discharge of treated water would be recharge or reinjection to groundwater, either through recharge basins operated by the Town of Oyster Bay or reinjection wells to be installed in the Bethpage State Park.

Capital Cost:	$ 6,313,000	Total Present Worth:	$ 16,085,000
Annual Costs:	$ 710,000	Time to Implement:	24 months

OFF-3 Pump and Treat (12 wells)

Off-site groundwater would be extracted through twelve recovery wells, two located in the most contaminated portion of the aquifer, five located at the downgradient edge of contamination, and five others installed in lesser contaminated portions of the plume. As compared to Alternative OFF-2, this well configuration would provide for the maximum removal of contaminants in an even shorter term, and long term containment of the plume to protect downgradient water supplies. By pumping a combined flow of 1800 gpm of groundwater, the estimated time to extract one pore volume of contaminated aquifer is 4 years. This alternative would therefore achieve aquifer restoration in a shorter timeframe than Alternative OFF-2.

Capital Cost:	$ 7,762,000	Total Present Worth:	$ 14,862,000
Annual Costs:	$ 847,000	Time to Implement:	26 months

OFF-4 Pump and Treat (Downgradient Edge)

Off-site groundwater would be extracted by five wells located at the downgradient edge of contamination. This would provide containment of the plume in the long term, and protection of downgradient water supplies. An estimated 600 gpm would be pumped from these wells. Although the time to extract one pore volume of contaminated aquifer was not calculated for this alternative, it is expected that pumping would be required for a longer duration than either OFF-2 or OFF-3.

Capital Cost:	$ 5,989,000	Total Present Worth:	$ 15,101,000
Annual Costs:	$ 662,000	Time to Implement:	24 months

B. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The remedial alternative selected for the site by the Department was developed in accordance with the New York State Environmental Conservation Law (ECL) and 6 NYCRR Part 375, NYS Inactive Hazardous Waste Site Remedial Program. The ROD is consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 USC Section 9601, et., seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). The criteria which were used in evaluating the remedial alternatives are summarized below.

The following "threshold criteria" are the most important, and must be satisfied by any alternative in order to be eligible for selection:

1. Compliance with Applicable or Relevant and Appropriate New York State Standards, Criteria and Guidance (SCGs)--Standards and Criteria are officially promulgated rules and standards that are directly applicable, or relevant and appropriate to the remedial action. Guidance documents are unpromulgated guidelines that, upon exercise of engineering judgement, are found to be applicable on a site-specific basis. SCGs are further divided

into the categories of chemical-specific (e.g., groundwater standards), action-specific (e.g., design of a landfill), and location-specific (e.g., protection of wetlands).

2. Protection of Human Health and the Environment--This criterion is an overall and final evaluation of the health and environmental impacts to assess whether each alternative is protective. This is based upon a composite of factors assessed under other criteria, especially short/long-term effectiveness and compliance with SCGs.

The following "primary balancing" criteria are used to make comparisons and to identify the major trade-offs between alternatives:

3. Short-term Impacts and Effectiveness--The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment is evaluated. The length of time needed to achieve the remedial objectives is estimated and compared with other alternatives.

4. Long-term Effectiveness and Permanence--If wastes or residuals will remain at the site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude and nature of the risk presented by the remaining wastes; 2) the adequacy of the controls intended to limit the risk to protective levels; and 3) the reliability of these controls.

5. Reduction of Toxicity, Mobility, and Volume--Department policy is to give preference to alternatives that permanently and significantly reduce the toxicity, mobility, and volume of the wastes at the site. This includes assessing the fate of the residues generated from treating the wastes at the site.

6. Implementability--The technical and administrative feasibility of implementing the alternative is evaluated. Technically, this includes the difficulties associated with the construction and operation of the alternative, the reliability of the technology, and the ability to effectively monitor the effectiveness of the remedy. Administratively, the availability of the necessary personnel and material is evaluated along with potential difficulties in obtaining special permits, rights-of-way for construction, etc.

7. Cost--Capital and operation and maintenance costs are estimated for the alternatives and compared on a present worth basis. Although cost is the last criterion evaluated, where two or more alternatives have met the requirements of the remaining criteria, lower cost can be used as the basis for final selection.

The following "modifying" criterion is used to modify a proposed remedy:

8. Community Acceptance--The evaluation of community support for or opposition to the components of the proposed remedy. This is completed after comments on the proposed plan are reviewed.

Overall Protection of Human Health and the Environment

Shallow Soils

The No Action alternative (SS-1) would provide the least degree of protection for public health and the environment because current exposures and associated risks would remain. Capping and deed restrictions (SS-2) would provide protection of human health by minimizing potential contact with contaminants through isolation and controls on future land use. SS-2 would provide some environmental protection by minimizing infiltration of water and the leaching of contaminants to groundwater. Alternatives SS-3 and SS-4 would provide the greatest protection of human health and the environment by removing all contaminants from shallow soils at the site.

Deep Soils

The No Action alternative (DS-1) would provide the least degree of protection for public health and the environment because current exposures and on-going releases to groundwater would remain. Capping and deed restrictions (DS-2) would provide protection of human health by minimizing potential contact with contaminants. However DS-2 would not provide any environmental protection due to the contact of product-saturated soils with groundwater. Drywell excavation (DS-3) would provide protection of public health by removing all deep soils that have the potential for human contact. DS-3 would provide only minor environmental benefits because product-saturated soils would remain in contact with groundwater.

Vacuum extraction (DS-4) alone would not provide sufficient protection of human health because the semivolatile contaminants that greatly contributed to health risks would not be removed. Vacuum extraction would provide some environmental protection by removing volatile organics from product-saturated soils in contact with the water table. If Vacuum Extraction is combined with either Capping or Drywell Excavation, public health would be protected and partial environmental protection would be achieved.

Air Sparging (DS-5) alone would also not provide acceptable protection of public health because semivolatile contaminants would not be removed. Air sparging would provide somewhat greater environmental protection than Vacuum Extraction because VOCs would be removed from a greater thickness of the aquifer that is in contact with product-saturated soils. As discussed above, a combination of Air Sparging with either Capping (DS-2) or Drywell Excavation (DS-3) would provide human health protection and significant environmental protection.

Bioremediation (DS-6) is potentially protective of both public health and the environment. Because both volatile and semivolatile contaminants would be degraded by these processes, human exposure risks and on-going groundwater releases would be mitigated. Bioventing would provide additional removal of volatile organics by vacuum extraction. Biosparging would provide removal of VOCs and degradation of semivolatiles to a greater depth in the saturated portion of the aquifer.

On-Site Groundwater

The No Action Alternative would provide no protection of public health or the environment. Alternative ON-2, which would capture contaminants from the CMB and BAF groundwater plumes, would offer some protection of public health and the environment. Because contaminants from the MUF plume would not be captured by ON-2, maximum environmental protection would not be provided. However because the MUF plume contaminants are relatively immobile and have not migrated beyond the site boundary, ON-2 would effectively minimize off-site migration of site contaminants. Alternative ON-3 would provide the greatest degree of environmental protection by capturing all dissolved on-site contamination.

Off-Site Groundwater

The No Action alternative would provide no protection for public health or the environment because contaminants would continue to migrate towards public supply wells. The remaining pump and treat alternatives offer equal protection of public health because they all contain the contaminant plume by installing collection wells at the downgradient edge of contamination. Environmental protection is best provided by extraction from 12 wells (OFF-3), because one pore volume of contaminated aquifer is collected in the shortest amount of time. Extraction from 7 wells (OFF-2) provides the next best degree of environmental protection. Downgradient Edge collection (OFF-4) provides little environmental protection because it is not expected to restore the aquifer to drinking water standards.

Compliance with SCGs

The following discussion focuses on key SCGs that were considered in evaluating different remedial alternatives. A complete list of SCGs for the remedial action is found in Table 1.

Shallow Soils

Remediation Standards and Criteria do not exist for contaminated soils; only Guidance values are available. These consist primarily of DEC guidance documents specifying soil cleanup goals for hazardous waste sites and petroleum contaminated soil. These cleanup goals are not standards, but rather are goals for which the engineering and economic feasibility of attainment must be evaluated.

Alternatives SS-1 and SS-2 would not reduce shallow soil contamination to levels that would comply with soil quality Guidance values. Alternatives SS-3 and SS-4 would comply with these values.

Action-specific SGCs for Alternative SS-3 are applicable solid and hazardous waste classification, transportation, and disposal regulations. Additional testing would be required to determine whether solid or hazardous waste regulations apply, but in either case, Alternative SS-3 will fully comply. An action-specific SGC for Alternative SS-4 is applicable air emissions standards and guidance values (6 NYCRR Part 212 and Air Guide 1). Alternative SS-4 would comply with these requirements.

Deep Soils

Because Standards and Criteria do not exist for soils, the Guidance values discussed for shallow soils are also the remedial goals for deep soils. The No Action and Capping Alternatives (DS-1 and DS-2) would not reduce soil contamination to levels that would comply with these goals. Drywell Excavation (DS-3), Vacuum Extraction (DS-4) and Air Sparging (DS-5) would partially comply with these soil quality levels. Drywell Excavation would achieve Guidance values in the drywell areas, but not in free product-saturated soils. Vacuum extraction and air sparging would meet cleanup goals for volatile organics, but not for semivolatiles. Bioremediation could potentially meet cleanup goals for all contaminants in both drywell and free product contaminated soils. Treatability testing would be necessary to determine whether this is possible.

Action-specific SGCs for deep soils are the same as those described for shallow soils. Alternative DS-3 would comply with applicable solid or hazardous waste classification, transportation and disposal regulations, and Alternatives DS-4 and DS-5 would comply with air emissions requirements. Similarly, Bioventing and Biosparging alternatives (DS-6) would also comply with air emissions requirements. Any bioremediation alternative would also meet groundwater standards (6NYCRR Part 703) for any nutrients added to the aquifer.

On-Site Groundwater

Chemical-specific SCGs for groundwater on site are State ambient water quality standards (6NYCRR Part 703). For chemical contaminants not specified in Part 703, guidance values are provided in Technical Operational Guidance Series (TOGS) 1.1.1, which is a TBC Criterion.

The No Action Alternative (ON-1) would not meet these SCGs. Alternative ON-2 would attempt to meet groundwater standards for only part of the site. Alternative ON-3 would attempt to meet standards for the entire site.

Action-specific SCGs include discharge standards established by the State Pollutant Discharge Elimination System (SPDES), which would be met by both treatment alternatives. SCGs associated with air emissions would be met to an equal degree by both ON-2 and ON-3. Residuals generated by any treatment process would be managed in accordance with applicable hazardous waste generation, storage, transportation and disposal regulations (6NYCRR Parts 370-373).

Off-Site Groundwater

Standards for off-site groundwater are the same as those discussed above for on-site groundwater. Additionally, because off-site groundwater is available for public water supply, drinking water standards (10NYCRR Part 5) are relevant and appropriate.

The No Action alternative would not comply with water quality SCGs. Alternatives OFF-2 (7 wells) and OFF-3 (12 wells) would attempt to meet ambient standards to an equal degree. Alternative OFF-4 (Downgradient Edge Recovery) would primarily contain groundwater contamination at its present extent and thereby protect downgradient water supplies. Although it is theoretically possible that very long term operation of OFF-4 would achieve ambient standards, this would more likely be attained by Alternatives OFF-2 and OFF-3.

As for the on-site groundwater alternatives, action-specific SCGs (air and water discharge standards, hazardous waste regulations) would be achieved by all treatment alternatives.

Location-specific SCGs will also be met by all alternatives. Based on data generated during the Remedial Investigation wetlands and other sensitive habitats are not affected by the site, and are not expected to be affected by any remedial actions. Significant cultural and historic properties, particularly the Bethpage State Park, will be protected by compliance with the National and State Historic Preservation Acts, and by continued close coordination with State Park personnel.

Long-Term Effectiveness and Permanence

Shallow Soils

Alternatives SS-2, SS-3 and SS-4 offer increasing degrees of long term effectiveness. Alternative SS-2 offers reliable protection for health and the environment only if the cap is properly maintained and deed restrictions are enforced. Excavation and off-site disposal (SS-3) or on-site thermal destruction (SS-4) are effective site remedies in the long term. Only SS-4 is a permanent remedy.

Deep Soils

As discussed in the Overall Protection of Health and Environment evaluation, most of the deep soil alternatives do not address the combination of volatile and semivolatile organic contaminants in both drywells and product-saturated deep soils. The following discussion pertains to the specific chemicals and portion of deep soils that each alternative is designed to address.

No Action (DS-1) and Capping (DS-2) do not offer reliable long term or permanent protection of the environment. Drywell Excavation (DS-3) would be effective in the long term because soils would be removed from the site, but would not be permanent because contaminated soils would be transferred elsewhere. Vacuum Extraction (DS-4) and Air Sparging (DS-5) would provide a long term remedy for volatile organics, and would be permanent if vapors were controlled with a combustion device. Bioremediation alternatives (DS-6) would be effective in the long term and permanent because contaminants would be degraded and removed from the soil matrix (bioventing and biosparging).

<u>On-Site Groundwater</u>

The No Action (ON-1) and 2 well Pump and Treat (ON-2) alternatives do not offer long term effectiveness because all or some contamination would not be captured and removed from the aquifer. Alternative ON-3 would effectively provide long term protection of public health and the environment because all on-site contamination would be captured. Treatment of extracted contaminants may be permanent if emissions from the air stripper are controlled by a combustion technology, such as catalytic oxidation.

<u>Off-Site Groundwater</u>

The long-term effectiveness of groundwater pump and treat systems in achieving ambient groundwater standards has not been conclusively demonstrated. Recent studies have shown that, due to sorption of contaminants onto aquifer soils and uneven groundwater flow through silt and clay lenses, aquifer restoration has not been achieved within the timeframes estimated in the extraction system design.

Based on the groundwater flow model prepared as part of the Feasibility Study, Alternative OFF-2 would require an estimated 10 years to extract one pore volume of contaminated groundwater. Alternative OFF-3 would require only 4 years to extract one pore volume. Alternative OFF-4 would require a much longer timeframe than either OFF-2 or OFF-3. Although it is difficult to predict the number of extracted pore volumes necessary to restore an aquifer to ambient water quality standards, alternatives that remove a pore volume in a short timeframe are expected to provide better long term effectiveness in restoring the aquifer. Therefore Alternative OFF-3 would provide the greatest long term effectiveness, followed by Alternative OFF-2.

Treatment of extracted contaminants by air stripping would be permanent if air emissions are controlled by carbon adsorption and spent carbon is regenerated through incineration. The specific need for carbon adsorption would be determined during the design of the selected alternative.

Reduction in Toxicity, Mobility, or Volume Through Treatment

Shallow Soils

No Action (SS-1) and Capping (SS-2) would not reduce the volume or toxicity of shallow soil contaminants. Capping would reduce the mobility of contaminants by minimizing infiltration of rain and wash water. Excavation and off-site disposal (SS-3) may limit the mobility of contaminants when soils are placed in a state-of-the-art landfill. Excavation and Thermal Destruction (SS-4) would reduce the toxicity, mobility, and volume of contaminants by destroying them.

Deep Soils

No Action (DS-1) and Capping (DS-2) would not reduce the toxicity, mobility or volume of deep soil contaminants. Drywell Excavation (DS-3) would reduce the mobility of drywell contaminants by relocating them to a more controlled landfill environment. Vacuum Extraction (DS-4) and Air Sparging (DS-5) would reduce the toxicity, mobility and volume of volatile organic, but not semivolatile organic, contaminants. Bioremediation (DS-6) would reduce the toxicity and volume of deep soil contaminants by degrading them. Air sparging and bioremediation can potentially increase the mobility of constituents if air or nutrient solutions are improperly introduced to the aquifer.

On-Site Groundwater

The No Action (ON-1) alternative does not reduce the toxicity, mobility or volume of contaminants because contamination would not be captured and removed from the aquifer. Alternative ON-2 (2 well extraction) would provide partial reduction of these parameters by extracting and treating contaminants from the CMB and BAF plumes. Alternative ON-3 would provide the greatest reduction of toxicity, mobility and volume because all on-site contamination would be captured.

Off-Site Groundwater

For the off-site groundwater alternatives, the degree of reduction of toxicity, mobility and volume is proportional to the amount of contaminants removed from the aquifer. Alternatives OFF-2 (7 wells) and OFF-3 (12 wells) would provide the greatest reduction because they are designed to remove the greatest mass of contaminants. Downgradient Edge Recovery (OFF-4) would provide a lesser reduction, and No Action would provide none.

Short-Term Effectiveness

Shallow Soils

No Action (SS-1) does not offer any short term effectiveness. Capping and deed restrictions would provide the greatest short term effectiveness and the least adverse impacts during construction of any shallow soil remedy. Excavation and Off-Site Disposal (SS-3) and On-Site Thermal Treatment (SS-4) would require a slightly longer timeframe to implement, and would pose some short term exposure risks during the excavation phase of construction. On-Site Thermal Destruction may pose additional exposure risks due to off-gassing of stockpiled material and if incomplete combustion occurs during treatment.

Deep Soils

No Action (DS-1) and Capping (DS-2) would provide little short term effectiveness because product-saturated soils would remain in contact with groundwater. Drywell Excavation (DS-3) would effectively address drywell contamination in the short term, but would create some exposure risks during excavation. Vacuum Extraction (DS-4) and Air Sparging (DS-5) would effectively remove volatile organics in an intermediate timeframe, with only minor increased exposure risks during implementation. Bioremediation technologies (DS-6) have variable short term effectiveness. In-situ biodegradation alone would be the least effective in the short term. Bioventing and Biosparging would provide better short term effectiveness due to the physical stripping of volatile organics. Exposure risks during implementation would be similar to those for vacuum extraction and air sparging.

On-Site Groundwater

No action (ON-1) would not provide any short term effectiveness. Because two recovery wells would capture contamination only in the CMB/BAF plume area, ON-2 would provide partial short term effectiveness. Three recovery wells (ON-3) would effectively contain on-site groundwater in the short term. Neither pump and treat alternative would pose significant risks during construction.

Off-Site Groundwater

No Action (OFF-1) would not be effective in the short term. All other off-site alternatives include extraction wells at the downgradient edge of the plume, and would therefore be equally effective at preventing contamination of downgradient water supplies in the short term. It is estimated that two years will be required for these wells to establish a hydraulic barrier to contain the plume.

For the remedial goal of restoring the aquifer, 12 extraction wells (OFF-3) would provide better short term effectiveness than 7 extraction wells (OFF-2) because a pore volume of water would be removed in four, rather than ten, years. Downgradient edge recovery (OFF-4) would provide less short term removal of contaminants because extraction wells would not be located in highly contaminated portions of the aquifer.

Implementability

Shallow Soils

No Action (SS-1) would be the simplest alternative to implement. Capping and Institutional Actions (SS-2) would be easy to implement because it requires conventional construction techniques and materials. Excavation and either Off-Site Disposal (SS-3) or On-Site Thermal Treatment (SS-4) would be more difficult to implement due to the need to phase the excavation schedule to minimize the disruption of fire training exercises. Due to the depth of excavation, extensive bracing and safety precautions would also be necessary.

Deep Soils

No Action (DS-1) would be easy to implement. Capping and Institutional Actions (DS-2) would be easy to implement because it requires conventional construction techniques and materials. Drywell Excavation (DS-3) would be more difficult to implement, as discussed above. Vacuum Extraction (DS-4) is a well developed technology that involves conventional equipment and installation techniques, and would be readily implementable. Air Sparging (DS-5) is a less developed technology that would require some pilot testing to properly design. Combined with conventional construction techniques and materials, this technical uncertainty would make air sparging moderately easy to implement. Bioremediation (DS-6) would require more extensive pilot testing during design. Although conventional construction techniques would be used, the innovative nature of Bioventing and Biosparging make this alternative the most difficult to implement.

On-Site Groundwater

No action (ON-1) would be the easiest alternative to implement. Two Well (ON-2) and Three Well (ON-3) Recovery alternatives would generally be equally easy to implement, due to the conventional materials and techniques involved. Some additional study will be necessary to properly design the injection wells required for alternative ON-3.

Off-Site Groundwater

No Action (OFF-1) would be the easiest alternative to implement. The remaining alternatives require installation of extraction wells, piping networks and a treatment system. These technologies are well developed, and of moderate complexity to construct due to the wide aerial extent of the required piping network through the Bethpage State Park. This complexity increases with the number of extraction wells to be connected to the treatment plant, and the volume of water to be recharged to groundwater. Therefore alternative (OFF-3) would be the most difficult off-site alternative to implement. Alternatives OFF-2 and OFF-4 would be relatively easy to implement.

Cost

Although cost is the last criterion evaluated, where two or more alternatives have met the requirements of the remaining criteria, cost effectiveness can be used as a basis for the final selection. Table 2 contains a summary of the estimated present worth costs of each alternative for a 30-year period, except where noted, using a discount factor of 6 percent. Deep soil treatment by vacuum extraction, air sparging and bioventing are estimated to require 10 years to reduce contaminant levels to achieve cleanup goals.

Although it is difficult to estimate the required duration of pump and treat systems to remediate groundwater, estimates of 3 to 10 extracted pore volumes are typically used for cost comparison. For Off-Site Groundwater alternatives, the time required to extract 3 pore volumes was used to develop present value cost estimates. This results in a 12 year project duration for OFF-3, and a 30 year duration for OFF-2 and OFF-4.

VII HIGHLIGHTS OF COMMUNITY PARTICIPATION

A Citizen Participation (CP) Plan was developed and implemented by Nassau County with the oversight and participation by NYSDEC. All work plans and reports were placed in document repositories in the vicinity of the site and were available for public review. A public contact list was developed and used to distribute fact sheets and meeting announcements. Press notices and press releases were distributed to local and regional media prior to major project milestones. Public meetings were held to update the community on remedial activities, and to solicit comment on the Proposed Remedial Action Plan for the site, as listed below:

August 31, 1989: Public meeting to present and receive comment on Interim Final RI/FS Work Plans.

December 21, 1992 - January 29, 1993: Public comment period on the Proposed Remedial Action Plan (PRAP).

January 12, 1993: Public meeting to present and solicit comment on the PRAP.

Inquiries and comments (written and verbal) were received and responded to throughout the course of the project. Comments received concerning the PRAP have been addressed and are documented in the Responsiveness Summary (Exhibit B). No written comments were received during the public comment period; only verbal comments were received during the public meeting. No commenters suggested that the proposed remedy should be modified.

VIII SELECTED REMEDY

Based on the results of the Remedial Investigation and a thorough analysis of the criteria for evaluation, DEC has selected the following remedy for the Nassau County Fire Training Center:

Shallow Soils
Capping and Institutional Actions (SS-2)

Deep Soils
Bioventing (DS-6)

On-Site Groundwater
Pump and Treat in CMB/BAF/MUF areas (ON-3)

Off-Site Groundwater
Pump and Treat - 12 Wells (OFF-3)

Capping shallow soils, combined with deed restrictions on the FTC property, will prevent future human exposure to site contaminants, and will minimize the future release of contaminants to groundwater. Although this alternative does not reduce the toxicity or volume of waste through treatment, it has less short term risk, better implementability, and lower costs than the other shallow soil treatment alternatives. Because SS-2 provides nearly equivalent protection of health and the environment as the other alternatives, DEC believes that Capping and Institutional Actions provides the best balance of trade-offs among evaluation criteria.

Nassau County will be required to record a Notice of Covenants and Restrictions on the property deed, subject to DEC and DOH approval, that will require notification and approval of any activity that could potentially result in disturbance of or contact with contaminated soils or any change in the use of the site.

Despite its technical uncertainty and difficulty of implementation, DEC believes that bioremediation, particularly bioventing, offers significant advantages over other deep soil alternatives. Bioremediation is the only single alternative that can potentially address both volatile and semivolatile contaminants in the drywell and product-saturated soil areas. Although a combination of Drywell Excavation (DS-3) Vacuum Extraction (DS-4) could provide similar protection with proven technology, the resulting short term exposure and costs make this unattractive. Bioremediation fulfills DECs preference for permanent destruction of contaminants and the use of innovative technologies in remediating sites. If the bioremediation aspect of this alternative does not perform acceptably, the Department will use the vacuum extraction portion of the bioventing technology to provide reliable removal of volatile organic contaminants. Some sparging of shallow groundwater may be necessary to provide sufficient moisture in the unsaturated zone to maximize soil microbe activity. Therefore, sparging may be implemented to optimize the bioventing process, but not for the purpose of remediating shallow groundwater contamination. On-site groundwater will be collected and treated as a source control measure, and any soil contamination that is not addressed by bioventing will be captured if it should enter groundwater. Excavation of the top few feet of certain drywells may be required to remove fine-grained deposits and enhance infiltration of nutrients. Excavated material will be disposed off-site in compliance with applicable regulations.

For on-site groundwater, DEC has selected three extraction wells (ON-3) to collect all contaminated groundwater on the FTC. Although this results in slightly higher cost and difficulty in implementation, all other evaluation criteria favor this remedy. Treated water will be discharged to a combination of an on-site recharge basin and on-site injection wells. The existing on-site storage basin will require rehabilitation to function as a recharge basin. During this rehabilitation, the Department will investigate whether past releases to the basin warrant remediation of contaminated soils. DEC will attempt to have the infiltration wells required for this remedy designed as nutrient injection wells for deep soil bioremediation. A representative treatment technology, consisting of metals precipitation, air stripping (with emission controls), sand filtration, and activated carbon adsorption, was chosen for treatment of extracted groundwater. If the Remedial Design shows that an alternative treatment scheme provides equivalent performance and is more cost-effective than this representative technology, the treatment system will be modified.

For off-site groundwater, DEC believes that the better short and long term performance of 12 extraction wells (OFF-3) outweighs their higher cost and difficulty of implementation. Due to the large flow of groundwater for treatment, this alternative is only feasible if a recharge basin is available for discharge of treated water. If a basin cannot be secured for discharge, the Department will implement alternative OFF-2 (7 wells) as a contingent remedy. OFF-2 provides the next best level of protection of public health and the environment and compliance with Standards, Criteria and Guidance. Discharge for the contingent remedy would be by injection wells, which is only feasible for the lower flow rate of OFF-2.

The representative treatment technology chosen for off-site groundwater is air stripping and, if necessary, air emission controls. As with the on-site representative treatment, if an alternative technology offers equivalent performance at lower cost, the proposed technology will be modified during design. Estimates of air emissions from the air stripper will be evaluated to determine whether an emission control device is necessary to meet regulatory requirements.

A long-term groundwater monitoring program will be developed and implemented to evaluate the effectiveness of groundwater remediation, to monitor the presence groundwater contaminants in presently unaffected aquifer zones, and to protect downgradient public water supply wells.

Contaminant removal for the selected pump and treat remedy will be enhanced, if necessary, during operation of the system by varying extraction rates, instituting a pulsed pumping schedule and installing additional extraction wells. The operation of the selected extraction system and the goals of the groundwater remediation will be periodically re-evaluated based on monitoring the system performance. This approach is consistent with recent EPA and DEC groundwater remediation strategy documents.

The effectiveness of this remedy will be evaluated throughout the operation of the system, to determine whether any modification to the system is necessary to achieve the remedial goal. Periodic monitoring will also be used to re-assess the time frame and technical practicability of achieving cleanup standards. Because contaminated soils will remain on site in an untreated state, a review will be conducted no later than five years after completion of construction of the remedial action, and every five years thereafter, to ensure that the remedy continues to provide adequate protection of human health and the environment.

The cost of each component of the remedy is estimated to be:

Contaminated Medium	Capital Cost	Annual Cost
Shallow Soil	$ 150,000	$ 7,000
Deep Soil	$ 1,770,000	$ 408,000
On-Site Groundwater	$ 4,362,000	$1,272,000
Off-Site Groundwater	$ 7,762,000	$ 847,000

Based on the estimated duration for bioventing (10 years), off-site pumping (12 years) and on-site pumping (30 years) the total present value of the remedial program is $41,752,000.

The selected remedy for each contaminated medium meets the threshold criteria for remedy selection and provides the best balance of trade-offs among alternatives with respect to the primary balancing criteria. The selected remedy is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. A list of Standards, Criteria and Guidance that are applicable or relevant and appropriate to the remedial action are presented in Table 1. The selected remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

TABLE 1

STANDARDS, CRITERIA AND GUIDANCE FOR THE REMEDIAL ACTION

ACTION-SPECIFIC SCGs

6 NYCRR 50:	National Primary and Secondary Ambient Air Quality Standards
6 NYCRR 182:	Endangered and Threatened Species of Fish & Wildlife
6 NYCRR 200:	General Air Provisions
6 NYCRR 201:	Air Permits and Certificates
6 NYCRR 211:	General Prohibitions
6 NYCRR 212:	General Process Emission Sources
6 NYCRR 257:	Air Quality Standards
6 NYCRR 364:	Waste Transporter Permits
6 NYCRR 370:	Hazardous Waste Management System - General
6 NYCRR 371:	Identification and Listing of Hazardous Waste
6 NYCRR 372:	Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities
6 NYCRR 373:	Hazardous Waste Management Facilities
6 NYCRR 373-1:	Hazardous Waste Treatment, Storage and Disposal Facility Permitting Requirements
6 NYCRR 375:	Inactive Hazardous Waste Disposal Site Remedial Program

CHEMICAL-SPECIFIC SCGs

USEPA Safe Drinking Water Act (SDWA), MCLs and MCLGs (40 CFR Part 141)
6 NYCRR parts 700-705: NYSDEC Water Quality Regulations for Surface and Groundwaters
10 NYCRR Subpart 5-1: NYSDOH Maximum Contaminant Levels, Public Water Supplies
NYSDEC Air Guide 1 (1991 Printing) - Guidelines for the Control of Toxic Ambient Air Concentrations
NYSDEC Technical and Operational Guidance Series (TOGS)

LOCATION-SPECIFIC SCGs

6 NYCRR Parts 662-665: Freshwater Wetlands Regulations
National Historic Preservation Act (16 USC 470-470 et seq.)

TABLE 2

ESTIMATED COSTS OF REMEDIAL ALTERNATIVES

Shallow Soils

	Capital Cost	Annual O & M Cost	Total Present Value
SS-1	$ 0	$ 0	$ 0
SS-2	$ 150,000	$ 7,000	$ 246,000
SS-3	$ 2,978,000	$ 0	$ 2,978,000
SS-4	$ 2,440,000	$ 0	$ 2,440,000

Deep Soils

	Capital Cost	Annual O & M Cost	Total Present Value
DS-1	$ 0	$ 0	$ 0
DS-2	$ 150,000	$ 7,000	$ 246,000
DS-3	$ 9,423,000	$ 0	$ 9,423,000
DS-4	$ 524,000	$ 165,000	$ 1,738,000*
DS-5	$ 1,390,000	$ 300,000	$ 3,598,000*
DS-6	$ 1,770,000	$ 408,000	$ 4,773,000*

* - Based on 10 year operation

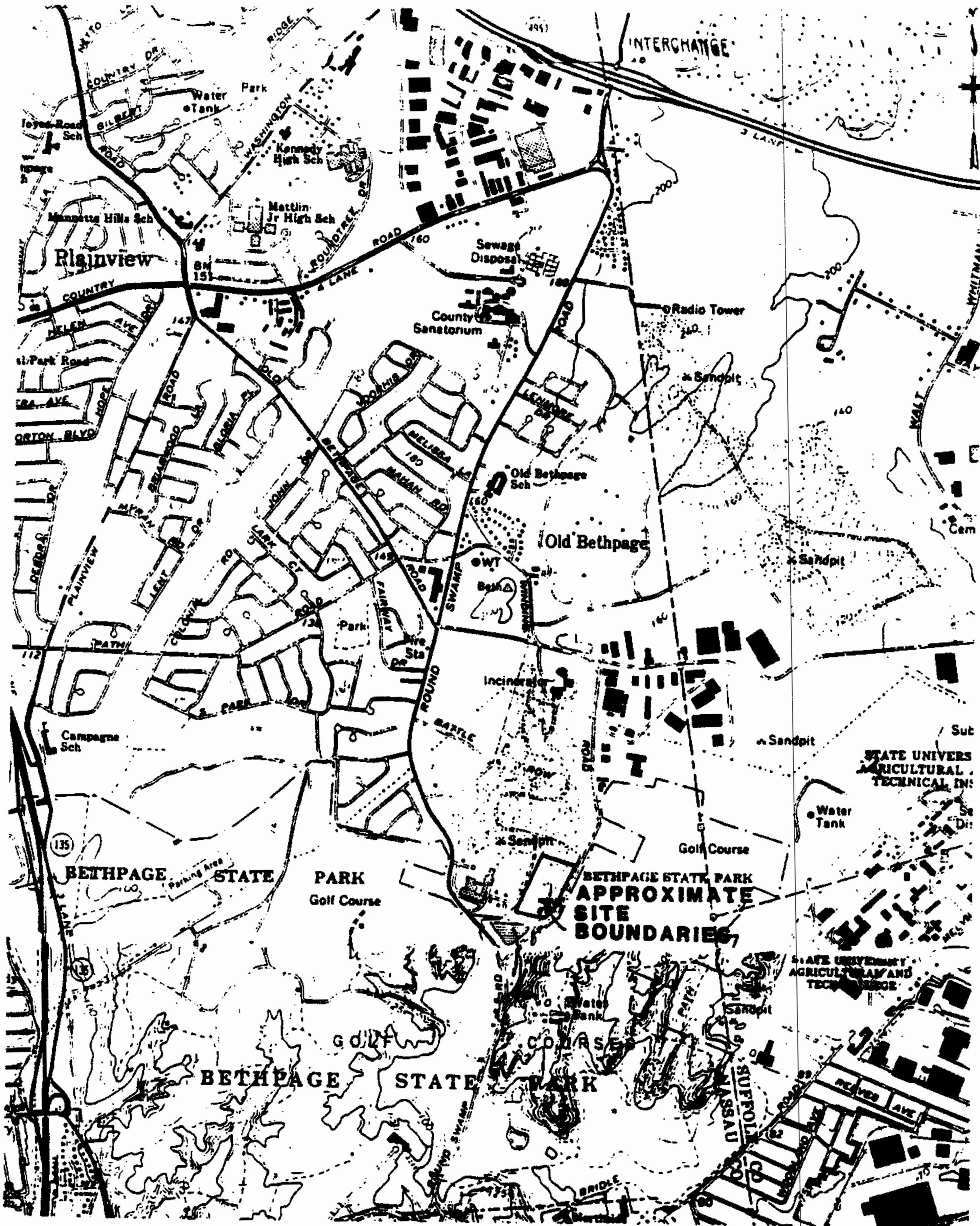
On-Site Groundwater

	Capital Cost	Annual O & M Cost	Total Present Value
ON-1	$ 0	$ 0	$ 0
ON-2	$ 4,266,000	$ 1,144,000	$ 20,013,160
ON-3	$ 4,362,000	$ 1,272,000	$ 21,871,080

Off-Site Groundwater

	Capital Cost	Annual O & M Cost	Total Present Value
OFF-1	$ 0	$ 0	$ 0
OFF-2	$ 6,313,000	$ 710,000	$ 16,085,000
OFF-3	$ 7,762,000	$ 847,000	$ 14,862,000*
OFF-4	$ 5,989,000	$ 662,000	$ 15,101,000

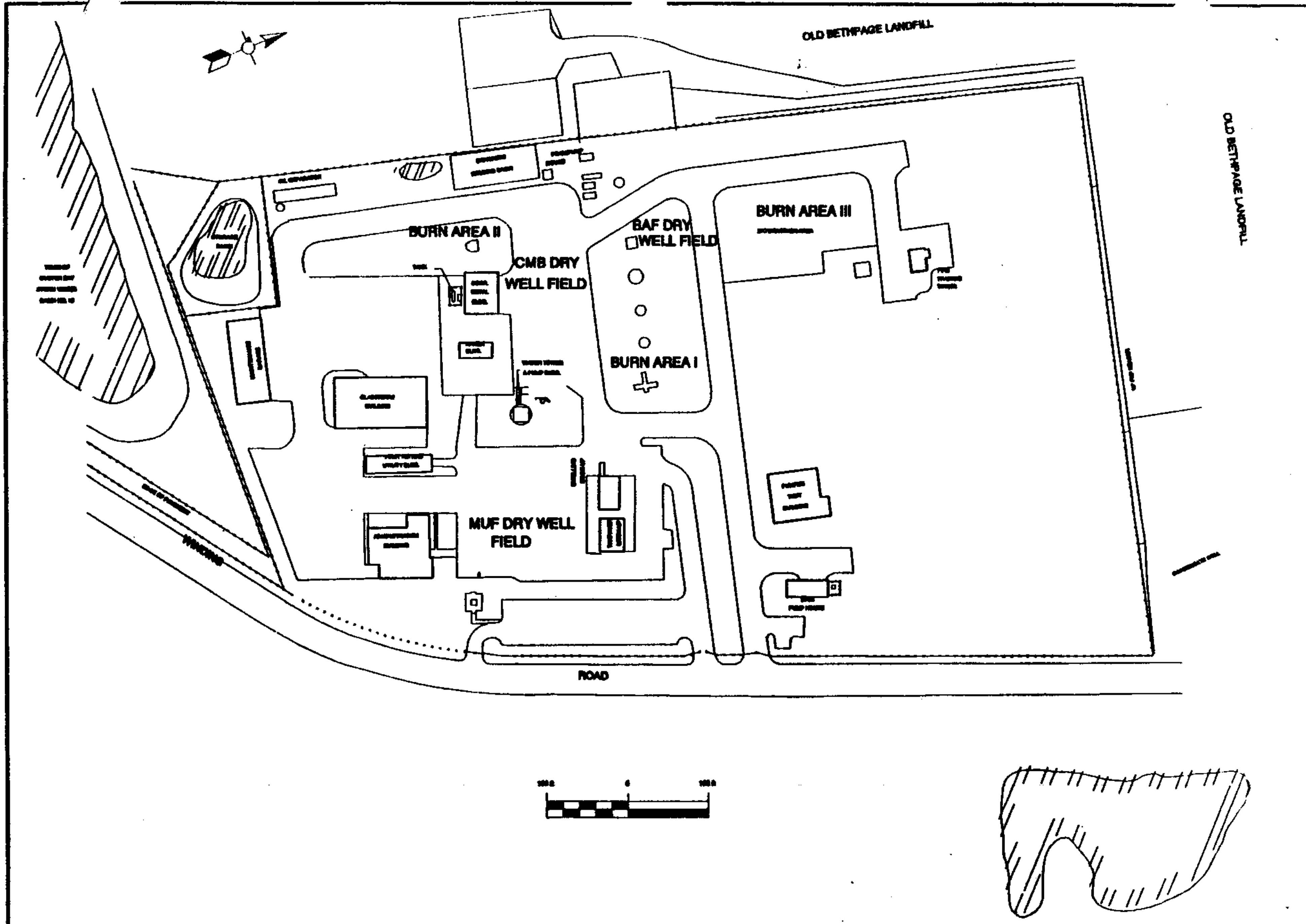
* - Based on 12 year operation



SCALE

0 2000 4000 FT

MALCOLM PIRNIE	COUNTY OF NASSAU DEPARTMENT OF PUBLIC WORKS FIREMEN'S TRAINING CENTER **SITE LOCATION MAP**	MALCOLM PIRNIE, INC. FIGURE 1



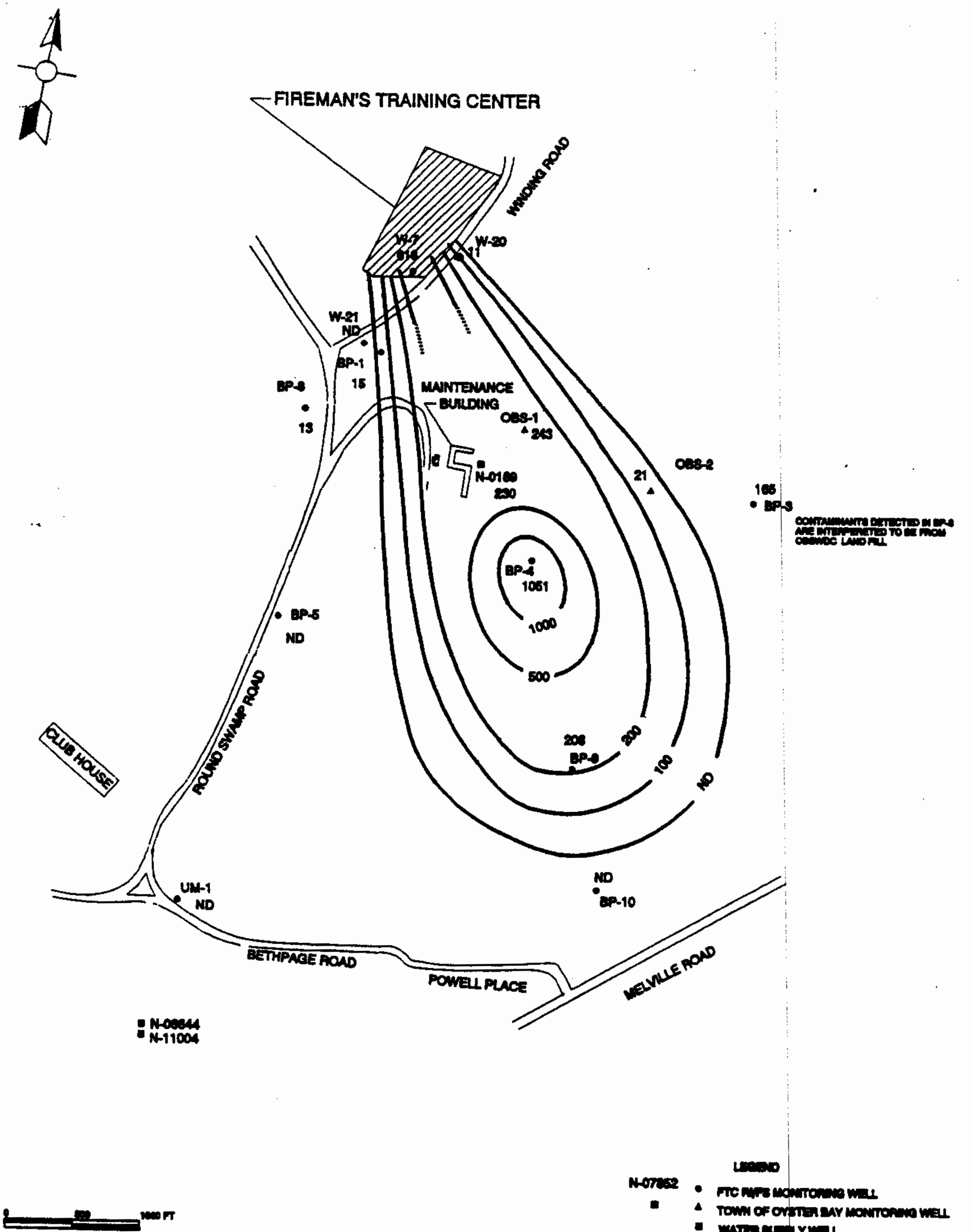
MALCOLM PIRNIE

NASSAU COUNTY FIREMAN'S TRAINING CENTER

FACILITY PLAN

MALCOLM PIRNIE, INC

FIGURE 2



MALCOLM PIRNIE

NASSAU COUNTY FIREMANS TRAINING CENTER
ISOCONCENTRATION MAP OF B-ZONE
TOTAL VOLATILE ORGANIC COMPOUNDS
DOWN GRADIENT OF THE FTC
JANUARY AND FEBRUARY, 1992

MALCOLM PIRNIE, INC.

FIGURE 3

EXHIBIT A

ADMINISTRATIVE RECORD

- Order on Consent (February 9, 1989)
- Response to Section IV of the Consent Order Pertaining to the Nassau County Fireman's Training Center (April 1989), Addendum A (July 1989)
- Remedial Investigation/Feasibility Study Work Plan (July 1989)
- Quality Assurance Project Plan (July 1989)
- Health and Safety Plan for the Nassau County Fireman's Training Center (Revised January 1989)
- Gasoline and Solvent Contamination Plume Vacuum Extraction System Pilot Test Work Plan (November 1990)
- Bench Testing for Inorganics Removal (Memorandum Report; January 9, 1991)
- Analysis of Off-Site Groundwater Data, Supplemental RI Investigation (March 1991)
- Fireman's Training Center Vacuum Extraction System Pilot Test (September 1991)
- Remedial Investigation Report (September 1992)
- Endangerment Assessment Report (November 1992)
- Feasibility Study Report (December 1992)
- Proposed Remedial Action Plan (December 1992)
- Public Meeting Transcript (January 12, 1993)

EXHIBIT B

NASSAU COUNTY FIRE TRAINING CENTER RESPONSIVENESS SUMMARY

The questions and comments presented below were raised during the January 12, 1993 public meeting. No written comments were received during the public comment period.

Question: Was the Bethpage State Park maintenance area investigated as a potential contaminant source area?

Response: A groundwater monitoring well was installed in the maintenance area as part of the Supplemental Remedial Investigation. Sampling data from that well indicated that the Park maintenance area was not a source of contamination.

Question: Has the remedy been proposed with consideration to the remedial program underway at the adjacent Old Bethpage Landfill? Will design of the Fire Training Center remedy be coordinated with the on-going remedial program at the landfill?

Response: From a legal and technical standpoint, the remedy was selected and will be designed with consideration to the landfill remedial program. Some monitoring wells downgradient of the Fire Training Center showed an influence from the landfill plume extraction wells, so the location and design of the FTC extraction wells must clearly be coordinated with the landfill extraction system.

Question: What inorganic constituents are migrating on to the FTC property from the landfill, and if they are heavy metals, has stabilization been considered as a treatment method?

Response: The inorganics migrating from the landfill are primarily ordinary landfill contaminants, such as iron, manganese and chloride. Only trace levels of heavy metals such as lead, chromium, and cadmium were detected, and therefore stabilization was not considered as part of the remedy.

Question: How new is the bioremediation technology, and does it work on cadmium and chromium?

Response: Bioremediation as a general technology has been extensively implemented in sewage treatment plant operations and in the treatment of petroleum-contaminated soils. The specific technology of in-situ bioventing, which is proposed for the FTC, is relatively new, and is just beginning to be installed at contaminated sites. Bioremediation does not work on heavy metals, but as previously discussed, heavy metals are not a concern at the site.

<u>Question:</u> Has there been any study of the residential area to the north of the site, and what were the results?

<u>Response:</u> Because groundwater in the area flows to the southeast, residential areas to the north should not be in the path of contamination. A monitoring well was installed upgradient of the site along Round Swamp Road, and it did not show any detectable levels of contaminants.

<u>Question:</u> Will this remedy eliminate the risk of cancer from contact with contaminated soils and drinking contaminated water?

<u>Response:</u> It should be emphasized that the estimated risks from contaminants at the site are potential future risks from theoretical excavation of soils and ingestion of groundwater. Because exposure to contaminated soils and groundwater is not presently occurring, there is no current cancer risk from site contaminants. Because the remedy will ensure that future exposures will not occur, it will prevent future cancer risks due to site-related contaminants.

<u>Question:</u> What is the schedule for completing the Remedial Design and breaking ground on construction of the remedy?

<u>Response:</u> Once the Record of Decision is signed in late February 1993, design of the remedy will take place during summer and fall 1993, with bids for construction to be let in winter 1993. Construction will take place in early spring 1994. Some components of the remedial program will move more quickly than others. Capping on-site soils is a relatively simple remedy to design and construct, and may be constructed earlier than the bioventing and pump and treat systems, which are more difficult to design.

<u>Question:</u> Is this the first remediation project of this magnitude taking place on Long Island, or have others been done before?

<u>Response:</u> Several large-scale cleanups are proposed or underway on Long Island. Multi-million dollar groundwater cleanups are underway at the Purex site in Mitchell Field, and at the neighboring Old Bethpage Landfill. Similar programs are proposed for the Islip and Babylon Landfills in Suffolk County.

<u>Question:</u> How will this remedy affect future use of the property, and will it continue to operate as a fire training facility?

<u>Response:</u> The remedy for the site should not affect on-going training activities at the site, nor the proposed expansion plans. Some restrictions will be placed on excavation in contaminated soil areas, but this should not affect training exercises.

Question: Will training activities be modified so that further contamination does not occur?

Response: The site improvements made in the early 1980's have eliminated on-going releases of contaminants from fire fighting exercises. Contaminated soils at the site are a result of past activities, particularly the acceptance of donated solvents, which was stopped in 1980.

Question: Have changes in weather patterns and flooding been considered in the selection and design of the site remedy?

Response: Proposed site improvements have been designed to address the flooding that occasionally occurs at the site. Longer term climate changes, which may affect regional groundwater levels, will be incorporated as contingencies in design of the groundwater extraction systems. For example, if water levels retreat sufficiently to make product recovery feasible, skimming devices will be installed in on-site recovery wells.

Question: Will the cleanup process be regulated to protect on-site workers?

Response: The remediation process will take place with an approved Health and Safety Plan to protect on-site workers and the surrounding community. This plan will comply with Occupational Health and Safety Administration (OSHA) regulations.

Question: Have vendors been selected for the design and construction phase of the project?

Response: No. A Request for Proposals will be sent out, shortly after the Record of Decision is signed, to solicit proposals for the design and construction work.

Question: Will the cost of this cleanup come out of the Nassau County or Town of Oyster Bay budget, or both?

Response: Approximately 25% of project costs will come out of the Nassau County budget, with the remaining 75% funded by New York State under the Environmental Quality Bond Act of 1986.

DECLARATION OF THE RECORD OF DECISION

SITE NAME AND LOCATION

Nassau County Fire Training Center
Town of Oyster Bay
Nassau County, New York
Site Code: 130042
Funding Source: 1986 Environmental Quality Bond Act

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Nassau County Fire Training Center inactive hazardous waste disposal site which was chosen in accordance with the New York State Environmental Conservation Law (ECL) and consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 USC Section 9601, et., sec., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). Exhibit A identifies the documents that comprise the Administrative Record for the site and includes the final Remedial Investigation and Feasibility Study (RI/FS) reports. The documents in the Administrative Record are the basis for the selected remedial action.

ASSESSMENT OF THE SITE

Actual or threatened release of hazardous waste constituents from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present a current or potential threat to public health and the environment.

SUMMARY OF REMEDY SELECTION

Based upon the results of the RI/FS for the Nassau County Fire Training Center and the criteria for selecting a remedy, the New York State Department of Environmental Conservation (NYSDEC) has selected a remedy consisting of an asphalt/concrete cap with institutional controls for shallow soils, bioventing of deep soils, pumping and treating on-site groundwater using three extraction wells, and pumping and treating off-site groundwater using twelve extraction wells.

The existing asphalt and concrete pavement will be extended over all areas of shallow soil contamination to prevent casual contact with contaminants. Deed restrictions will control future uses of the property, and will ensure notification of and approval by NYSDEC and NYSDOH if excavation into contaminated areas occurs. Bioventing, an innovative technology, will be attempted as a permanent remedy for both volatile and semivolatile contaminants found in deep soils. If bioventing is unsuccessful, vacuum extraction of volatile contaminants is retained as a contingent remedy. On-site and off-site groundwater will be extracted, treated on-site, and recharged to groundwater in compliance with discharge standards. If a recharge basin cannot be accessed to accept the flow from off-site extraction wells, a contingent remedy involving extraction from seven wells, treatment, and discharge to reinjection wells will be implemented. A long-term groundwater monitoring program will be implemented to evaluate the performance of the remedial action, and to protect nearby public water supplies.

DECLARATION

The selected remedy is protective of human health and the environment, complies with State and Federal Standards, Criteria and Guidance (SCGs) that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. Waivers are justified for SCGs that will not be met. This remedy utilizes permanent solutions and innovative technologies to the maximum extent practicable, and satisfies the statutory preference for treatment as a principal element.

Because contaminated soils will remain on site in an untreated state, a review will be conducted no later than five years after completion of construction of the remedial action, and every five years thereafter, to ensure that the remedy continues to provide adequate protection of human health and the environment.

February 26, 1993
Date

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