100046

DECLARATION STATEMENT
RECORD OF DECISION
Area D - Jet Fuel Farm
FAA Technical Center

FACILITY NAME AND LOCATION

FAA Technical Center, Atlantic County
Atlantic City International Airport, New Jersey

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for Area D, the Jet Fuel Farm at the FAA Technical Center, Atlantic City International Airport, New Jersey. The remedial action was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Contingency Plan (NCP). This decision is based on the administrative record for Area D.

Both the United States Environmental Protection Agency, Region II Acting Administrator and the Commissioner of the New Jersey Department of Environmental Protection concur with the selected remedy (See Appendices C and D).

ASSESSMENT OF THE AREA

Releases of hazardous substances from this area, if not addressed by implementing the response action selected in this Record of Decision, may present a current or potential threat to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

The selected action addresses the principal threat to Area D water table by treating contaminated soils and groundwater. The selected remedy for Area D includes the following components:

- Free product extraction and off-site cement kiln incineration.
- Groundwater extraction and addition of nutrients for subsequent re-injection and in situ biodegradation of volatile organic compounds (VOCs).
- soil venting, a system which extracts gas from the soil pore space.

- use of off-gas treatment unit for off-gas from soil venting, consisting either of a catalytic incinerator for combustion of VOCs to carbon dioxide and water, or activated carbon adsorption of VOCs.

STATUTORY DETERMINATIONS

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. The remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable and satisfies the statutory preference for remedies that enjoy treatment that reduces toxicity, mobility or volume of hazardous substances, pollutants, and contaminants as a principal element.

9/29/89

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(Date)

DECISION SUMMARY
RECORD OF DECISION
Area D - Jet Fuel Farm
FAA Technical Center

SITE DESCRIPTION

The FAA Technical Center encompasses an area of approximately 5,000 acres in Atlantic County, New Jersey, 8 miles northwest of Atlantic City. A location map is provided in Figure 1.

Among the installations on the property are the Atlantic City International Air Terminal, the New Jersey Air National Guard 177th Fighter Interceptor Group, the Upper Atlantic City Reservoir, the Laurel Memorial Park Cemetery and the extensive facilities of the FAA Technical Center. Atlantic City's municipal water supply is provided by nine groundwater supply wells located just north of the Upper Atlantic City Reservoir on FAA property as well as by water drawn directly from the Atlantic City Reservoirs. The reservoirs are fed by the North and South Branches of Doughty's Mill Stream, which traverse portions of the Technical Center grounds. The public water supply facilities on-site are owned by the Atlantic City Municipal Utilities Authority (ACMUA).

The FAA Technical Center is located within the Atlantic Coastal Plain, a broad, flat plain which encompasses the southern three-fifths of New Jersey. The area within two miles of the Center has a maximum relief of about 60 feet, ranging from an elevation of 10 feet above mean sea level (AMSL) at the lower Atlantic City Reservoir to 70 feet AMSL to the west and north of the airport. The Facility itself is relatively flat; slopes generally range from 0 to 3 percent. Forested areas exist north, south and east of the airport runways. These areas comprise about 40% of the 5,000 acre FAA property. The remaining 60% of the site has been cleared for FAA facilities and consists of buildings and paved surfaces, grassed lawns and native grassland and shrubs adjacent to the runways.

The area within one mile of the Technical Center boundaries includes open or forested land and commercial and residential areas. A large forested tract containing no commercial or residential property exist west of FAA. To the east, the property is bordered by the Garden State Parkway, the Atlantic City Reservoir, and the forested land surrounding the reservoir. The area north of the Center contains commercial properties along the White Horse Pike (Rt. 30) and a concentrated residential area, Pomona Oaks, north of the White Horse Pike. The closest residential area south of the Center is a series of three trailer parks at the intersection of Tilton Road and Delilah Road. The majority of commercial and residential areas south of the Center are greater than 2,000 feet away from the FAA property, south of the Atlantic City Expressway. All residential areas in the vicinity of FAA appear to be upgradient or otherwise isolated from the groundwater flow at the Technical Center.

Area D - Jet Fuel Farm is located near the juncture of the access roads to the Atlantic City International Terminal and the Technical Center's Technical/Administrative Building. Area D is currently used for the storage of jet fuel in two 420,000-gallon aboveground bermed tanks. Prior to 1972, fuel was stored in two 567,000-gallon underground storage tanks which are currently clean and empty. A plan for Area D is provided in Figure 2.

SITE HISTORY AND ENFORCEMENT ACTIONS

The first significant development of what is now FAA property came during the 1930s when the Atlantic City Reservoir was created by damming the South Branch of Doughty Mill Stream. Prior to 1942, the entire property was wooded, except for the presence of large borrow pits near the present-day Research and Development (R&D) facilities. On a 1940 aerial photograph several dirt roads and what appeared to be a railroad right-of-way traversed the property. In 1942 a Naval Air Base, including most of the existing runways, was constructed over much of the eastern two-thirds of the property. Many of the buildings in the western built-up area were also constructed at this time. In 1958, the Navy transferred its interests to the Airways Modernization Board (AMB).

The Federal Aviation Administration took over the operations of the AMB in November 1958. The early 1960s saw the development of most of the R&D portion of the Facility south of the Atlantic City Reservoir. The FAA's large Technical/Administrative Building was constructed in 1979. The New Jersey Air National Guard has maintained their facilities at the north end of the built-up area since 1973.

Initial Investigations:

In 1983 the New Jersey Department of Environmental Protection directed Weston to conduct an assessment of potential pollution sources that could impact the then-proposed Atlantic City Well field. The assessment included a review of all data on possible contaminant sources in the area, limited field investigation of these sources, and soil and groundwater sampling at the five areas considered most threatening to groundwater supplies in the area. The entire FAA Technical Center was included in the Weston Study, and the five areas identified by Weston were all located on the FAA property. Weston's report led the FAA to initiate the present Environmental Investigation/Feasibility Study, and the five areas identified by Weston have been investigated further, along with additional areas identified by the FAA.

Environmental Investigation/Feasibility Study:

Area D is one of the additional areas identified by the FAA subsequent to the Weston Study. Several potential sources of soil and groundwater contamination exist at Area D (see Figure 2). Both the in-use aboveground and out-of-use underground jet fuel tanks, and their associated valves and piping are the most obvious potential sources of contamination at Area D. Plans of the two abandoned underground storage tanks indicate that there is a dry well associated with each of the tanks. No specific information regarding the purpose of these dry wells is available.

An active dry well was associated with the fuel/water separators adjacent to the truck fill stand, where fuel is pumped from the two above-ground tanks into fuel trucks. The fuel/water separators are located in an underground vault. Spillage of fuel occurred when filters were changed on the separator. Waste liquids in the vault collected in a sump and were pumped to a dry well a 30 feet to the south. Waste liquids within the dry well infiltrate into the surrounding soils. The sump pit, its associated piping and the dry well were decommissioned in 1985 and are no longer in use.

A surface spill of fuel occurred on the grassy area south of the fuel fill stand in 1982. One truckload of visibly contaminated soil from this area was removed shortly after the spill occurred. An additional area where surface spillage may have occurred exists adjacent to the west edge of the driveway across from the fuel fill stand where trucks occasionally park for short periods of time.

The FAA's Environmental Investigation (EI) was conducted in two phases between December 1986 and December 1988. The most significant environmental problem identified during the EI is a hydrocarbon (JP-4 jet fuel) plume floating on the water table. As an interim remedial measure, product recovery pumps were installed between August 1988 and March 1989 in three on-site wells. Product is currently being extracted and transported off-site for incineration at a cement kiln incinerator.

In June 1989, the Risk Assessment and Feasibility Study (FS) for Area D were distributed to USEPA, Region II, Emergency and Remedial Response Division and New Jersey Department of Environmental Protection (NJDEP), Bureau of Federal Case Management for their review. The Proposed Remedial Action Plan was finalized by the FAA and approved by the above mentioned agencies on August 4, 1989, initiating a 32 day public comment period.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Area D Proposed Remedial Action Plan (PRAP) was issued to interested parties on August 4, 1989, on the same day that a newspaper notification inviting public comment on the EI/FS and PRAP appeared in the Atlantic City Press. The public comment period was held from August 4 to September 5, 1989. The newspaper notification also identified the Atlantic County Library as the location of the Information Repository.

A public meeting was held on August 30, 1989. At this meeting, representatives from the FAA, TRC Environmental Consultants, Inc., USEPA and NJDEP were available to answer questions about Area D and the remedial alternatives under consideration. A list of attendees is attached (See Appendix B).

A response to the comments received during this period is included in the Responsiveness Summary, which is part of this Record of Decision. This decision document presents the selected remedial action for Area D of the FAA Technical Center in Atlantic County, New Jersey, chosen in accordance with CERCLA, as amended by SARA and, to the extent practicable, the NCP. The decision for Area D is based on the administrative record.

SCOPE AND ROLE OF RESPONSE ACTION

The remedial action described herein addresses the environmental problems associated with Area D, the Jet Fuel Farm.

SUMMARY OF AREA CHARACTERISTICS

Area D contamination appears to be entirely attributable to on-site jet fuel. The specific source of contamination at Area D have not been identified. Subsurface jet fuel contamination could be associated with the aboveground and underground jet fuel storage tanks, associated valves, piping and dry wells, or the truck loading stand. Areas of identified surface soil contamination mirror areas of historic surface spills.

The media of concern at Area D include the floating free product, contaminated soil, and contaminated groundwater. The lateral and vertical extents of the free-phase and dissolved hydrocarbon plumes at Area D have been well-defined. The floating hydrocarbon plume is elongated in a northwest-southeast orientation parallel to the direction of groundwater flow and is approximately 550 feet long by 300 feet wide (see Figure 3). True product thicknesses within the formation is estimated to be 3 to 5 feet. The total volume of spilled free product at the site has been calculated to be 360,000 gallons based on estimated true product thicknesses and the known area where free product is present. The actual volume of free product could differ significantly from this estimate.

The thickest accumulations of floating product occur in wells close to the filter bank dry well, suggesting a source in that area. However, mounding of the top of the free product layer 50 feet to the north indicates that the source may be associated with underground piping leading to the nearby fuel fill stand and that the area of thickest accumulation is actually downgradient of the source. The Jet Fuel Farm will be closed within the next year, when the NJ Air National Guard activates their new Fuels Facility. All on-site fuel storage activities will be discontinued, thus eliminating any source which may be presently contributing to the problem.

Monitoring wells within several hundred feet of the downgradient edge of the floating hydrocarbon plume were not found to contain detectable concentrations of the organic constituents which make up jet fuel. The absence of these dissolved constituents suggests that the dissolved hydrocarbon plume is moving at approximately the same rate as the free product plume. Benzene and ethylbenzene were detected in two wells northeast of the plume. These constituents may be related to the floating hydrocarbon plume but are more likely associated with leakage or spills associated with the operation of the two large underground tanks which were abandoned in 1972. Despite a light downward vertical gradient at Area D, neither of the two deep (94 feet) wells at Area D has been impacted by the presence of the hydrocarbon plume in the shallow aquifer.

Two hot spots of surface soil contamination in areas of known or suspected fuel spills have been identified. These areas include an area south of the fuel/water separator dry well, where a spill occurred in 1983, and an area west of the fuel fill stand at a truck turning point. Subsurface soil contamination was identified by high total petroleum hydrocarbon concentrations detected in subsurface soil samples. The maximum petroleum hydrocarbon concentration detected in surface soils was 284 parts per million (ppm), while 18,500 ppm was the highest level detected in subsurface soils. The one subsurface soil sample analyzed for priority pollutants exhibited a total volatile organic compound concentration of less than 1 ppm.

The areal and vertical extent of surface and subsurface soil contamination was approximated using analytical results, product thickness estimates and subsurface soil headspace readings. The total volume of contaminated soil was estimated to be 33,000 cubic yards.

Groundwater contaminants consist of volatile organics, base neutrals and metals. Most of the organic contaminants detected are identical to the major components of jet fuel. The inorganic contaminants are thought to be attributable to suspended solids in the unfiltered groundwater samples. The major organic compounds and their maximum detected concentrations include benzene at 4,000 parts per billion (ppb), toluene at 3,100 ppb and naphthalene at 1,000 ppb. Contaminated groundwater volumes were based on the presence of benzene at levels exceeding the New Jersey Maximum Contaminant Level (MCL) of 1 ppb. The total volume of contaminated groundwater is estimated to be 13.3 million gallons.

SUMMARY OF SITE RISKS

A baseline risk assessment was conducted for Area D and is presented in a document entitled, Baseline Risk Assessment, Site D Jet Fuel Farm (TRC, June 1989). The risk assessment consisted of hazard identification, a dose-response evaluation, exposure assessment and risk characterization.

Selection of Contaminants of Concern

The hazard identification involved the selection of contaminants of concern (COCs), detected contaminants which have inherent toxic/carcinogenic effects that are likely to pose the greatest concern with respect to the protection of public health and the environment. Selected contaminants of concern at Area D included:

Volatile Organic Contaminants

* Benzene
* Toluene
* Ethylbenzene
* Xylene

Base/Neutral and Acid Extractable Compounds

* Naphthalene
* Phenol
* 2-Chlorophenol

Metals

* Chromium
* Nickel
* Lead

The media in which these contaminants were detected and associated concentrations are summarized in Table 1.

Dose-Response Evaluation

The dose-response evaluation presented available human health and environmental criteria for the contaminants of concern, and related the chemical exposure (dose) to expected adverse health effects (response). Included in this assessment are the pertinent standards, criteria, advisories and guidelines developed for the protection of human health and the environment. An explanation of how these values were derived and how they should be applied is presented below.

Cancer potency factors (CPFs) have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPFs, which are expressed in units of $(mg/kg/day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg/day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper-bound" reflects the conservative estimate of the risks calculated from the CPF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Cancer potency factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg/day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects of humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur.

The Office of Research and Development (ORD) has developed Health Effects Assessments (HEAs) for 58 hazardous substances. The intent of these assessments is to suggest an acceptable exposure level whenever sufficient data are available. These values reflect the relative degree of hazard associated with exposure to the chemical addressed.

When possible, two categories of maximum dose tolerated (MDT) have been estimated for systemic toxicants. The first, the "Acceptable Intake Subchronic" (AIS), is an estimate of an exposure level that would not be expected to cause adverse effects under subchronic exposure. Limited information is available on subhcronic exposure because efforts have been directed primarily to lifetime exposures. Subchronic human data are rarely available. Reported exposures are usually from chronic, occupational exposure situations, or from reports of acute accidental exposure. If data are available to estimate a chronic exposure, the subchronic exposure is also based on this data, with an uncertainty factor applied.

The "Acceptable Intake Chronic" (AIC) is similar to the concept of the Reference Dose (RfD) previously discussed. It is an estimate of an exposure level which would not be expected to cause adverse effects when exposure occurs for a significant portion of the life-span. As with the RfD, the AIC does not reflect the carcinogenic properties of the contaminant since it is assumed, correctly or incorrectly, that there is no acceptable intake level for carcinogens. The AIC is also considered to be route specific, thus it estimates the acceptable exposure for a given route with the implicit assumption that exposure via other routes is insignificant.

AIC and AIS values are generally derived from animal studies to which uncertainty factors have been applied. AIC and AIS values are expressed both in terms of human intake (mg/kg/day) and ambient concentration (e.g., mg/1 for drinking water).

Dose-response parameters used in the assessment of noncarcinogenic and carcinogenic risks at Area D are presented in Table 2.

Exposure Assessment

The exposure assessment identified potential pathways and routes for contaminants of concern to reach the receptors and the estimated contaminant concentration at the points of exposure. Contaminant release mechanisms from environmental media, based on relevant hydrologic and hydrogeologic information (fate and transport, and other pertinent site-specific information, such as local land and water use or demographic information), were also presented. At Area D, the current receptor population was identified as basically limited to government employees due to the size and security of the FAA facility. In addition, only a small percent of the Government employees (<2%) who work at the Technical Center are authorized access to the Fuel Farm. Potential exposure pathways evaluated include the ingestion of groundwater, ingestion of or direct contact with surface soils, and ingestion of or direct contact with subsurface soils. Inhalation of airborne contaminants or fugitive dust was not identified as a significant exposure pathway. For each potentially significant exposure pathway, exposure assumptions were made for realistic worst-case and most probable exposure scenarios.

Assumptions used to characterize exposure point concentrations were all based on a 70-kg adult. Specific assumptions for each exposure pathway and scenario are summarized in Table 3.

Risk Characterization

The risk characterization quantifies present and/or potential future threats to human health that result from exposure to the contaminants of concern at Area D. The site-specific risk values are estimated by incorporating information from the hazard identification, dose-response evaluation, and exposure assessment.

When sufficient data are available, a quantitative evaluation is made of either the incremental risk to the individual, resulting from exposure to a carcinogen or, for noncarcinogens, a numerical index or ratio of the exposure dose level to an acceptable dose level is calculated.

Risks which were assessed in the Area D feasibility study include noncarcinogenic and carcinogenic risks resulting from exposure to individual COCs.

For noncarcinogenic compounds, various regulatory agencies have developed standards, guidelines and criteria which provide "acceptable" contaminant levels considered to protect human populations from the possible adverse effects resulting from chemical exposures. A ratio of the estimated body dose level to the RfD or AIC/AIS provides a numerical index to show the transition between acceptable and unacceptable exposure. This ratio is referred to as the chronic hazard index. For noncarcinogenic risks, the term "significant" is used when the chronic hazard index is greater than one. When Federal standards do not exist, a comparison was made to the most applicable criteria or guideline.

Calculated body dose levels, as described previously, were compared to the body dose level associated with the most applicable standard or guideline. The estimated chronic body dose level in ug/kg/day is estimated using the exposure assessment assumptions and actual site data as summarized in Table 3. The body dose level is then compared to the AIC to determine if chronic exposure to the contaminated soil presents a risk. Because certain standards are derived for protection against acute (e.g., 1-day HA), subchronic (e.g., AIS), and chronic (e.g., AIC) exposures, body dose levels for noncarcinogens are developed for both acute and chronic exposures and the associated risks assessed.

For carcinogens or suspected carcinogens, a quantitative risk assessment involves calculating risk levels considered to represent the probability or range of probabilities of developing additional incidences of cancer under the prescribed exposure conditions. Carcinogenic risk estimates, expressed as additional incidences of cancer, are determined by multiplying the carcinogenic potency factor, as described earlier, by the projected exposure dose level. It is the carcinogenic potency factor, expressed in $(mg/kg/day)^{-1}$, which converts the estimated exposure dose level, expressed in (mg/kg/day), to incremental risk. These risks are probabilities that are generally expressed in scientific notation (e.g., 1×10^{-6} or 1E-6). An excess lifetime cancer risk of 1×10^{-6} indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site. To put the calculated risk estimates into perspective, they should be evaluated against a baseline risk level. Risk levels of 10^{-4} to 10^{-7} can be used to determine the "environmental significance" of the risk incurred and are used as a target range for remedial purposes (U.S. EPA, 1986). Using this range as a baseline, a risk level greater than 10^{-4} is considered to present a "significant" risk with regard to human health in an environmental context, and levels less than 10^{-7} are considered "insignificant". A risk level between 10^{-4} and 10^{-7} is classified as "potentially significant". The use of the terms "significant", "potentially significant", and "insignificant" are not meant to imply acceptability; however, they help to put numerical risk estimates developed in risk assessment into perspective.

The noncarcinogenic risk characterization for Area D concluded that under realistic worst-case and most probable exposure scenarios the acute and chronic noncarcinogenic risks associated with future exposures (ingestion or dermal contact) to surface and subsurface soils appear to be "insignificant". Likewise, acute or chronic ingestion of contaminated groundwater under realistic worst-case and most probable exposure scenarios does not appear to result in "significant" noncarcinogenic risk. A summary of noncarcinogenic chronic hazard indices is presented in Table 4.

The carcinogenic risk characterization concluded that the carcinogenic risks associated with future incidental ingestion of surface or subsurface soils under realistic worst-case and most probable exposure scenarios are considered "insignificant". Direct dermal contact with surface or subsurface soils under future realistic worst-case and most probable exposure scenarios also appears to be "insignificant". Future scenarios which evaluate the carcinogenic hazard associated with groundwater ingestion predict the carcinogenic risk to be "significant" (i.e., exceeds the EPA target range of 10^{-4} to 10^{-7}) for the realistic worst-case and "potentially significant" for the most probable exposure scenarios. A summary of carcinogenic risks at Area D is presented in Table 5.

Environmental risks associated with the presence of contamination at Area D are expected to be minimal. Based on the investigation results, surficial contamination is limited to the presence of petroleum hydrocarbons in relatively small areas of jet fuel spills. The majority of the threats posed by Area D are associated with the presence of the floating hydrocarbon plume and subsurface soil contamination. Therefore, risks to flora and fauna at the surface are limited.

Regardless of the type of risk estimate developed, it should be emphasized that all estimates of risk are based upon numerous assumptions and uncertainties. In addition to limitations associated with site-specific chemical data, other assumptions and uncertainties that affect the accuracy of the site-specific risk characterizations result from the extrapolation of potential adverse human health effects from animal studies, the extrapolation of effects observed at high dose to lose dose effects, the modeling of dose response effects, and route-to-route extrapolation.

The use of acceptable levels (established standards, criteria and guidelines) and unit cancer risk values which are derived from animal studies introduces uncertainty into the risk estimates. In addition, the exposure coefficients used in estimating body dose levels are often surrounded by uncertainties. As such, these estimates should not stand alone from the various assumptions and uncertainties upon which they are based. In developing numerical indices of risk, an attempt is made to evaluate the effect of the assumptions and limitations on the numerical estimates. When the assumptions and uncertainties outweigh the meaningfulness of a risk assessment, a qualitative assessment of the risk is performed.

The uncertainty factors which are incorporated into the risk estimates are believed to be conservative. As such, when they are considered collectively, exposure, and subsequently risk, may be overestimated.

In conclusion, based on the results of the risk assessment, actual or threatened releases of hazardous substances from Area D, if not addressed by implementing the response action selected in this ROD, may present an endangerment to public health, welfare, or the environment.

DESCRIPTION OF ALTERNATIVES

Eight remedial alternatives were developed for analysis in the Area D FS. Each of these alternatives is described in detail below. Because a number of the alternatives involve common remedial elements, these are described separately, where applicable, and then are referenced in the individual alternative descriptions.

Common Major Elements of Remaining Alternatives

The remedial components described below are common to the majority of the remaining alternatives. Therefore, these components are described once and the descriptions are then referenced in the subsequent alternative descriptions.

Free Product Extraction/Groundwater Extraction and Injection - Free product extraction involves the removal of floating free product through the use of extraction wells. The total estimated volume of free product is 360,000 gallons, based on its currently defined areal extent, measured thickness in monitoring wells and application of conversion factors to estimate true thickness within the formation. Four product extraction wells are proposed for use in the control and minimization of the product plume. The amount of product recoverable by pumping can vary from 20% to 60% of the total volume present. It has been assumed that 35% of the 360,000 gallons (126,000 gallons) of product at Area D is recoverable. Product residuals which are not extracted will subsequently be addressed by soil and/or groundwater remediation.

Recovery of product floating on the groundwater will take place concurrently with groundwater extraction. The pumping of adjacent product and groundwater extraction wells will induce a cone of depression around the product extraction wells and facilitate the collection of floating product by creating a flow gradient toward the wells.

The proposed groundwater extraction system consists of five extraction wells, located within the general contaminant plume area. Four of the five wells will be paired with product extraction wells. The total pumping rate of groundwater from the five extraction wells will be approximately 20 gallons per minute (28,800 gallons per day). Reinjection of treated groundwater is expected to significantly decrease the amount of time required to recover contaminated groundwater and prevent the collection of large quantities of uncontaminated groundwater.

Soil Excavation - As described earlier, surface soil and subsurface soil contamination are of concern at Area D. Surface soil sampling identified two hot spots of surface soil contamination in areas of known or suspected fuel spills. Subsurface soil contamination was identified by high total petroleum hydrocarbon concentrations detected in three subsurface soil samples.

The areal and vertical extent of subsurface soil contamination was approximated using analytical results, product thickness estimates and subsurface soil headspace readings. Three categories of soil contamination were defined: surface soil contamination only, surface and subsurface contamination combined and subsurface contamination only due to the present of the floating free product. Volume estimates were made for each category of subsurface contamination, with a total contaminated volume estimate of 33,000 cubic yards.

Alternative 3 - Free Product Extraction and Soil Excavation with On-Site Storage; Groundwater Extraction and Injection with In Situ Biodegradation

Cost: $7.9 million   Time to Implement: 10 years or more to completion

It would meet the criterion of approaching ARARs, as required by the NCP.

Free product would be extracted, as previously described, and stored on-site within a tank. On-site storage of product would allow for its future use in conjunction with the remediation of another FAA area. If not used in conjunction with the remediation of another area, the free product could be accumulated for off-site disposal at a future data.

Contaminated soil would be excavated and stored on-site within a secure building. On-site storage would allow for the future treatment of the soils using improved, more highly developed treatment technologies. It would also allow for combined treatment with similarly contaminated soils from other areas of the facility thereby providing potential economies of scale. The extent of excavation was discussed previously. Soil containment structures would be constructed on-site to specifically contain the excavated soil.

Groundwater extraction and reinjection were previously described. In situ biodegradation would involve the addition of nutrients and oxygen to the extracted groundwater prior to reinjection.

Alternative 4 - Free Product Extraction and Off-Site Cement Kiln Incineration; Soil excavation and Off-Site Disposal; Groundwater Extraction and Injection with In Situ Biodegradation

Cost: $8.7 million   Time to Implement: 7 years to reach cleanup goals

This alternative was developed to meet the NCP criterion for an off-site alternative. It could also be considered to fall within the treatment range for alternatives required by the current guidance.

Free product would be extracted, as previously described, and transported to an off-site cement kiln for incineration. Only cement kilns authorized to use waste materials, such as the free product, as supplementary fuel would be used for product incineration.

Contaminated soil would be excavated and shipped off-site to a permitted landfill facility. Soil excavation volumes were addressed previously. Excavated soils would be temporarily stockpiled on-site and sampled to allow for NJDEP classification (as represented by Area ID numbers). Based on previous soil excavation and disposal activities conducted at another FAA area, it is expected that the majority of contaminated soils will be classified as I.D. 27 industrial waste. Soils containing hydrocarbons beyond saturation (generally greater than 3%) would most likely be classified as X725 waste and require disposal in a hazardous waste landfill. Soils excavated from near the water table in areas of floating product could be expected to be classified X725, with other contaminated soils classified as I.D. 27. It is estimated that 13,500 cubic yards of material would require disposal as a hazardous waste, while 19,500 cubic yards of soil could be disposed of as an industrial waste.

Groundwater extraction and reinjection and in situ biodegradation would be as described previously for Alternative 3.

Alternative 5 - Free Product Extraction and Soil Excavation with On-Site Incineration; Groundwater Extraction and Injection with Physical Treatment

Cost: $58 million Time to Implement: 9 years to reach cleanup goals

This alternative was developed to meet both NCP and current guidance criteria. The proven characteristics of the chosen treatment methods and the treatment of all waste materials allow this alternative to conform with the current guidance criterion for an alternative which minimizes long-term management while it also meets the NCP criterion for an alternative which exceeds ARARs.

Free product would be extracted, as previously described, and treated on-site using incineration. On-site incineration would require construction of an incinerator on-site. Extracted product, with its high BTU value, would burn readily and would provide supplementary fuel for the destruction of other contaminated materials.

Contaminated soil would be excavated and then thermally treated within the on-site incinerator.

Groundwater extraction and reinjection were described previously. A physical treatment method would be used to treat extracted groundwater prior to reinjection.

Alternative 6 - Free Product Extraction and Off-Site Cement Kiln Incineration; Soil Venting; Groundwater Extraction and Injection with In Situ Biodegradation

Cost: $0.6 million Time to Implement: 6 years to reach cleanup goals

This alternative was developed to meet both NCP and current guidance criteria. The alternative will provide treatment to exceed ARARs, per the NCP, and will provide treatment as a primary component, per the current guidance.

Free product would be extracted, as previously described, and transported to an off-site cement kiln for incineration.

Should would be treated in situ using soil venting, also referred to as vacuum extraction. Soil venting can remove both free product and adsorbed hydrocarbons from contaminated soils without excavation and could be conducted concurrently with free product extraction and in situ biodegradation. Implementation of soil venting would require installation of vacuum extraction wells and the associated vacuum system. If residual soil contamination remains following product extraction and soil venting, soil biodegradation could be conducted in conjunction with groundwater biodegradation.

Groundwater extraction and reinjection and in situ biodegradation would be as described previously for Alternative 3.

Alternative 7 - Free Product Extraction and Off-Site Cement Kiln Incineration; Soil Excavation and Off-Site Incineration; Groundwater Extraction and Injection with Carbon Adsorption

Cost: $39.6 million Time to Implement: 7 years to reach cleanup goals

This alternative was developed to meet both NCP and current guidance criteria. The alternative will provide treatment to exceed ARARs, per the NCP, and will provide treatment as a primary component, per the current guidance.

Free product would be extracted, as described previously, and transported to an off-site cement kiln for incineration.

Contaminated soil would be excavated and shipped off-site to a permitted incineration facility.

Groundwater extraction and injection were described previously. A physical treatment method would be used to treat groundwater prior to reinjection.

Alternative 8 - Free Product Extraction and Off-Site Distillation; Soil Excavation and Soil Washing; Groundwater Extraction and Injection with Chemical Treatment

Cost: $11.0 million   Time to Implement: 9 years to reach cleanup goals

This alternative was developed to meet both NCP and current guidance criteria. It provides treatment exceeding ARARs, per the NCP, and retains innovative treatment technologies for further consideration, per the current guidance.

Free product would be extracted, as previously described, and transported off-site to a facility where it would be redistilled and separated into its various components for reblending. The resulting product would subsequently be used as an industrial fuel.

Contaminated soil would be excavated and treated on-site in a soil washing system. Soil washing would require the on-site construction of a system which would feed the contaminated soils into soil scrubbers, a filter press and to drying beds, if necessary.

Groundwater would be extracted and reinjected as described previously. Treatment of the extracted groundwater would be accomplished using chemical treatment. A unit would be set up on-site and extracted groundwater would be fed through the system prior to reinjection.

SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The eight alternatives identified above were evaluated using criteria derived from the National Contingency Plan and the Superfund Amendments and Reauthorization Act of 1986 (SARA). These criteria relate to the SARA amendment to Section 121 of CERCLA (Section 121(b)(1)) and Section 300.68(I) of the NCP and are as follows:

Overall protection of human health and the environment draws on the assessments conducted under other evaluation criteria and considers how the alternative addresses site risks through treatment, engineering, or institutional controls.

Compliance with ARARs evaluates the ability of an alternative to meet applicable or relevant and appropriate requirements (ARARs) established through Federal and State statutes and/or provides the basis for invoking a waiver.

Long-term effectiveness and permanence evaluates the ability of an alternative to provide long-term protection of human health and the environment and the magnitude of residual risk posed by untreated wastes or treatment residuals.

Reduction of toxicity, mobility or volume through treatment evaluates the reliability of an alternative to reduce risks through treatment technologies.

Short-term effectiveness addresses the cleanup time frame and any adverse impacts posed by the alternative during the construction and implementation phase, until cleanup goals are achieved.

Implementability is an evaluation of the technical feasibility, administrative feasibility, and availability of services and materials required to implement the alternative.

Cost includes an evaluation of capital costs, annual operation and maintenance costs, and net present worth costs.

State Acceptance indicates the State's response to the alternatives in terms of technical and administrative issues and concerns.

Community Acceptance evaluates the issues and concerns the public may have regarding the alternatives.

A comparative discussion of the eight alternatives on the basis of the evaluation criteria presented above follows. Comparative analyses of alternatives are also presented in Tables 6 through 12.

Overall Protection - Alternatives 5, 6, 7 and 8 all would provide adequate protection of human health and the environment. The preferred alternative, Alternative 6, offers the shortest remedial time frame and the greatest protection against short-term risks since no soil excavation is involved. Alternative 3 allows for future waste treatment but requires a long-term remedial time frame. Alternatives 1, 2 and 4 do not treat one or more of the contaminated media and thereby provide a lesser degree of protection.

Compliance with ARARs - Alternatives 5, 6, 7 and 8 will exceed ARARs while Alternatives 3 and 4 will attain ARARs. Alternatives 1 and 2 will not attain ARARs.

Long-Term Effectiveness and Permanence - Alternatives 5 and 7, which involve incineration of soil and product as well as groundwater treatment, are expected to provide the greatest long-term effectiveness due to the destruction efficiencies of incineration. The preferred alternative and Alternative 8 also provide treatment of all three media and are expected to be effective in the long-term. Alternatives 1, 2 and 4 do not provide treatment of one or more of the contaminated media, thereby reducing their long-term effectiveness. Alternative 3, which allows for future treatment of product and soil, may ultimately be effective in reducing risk but requires long-term monitoring until the fate of these materials is determined.

Reduction of Toxicity, Mobility or Volume - Alternatives 5, 6, 7 and 8 all provide a reduction of toxicity, mobility or volume of the three media of concern. Alternatives 5 and 7 are expected to provide the greatest reductions due to the destruction efficiencies of incineration, followed by the preferred alternative which provides in situ treatment of soil and groundwater. In situ treatment reduces potential mobility associated with waste handling and off-site waste transport. Alternative 6 is followed by Alternative 8, which requires additional waste handling and involves innovative technologies whose performance is not well proven. Alternative 3 offers potential future reductions in waste toxicity, mobility or volume while Alternatives 1, 2 and 4 offer no treatment of one or more of the contaminated media.

Short-Term Effectiveness - The preferred alternative offers the greatest short-term effectiveness because in situ soil treatment does not involve the short-term risks associated with soil excavation and it meets cleanup goals within the shortest time frame. Alternatives 4, 5, 7 and 8 involve increased short-term risks associated with soil excavation with successively longer remedial time frames (seven to nine years). Because of the temporary storage nature of Alternative 3, the time frame to meet cleanup goals is long. Alternatives 1 and 2, while providing minimal short-term risks, will not achieve cleanup goals.

Implementability - Alternative 1 offers the greatest degree of implementability, followed by Alternative 2, which involves proven technologies and no inter-agency coordination. Alternatives 4 and 7, which offer off-site handling of product and soil, are easily implemented although availability of off-site soil treatment/disposal capacities could significantly delay their implementation. Alternatives 6 and 8 involve on-site soil treatment with 6 being more implementable than 8 on the basis of equipment simplicity and availability. Alternatives 3 and 5 are considered to be the least implementable due to the extensive on-site construction/set-up required.

Cost - Alternative 1 has no cost associated with it. The preferred alternative has the lowest estimated net cost, with a total present worth of less than 1 million dollars. Alternatives 2, 3 and 4 have total present worth values between 1 and 10 million dollars. Alternatives 5, 7 and 8 range in cost from 10 to 58 million dollars.

State Acceptance - The preferred alternative is acceptable to the New Jersey Department of Environmental Protection.

Community Acceptance - Community acceptance of the preferred alternative will be evaluated on the basis of public comments and will be described in the Record of Decision for the site.

SELECTED REMEDY

The following section describes in detail the remedial action plan which the Federal Aviation Administration, in concurrence with USEPA and NJDEP, has selected to implement at Area D (See USEPA and NJDEP Letters of Concurrance, Appendices C & D). This selection is identical to that presented in the Proposed Remedial Action Plan.

The selected remedial alternative is Alternative 6 - Free product extraction and off-site cement kiln incineration, soil venting, and groundwater extraction and injection with in situ biodegradation. This alternative will address product extraction and soil and groundwater treatment simultaneously.

Free product will be extracted via the four product extraction wells and will be temporarily stored (for less than 90 days) on-site prior to transport off-site for cement kiln incineration. The product extraction rate is expected to be 200 gallons per day. Off-site incineration will provide a permanent reduction in toxicity with minimal short-term and long-term risks.

Soil venting will provide soil treatment concurrently with product extraction. In alternatives which involve soil excavation, excavation would not commence until product extraction was complete, to allow for soil treatment of the subsurface interval in which floating free product has contaminated the soil. Soil venting will aid in subsequent product extraction through volatilization of the product and extraction via the soil gas, and therefore could be implemented simultaneously with direct product extraction. It is estimated that the combined systems will extract free product over a one-year period and that soil venting will continue for an additional year. Soil venting will involve approximately 21 vacuum extraction wells, a manifold system, blowers and an off-gas treatment unit.

Groundwater treatment will also be conducted concurrent with soil treatment and product extraction. Groundwater will be extracted via five groundwater extraction wells. The extracted water will be processed through mixing tanks where nutrients and oxygen will be added. The water will then be reinjected upgradient of the contaminated area. To meet cleanup standards, it was estimated that extraction of three (3) contaminated aquifer volumes subsequent to completion of soil remediation activities will be required over a period of four years. Therefore, it is estimated that groundwater treatment will be implemented for a total period of six years.

The proposed remedy has been developed to meet Federal and State ARARs for drinking water and soil quality. New Jersey MCLs have been selected as groundwater cleanup levels because they are promulgated and are more stringent than Federal MCLs. The New Jersey MCL for benzene, the only carcinogenic COC identified in groundwater samples, is also more stringent than the cleanup level back-calculated assuming a worst-case scenario risk of 1 x 10^{-6} (6.17 ppb).

The soil cleanup level is based on NJDEP Soil Cleanup Objectives, which are not ARARs but are To Be Considered (TBCs). For volatile organic compounds in soils, the cleanup objective is 1 part per million (ppm) total priority pollutant volatile compounds. For total petroleum hydrocarbons the cleanup objective is 100 ppm. No chemical-specific ARARs for soil contaminants were identified.

A cost estimate for Alternative 6 is presented in Table 13. This cost estimate is based on preliminary design of the remedial systems. Because of the design's preliminary nature, changes could be implemented during the final design and construction processes. Such changes will reflect modifications resulting from the engineering design process and will not substantially change the intent of the selected alternative described herein.

STATUTORY DETERMINATIONS

Under Section 121 of CERCLA and Section 300.68(1) of the NCP, selected remedies must meet certain statutory and regulatory requirements. These requirements and a description of how the selected remedy satisfies each requirement are presented below.

Protection of Human Health and the Environment

The selected alternative will fully protect human health and the environment through treatment of each contaminated medium while also meeting ARARs and minimizing short-term risks. Floating free product will be extracted and thermally destroyed off-site, resulting in minimal short-term risks and no long-term risks associated with on-site treatment residuals. Soil contamination, including residual contamination in areas where free product has been extracted, will be treated via soil venting. The soil venting system will extract volatile contamination from the soil without the short-term risks associated with soil excavation, and off-gas treatment will destroy the extracted organic compounds. In situ groundwater treatment will similarly remediate organic contaminants within the groundwater with little or no associated short-term risks.

Compliance with ARARs

The selected remedy will attain Federal ARARs and those State ARARs which are more stringent than Federal ARARs. A list of applicable ARARs and TBCs is presented in Table 14.

It should be noted that, although evaluated, no location-specific ARARs were identified which were applicable to Area D. The area is not within the 500-year floodplain (area is located in Zone C, defined as an area of minimal flooding on the basis of the applicable Flood Insurance Rate Map). There are no Federally designated wild and scenic rivers or coastal barriers in the vicinity. Additionally, Area D does not lie within the coastal zone. Therefore, the Wild and Scenic River Act, the Coastal Barriers Protection Acts and the Coastal Zone Management Act are not considered to be ARARs. The National Environmental Policy Act and other laws, including those listed above, have been considered and it has been determined that the selected remedy will have no significant adverse environmental impacts and will have significant beneficial impact on human health and the environment.

Cost-Effectiveness

The selected remedy provides product extraction and treatment of contaminated soil and groundwater and has the lowest estimated remedial cost of all action alternatives. Combined soil treatment and product extraction minimizes the cleanup timeframe and associated costs. The treatment methods included in the alternative have been proven effective in the treatment of similarly contaminated materials and are expected to attain ARARs at Area D.

Utilization of Permanent Solutions and Alternative Treatment Technologies

The FAA, in cooperation with the USEPA and State of New Jersey, has determined that the selected remedy utilizes permanent solutions and treatment technologies to the maximum extent practicable. This determination was made based on the comparative evaluation of alternatives with respect to long-term effectiveness and permanence, reduction of toxicity, mobility or volume through treatment, short-term effectiveness, implementability, and cost, as well as the statutory preference for treatment as a principal element and State and community acceptance.

The main difference between alternatives in terms of long-term effectiveness is related to the manner in which the alternative treats soil contamination. The selected alternative may not provide the destruction efficiencies of a soil incineration alternative, but it will provide a permanent reduction in the toxicity of soil contaminants while meeting cleanup objectives and, therefore, be effective in the long-term. The selected alternative is expected to provide long-term effectiveness of a degree similar to the soil washing and the soil incineration alternatives and greater than the other alternatives examined.

The selected remedy is one of four alternatives (5, 6, 7 and 8) which provide a reduction in toxicity, mobility or volume of all three media of concern through treatment. Alternatives 5 and 7 may provide a greater degree of toxicity reduction through the destruction efficiency of soil incineration and more conventional groundwater treatment methods. However, the selected alternative has been proven effective in reducing soil and groundwater contaminant toxicity at sites of similar volatile organic and petroleum hydrocarbon contamination. Alternative 8 has not been thoroughly proven and, therefore, reductions in toxicity of soil or groundwater contamination may not be as great as anticipated.

The selected remedy provides the greatest short-term effectiveness. It has the shortest estimated timeframe to meet cleanup levels due to the fact that soil remediation and product extraction are concurrent. In alternatives involving soil excavation, product removal must be completed prior to conducting soil excavation to ensure contaminated soils are excavated to the greatest extent possible. Also, soil excavation alternatives create greater short-term risks due to the volatilization of organics in the excavated soils.

The selected remedy is less implementable than the no action or containment alternatives (Alternatives 1, 2 and 3), but those alternatives do not offer the degree of protection offered by the selected alternative. The selected remedy is feasible both from a technical and administrative standpoint. The availability of services and materials is somewhat limited but not as limited as for on-site incineration or soil washing alternatives.

The selected remedy is the lowest cost alternative except for the no action alternative. Its cost is one hundred times less than the estimated cost of soil incineration alternatives.

The New Jersey Department of Environmental Protection has indicated that the selected remedy for Area D is considered to be acceptable.

Overall, community acceptance of the chosen alternative was good. Opposition was limited to a written comment from the Township Committee of the Township of Egg Harbor indicating a preference for Alternatives 5 or 7.

Preference for Treatment as a Principal Element

The principal threats at Area D include the presence of the floating hydrocarbon plume and soil and groundwater contamination associated with the presence of the plume at Area D. The selected remedy satisfies the statutory preference for treatment as a principal element in addressing the human health and environmental threats posed by the site. Off-site cement kiln incineration will provide treatment of extracted product, soil venting with off-gas treatment will treat soil contamination and in situ biodegradation will treat groundwater contamination.

DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Remedial Action Plan for Area D was released for public comment on August 4, 1989. The Proposed Plan identified Alternative 6 (off-site product incineration, soil venting and in situ biodegradation) as the preferred alternative. FAA reviewed all written and verbal comments submitted during the public comment period. Upon review of these comments, it was determined that no significant changes to the remedy, as it was originally identified in the Proposed Plan, were necessary.

RESPONSIVENESS SUMMARY
AREA D, JET FUEL FARM
FAA TECHNICAL CENTER

The purpose of this responsiveness summary is to review public response to the Proposed Remedial Action Plan for Area D and public comment on other remedial alternatives considered but not recommended. It also documents the FAA's consideration of such comments during the decision-making process and provides answers to any major comments raised during the public comment period.

The responsiveness summary for the Area D Jet Fuel Farm is divided into the following sections:

* Overview - This section briefly describes the feasibility study (FS) process used to develop and evaluate remedial responses for Area D, the remedial alternative recommended within the Proposed Remedial Action Plan and any impacts on the proposed plan due to public comment.

* Background on Community Involvement - This section provides a summary of community interest in the site and identifies key public issues. It also describes community relations activities conducted with respect to the area of concern.

* Summary of Major Questions and Comments - This section summarizes verbal and written comments received during the public meeting and public comment period.

* Remedial Design/Remedial Action Concerns - This section describes public concerns which are directly related to design and implementation of the selected remedial alternative.

OVERVIEW

Area D is a Jet Fuel Farm at the FAA Technical Center and is under investigation for potential environmental contamination. The FAA Technical Center is located at the Atlantic City Airport in Atlantic County, New Jersey. This Responsiveness Summary addresses remediation and public response to the Proposed Remedial Action Plan for Area D only.

A summary of the site background, the alternatives evaluated, and a comparison of alternatives are presented in the Area D Proposed Remedial Action Plan and are more fully described in the Feasibility Study Report. Both documents, as well as other supporting information, are available for public review at the information repository located at the Atlantic County Library, 2 South Farragut Avenue, Mays Landing, New Jersey.

BACKGROUND ON COMMUNITY INVOLVEMENT

This section provides a brief history of community participation in the investigation and remedial planning activities conducted at Area D.

Throughout the investigation and feasibility study period, the USEPA, NJDEP and The Pinelands Commission have been directly involved through proposal and project review and comments. Periodic meetings have been held to maintain open lines of communication and to keep all parties abreast of current activities.

Prior to the public release of site-specific Area D documents, the FAA Technical Center public relations staff compiled a list of local public officials who demonstrated or were expected to have an interest in the investigation. Local environmental interest groups were also identified and included on this list. The list is included herein as Appendix A.

On August 4, 1989, FAA mailed the Area D Proposed Remedial Action Plan to concerned parties on the list described above. Also on that day, a notice appeared in The Press, the local Atlantic City newspapers, summarizing the feasibility study process, the remedial alternatives considered and the preferred remedial alternative. The announcement also identified the time and location of a public meeting to be held to discuss the proposed action, the location of the information repository, the length of the public comment period, and the address to which written comments could be sent. Public comments were accepted from August 4, 1989 through September 5, 1989.

A public meeting was held on August 30, 1989, at 7:00 p.m. at the Atlantic County Library in Mays Landing, New Jersey. The Area D site investigations, feasibility study process and proposed remedial alternative were discussed. FAA representatives included: Robert B. Heitsenrether, Project Manager; Michael G. Beres, Manager of the Engineering/Environmental Branch; and Tony Fazio, Hazardous Materials and Special Projects Staff. Vincent Petruzello, Chief of the Program Support Branch, represented the USEPA Emergency and Remedial Response Division; and Robert Hayton, Case Manager, represented the NJDEP Bureau of Federal Case Management. Other NJDEP staff and FAA's contractor, TRC Environmental Consultants, Inc. (TRC) also attended (see Appendix B).

SUMMARY OF MAJOR QUESTIONS AND COMMENTS

This section addresses public comments received during the August 4, 1989 through September 5, 1989 public comment period. Two questions were raised at the public meeting, and one set of written comments received. A summary of these comments and the FAA reponse are presented below.

Public Meeting Comments

Comment: James W. Herzog, a representative of the City of Atlantic City, Department of Public Works, questioned the accuracy of the remedial cost estimate for Alternative 6, indicating it may be low.

FAA Response: The cost estimate was developed on the basis of published cost information and is expected to be within the -30% to +50% accuracy range called for under current guidance. Considering the relative magnitude of cost of the other alternatives, Alternative 6 would remain the most cost-effective alternative even if the actual cost was 100% greater than the estimated cost.

Comment: James W. Herzog, a representative of the City of Atlantic City, Department of Public Works, questioned the relative degree of environmental problems associated with other areas of the FAA Technical Center Site, especially with respect to potential impacts to drinking water quality.

FAA Response: The FAA is attempting to address the areas of environmental contamination in the order of urgency. Area D was identified as a priority site due to its location near the Upper Atlantic City Reservoir and the need to formulate and implement a final remedial plan and thereby supplant interim remedial measures. For specific information regarding other sites and associated environmental concerns, the public is encouraged to visit the information repository and review the environmental investigation reports and, as they become available, the feasibility studies and Proposed Remedial Action Plans for other areas of the FAA Technical Center. The information repository is located at the Atlantic County Library in Mays Landing, New Jersey.

Written Comments

Comment: The Township Committee of the Township of Egg Harbor provided a written comment indicating that the Township is desirous of having contaminants removed in the most thorough manner feasible and that it is the consensus of the governing body that Alternatives 5 and 7 are most desirable, with a preference for Alternative 7 which provides off-site incineration. The Township Committee further expressed its desire to see an expeditious implementation of the selected remedial alternative.

FAA Response: The Feasibility Study process allows for a detailed evaluation of each remedial alternative using nine evaluation criteria, as well as a comparative analysis between alternatives. While Alternatives 5 and 7 provide for incineration of contaminated soil and product and may provide greater contaminant destruction efficiencies than in situ treatment methods, this advantage is offset by short-term risks posed by contaminant volatilization during excavation activities, implementation difficulties due to technical feasibility and/or availability of services, and the cost differential between these alternatives and other alternatives considered. Based on the comparative analysis of the eight alternatives under consideration, Alternative 6 was identified as the alternative which provides the best balance among the nine evaluation criteria.

REMEDIAL DESIGN/REMEDIAL ACTION CONCERNS

Public comments which specifically addressed the chosen remedial alternative were limited to a question about the estimated remedial cost. This question and the associated FAA response were presented in the previous section. Overall, due to the minimal public input received during the comment period, currently identified public concerns associated with the remedial action are limited.

FIGURES, APPENDICES AND TABLES

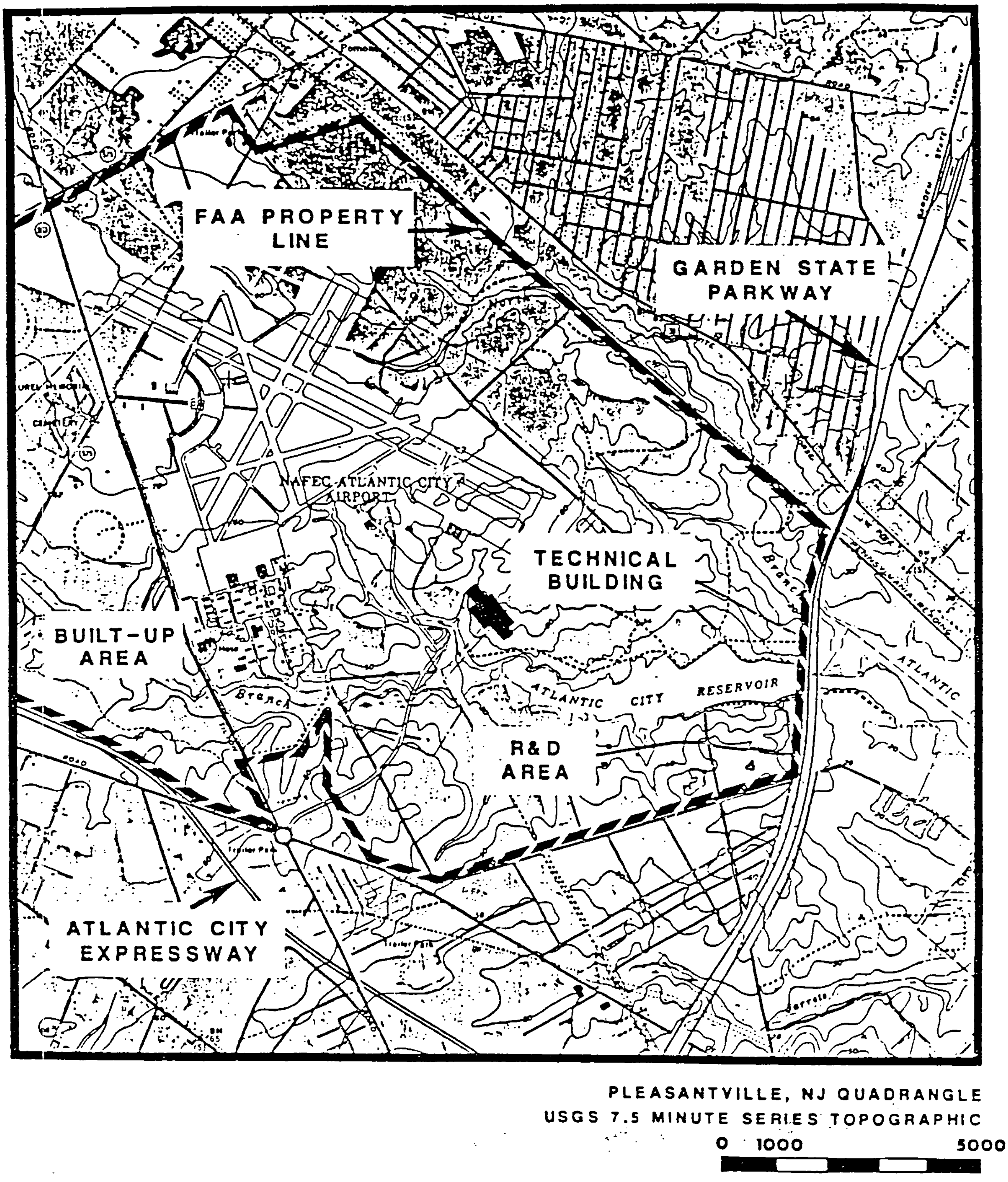
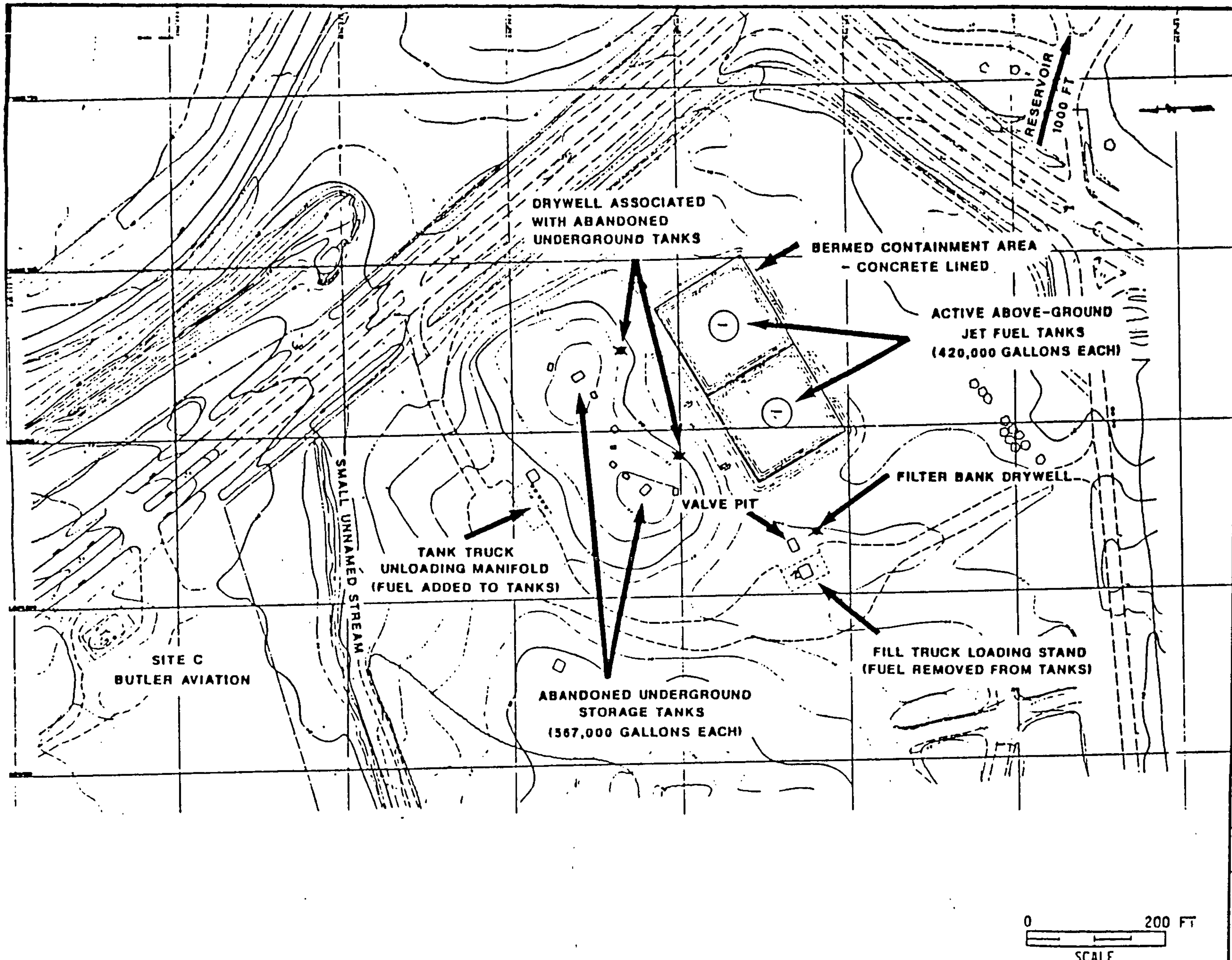


FIGURE 1 FAA TECHNICAL CENTER



LEGEND

✱ DRY WELL ASSOCIATED WITH FUEL TANK

TRC Environmental Consultants, Inc.

FAA TECHNICAL CENTER

ENVIRONMENTAL INVESTIGATIVE/FEASIBILITY STUD

FIGURE 2

AREA D SITE PLAN

SITE PLAN

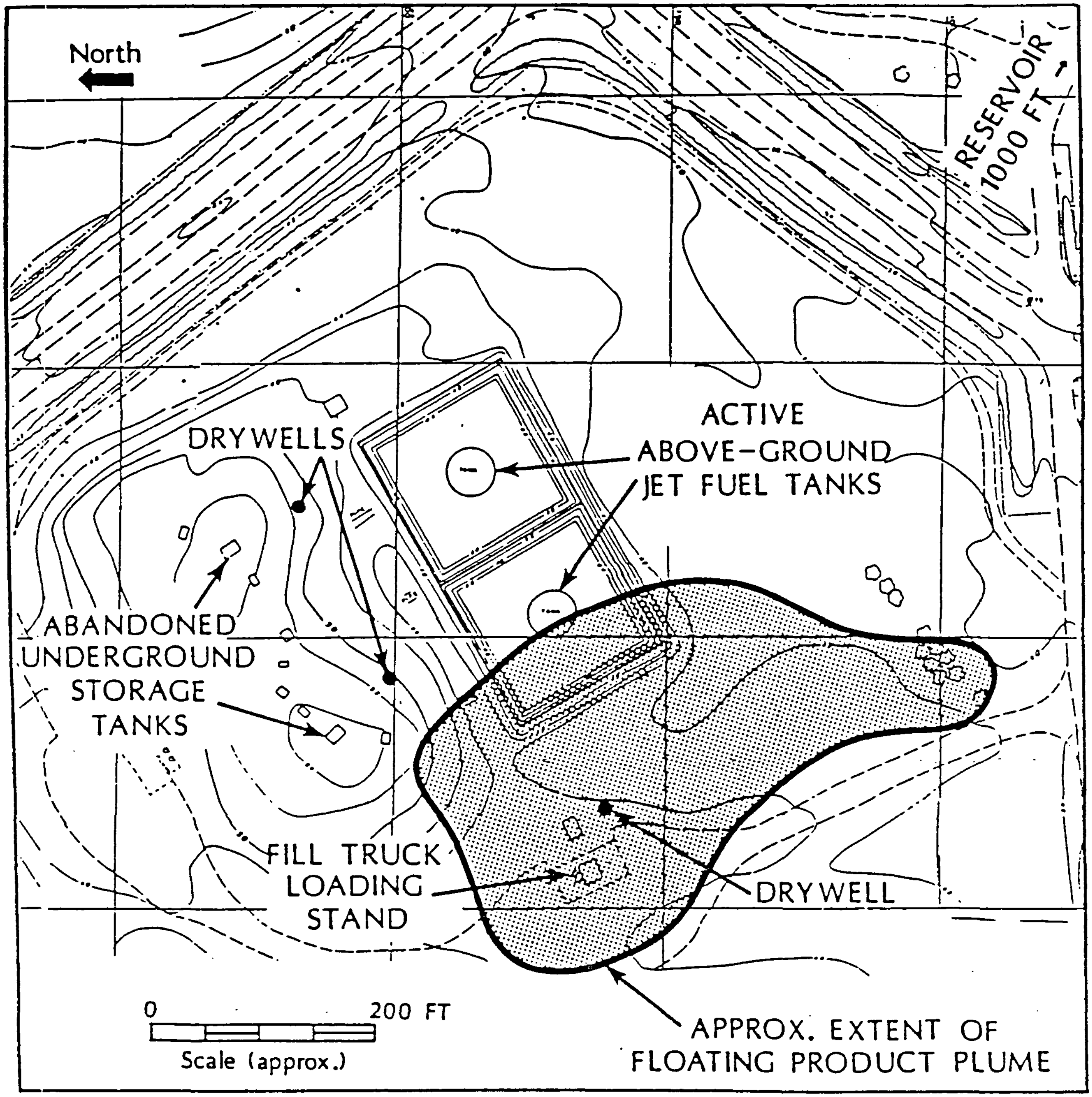


FIGURE 3
AREA D HYDROCARBON PLUME

APPENDIX A

The Honorable William J. Hughes
Member, United States House of Representatives
Central Park East, Building 4, Suite 5
222 New Road
Linwood, NJ 08221

The Honorable James L. Usry
Mayor of Atlantic City
City Hall
Tennessee Avenue and Bacharach Boulevard
Atlantic City, NJ 08401

The Honorable John W. Mooney
Mayor of Galloway Township
300 Jimmy Leeds Road
Galloway Township, NJ 08201

The Honorable James J. McCullough
Mayor of Egg Harbor Township
Egg Harbor Township Municipal Offices
RD 2A, Box 262
Linwood, NJ 08221-9621

The Honorable John J. Percy, III
Mayor, Township of Hamilton
21 Cantillon Boulevard
Mays Landing, NJ 08330

Mr. Richard E. Squires
Atlantic County Executive
1333 Atlantic Avenue
Atlantic City, NJ 08401

The Honorable Frank Lautenberg
United States Senator
1 Gateway Center
Newark, NJ 07102

Colonel Richard C. Cosgrave
Commander 177th Fighter Interceptor Group
400 Langley Road, ANGBACYIAP
Pleasantville, NJ 08232-9500

The Honorable William Gormley
New Jersey Senate, Second District
1333 Atlantic Avenue
Atlantic City, NJ 08401

Mr. John F. Gaffney
Chairman Freeholder-at-Large
201 Shore Road
Northfield, NJ 08225

Mr. Terrence Moore
Executive Director, New Jersey Pinelands Commission
Springfield Road
P. O. Box 7
New Lisbon, NJ 08064

Mr. Neil Goldfine
Executive Director, Atlantic City
Utilities/Water Department
29 South New York Avenue
Atlantic City, NJ 08401

Ms. Louise Speitel
Atlantic County Environmental Society
205 Tremont Avenue
Absecon, NJ 08201

Environmental Response Network
ATTN: Ms. Doreen Khebzou
104 East Sterling Drive
Absecon Highlands, NJ 08201

Ms. Ellen Hyatt
Department of Health and Institutions
201 Shore Road
Northfield NJ 08225

Mr. Tom Augspurger
Environmental Contaminants Specialist
U.S. Fish and Wildlife Service
P. O. Box 534, 705 White Horse Pike
Absecon, NJ 08201

APPENDIX B

PLEASE SIGN IN

PUBLIC MEETING WEDNESDAY, AUGUST 30, 1989

PROPOSED REMEDIAL ACTION PLAN (PRAP)

FOR AREA D - JET FUEL FARM

FEDERAL AVIATION ADMINISTRATION TECHNICAL CENTER

ATLANTIC CITY AIRPORT, NJ 08405

YOUR NAME	ADDRESS
VINCENT PITRUZZELLO	26 FEDERAL PLAZA N.Y. NY 10278
Tom Augsburger	P.O. Box 534 Absecon, NJ 08201
George Tamallio	Bureau of Community Relations, NJDEP
Bob HEITSENRETHER	FAA TECHNICAL CENTER
JIM VALENTI	5 WINFIELD COURT, SICKLERVILLE, N.J 08081
MICHAEL AUCOIN	41 CHAPEL CIRCLE SICKLERVILLE NJ 0808
James N. Herzog	Rm 503 City Hall Atlantic City, NJ, 08401
MICHAEL G. BERES	FAA TECHNICAL CENTER
Michael Cicali	Atlantic County Health Dept.
Tim KAYE	Atlantic County Utilities Auth
Keith C. Buch	Concerned Citizen
Tony Fazio	FAA - Washington D.C.
Ellen O'Neill	Cape May, N.J.
FRANK VALENTI	900 SHELBURNE AVE ABSECON NJ 08201
Tedd Ronning	NJDEP / Division of Water Resources
Robert Haijton	NJDEP Hazardous waste management
Robert SMITH	TRC Environmental Consultants
JEAN OLIVA	TRC ENVIRONMENTAL CONSULTANTS
JOHN HANKINS	TRC ENVIRONMENTAL CONSULTANTS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, NEW YORK 10278

SEP 26 1989

Mr. E.T. Harris, Director
FAA Technical Center
ACT-1
Atlantic City International Airport
Atlantic City, New Jersey 08404

Re: FAA Technical Center Record of Decision (ROD) for Site D, Jet Fuel Farm

Dear Mr. Harris:

This is to notify you that the United States Environmental Protection Agency (USEPA) has reviewed the FAA's ROD and supporting documents for remediating jet fuel contamination at Area D, Jet Fuel Farm, at the FAA Technical Center and that USEPA concurs with the remedy as stated.

The remedial action consists of the following:

* free product extraction and off-site cement kiln incineration,
* ground water extraction and addition of nutrients for subsequent re-injection and in-situ biodegradation of volatile organic compounds (VOCs),
* soil venting, a system which extracts gas from the soil pore space,
* use of off-gas treatment unit for off-gas from soil venting, consisting either of catalytic incinerator for combustion of VOCs to carbon dioxide and water, or activated carbon adsorption of VOCs,
* operation, monitoring, and maintenance of the system.

We look forward to a continued cooperative working relationship with you and the FAA Technical Center staff to address environmental concerns at the facility. If you have any questions regarding the subject of this letter, please call me at (212) 264-2525, or have your staff contact Mr. Lance Richman, the facility Project Manager, at (212) 264-6665.

Sincerely,

William J. Muszynski, P.E.
Acting Regional Administrator

cc: Christopher J. Daggett, Commissioner
New Jersey Department of Environmental Protection

Robert Hayton
New Jersey Department of Environmental Protection

Mr. T. Flatley, FAA
Mr. R. Heitsenrether, FAA

APPENDIX D

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
CHRISTOPHER J. DAGGETT, COMMISSIONER
CN 402
TRENTON, N.J. 08625-0402
(609) 292-2885
Fax: (609) 984-3962

9/21

E.T. Harris, Director
FAA Technical Center
ACT - 1
Atlantic City International Airport
Atlantic City, NJ 08404

Dear Mr. Harris:

Re: FAA Technical Center
Proposed Remedial Action Plan for Site D, Jet Fuel Farm

This is to formally notify you that the New Jersey Department of Environmental Protection has reviewed the draft Record of Decision for the Federal Aviation Administration Site D Jet Fuel Farm and concurs with the recommended remedy. This remedy will consist of the following:

- o Jet fuel free product extraction from the water table and off-site cement kiln incineration.
- o Ground water extraction and addition of nutrients for subsequent re-injection and in situ biodegradation of volatile organic compounds (VOC's).
- o A soil venting system to extract gas from the soil pore space.
- o Treatment of the off-gases from soil venting by either catalytic incineration for combustion of VOC's to carbon dioxide and water, or activated carbon adsorption of VOC's.
- o Operation, monitoring and maintenance of the system.

Our approval is based on the assumption that our comments on the draft ROD will be incorporated into the final ROD. New Jersey fully appreciates the importance of the Record of Decision in the cleanup process and will continue to take all reasonable steps to ensure that the State's commitments in this area are met.

Very truly yours,

Christopher J. Daggett

Signed on 9 27 89

c: Constantine Sibamon-Eristoff,
Regional Administrator, USEPA
Lance Richman, Project Manager, USEPA
Melinda Dower, DEP

TABLE 1

CONTAMINANTS OF CONCERN - AREA D

	MONITORING WELLS			SURFACE SOIL	
	Concentration		Detected	Concentration	EPA Carcinogenic
	Maximum	Average	Frequency	Detected	Classification
VOLATILE ORGANICS (ppb)					
Benzene	4,000	390.18	5/17	160	A[1]
Toluene	3,100	325.41	4/17	150	--
Ethylbenzene	530	67.53	6/17	160	D[2]
Xylene (total)	4,700	404.00	5/17	560	D[2]
SEMI-VOLATILE (BNAs) (ppb)					
Naphthalene	1,000	79.82	6/17		--
Phenol	303	33.79	9/16	600	--
2-Chlorophenol				570	--
INORGANICS (ppb)					
Chromium, Total	192[3]	29.73	8/17	7,700	D[2]
Nickel, Total	344[3]	36.51	6/17		D[2]
Lead, Total	68[3]	12.94	9/17	4,000	B2[1]

(1) EPA Carcinogen Classification: A = Known Human Carcinogen
B2 = Probable Human Carcinogen (based on animal studies - Inadequate evidence in humans)
D = Not Classified

Reference-Memorandum from S. Lee (Toxics Integration Branch), Updated Reference Dose and Cancer Potency Numbers for use in risk assessment (November 16, 1987)

(2) Drinking Water Regulations and Health Advisories, U.S. EPA Office of Drinking Water (December 1988).

(3) Inorganic concentrations are based on the analysis of unfiltered ground water samples.

TABLE 2 DOSE-RESPONSE PARAMETERS USED IN THE ASSESSMENT OF NONCARCINOGENIC AND CARCINOGENIC RISK - AREA D

Contaminant of Concern	(1) AIS (mg/kg/day)	(2) AIC (mg/kg/day)	(3) RfD (mg/kg/day)	Health Advisories (ppb) (4) 1-Day [Adult]	Long-Term [Adult]	(5) Carcinogenic Potency Factor (mg/kg/day) -1
Benzene	--	--	--	200	--	2.90E-02
Ethylbenzene	9.70E-01	1.00E-01	1.00E-01	30000	3000	--
Toluene	4.30E-01	3.00E-01	3.00E-01	20000	10000	--
Xylene	4.00E+00	2.00E+00	2.00E+00	40000	10000	--
Naphthalene	4.10E-01	4.10E-01	4.00E-01	--	--	--
Phenol	4.00E-02	4.00E-02	6.00E-01	--	--	--
2-Chlorophenol	5.70E-03	5.70E-03	5.00E-03 (6)	--	--	--
Chromium	2.50E-02	5.00E-03	5.00E-03 (6)	1000	800	--
Nickel	1.40E-02	1.00E-02	2.00E-02	1000	600	--
Lead	--	1.40E-03	1.40E-03 (7)	--	--	--

(1) Subchronic Acceptable Intake - Memorandum from S Lee (EPA, Toxics Integration Branch), Updated Reference Dose and Cancer Potency Numbers for use in risk assessment (November 16, 1987)

(2) Chronic Acceptable Intake - Memorandum from S Lee (EPA, Toxics Integration Branch), Updated Reference Dose and Cancer Potency Numbers for use in risk assessment (November 16, 1987)
Source RfD for lead

(3) Reference Doses (RfDs) of Oral Exposure- EPA Office of Research and Development, Health Effects Assessment Summary Tables, First Quarter FY89, January 1989

(4) Health Advisories - Drinking Water Regulations and Health Advisories, U.S. EPA Office of Drinking Water (December, 1988)

(5) Carcinogenic Potency Factor (Oral) - EPA Office of Research and Development, Health Effects Assessment Summary Tables, First Quarter FY89, January 1989

(6) Reference Dose (RfD) of Oral Exposure - Drinking Water Regulations and Health Advisories, U.S. EPA Office of Drinking Water (December, 1988)

(7) Reference Dose (RfD) - Superfund Public Health Evaluation Manual, October, 1986
EPA is currently reviewing lead as a carcinogen and may calculate a cancer potency factor (CPF) in the future. The RfD value listed in this table has been revoked. Since a CPF does not exist at present, the old RfD is being retained so that the noncarcinogenic potential of lead can be evaluated.

TABLE 3

EXPOSURE ASSESSMENT ASSUMPTIONS

Note: All exposures assume 70-kg adult as receptor

GROUND WATER - INGESTION

Most Probable Case: Ingest 1.0 liter/day (1/d), 250 days/year, over 10 years at average contaminant concentration

Worst Case: Ingest 2.0 1/d, 250 days/year over 20 years at maximum contaminant concentration

SURFACE SOIL - INGESTION

Most Probable Case: Ingest 0.05 g/exposure, 12 exposures/year over 10 years

Worst Case: Ingest 0.01 g/exposure, 6 exposures/year over 20 years

SURFACE SOIL - DIRECT CONTACT

Most Probable Case: Direct contact 12 times/year over 10 years; contact rate: 0.85 g/exposure over 3,400 cm^2 skin area

Worst Case: Direct contact 24 times/year over 20 years; contact rate: 0.85 g/exposure over 3,400 cm^2 skin area

SUBSURFACE SOIL - INGESTION

Most Probable Case: Ingest 0.05 g/exposure with 20 exposures/year over 2 years

Worst Case: Ingest 0.1 g/exposure with 10 exposures/year over 2 years

SUBSURFACE SOIL - DIRECT CONTACT

Most Probable Case: Direct contact 120 times/year over 2 years; contact rate: 0.85 g/exposure over 3,400 cm^2 skin area

Worst Case: Direct contact 240 times/year over 2 years; contact rate: 0.85 g/exposure over 3,400 cm^2 skin area

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[NC-rsk-SUM]

TABLE 4 SUMMARY OF NONCARCINOGENIC, CHRONIC RISKS PRESENT AT FAA AREA D

RISK TYPE : Noncarcinogenic

		NONCARCINOGENIC, CHRONIC HAZARD INDICES ASSOCIATED WITH EXPOSURE (1)				
		GROUND WATER	SURFACE SOIL		SUBSURFACE SOIL	
Exposure Scenario	Contaminant of Concern	Ingestion	Ingestion	Direct Contact	Ingestion	Direct Contact
Adult Realistic Worst-Case	Benzene	NA	NA	NA	NA	NA
	Ethylbenzene	2.96E-02	3.07E-10	1.82E-07	3.58E-09	3.65E-07
	Toluene	5.78E-02	9.59E-11	5.70E-08	1.12E-09	1.14E-07
	Xylene	1.31E-02	5.37E-11	3.19E-08	6.26E-10	6.39E-08
	Naphthalene	1.40E-02	NA	NA	NA	NA
	Phenol	2.82E-03	1.92E-10	1.14E-07	2.24E-09	2.28E-07
	2-Chlorophenol	NA	2.73E-10	1.63E-07	3.19E-09	3.25E-07
	Chromium	1.07E-01	1.48E-07	8.78E-05	1.72E-06	1.76E-04
	Nickel	4.81E-02	NA	NA	NA	NA
	Lead	1.36E-01	2.74E-07	1.63E-04	3.20E-06	3.26E-04
Adult Most Probable Case	Benzene	NA	NA	NA	NA	NA
	Ethylbenzene	9.44E-04	3.83E-11	4.56E-08	8.95E-10	1.82E-07
	Toluene	1.52E-03	1.20E-11	1.43E-08	2.80E-10	5.70E-08
	Xylene	2.82E-04	6.71E-12	7.98E-09	1.57E-10	3.19E-08
	Naphthalene	2.79E-04	NA	NA	NA	NA
	Phenol	7.87E-05	2.40E-11	2.85E-08	5.59E-10	1.14E-07
	2-Chlorophenol	NA	3.41E-11	4.06E-08	7.97E-10	1.63E-07
	Chromium	4.15E-03	1.85E-08	2.20E-05	4.31E-07	8.78E-05
	Nickel	1.28E-03	NA	NA	NA	NA
	Lead	6.44E-03	3.42E-08	4.07E-05	7.99E-07	1.63E-04

(1) Maximum Contaminant Concentrations Are Used to Develop the Adult Realistic Worst-Case Scenario
Average Contaminant Concentrations Are Used to Develop the Adult Most Probable Case Scenario

* Indicates that Hazard Index Is Greater Than 1, and May Illicit Chronic, Noncarcinogenic Health Effects in Humans.

NA Not Applicable

[C-rsk-SUM]

TABLE 5 SUMMARY OF CARCINOGEINC RISKS PRESENT AT FAA AREA D

RISK TYPE : Carcinogenic

		CARCINOGENIC RISK ASSOCIATED WITH EXPOSURE (1)				
		GROUND WATER	SURFACE SOIL		SUBSURFACE SOIL	
Exposure Scenario	Contaminant of Concern	Ingestion	Ingestion	Direct Contact	Ingestion	Direct Contact
Adult Realistic Worst-Case	Benzene	6.48E-04 E	6.23E-11 L	5.29E-10 L	1.04E-11 L	1.06E-09 L
	Ethylbenzene	NA	NA	NA	NA	NA
	Toluene	NA	NA	NA	NA	NA
	Xylene	NA	NA	NA	NA	NA
	Naphthalene	NA	NA	NA	NA	NA
	Phenol	NA	NA	NA	NA	NA
	2-Chlorophenol	NA	NA	NA	NA	NA
	Chromium	NA	NA	NA	NA	NA
	Nickel	NA	NA	NA	NA	NA
	Lead	NA	NA	NA	NA	NA
Adult Most Probable Case	Benzene	1.58E-05 W	7.78E-12 L	1.32E-10 L	2.59E-12 L	5.29E-10 L
	Ethylbenzene	NA	NA	NA	NA	NA
	Toluene	NA	NA	NA	NA	NA
	Xylene	NA	NA	NA	NA	NA
	Naphthalene	NA	NA	NA	NA	NA
	Phenol	NA	NA	NA	NA	NA
	2-Chlorophenol	NA	NA	NA	NA	NA
	Chromium	NA	NA	NA	NA	NA
	Nickel	NA	NA	NA	NA	NA
	Lead	NA	NA	NA	NA	NA

(1) = Maximum Contaminant Concentrations Are Used to Develop the Adult Realistic Worst-Case Scenario
Average Contaminant Concentrations Are Used to Develop the Adult Most Probable Case Scenario

W = Carcinogenic Risk Falls Within EPA Target Range of 10^{-4} through 10^{-7}

E = Carcinogenic Risk Exceeds Target Range

L = Carcinogenic Risk Is Less Than Target Range

NA = Not Applicable

TABLE 6

COMPARISON AMONG ALTERNATIVES
OVERALL PROTECTIVENESS OF HUMAN HEALTH AND THE ENVIRONMENT

Alternative 1:	No action	Baseline risks remain unchanged
Alternative 2:	Fencing, capping and slurry wall construction	Provides some containment but risks associated with ground water contaminants not addressed; approaches but does not attain ARARS
Alternative 3:	Free product extraction and on-site storage; Soil excavation and on-site storage; Ground water extraction and injection with in situ biodegradation	Provides temporary containment for future treatment, short-term risks associated with soil excavation; interim remedy; attains ARARs
Alternative 4:	Free product extraction and off-site cement kiln incineration; Soil excavation and off-site disposal; Ground water extraction and injection with in situ biodegradation	Treatment reduces risks associated with product and ground water; potential for increased short-term risks due to soil excavaton; attains ARARs
Alternative 5:	Free product extraction and on-site rotary kiln incineration; Soil excavation and on-site rotary kiln incineration; Ground water extraction and injection with carbon adsorption	Contaminants from all media treated on-site; potential for increased short-term risks due to soil excavation; attains ARARs
Alternative 6:	Free product extraction and off-site cement kiln incineration; Soil venting; Ground water extraction and injection with in situ biodegradation	Contaminants from all media treated off-site or in situ; short-term risks minimal; short time frame to meet objectives; exceeds ARARs
Alternative 7:	Free product extraction and off-site cement kiln incineration; Soil excavation and off-site rotary kiln incineration; Ground water extraction and injection with carbon adsorption	Contaminants from all media treated on-site or off-site; potential for increased short-term risks due to soil excavation; exceeds ARARs
Alternative 8:	Free product extraction and off-site distillation; Soil excavation and soil washing; Ground water extraction and injection with UV oxidation	Contaminants from all media treated on-site or off-site; potential for increased short-term risks due to soil excavation; exceeds ARARs

TABLE 7

COMPARISON AMONG ALTERNATIVES
COMPLIANCE WITH ARARs

Alternative 1:	No action	ARARs are not attained
Alternative 2:	Fencing, capping and slurry wall construction	Approaches but does not attain ARARs; does not meet the goals of SARA
Alternative 3:	Free product extraction and on-site storage; Soil excavation and on-site storage; Ground water extraction and injection with in situ biodegradation	Attains ARARS; approval for long-term, on-site storage of wastes required; meets interim remedy criteria under SARA
Alternative 4:	Free product extraction and off-site cement kiln incineration; Soil excavation and off-site disposal; Ground water extraction and injection with in situ biodegradation	Attains ARARs; off-site soil disposal is not consistent with SARA
Alternative 5:	Free product extraction and on-site rotary kiln incineration; Soil excavation and on-site rotary kiln incineration; Ground water extraction and injection with carbon adsorption	Exceeds ARARs; consistent with SARA preference for permanent solutions and reductions in mobility, txocity and volume
Alternative 6:	Free product extraction and off-site cement kiln incineration; Soil venting; Ground water extraction and injection with in situ biodegradation	Exceeds ARARs; consistent with SARA preference for permanent solutions and reductions in mobility, toxicity and volume, as well as use of innovative technologies
Alternative 7:	Free product extraction and off-site cement kiln incineration; Soil excavation and off-site rotary kiln incineration; Ground water extraction and injection with carbon adsorption	Exceeds ARARs; consistent with SARA preference for permanent solutions and reductions in mobility, toxicity and volume
Alternative 8:	Free product extraction and off-site distillation; Soil excavation and soil washing; Ground water extraction and injection with UV oxidation	Exceeds ARARs; consistent with SARA preference for permanent solutions and reductions in mobility, toxicity and volume, as well as use of innovatie technologies

TABLE 8

COMPARISON AMONG ALTERNATIVES
LONG-TERM EFFECTIVENESS AND PERMANENCE

Alternative 1:	No action	Baseline risks remain unchanged
Alternative 2:	Fencing, capping and slurry wall construction	Contaminants are untreated but contained; Long-term monitoring of containment area and ground water required; Risks associated with ground water contamination not addressed
Alternative 3:	Free product extraction and on-site storage; Soil excavation and on-site storage; Ground water extraction and injection with in situ biodegradation	Contaminants are treated or removed and contained for future treatment; Long-term monitoring of containment areas required; Treatment reduces risks associated with ground water contamination, possible future exposures to product and soil also reduced
Alternative 4:	Free product extraction and off-site cement kiln incineration; Soil excavation and off-site disposal; Ground water extraction and injection with in situ biodegradation	Contaminants are treated or removed and contained off-site; Off-site soil disposal significantly reduces potential risks on-site; relatively low risks at off-site disposal site; Treatment reduces risks associated with product and ground water contamination
Alternative 5:	Free product extraction and on-site rotary kiln incineration; Soil excavation and on-site rotary kiln incineration; Ground water extraction and injection with carbon adsorption	Contaminants from all media are treated on-site; Potential risks are low relative to Alternatives 1, 2 or 3
Alternative 6:	Free product extraction and off-site cement kiln incineration; Soil venting; Ground water extraction and injection with in situ biodegradation	Contaminants from all media are treated off-site or in situ; Potential risks are low relative to Alternatives 1, 2 or 3
Alternative 7:	Free product extraction and off-site cement kiln incineration; Soil excavation and off-site rotary kiln incineration; Ground water extraction and injection with carbon adsorption	Contaminants from all media are treated on-site or off-site Potential risks reduced since contaminated materials are partially removed off-site during remediaton; off-site risks are low relative to Alternatives 1, 2 or 3
Alternative 8:	Free product extraction and off-site distillation; Soil excavation and soil washing; Ground water extraction and injection with UV oxidation	Contaminants from all media are treated on-site or off-site. Potential risks are low relative to Alternatives 1, 2 or 3.

TABLE 9

COMPARISON AMONG ALTERNATIVES
REDUCTION OF TOXICITY (T), MOBILITY (M) OR VOLUME (V) THROUGH TREATMENT

Alternative 1:	No action	No reductions in T, M or V; Site conditions remain unchanged
Alternative 2:	Fencing, capping and slurry wall construction	No reductions in T or V (M is decreased through containment but not to the same degree as Alternative 3)
Alternative 3:	Free product extraction and on-site storage; Soil excavation and on-site storage; Ground water extraction and injection with in situ biodegradation	No immediate reductions in T or V of soil or product (M reduced by containment); T of ground water reduced (M reduced through gradient control)
Alternative 4:	Free product extraction and off-site cement kiln incineration; Soil excavation and off-site disposal; Ground water extraction and injection with in situ biodegradation	Reduced T of ground water (M reduced through pumping); Reduced T and V of product (M reduced through pumping); (Reduced overall M of soil through containment, although short-term potential M of soil and product increases due to transport off-site)
Alternative 5:	Free product extraction and on-site rotary kiln incineration; Soil excavation and on-site rotary kiln incineration; Ground water extraction and injection with carbon adsorption	Reduced T of ground water (M reduced through pumping); Reduced T and V of product (M reduced through pumping); Reduced T of soil
Alternative 6:	Free product extraction and off-site cement kiln incineration; Soil venting; Ground water extraction and injection with in situ biodegradation	Reduced T of ground water (M reduced through pumping); Reduced T and V of product (M reduced through pumping, short-term potential M of product increases due to transport off-site); Reduced T of soil
Alternative 7:	Free product extraction and off-site cement kiln incineration; Soil excavation and off-site rotary kiln incineration; Ground water extraction and injection with carbon adsorption	Reduced T of ground water (M reduced through pumping); Reduced T and V of product (M reduced through pumping, short-term potential M of soil and product increases due to transport off-site); Reduced T of soil
Alternative 8:	Free product extraction and off-site distillation; Soil excavation and soil washing; Ground water extraction and injection with UV oxidation	Reduced T of ground water (M reduced through pumping); Reduced T of product; V of product not reduced but converted into reuseable product (short-term potential M of product increases due to transport off-site); Reduced T of soil

Note: Reductions in toxicity, mobility or volume through means other than treatment (e.g., containment, pumping, etc.) are presented parenthetically.

TABLE 10

COMPARISON AMONG ALTERNATIVES
SHORT-TERM EFFECTIVENESS

Alternative 1:	No action	Baseline risks remain unchanged; Remedial response objectives not achieved
Alternative 2:	Fencing, capping and slurry wall construction	Risks to remediation workers may occur during cap construction due to surface soil contamination; Remedial response objectives not achieved
Alternative 3:	Free product extraction and on-site storage; Soil excavation and on-site storage; Ground water extraction and injection with in situ biodegradation	Health and safety factors[1] exist during initial remediation of contaminated area; Remedial response objectives not achieved until final disposition of soils and product (10 years or more)
Alternative 4:	Free product extraction and off-site cement kiln incineration; Soil excavation and off-site disposal; Ground water extraction and injection with in situ biodegradation	Health and safety factors[1] exist during remediation; Remedial response objectives achieved within 7 years
Alternative 5:	Free product extraction and on-site rotary kiln incineration; Soil excavation and on-site rotary kiln incineration; Ground water extraction and injection with carbon adsorption	Health and safety factors[1] exist during remediation; On-site incineration could potentially pose additional short-term respiratory risks; Remedial response objectives achieved within 9 years
Alternative 6:	Free product extraction and off-site cement kiln incineration; Soil venting; Ground water extraction and injection with in situ biodegradation	Health and safety factors[1] limited to direct contact risks because excavaton is not included; Soil venting could potentially pose short-term respiratory risks but risks are more controllable than with soil excavation alternatives; Remedial response objectives achieved within 6 years
Alternative 7:	Free product extraction and off-site cement kiln incineration; Soil excavation and off-site rotary kiln incineration; Ground water extraction and injection with carbon adsorption	Health and safety factors[1] exist during remediation; Remedial response objectives achieved within 7 years
Alternative 8:	Free product extraction and off-site distillation; Soil excavation and soil washing; Ground water extraction and injection with UV oxidation	Health and safety factors[1] exist during remediation; Remedial response objectives achieved within 9 years

(1) Health and safety factors include potential inhalation of volatilized organics and dust and direct contact with jet fuel and soils contaminated with petroleum hydrocarbons.

TABLE 11

COMPARISON AMONG ALTERNATIVES
IMPLEMENTABILITY

ALTERNATIVE	DESCRIPTION OF ALTERNATIVE	TECHNICAL FEASIBILITY	ADMINISTRATIVE FEASIBILITY	AVAILABILITY OF SERVICES AND MATERIALS
1:	No action	No implementation required	No implementation required	No implementation required
2:	Fencing, capping and slurry wall construction	Construction easily implemented; Cap could inhibit future remediation; Monitoring could potentially miss a failure of cap or slurry wall	No inter-agency coordination required	Suppliers of services and equipment readily available
3:	Free product extraction and on-site storage; Soil excavation and on-site storage; Ground water extraction and injection with in situ biodegradation	Construction easily implemented; Facilitates future remediation; Easily monitored	Requires authorization to store waste >90 days and to reinject extracted ground water; May require future coordination for final disposition of product and soil	Suppliers of services and equipment generally readily available; In situ biodegradation services may be somewhat limited
4:	Free product extraction and off-site cement kiln incineration; Soil excavation and off-site disposal; Ground water extraction and injection with in situ biodegradation	Construction easily implemented; Monitoring and future remediation not inhibited	Requires authorization to dispose of certain soils as industrial waste and to reinject extracted ground water	Capacity of off-site disposal sites limited; availability of in situ biodegradation services somewhat limited
5:	Free product extraction and on-site rotary kiln incineration; Soil excavation and on-site rotary kiln incineration; Ground water extraction and injection with carbon adsorption	Requires set-up and start-up of on-site incinerator; Technical problems possible; Monitoring and future remediation not inhibited	Requires authorization to operate on-site incinerator and to reinject treated ground water; Requires delisting of treated soil	Availability of rotary kilns and experienced operators is limited
6:	Free product extraction and off-site cement kiln incineration; Soil venting; Ground water extraction and injection with in situ biodegradation	Construction fairly easily implemented; Minor technical problems possible; Due to "in situ" nature of treatment, monitoring of completeness of treatment hindered	Requires authorization for soil venting emissions and reinjection of extracted ground water	Availability of soil venting and in situ biodegradation services is somewhat limited
7:	Free product extraction and off-site cement kiln incineration; Soil excavation and off-site rotary kiln incineration; Ground water extraction and injection with carbon adsorption	Construction easily implemented; Monitoring and future remediation not inhibited	Requires authorization to reinject treated ground water	Capacity of off-site rotary kiln facilities limited
8:	Free product extraction and off-site distillation; Soil excavation and soil washing; Ground water extraction and injection with UV oxidation	Requires set-up and start-up of on-site soil washing system; Technical problems possible; Monitoring and future remediaton not inhibited	Requires delisting of treated soil and authorization to reinject treated ground water	Availability of soil washing equipment and experienced personnel extremely limited; Availability of off-site distillation services and UV oxidation equipment somewhat limited

TABLE 12

COMPARISON AMONG ALTERNATIVES
COST

		TOTAL CAPITAL COST	TOTAL NET O&M COST	TOTAL PRESENT WORTH[1]
Alternative 1:	No action	-	-	-
Alternative 2:	Fencing, capping and slurry wall construction	$2,377,000	$113,000	$2,988,000
Alternative 3:	Free product extraction and on-site storage; Soil excavation and on-site storage; Ground water extraction and injection with in situ biodegradation	6,348,000	200,000	7,858,000
Alternative 4:	Free product extraction and off-site cement kiln incineration; Soil excavation and off-site disposal; Ground water extraction and injection with in situ biodegradation	7,079,000	190,000	8,722,000
Alternative 5:	Free product extraction and on-site rotary kiln incineration; Soil excavation and on-site rotary kiln incineration; Ground water extraction and injection with carbon adsorption	48,228,000	112,000	58,009,000
Alternative 6:	Free product extraction and off-site cement kiln incineration; Soil venting; Ground water extraction and injection with in situ biodegradation	286,000	200,000	583,000
Alternative 7:	Free product extraction and off-site cement kiln incineration; Soil excavation and off-site rotary kiln incineration; Ground water extraction and injection with carbon adsorption	32,949,000	92,000	39,649,000
Alternative 8:	Free product extraction and off-site distillation; Soil excavation and soil washing; Ground water extraction and injection with UV oxidation	8,904,000	224,000	10,954,000

[1] Includes 20% contingency. See Appendix A for detailed cost estimates.

TABLE 13

SITE D - Alternative 6:
Free Product Extraction and Off-Site Cement Kiln Incineration, Soil Venting, Groundwater Extraction and Injection with In-Situ Biodegradation

Item	Quantity Units	Unit Price	Basis year	Reference	Adjustment Factor	1989 Unit costs	1989 Costs	Years (O&M)	Present Value(O&M)
CAPITAL COSTS - DIRECT									
Security									
-Fence(4 ft snow fence)	1,200 linear ft	$2.01	1987	11	1.05	$2.11	$2,532.60		
-Warning Signs	6 signs	$32.00	1987	11	1.05	$33.60	$201.60		
Equipment Decontamination									
-Rental of steam cleaner	30 days	$50.00	1988	23	1.02	$51.00	$1,530.00		
-Construct Decon Pit									
Excavate Pit	100 cu.yd.	$2.59	1987	11	1.05	$2.72	$271.95		
Polyethylene Tarpeulin	1200 sq.ft.	$0.31	1987	11	1.05	$0.33	$390.60		
Total Equipment Decon Costs									$2,192.55
Engineering Mgmt. Mob/Demob (1 trailer)	2 months	$360.00	1988	11	1.02	$367.20	$734.40		
Free Product Removal									
-Transport of product	15 loads	$1,575.00	1989	38	1	$1,575.00	$23,625.00		
-Disposal at Cement Kiln Incinerator	73,000 gallons	$0.22	1989	38	1	$0.22	$16,060.00		
Vacuum Extraction (4" diameter, 21 10-ft wells)									
-Well Construction & Materials	210 ft	$35.00	1986	15	1.09	$38.15	$8,011.50		
-4" Pipe (PVC)	1950 ft	$12.40	1987	11	1.05	$13.02	$25,389.00		
-Health and Safety (17%)				17			$1,361.96		
-Mobilization	1 time	$600.00	1985	6	1.12	$672.00	$672.00		
-Industrial Blowers	2 blowers	$675.00	1987	16	1.05	$708.75	$1,417.50		
-Catalytic Incineration Unit	2 units	$60,000.00	1989	33	1	$60,000.00	$120,000.00		
Total Vacuum Extraction Costs									$156,851.96

TABLE 13 (Continued)

Item	Quantity Units	Unit Price	Basis year	Reference	Adjustment Factor	1989 Unit costs	1989 Costs	Years (O&M)	Present Value(O&M)
Soil Confirmation Sampling									
-Borings									
(10 -20 ft borings)	200 ft	$40.00	1989	35	1	$40.00	$8,000.00		
-Analysis									
Total Petroleum Hydrocarbons	10 samples	$100.00	1988	16	1.02	$102.00	$1,020.00		
Product/Groundwater Extraction									
-Well Construction and Materials									
2 -4" Diameter Wells	80 ft	$50.00	1986	15	1.09	$54.50	$4,360.00		
1 -8" Diameter Well	40 ft	$50.00	1986	15	1.09	$54.50	$2,180.00		
-Health and Safety(17%)				17			$1,111.80		
-Centrifugal Pumps (10 gpm each)	5 pumps	$445.00	1987	11	1.05	$467.25	$2,336.25		
-Ejector Pump (includes pump, 200 ft hose, 200 ft air line)	1 pump	$3,210.00	1989		1	$3,210.00	$3,210.00		
Total Extraction Cost									$13,198.05
Product Storage									
-Piping to Existing Tank (4" PVC)	400 ft.	$12.40	1987	11	1.05	$13.02	$5,208.00		
Groundwater Injection									
-Infiltration Galleries 2 total (100ft*5ft*4ft each) 1/2 cu. yd. backhoe	444 cu.yd.	$3.41	1987	11	1.05	$3.58	$1,589.74		
-Geotextile lining	289 sq.yd.	$3.10	1985	6	1.12	$3.47	$1,003.41		
-Crushed Stone Fill (3/4")	444 cu.yd.	$18.45	1987	11	1.05	$19.37	$8,601.39		
Total Injection Cost									$11,194.54
Piping To And From Treatment System									
-(2" diam. PVC in trench)	1,200 ft	$6.19	1988	23	1	$6.19	$7,428.00		

TABLE 13 (Continued)

Item	Quantity Units	Unit Price	Basis year	Reference	Adjustment Factor	1989 Unit costs	1989 Costs	Years (O&M)	Present Value(O&M)
Biodegradation System									
(assume 20 gpm flowrate)									
-Polyethylene Mix Tank(2000 gal)	1 tank	$1,580.00	1988	22	1.02	$1,611.60	$1,611.60		
-Mobilization	1 time	$600.00	1985	6	1.12	$672.00	$672.00		
Total Biodegradation Costs									$2,283.60
Direct Capital Cost Subtotal									$250,530.30
CAPITAL COSTS - INDIRECT									
Engineering and Design(11%)				18					$27,558.33
Legal and Administrative(3%)				18					$7,515.91
TOTAL CAPITAL COSTS									$285,604.54

TABLE 13 (Continued)

Item	Quantity Units	Unit Price	Basis year	Reference	Adjustment Factor	1989 Unit costs	1989 Costs	Years (O&M)	Present Value(O&M)
OPERATION AND MAINTENANCE COSTS									
-Groundwater Monitoring									
Sampling	40 samples	$25.00	1980	9	1.57	$39.25	$1,570.00	9	$9,043.20
Analysis									
Priority Pollutant - VOC	40 samples	$190.00	1988	36	1.02	$193.80	$7,752.00	9	$44,651.52
-Infiltration Gallery Maint.	100 labor hrs	$16.56	1987	12	1.05	$17.39	$1,738.80	6	$7,581.17
-Air sampling	12 months	$380.00	1988	16	1.02	$387.60	$4,651.20	2	$8,093.09
-Biodeg. System Maintenance	480 labor hrs	$16.56	1987	12	1.05	$17.39	$8,346.24	6	$36,389.61
-Chemicals	12 months	$1,500.00	1988	25	1.02	$1,530.00	$18,360.00	6	$80,049.60
-Vacuum Extraction System Oper. and Maint.	1 year	$8,000.00	1988	33,34	1.02	$8,160.00	$8,160.00	2	$14,198.40
TOTAL NET PRESENT VALUE OF O & M									$200,006.58
SUBTOTAL									$485,611.12
CONTINGENCY(20%)									$97,122.22
TOTAL PRESENT VALUE COST FOR ALTERNATIVE 6									$582,733.34

TABLE 14

SUMMARY OF MAJOR ARARs AND TBCs

CHEMICAL-SPECIFIC ARARs/TBCs

* New Jersey Safe Drinking Water Act (NJSDWA)
  - NJSDWA MCLs for: benzene - 1 ppb (final)
    xylene (total) - 44 ppb (final)
    chromium - 50 ppb (final)
    lead - 50 ppb (final)

* Safe Drinking Water Act (SDWA)
  - SDWA MCLs for: toluene - 2,000 ppb (proposed)
    ethylbenzene - 700 ppb (proposed)

* New Jersey Soil Cleanup Action Levels
  - Defines 1 ppm as action level for total volatile organics and 100 ppm as action level for total petroleum hydrocarbons in soils

* New Jersey Ground Water Quality Standards
  - NJAC 7:9-6 specifies groundwater quality standards for Class GW2 waters: phenol (total) - 300 ug/l
    toluene ++
    ethylbenzene ++
    naphthalene ++

LOCATION-SPECIFIC ARARs/TBCs

No location-specifics ARARs/TBCs were identified as being applicable to Area D remediation

ACTION-SPECIFIC ARARs

* Resource, Conservation and Recovery Act (RCRA)
  - 40 CFR 262 Subparts B and C and 264 Subparts I and J specify manifest and pre-transport requirements for the temporary storage and off-site transport of hazardous waste

* Superfund Amendments and Reauthorization Act of 1986 (SARA)
  - Section 121(c) allows the transfer of hazardous substances or pollutants only to a facility operating in compliance with RCRA or other Federal laws, where applicable, and all State laws

* Clean Air Act
  - 40 CFR 50 New Source Performance Standards establish emission standards for new sources and require use of Best Available Control Technology (BACT)

(++ = combined total shall not exceed 50.0 ug/l)

TABLE 14

SUMMARY OF MAJOR ARARs AND TBCs

(Continued)

ACTION-SPECIFIC ARARs (Continued)

- Office of Air Quality Planning and Standards
  - "Issues Relating to VOC Regulation Cutpoints, Deficiencies and Deviations" provides guidance on emission limit goals in ozone nonattainment areas which are applicable to air strippers and other vented extraction techniques.

- New Jersey Air Regulations
  - NJAC 7:27-13 specifies ambient air quality standards for selected contaminants.
  - NJAC 7:27-17 specifies control requirements and prohibition of air pollution by toxic substances.
  - NJAC 7:26-16 specifies emissions limitations for volatile organic compounds.
  - NJAC 7:26-17 requires the use of emission control apparatus.

- New Jersey Water Quality Regulations
  - NJAC 7:14A-1 specifies New Jersey Pollutant Discharge Elimination System Requirements.

- New Jersey Solid and Hazardous Waste Management Regulations
  - NJAC 7:26-7.3-4 establish requirements of hazardous waste generators (consistent with RCRA requirements).
