FEASIBILITY STUDY:

GROUNDWATER REMEDIATION ALTERNATIVES

FORMER FLAGSHIP AIRLINES
AIRCRAFT MAINTENANCE HANGAR
DUTCHESS COUNTY AIRPORT
WAPPINGERS FALLS, NEW YORK
SITE No. 3-14-10

ORDER ON CONSENT #W3-0837-98-12

NOVEMBER 1999

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

APPENDICES

LIST OF FIGURES AND TABLES

FIGURES

TABLES

1.0 INTRODUCTION

The Feasibility Study ("FS") that has been prepared for the former Flagship Airlines Maintenance Hanagar at the Dutchess County Airport in Wappingers Falls, New York ("the site") addresses technologies and remedial action alternatives that may be applied soil and groundwater contamination. The FS is based upon the background information provided in the August 1997 Phase Remedial Investigation Report ("Phased RI") on site history, the source areas, the contaminants, their distribution, and their concentrations.

A variety of remedial technologies have been identified and screened that may be feasible for addressing this contamination. Several site specific remedial alternatives were developed from these technologies, which protect human health and the environment. The relevant site history, geology, and characteristics, are presented in Sections 1.1 – 1.3 and contaminants of concern are listed in Section 2.12. Section 2.4 describes potential clean-up technologies, which may or may not be relevant for the site and Section 2.4.1 identifies which of these technologies may be reasonably considered. In Section 2.4.2, remedial alternatives are developed from the technologies retained in Section 2.4.1. These remedial alternatives are initially screened for their effectiveness and implementability in Section 3.0. Remedial alternatives that remain after the initial screening process are evaluated in detail in Section 4.0, for: 1) compliance with New York standards, criteria, and guidelines ("SCGs"); 2) protection of human health and the environment; 3) short-term effectiveness; 4) long-term effectiveness and permanence; 5) reduction in toxicity, mobility, and volume; 6) implementability; and, 7) cost. The results of the analysis are summarized in Section 5.0, compared in Section 6.0, and the selected alternative is presented in Section 7.0.

1.1 Background

Flagship Airlines, Inc. (dba American Eagle Airlines, Inc.) formerly owned and operated a hangar facility at the Dutchess County Airport in Wappingers Falls, New York (Figure 1-1). The site was brought to the attention of the NYSDEC Petroleum Bulk Storage Section in 1988, when a leaking, heating-oil tank was discovered. The initial investigation was expanded to a Phased RI to investigate potential volatile and semi-volatile organic compounds ("VOCs" and "SVOCs") in shallow groundwater, which were detected in the vicinity of the property boundary separating the site from the adjacent IBM hangar. Several underground storage tanks ("USTs") were identified during the Phased RI and a tank removal program was initiated by Flagship to remove/replace the heating oil UST and remove four (4) other USTs that contained: Jet-A; aircraft lavatory waste; and, wash-waters from hangar maintenance activities (Figure 1-2). A soil-vapor extraction ("SVE") system was installed as an interim remedial measure ("IRM") to reduce elevated levels of petroleum-related VOCs ("BTEX") detected in the vicinity of the fuel oil release. IRMs were implemented to remove/dispose of the contents of the site septic tank, which was then cleaned, prior to reuse by subsequent airport tenants.

Results of the Phase RI indicated that VOCs and SVOCs were present in soil and shallow groundwater in or near the former wash-water storage UST, the former drum storage area, the former hangar floor sump/wash-water piping area, and in the area northeast of the septic system and downgradient of the former wash-water UST. The contaminants of concern include chlorinated solvents and nonhalogenated SVOCs. The contaminants are present in the shallow aquifer, at levels above the applicable cleanup criteria. A more detailed discussion of the Phased RI is provided in the Phased Remedial Investigation Report dated August 1997.

On March 19, 1999, American Eagle Airlines, Inc. ("AEA") entered into an Order on Consent ("OOC") with NYSDEC to remediate groundwater contamination at the former Flagship Maintenance Hangar. As part of the remediation process and in compliance with the OOC, AEA has prepared this Feasibility Study.

1.2 Site Location and Description

The site is located on the southeastern portion of the Dutchess County Airport in the Town of Wappingers Falls, approximately 3.5 miles east of the Hudson River and three (3) miles southeast of the City of Poughkeepsie. The site is occupied by a single building, of approximately 15,000 square feet, which is currently used by the Associated Aircraft Group ("AAG") for aircraft maintenance (Figure 2-1). The northwestern portion of the building is office space and the remainder serves as the maintenance hangar. The area immediately surrounding the facility is covered with concrete or asphalt pavement on three (3) sides. Areas to the southeast and southwest of the hangar are used for vehicle parking, while the area to the northeast is unpaved and grass covered. Ramp and runway access for the Dutchess County Airport are located southwest of the hangar. The property is bounded on the northeast by a service road; on the southeast by the airport fire department, an active hangar, and Dutchess County maintenance garage; on the southwest by the airport ramps and runways; and on the northwest by an active hangar facility, which is also occupied by AAG. This northwestern AAG facility was formerly occupied by IBM, and is referred to in this study as the "IBM site".

1.3 Site Geology and Hydrogeology

The site is underlain by three (3) predominant unconsolidated units, overlying limestone and shale bedrock (Table 1-1):

- sand and silty sand;
- silt and clay; and,
- glacial till.

The total thickness of unconsolidated materials at the site ranges from 38 feet at monitoring well MW-3 to 60 feet at MW-4. Contamination at the site is limited to the upper geologic unit, the sand/silty sand zone, which ranges in thickness from 16 feet at monitoring well ME-12 to 33 feet at ME-17. The mean grain-size of the sediments in this zone becomes finer with depth and silt content increases with depth. The downward migration of contamination was limited by the underlying silt and clay unit.

Groundwater beneath the site is found in two (2) zones: 1) an overburden water-bearing unit consisting of the near surface sand/silty sand; and, 2) the uppermost (shallow) bedrock strata. The overburden water-bearing unit and the shallow bedrock aquifer are separated by semi-confining to confining silt/clay and glacial till units (Table 1-1). The water table was encountered at depths ranging from 2 – 6 feet below ground surface ("bgs"). Groundwater in the overburden flows northwest at a hydraulic gradient of about 0.017. The average hydraulic conductivity of the overburden is 3.8×10^{-3} cm/sec (7.5×10^{-3} ft/min).

2.0 DEVELOPMENT OF REMEDIAL ALTERNATIVES

2.1 Remedial Action Objectives

Remedial action is proposed to eliminate sources of contamination, prevent the off-site migration of contamination, and permanently reduce contaminants to acceptable clean-up levels. The objectives of the proposed remedial action include the following:

- Remediate contaminated soil to NYSDEC SCGs;
- Remediate contaminated groundwater to NYSDEC SCGs;
- Prevent present and future off-site migration of contaminants.

2.1.1 MEDIA OF CONCERN

The Phased RI identified contamination exceeding NYSDEC SCGs in the soil and groundwater at the former Flagship site. These are the media of concern at the site.

2.1.2 CONTAMINANTS OF CONCERN

The soil contaminants of concern were selected based upon the results of the Phased RI and the groundwater contaminants of concern were based upon the results of sampling performed in May 1999 (Table 2-1). Table 2-2 lists each contaminant of concern, its maximum concentration, the location of the maximum concentration, and the appropriate NYSDEC SCG. The contaminants of concern at the former Flagship site are:

Soil	1,1,1-trichloroethane ("TCA")
	tetrachloroethene ("PCE")
	carbon tetrachloride
	naphthalene SVOC
Groundwater	1,1,1-TCA
	1,1-dichloroethane ("DCA")
	$_{total}$ 1,2-dichloroethene ("DCE")
	PCE
	vinyl chloride
	xylene
	phenol SVOC
	4-methylphenol SVOC
	naphthalene SVOC

2.1.3 EXTENT OF CONTAMINATED MEDIA

2.1.3.1 Groundwater

A narrow, bifurcated plume of dissolved-phase groundwater contaminants originates from two (2) source areas on the site, a gravel leaching bed associated with the former wash-water storage UST and the former drum storage area (Appendix A, Figures 1 through 10). The principal leg of the plume appears to be migrating from the gravel leaching bed, along a former piping trench, toward the former floor sump. The subordinate branch of the plume is occasionally observed, extending from the former drum storage area toward the former floor sump, where it joins the main body of the plume. From the former floor sump, the plume extends beneath the office suites, toward monitoring well ME-19. The main body of the groundwater contaminant plume appears limited to a depth of 12 feet, based upon the results of discrete, direct-push, groundwater sampling .

A separate naphthalene plume emanates from the area of the former heating oil UST. Discrete, direct-push groundwater sampling along the northern property boundary near monitoring well DG-1 indicates that the naphthalene plume extends to a depth of approximately 22 feet (Appendix A, Figures 1 - 10).

2.1.3.2 Soil

Soil contaminants that exceed the SCGs include the following:

- PCE; 1,1,1-TCA; and carbon tetrachloride at a depth of 7 feet in the vicinity of the former wash water UST. The areal extent is estimated at 15 feet x 40 feet, based upon delineation samples.
- PCE at a depth between 8 – 12 feet beneath the former drum storage area. The areal extent is estimated at 10 feet x 10 feet, based upon delineation samples.
- Naphthalene at a depth between 5 – 7 in the vicinity of monitoring well ME-12, where the former wash-water UST piping connected with the hangar floor sump. The areal extent is estimated at 10 feet x 10 feet, based upon delineation samples.

2.1.4 CONTAMINANT SPECIFIC CLEANUP CRITERIA

New York State does not have statutory Applicable or Relevant and Appropriate Environmental and Public Health Requirements ("ARARs"). The clean-up criteria for the contamination at the Flagship site are the NYSDEC SCGs for soil and groundwater (Table 2-1).

2.1.4.1 Groundwater

Groundwater clean-up criteria are based upon NYSDEC Technical and Operational Guidance Series ("TOGS") No. 1.1.1, – "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations", October 22, 1993, Reissued in June, 1998. Contaminant-specific clean-up criteria for the Flagship site include the following:

Compound	Class GA Groundwater Cleanup Standard (µg/L)
1,1,1-TCA	5
1,1-DCA	5
1,2-DCE (total)	5
PCE	5
vinyl chloride	2
xylene	5
phenol	1
4-methylphenol	1
naphthalene	10*
*Guidance Value	

2.1.4.2 Soil

Soil clean-up criteria are based upon NYSDEC Technical and Administrative Guidance Memorandum ("TAGM") 4046, "Determination of Soil Cleanup Objectives and Cleanup Levels", January 24, 1994. Contaminant-specific clean-up criteria for the Flagship site include the following:

Compound	Recommended Soil Clean-Up Objective (mg/kg)
1,1,1-TCA	0.8
PCE	1.4
carbon tetrachloride	0.6
naphthalene	13

2.1.5 EXPOSURE PATHWAYS

Human exposure to the soil and groundwater contaminants at the site is minimal. Soil contamination at the site is >5 feet bgs. A person would not be exposed to these contaminants when walking across the site or working at the site. Direct contact with contaminants would only be possible if the site is excavated to a depth of approximately 7 feet, in the localized areas of soil contamination.

Groundwater is contaminated in a narrow, localized plume. Groundwater in the contaminated zone is not used locally for drinking water or as a water-supply source, although this shallow water-bearing unit is classified by the NYSDEC as a Class GA aquifer. Direct contact with the contaminated groundwater would only be possible during monitoring-well sampling

2.2 General Response Actions

General response actions were developed to satisfy the remedial action objectives. Based upon the Phased RI and the remedial objectives discussed in Section 2.1, the applicable general response actions for the site are:

- Passive Soil Remediation;
- Passive Groundwater Remediation;
- Active Soil Remediation;
- Active Groundwater Remediation;
- No Action.

While NYSDEC has stated that the no action option is unacceptable at the site, the no action option serves as a baseline against which evaluation of the other response actions can be performed. The general response actions also serve as the basis for evaluating site remediation technologies.

2.3 Contaminated Volumes or Areas to Apply Response Action

2.3.1 GROUNDWATER

The plume containing dissolved-phase chlorinated solvents travels is narrow and variable in time and space (Figure 2-1). The main body of the plume originates in the former wash-water storage UST source area, follows the former wash water UST piping trench, then migrates beneath the hangar office suites. A minor component of the plume occasionally migrates from the former drum storage area, and joins the wash water UST plume beneath the hangar building in the vicinity of the former floor sump (Appendix A, Figure 1). The commingled plume continues to migrate downgradient in a narrow band toward monitoring well ME-19. The solvent plume appears limited to a depth of 12 feet.

A separate naphthalene plume emanates from the area of the former heating oil UST. Discrete, direct-push groundwater sampling along the northern property boundary near monitoring well DG-1 indicates that the naphthalene plume extends to a depth of approximately 22 feet (Appendix A, Figure 10).

Groundwater Plumes	Approximate Volume of Plume (gallons)
Former Wash-Water UST/Drum Storage Area Plume	155,000
Former Heating Oil UST Plume	22,000
Total Volume of Contaminated Groundwater	**177,000**

The volume of contaminated groundwater was estimated as follows:

Plume Volume (ft^3) = length (ft) x width (ft) x thickness (ft)
Water Volume (ft^3) = Plume Volume (ft^3) x Estimated Porosity (25%)
Water Volume (gal.) = Water Volume (ft^3) x 7.48 gal/ft^3

2.3.2 SOIL

The Phased RI Report and the May 1999 groundwater sampling event form the basis for estimating the area and volume of contaminated soil and groundwater. The soil samples collected during the Phased RI identified soil contamination in the unsaturated zone of three (3) limited source areas (Figure 2-2):

Soil Contamination/Source Areas	Volume of Contaminated Soil (ft^3)
Former Wash-Water UST Leaching Bed	15' x 40' x 1' thick = 600
Former UST to Floor Sump Piping Area	10' x 10' x 2' thick = 200
Former Drum Storage Area	10' x 10' x 4' thick = 400
Volume of Contaminated Soil	**1,200 (44 cy)**

In addition to the contaminated soil in the source areas, the aquifer matrix in the plume is contaminated with sorbed solvents and naphthalene. For the purposes of the FS, it is assumed that contaminants are sorbed to the soil within the dissolved-phase groundwater plume, based upon the following relationship:

$M_{sorbed} = M_{dissolved} \times K_{oc}$ Where: M_{sorbed} = contaminant mass in the soil
$M_{dissolved}$ = dissolved phase contaminant mass
K_{oc} = partition coefficient of the contaminant compound

Applying this relationship to the area and thickness of the solvent and naphthalene plumes (Figure 2-1 and Appendix A, Figures 1 through 10) yields approximately 3,000 cy of contaminated soil:

Soil Contamination – Groundwater Plumes	Volume of Contaminated Soil (ft^3)
Solvent Plume – Former Wash-Water UST	40' x 210' x 8.5' thick = 71,000
Solvent Plume – Former Drum Storage Area	15' x 40' x 8.5' thick = 5,000
Naphthalene Plume – Former Heating Oil UST	25' x 15' x 13' thick = 5,000
Volume of Contaminated Soil	**81,000 ft^3 (3,000 cy)**

2.4 Potential Remedial Technologies

The remedial technologies that were evaluated are contaminant-specific and technically feasible, but may or may not be applicable for the site (Table 2-2). These technologies are components of the general response actions. They can be used alone or in combination with other technologies to meet SCGs. The USEPA ReachIt and GWRTAC databases were used to identify potentially applicable contaminant-specific remedial technologies:

Passive Soil Remediation	Natural Attenuation/Bioremediation
	Enhanced Natural Attenuation/Bioremediation
	Bioventing
Passive Groundwater Remediation	Natural Attenuation/Bioremediation
	Enhanced Natural Attenuation/Bioremediation
	Permeable Reactive Barrier
Active Soil Remediation	Excavation and Disposal
	Chemical Flushing
	In-well Stripping/Recirculation Wells
	Air-Sparge/SVE
Active Groundwater Remediation	Pump and Treat Technologies
	In-well Stripping/Recirculation Wells
	Air-Sparge/SVE
No Action	Monitoring
	Deed Notice

Table 2-2 illustrates the potential remedial technologies and the selection criteria.

2.4.1 APPLICABLE TECHNOLOGIES

Remedial technologies serve as the basis for the development of site-specific remedial alternatives, which are meant to represent comprehensive site remedies that address the site response objectives. The focus of the screening process was to eliminate technologies that are not feasible or have limitations that would prevent achievement of the remedial action objectives. The effectiveness/feasibility of the technologies were evaluated on their ability to meet the SCGs, the permanence of the remedy, implementability, and, reliability. In-situ technologies were preferred to ex-situ technologies, because the site is an active aircraft maintenance facility with a third-party tenant. Technologies which could potentially provide permanent destruction of contaminants or reduction of contaminant concentrations were selected over remedies which provide control or isolation.

The following remedial alternatives and technologies were considered applicable to the site.

Passive Soil Remediation	Enhanced Natural Attenuation/Bioremediation
	Bioventing
Passive Groundwater Remediation	Natural Attenuation/Bioremediation
	Enhanced Natural Attenuation/Bioremediation
Active Soil Remediation	In-well Stripping/Recirculation Wells
	Air-Sparge/SVE
Active Groundwater Remediation	In-well Stripping/Recirculation Wells
	Air-Sparge/SVE
No Action*	Long-Term Monitoring
	Deed Notice

*No Action is not considered an appropriate alternative, but is retained for comparison purposes.

2.4.2 APPROPRIATE REMEDIAL ALTERNATIVES

The appropriate remedial alternatives differ from the potentially applicable technologies listed in Section 2.4.1. Appendix B provides a comparison of the potentially applicable technologies against the selection criteria listed in Section 2.4.1. Based upon this comparison, three (3) technologies/alternatives were deemed appropriate for the site:

Alternative	Technology	Type of Remedial Action
1	Enhanced Natural Attenuation	Active
2	In-Well Stripping/Recirculation Wells	Active
3	Air Sparge/SVE	Active
4	No Action*	Passive

*No Action is not appropriate for the site, but it is retained for comparison purposes.

Each alternative has a proven track record of success at various hazardous waste sites throughout the country, as documented in the GWRTAC and EPA ReachIt databases.

3.0 PRELIMINARY SCREENING OF REMEDIAL ALTERNATIVES

Preliminary screening of the appropriate remedial alternatives identified in Section 2.4.2 was conducted in accordance with NYSDEC TAGM No. 4030. The criteria listed Table 4.1 of TAGM No. 4030 were used to evaluate and score the short-term/long-term effectiveness of each potential remedial action. The criteria listed in Table 4.2 of TAGM No. 4030 were used to evaluate and score the implementability of each potential remedial action. Tables 4.1 and 4.2 of TAGM No. 4030, are included in Appendix B.

3.1 Effectiveness Evaluation

The appropriate remedial alternatives were evaluated for short-term and long-term effectiveness (Appendix B, Table 4.1). No short-term human health or environmental risks were identified for any of the four (4) remedial alternatives. The time required to implement each of the potential remedies was acceptable. Alternatives 1, 2, and 3 provide on-site treatment and destruction of the soil and groundwater contaminants and are considered permanent remedies. The operation and maintenance periods for each of these remedies is expected to be relatively short, based upon their effectiveness and the minimal level of contamination at the site. No untreated waste is expected to remain, upon completion of the remediation program.. Alternatives 1, 2, and 3 passed the preliminary short-term/long-term effectiveness evaluation. The No Action option is not considered an effective or permanent remedy, but is retained for comparison purposes.

3.2 Implementability Evaluation

The appropriate remedial alternatives identified in Section 2.4.2 were evaluated for implementability and each was found to be implementable (Appendix B, Table 4.2). No significant problems are expected during implementation of the alternatives. None of the remedies were considered difficult to construct. Coordination with agencies other than NYSDEC was expected to be minimal and to proceed smoothly. Some coordination may be necessary with the Dutchess County Airport for sampling several off-site wells, if this action is required by NYSDEC. The technology necessary to implement the appropriate remedial alternatives is readily available. Equipment and specialists will be available, without significant delay.

4.0 DETAILED ANALYSIS OF ALTERNATIVES

4.1 Alternative Definition

In Section 4.0, the three (3) remedial alternatives that were retained after the preliminary screening and the no action alternative are described and analyzed in detail. The detailed analysis of remedial alternatives was conducted in accordance with NYSDEC TAGM No. 4030. The criteria listed in Table 5.1 of the TAGM were used to evaluate each remedial alternative. Tables 5.2 through 5.7 of the TAGM were used to numerically score the appropriate criteria for each potential alternative. Table 5.8 was completed to evaluate the cost of each alternative, based upon the criteria in the TAGM. TAGM Tables 5.1 through 5.8 are attached to the FS as Appendix C.

4.1.1 ALTERNATIVE 1 – ENHANCED NATURAL ATTENUATION

Enhanced natural attenuation is a faster, more efficient version of the natural degradation of contaminant compounds. Contaminants generally degrade over time, due to the presence of naturally occurring microbes or compounds in the subsurface. However, this natural attenuation of contaminants may require a long time to reach completion. Enhanced natural attenuation is the process of adding microbes, nutrients, or gases, such as oxygen, hydrogen, or methane, to facilitate and augment the degradation of contaminants. Additionally, certain co-contaminants, such as phenol and toluene, may serve as electron donors that promote the enhanced attenuation of chlorinated solvents.

Many VOCs and SVOCs attenuate efficiently in an aerobic environment. However, as the contaminants degrade, they deplete the oxygen available to promote further degradation. Therefore, the addition of oxygen, via the injection of air (bioventing) or chemical compounds that slowly release oxygen to the subsurface environment, greatly enhances the degradation of these contaminants. Chlorinated solvent compounds, such as TCE and PCE, degrade most efficiently in anaerobic environments. Therefore, the addition of oxygen would slow or stop the natural attenuation process. TCE and PCE degradation can be enhanced by the injection of hydrogen or methane into to subsurface, a rather hazardous process, or the addition of chemicals that slowly release hydrogen to the subsurface environment.

The enhanced natural attenuation alternative selected for the site utilizes commercially available oxygen ("ORC") and hydrogen ("HRC") releasing chemicals manufactured by Regenisis Bioremediation Products, Inc.. The remediation would begin with the addition of HRC in the contaminant source areas to promote reductive dechlorination of TCE and PCE. Concurrently, ORC would be injected in migration pathways, and the downgradient site boundary to promote aerobic degradation of vinyl chloride and non-halogenated VOCs and SVOCs. When TCE and PCE contamination has sufficiently degraded to vinyl chloride in the source areas, ORC will be added to the source areas to promote aerobic degradation of the remaining contaminant mass.

HRC and ORC are applied by pumping a chemical/water slurry into the subsurface under pressure, generally through Geoprobe drill rods. Filter socks filled with HRC or ORC may also be placed in existing monitoring wells, within or upgradient of the source area and plumes. The HRC or ORC is depleted over time and must be reapplied every 9 – 12 months, depending upon groundwater temperature, flow rate, and starting/residual contaminant levels.

4.1.2 ALTERNATIVE 2 – IN-WELL STRIPPING/RECIRCULATION WELLS

In-well stripping/recirculation wells is an innovative technology for in-situ remediation. There are several basic types of recirculating wells available with slightly varying techniques for treating contaminated groundwater. The NoVOCs™ recirculating well technology was selected for evaluation of this remedial alternative, because it includes in-well air stripping as the primary contaminant removal method. Groundwater is drawn into the well through an intake screen and oxygenated with a pressurized air-stream that also provides the motive force for recirculation. Mass transfer of the dissolved VOCs occurs as the oxygenated water flows upward through the well.. Groundwater passing through the well also becomes oxygenated and carries the dissolved oxygen into the aquifer where it can promote natural degradation.

A typical NoVOCs™ well has two (2) screened intervals, located at the top and bottom of the contaminant plume. Pressurized air is delivered by a diffuser into the submerged section of the well. The resulting air/water mixture rises in the well casing drawing more water from the aquifer into the well, achieving air-lift pumping. . The air/water mixture rising in the well casing is essentially an in-ground air stripper, resulting in the volatilization of dissolved VOCs. The air/water mixture rises to a predetermined elevation within the well, where it separates against a deflector plate. The vapors are vacuum extracted and treated above-ground by carbon adsorption or other appropriate method. The water, stripped of VOCs and saturated with dissolved oxygen, percolates back into the aquifer through the recharge screen. In cases where the contaminants of concern are chlorinated solvents, the air stream that drives the NoVOCs™ recirculation cell can be amended to produce a reducing environment, conducive to reductive dechlorination. This secondary effect of enhanced bioremediation/natural attenuation remediates contaminants not readily amenable to air stripping.

The reinfiltrated groundwater tends to follow a torroidal (donut shaped) circulation pattern leading back to the intake screen. Well locations and pumping rates are designed so that the groundwater particles undergo multiple stripping cycles before leaving the circulation/treatment zone. Depending on aquifer characteristics and contaminant concentrations, the NoVOCs™ well is generally designed to cycle contaminated groundwater through the well and aquifer treatment zone 3 – 5 times before the treated groundwater moves downgradient and out of the treatment zone. In-well stripping efficiency, which is controlled by the air/water ratio and contact time, can be varied according to field conditions and contaminant levels. With each pass, 50% - 90+% of the VOCs can be stripped from influent groundwater, resulting in cumulative mass removal rates that can exceed 99%.

When measured as average hydraulic head across the aquifer thickness, this extraction/reinjection pattern causes neither drawdown nor rise in the water-table. However, the vertical head differential induced in the treatment zone of a NoVOCs™ well is significantly greater than that in the immediate vicinity of a conventional pump-and-treat well, moving many more pore volumes of water through the contaminated sediments of the aquifer. This intense flushing greatly reduces the time required to recover sorbed contaminants, particularly from the low permeability sediments that cause rebound in contaminant levels after a remediation system is shutdown..

4.1.3 ALTERNATIVE 3 – AIR SPARGE/SVE

Air sparge/SVE is a combination of complementary technologies for in-situ volatilization of contaminants, enhanced biodegradation/natural attenuation, and vacuum extraction and treatment of the volatilized contaminants. The air sparge component of this remedial alternative is facilitated by injecting air under pressure into the contaminated zone, via subsurface injection wells. The air volatilizes the

contamination as it disperses in the aquifer. The volatilized contamination rises through the saturated zone to the unsaturated zone, where the SVE component of this remedial alternative vacuums off the contaminated vapor via strategically placed well screens in the vadose zone. The vapor is pushed through vapor-phase carbon or another appropriate air treatment system and the treated off-gas is released to the atmosphere.

Dissolved oxygen is dispersed throughout the treatment zone by the sparge points. The oxygen-enriched groundwater enhances the biodegradation/natural attenuation of the remaining contamination and/or contaminants not amenable to volatilization..

Sparge wells would be installed with their well screens located immediately beneath the contaminant source areas, migration pathways, and at the downgradient site boundary. Horizontal SVE wells would be installed within the vadose zone in the immediate vicinity of the sparge wells. Conventional vertical SVE wells would not be effective at the site, due to the shallow water-table depth.

4.1.4 ALTERNATIVE 4 – NO ACTION

The No Action alternative involves no remediation. For the FS, we have assumed that a possible deed restriction for the property and 20 years of groundwater monitoring. Alternative 4 is not expected to be effective at the site, but is retained for comparison purposes.

4.2 Analysis of Individual Alternatives

Each of the potential remedial alternatives is analyzed according to procedures set forth in NYSDEC TAGM No. 4030. The scores for the evaluation criteria are assigned according to the values provided in Tables 5.2 through 5.7 of the TAGM. Costs are presented in Table 5.8 of Appendix C as monetary values, rather than numerical scores.

4.2.1 COMPLIANCE WITH SCGS

Alternatives 1, 2,and 3 are expected to meet the chemical-, action-, and location-specific SCGs within a reasonable period of time. Alternative 4 is not expected to meet the criteria within a reasonable time period. The scores assigned in Table 5-2 of Appendix C are summarized below:

Alternative	Technology	Score (maximum = 10)
1	Enhanced Natural Attenuation	10
2	In-Well Stripping/Recirculation Wells	10
3	Air Sparge/SVE	10
4	No Action	0

4.2.2 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Alternatives 1, 2, and 3 are expected to protect human health and the environment. Alternative 4 would essentially leave the site in its present state. The following scores are assigned as per Table 5.3 of Appendix C:

Alternative	Technology	Score (maximum = 20)
1	Enhanced Natural Attenuation	20
2	In-Well Stripping/Recirculation Wells	20
3	Air Sparge/SVE	20
4	No Action	8

4.2.3 SHORT-TERM EFFECTIVENESS

The short-term risks at the site are minimal and the time required to implement a remedial action is short enough that alternatives 1 – 3 are expected to provide adequate protection to the community and the environment. The potential for short-term adverse risk to the community and/or the environment is so low that the No Action alternative is able to score 8 points under the NYSDEC selection criteria. No extraordinary measures will be necessary to protect workers during implementation of the potential remedial measures. The following scores were assigned as per Appendix C, Table 5.4:

Alternative	Technology	Score (maximum = 10)
1	Enhanced Natural Attenuation	10
2	In-Well Stripping/Recirculation Wells	10
3	Air Sparge/SVE	10
4	No Action	9

4.2.4 LONG-TERM EFFECTIVENESS AND PERMANENCE

Alternatives 1, 2 and 3 are expected to provide adequate long-term effectiveness. Each of these remedial alternatives is a permanent remedy, which will destroy the contaminants. The magnitude of remaining risk at the site is expected to be minimal for remedial alternatives 1, 2, and 3. Reliable controls are provided for each of these alternatives to prevent off-site migration of contaminants. Alternative 4 is not expected to be effective, but is included for comparison (Appendix C, Table 5.5):

Alternative	Technology	Score (maximum = 15)
1	Enhanced Natural Attenuation	15
2	In-Well Stripping/Recirculation Wells	15
3	Air Sparge/SVE	15
4	No Action	3

4.2.5 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME

Alternatives 1, 2, and 3 are each expected to permanently reduce the toxicity, mobility, and volume of contamination at the site. Alternative 4 will not effectively reduce toxicity, mobility, or volume of the contaminants, within a reasonable period of time (Appendix C, Table 5.5):

Alternative	Technology	Score (maximum = 15)
1	Enhanced Natural Attenuation	15
2	In-Well Stripping/Recirculation Wells	15
3	Air Sparge/SVE	15
4	No Action	1

4.2.5.1 Amount of Hazardous Materials That Will Be Destroyed

The amount of hazardous material that will be destroyed was calculated based upon the volume of contaminated soil and groundwater reported in Section 2.3.2, the soil contamination reported in the Phased RI, and groundwater contamination detected during the May 1999 sampling event. The reduction in toxicity, mobility, and volume for remedial alternatives 1, 2, and 3 is expected to be in the 99-100% range. The treatment is expected to be irreversible, with residuals limited to minute quantities of adsorbed contamination in the soil. The residuals are expected to be irreducible, immobile, and pose minimal to no human health or environmental risks.

4.2.5.1.1 Groundwater

Tables 1 – 4 in Appendix D illustrate the methodology used to estimate the contaminant mass found in the groundwater at the site. Isopleth maps were prepared for each contaminant of concern at the site (Appendix A, Figures 1 – 10). Plume volumes were calculated for each of the average contaminant concentration levels, and converted to groundwater volumes based upon an average aquifer porosity of 25%. The contaminant mass for each compound of concern was calculated as the product of these groundwater volumes and the average contaminant concentrations detected during the May 1999 groundwater sampling event.

The estimated contaminant mass in groundwater is:

Contaminants of Concern	Estimated Mass (lbs)
VOCs	
1,1,TCA	0.0062
1,1-DCA	0.0320
1,2-DCE (total)	0.0050
PCE	0.0562
TCE	0.0005
Xylene	0.0028
Vinyl Chloride	0.0003
Total VOCs	0.1030
SVOCs	
Total Phenols	0.1041
Naphthalene	0.1394
Total SVOCs	0.2435

4.2.5.1.2 Soil

The mass of contamination adsorbed to the soil was based upon the relationship discussed in Section 2.3.1. These estimates employ average partition coefficients published in various sources. It should be noted that partition coefficients may vary due to temperature or subsurface conditions. Tables 1 through 4 of Appendix D provide the estimated mass of contaminants in the soil for each compound of concern.

The estimated contaminant mass in soil is:

Contaminants of Concern	Estimated Mass (lbs)
VOCs	
1,1,TCA	0.9476
1,1-DCA	0.9610
1,2-DCE (total)	0.2923
PCE	20.4464
TCE	0.0587
Xylene	0.4565
Vinyl Chloride	0.0097
Carbon Tetrachloride*	0.0500
Total VOCs	23.2222
SVOCs	
Total Phenols	15.4
Naphthalene	121.4
Total SVOCs	136.8

*Carbon tetrachloride mass was calculated directly from soil sampling data. The compound was not detected in groundwater during the May 1999 sampling event.

4.2.6 IMPLEMENTABILITY

Each of the four (4) remedial alternatives is expected to be implementable at the site (Appendix C, Table 5.6):

Alternative	Technology	Score (maximum = 15)
1	Enhanced Natural Attenuation	11
2	In-Well Stripping/Recirculation Wells	12
3	Air Sparge/SVE	13
4	No Action	13

The implementation of all four (4) remedial alternatives is technically feasible. Construction and operation of alternatives 1 – 3 pose no significant difficulties. Alternatives 1, 2 , and 3 have been used at other hazardous waste sites and are considered reliable. Although alternative 4, No Action, is easily implementable, it is not considered reliable for site clean-up.

Additional remedial action would be relatively easy for alternatives 1, 2, and 3. Additional HRC or ORC could be easily be injected at locations where more Enhanced Natural Attenuation remediation is needed. Pumping rates could easily be increased for the In-Well Stripping/Recirculation alternative to expand the

zone of influence, or additional wells could be installed and added to the system with slightly more effort. The Air Sparge/SVE alternative could be designed with additional capacity to allow more air sparge and/or SVE points to be installed if needed. Alternative 1 could also be used in conjunction with Alternatives 2 and 3 to provide enhanced natural attenuation of contaminants in areas where additional remediation may be needed.

Performance monitoring considerations would be similar for each of the potential remedial alternatives to gauge the effectiveness of the clean-up. However, the Enhanced Natural Attenuation alternative would also require some additional soil and groundwater sampling to monitor the effectiveness and useful life of each HRC/ORC replenishment event.

Alternatives 1, 2, and 3 are administratively feasible. Services and materials are available within a reasonable time period for each alternative. Alternative 4 was deemed administratively unacceptable in meetings with the NYSDEC and is only retained for comparison purposes.

4.2.7 COST

The cost for each alternative was estimated based upon the considerations discussed in NYSDEC TAGM No. 4030. The cost and duration of each alternative was assumed, based upon input from suppliers, consultants, and contractors experienced in the appropriate methodology. These accuracy of these estimates is expected to fall within the +50% to -30% range identified in TAGM No. 4030. The cost estimates for alternatives 1 – 4 are included in Table 5.8 of Appendix C. These costs were based upon the following estimated completion times:

Alternative	Technology	Estimated Duration (years)
1	Enhanced Natural Attenuation	5
2	In-Well Stripping/Recirculation Wells	4
3	Air Sparge/SVE	2
4	No Action	20*

* Assumes 20 years of monitoring from existing wells.

4.2.7.1 Capital Costs

The estimated capital costs for each remedial alternative can be separated into direct capital costs and indirect capital costs. According to TAGM No. 4030, direct capital costs are related to: construction, equipment, land and site development, buildings and services, and disposal costs. Relocation costs would be included in direct capital costs, if surrounding residents need to be relocated due to remedial activities. Indirect capital costs are related to: engineering, legal, start-up, and shakedown costs, as well as a contingency allowance to cover unforeseen circumstances.

Land will not be purchased for any of the alternatives, nor will nearby residents need to be relocated during construction or operation. Disposal costs are expected to be minimal during construction. Disposal will be limited to purge water from monitoring-well sampling, water from decontamination activities, and contaminated soil from well installation and/or trenching operations that cannot be reused.

The following direct and indirect capital costs were estimated for the Flagship site:

Alternative	Technology	Direct Capital Cost ($)
1	Enhanced Natural Attenuation	56,000
2	In-Well Stripping/Recirculation Wells	121,000
3	Air Sparge/SVE	97,000
4	No Action	0

Alternative	Technology	Indirect Capital Cost ($)
1	Enhanced Natural Attenuation	30,000
2	In-Well Stripping/Recirculation Wells	52,000
3	Air Sparge/SVE	34,000
4	No Action	35,000*

* Assumes 20 years of monitoring from existing wells

4.2.7.2 Operation & Maintenance Costs

TAGM No. 4030 defines operations and maintenance costs as the "post construction costs necessary to ensure the continued effectiveness of a remedial action". Operations and maintenance costs are related to: operating labor, maintenance materials and labor, chemicals and electricity, disposal of residues, sampling and laboratory services, administration, equipment replacement, and periodic site review costs.

The following operation and maintenance costs were estimated for the four (4) proposed remedial alternatives, assuming quarterly sampling during the 1st year, semi-annual sampling during the 2nd year, and annual sampling, thereafter:

Alternative	Technology	O&M Cost ($)
1	Enhanced Natural Attenuation	295,000[1]
2	In-Well Stripping/Recirculation Wells	236,000[2]
3	Air Sparge/SVE	169,000[3]
4	No Action	336,000[4]

[1] 6 years of monitoring from existing wells
[2] 5 years of monitoring from existing wells.
[3] 3 years of monitoring from existing wells.
[4] 20 years of monitoring from existing wells.

4.2.7.3 Future Capital Costs

Future capital costs are generally included in the evaluation to account for additional capital expenses that may be incurred in case some component of the remediation should fail. TAGM No. 4030 indicates that future capital costs should only be included if a major component of the remediation can reasonably be expected to fail, and only to prevent significant exposure to contaminants. The Flagship site is not considered a significant risk to human health and/or the environment. Therefore, the need for future capital costs to prevent significant contaminant exposure is not anticipated. Remedial alternatives 1, 2,

and 3 are considered reliable and efficient remedies. Even if major component failure occurred, significant exposure to contaminants could not reasonably be expected. Alternative 4 may reasonably be expected to fail in cleaning up the site in a timely manner. However, contaminant levels will decline over the projected 20 year period of this alternative, and may ultimately be low enough so that no further action is required. Therefore, future capital costs are not expected for any of the four (4) remedial alternatives.

Alternative	Technology	Future Capital Cost ($)
1	Enhanced Natural Attenuation	0
2	In-Well Stripping/Recirculation Wells	0
3	Air Sparge/SVE	0
4	No Action	0

4.2.7.4 Cost of Future Land Use

According to TAGM NO. 4030, the "cost of future land use should only be determined for sites when such cost is deemed appropriate and significant". The site currently operates as an aircraft hangar and maintenance facility, without restriction. The upper aquifer at the site is not used for water-supply. Human exposure to soil and/or groundwater contamination is not anticipated during normal site activities. Additionally, a neighboring property is also an Inactive Hazardous Waste Site. Therefore, the cost of future land use will probably not be impacted by of any of the four (4) proposed remedial alternatives.

Alternative	Technology	Future Land Use Cost ($)
1	Enhanced Natural Attenuation	0
2	In-Well Stripping/Recirculation Wells	0
3	Air Sparge/SVE	0
4	No Action	0

4.2.7.5 Accuracy of Cost Estimates

The cost and duration of each alternative was assumed, based upon input from suppliers, consultants, and contractors experienced in the appropriate methodology. These estimates are expected to be accurate within the +50% to -30% range identified in TAGM No. 4030. Therefore, no further analysis of accuracy is required.

4.2.7.6 Present Value Analysis

The projected cost of each alternative was used in the cost comparisons provided above. Present worth analysis was conducted, based upon a discount rate of 5% and the duration of each remedial alternative presented in Section 4.2.7. Detailed present value analysis is presented in Appendix E. The present value of each remedial alternative is:

Alternative	Technology	Estimated Cost ($)	Present Value ($)
1	Enhanced Natural Attenuation	381,000	350,000
2	In-Well Stripping/Recirculation Wells	409,000	394,000
3	Air Sparge/SVE	300,000	294,000
4	No Action	371,000	286,000

4.2.7.7 Cost Sensitivity Analysis

TAGM No. 4030 states that "individual costs may be evaluated through a sensitivity analysis, if there is sufficient uncertainty concerning specific assumptions". Alternatives 1, 2, and 3 are relatively simple, straightforward remedies based upon well-founded assumptions and extensive data from the Phased RI. The duration of Alternative 4, No Action, is questionable, but this alternative was only retained in the FS for comparison purposes. Based upon this information, a cost sensitivity analysis was not deemed necessary.

5.0 PRESENTATION OF INDIVIDUAL ALTERNATIVES

This section presents a description of each of the four (4) proposed remedial actions and the results of the detailed analysis of these alternatives (Appendix C). The detailed analysis was performed to provide the basis for regulators and the general public to review the remedial action plans for the former Flagship site. The detailed evaluation of each remedial alternative was based upon the following criteria:

	Criteria	Method of Analysis
1	Compliance with ARARs and NYSDEC SCGs	NYSDEC Score
2	Protection of Human Health and the Environment	NYSDEC Score
3	Short-Term Effectiveness	NYSDEC Score
4	Long-Term Effectiveness	NYSDEC Score
5	Reduction in Toxicity, Mobility, or Volume	NYSDEC Score
6	Implementability	NYSDEC Score
7	Cost	Dollar Value

The remedial actions were also evaluated on the basis of duration, with the goal of selecting the alternative that achieved the cleanup criteria in the shortest period of time. The duration of each remedial alternative was evaluate over the periods set forth in Section 4.2.7.

5.1 Alternative 1 – Enhanced Natural Attenuation

5.1.1 ALTERNATIVE 1 –DESCRIPTION

Alternative 1 is a faster, more efficient version of the natural degradation of contaminant compounds. A commercially available, slow dosing, hydrogen-releasing compound is injected into areas contaminated with TCE and PCE. The hydrogen promotes anaerobic reductive dechlorination of these solvents to their respective breakdown products. Concurrently, a slow dosing oxygen-releasing compound is injected downgradient of the TCE/PCE plume, to promote aerobic degradation of the daughter products of reductive dechlorination and naphthalene. ORC may also be injected into the source areas, when TCA and PCE are sufficiently degraded to levels where the daughter products 1,2-DCE and vinyl chloride are the predominant dissolved compounds. The HRC and ORC is generally replenished annually, but the replenishment schedule may vary slightly, based upon field conditions. These compounds are readily available and can be installed using conventional drilling equipment, such as a Geoprobe. The estimated duration of the remedy is five (5) years.

Alternative 1 also includes periodic monitoring to evaluate the effectiveness of the remedy and an annual site inspection. Ten wells within and downgradient of the plume will be monitored for VOCs and SVOCs on a quarterly basis for the first year, semiannually for the second year, and annually for each additional year of the remediation. One (1) additional year of sampling will be conducted to monitor rebound effects, once the cleanup criteria have been achieved. Each round of sampling will include natural attenuation parameters to evaluate the efficiency of the remedy.

5.1.2 ALTERNATIVE 1 – SELECTION CRITERIA

5.1.2.1 Alternative 1 – Compliance with ARARs and NYSDEC SCGs

Enhanced Natural Attenuation using HRC and ORC is a proven technology that will attain compliance with ARARs and NYSDEC SCGs. Alternative 1 scored 10 out of a possible 10 points for compliance with ARARs and NYSDEC SCGs.

5.1.2.2 Alternative 1 – Protection of Human Health and the Environment

Based upon currently available data, as discussed in the Phased RI, groundwater and soil contamination are not likely to pose a threat to human health and/or the environment. Alternative 1 will reduce contaminant levels in the soil and groundwater at the site, providing further protection of human health and the environment. Alternative 1 scored 20 out of a possible 20 points for protection of human health and the environment

5.1.2.3 Alternative 1 – Short-Term Effectiveness

There is no short-term threat to public health, since groundwater in the upper aquifer is not currently used for potable supply or other activities that would result in ingestion. Risks to on-site workers may be present during groundwater sampling or excavation in contaminated areas. However, the potential risks would be mitigated with personal protective equipment and enforcement of applicable safety regulations. Alternative 1 will reduce contamination in the soil and groundwater at the site. Contaminant levels are expected to drop considerably within the first 6 months to a year. Alternative 1 scored 10 out of a possible 10 points for short-term effectiveness.

5.1.2.4 Alternative 1 – Long-Term Effectiveness and Permanence

Alternative 1 will reduce the level of contamination at the site by permanent destruction of the hazardous compounds. This alternative is considered a good long-term remedy, and is expected to provide long-term protection of human health and the environment. Alternative 1 scored 15 out of a possible 15 points for long-term effectiveness and permanence.

5.1.2.5 Alternative 1 – Reduction of Toxicity, Mobility, or Volume

Alternative 1 will reduce the toxicity, and volume of the soil and groundwater contamination by the permanent destruction of the toxic compounds in the soil and groundwater at the site. Although the degraded contaminants and their daughter compounds will still be mobile, the treatment will be applied in source areas, along the plume, and at the downgradient site boundary to progressively reduce the level of contamination and prevent further migration. This will effectively reduce mobility of the compounds. Alternative 1 scored 15 out of a possible 15 for reduction of toxicity, mobility, or volume.

5.1.2.6 Alternative 1 – Implementability

Alternative 1 is easily implementable at the site. The HRC and ORC are generally slurried and injected into the subsurface through Geoprobe rods using a high pressure pump. Filter socks containing the slow-release compounds may also be placed in existing monitoring wells. Although HRC and ORC are easily applied and maintained, they are patented products currently produced by only one (1) firm. Alternative 1 scored 11 out of a possible 15 for implementability.

5.1.2.7 Alternative 1 – Cost

The estimated cost for Alternative 1 was compiled from the manufacturer's quotation. The cost is based upon an initial application with annual replenishment for a period of 5 years. Monitoring costs were calculated for a period of 6 years. Monitoring would include additional natural attenuation parameters to track the efficiency of the remedy and predict the timing of replenishment events. The estimated cost of Alternative 1 is $381,000.

5.2 Alternative 2 – In-Well Stripping/Recirculation Wells

5.2.1 ALTERNATIVE 2 – DESCRIPTION

Alternative 2 consists of five (5) NoVOCs™ recirculation wells located in the contaminant source areas, the plume, and the downgradient site boundary. Recirculation wells work by drawing water into a lower extraction screen via air-lift pumping, stripping the VOCs from the contaminated groundwater as the air/water mixture rises in the casing, and separating the treated water from the vapor at a deflector plate. The deflector plate directs the treated water through an upper recharge screen back into the vadose zone at the water-table, and allows vacuum extraction of the contaminated vapor for carbon treatment. The reinjection of oxygenated groundwater into the aquifer provides diffusion of dissolved oxygen throughout the treatment zone, thereby enhancing aerobic degradation of contaminants.

Reinfiltrated groundwater travels through the aquifer in a torroidal circulation pattern leading back to the intake screen. This extraction/reinjection pattern subjects contaminated groundwater to multiple stripping cycles before it leaves the circulation zone. The circulation pattern induces a significant vertical gradient that promotes intense flushing of contaminants within the recirculation zone. This enhances the removal of contaminants accumulated in subsurface heterogeneities, accelerates cleanup, and reduces rebound of contaminant concentrations.

Alternative 2 also includes periodic monitoring to evaluate the effectiveness of the remedy and an annual site inspection. Ten wells within and downgradient of the plume will be monitored for VOCs and SVOCs on a quarterly basis for the first year, semiannually for the second year, and annually for each additional year of the remediation. One (1) additional year of sampling will be conducted to monitor rebound effects, once the cleanup criteria have been achieved. Each round of samples will include additional physical parameters to evaluate the efficiency of the remedy under field conditions.

5.2.2 ALTERNATIVE 2 – SELECTION CRITERIA

5.2.2.1 Alternative 2 – Compliance with ARARs and NYSDEC SCGs

In-Well Stripping/Recirculation Wells is a proven technology that will attain compliance with ARARs and NYSDEC SCGs. Alternative 2 scored 10 out of a possible 10 points for compliance with ARARs and NYSDEC SCGs.

5.2.2.2 Alternative 2 – Protection of Human Health and the Environment

Based upon currently available data, as discussed in the Phased RI, groundwater and soil contamination are not likely to pose a threat to human health and/or the environment. Alternative 2 will reduce contaminant levels in the soil and groundwater at the site, providing further protection of human health and the environment. Alternative 2 scored 20 out of a possible 20 points for protection of human health and the environment

5.2.2.3 Alternative 2 – Short-Term Effectiveness

There is no short-term threat to public health, since groundwater in the upper aquifer is not currently used for potable supply or other activities that would result in ingestion. Risks to on-site workers may be present during groundwater sampling or excavation in contaminated areas. However, the potential risks would be mitigated with personal protective equipment and enforcement of applicable safety regulations. Alternative 2 will reduce contamination in the soil and groundwater at the site. Alternative 2 scored 10 out of a possible 10 points for short-term effectiveness.

5.2.2.4 Alternative 2 – Long-Term Effectiveness and Permanence

Alternative 2 will reduce the level of contamination at the site by permanent destruction of the hazardous compounds. This alternative is considered a good long-term remedy, and is expected to provide long-term protection of human health and the environment. Alternative 2 scored 15 out of a possible 15 points for long-term effectiveness and permanence.

5.2.2.5 Alternative 2 – Reduction of Toxicity, Mobility, or Volume

Alternative 2 will reduce the toxicity, and volume of the soil and groundwater contamination by the permanent destruction of the toxic compounds in the soil and groundwater at the site. Proper placement and operation of the wells can provide containment of contaminated groundwater and prevent further migration of contaminants. Alternative 2 scored 15 out of a possible 15 for reduction of toxicity, mobility, or volume.

5.2.2.6 Alternative 2 – Implementability

Alternative 2 is implementable at the site using standard drilling, trenching, and construction techniques. Minor system calibration and adjustment problems may be encountered during shakedown, given the shallow water-table at the site. However, experienced personnel can resolve these issues. Alternative 2 scored 12 out of a possible 15 for implementability.

5.2.2.7 Alternative 2 – Cost

The estimated cost for Alternative 2 was based upon similar applications and assumes five (5) recirculating wells installed in source areas, the plume, and at the downgradient edge of the site. Licensing fees are included in the estimated cost of this patented technology. Monitoring costs were calculated for a period of 5 years. Monitoring would include additional parameters to track the efficiency of the remedy, determine vapor-phase carbon replacement, and track dissolved oxygen dispersion within the aquifer. The estimated cost of Alternative 2 is $409,000.

5.3 Alternative 3 – Air Sparge/SVE

5.3.1 ALTERNATIVE 3 – DESCRIPTION

Alternative 3, Air Sparge/SVE, involves the injection of pressurized air into the aquifer, where it disperses throughout an area of influence, within the contaminated zone. The dimensions of the area of influence are a function of the injection pressure, injection rate, and subsurface geology. Contaminants in contact with the air stream are transferred from the dissolved phase to the vapor phase. The vapor rises upward to the vadose zone, where it is vacuumed off via the SVE wells and directed to off-gas treatment.. Alternative 3 consists of seven (7) air sparge points with seven (7) corresponding SVE wells. Off gasses will be treated with vapor-phase carbon prior to release to the atmosphere

Alternative 3 also includes periodic monitoring to evaluate the effectiveness of the remedy and an annular site inspection. Ten wells within and downgradient of the plume will be monitored for VOCs and SVOCs on a quarterly basis for the first year, semiannually for the second year, and annually for each additional year of the remediation. One (1) additional year of sampling will be conducted to monitor rebound effects, once the cleanup criteria have been achieved. Each round of samples will include additional physical parameters to evaluate the efficiency of the remedy, under field conditions.

5.3.2 ALTERNATIVE 3 – SELECTION CRITERIA

5.3.2.1 Alternative 3 – Compliance with ARARs and NYSDEC SCGs

Air Sparge/SVE is a proven technology that will attain compliance with ARARs and NYSDEC SCGs. Alternative 3 scored 10 out of a possible 10 points for this criterion.

5.3.2.2 Alternative 3 – Protection of Human Health and the Environment

Based upon currently available data, as discussed in the Phased RI, groundwater and soil contamination are not likely to pose a threat to human health and/or the environment. Alternative 3 will reduce contaminant levels in the soil and groundwater at the site, providing further protection of human health and the environment. Alternative 3 scored 20 out of a possible 20 points for protection of human health and the environment

5.3.2.3 Alternative 3 – Short-Term Effectiveness

There is no short-term threat to public health, since groundwater in the upper aquifer is not currently used for potable supply or other activities that would result in ingestion. Risks to on-site workers may be present during groundwater sampling or excavation in contaminated areas. However, the potential risks would be mitigated with personal protective equipment and enforcement of applicable safety regulations. Alternative 3 will reduce contamination in the soil and groundwater at the site. Alternative 3 scored 10 out of a possible 10 points for short-term effectiveness.

5.3.2.4 Alternative 3 – Long-Term Effectiveness and Permanence

Alternative 3 will reduce the level of contamination at the site by permanent destruction of the hazardous compounds. This alternative is considered a good long term remedy, and is expected to provide long-term protection of human health and the environment. Alternative 3 scored 15 out of a possible 15 points for long-term effectiveness and permanence.

5.3.2.5 Alternative 3 – Reduction of Toxicity, Mobility, or Volume

Alternative 3 will reduce the toxicity and volume of the soil and groundwater contamination by the permanent destruction of the toxic compounds in the soil and groundwater at the site. Proper placement and operation of the wells can remediate contaminated groundwater before it moves offsite. Alternative 3 scored 15 out of a possible 15 for reduction of toxicity, mobility, or volume.

5.3.2.6 Alternative 3 – Implementability

Alternative 2 is implementable at the site using standard drilling, trenching, and construction techniques. The shallow water-table at the site precludes the use of conventional SVE wells. Therefore, the SVE wells will be installed horizontally. Alternative 2 scored 13 out of a possible 15 for implementability.

5.3.2.7 Alternative 3 – Cost

The estimated cost for Alternative 3 was developed from information provided by an engineering consultant and contractor who have installed and operated numerous Air Sparge/SVE remediation systems. The cost is based upon seven (7) air sparge/SVE couplets installed in source areas, the plume, and at the downgradient edge of the site. Monitoring costs were calculated for a period of 3 years.

Monitoring would include additional parameters to determine vapor-phase carbon replacement time, and track dissolved oxygen dispersion within the aquifer. The estimated cost of Alternative 2 is $300,000.

5.4 Alternative 4 – No Action

5.4.1 ALTERNATIVE 4 – DESCRIPTION

Alternative 4, No Action, essentially leaves the site as it presently exists, without remedial action. It would include a deed restriction that would outline health and safety procedures for excavation within contaminated areas and prevent the installation of water-supply wells in the upper aquifer at the site. No active or passive remedial measures would be implemented, and the contamination would be left to degrade naturally, without enhancement. The No Action alternative is included in the FS process as the baseline condition against which all other alternatives are compared. Although No Action is included as a potential remedial alternative, NYSDEC has indicated that they do not consider it to be appropriate for the site. The No Action alternative is only included for comparative purposes.

Alternative 4 includes periodic monitoring to evaluate the effectiveness of the remedy and an annual site inspection. Ten wells within and downgradient of the plume will be monitored for VOCs and SVOCs on a quarterly basis for the first year, semiannually for the second year, and annually for each additional year of the remediation. Alternative 4 has been evaluated on the basis of a 20 year duration.

5.4.2 ALTERNATIVE 4 – SELECTION CRITERIA

5.4.2.1 Alternative 4 – Compliance with ARARs and NYSDEC SCGs

Alternative 4 is not consistent with the cleanup goals established in Section 2.1.4 and will not likely comply with ARARs and NYSDEC SCGs. While contaminant levels are expected to decline over the proposed monitoring period, these levels are not likely to meet NYSDEC SCGs at the end of the proposed 20-year monitoring period. Consideration of this alternative is generally required as part of an FS, as a baseline level from which all other alternatives may be considered. Alternative 4 scored zero (0) out of a possible 10 points for compliance with ARARs and NYSDEC SCGs.

5.4.2.2 Alternative 4 – Protection of Human Health and the Environment

Based upon currently available data, as discussed in the Phased RI, groundwater and soil contamination are not likely to pose a threat to human health and/or the environment. Although the risk to human health and the environment is low, the NYSDEC has expressed their desire for active remediation, and this alternative does not completely mitigate the risk of exposure to contaminants. Alternative 4 would include a deed restriction to prevent the installation of water supply wells in the upper aquifer and restrictions on excavation in contaminated areas. Alternative 4 scored eight (8) out of a possible 20 points for protection of human health and the environment.

5.4.2.3 Alternative 4 – Short-Term Effectiveness

There is virtually no short-term threat to public health, since groundwater in the upper aquifer is not currently used for potable supply or other activities that would result in ingestion. Risks to on-site workers may be present during groundwater sampling or excavation in contaminated areas. However, the potential risks would be mitigated with personal protective equipment and enforcement of applicable safety regulations. Alternative 4 has little to no impact on short-term risk at the site, because no action will be taken to reduce contamination. However, Alternative 4 scored nine (9) out of a possible 10 points for short-term effectiveness because short-term risk at the site is relatively low.

5.4.2.4 Alternative 4 – Long-Term Effectiveness and Permanence

Although some degradation of contaminants will naturally occur at the site, Alternative 4 is not considered effective or permanent. This alternative does nothing to address contaminant source areas at the site. Therefore, sources of ongoing contamination will continue to exist for an indeterminate period. Alternative 4 scored three (3) out of a possible 15 points for long-term effectiveness and permanence.

5.4.2.5 Alternative 4 – Reduction of Toxicity, Mobility, or Volume

Alternative 4 would not involve containment, treatment, or disposal of contaminated media. Therefore, this alternative will not effectively reduce the toxicity, mobility, or volume of contamination at the site. Some natural degradation of contamination will occur, but it is not likely that the volume of toxic material in the source areas will decline significantly. These source areas will continue providing contamination to the groundwater for an indeterminate period. Based upon the Phased RI, this contamination is mobile, and will continue to migrate until source area contamination is addressed. Alternative 4 scored one (1) out of a possible 15 points for reduction of toxicity, mobility, or volume.

5.4.2.6 Alternative 4 – Implementability

Alternative 4 is the most easily implementable of the proposed remedial alternatives because it requires no action. No construction, design, or equipment would be needed to implement this alternative. Monitoring is proposed for information purposes but would not affect implementation of the remedy. Alternative 4 scored 13 out of a possible 15 points for implementability.

5.4.2.7 Alternative 4 – Cost

Although Alternative 4 requires no action, it includes a provision for 20 years of groundwater monitoring, preparation of a deed restriction, and an annual site inspection. The cost of the remedial action would be zero ($0). However, costs would be incurred for the monitoring program, site inspection, and preparation of a deed restriction. The estimated cost of Alternative 4 is $371,000 dollars.

6.0 COMPARATIVE ANALYSIS OF ALTERNATIVES:

The four (4) remedial alternatives presented for the site were compared, based upon the detailed scoring system described in TAGM No. 4030 (Appendix C, Tables 5.2 – 5.7). Estimated costs were compared directly by dollar values (Table 5.8, Appendix C). The estimated duration of each remedial alternative was compared in total years of operation, until contaminant levels are expected to fall below NYSDEC SCGs. Table 6-1 provides a side by side comparison of the four (4) remedial alternatives.

Alternative 4 was deemed inappropriate for the site because it does not adequately address contamination in the soil and groundwater. It was retained for the alternatives analysis to provide a baseline indicator against which the other alternatives could be compared. Consideration of this alternative is generally required for completion of an FS, but the No Action alternative was not selected as a remedy for the site..

Each of the remaining remedies, Alternatives 1, 2, and 3, is viable at the site. Each of these alternatives would be expected to meet cleanup goals, protect human health and the environment, provide short and long-term effectiveness, and reduce the toxicity, mobility, or volume of the contamination. Performance of the three (3) remedies scored equally well during detailed analysis of Categories 1 through 5 (Section 5.0). Given these results, the selection of an appropriate remedial measure for the site was based upon implementability, duration, and cost. Each of the three (3) alternatives is implementable. Enchanced natural attenuation would take the longest to remediate soil and groundwater contamination while air sparge/SVE would take the least amount of time. Air sparge/SVE is the least costly of the three alternatives while in-well stripping/recirculation wells is the most expensive. In addtion, each alternative has minor factors that may not be convenient to address during construction and shakedown.

Alternative 1, Enhanced Natural Attenuation, requires the use of HRC and ORC, which are patented products provided by a single supplier. Calibration of the initial dosing and replenishment is based upon evaluation of certain natural attenuation parameters. The collection and interpretation of these parameters can be difficult and requires a high level of technical expertise.

Alternative 2, In-Well Stripping/ Recirculation Wells, is a licensed technology available through a limited number of firms. The shallow water-table at the site may provide difficulty in recharging the treated groundwater through the upper well screen to establish a recirculation zone, and cause problems calibrating the air/vacuum balance within the well.

Alternative 3, Air Sparge/SVE is a readily available technology that may be designed and implemented by several consultants and contractors. The shallow water-table at the site may pose problems with the SVE wells during wet periods. Horizontal SVE wells may be installed, rather than standard vertical SVE wells, to address this potential problem..

7.0 PRESENTATION OF SELECTED ALTERNATIVE:

The alternative analysis was performed based upon knowledge of the geologic and environmental conditions at the site, as established during the Phased RI and the subsequent May 1999 groundwater sampling event. Alternative 3, Air Sparge/SVE, was selected as the appropriate remedy for the site based upon NYSDEC score, cost, and duration of the remedial action.

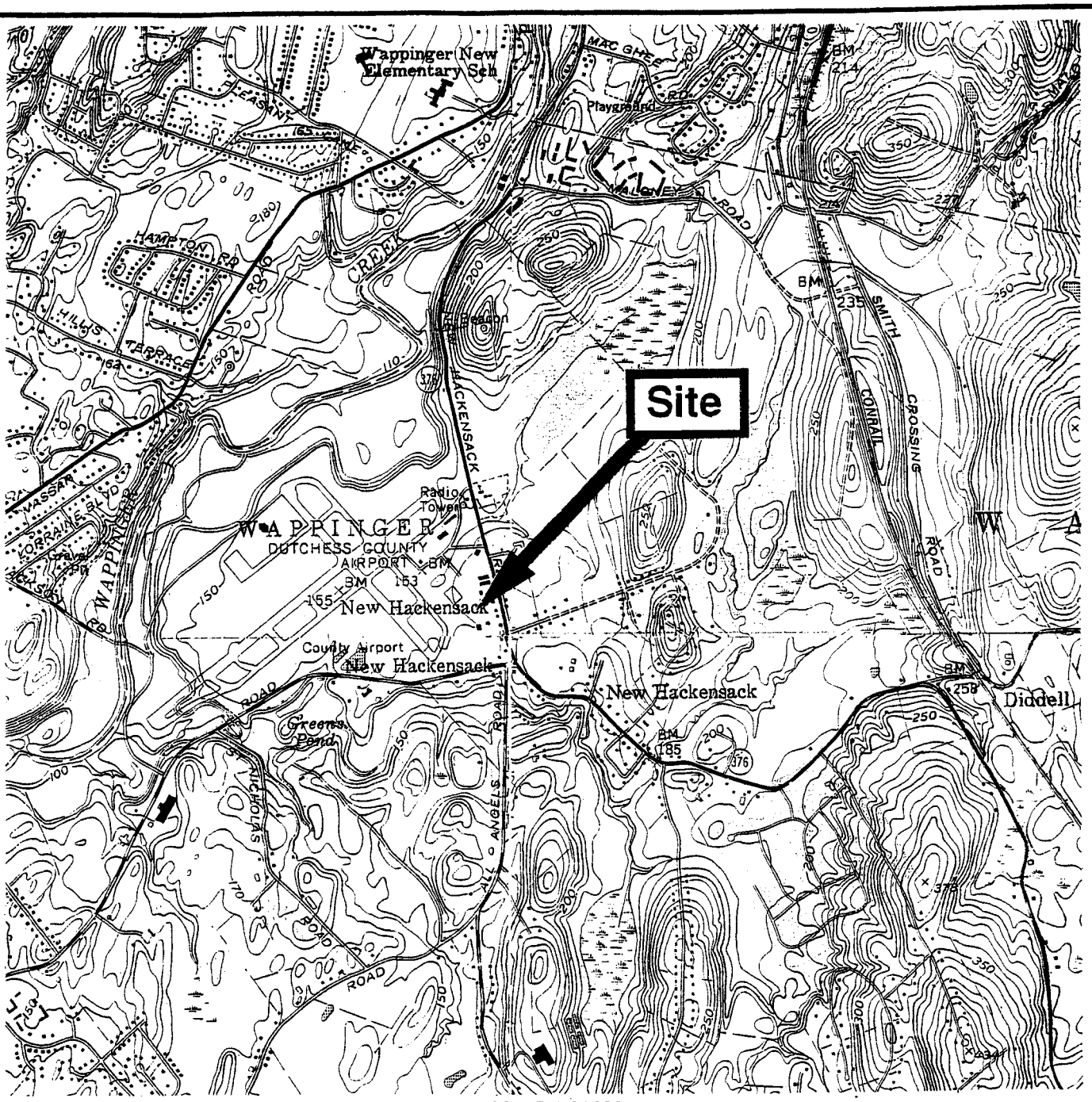
The proposed remedy consists of seven (7) air sparge points, paired with seven (7) horizontal SVE wells (Figure 7-1). The air sparge/SVE pairs are located beneath the gravel bed of the former wash water UST, the former drum storage area, the former wash water piping run, the former hangar floor sump, the plume migration pathway, and at the downgradient property boundary.

The main body of the plume extends to approximately 12 feet below ground surface ("bgs"). The 2-inch diameter Schedule 80 PVC air sparge points will be installed to approximately 15 feet bgs to directly address the main body of the plume. Each sparge point will include two (2) feet of slotted well screen from approximately 13 to 15 feet bgs. The anticipated radius of influence for each sparge point is 30 feet. The horizontal SVE wells will be installed at 2 to 5 feet bgs, with 10 feet of 4-inch PVC well screen with a pea gravel filter pack. Each SVE well will be covered with polyethylene sheeting extending 5 feet beyond the well limits, and backfilled with soil. The anticipated radius of influence for each SVE well is 35 feet.

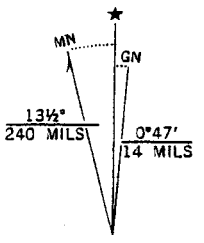
Subsurface piping will connect each sparge point and SVE well to a central control and instrumentation shed. This shed will include vapor phase carbon treatment for off-gas generated by the system. Equipment and controls will include vacuum and pressure blowers, moisture knockout tank, air filter, pressure relief valve, vacuum relief valve, pressure gauges, vacuum gauges, flow meters, manifolding, and controls for each individual well. The manifolding and controls will allow the operator to adjust the air injection and vacuum extraction rates for each individual well for optimum performance. The system will incorporate automatic controls and valves to operate three (3) separate zones, which will be pulsed on and off for measured periods of time to prevent disruption of the local groundwater flow pattern. Pulse periods will be adjusted to field conditions during system shakedown. The system is designed to allow the installation of additional air sparge points and/or SVE wells if necessary. System maintenance will be conducted daily for the first 2 days of operation, weekly for the first month, bimonthly for months 2 and 3, and monthly thereafter.

A baseline sampling event will be collected from each of the on-site monitoring wells and several downgradient wells located off-site. Groundwater samples will be collected from 10 selected on-site and off-site overburden wells on a quarterly basis for the first year of operation, biannually for the second year, and annually thereafter. Offgas samples will be collected prior to vapor-phase carbon treatment, between carbon vessels, and after vapor-phase treatment, on the same schedule. Offgas will also be monitored with a photoionization detector ("PID") during system maintenance visits.

FIGURES



CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929



QUADRANGLE LOCATION

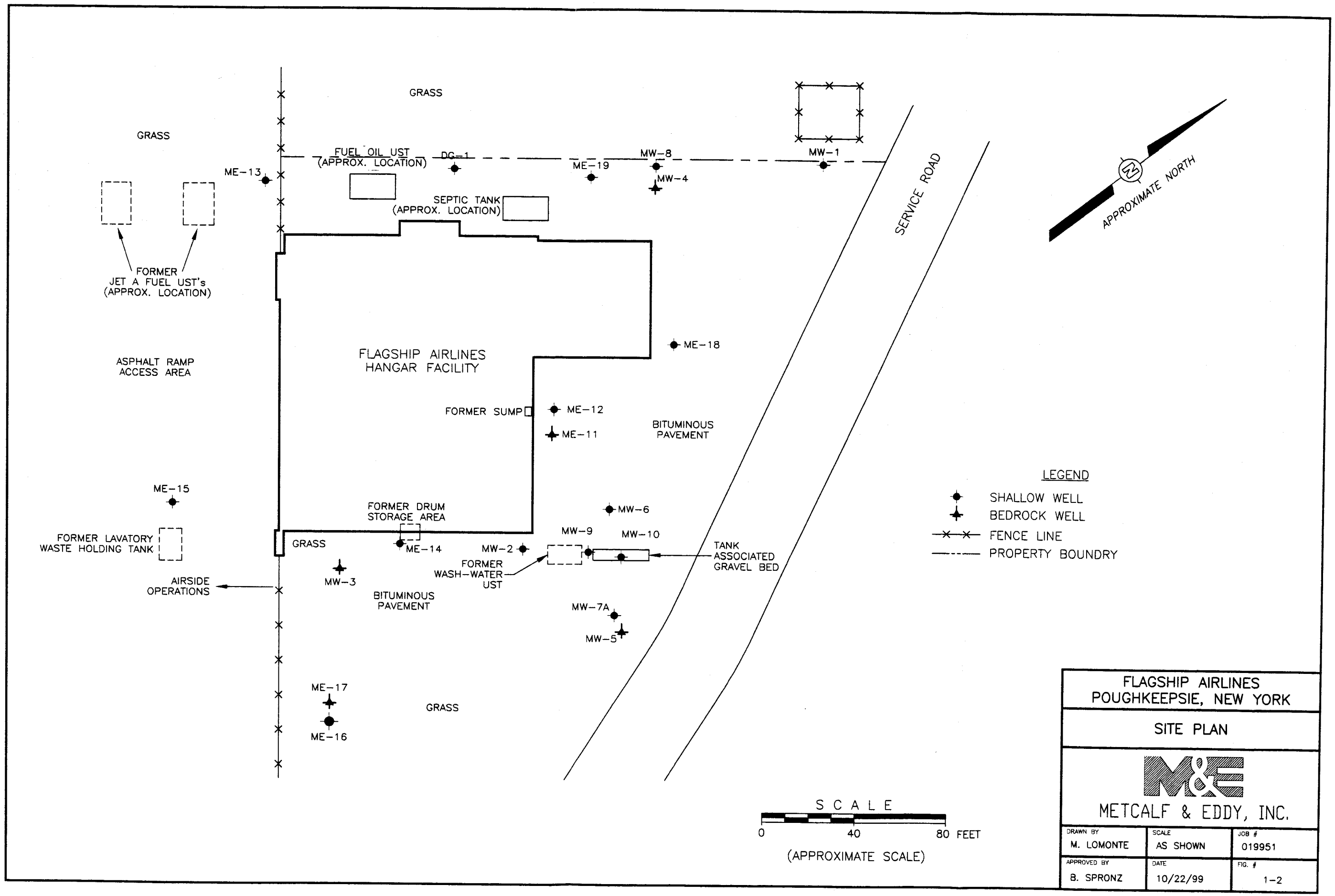
Source: USGS 7.5 Minute Topographic Quadrangles for Poughkeepsie, Pleasant Valley, Wappinger's Falls, and Hopewell Junction, NY

Flagship Airlines
Dutchess County Airport, NY

Site Location Map

Metcalf & Eddy of New York, Inc.

Figure 1-1



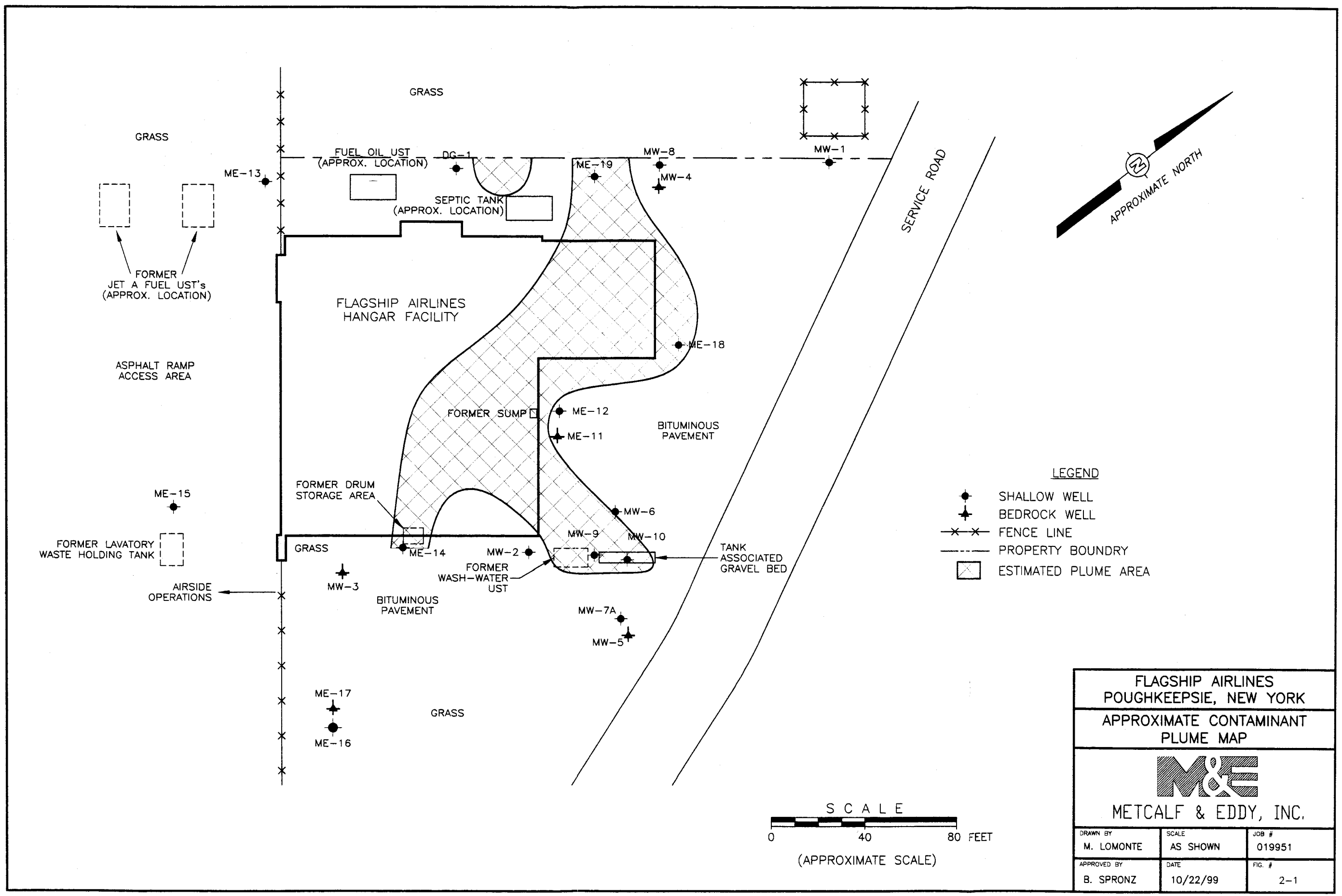
FLAGSHIP AIRLINES
POUGHKEEPSIE, NEW YORK

SITE PLAN

METCALF & EDDY, INC.

DRAWN BY	SCALE	JOB #
M. LOMONTE	AS SHOWN	019951
APPROVED BY	DATE	FIG. #
B. SPRONZ	10/22/99	1-2

DWG FILE: 019951_B.DWG



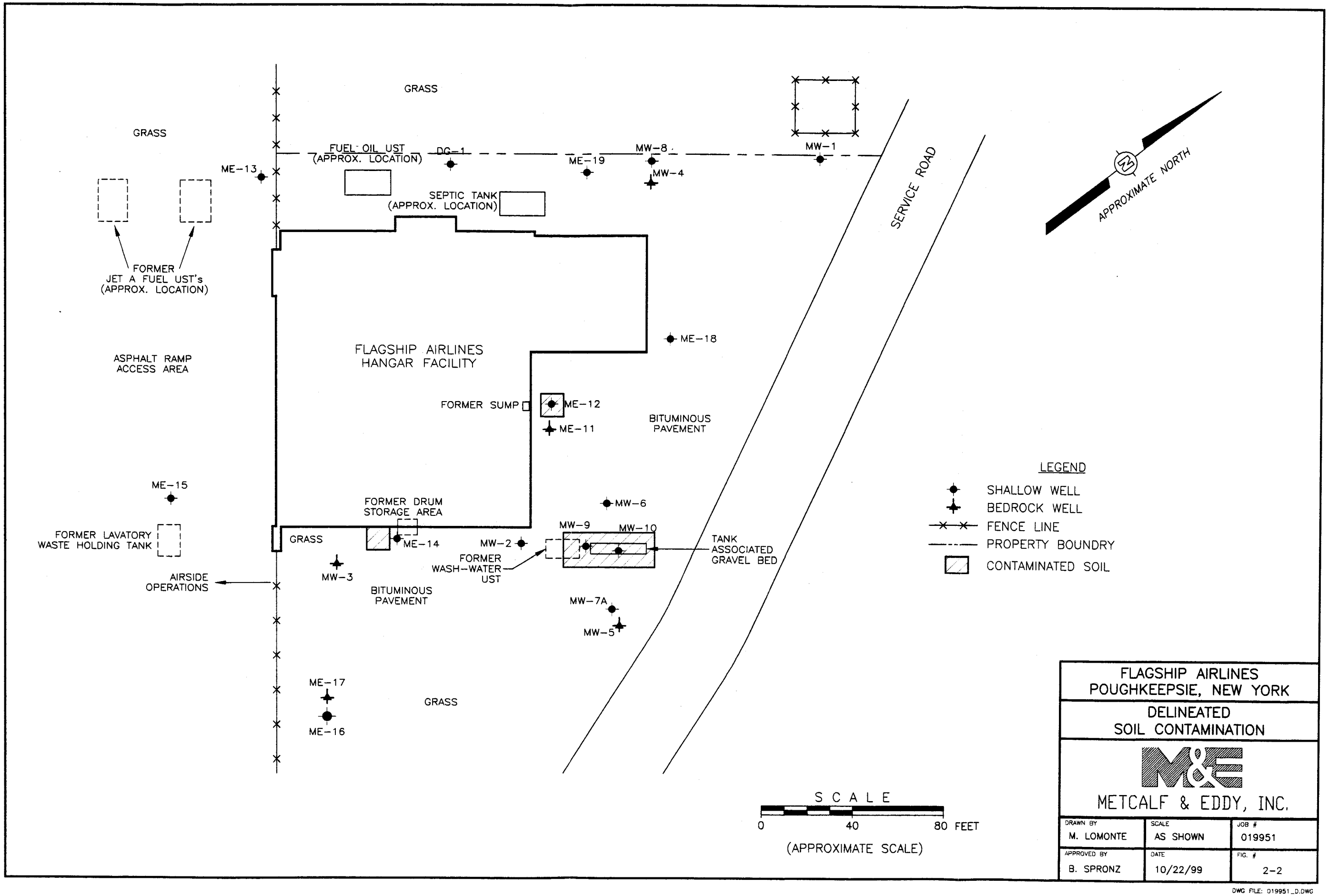
FLAGSHIP AIRLINES
POUGHKEEPSIE, NEW YORK

APPROXIMATE CONTAMINANT
PLUME MAP

METCALF & EDDY, INC.

DRAWN BY	SCALE	JOB #
M. LOMONTE	AS SHOWN	019951
APPROVED BY	DATE	FIG. #
B. SPRONZ	10/22/99	2-1

DWG FILE: 019951_C.DWG



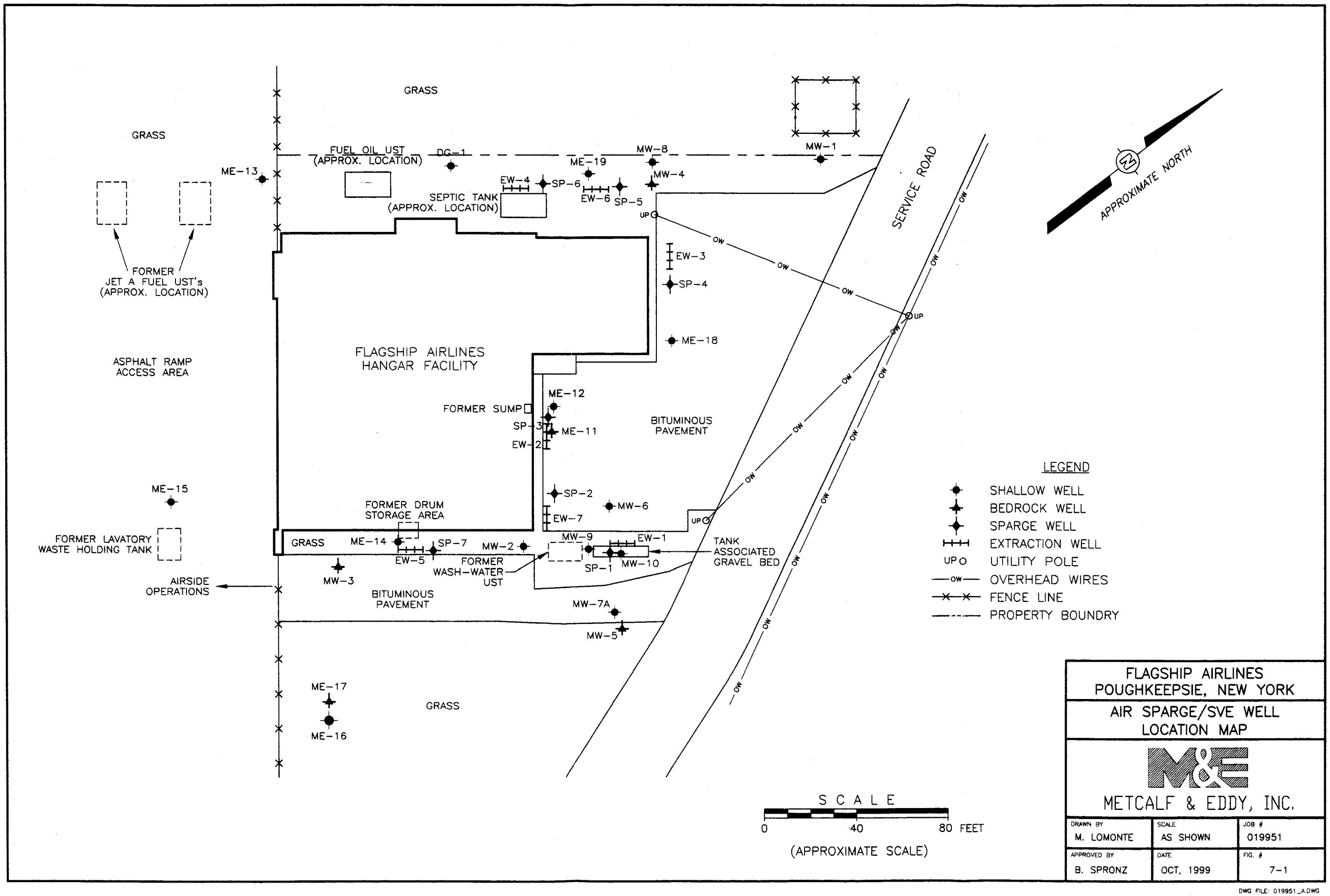
FLAGSHIP AIRLINES
POUGHKEEPSIE, NEW YORK

DELINEATED
SOIL CONTAMINATION

METCALF & EDDY, INC.

DRAWN BY	SCALE	JOB #
M. LOMONTE	AS SHOWN	019951
APPROVED BY	DATE	FIG. #
B. SPRONZ	10/22/99	2-2

DWG FILE: 019951_D.DWG



FLAGSHIP AIRLINES
POUGHKEEPSIE, NEW YORK

AIR SPARGE/SVE WELL
LOCATION MAP

METCALF & EDDY, INC.

DRAWN BY	SCALE	JOB #
M. LOMONTE	AS SHOWN	019951
APPROVED BY	DATE	FIG. #
B. SPRONZ	OCT, 1999	7-1

DWG FILE: 019951_A.DWG

TABLES

Table 1-1
Flagship Airlines - Site Characteristics
Dutchess County Airport - Poughkeepsie, New York

Unit	Geology	Thickness	Average Hydraulic Gradient (December 1996)	Average Hydraulic Conductivity (cm/s)
Overburden 38' to 60' Thick	Fine to Medium Sand, Trace to Some Silt, Grading to Silty Sand with Depth	16' to 33'	1.7×10^{-2}	3.8×10^{-3} *
	Silt and Clay	6' to 16'	---	10^{-5} to 10^{-8} **
	Glacial Till	6' to 25'	---	10^{-7} **
Bedrock	Shale and Limestone	Unknown	1.82×10^{-2}	7.0×10^{-5} *

Source:
* **Dames and Moore, 1991**
** **Feeze and Cherry, 1979**

TABLE 2-1
ANALYTICAL RESULTS, OVERBURDEN MONITORING WELLS
FORMER FLAGSHIP AIRLINES HANGER - DUTCHESS COUNTY AIRPORT
ORDER ON CONSENT NO. W3-0837-98-12, NYSDEC SITE NO. 3-14-101

Field Parameters	NYSDEC SCGs	DG-1	DUPA (Dup. Of DG-1)	MW-1	MW-2	MW-6	MW-7A	MW-8	MW-9	MW-10	ME-12	ME-13	ME-14	ME-15	ME-16	ME-18	ME-19	Septic Tank
pH		6.8	NS	7.36	6.97	7.18	6.95	6.98	6.03	6.47	7.79	6.71	7.00	6.48	6.83	7.26	6.99	NS
Temperature (deg Celcius)		13.2	NS	14.5	16.6	15.9	15.2	15.7	15.5	16.8	15.6	15.2	14.5	14.5	13.1	14.8	13.4	NS
Conductivity (umhos/cm)		566	NS	746	506	530	710	764	877	583	566	639	677	813	587	620	727	NS
Turbidity (NTU)		4.77	NS	10	25	10	999	161	89	10	197	999	999	10	10	10	10	NS
Dissolved Oxygen (ppm)		12.59	NS	14.87	15.23	13.51	13.0	12.53	13.58	11.12	14.39	10.13	10.41	9.09	9.86	14.69	13.17	NS
Volatile Organic Compound by ASP/CLP Method (ug/L)																		
Vinyl Chloride	2	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	**3J**	**3J**	10U
Methylene Chloride	5	10U	10U	10U	10U	10U	10U	10U	**8J**	10U	10U	10U	10U	10U	10U	10U	10U	10U
Acetone	-	10U	10U	10U	10U	10U	10U	10U	**32J**	10U	10U	10U	10U	10U	10U	10U	10U	10U
1,1-Dichloroethane	5	10U	10U	10U	10U	10U	10U	10U	**530**	**61**	10U	10U	10U	10U	10U	**6J**	**11**	10U
1,2-Dichloroethene, Total	5	10U	10U	10U	10U	10U	10U	10U	10U	**24**	10U	10U	10U	10U	10U	10U	**10**	10U
1,1,1-Trichloroethane	5	10U	10U	10U	10U	10U	10U	10U	**150**	**29**	10U	10U	10U	10U	10U	10U	10U	10U
Trichloroethene	5	10U	10U	10U	10U	10U	10U	10U	10U	**13J**	10U	10U	10U	10U	10U	10U	10U	10U
Tetrachloroethene	5	10U	10U	10U	10U	**4J**	10U	10U	**490**	**250**	10U	10U	**1J**	10U	10U	10U	**3J**	10U
Toluene	5	10U	10U	10U	10U	10U	10U	10U	40U	10U	10U	10U	10U	10U	10U	10U	10U	10U
Chlorobenzene	5	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	**2J**
Ethylbenzene	5	10U	10U	10U	10U	10U	10U	10U	**4J**	10U	10U	10U	10U	10U	10U	10U	10U	10U
Xylenes, Total	5	10U	10U	10U	10U	10U	10U	10U	**57**	10U	10U	10U	10U	10U	10U	10U	**1J**	**4J**
Total TICs	5	ND	ND	ND	ND	**101J**	ND	ND	**4896J**	**179J**	ND	**11J**	ND	**8J**	ND	**25J**	**49J**	ND
Semi-Volatile Organic Compound by ASP/CLP Method (ug/L)																		
Phenol	1*	10U	10U	10U	10U	10U	10U	10U	**380D**	**32**	10U	10U	10U	10U	10U	10U	10U	**4DJ**
4-Methylphenol	1*	10U	10U	10U	10U	10U	10U	10U	**1300D**	**8J**	10U	10U	10U	10U	10U	**2J**	**3J**	**120D**
Naphthalene	10	10U	10U	10U	10U	**39**	10U	10U	**1100D**	**19**	10U	10U	10U	10U	10U	**11**	**30**	20U
2-Methylnaphthalene	-	10U	10U	10U	10U	**2J**	10U	10U	**47DJ**	**2J**	10U	10U	10U	10U	10U	10U	10U	20U
Pentachlorophenol	1*	10U	10U	10U	10U	10U	10U	10U	620U	10U	10U	10U	10U	10U	10U	10U	10U	**7DJ**
Di-n-butyl phthalate	50	10U	10U	10U	10U	10U	10U	10U	250U	**3J**	10U	10U	10U	10U	10U	10U	10U	20U
Total TICs		**89J**	**82J**	**201J**	**443J**	**325J**	**739J**	**322J**	**10160J**	**635J**	**45J**	**423J**	**635J**	**238J**	**452J**	**484J**	**352J**	**204J**

Notes:

All measurements are in micrograms per liter (ug/L) or parts per billion (ppb).

* Total Phenol SCGs=1 ug/l

Only compounds detected at one or more sampling locations are listed.

BOLD values indicate detections above laboratory method detection limits.

Laboratory data on this table includes third party validation.

TIC = Tenatively Identified Compound

U = Indicates compound was analyzed for but not detected.

J = Indicates estimated value which is less than the sample quantitation limit but greater than zero.

D = Indentifies all compounds in analysis at a secondary dilution factor.

B = This flag is used when a analyte is found in the associated blank as well as in the sample.

N = Flag only used for TICs. Indicates presumptive evidence of a compound.

NS = Not Sampled, ND = Not Detected.

TABLE 2-1
ANALYTICAL RESULTS, BEDROCK MONITORING WELLS
FORMER FLAGSHIP AIRLINES HANGER - DUTCHESS COUNTY AIRPORT
ORDER ON CONSENT NO. W3-0837-98-12, NYSDEC SITE NO. 3-14-101

Field Parameters	NYSDEC SCGs	MW-3	MW-4	MW-5	ME-11	ME-17
pH		8.09	8.4	NS	9.49	11.05
Temperature (deg Celcius)		15.1	15.8	NS	15.5	13.1
Conductivity (umhos/cm)		648	153	NS	433	932
Turbidity (NTU)		102	9	NS	56	10
Dissolved Oxygen (ppm)		10.89	11.51	NS	14.4	10.27
Volatile Organic Compound by ASP/CLP Method (ug/L)						
Tetrachloroethene	5	10U	10U	NS	**2J**	10U
Total TICs		ND	**12JN**	NS	ND	ND
Semi-Volatile Organic Compound by ASP/CLP Method (ug/L)						
Phenol	1*	10U	**2J**	NS	10U	10U
Diethyl phthalate	50**	10U	**1J**	NS	10U	10U
Total TICs		**515J**	**306J**	NS	**71J**	**598J**

Notes:
All measurements are in micrograms per liter (ug/L) or parts per billion (ppb).
Only compounds detected at one or more sampling locations are listed.
Laboratory data on this table includes third party validation.
BOLD values indicate detections above laboratory method detection limits.
TIC = Tenatively Identified Compound
U = Indicates compound was analyzed for but not detected.
J = Indicates estimated value which is less than the sample quantitation limit but greater than zero.
D = Indentifies all compounds in analysis at a secondary dilution factor.
B = This flag is used when a analyte is found in the associated blank as well as in the sample.
N = Flag only used for TICs. Indicates presumptive evidence of a compound.
NS = Not Sampled, ND = Not Detected.
* SCG for Total Phenols
** Guidance Value

Table 2-2
Contaminant Concentrations in Soil and Groundwater
Former Flagship Airlines Site - Dutchess County Airport, NY

Contaminant Compound	Location of Maximum Concentration	Maximum Concentration	Qualifier	NYSDEC SCG
Soil *		(ppm)		(ppm)
1,1,1-TCA	7' deep at former wash-water UST	8.8		0.8
PCE	7' deep at former wash-water UST	11		1.4
carbon tetrachloride	7' deep at former wash-water UST	0.9		0.6
naphthalene	5'-7' deep in boring ME-12	44.5		13
Groundwater **		(ug/L)		(ug/L)
1,1,1-TCA	MW-9	150		5
1,1-DCA	MW-9	530		5
1,2-DCE (total)	MW-10	24		5
PCE	MW-9	490		5
TCE	MW-10	13	J	5
xylene	MW-9	57		5
vinyl chloride	ME-18 & ME-19	3	J	2
phenol	MW-9	380	D	1
4-methylphenol	MW-9	1300	D	1
naphthalene	MW-9	1100	D	10

* Data is from the Phased RI Report

** Data is from a recent sampling event in May 1999, that was performed after the Phased RI was submitted.

Table 2-3
Identification and Screening of Potential Remedial Technologies
Former Flagship Airlines Site - Dutchess County Airport, NY

General Response Actions	Remedial Technology	Process Option	Description	Screening
No Action	Monitoring	Yearly Groundwater Sampling	On-going monitoring of contamination.	Not Appropriate
	Deed Restriction	NA	Restricting On-Site Excavation and Well Installation	Not Appropriate
Passive Soil Remediation	Natural Attenuation/Bioremediation	Yearly Groundwater Sampling	Allow contaminants to degrade naturally	Not Appropriate
	Enhanced Natural Attenuation/Bioremediation	Innoculate With Microbes or Inject ORC or HRC	Addition of microbes or chemicals to speed-up the natural degredation of contaminants	Potential Technology
	Bioventing	Inject Gas or Air	Low Volume, Low Pressure Air or Gas Injection Without Volatilization	Not Appropriate
Passive Groundwater Remediation	Natural Attenuation/Bioremediation	Yearly Groundwater Sampling	Allow contaminants to degrade naturally	Not Appropriate
	Enhanced Natural Attenuation/Bioremediation	Innoculation with microbes or injection of ORC or HRC	Addition of microbes or chemicals to speed-up the natural degredation of contaminants	Potential Technology
	Permeable Reactive Barrier	Zero Valent Iron, ORC, or HRC Barrier	Trench filled with reactive material which treats groundwater flowing through the cell.	Not Appropriate
Active Soil Remediation	Excavation and Disposal	Off-Site Disposal	Excavate contaminated soil and transport to off-site disposal facility.	Not Appropriate
	Chemical Flushing	Surfactant or Reactive Chemicals	Inject reactive chemicals or surfactants into contaminated soil zone. Recover chemicals downgradient and dispose, or treat and reinject.	Not Appropriate
	In-Well Stripping/Recirculation Wells	Multiple-Pass In-Well Air Stripping for Source Area Reduction	Pull groundwater into lower screen of well, air-strip contamination within the well, return treated water to vadose zone creating a circulation cell.	Potential Technology
	Air Sparge/SVE	Sparge & Vacuum Wells	Air or Gas Injection to Volatilize Contaminants, With Vacuum Removal and Treatment of Offgasses	Potential Technology

Table 2-3
Identification and Screening of Potential Remedial Technologies
Former Flagship Airlines Site - Dutchess County Airport, NY

General Response Actions	Remedial Technology	Process Option	Description	Screening
Active Groundwater Remediation	Pump and Treat Technologies	Extraction Wells & Above-Ground Treatment	Removal of Contaminated Groundwater, Above-Ground Treatment, and Off-Site Disposal or Reinjection	Not Appropriate
	In-Well Stripping/Recirculation Wells	Multiple-Pass In-Well Air Stripper	Pull groundwater into lower screen of well, air-strip contamination within the well, return treated water to vadose zone creating a circulation cell.	Potential Technology
	Air Sparge/SVE	Sparge & Vacuum Wells	Air or Gas Injection to Volatilize Contaminants, With Vacuum Removal and Treatment of Offgasses	Potential Technology

Table 2-4
Remedial Alternatives
Former Flagship Airlines Site - Dutchess County Airport, NY

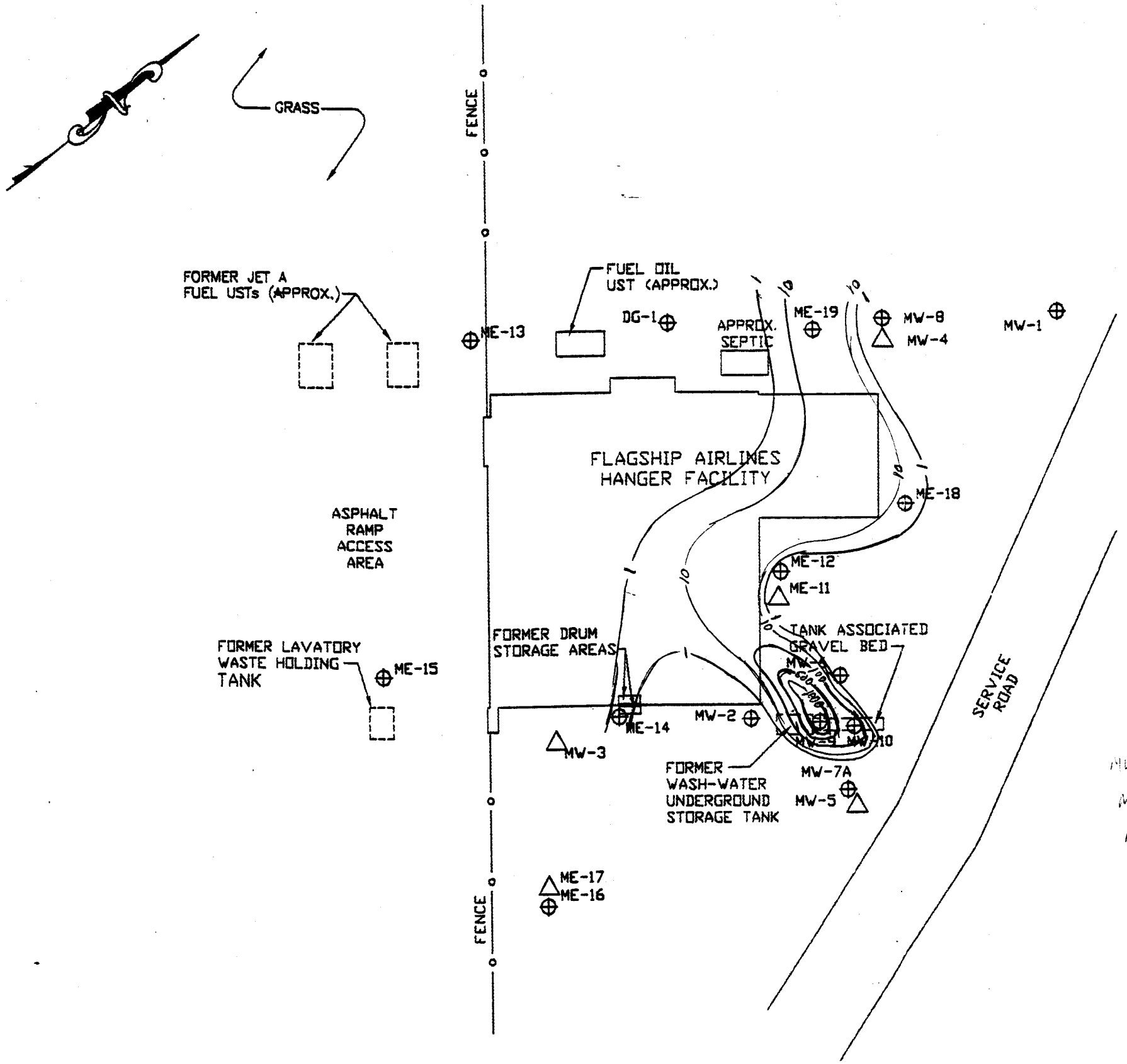
Number	Remedial Alternative	Media of Concern	Contaminants	Technology
1	Enhanced Natural Attenuation	Soil and Groundwater	Chlorinated Solvents	Inject HRC into "hot spots" to enhance anaerobic degredation of TCE and PCE. Inject ORC along GW plume and at the downgradient side of the site to enhance aerobic degredation of VOCs and SVOCs.
			VOCs and SVOCs	After Chlorinated Solvents reach SCGs, inject ORC into "hot spots" and along GW plume to enhance aerobic degredation of contamination.
2	In-Well Stripping/Recirculation Wells	Soil and Groundwater	Chlorinated Solvents and VOCs	In-well air stripping of VOCs. Recirculation cell within the treatment zone provides multiple passes through the in-well air stripper.
			SVOCs	In-well air stripping and the oxygen dffusion throughout the treated zone enhance aerobic and biodegradation of contaminants.
3	Air Sparge/SVE	Soil and Groundwater	Chlorinated Solvents and VOCs	Air sparging to volatilize VOCs, SVE for removal and treatment of vapor-phase contaminants.
			SVOCs	Oxygen diffusion throughout the treatment zone due to air sparging promotes aerobic and biodegradation of of contaminants

Table 6-1
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis - Comparison of Remedial Alternatives

	Score			
Analysis Factor	**Alternative 1 Enhanced Natural Attenuation**	**Alternative 2 In-Well Strippping Recirculation Wells**	**Alternative 3 Air Sparge/SVE**	**Alternative 4 No Action**
Compliance With ARARs and NYSDEC SCGs	10	10	10	0
Protection of Human Health and the Environment	20	20	20	8
Short-Term Effectiveness	10	10	10	9
Long-Term Effectiveness and Permanence	15	15	15	3
Reduction of Toxicity, Mobility, or Volume	15	15	15	1
Implementability	11	12	13	13
TOTAL SCORE:	**81**	**82**	**83**	**34**
ESTIMATED DURATION:	5 years*	4 years*	2 years*	20 years
ESTIMATED COST	$381,000	$409,000	$300,000	$371,000
SELECTED ALTERNATIVE:			X	

* Plus 1 additional year of monitoring.

APPENDIX A
PLUME MAPS – MAY 1999



LEGEND

⊕ ME-13 SHALLOW WELL

△ ME-11 BEDROCK WELL

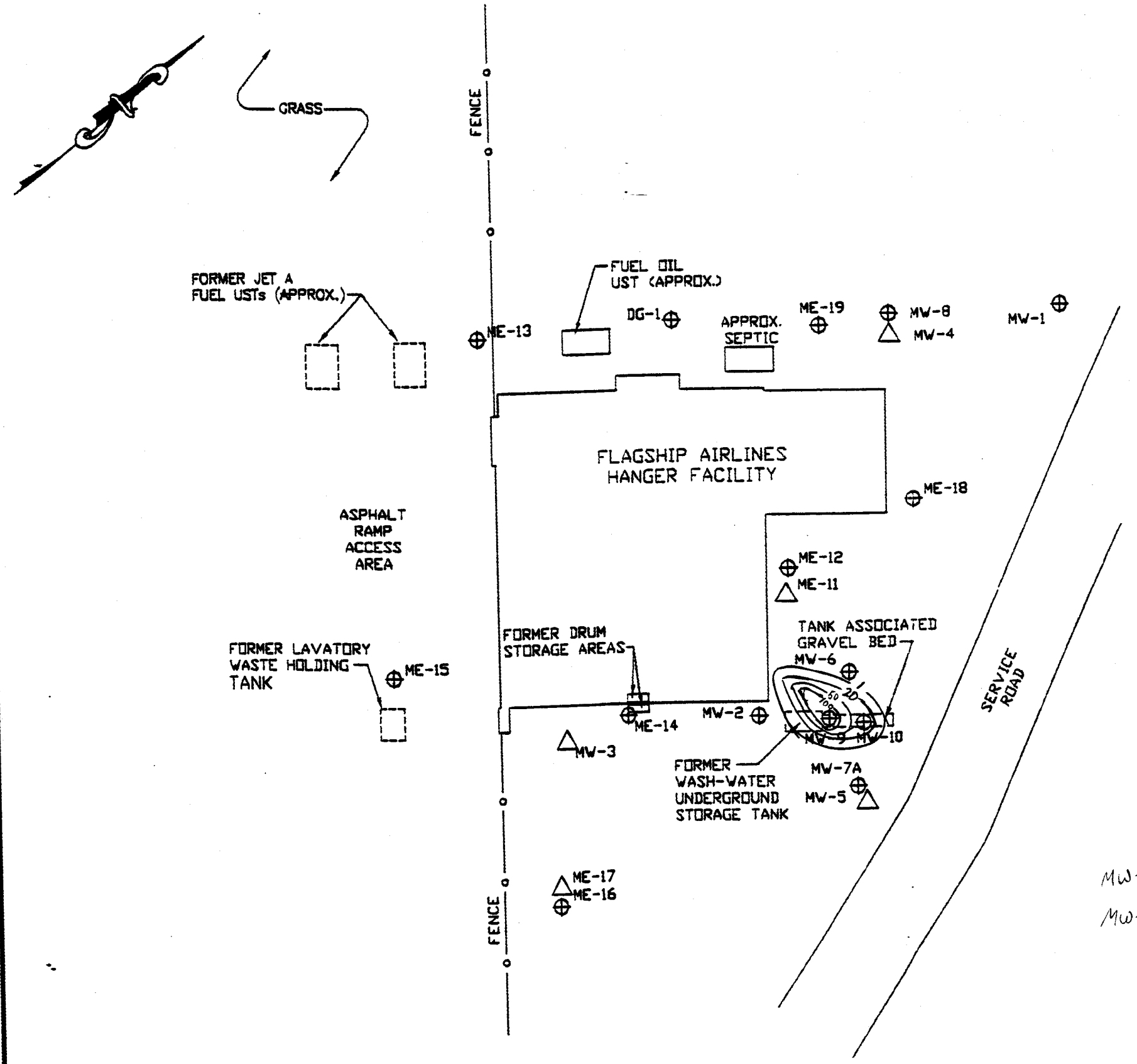
0 25 50 100

Metcalf & Eddy, Inc.

FLAGSHIP AIRLINES
DUTCHESS CO. AIRPORT, NY

TOTAL VOC PLUME
MAY 20 & 21, 1999

November 1999 | Appendix A, Figure 1



LEGEND

⊕ ME-13 SHALLOW WELL

△ ME-11 BEDROCK WELL

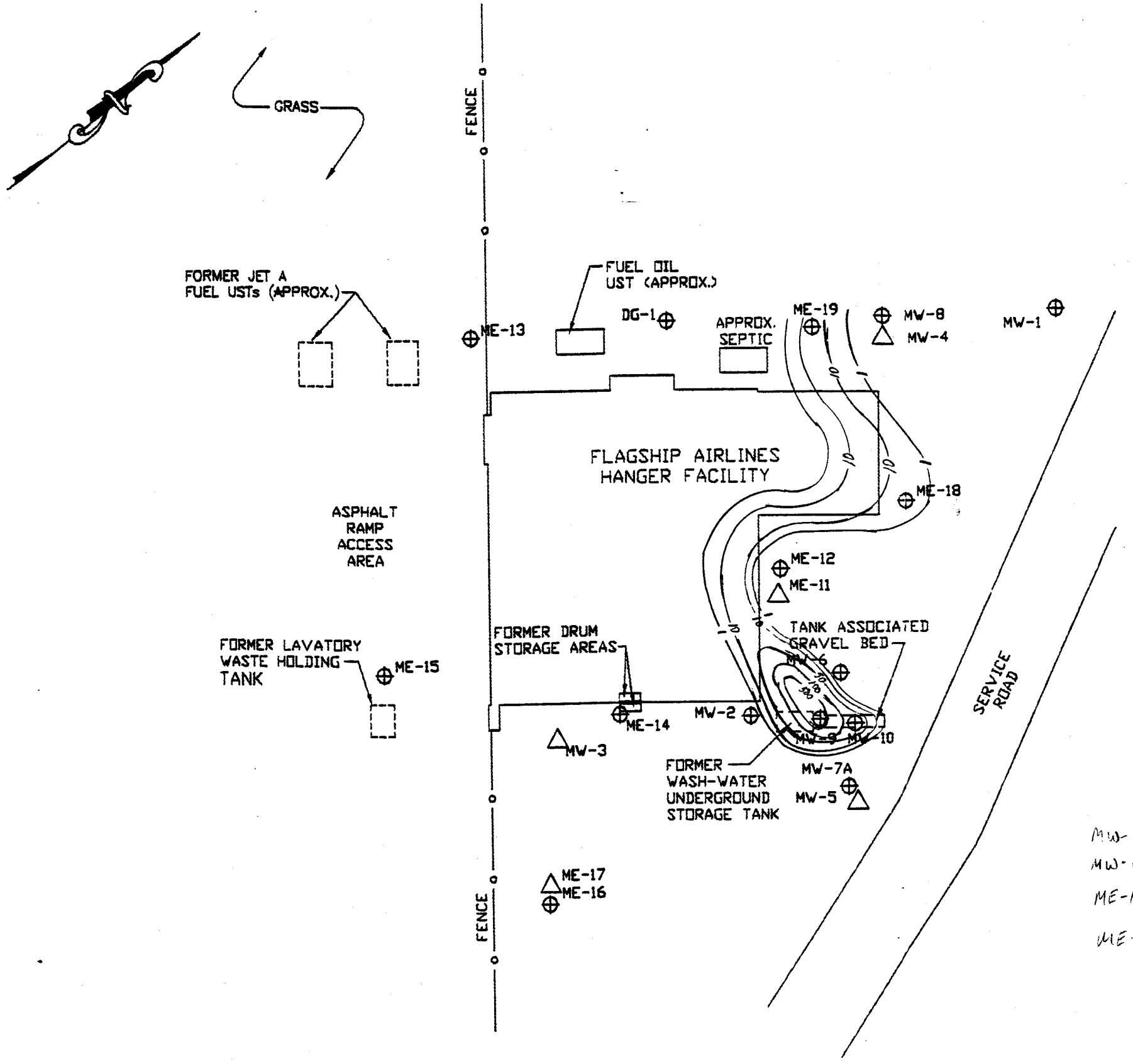
0 25 50 100

Metcalf & Eddy, Inc.

FLAGSHIP AIRLINES
DUTCHESS CO. AIRPORT, NY

1,1,1-TCA PLUME
MAY 20 & 21, 1999

November 1999 | Appendix A, Figure 2



LEGEND

⊕ ME-13 SHALLOW WELL

△ ME-11 BEDROCK WELL

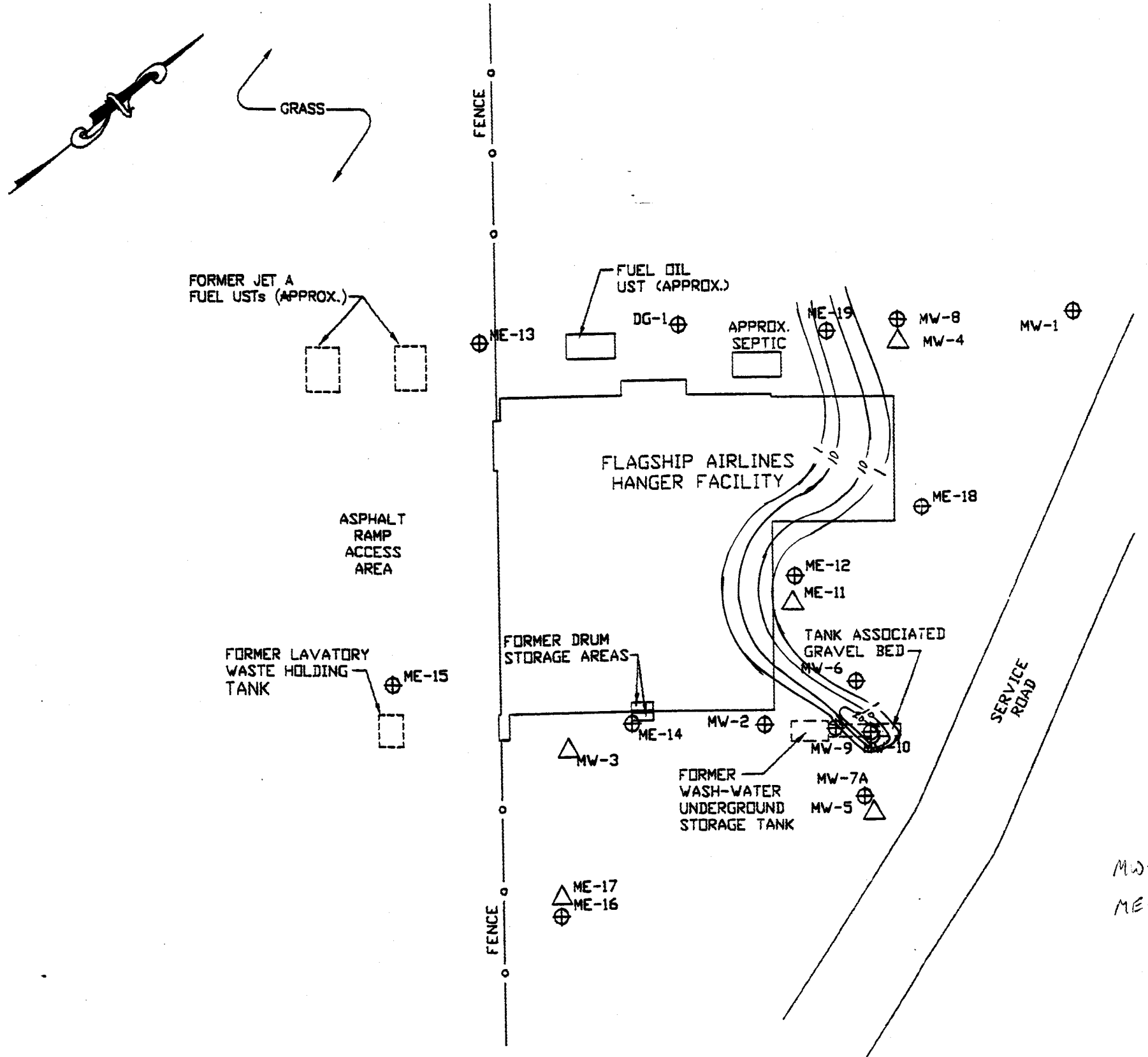
0 25 50 100

Metcalf & Eddy, Inc.

FLAGSHIP AIRLINES
DUTCHESS CO. AIRPORT, NY

1,1-DCA PLUME
MAY 20 & 21, 1999

November 1999 | Appendix A, Figure 3



LEGEND

ME-13 SHALLOW WELL

ME-11 BEDROCK WELL

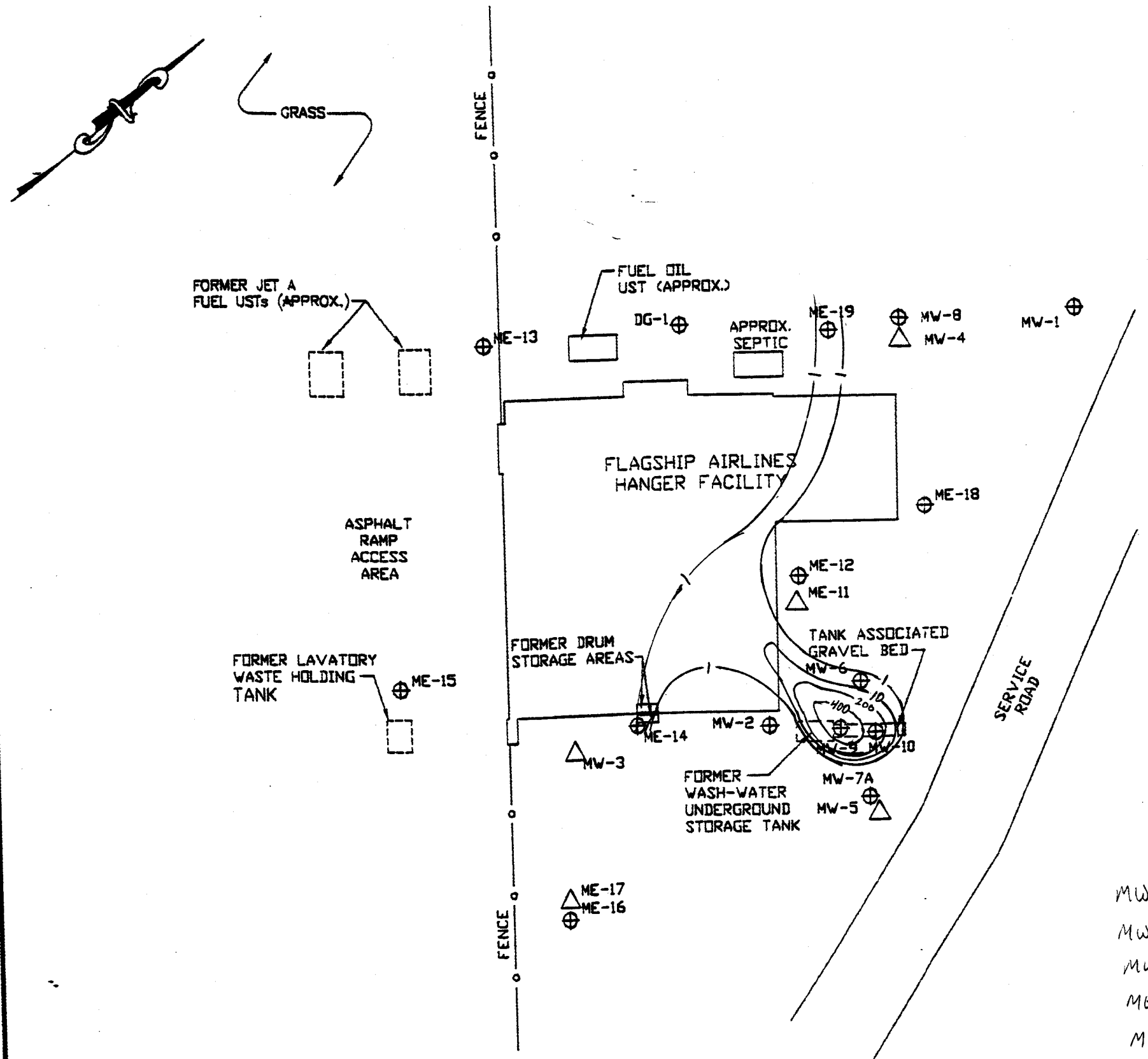
0 25 50 100

Metcalf & Eddy, Inc.

FLAGSHIP AIRLINES
DUTCHESS CO. AIRPORT, NY

1,2-DCE (total) PLUME
MAY 20 & 21, 1999

November 1999 | Appendix A, Figure 4



MW-6 = 4
MW-9 = 490
MW-10 = 250
ME-14 = 1
ME-19 = 3

LEGEND

⊕ ME-13 SHALLOW WELL

△ ME-11 BEDROCK WELL

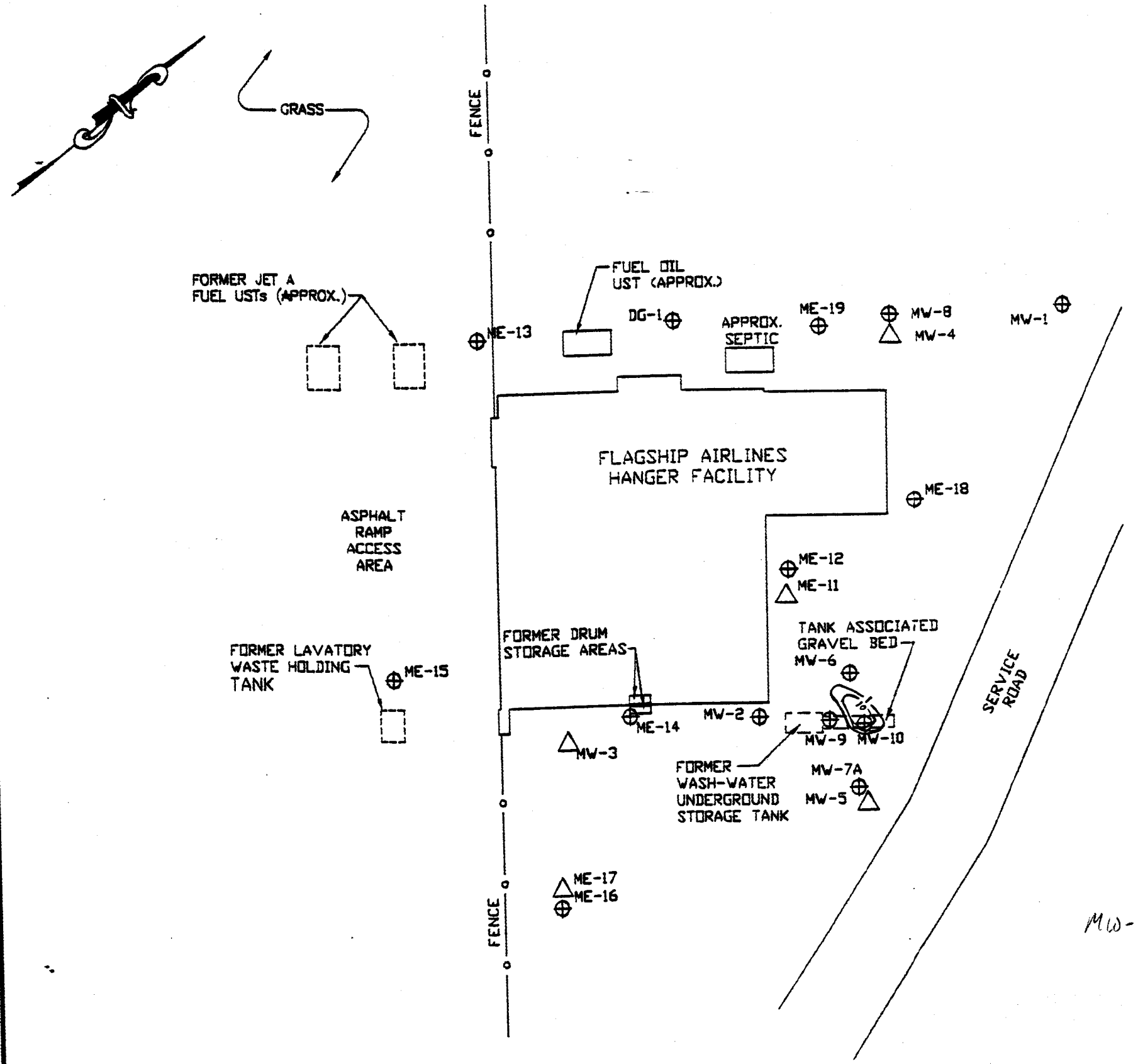
0 25 50 100

Metcalf & Eddy, Inc.

FLAGSHIP AIRLINES
DUTCHESS CO. AIRPORT, NY

PCE PLUME
MAY 20 & 21, 1999

November 1999 | Appendix A, Figure 5



LEGEND

ME-13 SHALLOW WELL

ME-11 BEDROCK WELL

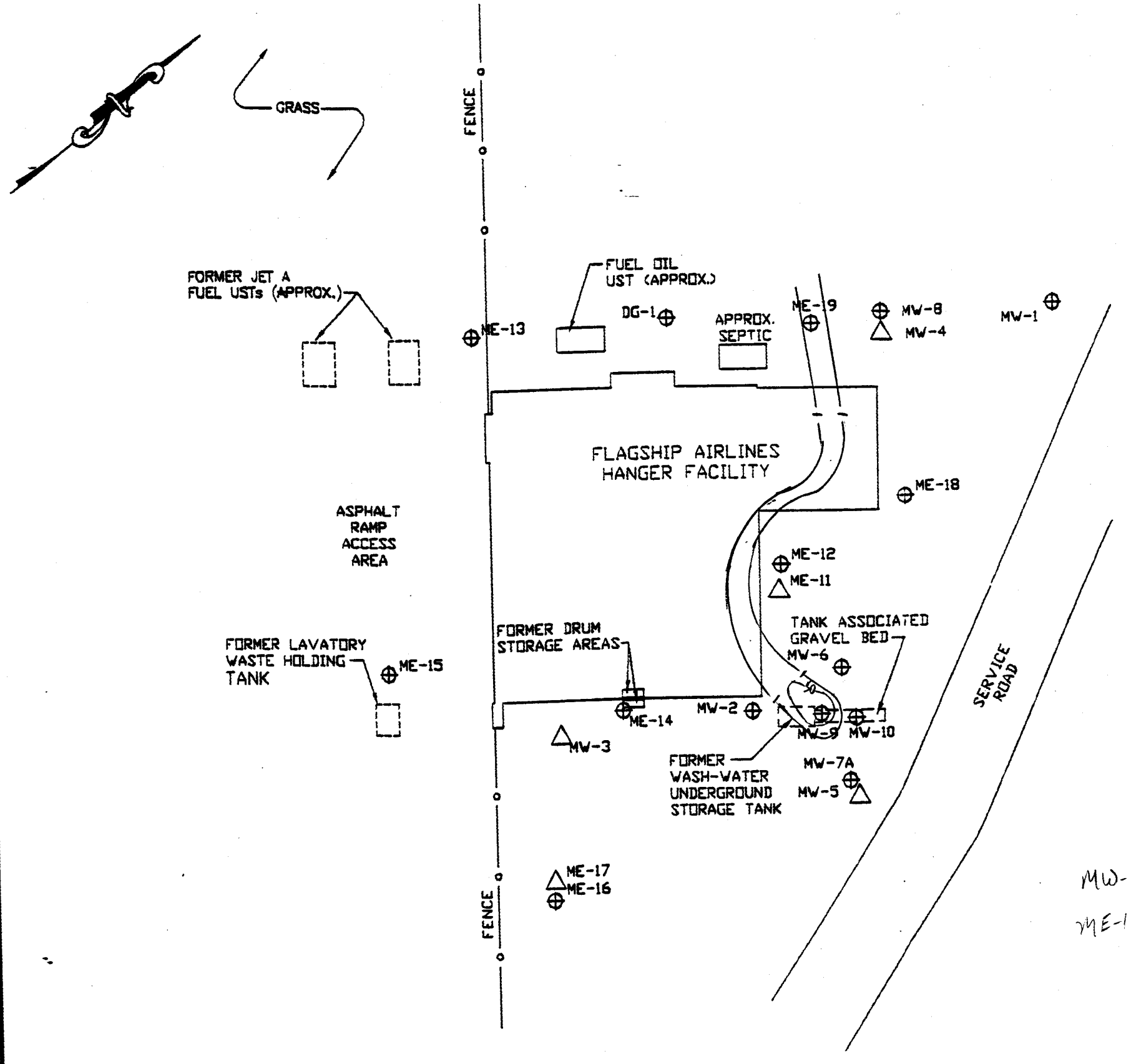
0 25 50 100

Metcalf & Eddy, Inc.

FLAGSHIP AIRLINES
DUTCHESS CO. AIRPORT, NY

TCE PLUME
MAY 20 & 21, 1999

November 1999 | Appendix A, Figure 6



MW-9 = 57
ME-19 = 1

LEGEND

⊕ ME-13 SHALLOW WELL

△ ME-11 BEDROCK WELL

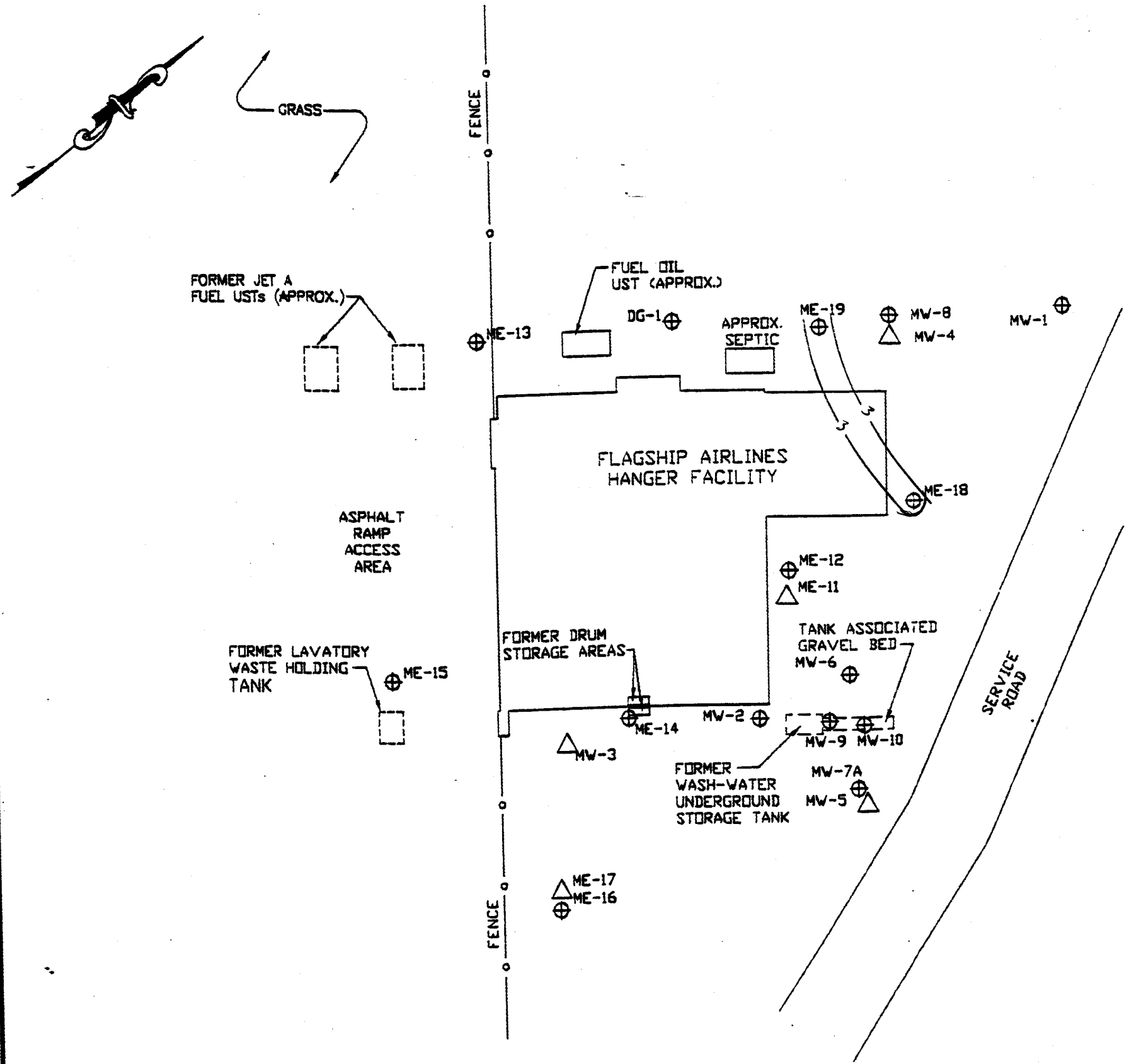
0 25 50 100

Metcalf & Eddy, Inc.

FLAGSHIP AIRLINES
DUTCHESS CO. AIRPORT, NY

XYLENE PLUME
MAY 20 & 21, 1999

November 1999 | Appendix A, Figure 7



ME-18 = 3
ME-19 = 3

LEGEND

⊕ ME-13 SHALLOW WELL

△ ME-11 BEDROCK WELL

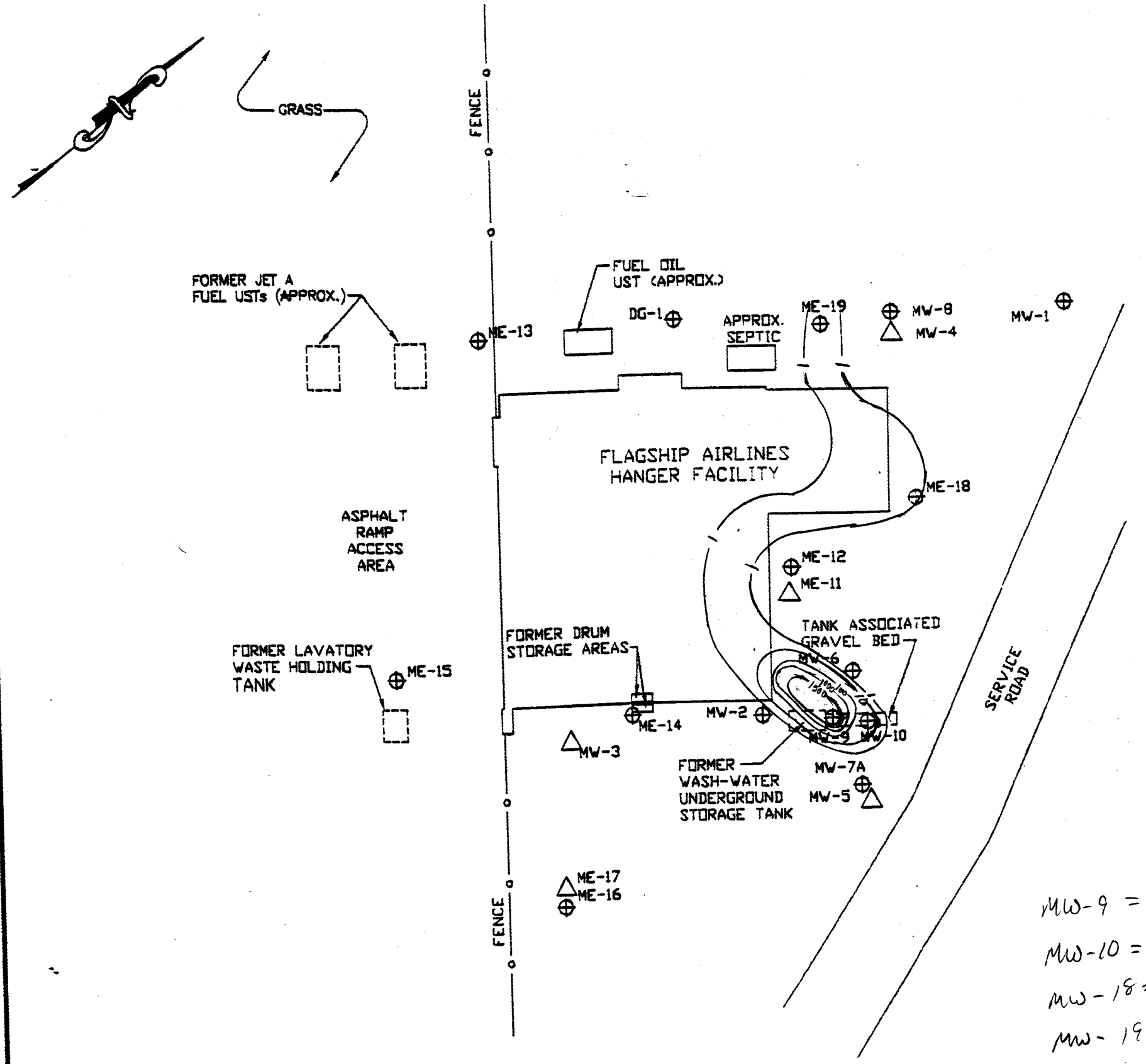
0 25 50 100

Metcalf & Eddy, Inc.

FLAGSHIP AIRLINES
DUTCHESS CO. AIRPORT, NY

VINYL CHLORIDE PLUME
MAY 20 & 21, 1999

November 1999 | Appendix A, Figure 8



MW-9 = 1680
MW-10 = 40
MW-18 = 2
MW-19 = 3

LEGEND

⊕ ME-13 SHALLOW WELL

△ ME-11 BEDROCK WELL

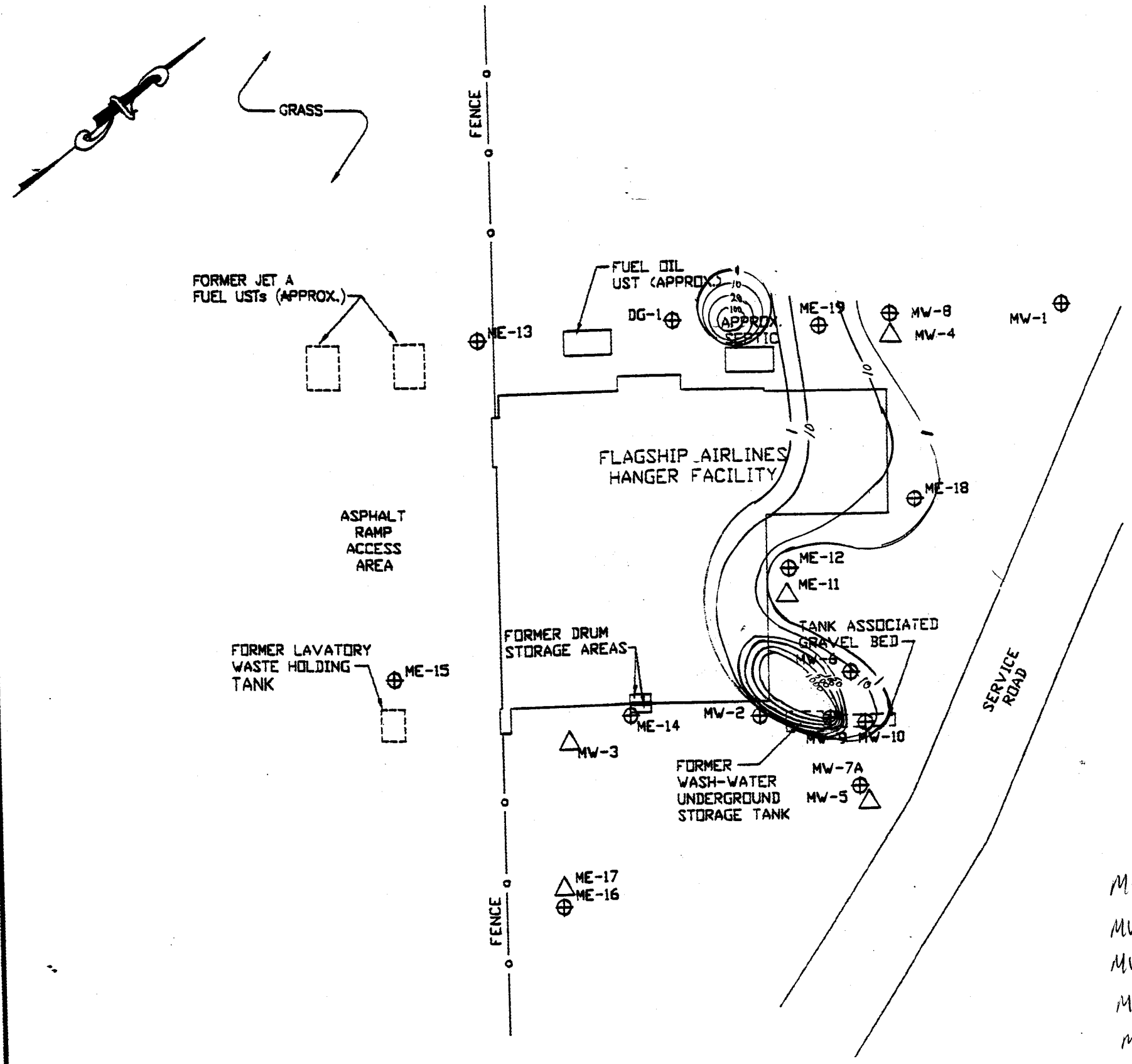
0 25 50 100

Metcalf & Eddy, Inc.

FLAGSHIP AIRLINES
DUTCHESS CO. AIRPORT, NY

TOTAL PHENOLS PLUME
MAY 20 & 21, 1999

November 1999 | Appendix A, Figure 9



MW-6 = 39
MW-9 = 1100
MW-10 = 19
ME-18 = 11
ME-19 = 30

LEGEND

⊕ ME-13 SHALLOW WELL

△ ME-11 BEDROCK WELL

0 25 50 100

Metcalf & Eddy, Inc.

FLAGSHIP AIRLINES
DUTCHESS CO. AIRPORT, NY

NAPHTHALENE PLUME
MAY 20 & 21, 1999

November 1999 | Appendix A, Figure 10

APPENDIX B
PRELIMINARY SCREENING OF ALTERNATIVES

Appendix B - Table 4.1A
Flagship Airlines - Dutchess County Airport, NY
Preliminary Screening of Short-Term/Long-Term Effectiveness (maximum score = 25)
Alternative No. 1 - Enhanced Natural Attenuation

No.	Analysis Factor	Basis for Evaluation During Preliminary Screening								Score
1.	Protection of community during remedial actions.		Yes	No						
		Are there significant short-term risks to the community that must be addressed? (if no go to Factor 2)		X						4
		Can the short-term risk be easily controlled?								
		Does the mitigative effort to control short-term risk impact the community life-style?								
		Subtotal (maximum 4):								**4**
2.	Environmental Impacts		Yes	No						
		Are there significant short-term risks to the environment that must be addressed? (if no go to Factor 3)		X						4
		Are the available mitigative measures reliable to minimize potential impacts?								
		Subtotal (maximum 4):								**4**
3.	Time to implement the remedy		<2 yrs.	>2 yrs.						
		What is the required time to implement the remedy?	X							1
		Required duration of the mitigative effort to control short-term risk?	X							1
		Subtotal (maximum 2):								**2**
4.	On-Site or Off-Site Treatment or Land Disposal		Yes	No						
		On-site treatment	X							3
		Off-site treatment		X						
		On-site or off-site land disposal		X						
		Subtotal (maximum 3):								**3**

Appendix B - Table 4.1A
Flagship Airlines - Dutchess County Airport, NY
Preliminary Screening of Short-Term/Long-Term Effectiveness (maximum score = 25)
Alternative No. 1 - Enhanced Natural Attenuation

No.	Analysis Factor	Basis for Evaluation During Preliminary Screening							Score
5.	Permanance of Remedial Alternative		Yes	No					
		Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or (c). (If answer is yes go to factor 7)	X						3
		Subtotal (maximum 3):							**3**
6.	Lifetime of Remedial Actions		25-30 yrs	20-25 yrs	15-20 yrs	<15 yrs			
		Expected lifetime or duration of effectiveness of the remedy							
		Subtotal (maximum 3):							
7.	Quantity and Nature of Waste or Residual Left at Site After Remediation.				none	<25%	25-50%	>50%	
		Quantity of untreated hazardous waste left at the site.			X				3
			Yes	No					
		Is there treated residual left at the site (if answer is no, go to Factor 8)?		X					2
		Is the treated residual toxic?							
		Is the treated residual mobile??							
		Subtotal (maximum 5):							**5**

Appendix B - Table 4.1A
Flagship Airlines - Dutchess County Airport, NY
Preliminary Screening of Short-Term/Long-Term Effectiveness (maximum score = 25)
Alternative No. 1 - Enhanced Natural Attenuation

No.	Analysis Factor	Basis for Evaluation During Preliminary Screening							Score
8.	Adequacy and Reliability of Controls.		<5yrs	>5yrs					
		i) Operation and maintenance required for a peiod of:	X						1
			Yes	No					
		ii) Are environmental controls required as part of the remedy to handle potential problems (if answere is no go to "iv")		X					1
			moderate to very confident (= 1)		somewhat to not confident (= 0)				
		iii) Degree of confidence that controls can adequately handle potential problems.							
			minimum (= 2)		moderate (= 1)		extensive (= 0)		
		iv) Relative degree of long-term monitoring required (compare with other remedial alternatives).			X				1
		Subtotal (maximum 4):							**3**
								TOTAL (maximum = 25):	**24**

Appendix B - Table 4.1B
Flagship Airlines - Dutchess County Airport, NY
Preliminary Screening of Short-Term/Long-Term Effectiveness (maximum score = 25)
Alternative No. 2 - In-Well Stripping/Recirculation Wells

No.	Analysis Factor	Basis for Evaluation During Preliminary Screening							Score
1.	Protection of community during remedial actions.		Yes	No					
		Are there significant short-term risks to the community that must be addressed? (if no go to Factor 2)		X					4
		Can the short-term risk be easily controlled?							
		Does the mitigative effort to control short-term risk impact the community life-style?							
		Subtotal (maximum 4):							**4**
2.	Environmental Impacts		Yes	No					
		Are there significant short-term risks to the environment that must be addressed? (if no go to Factor 3)		X					4
		Are the available mitigative measures reliable to minimize potential impacts?							
		Subtotal (maximum 4):							**4**
3.	Time to implement the remedy		<2 yrs.	>2 yrs.					
		What is the required time to implement the remedy?	X						1
		Required duration of the mitigative effort to control short-term risk?	X						1
		Subtotal (maximum 2):							**2**
4.	On-Site or Off-Site Treatment or Land Disposal		Yes	No					
		On-site treatment	X						3
		Off-site treatment		X					
		On-site or off-site land disposal		X					
		Subtotal (maximum 3):							**3**

Appendix B - Table 4.1B
Flagship Airlines - Dutchess County Airport, NY
Preliminary Screening of Short-Term/Long-Term Effectiveness (maximum score = 25)
Alternative No. 2 - In-Well Stripping/Recirculation Wells

No.	Analysis Factor	Basis for Evaluation During Preliminary Screening							Score
5.	Permanance of Remedial Alternative		Yes	No					
		Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or (c). (If answer is yes go to factor 7)	X						3
		Subtotal (maximum 3):							**3**
6.	Lifetime of Remedial Actions		25-30 yrs	20-25 yrs	15-20 yrs	<15 yrs			
		Expected lifetime or duration of effectiveness of the remedy							
		Subtotal (maximum 3):							
7.	Quantity and Nature of Waste or Residual Left at Site After Remediation.				none	<25%	25-50%	>50%	
		Quantity of untreated hazardous waste left at the site.			X				3
			Yes	No					
		Is there treated residual left at the site (if answer is no, go to Factor 8)?		X					2
		Is the treated residual toxic?							
		Is the treated residual mobile??							
		Subtotal (maximum 5):							**5**

Appendix B - Table 4.1B
Flagship Airlines - Dutchess County Airport, NY
Preliminary Screening of Short-Term/Long-Term Effectiveness (maximum score = 25)
Alternative No. 2 - In-Well Stripping/Recirculation Wells

No.	Analysis Factor	Basis for Evaluation During Preliminary Screening							Score
8.	Adequacy and Reliability of Controls.		<5yrs	>5yrs					
		i) Operation and maintenance required for a peiod of:	X						1
			Yes	No					
		ii) Are environmental controls required as part of the remedy to handle potential problems (if answere is no go to "iv")		X					1
			moderate to very confident (= 1)		somewhat to not confident (= 0)				
		iii) Degree of confidence that controls can adequately handle potential problems.							
			minimum (= 2)		moderate (= 1)		extensive (= 0)		
		iv) Relative degree of long-term monitoring required (compare with other remedial alternatives).	X						2
		Subtotal (maximum 4):							**4**
							TOTAL (maximum = 25):		**25**

Appendix B - Table 4.1C
Flagship Airlines - Dutchess County Airport, NY
Preliminary Screening of Short-Term/Long-Term Effectiveness (maximum score = 25)
Alternative No. 3 - Air Sparge/SVE

No.	Analysis Factor	Basis for Evaluation During Preliminary Screening							Score
1.	Protection of community during remedial actions.		Yes	No					
		Are there significant short-term risks to the community that must be addressed? (if no go to Factor 2)		X					4
		Can the short-term risk be easily controlled?							
		Does the mitigative effort to control short-term risk impact the community life-style?							
		Subtotal (maximum 4):							**4**
2.	Environmental Impacts		Yes	No					
		Are there significant short-term risks to the environment that must be addressed? (if no go to Factor 3)		X					4
		Are the available mitigative measures reliable to minimize potential impacts?							
		Subtotal (maximum 4):							**4**
3.	Time to implement the remedy		<2 yrs.	>2 yrs.					
		What is the required time to implement the remedy?	X						1
		Required duration of the mitigative effort to control short-term risk?	X						1
		Subtotal (maximum 2):							**2**
4.	On-Site or Off-Site Treatment or Land Disposal		Yes	No					
		On-site treatment	X						3
		Off-site treatment		X					
		On-site or off-site land disposal		X					
		Subtotal (maximum 3):							**3**

Appendix B - Table 4.1C
Flagship Airlines - Dutchess County Airport, NY
Preliminary Screening of Short-Term/Long-Term Effectiveness (maximum score = 25)
Alternative No. 3 - Air Sparge/SVE

No.	Analysis Factor	Basis for Evaluation During Preliminary Screening							Score
5.	Permanance of Remedial Alternative		Yes	No					
		Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or (c). (If answer is yes go to factor 7)	X						3
		Subtotal (maximum 3):							**3**
6.	Lifetime of Remedial Actions		25-30 yrs	20-25 yrs	15-20 yrs	<15 yrs			
		Expected lifetime or duration of effectiveness of the remedy							
		Subtotal (maximum 3):							
7.	Quantity and Nature of Waste or Residual Left at Site After Remediation.				none	<25%	25-50%	>50%	
		Quantity of untreated hazardous waste left at the site.			X				3
			Yes	No					
		Is there treated residual left at the site (if answer is no, go to Factor 8)?		X					2
		Is the treated residual toxic?							
		Is the treated residual mobile??							
		Subtotal (maximum 5):							**5**

Appendix B - Table 4.1C
Flagship Airlines - Dutchess County Airport, NY
Preliminary Screening of Short-Term/Long-Term Effectiveness (maximum score = 25)
Alternative No. 3 - Air Sparge/SVE

No.	Analysis Factor	Basis for Evaluation During Preliminary Screening							Score
8.	Adequacy and Reliability of Controls.		<5yrs	>5yrs					
		i) Operation and maintenance required for a peiod of:	X						1
			Yes	No					
		ii) Are environmental controls required as part of the remedy to handle potential problems (if answere is no go to "iv")		X					1
			moderate to very confident (= 1)		somewhat to not confident (= 0)				
		iii) Degree of confidence that controls can adequately handle potential problems.							
			minimum (= 2)		moderate (= 1)		extensive (= 0)		
		iv) Relative degree of long-term monitoring required (compare with other remedial alternatives).	X						2
		Subtotal (maximum 4):							4
							TOTAL (maximum = 25):		25

Appendix B - Table 4.1D
Flagship Airlines - Dutchess County Airport, NY
Preliminary Screening of Short-Term/Long-Term Effectiveness (maximum score = 25)
Alternative No. 4 - No Action

No.	Analysis Factor	Basis for Evaluation During Preliminary Screening							Score
1.	Protection of community during remedial actions.		Yes	No					
		Are there significant short-term risks to the community that must be addressed? (if no go to Factor 2)		X					4
		Can the short-term risk be easily controlled?							
		Does the mitigative effort to control short-term risk impact the community life-style?							
		Subtotal (maximum 4):							**4**
2.	Environmental Impacts		Yes	No					
		Are there significant short-term risks to the environment that must be addressed? (if no go to Factor 3)		X					4
		Are the available mitigative measures reliable to minimize potential impacts?							0
		Subtotal (maximum 4):							**4**
3.	Time to implement the remedy		<2 yrs.	>2 yrs.					
		What is the required time to implement the remedy?	X						1
		Required duration of the mitigative effort to control short-term risk?		X					0
		Subtotal (maximum 2):							**1**
4.	On-Site or Off-Site Treatment or Land Disposal		Yes	No					
		On-site treatment		X					0
		Off-site treatment		X					0
		On-site or off-site land disposal		X					0
		Subtotal (maximum 3):							**0**

Appendix B - Table 4.1D
Flagship Airlines - Dutchess County Airport, NY
Preliminary Screening of Short-Term/Long-Term Effectiveness (maximum score = 25)
Alternative No. 4 - No Action

No.	Analysis Factor	Basis for Evaluation During Preliminary Screening							Score
5.	Permanance of Remedial Alternative		Yes	No					
		Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or (c). (If answer is yes go to factor 7)		X					0
		Subtotal (maximum 3):							**0**
6.	Lifetime of Remedial Actions		25-30 yrs	20-25 yrs	15-20 yrs	<15 yrs			
		Expected lifetime or duration of effectiveness of the remedy				X			0
		Subtotal (maximum 3):							**0**
7.	Quantity and Nature of Waste or Residual Left at Site After Remediation.				none	<25%	25-50%	>50%	
		Quantity of untreated hazardous waste left at the site.						X	0
			Yes	No					
		Is there treated residual left at the site (if answer is no, go to Factor 8)?	X						0
		Is the treated residual toxic?	X						0
		Is the treated residual mobile??	X						0
		Subtotal (maximum 5):							**0**

Appendix B - Table 4.1D
Flagship Airlines - Dutchess County Airport, NY
Preliminary Screening of Short-Term/Long-Term Effectiveness (maximum score = 25)
Alternative No. 4 - No Action

No.	Analysis Factor	Basis for Evaluation During Preliminary Screening							Score
8.	Adequacy and Reliability of Controls.		<5yrs	>5yrs					
		i) Operation and maintenance required for a peiod of:	X						1
			Yes	No					
		ii) Are environmental controls required as part of the remedy to handle potential problems (if answere is no go to "iv")		X					1
			moderate to very confident (= 1)		somewhat to not confident (= 0)				
		iii) Degree of confidence that controls can adequately handle potential problems.							
			minimum (= 2)		moderate (= 1)		extensive (= 0)		
		iv) Relative degree of long-term monitoring required (compare with other remedial alternatives).					X		0
		Subtotal (maximum 4):							**2**
							TOTAL (maximum = 25):		**11**

Appendix B - Table 4.2A
Flagship Airlines - Dutchess County Airport, NY
Preliminary Screening of Implementability (maximum score = 15)
Alternative No. 1 - Enhanced Natural Attenuation

No.	Analysis Factor		Basis for Evaluation During Preliminary Screening							Score
1.	Technical Feasibility	a. Ability to Construct Technology		(i) = =3	(ii) = 2	(iii) = 1				
			i) Not difficult to construct. No uncertainties in construction.	X						3
			ii) Somewhat difficult to construct. No uncertainties in construction.							
			iii) Very difficult to construct and/or significant uncertainties in construction.							
		b. Releability of Technology		(i) = 3	(ii) = 2					
			i) Very reliable in meeting the specified process efficiencies or performance goals	X						3
			ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.							
		c. Schedule of Delays Due to Technical Problems			(i) = 2	(ii) = 1				
			i) Unlikely		X					2
			ii) Somewhat likely							
		d. Need of Undertaking Additional Remedial Action, if Necessary			(i) = 2	(ii) = 1				
			i) No future remedial actions may be necessayr.							
			ii) Some future remedial actions may be necessary.			X				1
			Subtotal (Maximum = 10)							**9**
2.	Administrative Feasibility	a. Coordination With Other Agencies			(i) = 2	(ii) = 1	(iii) = 0			
			i) Minimal coordination is required							
			ii) Required coordination is normal			X				1
			iii) Extensive coordination is required							
			Subtotal (maximum = 2)							**1**

Appendix B - Table 4.2A
Flagship Airlines - Dutchess County Airport, NY
Preliminary Screening of Implementability (maximum score = 15)
Alternative No. 1 - Enhanced Natural Attenuation

No.	Analysis Factor		Basis for Evaluation During Preliminary Screening							Score
						Yes = 1	No = 0			
3.	Availability of Services and Materials	a. Availability of prospective technologies	i) Are technologies under consideration generally commercially available for site-specific application?			X				1
			ii) Will more than one vendor be available to provide competitive bid?				X			0
		b. Availability of necessary equipment and specialists	I) Additional equipment and specialists may be available without significant delay.			X				1
			Subtotal (maximum = 3)							**2**
									TOTAL (maximum = 15)	**12**

Appendix B - Table 4.2B
Flagship Airlines - Dutchess County Airport, NY
Preliminary Screening of Implementability (maximum score = 15)
Alternative No. 2 - In-Well Stripping/Recirculation Wells

No.	Analysis Factor		Basis for Evaluation During Preliminary Screening							Score
1.	Technical Feasibility	a. Ability to Construct Technology		(i) = =3	(ii) = 2	(iii) = 1				
			i) Not difficult to construct. No uncertainties in construction.							
			ii) Somewhat difficult to construct. No uncertainties in construction.		X					2
			iii) Very difficult to construct and/or significant uncertainties in construction.							
		b. Releability of Technology		(i) = 3	(ii) = 2					
			i) Very reliable in meeting the specified process efficiencies or performance goals	X						3
			ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.							
		c. Schedule of Delays Due to Technical Problems			(i) = 2	(ii) = 1				
			i) Unlikely		X					2
			ii) Somewhat likely							
		d. Need of Undertaking Additional Remedial Action, if Necessary			(i) = 2	(ii) = 1				
			i) No future remedial actions may be necessayr.							
			ii) Some future remedial actions may be necessary.			X				1
			Subtotal (Maximum = 10)							**8**
2.	Administrative Feasibility	a. Coordination With Other Agencies			(i) = 2	(ii) = 1	(iii) = 0			
			i) Minimal coordination is required							
			ii) Required coordination is normal			X				1
			iii) Extensive coordination is required							
			Subtotal (maximum = 2)							**1**

Appendix B - Table 4.2B
Flagship Airlines - Dutchess County Airport, NY
Preliminary Screening of Implementability (maximum score = 15)
Alternative No. 2 - In-Well Stripping/Recirculation Wells

No.	Analysis Factor		Basis for Evaluation During Preliminary Screening							Score
						Yes = 1	No = 0			
3.	Availability of Services and Materials	a. Availability of prospective technologies	i) Are technologies under consideration generally commercially available for site-specific application?			X				1
			ii) Will more than one vendor be available to provide competitive bid?			X				1
		b. Availability of necessary equipment and specialists	I) Additional equipment and specialists may be available without significant delay.			X				1
			Subtotal (maximum = 3)							**3**
							TOTAL (maximum = 15)			**12**

Appendix B - Table 4.2C
Flagship Airlines - Dutchess County Airport, NY
Preliminary Screening of Implementability (maximum score = 15)
Alternative No. 3 - Air Sparge/SVE

No.	Analysis Factor		Basis for Evaluation During Preliminary Screening							Score
				(i) = =3	(ii) = 2	(iii) = 1				
1.	Technical Feasibility	a. Ability to Construct Technology	i) Not difficult to construct. No uncertainties in construction.	X						3
			ii) Somewhat difficult to construct. No uncertainties in construction.							
			iii) Very difficult to construct and/or significant uncertainties in construction.							
				(i) = 3	(ii) = 2					
		b. Releability of Technology	i) Very reliable in meeting the specified process efficiencies or performance goals	X						3
			ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.							
					(i) = 2	(ii) = 1				
		c. Schedule of Delays Due to Technical Problems	i) Unlikely		X					2
			ii) Somewhat likely							
					(i) = 2	(ii) = 1				
		d. Need of Undertaking Additional Remedial Action, if Necessary	i) No future remedial actions may be necessayr.							
			ii) Some future remedial actions may be necessary.			X				1
			Subtotal (Maximum = 10)							**9**
					(i) = 2	(ii) = 1	(iii) = 0			
2.	Administrative Feasibility	a. Coordination With Other Agencies	i) Minimal coordination is required							
			ii) Required coordination is normal			X				1
			iii) Extensive coordination is required							
			Subtotal (maximum = 2)							**1**

Appendix B - Table 4.2C
Flagship Airlines - Dutchess County Airport, NY
Preliminary Screening of Implementability (maximum score = 15)
Alternative No. 3 - Air Sparge/SVE

No.	Analysis Factor		Basis for Evaluation During Preliminary Screening								Score
						Yes = 1	No = 0				
3.	Availability of Services and Materials	a. Availability of prospective technologies	i) Are technologies under consideration generally commercially available for site-specific application?			X					1
			ii) Will more than one vendor be available to provide competitive bid?			X					1
		b. Availability of necessary equipment and specialists	I) Additional equipment and specialists may be available without significant delay.			X					1
			Subtotal (maximum = 3)								**3**
									TOTAL (maximum = 15)		**13**

Appendix B - Table 4.2D
Flagship Airlines - Dutchess County Airport, NY
Preliminary Screening of Implementability (maximum score = 15)
Alternative No. 4 - No Action

No.	Analysis Factor		Basis for Evaluation During Preliminary Screening							Score
1.	Technical Feasibility	a. Ability to Construct Technology		(i) = =3	(ii) = 2	(iii) = 1				
			i) Not difficult to construct. No uncertainties in construction.	X						3
			ii) Somewhat difficult to construct. No uncertainties in construction.							
			iii) Very difficult to construct and/or significant uncertainties in construction.							
		b. Releability of Technology		(i) = 3	(ii) = 2					
			i) Very reliable in meeting the specified process efficiencies or performance goals							
			ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.		X					0
		c. Schedule of Delays Due to Technical Problems			(i) = 2	(ii) = 1				
			i) Unlikely		X					2
			ii) Somewhat likely							
		d. Need of Undertaking Additional Remedial Action, if Necessary			(i) = 2	(ii) = 1				
			i) No future remedial actions may be necessayr.							
			ii) Some future remedial actions may be necessary.			X				1
			Subtotal (Maximum = 10)							**6**
2.	Administrative Feasibility	a. Coordination With Other Agencies			(i) = 2	(ii) = 1	(iii) = 0			
			i) Minimal coordination is required							
			ii) Required coordination is normal			X				1
			iii) Extensive coordination is required							
			Subtotal (maximum = 2)							**1**

Appendix B - Table 4.2D
Flagship Airlines - Dutchess County Airport, NY
Preliminary Screening of Implementability (maximum score = 15)
Alternative No. 4 - No Action

No.	Analysis Factor		Basis for Evaluation During Preliminary Screening							Score
						Yes = 1	No = 0			
3.	Availability of Services and Materials	a. Availability of prospective technologies	i) Are technologies under consideration generally commercially available for site-specific application?			X				1
			ii) Will more than one vendor be available to provide competitive bid?			X				1
		b. Availability of necessary equipment and specialists	I) Additional equipment and specialists may be available without significant delay.			X				1
			Subtotal (maximum = 3)							**3**
									TOTAL (maximum = 15)	**10**

APPENDIX C
DETAILED ANALYSIS OF ALTERNATIVES

Appendix C - Table 5.2A
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Compliance with ARARs and NYSDEC SCGs
(relative weight = 10)
Alternative 1 - Enhanced Natural Attenuation

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
			4	0		
1.	Compliance With Chemical Specific SCGs	Meets chemical specific SCGs such as groundwater standards	X			4
			3	0		
2.	Compliance With Action Specific SCGs	Meets SCGs such as technology standards for incineration	X			3
3.	Compliance With Location Specific SCGs	Meets location-specific SCGs such as Freshwater Wetlands Act	X			3
					Total (maximum = 10	10

Appendix C - Table 5.2B
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Compliance with ARARs and NYSDEC SCGs
(relative weight = 10)
Alternative 2 - In-Well Stripping/Recirculation Wells

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
			4	0		
1.	Compliance With Chemical Specific SCGs	Meets chemical specific SCGs such as groundwater standards	X			4
			3	0		
2.	Compliance With Action Specific SCGs	Meets SCGs such as technology standards for incineration	X			3
3.	Compliance With Location Specific SCGs	Meets location-specific SCGs such as Freshwater Wetlands Act	X			3
					Total (maximum = 10	10

Appendix C - Table 5.2C
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Compliance with ARARs and NYSDEC SCGs
(relative weight = 10)
Alternative 3 - Air Sparge/SVE

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
			4	0		
1.	Compliance With Chemical Specific SCGs	Meets chemical specific SCGs such as groundwater standards	X			4
			3	0		
2.	Compliance With Action Specific SCGs	Meets SCGs such as technology standards for incineration	X			3
3.	Compliance With Location Specific SCGs	Meets location-specific SCGs such as Freshwater Wetlands Act	X			3
					Total (maximum = 10	10

Appendix C - Table 5.2D
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Compliance with ARARs and NYSDEC SCGs
(relative weight = 10)
Alternative 4 - No Action

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
			4	0		
1.	Compliance With Chemical Specific SCGs	Meets chemical specific SCGs such as groundwater standards		X		0
			3	0		
2.	Compliance With Action Specific SCGs	Meets SCGs such as technology standards for incineration		X		0
3.	Compliance With Location Specific SCGs	Meets location-specific SCGs such as Freshwater Wetlands Act		X		0
					Total (maximum = 10	0

Appendix C - Table 5.3A
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis - Protection of Human Health and the Environment
(relative weight = 20)
Alternative 1 - Enhanced Natural Attenuation

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
1.	Use of the Site After Remediation		20 (yes)	0 (no)		
		i) Unrestricted use of the land and water. (If answer is yes, go to the end of the table)	X			20
		Total (Maximum = 20)				**20**
2.	Human Health and the Environment Exposure After the Remediation		3 (yes)	0 (no)		
		i) Is the exposure to contaminants via air route acceptable?				
			4 (yes)	0 (no)		
		ii) Is the exposure to contaminants via groundwater/surface water acceptable?				
			3 (yes)	0 (no)		
		iii) Is the exposure to contaminants vis sediments/soils acceptable?				
		Subtotal (maximum = 10)				
3.	Magnitude of Residual Public Health Risks After Remediation.		5 (i)	2 (ii)		
		i) Health Risk <1 in 1,000,000				
		ii) Health Risk <1 in 100,000				
		Subtotal (maximum = 5)				

Appendix C - Table 5.3A
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis - Protection of Human Health and the Environment
(relative weight = 20)
Alternative 1 - Enhanced Natural Attenuation

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
4.	Magnitude of Residual Environmental Risks After the Remediation		5 (i)	3 (ii)	0 (iii)	
		i) Less than acceptable				
		ii) Slightly greater than acceptable				
		iii) Significant risk still exists				
		Subtotal (maximum = 5)				
					TOTAL (maximum = 20)	**20**

Appendix C - Table 5.3B
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis - Protection of Human Health and the Environment
(relative weight = 20)
Alternative 2 - In-Well Stripping/Recirculation Wells

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
1.	Use of the Site After Remediation		20 (yes)	0 (no)		
		i) Unrestricted use of the land and water. (If answer is yes, go to the end of the table)	X			20
		Total (Maximum = 20)				**20**
2.	Human Health and the Environment Exposure After the Remediation		3 (yes)	0 (no)		
		i) Is the exposure to contaminants via air route acceptable?				
			4 (yes)	0 (no)		
		ii) Is the exposure to contaminants via groundwater/surface water acceptable?				
			3 (yes)	0 (no)		
		iii) Is the exposure to contaminants vis sediments/soils acceptable?				
		Subtotal (maximum = 10)				
3.	Magnitude of Residual Public Health Risks After Remediation.		5 (i)	2 (ii)		
		i) Health Risk <1 in 1,000,000				
		ii) Health Risk <1 in 100,000				
		Subtotal (maximum = 5)				

Appendix C - Table 5.3B
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis - Protection of Human Health and the Environment
(relative weight = 20)
Alternative 2 - In-Well Stripping/Recirculation Wells

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
4.	Magnitude of Residual Environmental Risks After the Remediation		5 (i)	3 (ii)	0 (iii)	
		i) Less than acceptable				
		ii) Slightly greater than acceptable				
		iii) Significant risk still exists				
		Subtotal (maximum = 5)				
					TOTAL (maximum = 20)	**20**

Appendix C - Table 5.3C
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis - Protection of Human Health and the Environment
(relative weight = 20)
Alternative 3 - Air Sparge/SVE

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
1.	Use of the Site After Remediation		**20 (yes)**	**0 (no)**		
		i) Unrestricted use of the land and water. (If answer is yes, go to the end of the table)	**X**			20
		Total (Maximum = 20)				**20**
2.	Human Health and the Environment Exposure After the Remediation		**3 (yes)**	**0 (no)**		
		i) Is the exposure to contaminants via air route acceptable?				
			4 (yes)	**0 (no)**		
		ii) Is the exposure to contaminants via groundwater/surface water acceptable?				
			3 (yes)	**0 (no)**		
		iii) Is the exposure to contaminants vis sediments/soils acceptable?				
		Subtotal (maximum = 10)				
3.	Magnitude of Residual Public Health Risks After Remediation.		**5 (i)**	**2 (ii)**		
		i) Health Risk <1 in 1,000,000				
		ii) Health Risk <1 in 100,000				
		Subtotal (maximum = 5)				

Appendix C - Table 5.3C
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis - Protection of Human Health and the Environment
(relative weight = 20)
Alternative 3 - Air Sparge/SVE

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
4.	Magnitude of Residual Environmental Risks After the Remediation		5 (i)	3 (ii)	0 (iii)	
		i) Less than acceptable				
		ii) Slightly greater than acceptable				
		iii) Significant risk still exists				
		Subtotal (maximum = 5)				
					TOTAL (maximum = 20)	**20**

Appendix C - Table 5.3D
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis - Protection of Human Health and the Environment
(relative weight = 20)
Alternative 4 - No Action

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
1.	Use of the Site After Remediation		20 (yes)	0 (no)		
		i) Unrestricted use of the land and water. (If answer is yes, go to the end of the table)		X		0
		Total (Maximum = 20)				**0**
2.	Human Health and the Environment Exposure After the Remediation		3 (yes)	0 (no)		
		i) Is the exposure to contaminants via air route acceptable?	X			3
			4 (yes)	0 (no)		
		ii) Is the exposure to contaminants via groundwater/surface water acceptable?		X		0
			3 (yes)	0 (no)		
		iii) Is the exposure to contaminants vis sediments/soils acceptable?		X		0
		Subtotal (maximum = 10)				**3**
3.	Magnitude of Residual Public Health Risks After Remediation.		5 (i)	2 (ii)		
		i) Health Risk <1 in 1,000,000		X		2
		ii) Health Risk <1 in 100,000				
		Subtotal (maximum = 5)				**2**

Appendix C - Table 5.3D
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis - Protection of Human Health and the Environment
(relative weight = 20)
Alternative 4 - No Action

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
4.	Magnitude of Residual Environmental Risks After the Remediation		5 (i)	3 (ii)	0 (iii)	
		i) Less than acceptable				
		ii) Slightly greater than acceptable		X		3
		iii) Significant risk still exists				
		Subtotal (maximum = 5)				3
					TOTAL (maximum = 20)	8

Appendix C - Table 5.4A
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Short-Term Effectiveness
(relative weight = 10)
Alternative 1 - Enhanced Natural Attenuation

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
1.	Protection of Community During Remedial Actions		0 (yes)	4 (no)		
		i) Are there significant short-term risks to the community that must be addressed? (If answer is no, go to Factor 2)		X		4
			1 (yes)	0 (no)		
		ii) Can the risk be easily controlled?				
			0 (yes)	2 (no)		
		iii) Does the mitigative effort to control risk impact the community lifestyle?				
		Subtotal (maximum = 4)				**4**
2.	Environmental Impacts		0 (yes)	4 (no)		
		i) Are there significant short-term risks to the environment that must be addressed? (If the answer is no, go to Factor 3)		X		4
			3 (yes)	0 (no)		
		ii) Are the available mitigative measures reliable to minimize potential impacts?				
		Subtotal (maximum = 4)				**4**

Appendix C - Table 5.4A
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Short-Term Effectiveness
(relative weight = 10)
Alternative 1 - Enhanced Natural Attenuation

No.	Analysis Factor		Basis for Evaluation During Detailed Analysis				Score
3.	Time to Implement the Remedy			<2 yrs=1	>2 yrs.=0		
		i)	What is the required time to implement the remedy?	X			1
				<2 yrs=1	>2 yrs.=0		
		ii)	required duration of the mitigative effort to control short-term risk.	X			1
			Subtotal (maximum = 2)				**2**
						TOTAL (maximum = 10)	**10**

Appendix C - Table 5.4B
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Short-Term Effectiveness
(relative weight = 10)
Alternative 2 - In-Well Stripping/Recirculating Wells

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
1.	Protection of Community During Remedial Actions		0 (yes)	4 (no)		
		i) Are there significant short-term risks to the community that must be addressed? (If answer is no, go to Factor 2)		X		4
			1 (yes)	0 (no)		
		ii) Can the risk be easily controlled?				
			0 (yes)	2 (no)		
		iii) Does the mitigative effort to control risk impact the community lifestyle?				
		Subtotal (maximum = 4)				**4**
2.	Environmental Impacts		0 (yes)	4 (no)		
		i) Are there significant short-term risks to the environment that must be addressed? (If the answer is no, go to Factor 3)		X		4
			3 (yes)	0 (no)		
		ii) Are the available mitigative measures reliable to minimize potential impacts?				
		Subtotal (maximum = 4)				**4**

Appendix C - Table 5.4B
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Short-Term Effectiveness
(relative weight = 10)
Alternative 2 - In-Well Stripping/Recirculating Wells

No.	Analysis Factor		Basis for Evaluation During Detailed Analysis				Score
3.	Time to Implement the Remedy			<2 yrs=1	>2 yrs.=0		
		i)	What is the required time to implement the remedy?	X			1
				<2 yrs=1	>2 yrs.=0		
		ii)	required duration of the mitigative effort to control short-term risk.	X			1
			Subtotal (maximum = 2)				2
						TOTAL (maximum = 10)	10

Appendix C - Table 5.4C
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Short-Term Effectiveness
(relative weight = 10)
Alternative 3 - Air Sparge/SVE

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
1.	Protection of Community During Remedial Actions		0 (yes)	4 (no)		
		i) Are there significant short-term risks to the community that must be addressed? (If answer is no, go to Factor 2)		X		4
			1 (yes)	0 (no)		
		ii) Can the risk be easily controlled?				
			0 (yes)	2 (no)		
		iii) Does the mitigative effort to control risk impact the community lifestyle?				
		Subtotal (maximum = 4)				**4**
2.	Environmental Impacts		0 (yes)	4 (no)		
		i) Are there significant short-term risks to the environment that must be addressed? (If the answer is no, go to Factor 3)		X		4
			3 (yes)	0 (no)		
		ii) Are the available mitigative measures reliable to minimize potential impacts?				
		Subtotal (maximum = 4)				**4**

Appendix C - Table 5.4C
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Short-Term Effectiveness
(relative weight = 10)
Alternative 3 - Air Sparge/SVE

No.	Analysis Factor		Basis for Evaluation During Detailed Analysis				Score
3.	Time to Implement the Remedy			<2 yrs=1	>2 yrs.=0		
		i)	What is the required time to implement the remedy?	X			1
				<2 yrs=1	>2 yrs.=0		
		ii)	required duration of the mitigative effort to control short-term risk.	X			1
			Subtotal (maximum = 2)				2
						TOTAL (maximum = 10)	10

Appendix C - Table 5.4D
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Short-Term Effectiveness
(relative weight = 10)
Alternative 4 - No Action

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
1.	Protection of Community During Remedial Actions		0 (yes)	4 (no)		
		i) Are there significant short-term risks to the community that must be addressed? (If answer is no, go to Factor 2)		X		4
			1 (yes)	0 (no)		
		ii) Can the risk be easily controlled?				
			0 (yes)	2 (no)		
		iii) Does the mitigative effort to control risk impact the community lifestyle?				
		Subtotal (maximum = 4)				**4**
2.	Environmental Impacts		0 (yes)	4 (no)		
		i) Are there significant short-term risks to the environment that must be addressed? (If the answer is no, go to Factor 3)		X		4
			3 (yes)	0 (no)		
		ii) Are the available mitigative measures reliable to minimize potential impacts?				0
		Subtotal (maximum = 4)				**4**

Appendix C - Table 5.4D
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Short-Term Effectiveness
(relative weight = 10)
Alternative 4 - No Action

No.	Analysis Factor		Basis for Evaluation During Detailed Analysis				Score
3.	Time to Implement the Remedy			<2 yrs=1	>2 yrs.=0		
		i)	What is the required time to implement the remedy?	X			1
				<2 yrs=1	>2 yrs.=0		
		ii)	required duration of the mitigative effort to control short-term risk.		X		0
			Subtotal (maximum = 2)				1
						TOTAL (maximum = 10)	9

Appendix C - Table 5.5A
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Long-Term Effectiveness and Permanence
(relative weight = 15)
Alternative 1 - Enhanced Natural Attenuation

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis							Score
1.	On-Site or Off-Site Treatment or Land Disposal		3 (i)	1 (ii)	0 (iii)				
		i) On-Site Treatment	X						3
		ii) Off-Site Treatment							
		iii) On-Site or Off-Site Land Disposal							
		Subtotal (maximum = 3)							**3**
2.	Permanence of the Remedial Alternative		Yes=3	No=0					
		Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or ©. (If answer is yes, go to factor 4.)	X						3
		Subtotal (maximum = 3)							**3**
3.	Lifetime of Remedial Actions		3 25-30 yrs	2 20-25 yrs	1 15-20 yrs	0 <15 yrs			
		Expected lifetime or duration of effectiveness of the remedy.							
		Subtotal (maximum = 3)							
4.	Quantity and Nature of Waste or Residual Left at the Site After Remediation.		none 3	≤25% 2	25-50% 1	≥50% 0			
		i) Quantity of untreated hazardous waste left at the site.	X						3
			Yes=0	No=2					
		ii) Is there treated residual left at the site? (If answer is no, go to Factor 5)		X					2
			Yes=0	No=1					
		iii) Is the treated residual toxic?							
		iv) Is the treated residual mobile?							
		Subtotal (maximum = 5)							**5**

Appendix C - Table 5.5A
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Long-Term Effectiveness and Permanence
(relative weight = 15)
Alternative 1 - Enhanced Natural Attenuation

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis							Score
5.	Adequacy and Reliability of Controls		1 <5 yrs	0 >5 yrs					
		i) Operation & maintenance required for a period of:	X						1
			Yes=0	No=2					
		ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv".)		X					2
			Moderate to Very Confident = 1		Somewhat to Not Confident = 0				
		iii) Degree of confidence that controls can adequately handle potential problems.							
			Minimum=2		Moderate=1		Extensive=0		
		iv) Relative degree of long-term monitoring required (compare with other remedial alternatives)			X				1
		Subtotal (maximum = 4)							4
								TOTAL (maximum =15)	15

Appendix C - Table 5.5B
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Long-Term Effectiveness and Permanence
(relative weight = 15)
Alternative 2 - In-Well Stripping/Recirculation Wells

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis							Score
1.	On-Site or Off-Site Treatment or Land Disposal		3 (i)	1 (ii)	0 (iii)				
		i) On-Site Treatment	X						3
		ii) Off-Site Treatment							
		iii) On-Site or Off-Site Land Disposal							
		Subtotal (maximum = 3)							**3**
2.	Permanence of the Remedial Alternative		Yes=3	No=0					
		Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or ©. (If answer is yes, go to factor 4.)	X						3
		Subtotal (maximum = 3)							**3**
3.	Lifetime of Remedial Actions		3 25-30 yrs	2 20-25 yrs	1 15-20 yrs	0 <15 yrs			
		Expected lifetime or duration of effectiveness of the remedy.							
		Subtotal (maximum = 3)							
4.	Quantity and Nature of Waste or Residual Left at the Site After Remediation.		none 3	≤25% 2	25-50% 1	≥50% 0			
		i) Quantity of untreated hazardous waste left at the site.	X						3
			Yes=0	No=2					
		ii) Is there treated residual left at the site? (If answer is no, go to Factor 5)		X					2
			Yes=0	No=1					
		iii) Is the treated residual toxic?							
		iv) Is the treated residual mobile?							
		Subtotal (maximum = 5)							**5**

Appendix C - Table 5.5B
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Long-Term Effectiveness and Permanence
(relative weight = 15)
Alternative 2 - In-Well Stripping/Recirculation Wells

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis							Score
5.	Adequacy and Reliability of Controls		1 <5 yrs	0 >5 yrs					
		i) Operation & maintenance required for a period of:	X						1
			Yes=0	No=2					
		ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv".)		X					2
			Moderate to Very Confident = 1		Somewhat to Not Confident = 0				
		iii) Degree of confidence that controls can adequately handle potential problems.							
			Minimum=2		Moderate=1		Extensive=0		
		iv) Relative degree of long-term monitoring required (compare with other remedial alternatives)			X				1
		Subtotal (maximum = 4)							**4**
								TOTAL (maximum =15)	**15**

Appendix C - Table 5.5C
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Long-Term Effectiveness and Permanence
(relative weight = 15)
Alternative 3 - Air Sparge/SVE

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis							Score
1.	On-Site or Off-Site Treatment or Land Disposal		3 (i)	1 (ii)	0 (iii)				
		i) On-Site Treatment	X						3
		ii) Off-Site Treatment							
		iii) On-Site or Off-Site Land Disposal							
		Subtotal (maximum = 3)							**3**
2.	Permanence of the Remedial Alternative		Yes=3	No=0					
		Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or ©. (If answer is yes, go to factor 4.)	X						3
		Subtotal (maximum = 3)							**3**
3.	Lifetime of Remedial Actions		3 25-30 yrs	2 20-25 yrs	1 15-20 yrs	0 <15 yrs			
		Expected lifetime or duration of effectiveness of the remedy.							
		Subtotal (maximum = 3)							
4.	Quantity and Nature of Waste or Residual Left at the Site After Remediation.		none 3	≤25% 2	25-50% 1	≥50% 0			
		i) Quantity of untreated hazardous waste left at the site.	X						3
			Yes=0	No=2					
		ii) Is there treated residual left at the site? (If answer is no, go to Factor 5)		X					2
			Yes=0	No=1					
		iii) Is the treated residual toxic?							
		iv) Is the treated residual mobile?							
		Subtotal (maximum = 5)							**5**

Appendix C - Table 5.5C
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Long-Term Effectiveness and Permanence
(relative weight = 15)
Alternative 3 - Air Sparge/SVE

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis							Score
5.	Adequacy and Reliability of Controls		1 <5 yrs	0 >5 yrs					
		i) Operation & maintenance required for a period of:	X						1
			Yes=0	No=2					
		ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv".)		X					2
			Moderate to Very Confident = 1		Somewhat to Not Confident = 0				
		iii) Degree of confidence that controls can adequately handle potential problems.							
			Minimum=2		Moderate=1		Extensive=0		
		iv) Relative degree of long-term monitoring required (compare with other remedial alternatives)			X				1
		Subtotal (maximum = 4)							**4**
								TOTAL (maximum =15)	**15**

Appendix C - Table 5.5D
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Long-Term Effectiveness and Permanence
(relative weight = 15)
Alternative 4 - No Action

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis								Score
1.	On-Site or Off-Site Treatment or Land Disposal		3 (i)	1 (ii)	0 (iii)					
		i) On-Site Treatment								
		ii) Off-Site Treatment								
		iii) On-Site or Off-Site Land Disposal			X					0
		Subtotal (maximum = 3)								**0**
2.	Permanence of the Remedial Alternative		Yes=3	No=0						
		Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or ©. (If answer is yes, go to factor 4.)		X						0
		Subtotal (maximum = 3)								**0**
3.	Lifetime of Remedial Actions		3 25-30 yrs	2 20-25 yrs	1 15-20 yrs	0 <15 yrs				
		Expected lifetime or duration of effectiveness of the remedy.				X				0
		Subtotal (maximum = 3)								**0**
4.	Quantity and Nature of Waste or Residual Left at the Site After Remediation.		none 3	≤25% 2	25-50% 1	≥50% 0				
		i) Quantity of untreated hazardous waste left at the site.				X				0
			Yes=0	No=2						
		ii) Is there treated residual left at the site? (If answer is no, go to Factor 5)	X							0
			Yes=0	No=1						
		iii) Is the treated residual toxic?	X							0
		iv) Is the treated residual mobile?	X							0
		Subtotal (maximum = 5)								**0**

Appendix C - Table 5.5D
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Long-Term Effectiveness and Permanence
(relative weight = 15)
Alternative 4 - No Action

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis								Score
5.	Adequacy and Reliability of Controls		1 <5 yrs	0 >5 yrs						
		i) Operation & maintenance required for a period of:	X							1
			Yes=0	No=2						
		ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv".)		X						2
			Moderate to Very Confident = 1		Somewhat to Not Confident = 0					
		iii) Degree of confidence that controls can adequately handle potential problems.								
			Minimum=2		Moderate=1		Extensive=0			
		iv) Relative degree of long-term monitoring required (compare with other remedial alternatives)					X			0
		Subtotal (maximum = 4)								3
									TOTAL (maximum =15)	3

Appendix C - Table 5.6A
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis - Reduction of Toxicity, Mobillity, or Volume
(relative weight = 15)
Alternative 1 - Enhanced Natural Attenuation

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis								Score
1.	Volume of Hazardous Waste Reduced (reduction in volume or toxicity) If Factor 1 is not applicable, go to Factor 2.		8 99-100%	7 90-99%	6 80-90%	4 60-80%	2 40-60%	1 20-40%	0 <20%	
		i) Quantity of hazardous waste destroyed or treated. Immobilization technologies do not score under Factor 1.	X							8
			Yes=0	No=2						
		ii) Is there untreated or concentrated hazardous waste produced as a result of (I)? If answer is no, go to Factor 2.		X						2
			0 Off-Site Land Disposal		1 On-Site Land Disposal		2 Off-Site Destruction or Treatment			
		iii) After remediation, how is the untreated, residual hazardous waste material disposed?								
		Subtotal (maximum = 10)								**10**
		If subtotal maximum = 10, go to Factor 3.								
2.	Reduction in Mobility of Hazardous Waste. If Factor 2 not Applicable, Go to Factor 3.		2 90-100%	1 60-90%	0 <60%					
		i) Quantity of available wastes immobilized after destruction/treatment								
			0 Reduced By Containment			3 Reduced By Alternative Treatment Technologies				
		ii) Method of Immobilization								
		Subtotal (maximum = 5)								

Appendix C - Table 5.6A
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis - Reduction of Toxicity, Mobillity, or Volume
(relative weight = 15)
Alternative 1 - Enhanced Natural Attenuation

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis									Score
				i) = 5	ii) = 3	iii) = 2	iv) = 0				
3	Irreversibility of the Destruction, Treatment, or Immobilization of Hazardous Waste	i)	Completely irreversible	X							5
		ii)	Irreversible for most hazardous waste constituents.								
		iii)	Irreversible for only some of the hazardous waste constituents.								
		iv)	Reversible for most of the hazardous waste constituents.								
			Subtotal (maximum = 5)								**5**
										TOTAL (maximum =15)	**15**

Appendix C - Table 5.6B
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis - Reduction of Toxicity, Mobillity, or Volume
(relative weight = 15)
Alternative 2 - In-Well Stripping/Recirculation Wells

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis								Score
1.	Volume of Hazardous Waste Reduced (reduction in volume or toxicity) If Factor 1 is not applicable, go to Factor 2.		8 99-100%	7 90-99%	6 80-90%	4 60-80%	2 40-60%	1 20-40%	0 <20%	
		i) Quantity of hazardous waste destroyed or treated. Immobilization technologies do not score under Factor 1.	X							8
			Yes=0	No=2						
		ii) Is there untreated or concentrated hazardous waste produced as a result of (I)? If answer is no, go to Factor 2.		X						2
			0 Off-Site Land Disposal		1 On-Site Land Disposal		2 Off-Site Destruction or Treatment			
		iii) After remediation, how is the untreated, residual hazardous waste material disposed?								
		Subtotal (maximum = 10)								**10**
		If subtotal maximum = 10, go to Factor 3.								
2.	Reduction in Mobility of Hazardous Waste. If Factor 2 not Applicable, Go to Factor 3.		2 90-100%	1 60-90%	0 <60%					
		i) Quantity of available wastes immobilized after destruction/treatment								
			0 Reduced By Containment			3 Reduced By Alternative Treatment Technologies				
		ii) Method of Immobilization								
		Subtotal (maximum = 5)								

Appendix C - Table 5.6B
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis - Reduction of Toxicity, Mobillity, or Volume
(relative weight = 15)
Alternative 2 - In-Well Stripping/Recirculation Wells

No.	Analysis Factor		Basis for Evaluation During Detailed Analysis									Score
				i) = 5	ii) = 3	iii) = 2	iv) = 0					
3	Irreversibility of the Destruction, Treatment, or Immobilization of Hazardous Waste	I)	Completely irreversible	X								5
		ii)	Irreversible for most hazardous waste constituents.									
		iii)	Irreversible for only some of the hazardous waste constituents.									
		iv)	Reversible for most of the hazardous waste constituents.									
			Subtotal (maximum = 5)									**5**
											TOTAL (maximum =15)	**15**

Appendix C - Table 5.6C
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis - Reduction of Toxicity, Mobillity, or Volume
(relative weight = 15)
Alternative 3 - Air Sparge/SVE

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis								Score
1.	Volume of Hazardous Waste Reduced (reduction in volume or toxicity) If Factor 1 is not applicable, go to Factor 2.		8 99-100%	7 90-99%	6 80-90%	4 60-80%	2 40-60%	1 20-40%	0 <20%	
		i) Quantity of hazardous waste destroyed or treated. Immobilization technologies do not score under Factor 1.	X							8
			Yes=0	No=2						
		ii) Is there untreated or concentrated hazardous waste produced as a result of (I)? If answer is no, go to Factor 2.		X						2
			0 Off-Site Land Disposal		1 On-Site Land Disposal		2 Off-Site Destruction or Treatment			
		iii) After remediation, how is the untreated, residual hazardous waste material disposed?								
		Subtotal (maximum = 10)								**10**
		If subtotal maximum = 10, go to Factor 3.								
2.	Reduction in Mobility of Hazardous Waste. If Factor 2 not Applicable, Go to Factor 3.		2 90-100%	1 60-90%	0 <60%					
		i) Quantity of available wastes immobilized after destruction/treatment								
			0 Reduced By Containment			3 Reduced By Alternative Treatment Technologies				
		ii) Method of Immobilization								
		Subtotal (maximum = 5)								

Appendix C - Table 5.6C
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis - Reduction of Toxicity, Mobillity, or Volume
(relative weight = 15)
Alternative 3 - Air Sparge/SVE

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis										Score
				i) = 5	ii) = 3	iii) = 2	iv) = 0					
3	Irreversibility of the Destruction, Treatment, or Immobilization of Hazardous Waste	i)	Completely irreversible	X								5
		ii)	Irreversible for most hazardous waste constituents.									
		iii)	Irreversible for only some of the hazardous waste constituents.									
		iv)	Reversible for most of the hazardous waste constituents.									
			Subtotal (maximum = 5)									**5**
											TOTAL (maximum =15)	**15**

Appendix C - Table 5.6D
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis - Reduction of Toxicity, Mobillity, or Volume
(relative weight = 15)
Alternative 4 - No Action

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis								Score
1.	Volume of Hazardous Waste Reduced (reduction in volume or toxicity) If Factor 1 is not applicable, go to Factor 2.		8 99-100%	7 90-99%	6 80-90%	4 60-80%	2 40-60%	1 20-40%	0 <20%	
		i) Quantity of hazardous waste destroyed or treated. Immobilization technologies do not score under Factor 1.							X	0
			Yes=0	No=2						
		ii) Is there untreated or concentrated hazardous waste produced as a result of (I)? If answer is no, go to Factor 2.	X							0
			0 Off-Site Land Disposal		1 On-Site Land Disposal		2 Off-Site Destruction or Treatment			
		iii) After remediation, how is the untreated, residual hazardous waste material disposed?			X					1
		Subtotal (maximum = 10)								**1**
		If subtotal maximum = 10, go to Factor 3.								
2.	Reduction in Mobility of Hazardous Waste. If Factor 2 not Applicable, Go to Factor 3.		2 90-100%	1 60-90%	0 <60%					
		i) Quantity of available wastes immobilized after destruction/treatment			X					0
			0 Reduced By Containment			3 Reduced By Alternative Treatment Technologies				
		ii) Method of Immobilization	X							0
		Subtotal (maximum = 5)								**0**

Appendix C - Table 5.6D
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis - Reduction of Toxicity, Mobillity, or Volume
(relative weight = 15)
Alternative 4 - No Action

No.	Analysis Factor		Basis for Evaluation During Detailed Analysis									Score
				i) = 5	ii) = 3	iii) = 2	iv) = 0					
3	Irreversibility of the Destruction, Treatment, or Immobilization of Hazardous Waste	i)	Completely irreversible									
		ii)	Irreversible for most hazardous waste constituents.									
		iii)	Irreversible for only some of the hazardous waste constituents.									
		iv)	Reversible for most of the hazardous waste constituents.				X					0
			Subtotal (maximum = 5)									**0**
											TOTAL (maximum =15)	**1**

Appendix C - Table 5.7A
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Implementability
(relative weight = 15)
Alternative 1 - Enhanced Natural Attenuation

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
1.	Technical Feasibility					
			i) = 3	ii) = 2	iii) = 1	
	a. Ability to Construct Technology	i) Not Difficult to construct. No uncertainties in construction.	X			3
		ii) Somewhat difficult to construct. No uncertainties in construction.				
		iii) Very difficult to construct and/or significant uncertainties in construction.				
			i) = 3	ii) = 2		
	b. Reliability of Technology	i) very reliable in meeting the specified process efficiencies or performance goals.				
		ii) Soewhat reliable in meeting the specified process efficiencies or performance goals.		X		2
			i) = 2	ii) = 1		
	c. Schedule of Delays Due to Technical Problems	i) Unlikely	X			2
		ii) Somewhat likely				
			i) = 2	ii) = 1		
	d. Need of Undertaking Additional Remedial Action, if Necessary.	i) No future remedial actions may be anticipated.				
		ii) Some future remedial actions may be necessary.		X		1
		Subtotal (maximum = 10)				**8**

Appendix C - Table 5.7A
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Implementability
(relative weight = 15)
Alternative 1 - Enhanced Natural Attenuation

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
2.	Administrative Feasibility					
			i) = 2	ii) = 1	iii) = 0	
	a. Coordination With Other Agencies	i) Minimal coordination is required				
		ii) Required coordination is normal		X		1
		iii) Extensive coordination is required				
		Subtotal (maximum = 2)				**1**
3.	Availabliity of Services and Materials					
			Yes = 1	No = 0		
	a. Availability of Prospective Technologies	i) Are technologies under consideration generally commercially available for the site-specifec application?	X			1
		ii) will more than one vendor be available to provide a competitive bid?		X		0
	b. Availability of Necessary Equipment and Specialists.	i) Additional equipment and specialists may be available without significant delay.	X			1
		Subtotal (maximum = 3)				**2**
					TOTAL (maximum = 15)	**11**

Appendix C - Table 5.7B
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Implementability
(relative weight = 15)
Alternative 2 - In-Well Stripping/Recirculation Wells

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
1.	Technical Feasibility					
			i) = 3	ii) = 2	iii) = 1	
	a. Ability to Construct Technology	i) Not Difficult to construct. No uncertainties in construction.				
		ii) Somewhat difficult to construct. No uncertainties in construction.		X		2
		iii) Very difficult to construct and/or significant uncertainties in construction.				
			i) = 3	ii) = 2		
	b. Reliability of Technology	i) very reliable in meeting the specified process efficiencies or performance goals.	X			3
		ii) Soewhat reliable in meeting the specified process efficiencies or performance goals.				
			i) = 2	ii) = 1		
	c. Schedule of Delays Due to Technical Problems	i) Unlikely	X			2
		ii) Somewhat likely				
			i) = 2	ii) = 1		
	d. Need of Undertaking Additional Remedial Action, if Necessary.	i) No future remedial actions may be anticipated.				
		ii) Some future remedial actions may be necessary.		X		1
		Subtotal (maximum = 10)				**8**

Appendix C - Table 5.7B
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Implementability
(relative weight = 15)
Alternative 2 - In-Well Stripping/Recirculation Wells

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
2.	Administrative Feasibility					
			i) = 2	ii) = 1	iii) = 0	
	a. Coordination With Other Agencies	i) Minimal coordination is required				
		ii) Required coordination is normal		X		1
		iii) Extensive coordination is required				
		Subtotal (maximum = 2)				**1**
3.	Availabliity of Services and Materials					
			Yes = 1	No = 0		
	a. Availability of Prospective Technologies	i) Are technologies under consideration generally commercially available for the site-specifec application?	X			1
		ii) will more than one vendor be available to provide a competitive bid?	X			1
	b. Availability of Necessary Equipment and Specialists.	i) Additional equipment and specialists may be available without significant delay.	X			1
		Subtotal (maximum = 3)				**3**
					TOTAL (maximum = 15)	**12**

Appendix C - Table 5.7C
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Implementability
(relative weight = 15)
Alternative 3 - Air Sparge/SVE

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
1.	Technical Feasibility					
			i) = 3	ii) = 2	iii) = 1	
	a. Ability to Construct Technology	i) Not Difficult to construct. No uncertainties in construction.	X			3
		ii) Somewhat difficult to construct. No uncertainties in construction.				
		iii) Very difficult to construct and/or significant uncertainties in construction.				
			i) = 3	ii) = 2		
	b. Reliability of Technology	i) very reliable in meeting the specified process efficiencies or performance goals.	X			3
		ii) Soewhat reliable in meeting the specified process efficiencies or performance goals.				
			i) = 2	ii) = 1		
	c. Schedule of Delays Due to Technical Problems	i) Unlikely	X			2
		ii) Somewhat likely				
			i) = 2	ii) = 1		
	d. Need of Undertaking Additional Remedial Action, if Necessary.	i) No future remedial actions may be anticipated.				
		ii) Some future remedial actions may be necessary.		X		1
		Subtotal (maximum = 10)				**9**

Appendix C - Table 5.7C
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Implementability
(relative weight = 15)
Alternative 3 - Air Sparge/SVE

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
2.	Administrative Feasibility					
			i) = 2	ii) = 1	iii) = 0	
	a. Coordination With Other Agencies	i) Minimal coordination is required				
		ii) Required coordination is normal		X		1
		iii) Extensive coordination is required				
		Subtotal (maximum = 2)				**1**
3.	Availabliity of Services and Materials					
			Yes = 1	No = 0		
	a. Availability of Prospective Technologies	i) Are technologies under consideration generally commercially available for the site-specifec application?	X			1
		ii) will more than one vendor be available to provide a competitive bid?	X			1
	b. Availability of Necessary Equipment and Specialists.	i) Additional equipment and specialists may be available without significant delay.	X			1
		Subtotal (maximum = 3)				**3**
					TOTAL (maximum = 15)	**13**

Appendix C - Table 5.7D
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Implementability
(relative weight = 15)
Alternative 4 - No Action

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
1.	Technical Feasibility					
			i) = 3	ii) = 2	iii) = 1	
	a. Ability to Construct Technology	i) Not Difficult to construct. No uncertainties in construction.	X			3
		ii) Somewhat difficult to construct. No uncertainties in construction.				
		iii) Very difficult to construct and/or significant uncertainties in construction.				
			i) = 3	ii) = 2		
	b. Reliability of Technology	i) very reliable in meeting the specified process efficiencies or performance goals.				
		ii) Soewhat reliable in meeting the specified process efficiencies or performance goals.		X		2
			i) = 2	ii) = 1		
	c. Schedule of Delays Due to Technical Problems	i) Unlikely	X			2
		ii) Somewhat likely				
			i) = 2	ii) = 1		
	d. Need of Undertaking Additional Remedial Action, if Necessary.	i) No future remedial actions may be anticipated.				
		ii) Some future remedial actions may be necessary.		X		1
		Subtotal (maximum = 10)				**8**

Appendix C - Table 5.7D
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Implementability
(relative weight = 15)
Alternative 4 - No Action

No.	Analysis Factor	Basis for Evaluation During Detailed Analysis				Score
2.	Administrative Feasibility					
			i) = 2	ii) = 1	iii) = 0	
	a. Coordination With Other Agencies	i) Minimal coordination is required	X			2
		ii) Required coordination is normal				
		iii) Extensive coordination is required				
		Subtotal (maximum = 2)				**2**
3.	Availabliity of Services and Materials					
			Yes = 1	No = 0		
	a. Availability of Prospective Technologies	i) Are technologies under consideration generally commercially available for the site-specifec application?	X			1
		ii) will more than one vendor be available to provide a competitive bid?	X			1
	b. Availability of Necessary Equipment and Specialists.	i) Additional equipment and specialists may be available without significant delay.	X			1
		Subtotal (maximum = 3)				**3**
					TOTAL (maximum = 15)	**13**

Appendix C - Table 5.8
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Cost - Alternatives 1 - 4

Analysis Factor			Alternative 1, Enhanced Natural AttenuationCost	Alternative 2, In-Well Stripping Recirculation Wells Cost	Alternative 3, Air Sparge/SVE Cost	Alternative 4, No Action Cost
1.	Capital Costs					
	a. Direct Capital Costs					
		i) Construction Costs	$55,000	$40,000	$24,000	$0
		ii) Equipment Costs	$0	$50,000	$40,000	$0
		iii) Land and Site Development Costs	$0	$10,000	$2,000	$0
		iv) Buildings and Services Costs	$0	$20,000	$30,000	$0
		v) Relocation Expenses	$0	$0	$0	$0
		vi) Disposal costs	$1,000	$1,000	$1,000	$0
		Subtotal:	**$56,000**	**$121,000**	**$97,000**	**$0**
	b. Indirect Capital Costs	i) Engineering costs	$10,000	$12,000	$9,000	$5,000
		ii) Legal fees	$10,000	$10,000	$10,000	$10,000
		iii) Startup & shakedown costs	$0	$10,000	$5,000	$0
		iv) Contingency allowances	$10,000	$20,000	$10,000	$20,000
		Subtotal:	**$30,000**	**$52,000**	**$34,000**	**$35,000**

Appendix C - Table 5.8
Flagship Airlines - Dutchess County Airport, NY
Detailed Analysis of Cost - Alternatives 1 - 4

Analysis Factor			Alternative 1, Enhanced Natural AttenuationCost	Alternative 2, In-Well Stripping Recirculation Wells Cost	Alternative 3, Air Sparge/SVE Cost	Alternative 4, No Action Cost
2.	Operation & Maintenance Costs					
		i) Operating labor costs	$28,000	$44,000	$63,000	$54,000
		ii) Maintenance materials and labor costs	$163,000	$29,500	$39,000	$4,000
		iii) Auxiliary materials and energy	$0	$50,000	$5,000	$0
		iv) Disposal of residues	$6,500	$5,000	$5,000	$27,000
		v) Purchased services	$61,000	$32,000	$27,000	$92,500
		vi) Administrative costs	$6,000	$5,500	$6,000	$27,000
		vii) Insurance, taxes, and licensing costs	$19,500	$56,000	$10,000	$80,500
		viii) Replacement costs	$0	$5,000	$8,000	$4,000
		ix) Cost of periodic site reviews	$11,000	$9,000	$5,500	$47,000
		Subtotal:	**$295,000**	**$236,000**	**$169,000**	**$336,000**
3.	Future Capital Costs	**Subtotal:**	**$0**	**$0**	**$0**	**$0**
4.	Cost of Future Land Use	**Subtotal:**	**$0**	**$0**	**$0**	**$0**
		TOTAL COST:	**$381,000**	**$409,000**	**$300,000**	**$371,000**

APPENDIX D
ESTIMATED CONTAMINANT MASS

Appendix D - Table 1
Flagship Airlines - Dutchess County Airport, NY
Estimated VOC Contaminant Mass in Groundwater

Contaminant	Location	Average Plume Depth (feet)	Average Water Depth (feet)	Average Plume Thickness (feet)	Plume Width (feet)	Plume Length (feet)	Total Volume of Plume (ft^3)	Water Volume of Plume (ft^3)	Water Mass (lbs)	Contaminant Concentration (ug/l)	Estimated Contaminant Mass (lbs.)
1,1,1-TCA	Leaching Bed	12	3.7	8.3	7	20	1162	290.5	18,127.2	125	0.002
	Leaching Bed	12	3.7	8.3	12	30	1826	456.5	28,485.6	75	0.002
	Leaching Bed	12	3.7	8.3	15	40	1328	332.0	20,716.8	35	0.001
	Leaching Bed	12	3.7	8.3	25	55	7097	1774.1	110,705.4	10	0.001
										Total lbs of 1,1,1-TCA:	**0.0062**
1,1-DCA	Leaching Bed	12	3.7	8.3	8	23	1527	381.8	23,824.3	515	0.012
	Leaching Bed	12	3.7	8.3	13	37	2465	616.3	38,455.6	300	0.012
	Leaching Bed	12	3.7	8.3	20	47	3810	952.4	59,431.3	75	0.004
	Leaching Bed	12	3.7	8.3	25	60	4648	1162.0	72,508.8	30	0.002
	Leaching Bed	12	3.7	8.3	30	70	4980	1245.0	77,688.0	5	0.000
	Comingled Plume	12	4.6	7.4	15	170	1440	360.0	22,464.0	10	0.000
	Comingled Plume	12	4.6	7.4	25	170	12580	3145.0	196,248.0	5	0.001
										Total lbs of 1,1,-DCA:	**0.0320**
1,2-DCE	Leaching Bed	12	3.7	8.3	5	25	1038	259.4	16,185.0	22	0.000
	Leaching Bed	12	3.7	8.3	10	30	1453	363.1	22,659.0	15	0.000
	Comingled Plume	12	4.6	7.4	10	230	14530	3632.5	226,668.0	10	0.002
	Comingled Plume	12	4.6	7.4	25	230	25530	6382.5	398,268.0	5	0.002
										Total lbs of 1,2,-DCE:	**0.0050**
PCE	Leaching Bed	12	3.7	8.3	12	30	2988	747.0	46,612.8	445	0.021
	Leaching Bed	12	3.7	8.3	18	50	4482	1120.5	69,919.2	300	0.021
	Leaching Bed	12	3.7	8.3	25	75	8093	2023.1	126,243.0	105	0.013
	Leaching Bed	12	3.7	8.3	35	85	9130	2282.5	142,428.0	5	0.001
	Drum Storage	12	3.7	8.3	15	30	3735	933.8	58,266.0	1	0.000
	Comingled Plume	12	4.6	7.4	40	60	17760	4440.0	277,056.0	1	0.000
	Comingled Plume	12	4.6	7.4	10	130	9620	2405.0	150,072.0	1	0.000
										Total lbs of PCE:	**0.0562**

Appendix D - Table 1
Flagship Airlines - Dutchess County Airport, NY
Estimated VOC Contaminant Mass in Groundwater

Contaminant	Location	Average Plume Depth (feet)	Average Water Depth (feet)	Average Plume Thickness (feet)	Plume Width (feet)	Plume Length (feet)	Total Volume of Plume (ft^3)	Water Volume of Plume (ft^3)	Water Mass (lbs)	Contaminant Concentration (ug/l)	Estimated Contaminant Mass (lbs.)
TCE	Leaching Bed	12	3.7	8.3	10	20	1660	415.0	25,896.0	11	0.000
	Leaching Bed	12	3.7	8.3	15	32	2324	581.0	36,254.4	5	0.000
										Total lbs of TCE:	**0.0005**
Xylene	Leaching Bed	12	3.7	8.3	12	30	2988	747.0	46,612.8	52	0.002
	Comingled Plume	12	3.7	8.3	12	240	20916	5229.0	326,289.6	1	0.000
										Total lbs of Xylene:	**0.0028**
Vinyl Chloride	Comingled Plume	12	5.5	6.5	12	90	7020	1755.0	109,512.0	3	0.000
										Total lbs of Vinyl Chloride:	**0.0003**
										Total VOCs in Groundwater (lbs.):	**0.1029**

Appendix D - Table 2
Flagship Airlines - Dutchess County Airport, NY
Estimated VOC Contaminant Mass in Soil

Contaminant	Location	Dissolved Concentration in Groundwater (ug/l)	Estimated Dissolved Contaminant Mass (lbs.)	Partition Coefficient (mL/g)	Estimated Contaminant Mass on Soil (lbs.)
1,1,1-TCA	Leaching Bed	125	0.002	152	0.344
	Leaching Bed	75	0.002	152	0.325
	Leaching Bed	35	0.001	152	0.110
	Leaching Bed	10	0.001	152	0.168
Total lbs of 1,1,1-TCA:		**In Groundwater:**	**0.0062**	**In Soil:**	**0.9476**
1,1-DCA	Leaching Bed	515	0.012	30	0.368
	Leaching Bed	300	0.012	30	0.346
	Leaching Bed	75	0.004	30	0.134
	Leaching Bed	30	0.002	30	0.065
	Leaching Bed	5	0.000	30	0.012
	Comingled Plume	10	0.000	30	0.007
	Comingled Plume	5	0.001	30	0.029
Total lbs of 1,1,-DCA:		**In Groundwater:**	**0.0320**	**In Soil:**	**0.9610**
1,2-DCE	Leaching Bed	22	0.000	59	0.021
	Leaching Bed	15	0.000	59	0.020
	Comingled Plume	10	0.002	59	0.134
	Comingled Plume	5	0.002	59	0.117
Total lbs of 1,2,-DCE:		**In Groundwater:**	**0.0050**	**In Soil:**	**0.2923**
PCE	Leaching Bed	445	0.021	364	7.550
	Leaching Bed	300	0.021	364	7.635
	Leaching Bed	105	0.013	364	4.825
	Leaching Bed	5	0.001	364	0.259
	Drum Storage	1	0.000	364	0.021
	Comingled Plume	1	0.000	364	0.101
	Comingled Plume	1	0.000	364	0.055
Total lbs of PCE:		**In Groundwater:**	**0.0562**	**In Soil:**	**20.4464**

Appendix D - Table 2
Flagship Airlines - Dutchess County Airport, NY
Estimated VOC Contaminant Mass in Soil

Contaminant	Location	Dissolved Concentration in Groundwater (ug/l)	Estimated Dissolved Contaminant Mass (lbs.)	Partition Coefficient (mL/g)	Estimated Contaminant Mass on Soil (lbs.)
TCE	Leaching Bed	11	0.000	126	0.036
	Leaching Bed	5	0.000	126	0.023
Total lbs of TCE:		**In Groundwater:**	**0.0005**		**0.0587**
Xylene	Leaching Bed	52	0.002	166	0.402
	Comingled Plume	1	0.000	166	0.054
Total lbs of Xylene:		**In Groundwater:**	**0.0028**		**0.4565**
Vinyl Chloride	Comingled Plume	3	0.000	29.6	0.010
Vinyl Chloride:		**In Groundwater:**	**0.0003**		**0.0097**
		TVOCs in GW (lbs):	**0.103**	**TVOCs in Soil (lbs):**	**23.172**

Appendix D - Table 3
Flagship Airlines - Dutchess County Airport, NY
Estimated SVOC Contaminant Mass in Groundwater

Contaminant	Location	Average Plume Depth (feet)	Average Water Depth (feet)	Average Plume Thickness (feet)	Plume Width (feet)	Plume Length (feet)	Total Volume of Plume (ft^3)	Water Volume of Plume (ft^3)	Water Mass (lbs)	Contaminant Concentration (ug/l)	Estimated Contaminant Mass (lbs.)
Total Phenols	Leaching Bed	12	3.7	8.3	8	26	1726	431.6	26,931.8	1600	0.043
	Leaching Bed	12	3.7	8.3	13	34	1942	485.6	30,298.3	1250	0.038
	Leaching Bed	12	3.7	8.3	18	38	2009	502.2	31,334.2	550	0.017
	Leaching Bed	12	3.7	8.3	25	55	5735	1434	89,471	55	0.005
	Leaching Bed	12	3.7	8.3	32	70	7180	1795	112,000	5	0.001
	Comingled Plume	12	4.6	7.4	25	180	14708	3677	229,445	2	0.000
										Total lbs of Total Phenols:	**0.1041**
Naphthalene	Leaching Bed	12	3.7	8.3	16	37	4914	1228	76,652	1050	0.080
	Leaching Bed	12	3.7	8.3	21	42	2407	602	37,549	750	0.028
	Leaching Bed	12	3.7	8.3	26	47	2822	706	44,023	300	0.013
	Leaching Bed	12	3.7	8.3	30	53	3054	764	47,649	75	0.004
	Leaching Bed	12	3.7	8.3	33	65	4607	1152	71,861	30	0.002
	Leaching Bed	12	3.7	8.3	38	70	4275	1069	66,682	5	0.000
	Comingled Plume	12	4.6	7.4	24	160	28416	7104	443,290	10	0.004
	Comingled Plume	12	4.6	7.4	40	160	18944	4736	295,526	5	0.001
	Heating Oil UST	22	9	13	10	10	1300	325	20,280	100	0.002
	Heating Oil UST	22	9	13	17	17	2457	614	38,329	60	0.002
	Heating Oil UST	22	9	13	24	24	3731	933	58,204	15	0.001
	Heating Oil UST	22	9	13	30	30	4212	1053	65,707	5	0.000
										Total lbs of Naphthalene:	**0.1394**
										Total SVOCs in Groundwater (lbs.):	**0.2435**

Appendix D - Table 4
Flagship Airlines - Dutchess County Airport, NY
Estimated SVOC Contaminant Mass in Soil

Contaminant	Location	Dissolved Concentration in Groundwater (ug/l)	Estimated Dissolved Contaminant Mass (lbs.)	Partition Coefficient (mL/g)	Estimated Dissolved Contaminant Mass (lbs.)
Total Phenols	Leaching Bed	1600	0.043	148	6.4
	Leaching Bed	1250	0.038	148	5.6
	Leaching Bed	550	0.017	148	2.6
	Leaching Bed	55	0.005	148	0.7
	Leaching Bed	5	0.001	148	0.1
	Comingled Plume	2	0.000	148	0.1
Total lbs. Of Total Phenols:		**In Groundwater:**	**0.104**	**In Soil:**	**15.4**
Naphthalene	Leaching Bed	1050	0.080	871	70.1
	Leaching Bed	750	0.028	871	24.5
	Leaching Bed	300	0.013	871	11.5
	Leaching Bed	75	0.004	871	3.1
	Leaching Bed	30	0.002	871	1.9
	Leaching Bed	5	0.000	871	0.3
	Comingled Plume	10	0.004	871	3.9
	Comingled Plume	5	0.001	871	1.3
	Heating Oil Ust	100	0.002	871	1.8
	Heating Oil Ust	60	0.002	871	2.0
	Heating Oil Ust	15	0.001	871	0.8
	Heating Oil Ust	5	0.000	871	0.3
Total lbs of Naphthalene:		**In Groundwater:**	**0.139**	**In Soil:**	**121.4**
		SVOCs In Groundwater (lbs.):	**0.243**	**SVOCs In Soil:**	**136.8**

APPENDIX E
PRESENT VALUE ANALYSIS

Appendix E - Table 1A
Flagship Airlines - Dutchess County Airport, NY
Alternative 1 - Enhanced Natural Attenuation
Present Value Analysis

Labor per Sample Event	Sampling Labor per Year	Laboratory Cost per Sample Event	Laboratory Cost per Year	Sampling Events per Year	Disposal	Annual Site Audit	Date
$2,640	$10,560	$5,000	$20,000	4	$1,000	$1,750	12/31/1999
$2,719	$5,438.40	$5,150	$10,300	2	$1,030	$1,803	12/31/2000
$2,801	$2,800.78	$5,305	$5,305	1	$1,061	$1,857	12/31/2001
$2,885	$2,884.80	$5,464	$5,464	1	$1,093	$1,912	12/31/2002
$2,971	$2,971.34	$5,628	$5,628	1	$1,126	$1,970	12/31/2003
$3,060	$3,060.48	$5,796	$5,796	1	$1,159	$2,029	12/31/2004
$17,077	**$27,716**	**$32,342**	**$52,492**	**10**	**$6,468**	**$11,320**	**Total Cost**
$15,103	**$25,612**	**$28,603**	**$48,508**		**$5,721**	**$10,011**	**Present Value**

Replacement Costs	Operating Labor costs	Maintenance Materials and Labor	Additional Purchased Services	Auxiliary Materials and Energy	Administrative Services	Insurance, Tax & Licensing	Date
$ -	$ -	$ -	$ -	$ -	$ 1,000	$ 3,000	12/31/1999
$ -	$ -	$ 39,000	$ 2,000	$ -	$ 1,030	$ 3,090	12/31/2000
$ -	$ -	$ 40,170	$ 2,060	$ -	$ 1,061	$ 3,183	12/31/2001
$ -	$ -	$ 41,375	$ 2,122	$ -	$ 1,093	$ 3,278	12/31/2002
$ -	$ -	$ 42,616	$ 2,185	$ -	$ 1,126	$ 3,377	12/31/2003
$ -	$ -	$ -	$ -	$ -	$ 1,159	$ 3,478	12/31/2004
$ -	**$ -**	**$ 163,161**	**8,367**	**-**	**$ 6,468**	**$ 19,405**	**Total Cost**
$ -	**$ -**	**$ 144,361**	**7,403**	**-**	**$ 5,721**	**$ 17,162**	**Present Value**

Appendix E - Table 1A
Flagship Airlines - Dutchess County Airport, NY
Alternative 1 - Enhanced Natural Attenuation
Present Value Analysis

Analysis Factor	Total Cost	Present Value
Direct Capital Costs:	**$56,000**	**$56,000**
Indirect Capital Costs:	**$30,000**	**$30,000**
Operating Labor Costs:	$27,716	$25,612
Maintenance, Materials and Labor Costs:	$163,161	$144,361
Auxiliary Materials and Energy:	$0	$0
Disposal of Residues:	$6,468	$5,721
Purchased Services:	$60,859	$55,911
Administrative Costs:	$6,468	$5,721
Insurance, Taxes, and Licensing Fees:	$19,405	$17,162
Replacement Costs:	$0	$0
Cost of Periodic Site Reviews:	$11,320	$10,011
Total O&M Costs:	**$295,000**	**$264,000**
Future Capital Costs:	**$0**	**$0**
Cost of Future Land Use:	**$0**	**$0**
TOTAL COSTS:	**$381,000**	**$350,000**

Notes: Present value calculated at 5% discount rate.
Costs escalate at 3% per year.

Appendix E - Table 1B
Flagship Airlines - Dutchess County Airport, NY
Alternative 2 - In-Well Stripping/Recirculation Wells
Present Value Analysis

Labor per Sample Event	Sampling Labor per year	Laboratory Cost per Sample Event	Laboratory Cost per Year	Sampling Events per Year	Disposal	Annual Site Audit	Date
$1,760	$7,040	$3,000	$12,000	4	$1,000	$1,750	12/31/1999
$1,813	$3,626	$3,090	$6,180	2	$1,030	$1,803	12/31/2000
$1,867	$1,867	$3,183	$3,183	1	$1,061	$1,857	12/31/2001
$1,923	$1,923	$3,278	$3,278	1	$1,093	$1,912	12/31/2002
$1,981	$1,981	$3,377	$3,377	1	$1,126	$1,970	12/31/2003
$9,344	**$16,437**	**$15,927**	**$28,017**	**9**	**$5,309**	**$9,291**	**Total Cost**
$8,470	**$15,476**	**$14,438**	**$26,380**		**$4,813**	**$8,422**	**Present Value**

Replacement Costs	Operating Labor Costs	Maintenance Materials and Labor	Additional Purchased Services	Auxiliary Materials and Energy	Administrative Services	Insurance Tax and Licensing	Date
$0	$6,500	$7,000	$1,000	$12,000	$1,000	$35,000	12/31/1999
$0	$6,695	$7,210	$1,030	$12,360	$1,030	$5,000	12/31/2000
$5,000	$6,896	$7,426	$1,061	$12,731	$1,061	$5,150	12/31/2001
$0	$7,103	$7,649	$1,093	$13,113	$1,093	$5,305	12/31/2002
$0	$0	$0	$0	$0	$1,126	$5,464	12/31/2003
$5,000	**$27,194**	**$29,285**	**$4,184**	**$50,204**	**$5,309**	**$55,918**	**Total Cost**
$4,535	**$25,264**	**$27,207**	**$3,887**	**$46,641**	**$4,813**	**$53,508**	**Present Value**

Appendix E - Table 1B
Flagship Airlines - Dutchess County Airport, NY
Alternative 2 - In-Well Stripping/Recirculation Wells
Present Value Analysis

Analysis Factor	Total Cost	Present Value
Direct Capital Costs:	**$121,000**	**$121,000**
Indirect Capital Costs:	**$52,000**	**$52,000**
Operating Labor Costs:	$43,630	$40,740
Maintenance, Materials and Labor Costs:	$29,285	$27,207
Auxiliary Materials and Energy:	$50,204	$46,641
Disposal of Residues:	$5,309	$4,813
Purchased Services:	$32,201	$30,267
Administrative Costs:	$5,309	$4,813
Insurance, Taxes, and Licensing Fees:	$55,918	$53,508
Replacement Costs:	$5,000	$4,535
Cost of Periodic Site Reviews:	$9,291	$8,422
Total O&M Costs:	**$236,000**	**$221,000**
Future Capital Costs:	**$0**	**$0**
Cost of Future Land Use:	**$0**	**$0**
TOTAL COSTS:	**$409,000**	**$394,000**

Notes: Present value calculated at 5% discount rate.
Costs escalate at 3% per year.

Appendix E - Table 1C
Flagship Airlines - Dutchess County Airport, NY
Alternative 3 - Air Sparge/SVE
Present Value Analysis

Labor per Sample Event	Sampling Labor per year	Laboratory Cost per Sample Event	Laboratory Cost per Year	Sampling Events per Year	Disposal	Annual Site Audit	Date
$1,760	7,040	$3,500	$14,000	4	$1,600	$1,750	12/31/1999
$1,813	3,626	$3,605	$7,210	2	$1,648	$1,803	12/31/2000
$1,867	1,867	$3,713	$3,713	1	$1,697	$1,857	12/31/2001
$5,440	**12,533**	**$10,818**	**$24,923**	**7**	**$4,945**	**$5,409**	**Total Cost**
$5,180	**12,186**	**$10,300**	**$24,233**		**$4,709**	**$5,150**	**Present Value**

Replacement Costs	Operating Labor Costs	Maintenance Materials and Labor	Additional Purchased Services	Auxiliary Materials and Energy	Administrative Services	Insurance Tax and Licensing	Date
$3,900	$25,000	$19,000	$1,000	$2,500	$2,000	$3,300	12/31/1999
$4,017	$25,750	$19,570	$1,030	$2,575	$2,060	$3,399	12/31/2000
$0	$0	$0	$0	$0	$2,122	$3,501	12/31/2001
$7,917	**$50,750**	**$38,570**	**$2,030**	**$5,075**	**$6,182**	**$10,200**	**Total Cost**
$7,725	**$49,521**	**$37,636**	**$1,981**	**$4,952**	**$5,886**	**$9,712**	**Present Value**

Appendix E - Table 1C
Flagship Airlines - Dutchess County Airport, NY
Alternative 3 - Air Sparge/SVE
Present Value Analysis

Analysis Factor	Total Cost	Present Value
Direct Capital Costs:	**$97,000**	**$97,000**
Indirect Capital Costs:	**$34,000**	**$34,000**
Operating Labor Costs:	$63,283	$61,706
Maintenance, Materials and Labor Costs:	$38,570	$37,636
Auxiliary Materials and Energy:	$5,075	$4,952
Disposal of Residues:	$4,945	$4,709
Purchased Services:	$26,953	$5,694
Administrative Costs:	$6,182	$26,214
Insurance, Taxes, and Licensing Fees:	$10,200	$9,712
Replacement Costs:	$7,917	$7,725
Cost of Periodic Site Reviews:	$5,409	$5,150
Total O&M Costs:	**$169,000**	**$163,000**
Future Capital Costs:	**$0**	**$0**
Cost of Future Land Use:	**$0**	**$0**
TOTAL COSTS:	**$300,000**	**$294,000**

Notes: Present value calculated at 5% discount rate.
Costs escalate at 3% per year.

Appendix E - Table 1D
Flagship Airlines - Dutchess County Airport, NY
Alternative 4 - No Action
Present Value Analysis

Labor per Sample Event	Sampling Labor per year	Laboratory Cost per Sample Event	Laboratory Cost per Year	Sampling Events per Year	Disposal	Annual Site Audit	Date
$1,760	$7,040	$3,000	$12,000	4	$1,000	$1,750	12/31/1999
$1,813	$3,626	$3,090	$6,180	2	$1,030	$1,803	12/31/2000
$1,867	$1,867	$3,183	$3,183	1	$1,061	$1,857	12/31/2001
$1,923	$1,923	$3,278	$3,278	1	$1,093	$1,912	12/31/2002
$1,981	$1,981	$3,377	$3,377	1	$1,126	$1,970	12/31/2003
$2,040	$2,040	$3,478	$3,478	1	$1,159	$2,029	12/31/2004
$2,102	$2,102	$3,582	$3,582	1	$1,194	$2,090	12/31/2005
$2,165	$2,165	$3,690	$3,690	1	$1,230	$2,152	12/31/2006
$2,230	$2,230	$3,800	$3,800	1	$1,267	$2,217	12/31/2007
$2,296	$2,296	$3,914	$3,914	1	$1,305	$2,283	12/31/2008
$2,365	$2,365	$4,032	$4,032	1	$1,344	$2,352	12/31/2009
$2,436	$2,436	$4,153	$4,153	1	$1,384	$2,422	12/31/2010
$2,509	$2,509	$4,277	$4,277	1	$1,426	$2,495	12/31/2011
$2,585	$2,585	$4,406	$4,406	1	$1,469	$2,570	12/31/2012
$2,662	$2,662	$4,538	$4,538	1	$1,513	$2,647	12/31/2013
$2,742	$2,742	$4,674	$4,674	1	$1,558	$2,726	12/31/2014
$2,824	$2,824	$4,814	$4,814	1	$1,605	$2,808	12/31/2015
$2,909	$2,909	$4,959	$4,959	1	$1,653	$2,892	12/31/2016
$2,996	$2,996	$5,107	$5,107	1	$1,702	$2,979	12/31/2017
$3,086	$3,086	$5,261	$5,261	1	$1,754	$3,069	12/31/2018
$47,292	**$54,385**	**$80,611**	**$92,701**	**24**	**$26,870**	**$47,023**	**Total Cost**
$29,493	**$36,499**	**$50,272**	**$62,214**		**$16,757**	**$29,325**	**Present Value**

Appendix E - Table 1D
Flagship Airlines - Dutchess County Airport, NY
Alternative 4 - No Action
Present Value Analysis

Replacement Costs	Operating Labor Costs	Maintenance Materials and Labor	Additional Purchased Services	Auxiliary Materials and Energy	Administrative Services	Insurance Tax and Licensing	Date
$1,000	$0	$1,000	$0	$0	$1,000	$3,000	12/31/1999
$0	$0	$0	$0	$0	$1,030	$3,090	12/31/2000
$0	$0	$0	$0	$0	$1,061	$3,183	12/31/2001
$0	$0	$0	$0	$0	$1,093	$3,278	12/31/2002
$0	$0	$0	$0	$0	$1,126	$3,377	12/31/2003
$1,000	$0	$1,000	$0	$0	$1,159	$3,478	12/31/2004
$0	$0	$0	$0	$0	$1,194	$3,582	12/31/2005
$0	$0	$0	$0	$0	$1,230	$3,690	12/31/2006
$0	$0	$0	$0	$0	$1,267	$3,800	12/31/2007
$0	$0	$0	$0	$0	$1,305	$3,914	12/31/2008
$1,000	$0	$1,000	$0	$0	$1,344	$4,032	12/31/2009
$0	$0	$0	$0	$0	$1,384	$4,153	12/31/2010
$0	$0	$0	$0	$0	$1,426	$4,277	12/31/2011
$0	$0	$0	$0	$0	$1,469	$4,406	12/31/2012
$0	$0	$0	$0	$0	$1,513	$4,538	12/31/2013
$1,000	$0	$1,000	$0	$0	$1,558	$4,674	12/31/2014
$0	$0	$0	$0	$0	$1,605	$4,814	12/31/2015
$0	$0	$0	$0	$0	$1,653	$4,959	12/31/2016
$0	$0	$0	$0	$0	$1,702	$5,107	12/31/2017
$0	$0	$0	$0	$0	$1,754	$5,261	12/31/2018
$4,000	**$0**	**$4,000**	**$0**	**$0**	**$26,870**	**$80,611**	**Total Cost**
$2,878	**$0**	**$2,878**	**$0**	**$0**	**$16,757**	**$50,272**	**Present Value**

Appendix E - Table 1D
Flagship Airlines - Dutchess County Airport, NY
Alternative 4 - No Action
Present Value Analysis

Analysis Factor	Total Cost	Present Value
Direct Capital Costs:	**$0**	**$0**
Indirect Capital Costs:	**$35,000**	**$35,000**
Operating Labor Costs:	$54,385	$36,499
Maintenance, Materials and Labor Costs:	$4,000	$36,499
Auxiliary Materials and Energy:	$0	$0
Disposal of Residues:	$26,870	$16,757
Purchased Services:	$92,701	$62,214
Administrative Costs:	$26,870	$16,757
Insurance, Taxes, and Licensing Fees:	$80,611	$50,272
Replacement Costs:	$4,000	$2,878
Cost of Periodic Site Reviews:	$47,023	$29,325
Total O&M Costs:	**$336,000**	**$251,000**
Future Capital Costs:	**$0**	**$0**
Cost of Future Land Use:	**$0**	**$0**
TOTAL COSTS:	**$371,000**	**$286,000**

Notes: Present value calculated at 5% discount rate.
Costs escalate at 3% per year.