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Jefferson Borough,
Allegheny County,
Pennsylvania

PICCO Resin Landfill Site Report

Part III: Feasibility Study

May, 1991

Version No. 2

WESTON
MANAGERS DESIGNERS/CONSULTANTS

FEASIBILITY STUDY FOR THE
PICCO RESIN LANDFILL
JEFFERSON BOROUGH
ALLEGHENY COUNTY, PENNSYLVANIA

Prepared for:

Hercules, Incorporated
Wilmington, Delaware

May 1991

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PREFACE

The PICCO Resin Landfill Site Report is divided into three separately bound documents (with appendices) entitled as follows:

- Part I: Remedial Investigation (Five Volumes)
- Part II: Baseline Risk Assessment
- Part III: Feasibility Study

Please consult the appropriate document based on need. Together, all three documents represent the "Site Report." This Site Report has been prepared in accordance with the terms specified in the Consent Order and Agreement (COA) executed on 2 November 1987 between the Pennsylvania Department of Environmental Resources (Pennsylvania DER) and Hercules, Inc.

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SUMMARY OF ACRONYMS

ACHD	Allegheny County Health Department
AER	Advanced Electric Reactor
AOC	Area of Contamination
ARAR	Applicable or Relevant & Appropriate Environmental & Public Health Requirements
BAT	Best Available Technology
BCT	Best Conventional Technology
BDAT	Best Demonstrated Available Technology
BNA	Base Neutral/Acid Extractable Compound
BOD	Biological Oxygen Demand
BTXE	Benzene, Toluene, Xylene & Ethylbenzene
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, & Liability Act (Superfund)
CFR	Code of Federal Regulations
CO	Carbon Monoxide
COA	Consent Order & Agreement
CTV	Critical Toxicity Values
CWA	Clean Water Act
DAF	Dissolved Air Flotation
DER	(Pennsylvania) Department of Environmental Resources
DOT	Department of Transportation
DRE	Destruction & Removal Efficiency
EP	Extraction Procedure
EPA	(United States) Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FIFRA	Federal Insecticide, Fungicide, & Rodenticide Act
FR	Federal Register
FS	Feasibility Study
GRA	General Response Action
HCl	Hydrogen Chloride
HDPE	High Density Polyethylene
HSWA	Hazardous & Solid Waste Amendments
HTFWR	High-Temperature Fluid Wall Reactor
LTTS	Low-Temperature Thermal Stripping
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MPRSA	Marine Protection Research & Sanctuaries Act
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emission Standards for Hazardous Air Pollutants
NCP	National Contingency Plan
NCSS	National Cooperative Soil Survey
NOAA	National Oceanic & Atmospheric Administration
NOEL	No Observed Effects Level
NPDES	National Pollution Discharge Elimination System
NPDWS	National Primary Drinking Water Standards
NPL	National Priorities List
NSDWS	National Secondary Drinking Water Standards

SUMMARY OF ACRONYMS
(cont'd)

NSPS	New Source Performance Standards
O&M	Operating & Maintenance
OSHA	Occupational Safety & Health Act
PAAQS	Pennsylvania Ambient Air Quality Standards
PAH	Polyring Aromatic Hydrocarbon
PC	Pennsylvania Code
PIC	Product of Incomplete Combustion
PICCO	Pennsylvania Industrial Chemical Corporation
POHC	Principal Organic Hazardous Constituent
POTW	Publicly-Owned Treatment Works
ppb	parts per billion
ppm	parts per million
PS	Pennsylvania Statutes
QA	Quality Assurance
QC	Quality Control
RA	(Baseline) Risk Assessment
RCRA	Resource Conservation & Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
RW	Residential Well
SARA	Superfund Amendments & Reauthorization Act
SCS	Soil Conservation Service
SDWA	Safe Drinking Water Act
SIP	State Implementation Plan
SMCL	Secondary Maximum Contaminant Level
SWMU	Solid Waste Management Unit
TBC	To Be Considered
TC	Toxicity Characteristic
TCLP	Toxicity Characteristic Leaching Procedure
TSCA	Toxic Substances Control Act
TSD	Treatment, Storage, & Disposal Facility
TW	Test Well
TXE	Toluene, Xylene, & Ethylbenzene
UIC	Underground Injection Control
USC	United States Code
USDA	United States Department of Agriculture
USGS	United States Geological Survey
USLE	Universal Soil Loss Equation
UST	Underground Storage Tank
UV	Ultraviolet
VOC	Volatile Organic Compound
WESA	West Elizabeth Sanitary Authority
WPER	Waste Pile Evaluation & Repair
WQM	Water Quality Management

EXECUTIVE SUMMARY

The Pennsylvania Industrial Chemical Corporation (PICCO) Resin Disposal Site (henceforth referred to as the PICCO Resin Landfill) (the Site) is located on a 26-acre parcel currently owned by Hercules Incorporated (Hercules). The site is located approximately one-half mile northwest of the town of West Elizabeth in Jefferson Borough, Allegheny County, Pennsylvania. The landfill covers approximately two acres and is located at the head of a narrow valley on the site of a former coal strip mine.

The original coal was strip mined from the valley sometime prior to 1950 based upon review of historical aerial photographs. The site was utilized by PICCO as an industrial landfill from 1950 to 1964. During this period of active landfill use, PICCO deposited at the site an estimated 77,000 tons (estimated by Hercules based on production records) of resin production wastes (resin cakes, polymerized oils, and filter materials) primarily from PICCO's plant located in nearby Clariton, Pennsylvania. The wastes deposited are believed to have consisted mainly of sludge materials containing 80% water, 10% clay and lime, and up to 10% aromatic and aliphatic solvents and resins. Results from the Remedial Investigation (RI) indicated 47,500 cubic yards (77,000 tons) of waste material present at an average depth of 18 feet. A soil cover ranging from 4 to 10 feet in thickness overlies the waste. The principal chemical compounds detected in the waste included BTXE (benzene, toluene, xylene, and ethylbenzene), styrene, naphthalene, and 2-methylnaphthalene. All of these compounds are organic in nature and are classified as aromatic hydrocarbons.

None of the waste at the PICCO Resin Landfill was deposited by Hercules. Hercules purchased the business and facilities, including the landfill property in 1973 from PICCO. The site was placed on the Superfund National Priorities List (NPL) on September 8, 1983.

As specified in the Consent Order and Agreement executed on 2 November 1987 between the Pennsylvania Department of Environmental Resources (Pennsylvania DER) and Hercules, the Feasibility Study (FS) as presented in this document for the PICCO Resin

Landfill site has been performed to develop, screen, and evaluate alternative remedial actions for the site. Alternatives are evaluated in terms of criteria specified under the revised National Contingency Plan (NCP) and current United States Environmental Protection Agency (EPA) Superfund guidance documents. The remedial controls that have been previously implemented at the site are included as a major component in the FS analysis. The overall objective of the FS program is the control of actual and potential releases of contaminants to the air, soil, groundwater, and surface water. The successful implementation of a remedial action program will meet this objective and thereby mitigate potential threats to public health and the environment. The overall approach to the FS consists of the five major steps:

1. Project Scoping - Involves site characterization, development of remedial action objectives, and identification of general response actions.

2. Identification of Applicable or Relevant and Appropriate Environmental and Public Health Requirements (ARARs) - Involves identification of cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal, state, or local law that are either potentially applicable or relevant and appropriate to address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at the site.

3. Development of Alternatives - Involves identification and screening of technologies and associated process options followed by assembling screened technologies/process options into remedial alternatives. Based on the results of the project scoping phase, the approach taken was to develop media-specific alternatives.

4. Initial Screening of Alternatives - Based on effectiveness (environmental and public health issues), implementability (technical and institutional considerations), and relative costs. Following this screening, the media-specific alternatives were then combined into comprehensive alternatives that address the site as a whole.

5. Detailed Analysis of Alternatives - Based on criteria specified in the revised NCP and current EPA Superfund guidance. The alternatives were first independently analyzed without consideration of the other alternatives. A comparative analysis was then conducted to evaluate each alternative's relative performance in relation to the specific evaluation criteria.

Results from each of the identified FS steps are individually summarized below.

Project Scoping

The initial step in project scoping consisted of site characterization. Site Characterization involves development of a site model based on the site background, results from the Remedial Investigation (RI) and baseline Risk Assessment (RA). The RI was issued as a final document in March 1991 as Part I of the Site Report. It consisted of five volumes, with Volume I-1 containing the actual report and Volumes I-2 through I-5 containing various appendices. The draft version of the baseline RA was issued in January 1991 as Part II of the Site Report. The RA is undergoing final revision based on U.S. EPA Region III and PADER comments and this FS may require minor revision to reflect the final version of the RA. The site model identifies and briefly summarizes key site features and current conditions and provides volume/mass estimates subsequently utilized to develop remedial alternatives. Model elements consisted of:

- General Site
- Landfill Unit
- Downslope Site Soils
- Unnamed Site Stream
- Groundwater
- Residential Wells
- Seeps
- Air

General site model elements established include:

- Location: One-half mile northwest of the town of West Elizabeth in Jefferson Borough, Allegheny County, Pennsylvania. The site is a narrow valley which was formerly strip-mined. Bedrock is generally shallow (<20 ft.) along the valley slopes and crops out at the surface along steeper sections of the valley wall.

* Surrounding Land Use: Suburban residential to the immediate north and west; undeveloped property and former mined areas to the immediate south and east. Trailer park and other residential homes located approximately 1/4-mile southeast and downslope of the site. Further below is the town of West Elizabeth, a mixed commercial, industrial, and residential area.

* Surrounding Population: Approximately 1,819 within a 1-mile radius of the site based on the 1990 census.

* Potential Site Development: The natural slopes around the immediate landfill site are steep to very steep (25%-80%). Soil survey reports indicate that the site area is unsuitable for cultivation, community development, or even recreation, and should be restricted to woodland.

* Primary Chemical Compounds of Concern (Based on RI Results): Aromatic hydrocarbons, principally benzene, toluene, xylene, ethylbenzene, and styrene (VOC) as well as naphthalene and 2-methylnaphthalene (BNA).

The site model elements established for specific site features include:

* Landfill: 1.8 acre landfill (approximately 225 ft. wide by 350 ft. long) operated from 1950-64, located in the middle of the steeply-sloped and narrow valley which forms the site. Vegetated clay soil cover (6 ft. on average) over 18 ft. (on average) of waste material (80% water, 10% clay and lime, and up to 10% aromatic and aliphatic solvents and resins), over 6 ft. (on average) of underlying clay soil. Relatively unfractured bedrock underlies the bottom clay soils.

* Landfill Dike: Approximately 30 ft. high containment dike located at the southeastern end of the landfill. A preliminary geotechnical analysis of the dike indicated potential stability concerns due in part to an existing erosional feature in the middle of the dike.

* Leachate Collection/Treatment System: In place since 1983 with product recovery (reclaimed as fuel) and aqueous discharge to the local POTW. The interceptor trench collection system (keyed into the shallow underlying bedrock to achieve complete interception of seepage) serves to collect leachate migrating through the landfill dike and into the soils immediately downslope of the dike.

* Oil/Water Separator: Separates landfill leachate collected by the existing interceptor trench into aqueous and non-aqueous fractions. The separator is

identified as a potential source for air emissions of volatile organics. Vapor inhalation was identified in the baseline risk assessment as an exposure route which exceeds 1 in 1,000,000 risk under the scenarios considered. The two main compounds of concern identified are carbon tetrachloride (likely non-site related) and benzene.

- Soils (Downslope of the Landfill): Dense clay soils generally 10 to 30 ft. thick located above bedrock. Some of the soils were disturbed by previous site mining and landfill construction activities and some of the soils comprise the existing dirt access road. Discrete pockets of elevated VOC and BNA compounds were found at all depth zones and appear to be randomly distributed.

  The heterogenous distribution of the target organic compounds in the downslope site soils indicate that the contaminants did not move laterally through the subsurface soils but were mixed or deposited with the soils during earthmoving or construction activities and have remained relatively immobile since deposition. The results of analysis of groundwater samples collected from wells constructed in the site soils supports this conclusion.

  The human health baseline RA indicated surface soils exceeded 1 in 1,000,000 risk via both dermal absorption and chemical ingestion due to PAH compounds present.

- Surface Water: Small (<1-20 gpm flow typically) unnamed stream draining the site, flowing southeast along the northeast and east side of the site. The stream originates above the head of the landfill, extends along side the downslope site soils parallel to the access road, and flows past the site boundary with ultimate discharge into the Monongahela River located approximately 4/5 mile from the site boundary.

  The stream is primarily fed by groundwater discharging from the shallow soil aquifer. During rainy periods the stream is also fed by stormwater runoff and exhibits a rapid response. Neither surface water nor sediment was identified as a site-related concern from the human health and ecological baseline risk assessment.

- Groundwater: Three hydrogeologic zones (unconsolidated soils with perched water table conditions, partially mined-out Pittsburgh Coal seam representing the primary water table zone, and deep bedrock formation essentially dry on-site).

  - Unconsolidated Zone Groundwater: Represents limited amounts of shallow, perched groundwater found in the soils, generally moving along the topographic surface downslope. The baseline RA identified this groundwater as a potential contaminant migration pathway via discharge to the unnamed stream. However, chemical analyses of groundwater samples from the unconsolidated soils both on-site and below the site boundary indicated that minimal contaminant transport is occurring in this groundwater system. The existing leachate interceptor trench effectively intercepts leachate/unconsolidated zone groundwater flow from the landfill, thereby preventing migration into the downslope soils.

Due to the limited saturated thickness in the unconsolidated zone and the seasonal variations in groundwater level, the volume of groundwater present in the unconsolidated soils is limited and is a poor potential water supply. Wells screened in the unconsolidated zone in the site area have reportedly gone dry during dry periods. Therefore, it is not likely that new wells in the unconsolidated zone would be utilized in the future as a potable water source since public water is available. The residential well survey conducted during the RI identified a single dug well in the unconsolidated zone located topographically downslope (i.e., potentially downgradient) from the site (Residential Well No. 3). This residence is connected to public water and utilizes this well for outdoor uses (gardening, grass watering, etc.) only.

Pittsburgh Coal Groundwater: Groundwater in the partially saturated coal seam generally flows west and southwest across the site in the direction of the coal bedding dip. On a smaller scale, flow is complicated due to existence of mine voids throughout the coal seam around the site from earlier deep mining activities. These mine voids act as a preferential flow path for groundwater through the Pittsburgh Coal.

Groundwater movement through the landfill and into the Pittsburgh Coal has allowed non-aqueous phase product to migrate into the mine voids in the area immediately southwest and downgradient of the site, between the landfill and Circle Glenn Drive. The quantity and extent of the floating product cannot be precisely determined although it appears to be of a limited extent adjacent to the landfill. The presence of this non-aqueous phase product on the groundwater table found in two mine voids may be a source for dissolved phase plume which extends to the area located approximately 1,000 ft. downgradient of the site.

No users of Pittsburgh Coal groundwater were identified during the residential well survey. Furthermore, it was noted that the background well for the Pittsburgh Coal had levels of metals exceeding drinking water standards. Specific standards exceeded include the MCL for chromium, and SMCLs for aluminum, iron, and manganese. The SMCLs were exceeded by an order of magnitude. It is, therefore, not realistic that the Pittsburgh Coal would be used in the future as a potable waste source when public water is readily available.

- Deep Bedrock Groundwater: Deep monitoring wells drilled into the bedrock below the Pittsburgh Coal within the site did not encounter significant groundwater and a core sample collected from this bedrock zone revealed no fractures. These data, relating to the bedrock below the Pittsburgh Coal, indicate that the deep bedrock below the site is not an aquifer (i.e., capable of sustaining a measurable yield of groundwater). Based on the residential well survey results, however, the deep bedrock may potentially yield enough water for residential use. Therefore, the deep bedrock may potentially be an aquifer unit off-site.

- Seeps: Nine surface seeps representing groundwater discharge points were identified as flowing from the Pittsburgh Coal outcrop seam downgradient (southwest) of the site in the Calamity Hollow/Lobbs Run area. Flow rates varied from 1/4 to 20 gpm. Baseline risk assessment results did not indicate the seeps to be a media of concern for either human health or ecological assessments.

- Residential Wells: Most local residents are supplied with public water, while a total of 16 residential wells were identified during the RI residential well survey. Four of these residents are not connected to public water and utilize their well as their primary source of water. In addition, some residents continue to maintain their old wells for an additional supply of water. Three residents who were connected to public water also use their well water for indoor use (drinking, cooking and/or washing).

  Sampling was performed at 10 of the 16 wells identified (the remaining wells were not sampled due to inaccessibility and/or property owner refusal). Results indicated trace levels in two wells of compounds which are not identified as indicator compounds for the landfill site. Baseline risk assessments performed for these two residential wells indicated no apparent carcinogenic or non-carcinogenic human health risk.

- Wetlands: Several small poorly drained areas supporting wetland vegetation were observed in low areas on top of the landfill and along the upper portion of the unnamed stream. These wetland areas were small with a total area of less than one-half acre.

Key remediation volume/mass estimates developed include the following:

* <u>Landfill Unit</u>: 92,000 yd^3 (157,000 tons) which include 47,500 yd^3 (77,000 tons) of waste material. The remaining material consists of cover soil, soil underlying the waste, the landfill dike, downslope soils located between the dike and the interceptor trench, and the interceptor trench.

* <u>Downslope Soils</u>: 23,000 yd^3 (31,000 tons).

* <u>Landfill Leachate</u>: 790,000 gallons per year (1.5 gpm) currently with three drums (5,000 pounds) of non-aqueous "oil" currently recovered per week (1 gallon per hour) after oil/water separation of the leachate.

After site model development, remedial action objectives were then established specifying medium-specific preliminary remediation goals that permit a range of treatment and containment alternatives to be developed. Development of the remedial action objectives was based on the site model (which considered the results of the RI and the baseline RA) and consideration of ARARs.

The remedial action objectives utilized to develop remedial alternatives for the PICCO site consist of:

* <u>Waste Material (landfill unit)</u>: Minimize generation of landfill leachate.

* <u>Leachate (landfill unit)</u>: Prevent contaminant migration into groundwater.

* <u>Soil (downslope of the landfill unit)</u>:

  - Prevent ingestion (both direct and via vegetable ingestion) with surface soil having 1 in 10,000 to 1 in 1,000,000 carcinogenic risk from PAH compounds.

  - Prevent dermal adsorption with surface soil having 1 in 10,000 to 1 in 1,000,000 carcinogenic risk from PAH compounds.

- Groundwater (Pittsburgh Coal and unconsolidated zone):
  - Prevent ingestion of water having in excess of 1 in 10,000 to 1 in 1,000,000 carcinogenic risk from identified carcinogens.
- Air (oil/water separator emissions) - Prevent (or control) fugitive emissions from the existing oil/water separator to address potential carcinogenic risk from the site in excess of 1 in 10,000 to 1 in 1,000,000 due to benzene levels.

Finally, the following potential general response actions were established based upon specific site concerns and established remedial action objectives:

- No action.
- Institutional actions and controls.
- Landfill infiltration controls.
- Leachate and groundwater controls.
- Excavation and removal (waste and downslope soils).
- Treatment (waste, soil, groundwater, and leachate).
- Land disposal.
- Air emissions controls (oil/water separator).
- Private water supply actions and controls (retained as a contingency action if future conditions warrant such a response action).

Identification of ARARs

The following potential ARAR sources were evaluated for potential applicability to the PICCO site:

- Federal
  - Resource Conservation and Recovery Act (RCRA)
  - Clean Water Act (CWA)
  - Safe Drinking Water Act (SDWA)
  - Clean Air Act (CAA)
  - Occupational Safety and Health Act
  - Hazardous Materials Transportation Act
  - Executive Order on Protection of Wetlands
  - Executive Order on Floodplain Management

- Surface Mining Control and Reclamation Act
- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)
- Toxic Substances Control Act (TSCA)
- Marine Protection Research and Sanctuaries Act (MPRSA)
- National Historic Preservation Act
- Archeological and Historical Preservation Act
- Historic Sites, Buildings, and Antiquities Act
- Fish and Wildlife Coordination Act
- Endangered Species Act
- Coastal Zone Management Act
- Rivers and Harbors Act of 1899
- Wilderness Act
- National Wildlife Refuge System Act
- Wild and Scenic Rivers Act

* State

  - Pennsylvania Solid Waste Management Act (includes State hazardous waste management regulations)
  - Pennsylvania Clean Streams Law
  - Pennsylvania Safe Drinking Water Act
  - Pennsylvania Air Pollution Control Act
  - Pennsylvania Dam Safety and Encroachments Act
  - Pennsylvania Stormwater Management Act
  - Pennsylvania Game and Wildlife Code
  - Pennsylvania Floodplain Management Act
  - Pennsylvania Surface Mining Conservation Reclamation Act
  - Pennsylvania Bituminous Mine Subsidence and Land Conservation Act
  - Pennsylvania Coal Refuse Disposal Control Act
  - Pennsylvania Coal Mining Sealing Act

* Local

  - West Elizabeth Sanitary Authority (WESA) Regulations
  - Allegheny County Health Department (ACHD) Air Pollution Regulations
  - Allegheny County Stormwater Management Plan

From this screening analysis, potential chemical-specific, location specific, and action-specific requirements were noted as potential ARARs from the following sources:

- Federal

  - Resource Conservation and Recovery Act (RCRA)
  - Clean Water Act (CWA)
  - Safe Drinking Water Act (SDWA)
  - Clean Air Act (CAA)
  - Occupational Safety and Health Act
  - Hazardous Materials Transportation Act
  - Wetlands Protection (Executive Order 11,990)

- State

  - Pennsylvania Solid Waste Management Act (includes State hazardous waste regulations)
  - Pennsylvania Clean Streams Law
  - Pennsylvania Safe Drinking Water Act
  - Pennsylvania Air Pollution Control Act
  - Pennsylvania Dam Safety and Waterway Management Act
  - Pennsylvania Stormwater Management Act

- Local

  - West Elizabeth Sanitary Authority (WESA) Regulations
  - Allegheny County Health Department (ACHD) Air Pollution Regulations
  - Allegheny County Stormwater Management Regulations

Potential chemical-specific location-specific, and action-specific requirements were subsequently detailed for each of the above ARAR sources retained after screening.

In addition to these potential ARARs, one To-Be-Considered (TBC) criteria/guidance was identified as being Pennsylvania's Groundwater Remediation Policy. This policy calls for clean-up of impacted groundwater aquifers to background or not-detected levels unless such clean-up is shown to be infeasible or impractical/inappropriate. It should be noted that TBC criteria/guidance are not considered ARARs but are considered if relevant for the PICCO site.

Development of Alternatives

The initial step performed under alternatives development was identification and screening of available technologies and associated process options for each of the potential general response actions established under project scoping. Screening elements involved the following:

- Screening of technology types applicable to each general response action to eliminate from further consideration those technology types that are clearly ineffective or unworkable to the PICCO site based on evaluation of technical implementability.

- Screening of technology process options to select a representative process(es) for each technology type retained for consideration. Process options are evaluated based primarily on technical implementability and effectiveness along with consideration of institutional implementability and cost-effectiveness. One representative process option is selected, if possible, for each technology type to simplify subsequent development and evaluation of alternatives without limiting future (i.e., post-FS) design flexibility. Although a specific process option is selected (if possible) for alternative development and evaluation, the process option selected is intended to represent the broader range of process options available within a general technology type. The actual process option used to implement the remedial action at the PICCO site may not be selected until the post-FS remedial design stage.

Primary screening criteria utilized consisted of:

- Technical implementability to eliminate those technologies/process options that cannot be implemented at the PICCO site based on the main contaminants present (i.e., BTXE and PAH compounds), their physical matrix, and other site concerns or characteristics. This represents the initial criteria utilized to screen technologies/process options for the PICCO site.

- Effectiveness, focusing on the following:

  - Ability to meet defined Remedial Action Objectives.

  - Reliability with respect to contaminants present and specific site conditions. As part of the screening the status of each technology/process option is specified as being either conventional/demonstrated or as noted otherwise.

- Potential impacts to human health and the environment.

The effectiveness criteria represents the primary criteria utilized to evaluate available process options in order to select a single (if possible) process option that is representative of the particular technology type.

Secondary screening criteria utilized included:

- Administrative implementability to consider institutional aspects of implementability, such as the availability of services, equipment, and skilled workers to implement the technology/process option.
- Cost effectiveness based on relative costs utilizing engineering judgment and available reference sources.

After screening the technologies and process options, they were classified into one of three general categories:

- Not applicable.
- Not recommended.
- Potentially applicable/retained for further analysis.

The "not applicable" category indicates that the technology/process option was screened out based on evaluation of technical implementability. The "not recommended" category indicates that although the technology/process option may be able to address a site concern (i.e., it met the initial evaluation criteria for technical implementability), its use is not recommended (and, therefore, the technology/process option is screened out) based on evaluation of effectiveness, administrative implementability, and relative cost-effectiveness. None of the technology/process options falling into these two categories were retained for further analysis. The final category, "potentially applicable/retained for further analysis," indicates recommended technologies/process options that passed this initial screening as potentially being able to address identified site concerns while not being noted as having severe limitations with respect to effectiveness, implementability, and relative cost effectiveness. It is from this category that remedial alternatives were developed.

Under this screening process, a detailed feasibility evaluation for potential groundwater recovery/remediation at the PICCO site was presented. Groundwater remediation technologies of skimmer-type recovery wells and interceptor trench were retained for use in alternatives development. Additional groundwater recovery/remediation was determined to be infeasible and impractical/inappropriate for the PICCO site. This evaluation was put forth to address Pennsylvania's Groundwater Remediation Policy, earlier identified as a TBC criteria/guidance. The feasibility evaluation addressed the following areas of concern:

* Exploratory drilling program which potentially could involve 820 boreholes (based on a 40 ft. grid pattern) in residential areas to define mine voids and mine pillar locations.

* Open-channel-like hydraulic conditions in the mine voids make it very difficult if not impossible to create an effective hydraulic barrier for complete control and recovery of groundwater flow.

* Recovery well system requirements would likely be extensive, requiring an estimated 40 to 70 recovery wells. Given the poor quality of coal seam groundwater (high solids and metals), intensive maintenance would likely be required to address potential pump fouling by bacteria and inorganic precipitants, particularly iron.

* Treatment system requirements would likely be intensive, with potential treatment for oil and suspended solids, iron, manganese, and sulfides, as well as the organic compounds of principal concern. In addition, discharge of the estimated 3 to 5 million gallons per day of groundwater potentially recovered may pose significant problems. At such flow rates, discharge to the local POTW is not practical. Finally, sludges produced from treatment for metals may require disposal as a hazardous waste.

* Potential mine subsidence may be induced by extensive groundwater pumping of the mine voids.

- Natural remediation processes have been observed in other cases of contaminated coal seam groundwater. The processes to which reduction in organic concentrations are attributed include biodegradation and adsorption of organic chemicals to coal. Research related to the coal adsorption phenomena indicate that coal can adsorb many types of organic compounds including naphthalene and benzene, which are compounds of concern in the groundwater at the PICCO site.

- Remediation limitations exist in a complex hydrogeologic environment, such as the mined Pittsburgh Coal, where many factors work against restoration of groundwater by pump and treat methods. These include problems with establishing a capture zone discussed above, desorption of chemical constituents from the coal and clay and the existence of free phase product within the mine voids.

- The background quality of the Pittsburgh Coal groundwater is very poor and the groundwater would not make a suitable water supply source without treatment. The Pittsburgh Coal groundwater in the background well exceeds federal and state primary or secondary drinking water standards for four parameters. These parameters are aluminum, chromium, iron, and manganese which, with the exception of chromium, exceed the federal and state drinking water standards by more than an order of magnitude. This information indicates that the background quality of the Pittsburgh Coal groundwater presents a potential health risk and is also of aesthetically poor quality. Therefore, the negative impacts of the noise, odors, and general disruption of the community are believed to far outweigh the benefits of an attempt to treat this groundwater to background conditions at the PICCO site.

The selected technologies and representative process options retained after screening were then assembled into alternatives representing a range of treatment and containment options as follows:

- A number of treatment alternatives ranging from one that would eliminate or minimize to the extent feasible the need for long-term management (including monitoring) at a site to one that would use treatment as a primary component of an alternative to address the principle threats at the site.

- One or more alternatives that involve containment of waste with little or no treatment, but protect human health and the environment by preventing potential exposure and/or reducing the mobility of contaminants.

* A limited action alternative that involves minimal institutional actions necessary to reduce the potential for exposure.

* A no action alternative.

Based on the established site model, the approach taken was to develop medium-specific alternatives for the following identified environmental media of concern:

* Waste material (landfill unit).
* Leachate (landfill unit).
* Soil (downslope of the landfill unit).
* Air (oil/water separator emissions).
* Groundwater (Pittsburgh Coal and Unconsolidated Zone).

The medium-specific alternatives were defined based on the general response actions utilized and technologies/representative process options utilized.

<u>Initial Screening of Alternatives</u>

The developed medium-specific alternative were screened based on effectiveness (environmental/public health issues), implementability (technical/institutional issues) and relative cost-effectiveness.

Items considered under the general effectiveness evaluation included:

* Protection of human health and the environment.
* Reduction in toxicity, mobility, or volume.
* Short-term effectiveness during construction/implementation.
* Long-term effectiveness.
* Compliance with ARARs.

Items considered under the general implementability evaluation included:

- Technical feasibility with respect to construction, operation, and maintenance requirements.

- Administrative feasibility with respect to institutional aspects such as the availability of services, equipment, and skilled workers.

Finally, cost-effectiveness was evaluated based on establishment of relative capital and O&M costs utilizing engineering judgment and available reference sources.

From the screening, the following medium-specific alternatives were retained for further analysis:

- Waste Material (landfill unit)
  - No action
  - Limited action (access controls)
  - Containment
  - Excavation/Off-Site Landfill Disposal
  - Excavation/Thermal treatment (rotary kiln incineration)
  - In situ biodegradation

- Soil (downslope of landfill unit)
  - No action
  - Limited action (access controls)

- Leachate (landfill unit)
  - No action
  - Limited action (access controls)
  - Collection/Biological treatment (activated sludge) of aqueous phase/thermal treatment (industrial boiler) for non-aqueous oil phase

- Groundwater (Pittsburgh Coal and unconsolidated zone)
  - No action
  - Limited action (access controls)

* Air emissions (oil/water separator)

  - No action
  - Limited action (access controls)
  - Emissions control

After screening, the retained medium-specific alternatives were combined into comprehensive alternatives that address the PICCO site as a whole. The comprehensive site alternatives established were:

* Alternative 1 - No Action: Provides the baseline for comparing existing site conditions with those resulting from implementation of other proposed alternatives. Under the no action alternative, no additional remedial action beyond the landfill leachate collection/treatment system currently in place would be implemented at the site. Environmental monitoring of the site would continue long-term.

* Alternative 2 - Limited Action: Involves implementation of institutional controls aimed at limiting site access both physically and legally to reduce future potential exposure of human receptors to the site. This alternative involves implementation of the following access restrictions:

  - Site perimeter fencing.
  - Property deed notation.
  - Groundwater restriction.

  In addition, the landfill leachate collection/treatment system currently in place would be maintained, and a periodic site monitoring program implemented. Finally, potential private water supply actions and controls identified are retained as a contingency measure if future conditions warrant such a response action.

* Alternative 3 - Closure: Involves implementation of a series of onsite remedial measures designed to achieve the remedial action objectives viz:

  - Upgrade of the existing landfill unit via capping and additional infiltration controls to minimize leachate generation.

  - Institutional controls to limit access and future site use.

- Collection/treatment of landfill leachate to address potential groundwater contamination.

- Replacement of the oil/water separator with an enclosed system to prevent uncontrolled air emissions.

- Retention of identified potential private water supply actions and controls as a contingency measure if future conditions warrant such a response action.

- Periodic site monitoring.

Two options (A and B) were considered under this alternative. The difference in options is that Option B includes provisions for a potential skimmer-type recovery well network to recover non-aqueous product from the Pittsburgh Coal, while Option A does not.

• Alternative 4 - Excavation/Offsite Landfill Disposal: Involves implementation of a series of onsite remedial measures designed to achieve the remedial action objectives via:

  - Excavation of the landfill unit materials for removal off-site to an appropriate permitted disposal facility. Potential pretreatment of removed materials from the landfill unit would be arranged by the disposal facility as required to meet disposal permit conditions.

  - Institutional controls to limit access and future site use.

  - Collection/treatment of landfill leachate to address potential groundwater contamination.

  - Replacement of the oil/water separator with an enclosed system to prevent uncontrolled air emissions.

  - Retention of identified potential private water supply actions and controls as a contingency measure if future conditions warrant such a response action.

  - Periodic site monitoring.

- Alternative 5 - Excavation/Thermal Treatment: Involves implementation of a series of onsite remedial measures designed to achieve the remedial action objectives viz:

  - Excavation of the landfill unit materials for thermal treatment. If suitable, the treated material would be backfilled on-site, covered, and revegetated. The representative thermal treatment device is a transportable rotary kiln incinerator. Because of physical site restrictions, the incinerator would be set up at the local Hercules Jefferson plant, approximately 4/5 mile from the site.

  - Institutional controls to limit access and future site use.

  - Collection/treatment of landfill leachate to address potential groundwater contamination.

  - Replacement of the oil/water separator with an enclosed unit to prevent uncontrolled air emissions.

  - Retention of identified potential private water supply actions and controls as a contingency measure if future conditions warrant such a response action.

  - Periodic site monitoring.

- Alternative 6 - In Situ Biodegradation Treatment: Involves implementation of a series of onsite remedial actions designed to achieve the remedial action objectives viz:

  - In-place biological treatment of landfill unit materials.

  - Institutional controls to limit access and future site use.

  - Collection/treatment of landfill leachate to address potential groundwater contamination.

  - Retention of identified potential private water supply actions and controls as a contingency measure if future conditions warrant such a response action.

  - Periodic site monitoring.

In addition to the above, under each alternative except Alternative 1 (No Action), the following is proposed to address special site concerns:

- Exploratory boreholes will be drilled into the deep bedrock at two downgradient off-site locations yet to be determined. The results of the RI indicated that the deep bedrock zone under the site does not act as a groundwater aquifer. The proposed exploratory program will evaluate the viability of this zone to act as an aquifer at off-site locations. If significant groundwater is encountered at each location, the boreholes will be converted to deep bedrock monitoring wells (otherwise, the boreholes will be sealed with grout). These wells would then serve as permanent groundwater monitoring points which would be added to the routine quarterly monitoring program proposed under the alternatives for all groundwater monitoring wells at the site.

- As per discussions with U.S. EPA Region III and Pennsylvania DER, existing deep bedrock Monitoring Wells TW-5 and TW-6 will be properly abandoned via filling with grout. Both wells do not yield sufficient amounts of water for sampling purposes and there is concern that leakage from the upper casing may be occurring in TW-5.

- The lower landfill dike would be upgraded as required in response to the potential stability concerns identified by the limited geotechnical analysis performed during the RI.

Detailed Analysis of Alternatives

In accordance with the NCP and EPA Superfund guidance documents, the following seven criteria were utilized for evaluation of each of the developed site alternatives that were selected for detailed analysis and represent the basis for comparing these alternatives:

- Compliance with ARARs with respect to identified chemical, location, and action-specific requirements.

- Short-term effectiveness during construction and implementation, focusing on the protection of the community and the onsite personnel during implementation of remedial measures, potential human health and environment impacts, and the time required to achieve remedial response objectives.

* <u>Long-term effectiveness and permanence</u> after implementation, focusing on defining the extent and effectiveness (adequacy and reliability) of the controls that may be required to manage the residual risk remaining from untreated waste and/or treatment residues.

* <u>Overall protection of human health and the environment</u>, drawing on the assessments conducted for other evaluation criteria, particularly long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

* <u>Reduction of toxicity, mobility, and volume of contaminants</u>, focusing on the anticipated performance of the remedial alternatives with respect to these criteria.

* <u>Implementability</u>, focusing on both technical and administrative feasibility, including the availability of materials and services required for implementation.

* <u>Estimated order of magnitude (+50% to -30% accuracy) cost</u>. Cost elements considered include:

  - Capital costs including direct (construction) and indirect (nonconstruction and overhead) costs.

  - Operating and maintenance (O&M) costs including post-construction expenditures incurred to ensure effective implementation of the alternative. Also included under O&M costs are long-term costs consisting of post-cleanup or longer term costs such as site monitoring and inspection costs.

  A 30-year present worth analysis is utilized for the cost evaluation utilizing a discount rate of 5% and with a 5% inflation factor applied to annual O&M costs.

Two criteria (compliance with ARARs and overall protection of human health and the environment) were categorized as threshold criteria in that each alternative must meet them (or a variance obtained). The other five criteria were categorized as the primary criteria upon which the analysis is based.

Detailed analysis of alternatives consisted first of an individual analysis of each alternative without consideration of the other alternatives. A comparative analysis was then conducted to evaluate each alternative's relative performance.

In the comparative analysis of alternatives, relative (qualitative) ratings were assigned to each of the six non-cost evaluation criteria outlined above. A "zero" (0) represented a baseline in which the alternative meets the particular evaluation criteria. A "plus" (+) represented that the alternative exceeds that particular evaluation criteria, while a "minus" (-) indicated that the alternative does not meet and/or there are major limitations associated with that evaluation criterion. These relative ratings were established strictly to highlight certain issues associated with an alternative and not for numerical summation or rating.

Highlights from the detailed/comparative analysis of alternatives included the following:

- Alternative 1 (No Action): Noted as having major limitations associated with each non-cost evaluation criteria considered, except for ARARs.

- Alternative 2 (Limited Action): Noted as having major limitations associated with each non-cost evaluation criteria considered, except for short-term effectiveness and implementability (strictly due to the limited nature of remedial action involved in implementing this alternative) and ARARs.

- Alternative 3 (Closure): Noted as the only alternative meeting or exceeding each of the non-cost evaluation criteria.

- Alternative 4 (Excavation/Offsite Disposal) and Alternative 5 (Excavation/Thermal Treatment): Both noted as having major limitations in terms of implementability and short-term effectiveness due to the intrusive nature and magnitude of excavation activities proposed. Concerns include the ability to excavate the landfill while adequately addressing air quality concerns, fugitive VOC air emissions, heavy truck traffic impacts, and safety concerns with respect to material transport.

- Alternative 6 (In situ Biodegradation): Noted major advantage of potentially offering treatment without the need for intrusive activities into the high concentration waste present in the landfill. However, major limitations were noted in implementability due to concerns raised in regards to the high concentrations present in the waste material, the biodegradation rate for Base Neutral/Acid Extractable (BNA) compounds, such as naphthalene present in the waste and the variable waste/clay soil matrix.

The order of magnitude estimated total capital and present worth operating and maintenance cost for each of the alternatives is as follows:

- Alternative 1 (No Action): $2,452,000
- Alternative 2 (Limited Action): $2,860,000
- Alternative 3 (Closure): Option A - $3,127,000; Option B - $4,348,000
- Alternative 4 (Excavation/Offsite Disposal): $25,500,000 - 300,000,000
  (Cost is dependent on pretreatment requirements)
- Alternative 5 (Excavation/Thermal Treatment): $93,000,000-175,000,000
  (Cost is dependent on pretreatment/treatment requirements)
- Alternative 6 (In Situ Biodegradation): $11,800,000 - 20,000,000
  (Cost range given due to uncertainties associated with in situ biodegradation and site-specific concerns)

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SECTION 1

INTRODUCTION/PROJECT SCOPING

1.1 BACKGROUND

As specified in the Consent Order and Agreement executed on 2 November 1987 between the Pennsylvania Department of Environmental Resources (Pennsylvania DER) and Hercules, Inc., the Feasibility Study (FS) as summarized in this document for the Resin Disposal site (henceforth referred to as the PICCO Resin Landfill site) has been conducted in accordance with the following:

- Approved Work Plan dated 18 September 1987.
- United States Environmental Protection Agency (EPA) current guidance document entitled "Guidance for Conducting Remedial Investigation and Feasibility Studies Under CERCLA - Interim Final" (EPA/540/G-89/004, October 1988).
- Current version (revised 9 April 1990) of the National Contingency Plan (NCP) as specified under 40 CFR 300.
- Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (Superfund), along with the Superfund Amendments and Reauthorization Act (SARA) of 1986 and rules and regulations promulgated thereunder.
- Solid Waste Management Act of 1980 and rules and regulations promulgated thereunder.
- Pennsylvania Clean Streams Law and rules and regulations promulgated thereunder.

The FS was performed to develop, screen, and evaluate alternative remedial actions for the site. Alternatives are evaluated in terms of criteria specified under the revised NCP and current EPA Superfund guidance documents. Also, in meeting the requirements of SARA and the revised NCP, remedies that utilize permanent solutions and alternative treatment and/or resource recovery technologies receive preferential consideration to the maximum extent possible. The remedial controls that have been previously implemented at the site are included as a major component in the FS analysis. Potential remedial actions consider possible migration pathways via groundwater, surface water, soils, and air, along with health or environmental risks attributable to on-site contaminants and contaminant migration. Some of these migration pathways have been addressed by the controls now in place at the site. The overall objective of the FS program is the control of actual and potential releases of contaminants to the air, soil, groundwater, and surface water. The successful implementation of a remedial action program will meet this objective and thereby mitigate the potential threat to public health and the environment that may be posed by existing site conditions.

The overall approach to preparation of this FS report is shown on the flow diagram presented as Figure 1-1 and consists of the following four major steps:

1. Project Scoping - Involves site characterization, development of remedial action objectives, and identification of general response actions.

2. Development of Alternatives - Involves identification and prescreening of technologies and associated process options followed by assembling screened technologies/process options into remedial alternatives. Based on the results from the project scoping phase, the approach taken was to develop media-specific alternatives.

3. Initial Screening of Alternatives - Based on effectiveness (environmental and public health issues), implementability (technical and institutional considerations), and relative cost. Following this screening, the media-specific alternatives were then combined into comprehensive alternatives that address the site as a whole.

4. Detailed Analysis of Alternatives - Based on the following criteria specified in the revised NCP and current EPA Superfund guidance:

   - Compliance with Applicable or Relevant and Appropriate Environmental and Public Health Requirements (ARARs).

   - Short-term effectiveness.

   - Long-term effectiveness and permanence.

   - Overall protection of human health and the environment.

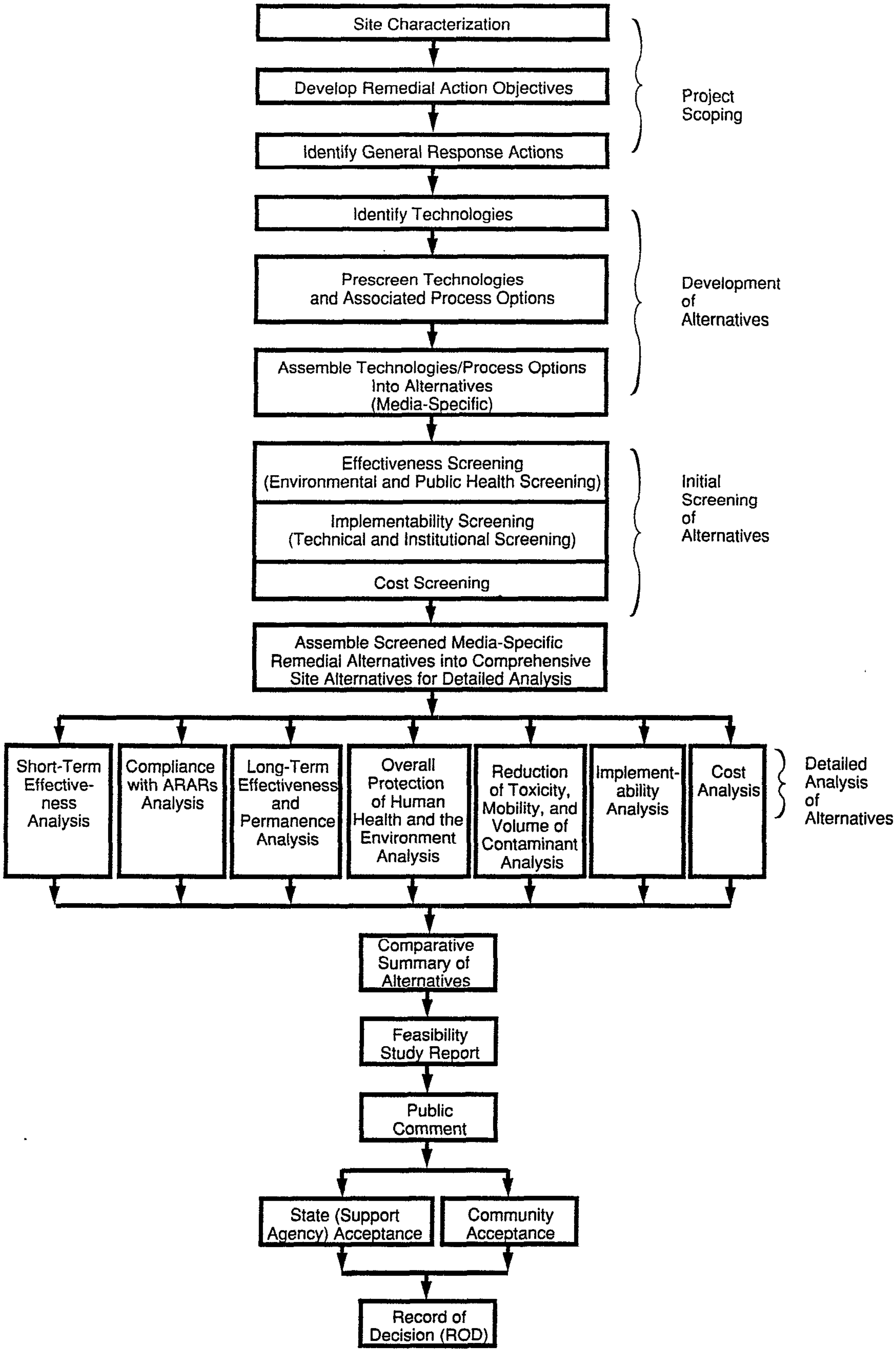

FIGURE 1-1 FEASIBILITY STUDY PROCESS

- Reduction of toxicity, mobility, and volume of contaminants.
- Implementability.
- Cost.

Project scoping is discussed in Subsection 1.2, development of media-specific alternatives is presented in Section 3, initial screening of media-specific alternatives followed by development of comprehensive site alternatives presented in Section 4, and detailed analysis of alternatives is presented in Section 5. Identification of ARARs is presented in Section 2.

It should be noted that the feasibility study process does not end with preparation of this FS Report. As indicated in Figure 1-1, the FS Report is open to public comment. Following the comment period, two additional criterion are used to evaluate proposed remedial alternatives, including:

- State (Support Agency) Acceptance - Evaluating the technical and administrative issues and concerns the State (in this case being represented by the Pennsylvania DER) may have regarding each of the alternatives.
- Community Acceptance - Evaluating the issues and concerns the public may have regarding each of the alternatives.

Both criterion will be addressed in the Record of Decision (ROD) after comments on this FS Report have been received. U.S. EPA, in consultation with the Commonwealth of Pennsylvania, will make its final selection of a remedy for the PICCO site in the Record of Decision (ROD).

1.2 PROJECT SCOPING

Project scoping for the PICCO site involved the following three distinct elements:

- Site characterization, involving development of a site model (Subsection 1.2.1.4) based on the site background, results of the Remedial Investigation (RI), and results of the baseline Risk Assessment (RA). The site model includes identification of volumes or areas of media to which general response actions might be applied.

- Development of remedial action objectives to protect human health and the environment specifying preliminary remediation goals that permit a range of treatment and containment alternatives to be developed. The preliminary remediation goals are developed on the basis of the site model (Subsection 1.2.1.4) and ARARs (Section 2).

- Identification of general response actions defining containment/diversion, removal/collection, treatment/disposal, or other actions, singly or in combination, that may be taken to address the environmental concerns at the site and to satisfy the remedial action objectives for the site.

Each of these project scoping items is detailed in an individual subsection presented below.

1.2.1 Site Characterization

Site characterization for the PICCO Resin Landfill is divided into the following components:

- Site Background
- Results of the RI
- Results of the Baseline RA
- Site Model

Each component is outlined individually below.

1.2.1.1 Site Background

The Pennsylvania Industrial Chemical Corporation (PICCO) Resin Landfill (the site) is located on a 26-acre parcel currently owned by Hercules Incorporated (Hercules). The site is located approximately one half mile northwest of the town of West Elizabeth in Jefferson Borough, Allegheny County, Pennsylvania (Figure 1-2). A plan view schematic of the 26-acre property on which the landfill is located is shown in Figure 1-3. The landfill covers approximately 2 acres and is located at the head of a narrow valley on the site of a former coal strip mine.

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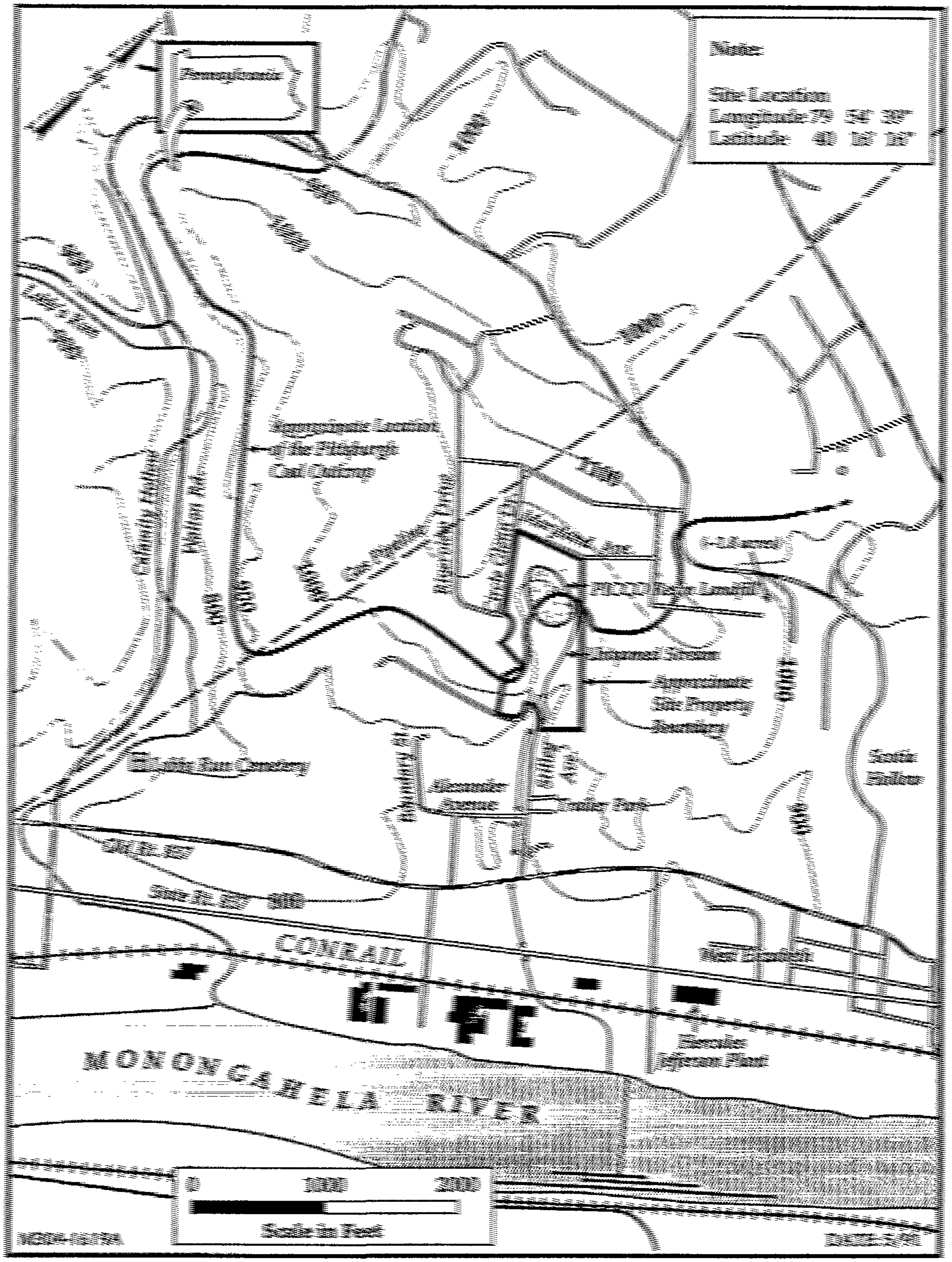

Figure 1-2 Site Location Map for PICCO Resin Landfill, Jefferson Borough, Allegheny County, Pennsylvania (Modified from 1979 USGS Topographic Map, Glassport 7.5 minute Quadrangle)

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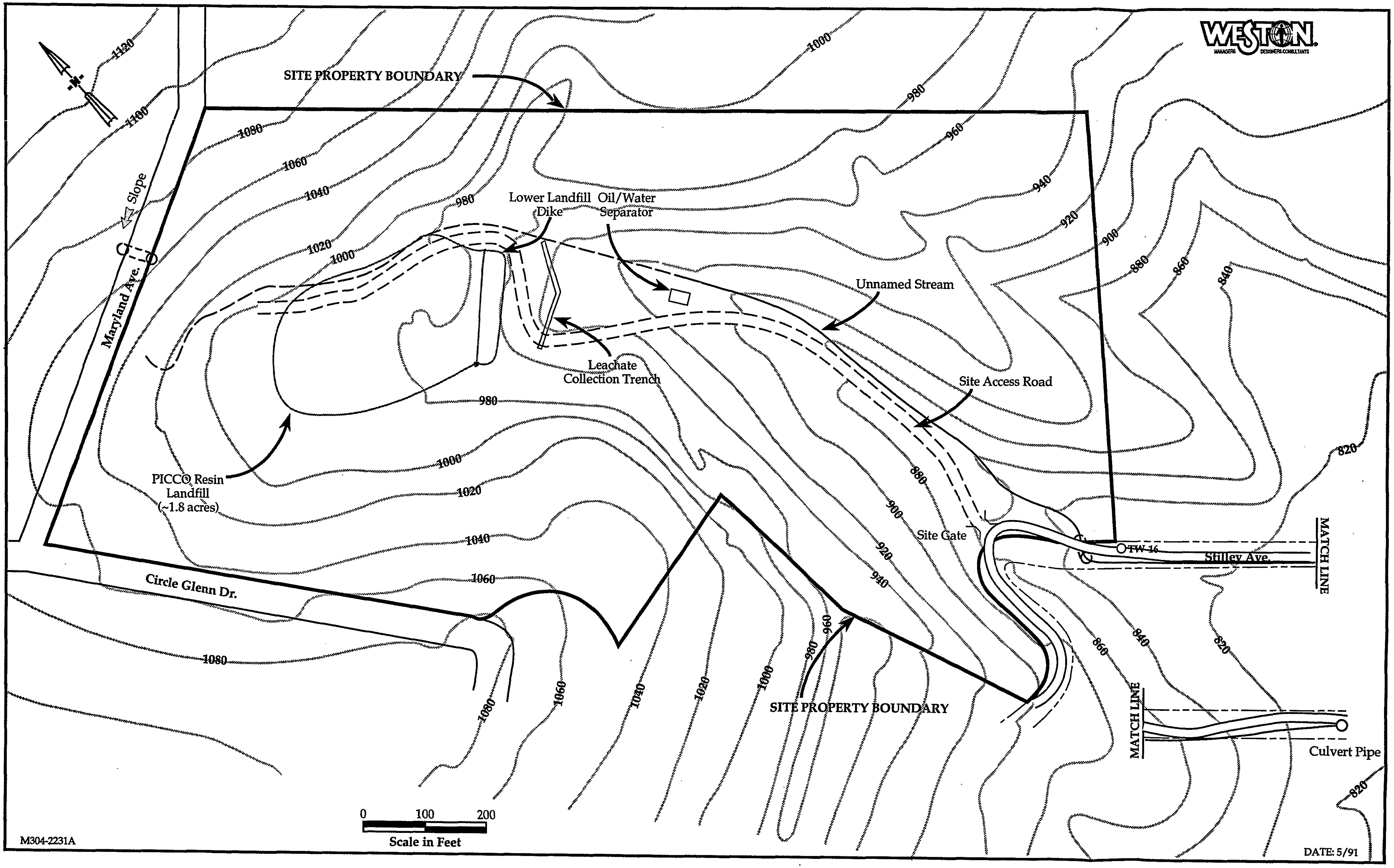

Figure 1-3 Site Base Map of the PICCO Resin Landfill

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The original coal was strip mined from the valley sometime prior to 1950 based upon aerial photograph review. The site was utilized by PICCO as an industrial landfill from 1950 to 1964. During this period of active landfill use, PICCO deposited at the site an estimated 77,000 tons (estimated by Hercules based on production records) of production wastes (resin cakes, polymerized oils, and filter materials) from a resins manufacturing process from PICCO's plant located in nearby Clairton, Pennsylvania. The wastes deposited are believed to have consisted mainly of sludge materials containing 80% water, 10% clay and lime, and up to 10% aromatic and aliphatic solvents and resins. The average depth of waste material deposited in the landfill was approximately 18 ft.

None of the waste at the PICCO Resin Landfill was deposited by Hercules. Hercules purchased the business and facilities, including the landfill property in 1973 from PICCO. The site was placed on the CERCLA National Priorities List (NPL) on 8 September, 1983.

The resin products manufactured by PICCO between 1950 and 1964 at their Clairton plant were primarily plasticizers and tackifiers. These resins were used in adhesives, floor tiles, paint, plastics, chewing gum, tires, and other molded rubber products, all manufactured by PICCO's customers.

Products were produced by the polymerization of coal tar chemicals and petroleum distillates (C8 - C10 hydrocarbons) in aromatic naphtha using acid-activated clay, gaseous boron trifluoride or powdered aluminum chloride as catalyst. Resins were also manufactured by polymerization of styrene and styrene derivatives in aromatic or aliphatic naphtha using acid activated clay or gaseous boron trifluoride as the catalyst.

During the period of active landfill use (1950-1964) the waste was deposited by dumping it down a chute at the corner of Circle Glenn Drive and Maryland Avenue above the landfill. The material was deposited as a wet viscous sludge behind an earthen dike. It was reported that when the area behind the first dike was filled, a second dike was built further downslope, and the area behind it filled (WESTON, 1981a). The existence of this first (upper) dike was not definitively verified during the RI. Sometime after the use of the landfill was discontinued in 1964, a soil cover, approximately 4-8 ft thick, was placed on top of the landfill. This cover material was likely derived from the hillside surrounding the landfill and has become vegetated with grasses and volunteer vegetation since its placement. Figure 1-4 represents a schematic cross sectional view of the presumed construction history for the landfill although no PICCO construction drawings or records of design on maps could be located to verify this theory.

Site features of note include the following (refer to Part I: Remedial Investigation for further details).

- The bedrock underlying the general area is sedimentary, consisting of interbedded sandstone, shale, siltstone, limestone, and coal.

- The bottom of the landfill is at approximately the same elevation as the base of the Pittsburgh Coal which was strip-mined from the landfill site. The Pittsburgh Coal was apparently deep mined in the area surrounding the site (based on mine voids encountered during RI activities) although mine maps are not available to confirm this.

- The hills surrounding the landfill are covered by a relatively thin (<20 feet thick) mantle of clayey soil. Figure 1-5 is a generalized geologic cross-section of the site area.

- The soils at the site consist of both native and strip mine soils. The majority of the soils at the site are classified as Strip Mines soil, with high slopes resulting from past strip mining, and are a mixture of disturbed native soils and fragments of excavated bedrock. The native soils at the site are classified as the Dormont Silt Loam series, with reported slopes ranging from 8 to 25%. A minor amount of Gilpin Silt Loam soils with reported slopes ranging from 8 to 15% has been mapped in the southern portion of the site area. (USDA, SCS, 1981)

- The climate in the Allegheny Plateau of southwestern Pennsylvania is classified as a humid continental type, with long, hot summers (average temperature of 75°F) and severe winters (average temperature of 33°F). Total precipitation averages 37 inches per year. The greatest amount of precipitation usually occurs during the spring and summer months, while February is the driest month. Dry periods may develop occasionally and persist for several months, reducing monthly precipitation to less than 1/4 inch. (NOAA, 1974)

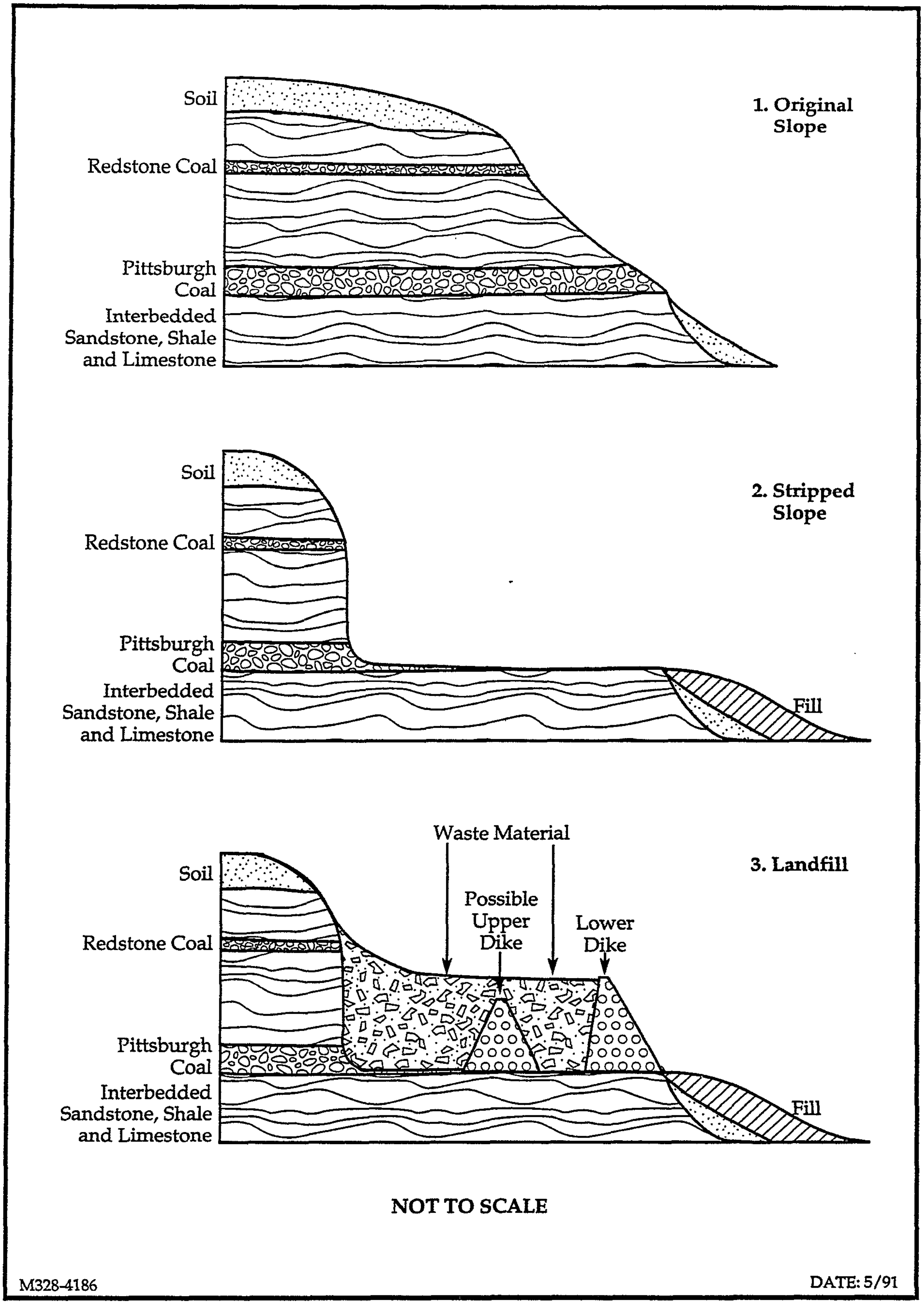

Figure 1-4 Schematic of PICCO Resin Landfill Construction

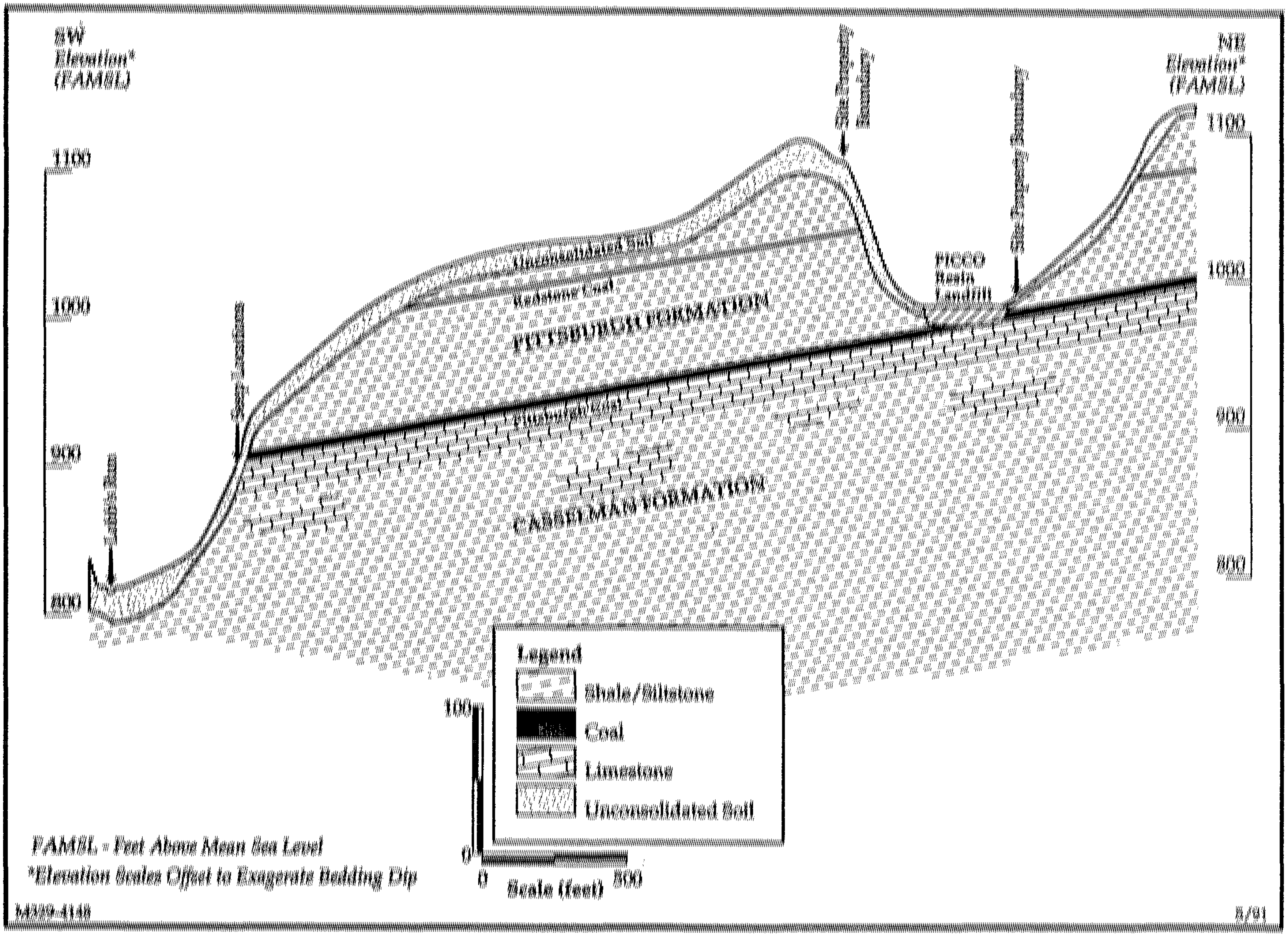

Figure 1-5 Generalized Geologic Cross-Section from Northeast to Southwest Across the PICCO Resin Landfill Site Area

- In the site area, groundwater supplies are limited to storage in fractured bedrock or within the unconsolidated soils above the bedrock. With respect to these groundwater supplies:

  - Quantities of groundwater in the bedrock at the site are relatively small and discontinuous (except within the Pittsburgh Coal) due to the generally unfractured condition of the bedrock.

  - The Pittsburgh Coal, being moderately permeable due to cleat (vertical fractures) development, also contains groundwater. The groundwater flow in the Pittsburgh Coal tends to be in the direction of bedding dip generally in a south-southwest direction. It should be noted that groundwater in coal seams is generally considered less desirable than other aquifers due to naturally high levels of dissolved solids, metals, and sulfur compounds. In fact, it was noted that the background well for the Pittsburgh Coal had levels of metals exceeding drinking water standards. Specific standards exceeded include the MCL for chromium, and SMCLs for aluminum, iron, and manganese. The SMCLs were exceeded by an order of magnitude. It is therefore not realistic that the Pittsburgh Coal would be used in the future as a potable water source when public water is readily available. In addition, no current users of Pittsburgh Coal groundwater were identified in the residential well survey conducted during the RI.

  - Groundwater encountered in the unconsolidated soils at the site is present as perched groundwater 2.5 to 11 ft thick generally located above the soil/bedrock interface. Movement of groundwater in the unconsolidated zone generally follows the topographic surface. It should be noted that due to the limited saturated thickness in the unconsolidated zone and the seasonal variations in groundwater level, the volume of groundwater present in the unconsolidated soils is limited and is a poor potential water supply. Wells screened in the unconsolidated zone in the site area have reportedly gone dry during dry periods. Therefore, it is not likely that new wells in the unconsolidated zone would be utilized in the future as a potable water source since public water is available. The residential well survey conducted during the RI identified a single dug well in the unconsolidated zone located topographically downslope (i.e., potentially downgradient) from the site (residential well 3). This residence is connected to public water and utilizes this well for outdoor uses (gardening, grass watering, etc.) only.

- Surface water drainage in the site area is to the southeast towards the Monongahela River by way of an unnamed perennial stream which originates on the site. This stream flows downslope along the east side of the site through several culverts and ponds and through the Hercules Jefferson Plant, eventually draining into the Monongahela River approximately 4/5 mile from the site boundary.

- The site is not affected by flooding along the Monongahela River due to its high elevation (840-1,080 ft above mean sea level within the property boundaries) with respect to the normal river level (727 ft above mean sea level).

- The property on which the site is located is zoned residential/agricultural.

- The natural slopes around the immediate landfill site are steep to very steep (25%-80%) (NCSS, 1981). Soil survey reports indicate that the site area is unsuitable for cultivation, community development, or even recreation, and should be restricted to woodlands (NCSS, 1981).

- The site area is surrounded by a residential area to the north and west and by undeveloped property to the south and east. East of the site is an area which was extensively deep mined and strip mined and also used as an experimental study area for an underground mine fire control project by the U.S. Bureau of Mines (Irani, et al., 1983). Approximately 1/4-mile southeast and downslope of the site is a trailer park and several other residential homes. Further below this area, to the southeast and east is the town of West Elizabeth, a mixed commercial, industrial and residential area. Figure 1-6 illustrates the land use patterns in the site area.

- According to 1990 Census Bureau records, the population within a 1-mile radius of the site is approximately 1,819.

- The communities surrounding the site have access to a sanitary sewer and a public water supply.

- Most of the residents in the site area are supplied with public water by the Western Pennsylvania Water Company. Quantities of groundwater sufficient for domestic water supplies, however, apparently exist in the area surrounding the site as evidenced by the presence of a few old hand-dug and drilled wells in the site area. Four residents were found not to be connected to the public water system at the time of the remedial investigation. In addition, some residents continue to maintain their old wells for an additional supply of water. No users of Pittsburgh Coal groundwater were identified during the residential well survey.

- A section of a sanitary sewer line runs along the northeastern side of the site parallel to the unnamed stream. This 8-inch diameter sewer line is part of the Jefferson Borough sanitary sewer system.

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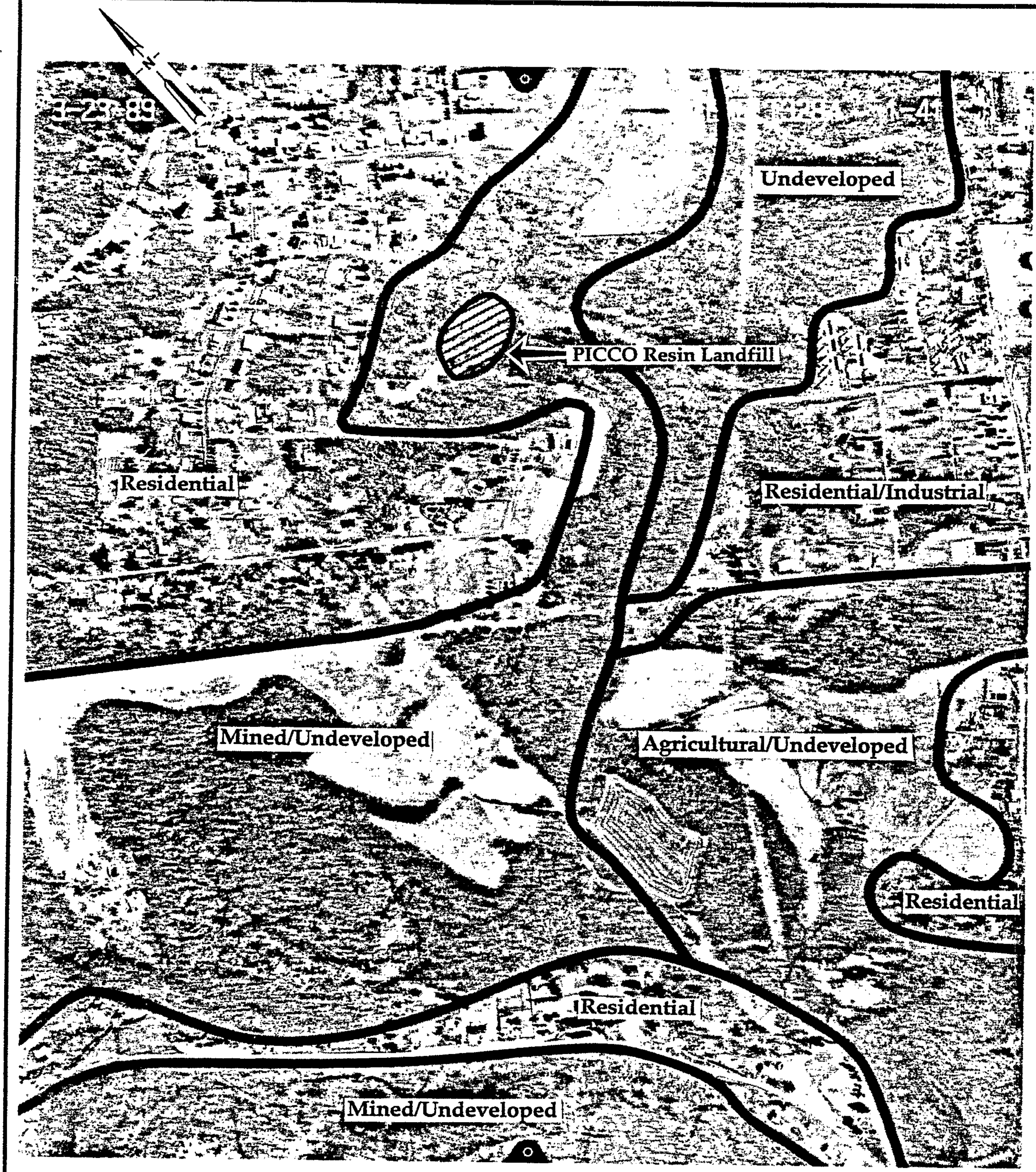

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Figure 1-6 Land Use Map for the Site Area
PICCO Resin Landfill

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A summary of previous remedial work performed at the site includes the following:

- Prior to 1981, an oil/water separator was installed downslope of the toe of the lower dike in order to treat leachate which was seeping from the soils from below the dike. Leachate, in the form of surface seeps, was directed into the oil/water separator where the non-aqueous phase product (oil) was removed from the leachate and transported from the site.

- In 1983, Hercules installed a leachate interceptor trench below the lower landfill dike to collect leachate migrating through the dike and into the surface soils downslope of the dike. The trench was keyed into the shallow underlying bedrock so that complete interception of seepage could be achieved. Figures 1-7 and 1-8 show the cross sectional design detail of the leachate interceptor trench. Leachate collected by the trench is routed via gravity pipeline to an oil/water separator located on-site. Non-aqueous phase product (oil) is separated out and retained within the separator. Hercules employees manually remove the "oil" periodically and it is subsequently burned as a fuel in the Hercules Jefferson Plant industrial boilers under permit by the Allegheny County Health Department (ACHD). Separated aqueous liquids (water) is discharged by gravity via pipeline to the Jefferson Borough sanitary sewer system, (as previously noted, an 8-inch diameter Jefferson Borough sanitary sewer line runs along the northeastern side of the site, parallel to the unnamed stream) which routes the water to the West Elizabeth Sewer Authority (WESA) biological (extended aeration) wastewater treatment plant. This discharge to WESA is performed under a contractual agreement between Hercules and WESA as approved by Pennsylvania DER.

- In September 1989 a collection basin approximately 10 ft by 5 ft deep was installed to accommodate a leachate surface seep which had appeared approximately 10 ft upgradient from the existing leachate collection trench on the west end of the trench. A 6-inch perforated stainless steel collection pipe was installed from this gravel-filled drainage basin downslope to the original leachate collection trench. Figure 1-9 illustrates the design drawing for the collection basin. Upon completion of the modification, the surface seep was eliminated. This collection basin was installed in accordance with addendum No. 1 to the RI/FS Work Plan and resulted in the improvement of the water quality of the unnamed stream draining the site. This improvement is documented by the results of the bimonthly stream samples collected subsequent to the addition of the collection basin.

- In addition to the collection trench which passively collects leachate, there have been efforts to recover non-aqueous phase product from monitoring wells which were found to contain product. Using a bailer or a pump, small amounts of product have been intermittently recovered from monitoring well TW-9 (downgradient of the collection trench). No product has been observed

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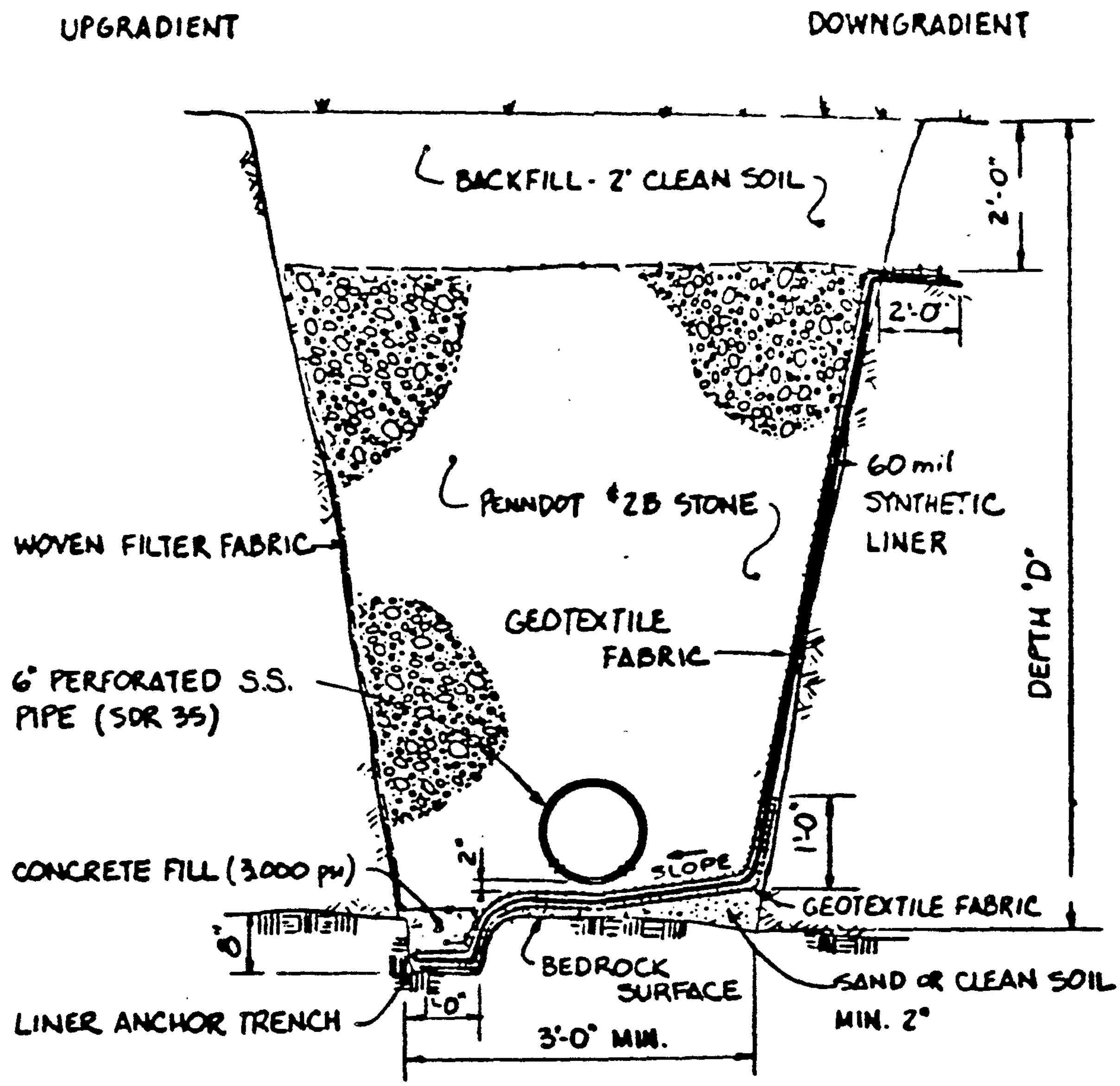

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Figure 1-7 Cross Section of Interception Trench Design, PICCO Resin Landfill (From Weston, 1982)

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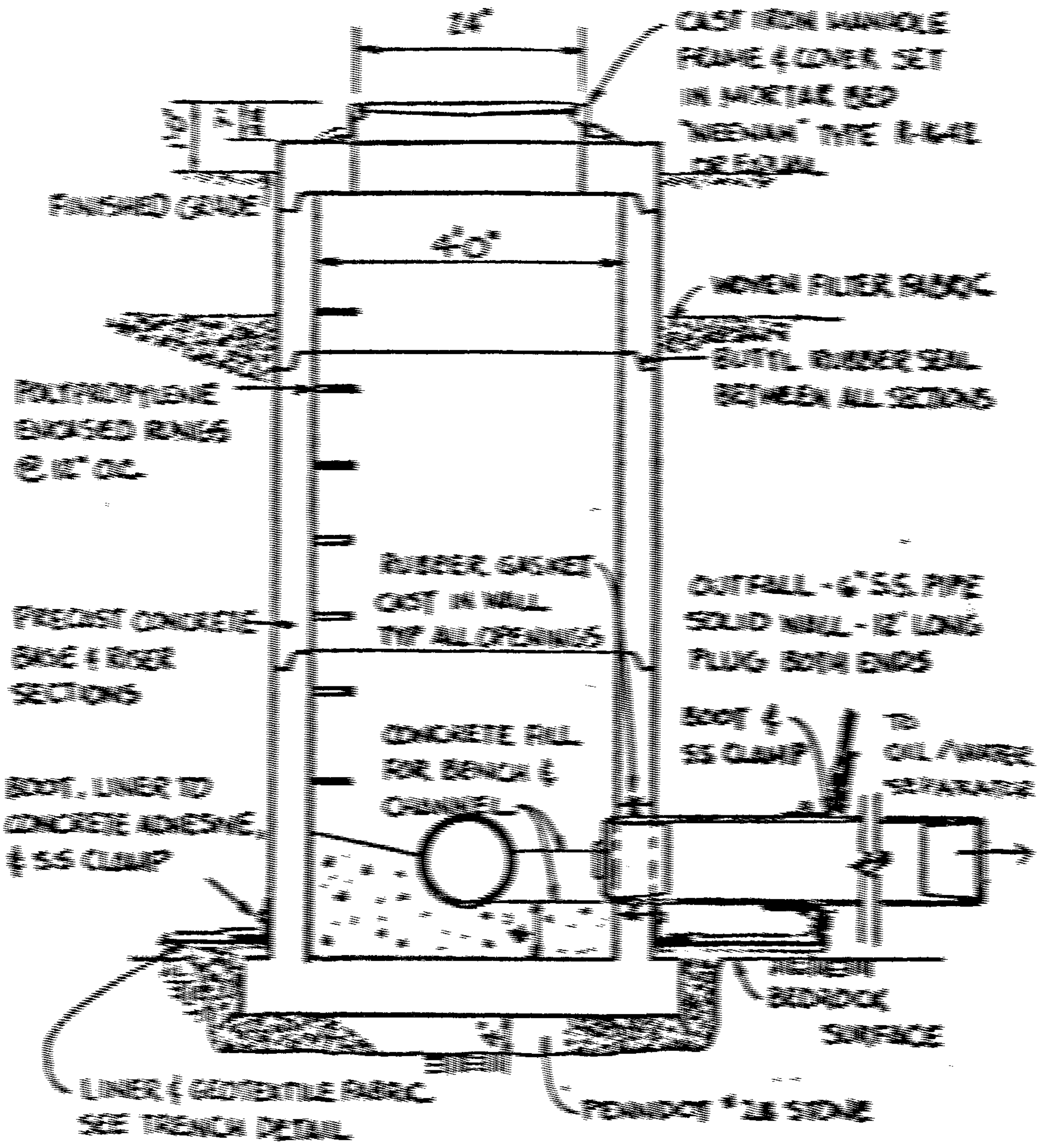
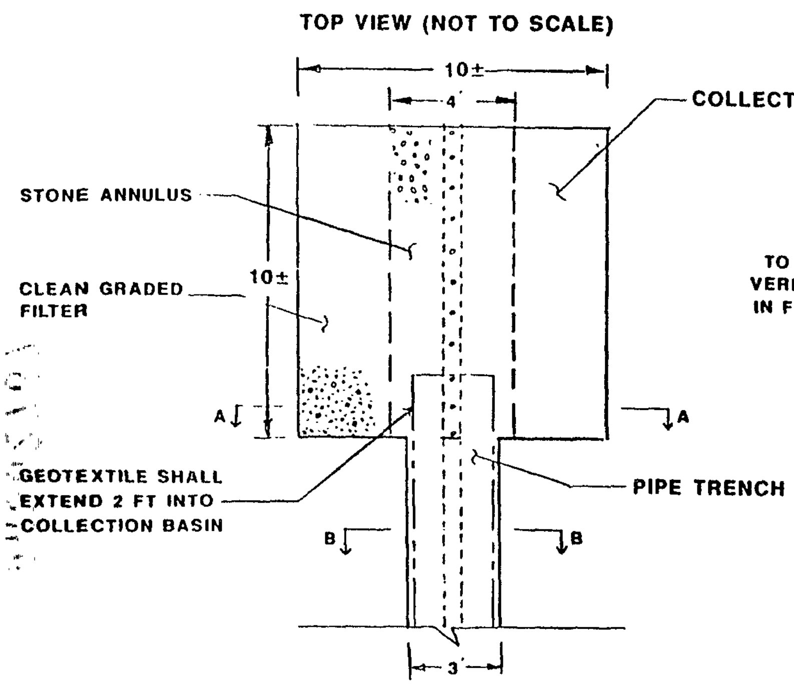
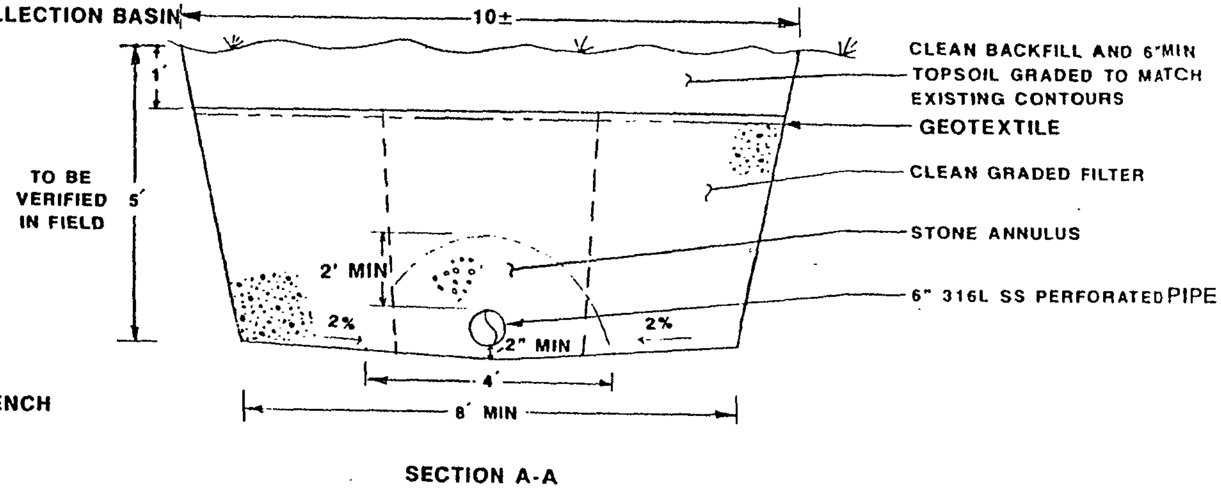
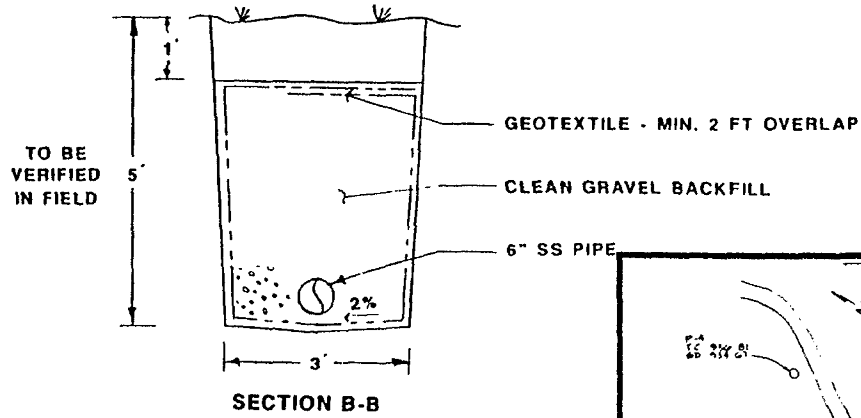


Figure 1-8 Cross Section of Interception Trench Manhole and Outfall Pipe Design, PICCO Resin Landfill (From Weston, 1990)

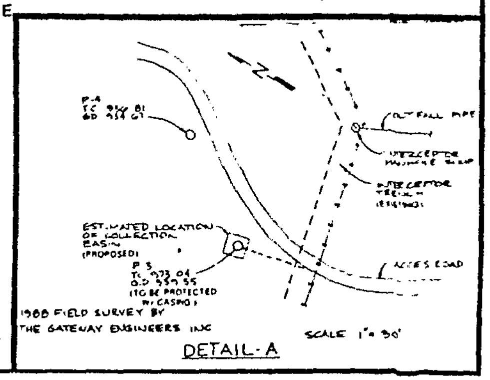






NOTES:

1. STONE ANNULUS AND CLEAN GRAVEL BACKFILL SHALL BE AASHTO NO. 3 COARSE AGGREGATE
2. CLEAN GRADED FILTER SHALL BE PENNDOT NO. 2A COARSE AGGREGATE
3. GEOTEXTILE SHALL BE A MIN. 10 OZ. NONWOVEN NEEDLEPUNCH GEOTEXTILE
4. THE COLLECTION BASIN WILL ONLY CONTAIN GEOTEXTILE BETWEEN THE CLEAN BACKFILL AND THE CLEAN GRADED FILTER.
5. ALL DISTURBED AREAS AND CLEAN BACKFILL SHALL BE COVERED WITH A MIN. 6" OF TOPSOIL, THEN SEEDED AND MULCHED.
6. THE ACTUAL DEPTH AND AREAL EXTENT OF THE COLLECTION BASIN WILL BE DETERMINED IN THE FIELD. DIMENSIONS SHOWN ARE APPROXIMATE AND WILL DEPEND ON EXTENT OF SEEP AND EXCAVATION SIDEWALL STABILITY.



DATE: 5/91

Figure 1-9 Leachate Collection Basin Design Drawing, PICCO Resin Landfill in well TW-9 since September 1989 and therefore monitoring for the presence of nonaqueous phase product was discontinued in July 1990. It is believed that the non-aqueous phase product which was in TW-9 was a pre-existing condition to the interceptor trench installation and does not indicate a pathway through or around the trench. Non-aqueous phase product was also recovered from the well installed in test pit No. 5 during the early 1980s. These efforts appear to have been effective in removing the limited quantities of non-aqueous phase product which were present in the area of these wells prior to the installation of the leachate collection trench.

- Prior to 1981, a small drainage channel was constructed along the western side of the landfill in order to divert stormwater runon and limit the amount of infiltration occurring on the landfill. This drainage channel was widened and deepened in early 1989 by Hercules engineers after Hercules discovered the channeled water was entering an underground channel near the landfill.

- In March 1991, the pipeline running from the existing oil/water separator to the tie-in point (located near the site gate) with the 8-inch diameter Jefferson Borough sanitary sewer was removed and replaced with a double-walled (2-inch inside of 4-inch HDPE) pipe. This pipe transfers the separated aqueous portion of collected interceptor trench leachate to the Jefferson Borough sewer line.

1.2.1.2 Results of the Remedial Investigation (RI)

The purpose of the Remedial Investigation (RI) at the PICCO Resin Landfill site was to complete the characterization of the site for potential remediation.

Previous voluntary investigations indicated the following concerning the environmental conditions at the site:

- The soils and perched groundwater immediately downslope of the landfill contained oily non-aqueous phase product containing volatile organic compounds (VOC) and base neutral/acid extractable compounds (BNA) which were related to the waste deposited in the landfill.

- Groundwater in the Pittsburgh coal adjacent to the landfill also contained non-aqueous phase product and chemical constituents similar to those downslope of the landfill.

The objective of the RI included the development of a comprehensive understanding of the degree and the extent of contamination of soils, groundwater and surface water associated with the landfill and related activities at the site, as well as the development of an understanding of the character and geometry of the landfill waste.

The RI/FS work plan for the site was approved by the Pennsylvania DER and EPA in February 1988. The RI field investigation was begun 17 March 1988 and involved three field investigation phases. During these phases the landfill waste, site soils, surface water, and sediment from the unnamed stream crossing the site, groundwater, ambient air, and the site ecosystem were studied. Each of these was evaluated for potential impact from the landfill.

Based upon the results of the RI the following conclusions have been drawn relative to the PICCO Resin Landfill site:

- The primary chemical compounds identified at the site are organic in nature and consist of aromatic hydrocarbons. The specific aromatic hydrocarbons principally found include single ring compounds (benzene, toluene, xylene, ethylbenzene, and styrene) and double ring compounds (naphthalene and 2-methylnaphthalene). Table 1-1 provide a summary of primary compounds for the site based on RI sampling results.

- The volume of waste deposited in the landfill is approximately 47,500 yd^3 or 77,000 tons (based on a density of 120 lbs/ft^3). This matches the 77,000 ton estimate based on production records. The waste is present at an average thickness of approximately 18 ft within the landfill. The waste in the landfill is overlain by a silty clay soil cover ranging in thickness from approximately 4 to 10 ft. A layer of clayey soil varying up to 10 ft in thickness was found between the waste at the bottom of the landfill and the bedrock. This soil appears to be impacted by the waste material as evidenced by staining.

- The landfill waste is chemically and physically heterogeneous but generally contains the following aromatic hydrocarbon compounds: benzene, toluene, xylene, ethylbenzene, styrene, naphthalene and 2-methylnaphthalene which compose approximately 1% to 5% of the waste material. The petroleum hydrocarbon content of the waste material averaged 6% and ranged up to 20%. The remaining 94% of the waste material is believed to be composed of water, clay, lime, and other solids. The average moisture content of the waste was found to be 44%.

Table 1-1

Summary of Primary Chemical Compounds Identified
Based on RI Sampling Results

	Primary	
Media	**VOA**	**BNA**
Landfill Waste	BTXE Styrene	Naphthalene 2-Methylnaphthalene
Downslope Soils	TXE	Naphthalene 2-Methylnaphthalene Phenanthrene
Stream Surface Water[(1)]	TXE	Naphthalene Benzoic Acid Bis(2-ethylhexyl) phthalate
Stream Sediment	—	Naphthalene Anthracene
Groundwater		
Perched Unconsolidated Zone (Floating Layer in TW-9)	—	—
Pittsburgh Coal (Floating Layer)	BTXE	Naphthalene 2-Methyl-naphthalene
Deep Bedrock[(2)]	—	
Seeps (water and sediment)	—	—
Residential Wells	—	—
Air	TXE	—

[1] Following correction of leachate seep problem, bimonthly stream sampling since 9/89 has indicated elimination of the presence of these compounds in the stream surface water.

[2] A low level of phenol detected was attributed to cross contamination from the Pittsburgh Coal.

- An evaluation of dike stability, based upon limited data, indicates that the application of additional stresses to the lower landfill dike (i.e., the use of heavy equipment on the dike) may result in dike failure. An evaluation of long-term static dike conditions indicate that a potential stability problem may exist for the long-term (i.e., a factor of safety less than unity). A primary factor in the potential for dike failure is the presence of a localized erosional feature near the middle of the dike.

- Sediment transport modeling per the Universal Soil Loss Equation (USLE) indicates that approximately 1.7 tons of soil per acre (corresponding to a uniform 0.01 inch layer of soil) is transported as sediment annually from the landfill and areas immediately downslope of the landfill.

- Water budget analysis indicated the following:

  - Potential landfill leachate generation rate: 46.7 million gallons per year (43.4 million gallons from groundwater entering the landfill via the Pittsburgh Coal aquifer, and 3.3 million gallons from precipitation entering the landfill via surface infiltration).

  - Average leachate removal rate via interceptor trench is 760,000 gallons per year.

  - Groundwater flow velocity through the Pittsburgh Coal aquifer is estimated at 57 ft per day.

- Site soils, downslope of the landfill, contain elevated concentrations of landfill related organics (VOC and BNA) in the area between the lower landfill dike and borehole BH-7 (which is located immediately downslope of the oil/water separator). The primary compounds detected in this area were the following aromatic hydrocarbons: toluene, xylene, ethylbenzene, naphthalene, 2-methylnaphthalene, and phenanthrene.

- The analytical data of surface water and sediment samples from the unnamed stream draining the site indicate that:

  - Organic (VOC and BNA) constituents were found in the stream surface water during the period of time that a leachate seep was active above the west end of the interception trench and immediately downslope of the landfill. This seepage was eliminated through the installation of the leachate collection basin. The presence of these constituents in the surface water was virtually eliminated, based on analysis of bi-monthly sampling of the unnamed tributary which began in September 1989.

  - Organic BNA concentrations exceeding 10 mg/kg were detected in the sediments of the stream immediately below the leachate oil/water separator (stream sampling locations S-6 and S-7) as well as along the upstream, intermittent section as seen in the sediment sample from stream sampling location S-8. These concentrations decreased significantly (approaching non-detect) at sampling locations below the site. The primary compounds detected were naphthalene and anthracene, both polyring aromatic hydrocarbons (PAH).

* Groundwater in the shallow unconsolidated zone (soils) downgradient of the landfill contains only trace concentrations of organic compounds (VOC and BNA) with the exception of monitoring well TW-9 immediately downgradient of the leachate collection trench. This leachate collection trench sentry well contains higher than trace concentrations of VOC and BNA primarily due to the presence of residual non-aqueous phase product in the well, which was present prior to the installation of the collection trench. This residual product has been removed, and no product has been noted in the well since February 1990.

* The deep bedrock below the Pittsburgh Coal seam is composed of a sequence of sedimentary rocks which appears to be unfractured and does not yield sustainable quantities of groundwater.

* The Pittsburgh Coal seam was apparently deep mined in the site area and provides a migration pathway for landfill related constituents (VOC and BNA) to the area southwest of the site. Non-aqueous phase floating product has migrated into the area between the landfill and Circle Glenn Drive. The dissolved-phase plume extends at least to the area of monitoring well TW-19, approximately 1,000 ft downgradient of the landfill.

* The sediment sample collected at Seep-2, which flows from the Pittsburgh Coal seam downgradient of the site in Calamity Hollow, indicates that landfill related constituents (VOC and BNA) may have intermittently reached the surface at that location.

* Analysis of samples from residential wells in the site area indicate that one residential well (RW-2) contained the VOC constituents 2-butanone and 2-hexanone, at trace concentrations, while a sample from a second residential well (RW-3) contained the BNA constituent di-n-butylphthalate, at a trace concentration. These compounds were detected infrequently and/or sporadically at low concentrations in other samples taken from the landfill site. They were not identified as target compounds for the site. The source of these contaminants is not known and they may not be site-related. In addition, di-n-butylphthalate was detected in the upgradient (background) Pittsburgh Coal monitoring well TW-15. Di-n-butylphthalate is a common compound found in the environment from the use of plasticizers.

* The site ecological survey indicated that the unnamed stream crossing the site and the disturbed forest community appeared to be slightly impacted.

However, it was not possible to determine if the impact was due to the previous mining activities in the valley or activities related to the construction and operation of the PICCO Resin Landfill. Observations of aquatic communities in the unnamed stream were made during the ecological survey in conjunction with the first round of surface water sampling. No aquatic organisms (i.e., fish and/or aquatic invertebrates) were observed at any location sampled and therefore no invertebrate samples were collected. Algae (filamentous green) was observed at several of the sample locations growing only in isolated pools. In addition, stream flow appeared to be a primary factor limiting habitation of the stream, with the stream reduced to only a few isolated flowing sections during dry periods. No state or federal endangered or threatened species were identified in the site area. Several small poorly drained areas supporting wetland vegetation were observed in low areas on top of the landfill and along the upper portion of the unnamed stream. These wetland areas were small with a total area of less than one-half acre.

- The ambient air sampling program indicated that trace (ppb) concentrations of landfill-related VOC (toluene, xylene, and ethylbenzene) were detected near the oil/water separator.

1.2.1.3 Results of the Baseline Risk Assessment (RA)

The purpose of the baseline Risk Assessment (RA) is to evaluate the potential for adverse effects posed by the PICCO Resin Landfill based on the results of the RI performed for the site. The baseline RA is intended to provide information that can be used to determine the need for remedial action and, if necessary, to aid in selection of remedial alternatives.

The baseline RA performed was divided as follows:

- Human health risk assessment to evaluate for potential for adverse human health effects posed by the site.
- Ecological risk assessment - to evaluate for potential of adverse ecological effects posed by the site.

In each case, the assessment involved four basic components:

- Data evaluation - to review, evaluate, and summarize available sampling data by medium for use in exposure and toxicity assessments.

- Exposure assessment - to estimate chemical dosages to potential receptors. In this effort, potential chemical migration pathways and exposure routes are evaluated.

- Toxicity assessment - to identify receptor-specific toxicity values for identified chemicals of concern through applicable exposure routes.

- Risk characterization - to evaluate potential risks to identified receptors. This is performed via consideration of the exposure doses established in the exposure assessment, and the toxicity values identified in the toxicity assessment.

A summary of results from each assessment is presented below. It should be noted that this summary is based on the January 1991 draft version of the baseline RA (Part II of the Site Report). At the time of this writing, the draft baseline RA was being revised based on U.S. EPA Region III and Pennsylvania DER comments.

1.2.1.3.1 Human Risk Assessment

Results from each of the four components of the baseline risk assessment process are as follows:

<u>Data Evaluation:</u>

- The RI sampling analytical data for organics were evaluated and summarized by medium. Each data summary included for each chemical: the frequency of detection, the range of detected concentrations, the arithmetic average, the 90% upper confidence limit of the mean (average), and background data (if available).

- The analytical data for the waste samples and Pittsburgh coal were not addressed because there are no apparent exposure routes by which potential receptors may come into direct contact with these media. The waste material is present under a soil cover which ranges from 4 to 10 ft in thickness, thereby precluding direct waste contact. Groundwater from coal seams is generally considered to be nonpotable and, therefore, unsuitable as a domestic water source. It is unlikely that in the future any wells would be constructed which would draw water directly from this aquifer. Although analytical data on the waste material and Pittsburgh coal are not addressed, sampling data from media which may be directly or indirectly impacted by them (based on evaluation of potential contaminant migration pathways), and for which there is potential exposure by humans and other receptors, are considered in the data evaluation and subsequent risk assessment.

Exposure Assessment:

- Potential contaminant migration pathways were identified as shown in Figure 1-10.

- Three exposures scenarios were established:

  - Current (off-site) resident, with exposure limited to household groundwater use. Three age groups (a child 1-6 years of age, a child 6-11 years of age, and an adult) were evaluated.

  - Trespasser (either current or future), with exposure potentially occurring through contact with air, surface soil, surface water/sediment, seeps, and groundwater. Two age groups (a child 6-11 years of age, and an adult) were evaluated.

  - Future (on-site) resident, with exposure potentially occurring through contact with air, surface soil, surface water/sediment, seeps and groundwater. Three age groups (a child 1-6 years of age, a child 6-11 years of age, and an adult) were evaluated.

- Exposure concentrations were established:

  - Both a most probable and a maximum plausible concentration were utilized for the trespasser and future (on-site) resident scenarios.

  - The single round of residential well sampling results were utilized for the current (off-site) resident scenario.

Toxicity Assessment:

- Toxicity values (cancer slope factors and reference doses) were established considering oral, inhalation, and dermal exposure routes.

Risk Characterization:

- For carcinogenic risk (summarized in Table 1-2):

  - Current (off-site) resident: No apparent carcinogenic risk (due to the fact that no carcinogens were detected in the residential wells).

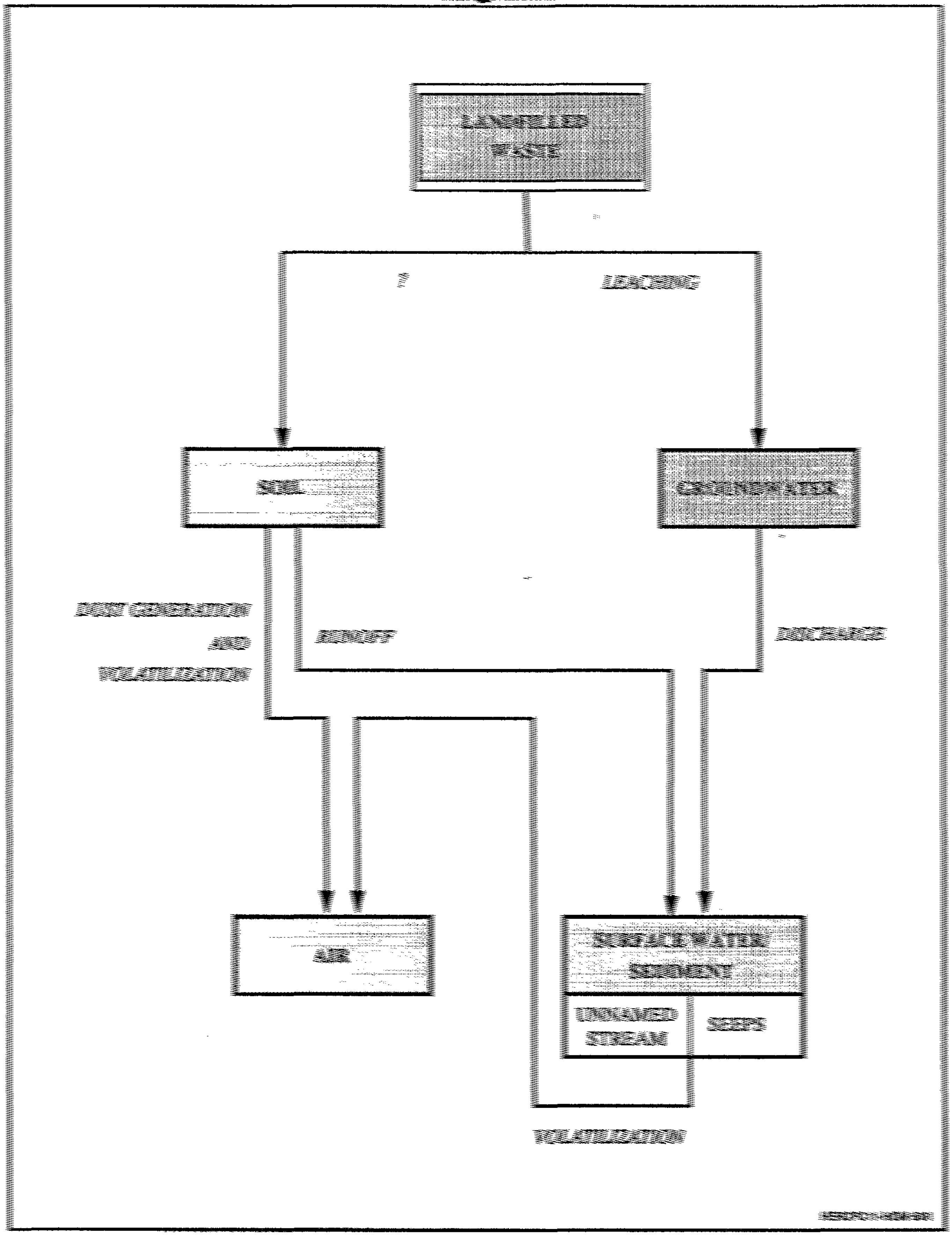


FIGURE 1-10 POTENTIAL CONTAMINANT MIGRATION PATHWAYS

WESTON

Table 1-2

Summary of Baseline Risk Assessment Results
Carcinogenic Risk

		Trespasser		Future Resident	
Media	Exposure Route	Most Probable	Maximum Plausible	Most Probable	Maximum Plausible
Soil	Direct Ingestion	1.13×10^{-7}	1.60×10^{-7}	1.23×10^{-5}	1.74×10^{-5}
	Vegetable/Fruit Ingestion	NA	NA	9.63×10^{-6}	1.37×10^{-5}
	Dermal Absorption	7.15×10^{-7}	1.01×10^{-6}	3.54×10^{-6}	5.02×10^{-6}
	Inhalation	9.40×10^{-10}	1.34×10^{-9}	2.33×10^{-8}	3.30×10^{-8}
	Subtotal	8.29×10^{-7}	1.17×10^{-6}	2.55×10^{-5}	3.62×10^{-5}
Sediment	Ingestion	3.77×10^{-9}	4.26×10^{-9}	9.30×10^{-8}	1.07×10^{-7}
	Dermal Absorption	8.48×10^{-9}	9.39×10^{-9}	4.47×10^{-8}	5.15×10^{-8}
	Subtotal	12.3×10^{-8}	1.37×10^{-8}	1.38×10^{-7}	1.59×10^{-7}
Surface Water	Dermal Absorption	6.82×10^{-11}	8.42×10^{-11}	1.02×10^{-10}	1.26×10^{-10}
Seeps	Dermal Absorption	2.50×10^{-10}	5.44×10^{-10}	1.84×10^{-10}	3.99×10^{-10}
Air	Inhalation	4.45×10^{-7}	4.45×10^{-7}	1.33×10^{-5}	1.33×10^{-5}
Total		1.29×10^{-6}	1.63×10^{-6}	3.90×10^{-5}	4.96×10^{-5}

NA - Not Applicable.

- Trespasser: Risk from 1 in 1,000,000 to 2 in 1,000,000 (within risk range of 1 in 10,000 to 1 in 1,000,000 which is generally used by EPA to regulate risk at Superfund sites).

- Future (on-site) resident: Risk from 4 in 100,000 to 5 in 100,000 (within risk range of 1 in 10,000 to 1 in 1,000,000 which is generally used by EPA to regulate risk at Superfund sites).

* For non-carcinogenic risk (summarized in Tables 1-3 and 1-4):

  - Under all scenario/receptor combinations considered, the total hazard index (for both chronic and acute cases) did not exceed 1. The highest value calculated was 0.7 for chronic hazard when considering a young child (1 to 6 years of age) under the future (on-site) resident scenario.

  - As the hazard index did not exceed 1, there is no apparent non-carcinogenic risk as per EPA guidance.

* Evaluation of individual exposure routes which exceed 1 in 1,000,000 risk under the scenarios considered and chemicals that drive the lifetime cancer risk identified four areas of concern:

  - Vapor inhalation - This risk is likely overestimated since half the risk due to vapor inhalation is attributed to carbon tetrachloride, which was not found above the detection limit in any other site-related media, and is suspected to be due to an unidentified non-related off-site source. In addition, the air sampling performed was biased to represent the highest vapor concentrations expected on-site. In addition, benzene was identified as a chemical of concern.

  - Surface soil ingestion, with more than 99% of the risk through surface soil ingestion attributed to the presence of PAH compounds.

  - Dermal absorption from surface soil, with more than 99% of the risk through dermal absorption attributed to the presence of PAH compounds.

  - Vegetable ingestion (considered for the future on-site resident), with more than 99% of the risk through vegetable ingestion attributable almost exclusively to PAH compounds in the surface soils.

Table 1-3

Summary of Baseline Risk Assessment Result: Chronic Hazard Indices

		Trespasser				Future Resident					
		Child (6-11)		Adult		Child (1-6)		Child (6-11)		Adult	
Media	Exposure Route	Most Probable	Maximum Plausible	Most Probable	Maximum Plausible	Most Probable	Maximum Plausible	Most Probable	Maximum Plausible	Most Probable	Maximum Plausible
SOIL	Direct Ingestion	$1.46 - 10^{-4}$	$2.60 - 10^{-4}$	$2.07 - 10^{-5}$	$3.69 - 10^{-5}$	$1.49 - 10^{-2}$	$2.66 - 10^{-2}$	$4.43 - 10^{-3}$	$7.90 - 10^{-3}$	$1.74 - 10^{-3}$	$3.10 - 10^{-3}$
	Vegetable/Fruit Ingestion	NA	NA	NA	NA	$8.87 - 10^{-2}$	$1.68 - 10^{-1}$	$8.25 - 10^{-2}$	$1.56 - 10^{-1}$	$4.81 - 10^{-2}$	$9.11 - 10^{-2}$
	Dermal Absorption	$9.91 - 10^{-4}$	$1.77 - 10^{-3}$	1.18×10^{-4}	$2.10 - 10^{-4}$	$3.19 - 10^{-3}$	$5.68 - 10^{-3}$	$2.55 - 10^{-3}$	$4.54 - 10^{-3}$	$4.58 - 10^{-4}$	$8.17 - 10^{-4}$
	Inhalation	$6.18 - 10^{-7}$	$9.26 - 10^{-7}$	$5.96 - 10^{-8}$	$8.93 - 10^{-8}$	$7.17 - 10^{-6}$	$1.07 - 10^{-5}$	$6.57 - 10^{-6}$	$9.83 - 10^{-6}$	$3.28 - 10^{-6}$	$4.91 - 10^{-6}$
	Subtotal	$1.14 - 10^{-3}$	$2.03 - 10^{-3}$	$1.39 - 10^{-4}$	$2.47 - 10^{-4}$	$1.07 - 10^{-1}$	$2.00 - 10^{-1}$	$8.94 - 10^{-2}$	$1.68 - 10^{-1}$	$5.03 - 10^{-2}$	$9.50 - 10^{-2}$
SEDIMENT	Ingestion	$1.24 - 10^{-5}$	$2.02 - 10^{-5}$	NA	NA	$2.24 - 10^{-4}$	$3.63 - 10^{-4}$	$6.62 - 10^{-5}$	$1.08 - 10^{-4}$	NA	NA
	Absorption	$3.17 - 10^{-5}$	$5.17 - 10^{-5}$	NA	NA	$7.58 - 10^{-5}$	$1.24 - 10^{-4}$	$6.30 - 10^{-5}$	$1.03 - 10^{-4}$	NA	NA
	Subtotal	$4.41 - 10^{-5}$	$7.19 - 10^{-5}$	NA	NA	$3.00 - 10^{-4}$	$4.87 - 10^{-4}$	$1.29 - 10^{-4}$	$2.11 - 10^{-4}$	NA	NA
SURFACE WATER	Absorption	$3.78 - 10^{-5}$	$4.86 - 10^{-5}$	NA	NA	$3.14 - 10^{-5}$	$4.04 - 10^{-5}$	$2.53 - 10^{-5}$	$3.25 - 10^{-5}$	NA	NA
SEEPS	Dermal Absorption	$2.97 - 10^{-4}$	$7.02 - 10^{-4}$	$6.27 - 10^{-5}$	$1.48 - 10^{-4}$	NA	NA	$1.98 - 10^{-4}$	$4.68 - 10^{-4}$	$6.26 - 10^{-5}$	$1.48 - 10^{-4}$
AIR	Inhalation	$2.58 - 10^{-2}$	$2.58 - 10^{-2}$	$2.49 - 10^{-3}$	$2.49 - 10^{-3}$	$3.00 - 10^{-1}$	$3.00 - 10^{-1}$	$2.75 - 10^{-1}$	$2.75 - 10^{-1}$	$1.37 - 10^{-1}$	$1.37 - 10^{-1}$
GROUND-WATER	Drinking Water Ingestion	NA	NA	NA	NA	$5.27 - 10^{-2}$	$9.67 - 10^{-2}$	$4.17 - 10^{-2}$	$7.64 - 10^{-2}$	$4.02 - 10^{-2}$	$7.37 - 10^{-2}$
	Noningestion Household Uses	NA	NA	NA	NA	$3.97 - 10^{-2}$	$7.42 - 10^{-2}$	$4.71 - 10^{-2}$	$8.80 - 10^{-2}$	$4.54 - 10^{-2}$	$8.48 - 10^{-2}$
	Ingestion while Swimming	NA	NA	NA	NA	$1.22 - 10^{-3}$	$2.24 - 10^{-3}$	$7.25 - 10^{-4}$	$1.33 - 10^{-3}$	$2.80 - 10^{-4}$	$5.13 - 10^{-4}$
	Absorption while Swimming	NA	NA	NA	NA	$2.27 - 10^{-4}$	$4.27 - 10^{-4}$	$1.96 - 10^{-4}$	$3.69 - 10^{-4}$	$1.36 - 10^{-4}$	$2.57 - 10^{-4}$
	Subtotal	NA	NA	NA	NA	$9.38 - 10^{-2}$	$1.74 - 10^{-1}$	$8.97 - 10^{-2}$	$1.66 - 10^{-1}$	$8.60 - 10^{-2}$	$1.59 - 10^{-1}$
TOTAL		$2.73 - 10^{-2}$	$2.86 - 10^{-2}$	$2.69 - 10^{-3}$	$2.88 - 10^{-3}$	$5.01 - 10^{-1}$	$6.74 - 10^{-1}$	$4.54 - 10^{-1}$	$6.10 - 10^{-1}$	$2.73 - 10^{-1}$	$3.91 - 10^{-1}$

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Table 1-4

Summary of Baseline Risk Assessment Results: Short-Term Hazard Indices

Media	Exposure Route	Trespasser Child (6-11) Most Probable	Trespasser Child (6-11) Maximum Plausible	Trespasser Adult Most Probable	Trespasser Adult Maximum Plausible	Future Resident Child (1-6) Most Probable	Future Resident Child (1-6) Maximum Plausible	Future Resident Child (6-11) Most Probable	Future Resident Child (6-11) Maximum Plausible	Future Resident Adult Most Probable	Future Resident Adult Maximum Plausible
SOIL	Direct Ingestion	4.72×10^{-3}	8.05×10^{-3}	2.43×10^{-3}	4.14×10^{-3}	1.37×10^{-2}	2.17×10^{-2}	3.78×10^{-3}	6.44×10^{-3}	1.94×10^{-3}	3.31×10^{-3}
	Vegetable/Fruit Ingestion	NA	NA	NA	NA	4.46×10^{-2}	8.79×10^{-2}	4.14×10^{-2}	8.14×10^{-2}	2.39×10^{-2}	4.71×10^{-2}
	Dermal Absorption	6.04×10^{-4}	1.03×10^{-3}	1.03×10^{-4}	1.77×10^{-4}	7.22×10^{-4}	1.23×10^{-3}	6.04×10^{-4}	1.03×10^{-3}	1.03×10^{-4}	1.77×10^{-4}
	Inhalation	7.65×10^{-7}	1.30×10^{-6}	2.21×10^{-7}	3.72×10^{-7}	2.34×10^{-6}	4.36×10^{-6}	2.22×10^{-6}	3.90×10^{-6}	1.16×10^{-6}	1.95×10^{-6}
	Subtotal	6.53×10^{-3}	1.11×10^{-2}	1.88×10^{-3}	3.19×10^{-3}	4.66×10^{-2}	9.13×10^{-2}	4.24×10^{-2}	8.31×10^{-2}	2.45×10^{-2}	4.77×10^{-2}
SEDIMENT	Ingestion	1.36×10^{-3}	1.94×10^{-3}	NA	NA	3.42×10^{-3}	5.23×10^{-3}	1.01×10^{-3}	1.55×10^{-3}	NA	NA
	Absorption	9.62×10^{-4}	1.47×10^{-3}	NA	NA	1.16×10^{-3}	1.78×10^{-3}	9.62×10^{-4}	1.47×10^{-3}	NA	NA
	Subtotal	1.09×10^{-3}	1.66×10^{-3}	NA	NA	4.58×10^{-3}	7.01×10^{-3}	1.97×10^{-3}	3.02×10^{-3}	NA	NA
SURFACE WATER	Absorption	4.44×10^{-3}	3.88×10^{-3}	NA	NA	2.53×10^{-3}	7.32×10^{-3}	4.44×10^{-3}	3.88×10^{-3}	NA	NA
SEEPS	Dermal Absorption	1.07×10^{-4}	2.48×10^{-4}	6.76×10^{-5}	1.57×10^{-4}	NA	NA	1.07×10^{-4}	2.48×10^{-4}	6.76×10^{-5}	1.57×10^{-4}
AIR	Inhalation	3.37×10^{-3}	3.37×10^{-3}	6.38×10^{-3}	6.38×10^{-3}	7.54×10^{-3}	7.54×10^{-3}	6.90×10^{-3}	6.90×10^{-3}	3.45×10^{-3}	3.45×10^{-3}
GROUND-WATER	Drinking Water Ingestion	NA	NA	NA	NA	4.68×10^{-2}	8.76×10^{-2}	3.70×10^{-2}	6.93×10^{-2}	3.56×10^{-2}	6.67×10^{-2}
	Noningestion Household Uses	NA	NA	NA	NA	2.81×10^{-2}	5.23×10^{-2}	3.35×10^{-2}	6.19×10^{-2}	3.21×10^{-2}	5.96×10^{-2}
	Ingestion while Swimming	NA	NA	NA	NA	1.01×10^{-2}	1.90×10^{-2}	6.01×10^{-3}	1.13×10^{-2}	2.32×10^{-3}	4.34×10^{-3}
	Absorption while Swimming	NA	NA	NA	NA	1.94×10^{-3}	3.71×10^{-3}	1.88×10^{-3}	3.31×10^{-3}	1.17×10^{-3}	2.23×10^{-3}
	Subtotal	NA	NA	NA	NA	8.09×10^{-2}	1.63×10^{-1}	7.80×10^{-2}	1.46×10^{-1}	7.13×10^{-2}	1.33×10^{-1}
TOTAL		2.36×10^{-2}	3.43×10^{-2}	6.84×10^{-3}	7.06×10^{-3}	2.09×10^{-1}	3.39×10^{-1}	1.90×10^{-1}	2.99×10^{-1}	1.30×10^{-1}	2.15×10^{-1}

1.2.1.3.2 Ecological Risk Assessment

Results from each of the four components of the baseline risk assessment process are as follows:

Data Evaluation:

The RI sampling analytical data summary established for the human health assessment was utilized for the ecological assessment.

Exposure Assessment:

Two exposure scenarios were considered:

- White-tailed deer (terrestrial wildlife representative) exposed via:
  - Ingestion of surface soil
  - Ingestion of plant material
  - Ingestion of surface water from the unnamed stream
  - Ingestion of seep water
- Aquatic invertebrates (aquatic life representative) potentially present in the unnamed site stream. It should be noted that no aquatic organisms (fish or aquatic invertebrates) were observed at any stream location sampled during the ecological survey. Algae (filamentous green) was observed growing in several sample locations.

Toxicity Assessment:

Critical toxicity values (CTV) were established for both potential receptors. For the white-tailed deer, CTV were derived based on estimated no observed effects levels (NOELs) extrapolated from rodent testing. For aquatic invertebrates, acute and/or chronic ambient water quality criteria were utilized.

Risk Characterization:

* For the white-tailed deer, the cumulative hazard indices calculated ranged from 0.007 to 0.014. As the cumulative hazard index is below 1 in each case, there is no apparent excessive risk posed by the site to terrestrial organisms.

* For aquatic invertebrates, the cumulative hazard index for acute effects ranges from 0.02 to 0.05. As this value range is below 1, there is no apparent excessive acute risk posed by the site to aquatic life.

* For aquatic invertebrates, the cumulative hazard index for chronic effects ranges from 2.3 to 3.0. As this value range is above 1, chronic effects on aquatic life might be expected from contaminants found during the RI in the unnamed stream. As the hazard index is less than 10, however, the potential chronic effects would not be expected to be severe. Ninety-eight percent of the hazard index was attributable to the phthalate esters.

  Upon further review, this result was discounted due to the following:

  - Phthalates are likely non-site related compounds: It was noted that based on general knowledge of the waste deposited in the landfill, phthalates were not expected to be found. This was confirmed by the sampling results for the waste material, with all results being non-detect, indicating that no phthalates were present. The source of the phthalates is therefore suspected to be non-site-related. Di-n-butylphthalate was detected in the upgradient (background) Pittsburgh Coal monitoring well (TW-15). Phthalates are generally recognized as common environmental and laboratory contaminants.

  - Uncertainties regarding accurate quantification of phthalates at trace levels: The calculated stream concentration of phthalates (2 to 7 ug/L) is less than the analytical detection limit achievable (10 ug/L). Therefore, it is questionable as to whether phthalates are actually present in the stream at all. In addition, quantification at values below the detection limit is not considered reliable. It should be noted that the ambient water quality criteria for phthalates used to evaluate chronic effects was 3 ug/L, which is also below the analytical detection limit of 10 ug/L.

1.2.1.4 Site Model

A site model for the PICCO Resin Landfill has been developed based on consideration of site background, results of the RI, and results of the baseline RA. This site model, in turn, has been utilized in the development of both remedial action objectives and remedial alternatives for the site.

The site model seeks to identify and briefly summarize key site features and current conditions. Model elements are outlined below:

General Site

- Location: One-half mile northwest of the town of West Elizabeth in Jefferson Borough, Allegheny County, Pennsylvania. The site is a narrow valley which was formerly strip-mined. Bedrock is generally shallow (<20 ft) along the valley slopes and crops out at the surface along steeper sections of the valley wall.
- Areal Extent of Property: 26 acres
- Features:
  - 1.8 acre landfill operated from 1950-64.
  - Leachate collection/treatment system in place since 1983 with product recovery and aqueous discharge to local POTW. The system serves to collect leachate migrating through the landfill dike and into the surface soils immediately downslope of the dike.
  - Impacted surface soils located downslope of the landfill.
  - Small (<1-20 gpm flow typically) unnamed stream crossing the site.
  - Three hydrogeologic zones (unconsolidated soils with perched water table conditions, partially mined-out Pittsburgh Coal seam representing primary water table zone, and deep bedrock formation essentially dry on-site).
  - Off-site seeps located in the area of Calamity Hollow and Lobbs Run discharging groundwater from the Pittsburgh Coal seam.
  - Sanitary sewer line (part of the Jefferson Borough sanitary sewer system) located along the northeastern edge of the site parallel to the unnamed stream. This 8-inch diameter sewer line receives the separated aqueous fraction of collected landfill leachate which routes the water to the WESA biological wastewater treatment plant for treatment. This discharge to WESA is performed under a contractual

agreement between Hercules and WESA as approved by the Pennsylvania DER.

* Primary Chemical Compounds of Concern (Based on RI Results):

  - Aromatic hydrocarbons, principally benzene, toluene, xylene, ethylbenzene, and styrene (VOC) as well as naphthalene and 2-methylnaphthalene (BNA).

* Site Soils:

  - Majority of site soils are Strip Mine soils, which are a mixture of disturbed native soils and fragments of excavated bedrock.

  - Native soils are classified as silty loams.

* Climate:

  - Hot summers (average temperature of 75°F), cold winters (average temperature of 33°F).

  - Total annual precipitation of 37 inches.

* Site Zoning: Residential/agricultural

* Potential Site Development:

  - The natural slopes around the immediate landfill site are steep to very steep (25% - 80%) (NCSS, 1981). Soil survey reports indicate that the site area is unsuitable for cultivation, community development, or even recreation, and should be restricted to woodlands (NCSS, 1981).

* Surrounding Land Use:

  - Suburban residential to the immediate north and west; undeveloped property and former mined areas to the immediate south and east.

  - Trailer park and other residential homes approximately 1/4-mile southeast and downslope of the site. Further below is the town of West Elizabeth, a mixed commercial, industrial, and residential area.

* Surrounding Population:

  - Approximately 1,819 within a 1-mile radius of the site based on the 1990 census.

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- Water Supply:

    - Most residents connected to public water maintain their old wells as an additional source of water to be used for gardening, washing automobiles, or watering grass. Four of the residents surveyed were not connected to public water and used their wells as their primary source of water. Two residents who were connected to public water also used their well water for indoor use.

    - Several wells are located in the adjacent valley (Lobbs Run) and the site area.

    - No users of Pittsburgh Coal groundwater were identified during the residential well survey. Furthermore, it was noted that the background well for the Pittsburgh Coal had levels of metals exceeding drinking water standards. Specific standards exceeded include the MCL for chromium, and SMCLs for aluminum, iron, and manganese. The SMCLs were exceeded by an order of magnitude. It is therefore not realistic that the Pittsburgh Coal would be used in the future as a potable water source when public water is readily available.

      Due to the limited saturated thickness in the unconsolidated zone and the seasonal variations in groundwater level, the volume of groundwater present in the unconsolidated soils in limited and is a poor potential water supply. Wells screened in the unconsolidated zone in the site area have reportedly gone dry during dry periods. Therefore, it is not likely that new wells in the unconsolidated zone would be utilized in the future as a potable water source since public water is available. The residential well survey conducted during the RI identified a single dug well in the unconsolidated zone located topographically downslope (i.e., potentially downgradient) from the site (residential well 3). This residence is connected to public water and utilizes this well for outdoor uses (gardening, grass watering, etc.) only.

- Site Ecological Status:

    - The site ecological survey indicated that the unnamed stream crossing the site and the disturbed forest community appeared to be slightly impacted. However, it was not possible to determine if the impact was due to the previous mining activities in the valley or activities related to the construction and operation of the PICCO Resin Landfill.

    - Stream flow appears to be a primary factor limiting habitation of the stream, with flow reduced to only a few isolated sections during dry periods. No aquatic organisms (fish or invertebrates) were observed in the stream during the ecological survey. Green filamentous algae was observed at several locations growing in isolated pools.

- No state or federal endangered or threatened species were identified in the site area.

- Several small poorly drained areas supporting wetland vegetation were observed in low areas on top of the landfill and along the upper portion of the unnamed stream. These wetland areas were small with a total area of less than one-half acre.

* Site Drainage: The landfill unit is located in the middle of the steeply-sloped and narrow valley which forms the site. Drainage from the surrounding hillsides runs toward the relatively flat landfill area, along with discharge from a storm drain located on Maryland Avenue. Drainage of a portion of the western side of the landfill occurs via a drainage channel, which serves to partially divert potential stormwater runon around the landfill. This drainage channel ultimately connects into the unnamed site stream below the site gate. Drainage on the eastern side of the landfill occurs via the intermittent headwaters of the unnamed site stream.

  Downslope of the landfill, drainage is provided by a drainage channel running along the western side of the site access road, along with the unnamed valley stream located on the eastern side of the access road. The drainage channel ultimately connects into the unnamed site stream below the site gate. The stream ultimately discharges into the Monongahela River approximately 4/5 mile from the site boundary.

* Mine Void Subsidence: Although mine void subsidence in the area of the landfill is not impossible, it is unlikely. Subsidence along and surrounding the landfill boundary is unlikely due to the following factors:

  - Original mining occurred in the late 1800s and early 1900s. Since that time, no cases of catastrophic subsidence have been reported. Gradual subsidence may have occurred, but an evaluation of mine subsidence performed for the Environmental Protection Agency states, "With respect to the Pittsburgh Coal seam, if it (subsidence) has not occurred within 30 to 40 years, it is unlikely to begin." ("Evaluation of the Applicability of Subsidence Models to Hazardous Waste Sites," PEI Associates, Inc.; March 1986). Mining in this area took place almost 100 years ago.

  - In over 25 years since the landfill has been in place, no subsidence or slumping has been reported along the landfill boundary. The landfill itself is placed upon bedrock and not on the mine void. Subsidence within the landfill itself, therefore, is improbable. Any subsidence that might occur along the landfill boundary would likely be the result of overburden materials slumping into the landfill. Since the landfill has been in place this has not occurred. The landfill and surrounding materials are therefore stable.

- The coal seam (and height of the mine void) is relatively thin compared to the thickness of overburden material. The coal seam is approximately 8-ft thick while the overburden material is over 100-ft thick at the site boundary. These site conditions reduce subsidence likelihood.

- Although overburden material is thick compared to the mine void thickness, overburden material is still fairly thin. For this reason, the overburden weight upon the shafts is reduced. The number of mine shafts placed in the coal seam was also reduced due to this fact. Fewer shafts and reduced overburden weight limits the likelihood of subsidence (U.S. EPA, 1986).

- Coal removal from the shafts was estimated at 50%. This removal percentage is very low. The larger the amount of coal pillars remaining, the lower the likelihood of subsidence (U.S. EPA, 1986).

- Subsidence of a mine void could possibly occur away from the landfill boundary, but this should have no adverse effects upon the landfill. If mine subsidence occurred in an area away from the landfill, it could actually reduce potential contamination by restricting the groundwater pathway.

• Baseline Risk Assessment Summary:

  - Potential contaminant migration pathways identified are indicated in Figure 1-10.

  - Human health assessment:

    -- Current (off-site) resident: No apparent carcinogenic risk (no carcinogens detected in residential wells). No apparent non-carcinogenic risk (cumulative hazard index below 1).

    -- Trespasser: Carcinogenic risk from 1 to 2 in 1,000,000 (within risk range of 1 in 10,000 to 1 in 1,000,000 which is generally used by EPA to regulate risk at Superfund sites).

    -- Future (on-site) resident: Carcinogenic risk from 4 to 5 in 100,000 (within risk range of 1 in 10,000 to 1 in 1,000,000 which is generally used by EPA to regulate risk at Superfund sites). No apparent non-carcinogenic risk (cumulative hazard index below 1). This exposure scenario assumed use of the perched groundwater downslope of the landfill for residential supply.

- Individual exposure routes which exceed 1 in 1,000,000 risk under the scenarios considered and chemicals which drive the risk:

  Air Inhalation: Carbon tetrachloride (likely non-site related) and benzene

  Surface Soils Ingestion: PAH compounds

  Dermal Absorption from Surface Soils: PAH compounds

  Vegetable Ingestion (surface soil route): PAH compounds

- Ecological assessment

  - Terrestrial organisms (represented by white-tailed deer): No apparent risk (cumulative hazard index below 1).

  - Aquatic life: No apparent site-related acute or chronic risk (cumulative hazard index below 1).

<u>Landfill Unit</u>

* Location: In the middle of the steeply-sloped and narrow valley which forms the site.

* Areal Extent: Approximately 225 ft wide by 350 ft long (1.8 acres).

* Components (refer to Figures 1-11 through 1-13 for landfill cross-sections developed based on the RI):

  - The cover consists of 4 to 10 ft (6 ft on average) of a clay to silty clay soil with permeability values ranging from 2.5 x 10^{-5} to 0.5 x 10^{-8} cm/sec, with an average density of 105 lb/ft^3 and an average moisture content of 18%. The cover soil is vegetated with grasses and volunteer vegetation.

  - The waste consists of 2 to 25 ft (18 ft on average) of a soft, spongy material believed to have been originally deposited as a sludge material containing 80% water, 10% clay and lime, and up to 10% aromatic and aliphatic solvents and resins. Table 1-5 provides a waste material physical and chemical characterization summary based on RI sampling results. As indicated by the table, the waste material contains an average of 1.5% of VOC (principally benzene, toluene,

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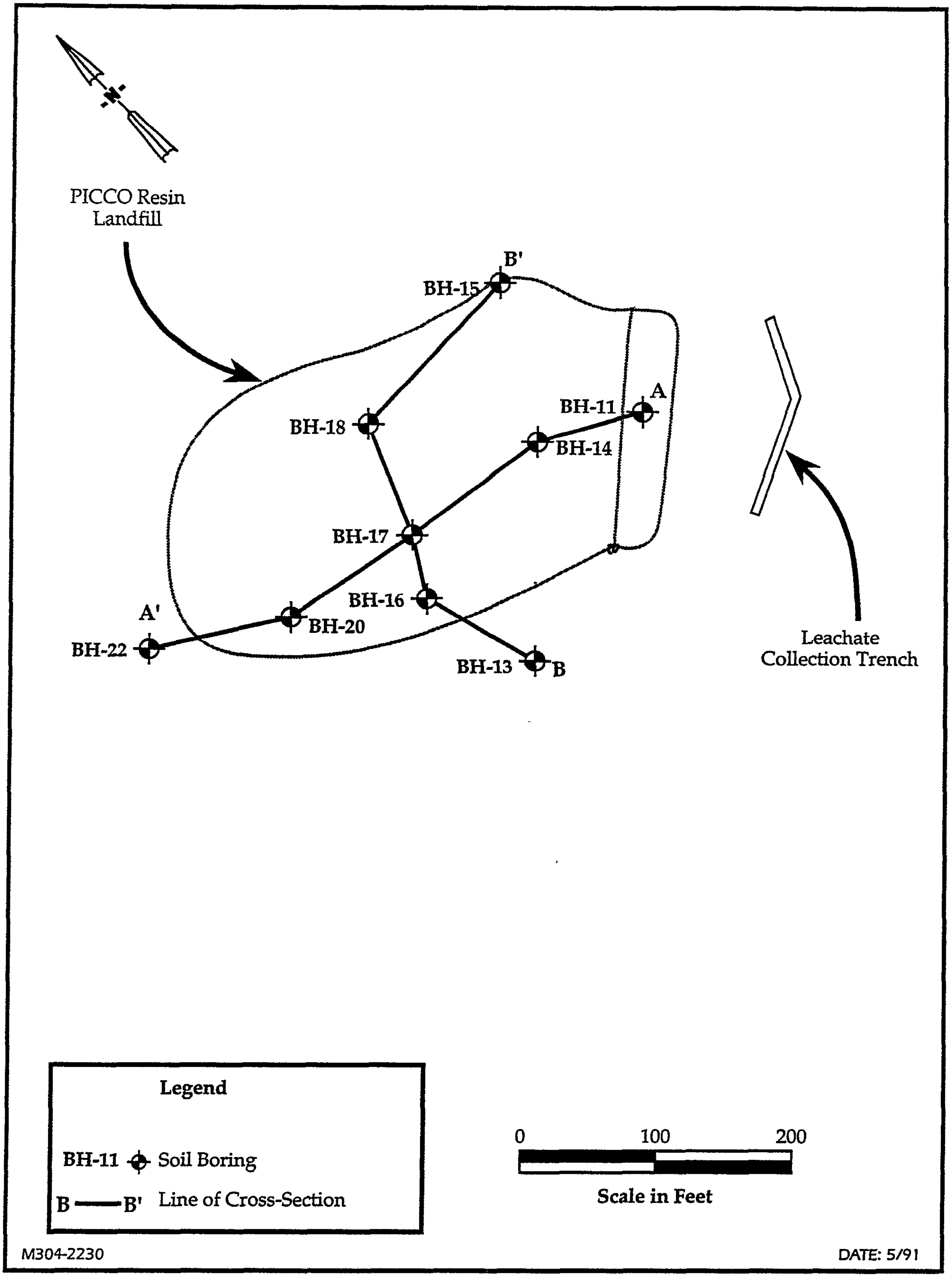

Figure 1-11 Landfill Cross-Section Locations

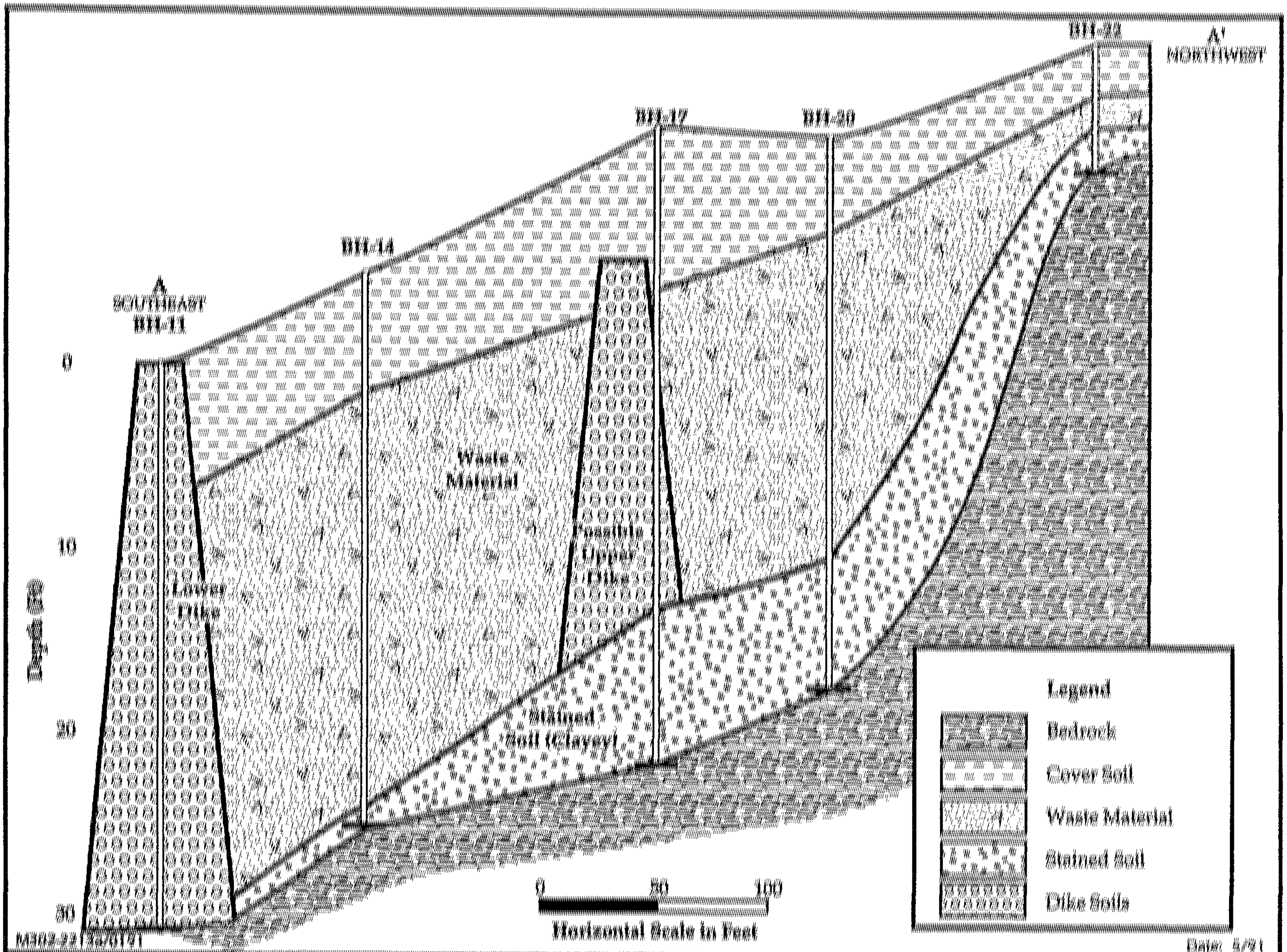

Figure 1-12 Longitudinal Landfill Cross Section A-A',
PICCO Resin Landfill

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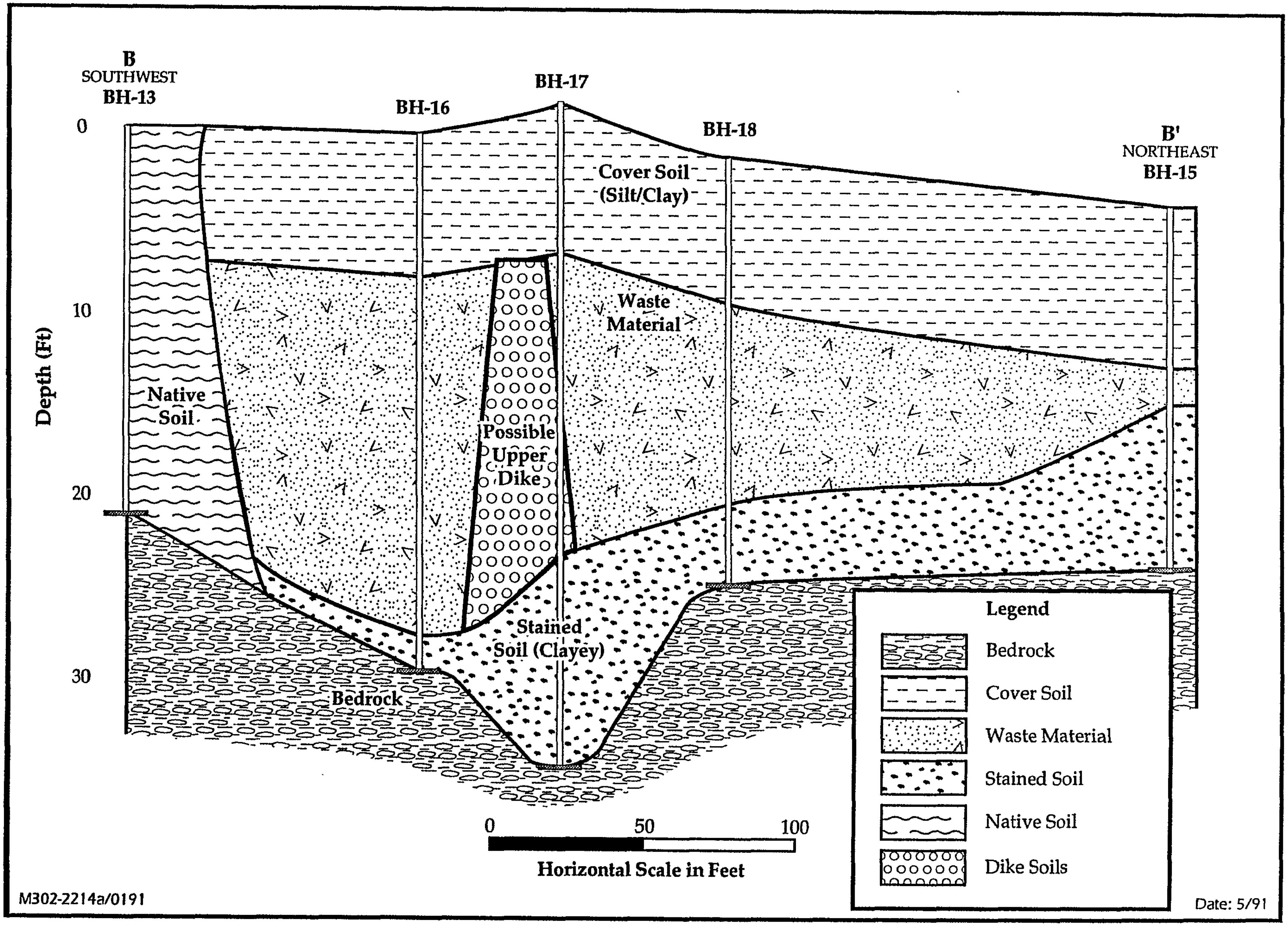

Figure 1-13 Transverse Landfill Cross Section B-B'
PICCO Resin Landfill

Table 1-8

Waste Material Characterization Summary
Picco Resin Landfill

Parameter	Average	Maximum	Parameter	Average	Maximum	Parameter	Average	Range
VOC (mg/kg):			METALS (mg/kg):			HEATING VALUE (Btu/LB):	3000	2500-3900
Benzene	124	250	Antimony	<30	<30			
Toluene	1900	4800	Arsenic	13	24			
Xylenes (Total)	9600	21000	Barium	86	135			
Ethylbenzene	1400	3400	Beryllium	<3	<3			
Styrene	1300	4600	Cadmium	<3	4			
			Calcium	41000	128000			
TOTAL BTXE	13200	28600	Chromium	30	42	OVERALL CONTENT		
TOTAL VOC	14300	33600	Cobalt	<15	<15	("As is" basis):		
			Copper	100	162	Moisture	44%	40-49%
			Lead	41	77	Volatile Matter (Organics)	16%	13-20%
BNA (mg/kg):			Magnesium	8500	20100	Non-Volatile Matter (Ash)	40%	37-43%
2-Methylnaphthalene	1040	3700	Manganese	245	1300			
Naphthalene	16000	38000	Mercury	0.3	0.5			
			Nickel	19	31	OVERALL CONTENT		
TOTAL BNA	17800	41800	Potassium	1920	2400	(Dry basis):		
			Selenium	<3	<3	Volatile Matter (Organics)	28%	25-35%
			Sodium	8470	13000	Non-Volatile Matter (Ash)	72%	65-75%
TOTAL HYDROCARBONS (mg/kg)	61000	200000	Thallium	<3	<3			
			Vanadium	38	37			
			Zinc	1073	1900			
			CYANIDE (mg/kg)	<3	<3			

NOTES: 1) Average based on results from sampling at various depths and locations in the landfill. Analytical samples taken: 15 for organics, 6 for metals & cyanide, and 7 for physical properties. 2) Maximum noted for total VOC/total BNA based on the highest result of the 15 samples taken. 3) Total waste volume in the landfill estimated at 1.4 million ft³ (47,200 yd³). Based on a landfill footprint of 225 by 330 ft with an average waste layer thickness of 18 ft.

xylene, ethylbenzene, and styrene, all of which are aromatic hydrocarbons), 1.7% of BNA (principally naphthalene and 2-methylnaphthalene, both aromatic hydrocarbons), and 6.1% petroleum hydrocarbons. The waste material is relatively low in heating value (3000 Btu/lb on average), high in moisture (44% on average), and possesses a high ash content (72% on average). The wet density of the material is 120 lb/ft^3.

- 1 to 10 ft (6 ft on average) of clay soil underlying the waste materials. This soil appears to be impacted by the waste material as evidenced by staining.

- Relatively unfractured bedrock underlying the clay soil. The bedrock is sedimentary, consisting of interbedded sandstone, shale, siltstone, and limestone.

- Approximately 30-ft-high containment dike located at the southeastern end of the landfill.

- Primary chemical compounds identified based on RI sampling results:

  - VOC: BTXE, Styrene
  - BNA: Naphthalene, 2-Methylnaphthalene

- Potential Landfill Leachate Generation Rate: 46.7 million gallons per year (43.4 million gallons from groundwater entering the landfill via the Pittsburgh Coal aquifer and 3.3 million gallons from precipitation entering the landfill via surface infiltration).

- Leachate Collection/Disposal: Leachate migrating through the lower landfill dike and into soils immediately downslope of the dike is collected by an interceptor trench installed as a remedial measure by Hercules in 1983. The trench is keyed into the shallow underlying bedrock to achieve interception of seepage. Collected leachate is passed through an oil/water separator. Non-aqueous phase product (oil) is collected and utilized as a fuel in the local Hercules plant industrial boilers under ACHD permit. The aqueous phase (water) is discharged to the Jefferson Borough sanitary sewer for biological treatment by the WESA POTW under a contractual agreement. Table 1-6 provides a characterization summary for collected leachate based on recent (March 1991) sampling.

- Current Average Leachate Removal Rate by Interceptor Trench: 760,000 gallons per year (approximately 1.5 gallons per minute). Approximately threedrums (5,000 pounds) of "oil" (non-aqueous) are recovered each week (approximately 1 gallon per hour) after oil/water separation of the leachate.

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Table 1-6

Landfill Leachate
Characterization Summary

Aqueous Phase Parameter		Non-Aqueous ("Oil") Phase Parameter	
RCRA Metals (mg/L):		**RCRA Metals (mg/kg):**	
Arsenic	ND	Arsenic	0.72
Barium	0.18	Barium	0.56
Cadmium	ND	Cadmium	ND
Chromium	ND	Chromium	1.0
Lead	0.1	Lead	ND
Mercury	0.009	Mercury	ND
Selenium	ND	Selenium	ND
Silver	ND	Silver	0.74

Aqueous Phase Parameter		Non-Aqueous ("Oil") Phase Parameter	
Semi-Volatile Organics (ug/L)(1):		**TCLP Volatile Organics (mg/L):**	
Naphthalene	9,600	Benzene	50(2)
2-Methylnaphthalene	228	Carbon Tetrachloride	ND
Phenol	11.4	Chlorobenzene	ND
		Chloroform	ND
Volatile Organics (ug/L)(1):		1,2-Dichloroethane	ND
Benzene	260	1,1-Dichloroethylene	ND
Toluene	3,000	Methyl Ethyl Ketone	ND
Xylenes	14,000	Tetrachloroethylene	ND
Ethylbenzene	500	Trichloroethylene	ND
Styrene	930	Vinyl Chloride	ND
Cumene	151		

Other (mg/L or as noted):	
pH	6.9 S.U.
Alkalinity (as $CaCO_3$)	210
BOD	135
COD	402
Chloride	190
Ammonia (as N)	3.88
Phenols	0.38
Total Dissolved Solids	1,140
Oil & Grease	24
Aluminum	0.41
Fluoride	2.87
Boron	26.1

Other (as noted):	
Ash	0.138%
Heating Value	18,500 (Btu/lb)
Total Halogens	726 (mg/kg)
Flashpoint	118°F(3)
Nickel	0.38 (mg/kg)
Settleable Solids and Water	0.3%

ND - Not Detected

Source: Analytical results from one sample taken during March 1991.

Notes: (1) Only detected organic compounds listed. (2) Exceeds corresponding RCRA characteristic hazardous waste limit of 0.5 mg/L for benzene under TCLP analysis. (3) Corresponding RCRA characteristic hazardous waste limit for ignitability is less than 140°F flashpoint.

- Remediation Volume/Mass Estimates (refer to Table 1-7 for details):

  - Waste Material: 47,500 yd^3 (77,000 tons based on 120 lb/ft^3)
  - Cover soil: 15,800 yd^3 (21,400 tons based on 100 lb/ft^3)
  - Underlying soil: 15,800 yd^3 (21,400 tons based on 100 lb/ft^3)
  - Landfill Dike: 6,600 yd^3 (8,900 tons based on 100 lb/ft^3)
  - Immediate downslope soils (between dike and interceptor trench): 4,000 yd^3 (5,400 tons)
  - Interceptor trench: 1,800 yd^3 (2,400 tons)
  - Total: 92,000 yd^3 (137,000 tons)

  For subsequent development of alternatives, the soils located immediately downslope of the dike (between the dike and the interceptor trench) and the interceptor trench itself are included as part of the landfill unit.

- Drainage: The landfill unit is located in the middle of the steeply-sloped and narrow valley which forms the site. Drainage from the surrounding hillsides runs towards the relatively flat landfill area, along with discharge from a storm drain located on Maryland Avenue. Drainage of a portion of the western side of the landfill occurs via a drainage channel which serves to partially divert potential stormwater runon around the landfill. This drainage channel ultimately connects into the unnamed site stream below the site gate. Drainage on the eastern side of the landfill occurs via the intermittent headwaters of the unnamed site stream. The stream ultimately discharges into the Monongahela River approximately 4/5 miles from the site boundary.

- Drainage Basin:

  - 45.3 acres above site gate
  - 32.8 acres above lower landfill dike

- Lower Landfill Dike: Approximately 30 ft high containment dike located at the southeastern end of the landfill. A preliminary geotechnical analysis of the dike indicated potential stability problems under:

  - Long-term static conditions
  - Additional stress conditions (i.e., - use of heavy equipment on the dike)

  The stability problems identified are due in part to an existing erosional feature in the middle of the dike. To address this specific concern, upgrade of the dike as required is included as part of the remedial alternatives considered for the site.

- Mining Activity: The bottom of the landfill is at approximately the same elevation as the base of the Pittsburgh Coal which was strip-mined from the landfill site prior to placement of waste material. The Pittsburgh Coal has also apparently been extensively deep mined in the area surrounding the site.

Table 1-7

Volume Estimate Summary: Landfill Material
PICCO Resin Landfill

Landfill Material	Surface Area (sq ft)	Average Depth (ft)	Volume (yd^3)	Mass (tons)
Waste Material	71,300	18	47,500	77,000
Underlying Soils	71,300	6	15,800	21,400
Soil Cover	71,300	6	15,800	21,400
Dike	5,900	30	6,600	8,900
Immediate Downslope Soils (located between the dike and the interceptor trench)	10,700	10	4,000	5,400
Interceptor trench	3,200	15	1,800	2,400
Total	91,000	-	92,000	137,000

NOTES: 1) Assumed soil density of 100 lbs/ft^3.
2) Assumed waste material density of 120 lbs/ft^3.
3) Individual surface areas, volumes, and mass figures are rounded to the nearest 100 units.
4) Total surface areas, volumes, and mass figures are rounded to the nearest 100 units.

The common mining practice of the time (room and pillar mining) resulted in a series of rooms separated by coal pillars which were left in place to aid in roof support of the mine. Typically, a 50% recovery of coal was obtained by this mining method. During the RI, mine voids on the order of 5 to 10 ft in depth were encountered.

- Baseline Risk Assessment Summary:
  - The landfill was not evaluated directly in the baseline RA, as there are no apparent exposure routes by which potential receptors may come in direct contact with the waste material (the waste material is present under a soil cover which ranges from 4 to 10 ft in thickness).
  - Represents the ultimate source for past, present, and potential future contaminant migration pathways.

Downslope Site Soils

- Area of Concern: Soils downslope of the landfill unit extending from the lower landfill dike along the site access road down to the site gate and southern property boundary. The soils can be further divided into three distinct areas: (Figure 1-14):
  - Area 1: From the lower landfill dike to the interceptor trench. This area, along with the interceptor trench, is considered part of the landfill unit for purposes of development of remedial alternatives.
  - Area 2: From the interceptor trench to the oil/water separator.
  - Area 3: From the oil/water separator to the site gate/southern property boundary.

Previous investigations prior to installation of the interception trench and the RI indicated visibly contaminated soils and non-aqueous free product present in soils extending downslope from the lower landfill dike to just downslope of the oil/water separator (Areas 1 and 2). Therefore, the focus of the RI effort was on evaluating conditions within Area 3.

- Soil Type: Dense to very dense clay soils.
- Bedrock: Generally 10 to 30 ft below ground surface.
- History: Some of the soils were disturbed by the mining and construction activities that have occurred over the years.

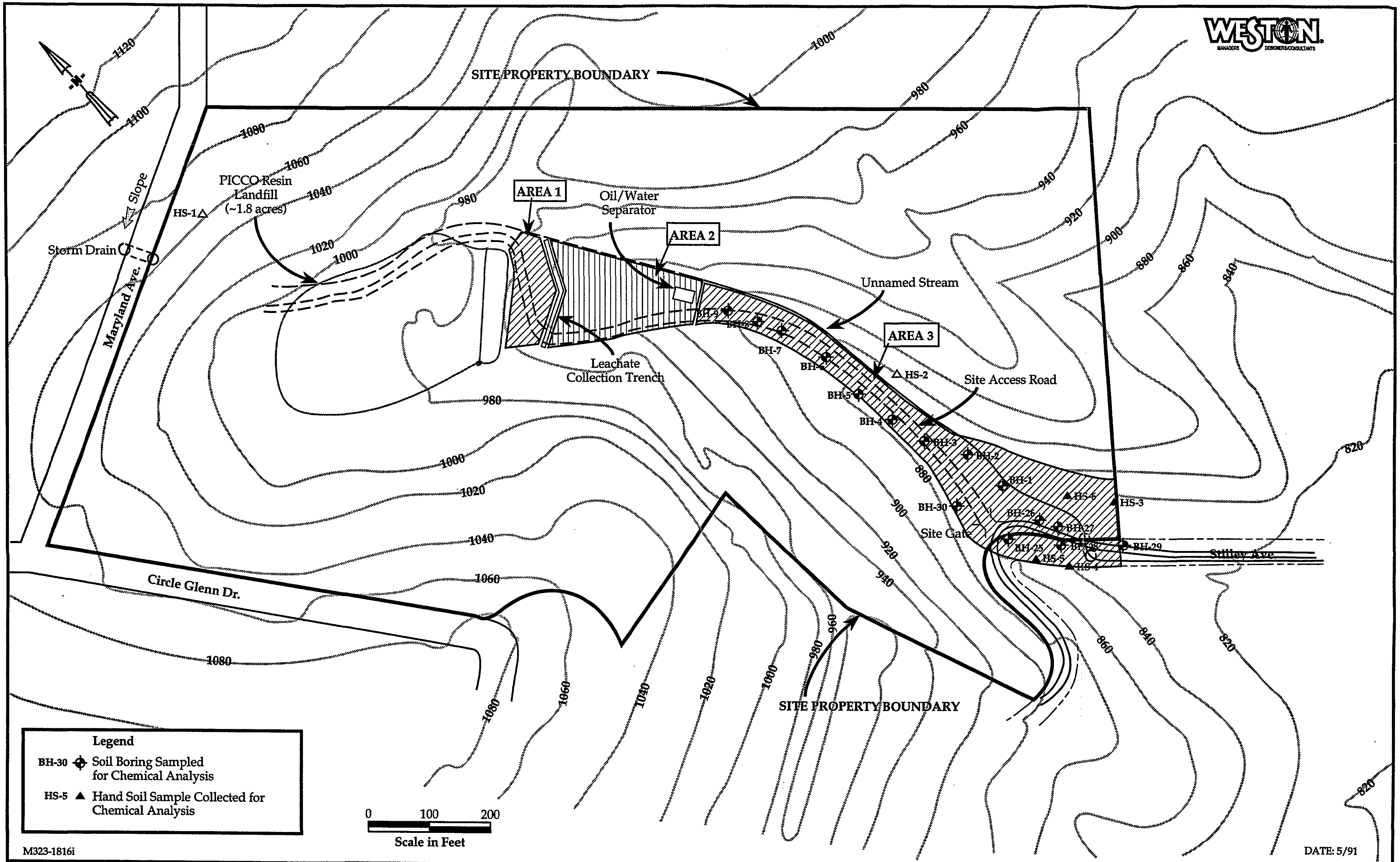

Figure 1-14 Downslope Soil Areas

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- Chemical Characterization (Area 3):

  - Elevated levels of VOC (principally toluene, xylene, and ethylbenzene) and BNA (principally naphthalene, 2-methylnaphthalene, and phenanthrene) which are landfill-related aromatic hydrocarbon compounds were detected in localized areas.

- Chemical Distribution (Area 3):

  - Discrete pockets of elevated concentrations occurring within all depth zones and appearing to be distributed somewhat randomly within the soils. In general, those yielding the highest levels was found to be in soils located immediately below the oil/water separator (sampling locations BH-7, 8, and 9). Four other locations were also identified as having elevated chemical concentrations, namely deep ($\geq$14 ft) soils around sampling location BH-5, and in shallow soils ($\leq$6 ft) around sampling locations BH-1, BH-4, and HS-6. These four targeted locations within Area 3 were identified based on identifying samples which exceeded any one of the following criteria:

    -- Total VOC above 10 mg/kg
    -- Total BNA above 100 mg/kg
    -- Total petroleum hydrocarbons above 1,000 mg/kg

    Table 1-8 provides a chemical characterization summary for these locations.

  - The heterogenous distribution of the target organic compounds in the site soils indicate that the contaminants did not move laterally through the subsurface soils but were mixed or deposited with the soils during earthmoving or construction activities and have remained relatively immobile since deposition. The results of analysis of groundwater samples collected from wells constructed in the site soils supports this conclusion.

- Baseline Risk Assessment Summary (Area 3 Surface Soils):

  - Surface soils defined as those from 0 to 6 ft in depth.
  - Identified as a potential contaminant migration pathway via:

    -- Fugitive dusts and volatilization into the air
    -- Stormwater runoff into the unnamed stream at the site
  - Individual exposure routes which exceed 1 in 1,000,000 risk under the scenarios considered and chemicals which drive the risk:

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Table 1-8

Area 3
Downslope Soils Characterization Summary
PICCO Resin Landfill

Parameter	Location Depth	BH-7,8,9 0-10'	BH-5 16-18'	BH-4 2-4'	BH-1 4-6'	SS-6 0-2'
VOC (mg/kg):						
Toluene		0.19	17	ND	ND	ND
Xylenes (Total)		20.3	46	ND	ND	ND
Ethylbenzene		4.77	18	ND	ND	ND
TOTAL VOC		20.3	66	0.002	0	0.003
BNA (mg/kg):						
2-Methylnaphthalene		14.4	11	4.6	2.1	0.12
Naphthalene		10.1	94	41	27	0.09
TOTAL BNA		24.9	105	46	48	2.1
PETROLEUM HYDROCARBONS (mg/kg)		1250	900	1500	2300	1800

Legend: BH - Borehole
SS - Soil Sample
ND - Not Detected

Data Sources: BH - 7,8,9: Based on average of results from sampling at three depths at each location.
BH - 5: Based on results for sample BH - 5 - 3.
BH - 4: Based on results for sample BH - 4 - 1.
BH - 1: Based on results for sample BH - 1 - 1.
SS - 6: Based on results for sample SS - 6.

-- Dermal absorption: PAH compounds

-- Chemical ingestion (both directly and via vegetable ingestion): PAH compounds

- Remediation Volume/Mass Estimates (based on 100 lbs/ft^3).
Refer to Figure 1-15 for site locations and Table 1-9 for estimation details. (Note: Area 1 soils and the interceptor trench are not included as they are considered part of the landfill unit for development of remedial alternatives.)

  - Area 1: 14,400 yd^3 (19,400 tons)

  - Area 2: 6,300 yd^3 (8,600 tons) for soils around BH-7, 8 and 9 sampling locations

    700 yd^3 (900 tons) for deeper ($\geq$ 14 ft) soils around the BH-5 sampling location

    500 yd^3 (600 tons) for shallow ($\leq$ 4 ft) soils around the BH-4 sampling location

    600 yd^3 (800 tons) for shallow ($\leq$ 6 ft) soils around the BH-1 sampling location

    200 yd^3 (300 tons) for shallow ($\leq$ 2 ft) soils around the HS-1 sampling location

  - Total: 23,000 yd^3 (31,000 tons)

Unnamed Site Stream

- Description: Small unnamed stream draining the site which flows southeast along the northeast and east side of the site. The stream originates above the head of the landfill, extends along side the downslope site soils parallel to the access road, and flows past the site boundary along Stilley Avenue through a residential area below the site. It then flows through a culvert pipe and through the Hercules Jefferson plant property south of the Town of West Elizabeth with ultimate discharge into the Monongahela River located approximately 4/5 mile from the site boundary.

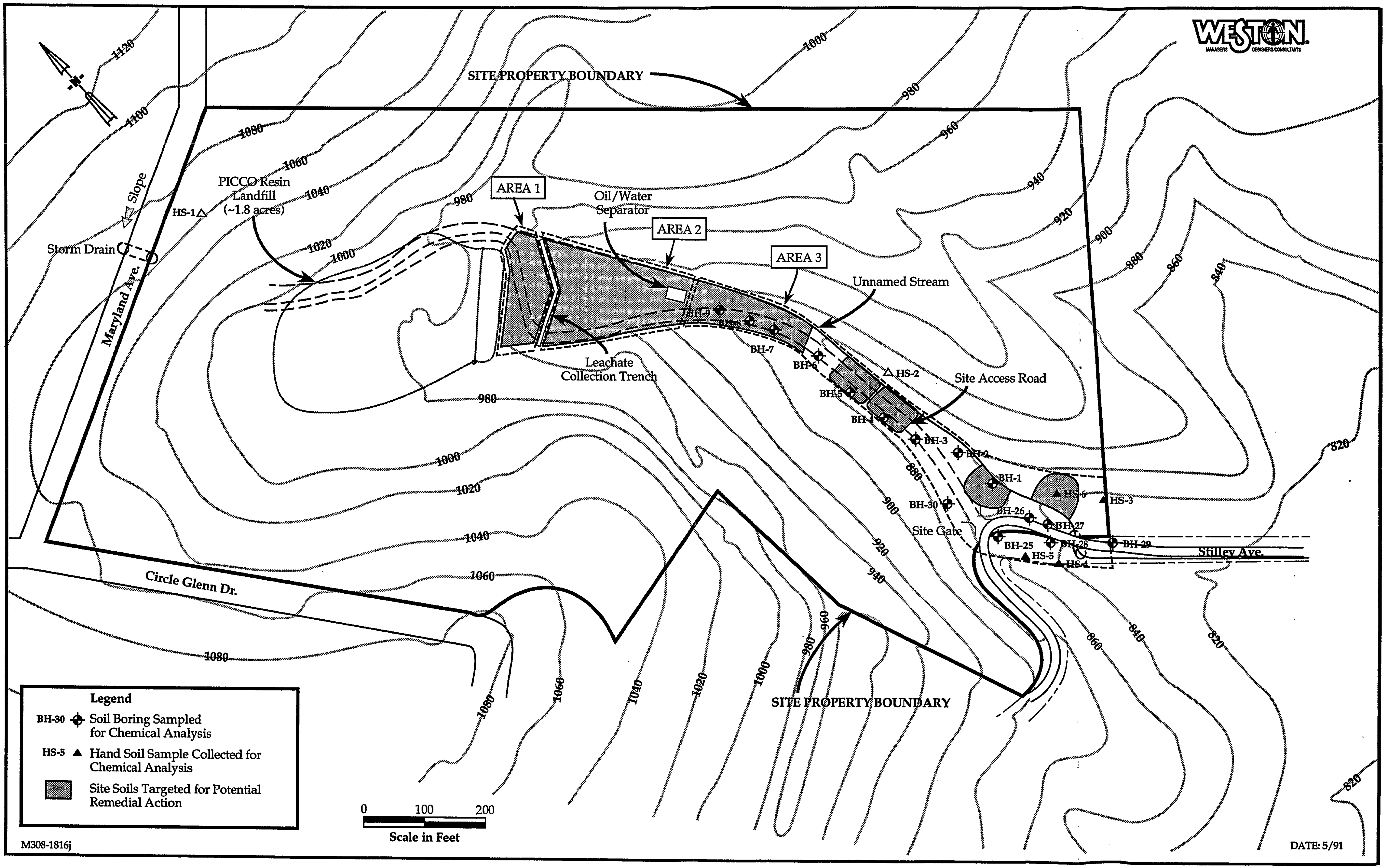

Figure 1-15 Site Soils Targeted for Potential Remedial Action

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Table 1-9

Volume Estimate Summary: Downslope Soils PICCO Resin Landfill

Downslope Soil Area	Surface Area (ft^2)	Average Depth (ft)	Volume (yd^3)	Mass (tons)
From trench to oil/water separator-Area 2	25,900	15	14,400	19,400
From separator to midway BH-6/BH-7	11,400	15	6,300	8,600
Deeper soils around BH-5	3,000	6	700	900
Shallow soils around BH-4	3,000	4	500	600
Shallow soils around BH-1	2,800	6	600	800
Shallow soils around HS-6	2,800	2	200	300
Total	49,000		23,000	31,000

Notes: 1) Assumed soil density of 100 lbs/ft^3.

2) Area 1 downslope of soils and the interceptor trench are not included as they are not considered part of the landfill unit for purposes of developing remedial alternatives.

3) Figures for individual surface area, volume, and mass are rounded to the nearest 100 units.

4) Figures for total surface area, volume, and mass are rounded to the nearest 100 units.

- Size:

  - Width - 1 to 3 ft
  - Depth - 1 to 6 inches
  - Length - 1,300 ft within site boundaries

- Flow: Intermittent upstream of the oil/water separator. The stream is primarily fed by groundwater discharging from the shallow soil aquifer. During rainy periods the stream is also fed by stormwater runoff and exhibits a rapid response. Based on stream gauging downstream of the oil/water separator, the stream has generally very low flow during dry periods (typically 1 gpm or less) and low flow during wet periods (1-20 gpm typically).

- Chemical Characterization:

  - Surface Water: After correction of a leachate seep above the west end of the interception trench in September 1989, only trace levels of landfill-related constituents have been detected based on bi-monthly stream sampling, which began in September 1989. Sampling revealed pH levels ranging from 4.0 to 5.7. The stream water quality is also affected by past mining activities on-site and in the area.

  - Sediments: BNA compounds (primarily naphthalene and anthracene, both landfill-related aromatic hydrocarbons) were detected, exceeding 10 mg/kg in on-site sampling locations both above and below the oil/water separator. Trace levels were detected at sampling locations below the site.

- Ecological Survey:

  - No reptiles, amphibians, aquatic invertebrates, or fish noted.

  - Green filamentous algae noted at several locations, growing in isolated pools.

- Baseline Risk Assessment Summary:

  - Identified as potentially receiving contaminants via:

    - Stormwater runoff from surface soils.

    - Discharge from the shallow (unconsolidated zone) perched groundwater.

  - Identified as a potential contaminant migration pathway via volatilization into the air.

- Neither surface water nor sediment identified as a site-related concern regarding the human health or ecological risk assessment.

Groundwater

- Hydrogeologic Zones:

  - Unconsolidated soils
  - Partially mined-out Pittsburgh Coal seam
  - Deep bedrock below the Pittsburgh Coal

- Unconsolidated Zone

  - Limited amounts of shallow, discontinuous perched groundwater in the downslope soils.

  - Groundwater movement generally follows the topographic surface downslope.

    Due to the limited saturated thickness in the unconsolidated zone and the seasonal variations in groundwater level, the volume of groundwater present in the unconsolidated soils is limited and is a poor potential water supply. Wells screened in the consolidated zone in the site area have reportedly gone dry during dry periods. Therefore, it is not likely that new wells in the unconsolidated zone would be utilized in the future as a potable water source since public water is available. The residential well survey conducted during the RI identified a single dug well in the unconsolidated zone located topographically downslope (i.e., potentially downgradient) from the site (residential Well 3). This residence is connected to public water and utilizes this well for outdoor uses (gardening, grass watering, etc) only.

  - A component of groundwater flow moves towards and discharges into the unnamed site stream.

  - Saturated zones, when encountered, varied from 2.5 to 11 ft in thickness, and were generally encountered 2 to 4 ft above the soil/bedrock interface.

  - Existing leachate interception trench effectively intercepts leachate/groundwater flow from the landfill, thereby preventing migration into the downslope soils.

  - Landfill-related compounds detected mainly in TW-9 in all probability were present in the soils below the trench prior to installation of the interception trench.

- No significant downgradient migration of contaminants from the area below TW-9 were found.

- The baseline RA identified this groundwater as a potential contaminant migration pathway via discharge to the unnamed stream. However, chemical analyses of groundwater samples from the unconsolidated soils both on-site and below the site boundary indicated that minimal contaminant transport is occurring in this groundwater system.

* Pittsburgh Coal

  - The 5 to 8 ft thick coal seam is partially saturated, containing 1 to 3 ft of groundwater.

  - Rock above and below the coal contains little groundwater.

  - Groundwater generally flows west and southwest across the site through the coal seam in the direction of the coal bedding dip. On a smaller scale, flow is complicated due to existence of mine voids throughout the coal seam around the site from earlier deep mining activities.

  - Mine voids act as a preferential flow path for groundwater through the Pittsburgh Coal.

  - Groundwater movement through the landfill and into the Pittsburgh Coal has allowed non-aqueous phase product to migrate into the mine voids in the area immediately southwest and downgradient of the site, between the landfill and Circle Glenn Drive. The quantity and extent of the floating product cannot be precisely determined although it appears to be of a limited extent adjacent to the landfill. The presence of this non-aqueous phase product on the groundwater table found in two mine voids may be a source for a dissolved phase plume which extends to the area of Monitoring Well TW-19, located approximately 1,000 ft downgradient of the site.

  - Primary compounds present are landfill-related aromatic hydrocarbons, principally benzene, toluene, xylene, ethylbenzene, naphthalene, and 2-methylnaphthalene.

  - The groundwater in the mine voids generally contained higher organic contaminant concentrations than groundwater within unmined sections.

  - Groundwater present in coal seams is generally considered less desirable than other aquifers due to naturally high levels of dissolved solids, metals, and sulfur compounds. In fact, it was noted that the background well for the Pittsburgh Coal had levels of metals exceeding drinking water standards. Specific standards exceeded include the MCL for chromium, and SMCLs for aluminum, iron, and manganese. The SMCLs were exceeded by an order of magnitude. It is therefore not realistic that the Pittsburgh Coal would be used in the future as a potable water source when public water is readily available. In addition, no current users of Pittsburgh Coal groundwater were identified in the residential well survey conducted during the RI.

- Groundwater in the Pittsburgh Coal represents a potential contaminant migration pathway via discharge to seeps. It should be noted, however, that baseline RA results did not indicate the seeps to be a media of concern.

- Deep Bedrock

    - Deep monitoring wells drilled into the bedrock below the Pittsburgh Coal within the site did not encounter significant groundwater and a core sample collected from this bedrock zone encountered no fractures. These data, relating to the bedrock below the Pittsburgh Coal, indicate that the deep bedrock below the site is not an aquifer (i.e., capable of sustaining a measurable yield of groundwater).

    - Based on the residential well survey results, the deep bedrock may potentially yield enough water for residential use. Therefore, the deep bedrock may potentially be an aquifer unit off-site. To further evaluate its potential as an aquifer unit, additional investigation is proposed as a component of the remedial alternatives considered for the site. The proposed investigation involves drilling exploratory boreholes at two off-site downgradient locations with potential installation of monitoring wells.

Residential Wells

- Most local residents are supplied with public water from the Western Pennsylvania Water Company.

- A total of 16 residential wells were identified during the well survey.

- Four of these residents are not connected to public water and utilize their well as their primary source of water. In addition, some residents continue to maintain their old wells for an additional supply of water. Three residents who were connected to public water also use their well water for indoor use (drinking, cooking and/or washing).

- No users of Pittsburgh Coal groundwater were identified during the residential well survey. Furthermore, it was noted that the background well for the

Pittsburgh Coal had levels of metals exceeding drinking water standards. Specific standards exceeded include the MCL for chromium, and SMCLs for aluminum, iron, and manganese. The SMCLs were exceeded by an order of magnitude. It is therefore not realistic that the Pittsburgh Coal would be used in the future as a potable waste source when public water is readily available.

Due to the limited saturated thickness in the unconsolidated zone and the seasonal variations in groundwater level, the volume of groundwater present in the unconsolidated soils is limited and is a poor potential water supply. Wells screened in the unconsolidated zone in the site area have reportedly gone dry during dry periods. Therefore, it is not likely that new wells in the unconsolidated zone would be utilized in the future as a potable water source since public water is available. The residential well survey conducted during the RI identified a single dug well in the unconsolidated zone located topographically downslope (i.e., potentially downgradient) from the site (residential Well 3). This residence is connected to public water and utilizes this well for outdoor uses (gardening, grass watering, etc.) only.

- Sampling was performed at 10 of the 16 wells identified (the remaining wells were not sampled due to inaccessibility and/or property owner refusal). Results indicated trace levels in two wells of compounds which are not identified as indicator compounds for the landfill site. Baseline risk assessments performed for these two residential wells indicated no apparent carcinogenic or non-carcinogenic human health risk.

Seeps

- Nine surface seeps representing groundwater discharge points were identified as probably flowing from the Pittsburgh Coal outcrop seam downgradient (southwest) of the site in the Calamity Hollow/Lobbs Run area.

- Discharge rates from the seeps varied from 1/4 to 20 gpm, while pH ranged from 3.0 - 7.6 and averaged 5.6. The seep water commonly emitted a sulphurous odor and deposited white and/or rust colored precipitates at the point of discharge and downstream.

- All nine seeps have been sampled at least once for chemical analysis. No landfill indicator constituents were found in any of the samples with the exception of the initial sample from one seep location (Seep 2) which has not been confirmed with three subsequent sampling rounds.

- A sediment sample collected at one seep location (Seep-2) indicated the presence of low levels of xylene and various BNA compounds which are indicator compounds for the landfill.

- Sampling of residential wells in Calamity Hollow below the Pittsburgh Coal seeps indicates that landfill-related constituents have not impacted the residential wells sampled in the areas below the Pittsburgh Coal seeps. Based on this data, groundwater in the areas below the Pittsburgh Coal seeps does not appear to be impacted.

- The seeps represent a potential source of direct contact by potential receptors. However, baseline risk assessment results did not indicate the seeps to be a media of concern for either human health or ecological assessments.

Air

- Ambient air quality monitoring was conducted at 10 stations around the site during the RI including six stations along the landfill perimeter, one station at the oil/water separator, one station at the site gate, and one station on Maryland Avenue.

- Trace (ppb) VOC concentrations were detected near the oil/water separator. The compounds detected above 1 ppb were toluene, xylene, and ethylbenzene while benzene and styrene were detected between 0.25 - 0.5 ppb. These are each identified in the RI as landfill-related compounds.

- Vapor inhalation was identified in the baseline risk assessment as an exposure route which exceeds 1 in 1,000,000 risk under the scenarios considered. The two main compounds of concern identified are carbon tetrachloride and benzene. The overall risk is likely overestimated since half the risk is attributed to carbon tetrachloride which was not found above the detection limit in any other site-related media, and is suspected to be due to an unidentified non-related off-site source. In addition, the air sampling performed was biased to represent the highest vapor concentrations expected on-site.

- The major potential for air emission would be from the oil/water separator. The landfilled waste is under 4 to 10 ft of a low permeable clay to silty clay cover which inhibits potential air emissions. The downslope soils are also clay to silty clay which would be expected to tightly hold contaminants, thereby inhibiting potential air emissions.

1.2.2 Remedial Action Objectives

Remedial action objectives consist of medium-specific goals for protecting human health and the environment. The objectives have been developed based on site characterization (subsection 1.2.1) and consideration of ARARs (Section 2). The objectives have been developed as specific as possible but not specific that the range of alternatives that can be developed is unduly limited.

Remedial action objectives developed for protecting human health and the environment specify:

- The contaminant(s) of concern.
- Exposure route(s) and receptor(s).
- An acceptable contaminant level or range of levels for each exposure route (i.e., a preliminary remediation goal).

The remedial action objectives established for the PICCO site are given in Table 1-10. In developing the remedial action objectives, the following environmental media were initially considered:

- Waste Material (landfill unit).
- Leachate (landfill unit).
- Soils (downslope of the landfill unit).
- Surface Water (unnamed valley stream).
- Sediments (unnamed valley stream).
- Groundwater (unconsolidated zone groundwater; Pittsburgh Coal groundwater; and deep aquifer groundwater).
- Seeps.
- Residential wells.
- Air (oil/water separator emissions).

In reviewing the results of the baseline RA, the following media were identified for potential remedial action based on individual human exposure routes that exceed 1 in 1,000,000 risk:

- Soil (downslope of landfill unit).
- Groundwater (unconsolidated zone and Pittsburgh Coal).
- Air (oil/water separator emissions).

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Table 1-10

Remedial Action Objectives

Environmental Media	Remedial Action Objectives (from site characterization)
Waste Material (landfill unit)	Minimize generation of landfill leachate.
Leachate (Landfill unit)	Prevent contaminant migration into groundwater.
Soil (downslope of the landfill unit)	Prevent ingestion (both direct and via vegetable ingestion) with surface soil having 1 in 10,000 to 1 in 1,000,000 carcinogenic risk from PAH compounds.
	Prevent dermal adsorption with surface soil having 1 in 10,000 to 1 in 1,000,000 carcinogenic risk from PAH compounds.
Groundwater (Pittsburgh Coal and unconsolidated zone)	Prevent ingestion of water having in excess of 1 in 10,000 to 1 in 1,000,000 carcinogenic risk from identified carcinogens.
Air (oil/water separator emissions)	Prevent (or control) fugitive emissions from the existing oil/water separator to address potential carcinogenic risk from the site in excess of 1 in 10,000 to 1 in 1,000,000 due to benzene levels.

(Note: Groundwater is listed as under the proposed revisions to the baseline RA; it is anticipated that the calculated risk will exceed 1 in 1,000,000 for both the unconsolidated zone and Pittsburgh Coal.)

Remedial action objectives were then established to prevent human exposure via identified pathways of concern in excess of 1 in 10,000 to 1 in 1,000,000. It should be noted that under current conditions as delineated by the baseline RA, the current risk falls in this regulated range.

The waste material contained in the existing landfill unit was also identified as an environmental media for potential remedial action based on its representing the ultimate source of site contamination via migration of landfill generated leachate. A remedial action objective was established to minimize generation of landfill leachate. An associated remedial action objective for the leachate itself was also established as prevention of contaminant migration into groundwater.

Regarding the remaining environmental media (surface water, stream sediments, seeps, and residential wells) the results of the baseline RA and a review of ARARs did not indicate the potential remedial action is currently required. Furthermore, by addressing the other media identified for potential remedial action, potential future impacts via contaminant migration into these media will be addressed.

As an added precaution, private water supply (i.e., residential well) actions and controls are included as a potential contingency general response action (Section 1.2.3) if future conditions warrant such a response action.

1.2.3 General Response Actions

Typical general response actions based on previous WESTON experience and EPA literature (U.S. EPA, 1988b; U.S. EPA, 1987a) were evaluated with respect to the specific site concerns and remedial action objectives as defined in the preceding subsections. From this evaluation, the following general response actions were found potentially applicable to the PICCO site as a whole:

- No action.
- Institutional actions and controls.
- Landfill infiltration controls.
- Leachate and groundwater controls.
- Excavation and removal of waste and downslope soils.
- Treatment (waste, soil, groundwater, and leachate).
- Land disposal.
- Air emissions controls (oil/water separator).
- Private water supply actions and controls (considered as a contingency action if future conditions warrant such a response action).

These potential general response actions address the environmental media of concern as detailed in Table 1-11.

These identified potential response actions were utilized in subsequent identification and screening of potential remedial technologies, as discussed in Section 3.

Table 1-11

Applicability of Potential General Response Actions

General Response Action*	Waste Material (Landfill Unit)	Leachate (Landfill Unit)	Soil (Downslope of Landfill Unit)	Groundwater (unconsolidated zone GW; Pittsburgh Coal GW)	Air (oil/water separator emissions)
	Environmental Media				
No Action	X	X	X	X	X
Institutional Action and Controls	X	X	X	X	X
Landfill Infiltration Controls	X				
Leachate and Groundwater Controls		X		X	
Excavation and Removal	X		X		
Treatment	X		X	X	
Land Disposal	X		X		
Air/Emission Controls					X

*In addition to the listed GRAs, private water supply actions and controls are considered as a contingency action if future conditions warrant such a response action.

SECTION 2

APPLICABLE OR RELEVANT AND APPROPRIATE ENVIRONMENTAL AND PUBLIC HEALTH REQUIREMENTS (ARARs)

2.1 INTRODUCTION

The Superfund Amendments and Reauthorization Act (SARA) of 1986 and the National Contingency Plan (NCP), revised 8 March 1990 (40 CFR 300), provides that the development and evaluation of remedial actions under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or Superfund) must include a comparison of alternative site responses to applicable or relevant and appropriate federal and state environmental and public health requirements (ARARs).

In accordance with the requirements of the NCP, the remedial action selected must meet all ARARs unless a waiver from specific requirements can be granted. The seven conditions (SARA Section 121; CERCLA Section 121(d)(4)) for a possible waiver are summarized as follows:

- The remedy under consideration is only an interim remedy and is not the final or permanent remedy selected for the site.
- Compliance with such standards would create greater risks to public health than the benefit it would provide.
- Compliance with such standards is "technically impractical."
- A different remedy exists that provides public health protection "equivalent" to the preferred cleanup standard.
- A more stringent state standard, which would otherwise be applicable, has not been consistently applied to other sites in the state.
- Compliance with an applicable state requirement would effectively result in the statewide prohibition of land disposal of hazardous substances.
- The cost of the remedy is too expensive, considering the other demands on the fund.

2.2 IDENTIFICATION OF ARARs

Identification of ARARs must be performed on a site-specific basis. The NCP and SARA do not provide across-the-board standards for determining whether a particular remedial action will produce an adequate remedy at a particular site. Rather, the process recognizes that each site will have unique characteristics that must be evaluated and compared to those applicable and relevant requirements that apply under the given circumstances. ARARs are defined as follows:

- Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal, state, or local law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site.

- Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal, state, or local law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at a CERCLA site.

It should be noted that the PICCO site has been classified under 40 CFR 300 as a CERCLA site in the National Priorities List (NPL).

For remedial actions performed under SARA, permits for compliance with relevant and appropriate regulations for on-site remedial actions are not required. However, CERCLA and SARA do require that the selected alternative meet relevant and appropriate regulatory standards or performance levels where possible, even though a permit is not required.

ARARs may be divided into the following categories:

- Chemical-specific requirements are health- or risk-based concentration limits or ranges in various environmental media for specific hazardous substances, pollutants, or contaminants. These limits may take the form of action levels or discharge levels.

- Location-specific requirements are restrictions on activities that are based on the characteristics of a site or its immediate environment. An example would be restrictions on wetlands development.

- Action-specific requirements are controls or restrictions on particular types of activities in related areas such as hazardous waste management or wastewater treatment. An example would be RCRA incineration standards. Because such requirements are triggered by the particular remedial alternative action considered, and the Feasibility Study (FS) evaluates a wide range of alternative actions, many different action-specific requirements may be applicable.

Based on discussions with U.S. EPA Region III and Pennsylvania Department of Environmental Resources (DER) and review of appropriate guidance documents (U.S. EPA 1988c, U.S. EPA 1989c), federal, state, and local ARAR sources were identified as listed in Table 2-1.

Based on these sources, Tables 2-2, 2-3, and 2-4 were developed which break down potential chemical-, location-, and action-specific ARARs from federal, state, and local ARAR sources, respectively. These tables indicate the following:

- Applicable law.
- Regulatory citation.
- Description.
- Indication if the ARAR is potentially applicable and/or relevant and appropriate (yes or no).
- Comment justifying the determination.

Subsections 2.3, 2.4, and 2.5 further discuss in detail the federal, state, and local ARARs respectively identified as potentially applicable and/or relevant and appropriate in terms of associated requirements.

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Table 2-1

Summary of ARAR Sources Evaluated

FEDERAL

- Resource Conservation and Recovery Act (RCRA)
- Clean Water Act (CWA)
- Safe Drinking Water Act (SDWA)
- Clean Air Act (CAA)
- Occupational Safety and Health Act
- Hazardous Materials Transportation Act
- Executive Order on Protection of Wetlands
- Executive Order on Floodplain Management
- Surface Mining Control and Reclamation Act
- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)
- Toxic Substances Control Act (TSCA)
- Marine Protection Research and Sanctuaries Act (MPRSA)
- National Historic Preservation Act
- Archeological and Historical Preservation Act
- Historic Sites, Buildings, and Antiquities Act
- Fish and Wildlife Coordination Act
- Endangered Species Act
- Coastal Zone Management Act
- Rivers and Harbors Act of 1899
- Wilderness Act
- National Wildlife Refuge System Act
- Wild and Scenic Rivers Act

STATE

- Pennsylvania Solid Waste Management Act
  (includes State hazardous waste management regulations)
- Pennsylvania Clean Streams Law
- Pennsylvania Safe Drinking Water Act
- Pennsylvania Air Pollution Control Act
- Pennsylvania Dam Safety and Encroachments Act
- Pennsylvania Stormwater Management Act
- Pennsylvania Game and Wildlife Code
- Pennsylvania Floodplain Management Act
- Pennsylvania Surface Mining Conservation and Reclamation Act
- Pennsylvania Bituminous Mine Subsidence and Land Conservation Act
- Pennsylvania Coal Refuse Disposal Control Act
- Pennsylvania Coal Mining Sealing Act

LOCAL

- West Elizabeth Sanitary Authority (WESA) Regulations
- Allegheny County Health Department (ACHD) Air Pollution Regulations
- Allegheny County Stormwater Management Plan

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Table 2-2

Analysis of Potential Federal ARARs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
I. Chemical-Specific ARARS				
A. Resource Conservation and Recovery/Act	42 U.S.C. 6901-6987			
1. Identification and Listing of Hazardous Waste	40 CFR Part 264.1	Defines those solid wastes which are subject to regulations as hazardous wastes under 40 CFR Parts 262-265 and Parts 124, 270, and 271.	Yes	Potentially applicable to remedial actions involving solid waste removal. Not applicable to wastes remaining in-place, as placement occurred prior to RCRA enactment.
2. Releases from Solid Waste Management Units	40 C.F.R. Part 264 Subpart F	Establishes maximum contaminant concentrations that can be released from hazardous waste units as part of RCRA groundwater protection standards (40CFR264.94).	No	Landfill operations ceased prior to RCRA enactment and therefore the landfill is not a hazardous waste unit.
B. Clean Water Act	33 U.S.C. 1251-1376			
1. Water Quality Criteria	40 CFR Part 131	Sets non-enforceable guidance for water quality of surface waters based on toxicity to aquatic organisms and human health. Used by states to establish water quality standards based on designated use.	Yes	Potentially applicable to remedial actions involving discharge of treated groundwater to the unnamed site stream.
2. Toxic Pollutants	40 CFR Part 129	Establishes effluent standards or prohibitions for certain "toxic pollutants" - aldrin/dieldrin, DDT, endrin, toxaphen, benzidene, PCBs.	No	Cited toxic pollutants not present at the PICCO site.

Table 2-2

Analysis of Potential Federal ARARs (continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
C. Safe Drinking Water Act	40 U.S.C. 300			
1. National Primary Drinking Water Standards	40 CFR Part 141	Establishes health-based enforceable standards for public water systems (maximum contaminant levels (MCLs).	Yes	Current limited use and future potential use of groundwater as a potable water supply.
2. National Secondary Drinking Water Standards	40 CFR Part 143	Establishes aesthetic-based non-enforceable guidelines for public water systems (secondary maximum contaminant levels) (SMCLs).	Yes	Current limited use and future potential use of groundwater as a potable water supply.
3. Maximum Contaminant Level Goals	40 CFR Part 141	Establishes non-enforceable drinking water quality goals (MCLGs) set at levels of no known or anticipated adverse health effects with an adequate margin of safety without consideration of available treatment technology or cost.	Yes	Current limited use and future potential use of groundwater as a potable water supply.
D. Clean Air Act	42 USC 7401			
1. National Emission Standards for Hazardous Air Pollutants (NESHAP)	40 CFR Part 61	Establishes emission standards for seven contaminants - benzene, mercury, arsenic, asbestos, beryllium, vinyl chloride, and radionuclides.	No	Only benzene is a concern for the PICCO site. However, the benzene standard only applies to chemical manufacturing, coke byproduct, and petroleum refining activities and not to hazardous waste sites.

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Table 2-2

Analysis of Potential Federal ARARs (continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
2. National Ambient Air Quality Standards (NAAQS)	40 CFR Part 50	Establishes ambient air quality standards for seven classes of pollutants - carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, and sulfur oxides. Standards do not apply directly to source-specific emissions, but rather are ambient concentration limitations.	No	Only "major sources" (emissions exceeding 100-250 tons per year of regulated pollutants) are subject to NAAQS attainment requirements.
II. Location-Specific ARARs				
A. Resource Conservation and Recovery Act	42 U.S.C. 6901-6987			
1. Siting Criteria for Hazardous Waste Treatment, Storage, and Disposal Facilities.	40 CFR 264.18	Establishes siting requirements for new RCRA hazardous waste treatment, storage, and disposal (TSD) facilities.	Yes	Potentially applicable if a TSD facility is set up on-site to manage removed RCRA hazardous waste. Not applicable to wastes remaining in-place as placement occurred prior to enactment of RCRA.
B. Clean Water Act	33 U.S.C. 1251-1376			
1. Dredge or Fill Requirements (Section 404)	40 CFR Parts 230-231	Requires permits for discharge of dredge or fill material into surface waters, including filling of wetlands.	Yes	Limited wetlands have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.

AR302820

Table 2-2

Analysis of Potential Federal ARARs
(continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
C. Executive Order on Protection of Wetlands	Executive Order No. 11,990 40 CFR 6.302(a) and Appendix A.	Requires consideration of the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands if a practical alternative exists.	Yes	Limited wetland areas have tentatively been identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.
D. Executive Order on Floodplain Management	Executive Order No. 11,988 40 CFR 6, Appendix A	Requires evaluation of the potential effects of actions which may be taken in a floodplain to avoid the adverse impacts associated with direct and indirect development of a floodplain.	No	The site is not located in a known or suspected floodplain as defined by FEMA.
E. Marine Protection Research and Sanctuaries Act	33 U.S.C.1401	Establishes requirement to protect designated marine sanctuaries.	No	The PICCO site is not located in or near any known or suspected marine sanctuaries.
F. National Historic Preservation Act	49 U.S.C. 470 40 CFR 6.301(b) 36 CFR Part 800	Requires action to take into account effects on properties included in or eligible for inclusion in the National Register of Historic Places.	No	The site is not known or suspected to contain properties included and/or eligible for inclusion in the National Register of Historic Places.
G. Archeological and Historical Preservation Act	16 U.S.C. 469 40 CFR 6.301(c)	Establishes procedures to provide for preservation of historical and archaeological data which might be destroyed through alteration of terrain.	No	The site is not known or suspected to contain historical and/or archaeological items.

AR302321

Table 2-2

Analysis of Potential Federal ARARs (continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
H. Historical Sites, Buildings and Antiquities Act	16 U.S.C. 461-467 40 CFR 6.301(a)	Requires consideration as to the existence and location of landmark on the National Registry of Natural Landmarks to avoid undesirable impacts on such landmarks.	No	The site is not known or suspected to contain landmarks on the National Registry of Natural Landmarks.
I. Fish And Wildlife Coordination Act	16 U.S.C. 661-666	Requires adequate provision for protection of fish and wildlife resources when any modification of any stream or other water body is proposed.	No	Unnamed site stream does not require modification.
J. Endangered Species Act	16 U.S.C. 1531 50 CFR Part 200 50 CFR Part 402	Requires action to conserve endangered species and/or critical habitats upon which endangered species depend.	No	The site is not known or suspected to contain endangered species.
K. Coastal Zone Management Act	16 U.S.C. 1451	Requires non-interference with designated coastal zone management.	No	The site is not located in or near a coastal zone.
L. Rivers and Harbors Act of 1899	33 U.S.C. 403			
1. Section 10 Permit	33 CFR Parts 320-330	Requires permit for structures or work in or affecting navigable waters.	No	No navigable waters are present on this site.
M. Wilderness Act	16 U.S.C. 1131 50 CFR 35.1	Administers federally-owned wilderness areas with intent to leave areas unimpacted.	No	The site is not located in a known or suspected federally-owned wilderness area.
N. National Wildlife Refuge System Act	16 U.S.C. 668	Restricts activities within a National Wildlife Refuge.	No	The site is not located in a known or suspected national Wildlife Refuge.

Table 2-2

Analysis of Potential Federal ARARs
(continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
O. Wild and Scenic River Act	16 U.S.C. 1271 40 CFR 6.302(e)	Prohibits adverse effects on a designated wild or scenic river.	No	No known or suspected wild or scenic rivers are located at the site.
III. Action-Specific ARARs				
A. Resource Conservation Recovery Act	42 U.S.C. 6901-6987			
1. Criteria for Classification of Solid Waste Disposal Facilities and Practices	40 CFR Part 257	Established criteria for use in determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on public health or the environment and thereby constitute prohibited open dumps.	No	Not applicable as landfill operations ceased prior to RCRA enactment.
2. Hazardous Waste Management Systems	40 CFR Part 260	Establishes procedure and criteria for modification or revocation of provisions in 40 CFR Part 260-265.	Yes	Not applicable as regulatory provisions are analyzed without modifications or revocation.
3. Standards Applicable to Generators of Hazardous Waste	40 CFR Part 262	Establishes standards for generators of hazardous wastes.	Yes	Potentially applicable to remedial actions involving removal of waste which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place, as placement occurred prior to enactment of RCRA.

AR302823

Table 2-2

Analysis of Potential Federal ARARs (continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
4. Standards Applicable to Transporters of Hazardous Waste	40 CFR Part 263	Establishes standards which apply to transporters of hazardous waste within the United States if the transportation requires a manifest under 40 CFR Part 262.	Yes	Potentially applicable to remedial actions involving removal of waste which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place, as placement occurred prior to enactment of RCRA.
5. Standard for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities	40 CFR Part 264	Establishes minimum national standards which define the acceptable management of hazardous wastes for owners and operators of facilities which treat, store, or dispose of hazardous wastes.	Yes	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed wastes which qualify as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to enactment of RCRA.
a. General Facility Standards	Subpart B	Establishes administrative regulations for TSD operations.	Yes	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed wastes which qualify as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to enactment of RCRA.

Table 2-2

Analysis of Potential Federal ARARs (continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
b. Preparedness and Prevention	Subpart C	Establishes design and operational requirements for TSD operations.	Yes	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed wastes which qualify as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to enactment of RCRA.
c. Contingency Plan and Emergency Procedures	Subpart D	Establishes regulations to minimize hazards to human health and the environment.	Yes	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed wastes which qualify as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to enactment of RCRA.
d. Manifest System, Recordkeeping, Reporting	Subpart E	Establishes regulations on manifesting.	Yes	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed wastes which qualify as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to enactment of RCRA.

Table 2-2

Analysis of Potential Federal ARARs (continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
e. Release from Solid Waste Management Units (SWMUs)	Subpart F	Establishes regulations for monitoring and responding to releases from SWMUs.	Yes	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed wastes which qualify as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to enactment of RCRA.
f. Closure and Post-Closure	Subpart G	Establishes regulations for owners and operators of hazardous waste management facilities.	Yes	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed wastes which qualify as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to enactment of RCRA.
g. Use and Management of Containers	Subpart I	Establishes regulations for owners and operators of hazardous waste facilities that store or treat waste in containers.	Yes	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed wastes which qualify as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to enactment of RCRA.

Table 2-2

Analysis of Potential Federal ARARs
(continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
h. Tanks	Subpart J	Establishes regulations for owners and operators of hazardous waste facilities that store or treat wastes in tanks.	Yes	Potentially applicable to remedial actions utilizing on-site T&D units to manage removed wastes which qualify as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to enactment of RCRA.
i. Surface Impoundments	Subpart K	Establishes regulations for owners and operators that use surface impoundments to treat, store, or dispose of hazardous waste.	No	Surface impoundments are not present at the site nor proposed for any remedial action.
j. Waste Piles	Subpart L	Establishes regulations for owners and operators that treat or store hazardous waste in piles.	Yes	Potentially applicable to remedial actions utilizing on-site T&D units to manage removed wastes which qualify as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to enactment of RCRA.
k. Land Treatment	Subpart M	Establishes regulations for owners and operators of hazardous waste land treatment facilities.	Yes	Potentially applicable to remedial actions utilizing on-site T&D units to manage removed wastes which qualify as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to enactment of RCRA.

Table 2-2

Analysis of Potential Federal ARARs (continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
l. Landfills	Subpart N	Establishes regulations for owners and operators of facilities that dispose of hazardous waste in landfills.	Yes	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed wastes which qualify as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to enactment of RCRA.
m. Incinerators	Subpart O	Establishes regulations for owners and operators of facilities that incinerate hazardous waste.	Yes	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed wastes which qualify as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to enactment of RCRA.
n. Process Vents	Subpart AA	Establishes air emissions standards for process vents of selected RCRA TSD treatment facilities.	Yes	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed wastes which qualify as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to enactment of RCRA.

Table 2-2

Analysis of Potential Federal ARARs
(continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
c. Equipment Leaks	Subpart BB	Establishes air emission standards for equipment leaks from RCRA TSD facilities.	Yes	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed wastes which qualify as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to enactment of RCRA.
6. Interim Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities	40 CFR Part 265	Establishes minimum national standards that define the acceptable management of hazardous waste during the period of interim status and until certification of final closure occurs, or, if the facility is subject to post-closure requirements, until post-closure responsibilities have been fulfilled.	No	Interim status not applicable as landfill operations ceased prior to RCRA enactment.
7. Standards for the Management of Specific Hazardous Waste and Specific Types of Hazardous Waste Management Facilities	40 CFR Part 266	Establishes requirements which apply to recyclable hazardous waste materials that are reclaimed.	Yes	Potentially applicable to remedial actions involving reclamation of recyclable wastes which qualify as hazardous under RCRA. May apply to recovered non-aqueous product.

Table 2-2

Analysis of Potential Federal ARARs (continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
8. Interim Standards for Owners and Generators of New Hazardous Waste Land Disposal Facilities	40 CFR Part 267	Establishes minimum standards that define acceptable management of hazardous wastes for new land disposal facilities during the period of interim status.	No	Interim status not applicable as landfill operations ceased prior to RCRA enactment (40 CFR 264 requirements are applicable).
9. Land Disposal Restrictions	40 CFR Part 268	Establishes restrictions on land disposal of hazardous wastes.	Yes	Potentially applicable to remedial actions involving removal of waste which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place, as placement occurred prior to enactment of RCRA.
10. Hazardous Waste Permit Program	40 CFR Part 270	Establishes provisions covering basic hazardous waste permitting requirements.	No	Formal permits not required for remedial action at CERCLA sites.
11. Underground Storage Tanks (USTs)	40 CFR Part 280	Establishes regulations related to USTs.	No	USTs are not present at the site and will not be used as part of any proposed remedial action.
B. Clean Water Act	33 U.S.C. 1251-1376			
1. National Pollutant Discharge Elimination System (NPDES)	40 CFR Part 125	Requires permit for effluent discharge from any point source into surface waters of the United States.	Yes	Potentially applicable to remedial actions involving discharge to the unnamed stream.

Table 2-2

Analysis of Potential Federal ARARs
(continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
2. Effluent Guidelines and Standards for the Point Source Category	40 CFR Part 401	Requires specific effluent characteristics for discharge under NPDES permits	No	No categorical standards established for hazardous waste sites.
3. National Pretreatment Standard	40 CRF Part	Sets standards to control pollutants which pass through or interfere with treatment processes in public treatment works which may contaminant sewage sludge.	Yes	Potentially applicable to current discharge of aqueous fraction of treated leachate into local POTWs.
C. Safe Drinking Water Act	40 U.S.C. 300			
1. Underground Injection Control (UIC) Regulations	40 CFR Parts 144-147	Provides for protection of underground sources of drinking water.	Yes	Potentially applicable to remedial actions involving re-injection of groundwater or injection of treatment chemicals.
D. Clean Air Act	42 U.S.C 7401			
1. New Source Performance Standards (NSPS)	40 CFR Part 60	Provides source-specific emissions standards for new sources of air emissions.	Yes	Potentially applicable to remedial actions involving incineration.
E. Occupational Safety and Health Act	29 U.S.C. 651-678 29 CFR 1910	Regulates workers' health and safety	Yes	Applicable to remedial actions at hazardous waste sites.
F. Hazardous Materials Transportation Act	49 U.S.C. 1801-1813			

Table 2-2

Analysis of Potential Federal ARARs
(continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
1. Hazardous Materials Transportation Regulations	40 CFR Parts 107, 171-177	Regulates transportation of DOT-defined hazardous materials.	Yes	Applicable to remedial action involving transportation of DOT-defined hazardous materials off-site.
G. Surface Mining Control and Reclamation Act	30 U.S.C. 1201 30 CFR Part 816	Establishes standards for surface coal mining operations.	No	The PICCO site is not an active surface coal mining operation.
H. Federal Insecticide, Fungicide, and Rodenticide Act	7 U.S.C. 136 40 CFR Part 165	Establishes management requirements for pesticide-containing wastes.	No	Pesticides are not present at the PICCO site.
I. Toxic Substances Control Act	40 CFR 761	Establishes management requirements for PCB-containing wastes.	No	PCBs are not present at the PICCO site.

Table 2-3

Analysis of Potential State ARARs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
I. Chemical-Specific ARARs				
A. PA Solid Waste Management Act	35 PS 6018.101-6018.1003			
1. Identification and Listing of Hazardous Waste	25 PA Code Chapter 75.261	Defines those solid wastes which are subject to state regulation as a hazardous waste. Consistent with corresponding federal standards (characteristic and listed hazardous waste designations).	Yes	Potentially applicable to remedial actions involving solid waste removal. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment.
B. PA Clean Streams Law	35 PS 691.1-691.1001			
1. Water Quality Criteria including Toxic Management Strategy	25 PA Code Chapters 16 and 93	Establishes acceptable water quality-related parameters in state surface water.	Yes	Potentially applicable to remedial actions involving discharge of treated groundwater into the unnamed site stream.
C. PA Safe Drinking Water Act	35 PS 721.1-721.17 25 PA Code Chapter 109	Establishes criteria for protection of state public water supplies. Cited by reference current corresponding federal standards (MCLs, MCLGs, and SMCLs).	Yes	Current limited use and potential future use of groundwater as a potable water supply.
D. PA Air Pollution Control Act	35 PS 4001-4015			

Table 2-3

Analysis of Potential State ARARs (continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
1. Emission Standards for Hazardous Air Pollutants	25 PA Code Chapter 124	Adopts by reference federal emissions standards (NESHAP) for seven contaminants - benzene, mercury, arsenic, asbestos, beryllium, vinyl chloride, and radionuclides.	No	Only benzene is a concern for the PICCO site. However, the benzene standard only applies to chemical manufacture coke byproduct and petroleum refining activities, not to hazardous waste sites.
2. PA Ambient Air Quality Standards (PAAQS)	25 PA Code Chapter 131	Adopts federal ambient air quality standards (NAAQS) for seven classes of pollutants - Carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, and sulfur oxides. Also sets Pennsylvania-specific standards for settled particulates, beryllium, sulfates, fluorides, and hydrogen sulfide.	No	Only "major sources" (emissions exceeding 100-250 tons per year of regulated pollutants) are subject to PAAQS attainment requirements.
II. Location-Specific ARARs				
A. PA Solid Waste Management Act	35 PS 6018.101-6018.103			
1. Siting Criteria for Hazardous Waste Treatment and Disposal Facilities	25 PA Code Chapter 75 Subchapter F	Establishes state siting criteria for new hazardous waste treatment and disposal facilities.	Yes	Potentially applicable if a treatment and/or disposal facility is set up on-site to manage removed hazardous waste.

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AR302835

Table 2-3

Analysis of Potential State ARARs (continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
B. PA Dam Safety and PA Waterway Management Act	32 PS 693.1 et seq.	Establishes state criteria for protection of wetlands.	Yes	Limited wetland areas have been tentatively identified at the site. Potentially applicable to remedial actions that may require filling of wetlands.
C. PA Flood Plain Management Act and PA Dam Safety and Waterway Management Act	32 PS 679.101 et seq. and 32 PS 693.1 et seq.	Establishes state criteria for protection of floodplains.	No	The site is not located in a floodplain as defined by FEMA.
D. PA Game and Wildlife Code	34 PS 101 et seq.	Allows the State Game Commission to protect, propagate, manage, and preserve game fur-bearing animals and birds through management of lands for public hunting.	No	The site is private property and is not a public land designated for hunting activities.
III. Action-Specific ARARs				
A. PA Solid Waste Management Act	35 P.S. 6018.101-6018.1003			

Table 2-3

Analysis of Potential State ARARs (continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
1. Residual (Non-Hazardous Solid) Waste Management	25 PC 75 Subchapter C	Establishes state-level comprehensive residual waste management system.	Yes	Potentially applicable to remedial actions involving removal of wastes that qualify as residual waste. Not applicable to wastes remaining in-place, as placement occurred prior to regulatory enactment.
2. Hazardous Waste Management	25 PC 75 Subchapter D	Establishes state-level version of comprehensive hazardous waste management system.	Yes	Potentially applicable to remedial actions involving removal of wastes that qualify as hazardous wastes. Not applicable to wastes remaining in-place, as placement occurred prior to regulatory enactment. Section 2.4.1.2 presents a comparison of state versus federal requirements for hazardous waste management.
B. PA Clean Streams Law	35 PS 691.1-691.1001			
1. Water Quality Management (WQM) Program	25 PA Code Chapter 92	Requires permit for discharge of effluent from point sources into surface waters. State-level version of federal NPDES program.	Yes	Potentially applicable to remedial actions involving point source discharges to surface waters.
2. Wastewater Treatment Requirements	25 PA Code Chapter 95	Establishes basic wastewater treatment requirements for effluent discharge.	Yes	Potentially applicable to remedial actions involving point source discharges.

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Table 2-3

Analysis of Potential State ARARs (continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
3. Industrial Wastes	25 PA Code Chapter 97	Establishes standards for industrial waste discharges.	Yes	Potentially applicable to remedial actions involving point source discharges.
4. Erosion Control	25 PA Code Chapter 102	Establishes erosion and sedimentation control measures for earth-moving activities.	Yes	Potentially applicable to remedial actions involving earth moving.
C. PA Air Pollution Control Act	35 PS 4001-4015			
1. Standards for Contaminants	25 PA Code Chapter 123	Establishes state source-specific emissions limitations for particulate matter, sulfur compounds, odor, and opacity.	Yes	Potentially applicable to remedial actions involving air emissions, principally incineration.
2. New Source Performance Standards	25 PA Code Chapter 122	Adopts by reference federal sources specific emissions standards for new sources of air emissions.	Yes	Potentially applicable to remedial actions involving incineration.
3. Standards for Sources of VOCs	25 PA Code Chapter 129	Establishes state standards for storage tanks containing VOCs.	Yes	Potentially applicable to remedial actions utilizing storage tanks for VOC-containing wastes.
D. PA Dam Safety and Waterway Management Act	32 P.S. 693.1 et seq.			
1. Outfall Structures	25 PA Code Chapter 105	Establishes criteria on discharge outfall structures to streams.	Yes	Potentially applicable to remedial actions involving point source discharges to streams.

Table 2-3

Analysis of Potential State ARARs (continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
2. Dams	25 PA Code Chapter 105	Establishes standards for dams.	No	No dams (as defined under the regulations) present at the site or proposed under potential remedial alternatives.
E. PA Stormwater Management Act	32 PS 680.1 et seq.	Requires counties to adopt a stormwater management plan for each watershed located within its boundaries. Individual project stormwater management plans are to be developed in accordance with the county watershed-wide stormwater management plan.	Yes	Potentially applicable to remedial actions requiring stormwater management.
F. PA Surface Mining Conservation and Reclamation Act	52 PS 1396.1 et seq. 25 PA Code Chapter 87	Establishes standards for surface coal mining operations.	No	The PICCO site is not an active surface coal mining operation.
G. PA Bituminous Mine Subsidence and Land Conservation Act	52 PS 1406.1 et seq. 25 PA Code Chapter 89	Establishes standards for subsurface coal mining operations.	No	The PICCO site is not an active subsurface coal mining operation.
H. PA Coal Refuse Disposal Control Act	52 PS 30.51 et seq. 25 PA Code Chapter 90	Establishes standards for active coal refuse disposal sites.	No	The PICCO site is not an active coal mining operation.

Table 2-3

Analysis of Potential State ARARs
(continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
1. PA Coal Mine Sealing Act	52 PS 28.1 et seq.	Requires that openings in abandoned coal mines be sealed to prevent water pollution and access by people and animals. "Mine sealing" is defined as "the closing of openings to permit the outflow of water that may accumulate therein while simultaneously preventing the flow of appreciable quantities of air into the mine."	No	The PICCO site does not contain mine openings that are not "sealed" as defined by this Act.

AR302839

Table 2-4

Analysis of Potential Local ARARs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
I. Chemical-Specific ARARS				
A. ACHD Air Pollution Control Regulations	Article XX County Ordinance 16782			
1. Allegheny County Ambient Air Quality Standards	Paragraph 109	Establishes ambient air quality standards that match state-cited standards. The standards do not apply directly to source-specific emissions, but rather are ambient concentration limitations.	No	Only "major sources" (emissions exceeding 100-250 tons per year of regulated pollutants) are subject to attainment requirements.
2. Allegheny County Emission Standards for Hazardous Air Pollutants	Paragraph 515	Adopts by reference federal emission standards (NESHAP) for seven contaminants - benzene, mercury, arsenic, asbestos, beryllium, vinyl chloride, and radionuclides.	No	Only benzene is a concern for the PICCO site. However, the benzene standard only applies to chemical manufacturing, coke byproduct, and petroleum refining activities and not to hazardous waste sites.
II. Location-Specific ARARs				
None Identified				
III. Action-Specific ARARs				
A. WESA Pretreatment Effluent Limitations	WESA - Hercules Effluent Limitations Agreement.	Establishes acceptable levels on discharge to the WESA POTW.	Yes	Aqueous portion of leachate currently being discharged in accordance with the effluent limitations agreement.

Table 2-4

Analysis of Potential Local ARARs (continued)

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable and/or Relevant and Appropriate (Yes/No)	Justification Comments
B. ACHD Air Pollution Control Regulations	Article XX County Ordinance 16782			
1. Air Emission Standards	Paragraphs 401-404, 517	Establishes source-specific air emission levels for particulate matter, sulfur compounds, odor, and opacity. Standards similar but are not identical to state standards - see Subsection 2.3.2. for details.	Yes	Potentially applicable to remedial actions producing air emissions, principally incineration.
2. Waste-Derived Liquid Fuel Standards	Paragraph 1002	Establishes regulations for waste derived liquid fuels.	Yes	Applicable to current practice of utilizing recovered non-aqueous product as a fuel under ACHD permit.
3. New Source Performance Standards	Paragraph 514	Adopts by reference federal source-specific emission standards for new sources of air emissions.	Yes	Potentially applicable to remedial actions involving incineration.
4. Standards for Sources of VOCs	Paragraph 507	Establishes standards for storage tanks containing VOCs matching state-cited standards.	Yes	Potentially applicable to remedial actions utilizing storage tanks for VOC-containing wastes.
C. Allegheny County Stormwater Management Regulations	Allegheny County Stormwater Management Plan (Note: Not yet published; currently in preparation.)	As mandated under the PA Stormwater Management Act, establishes stormwater management regulations.	Yes	Potentially applicable to remedial actions requiring stormwater management.

In addition to legally binding laws and regulations addressed above, other federal and state environmental and public health programs may also develop criteria, advisories, guidance, and non-promulgated policy statements that are not legally binding, but are identified for appropriate consideration in development and evaluation of remedial alternatives.

These "To Be Considered" (TBC) materials are not potential ARARs but are evaluated as appropriate along with ARARs. Section 2.6 addresses TBCs identified for the PICCO site.

2.3 FEDERAL ARARs

Federal ARAR sources found to be potentially applicable to the PICCO site are discussed below and consist of:

- Resource Conservation and Recovery Act (RCRA)
- Clean Water Act (CWA)
- Safe Drinking Water Act (SDWA)
- Clean Air Act (CAA)
- Occupational Safety and Health Act (OSHA)
- Hazardous Materials Transportation Act
- Wetlands Protection (Executive Order 11,990)

WESTON

2.3.1 Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) (42 USCA 6901 et seq.) mandated EPA to:

- Under Subtitle C, establish a comprehensive regulatory program to control and manage hazardous waste.
- Under Subtitle D, promulgate regulations containing guidelines to assist in the development and implementation of state nonhazardous solid waste management plans.
- Under Subtitle I, establish a comprehensive regulatory program to address underground storage tanks (USTs).

Discussion of the Pennsylvania Solid Waste Management Act and associated hazardous and nonhazardous solid waste regulatory requirements is presented in Subsection 2.4.1. The remainder of this subsection provides discussion of hazardous waste-related regulatory requirements promulgated under Subtitle C of RCRA. In addition, Subtitle I regulatory requirements for USTs are also addressed under the discussion presented for tank systems.

RCRA requirements with regard to hazardous waste management may be applicable to the PICCO site because some of the waste material contained in the landfill at the site may potentially qualify as a RCRA characteristic hazardous waste under EPA's recently enacted Toxicity Characteristic (TC) regulations (Federal Register, Vol. 55, No. 61, p. 11,798) that became effective 25 September 1990. A specific constituent of concern for this site is benzene, which has a TC regulatory level of 0.5 mg/L based on the specified Toxicity Characteristic Leaching Procedure (TCLP). Sampling of the waste material during the remedial investigation (RI) yielded total benzene levels averaging 134 mg/kg with a maximum of 290 mg/kg. Depending upon its leachability characteristics, the waste material may yield benzene levels above 0.5 mg/L if subjected to TCLP testing. It should be noted that due to its recent enactment, TCLP testing was not included in the approved RI/FS Work Plan.

In addition, recent (March 1991) testing (as reported in Table 1-6) of the separated non-aqueous ("oil") fraction of landfill leachate recovered via the interceptor trench revealed that it qualifies as a characteristic RCRA hazardous waste. The RCRA characteristics of concern are ignitability (less than 140 °F flashpoint) and leachable benzene (greater than 0.5 mg/L based on TCLP testing).

In general, RCRA regulations apply to the management of RCRA hazardous wastes and RCRA management (TSD) facilities. That is, RCRA applies to hazardous waste activities subsequent to the effective date of RCRA regulations. For example, hazardous wastes which may have been disposed of in facilities like the PICCO Resin Landfill, which closed in 1964 prior to the enactment in 1976 of RCRA, do not have to be excavated, treated, and redisposed of to satisfy RCRA requirements. However, wastes that are removed from closed facilities like the PICCO Resin Landfill are subject to RCRA waste classification and must meet RCRA standards with respect to proper management, treatment, and disposal. Therefore, although the waste materials were disposed of in the PICCO Resin Landfill well before the effective date of RCRA, RCRA regulations may be considered applicable for those materials targeted for removal which qualify as a RCRA hazardous waste.

Regulations promulgated under RCRA generally provide the basis for management of hazardous waste and establish technology-based requirements for hazardous waste facilities. RCRA facility design standards may also be consulted if considered relevant and appropriate for wastes other than RCRA hazardous wastes containing significant concentrations of hazardous constituents.

2.3.1.1 Chemical-Specific Requirements

Hazardous waste identification under RCRA is detailed within 40 CFR 261. The two basic classifications of RCRA hazardous waste are:

- Listed hazardous wastes (defined under Subpart D of 40 CFR 261), which involve specific identification of the following regulatory listings:

- Hazardous Waste from Nonspecific Sources (F - series wastes listed under 40 CFR 261.31).

- Hazardous Waste from Specific Sources (K - series wastes listed under 40 CFR 261.32).

- Commercial Chemical Products (P - and U - series wastes listed under 40 CFR 261.33).

- Characteristic hazardous wastes (defined under Subpart C of 40 CFR 261), which involve evaluation of the following general waste characteristics:

  - Ignitability (D001 waste)
  - Corrosivity (D002 waste)
  - Reactivity (D003 waste)
  - Toxicity (D004 - D043 wastes) due to specific chemical compounds

If a waste is not a listed hazardous waste, it may still be a hazardous waste if it meets any of the four characteristics cited above; these characteristics can be determined by specific tests cited in the regulations. Alternatively, if knowledge of the source or properties of a waste indicates that it may have any of these characteristics, the material can be declared hazardous without being tested.

The PICCO Resin Landfill was utilized between 1950 and 1964 for disposal of resin cakes, polymerized oils, and filter materials from a resins manufacturing process. A review of the RCRA regulations indicate that such wastes are not specifically identified in one of the listed hazardous waste classifications. Therefore, it does not appear that RCRA listed wastes were disposed at the landfill. However, based on sampling results from the RI, some of this waste material can potentially fall under a characteristic hazardous waste designation of D018 waste for benzene toxicity, which as previously noted has a TC regulatory level of 0.5 mg/L based on TCLP testing. No TCLP testing has been done on the landfill waste material but benzene levels up to 290 mg/kg were found in the waste material during the RI. Depending upon its leachability characteristics, the waste material may yield benzene levels above 0.5 mg/L if subjected to TCLP testing.

It should be noted that in addition to the waste material itself, the RCRA hazardous waste designation can also apply to collected landfill leachate if it exceeds the TC benzene level under TCLP testing.

Recent (March 1991) testing (as reported in Table 1-6) of the separated non-aqueous ("oil") fraction of landfill leachate recovered via the interceptor trench revealed that it qualifies as a characteristic RCRA hazardous waste. The RCRA characteristics of concern are D001, ignitability (less than 140 °F flashpoint) and D018, leachable benzene (greater than 0.5 mg/L based on TCLP testing).

2.3.1.2 Location-Specific Requirements

Location-specific ARARs within RCRA are location standards detailed under 40 CFR 264.18 that are potentially applicable to the siting of a new on-site TSD unit managing RCRA hazardous waste as part of a remedial alternative.

These location standards are specified and addressed as follows:

- Seismic considerations restricting TSD facilities within 200 ft of a fault that has had a displacement within Holocene time. As the PICCO Resin Landfill site is not located in the political jurisdictions listed in Appendix VI of 40 CFR 264, such an on-site facility would be in compliance with this requirement as per 40 CFR 270.14(b)(11).

- Floodplains requiring TSD facilities located within a 100-year floodplain to be designed, constructed, operated, and maintained to prevent washout (the movement of hazardous waste from the active portion of the facility as a result of flooding). The PICCO Resin Landfill site is not within a 100-year floodplain as established by the Federal Emergency Management Agency (FEMA). As such, an on-site facility would be in compliance with this requirement.

- Salt dome formations, salt bed formations, underground mines and caves prohibiting placement of noncontainerized or bulk liquid hazardous waste in such locations. This requirement would prohibit use of the underground mine voids identified at the PICCO Resin Landfill site for use in waste disposal.

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2.3.1.3 Action-Specific Requirements

Potentially applicable action-specific ARARs for management of hazardous waste under RCRA include the following, which are individually addressed in the following subsections:

- Recycling/reclamation.
- Incineration.
- Land disposal restrictions.
- Landfilling.
- Tank management.
- Container management.
- Land Treatment.
- Waste Piles.
- Generator requirements.
- Transporter requirements.
- TSD facility requirements.

The first eight items cover highly specific actions.

Each of these actions was identified as potentially relevant for consideration in the various proposed remedial alternatives for management of materials qualifying as RCRA hazardous wastes at the PICCO Resin Landfill site.

The first eight items represent specific waste management action requirements, while the final three items represent general waste management action requirements depending upon facility classification as a generator, transporter, or TSD facility.

2.3.1.3.1 Recycling/Reclamation

Recycling/reclamation of the non-aqueous phase portion of landfill leachate via burning for energy recovery (i.e., use as a fuel) is a remedial action under consideration for the PICCO Resin Landfill site. Since the waste material contains high levels of benzene (up to 290 mg/kg), leachate from the landfill (particularly the separated non-aqueous portion) could contain benzene above the RCRA hazardous waste criteria of 0.5 mg/L under TCLP testing. To specifically address this issue, recent (March 1991) testing was performed (as reported in Table 1-6) on the separated non-aqueous ("oil") fraction of landfill leachate recovered via the interceptor trench. This testing revealed that the "oil" qualifiers as a characteristic RCRA hazardous waste. The RCRA characteristics of concern are ignitability (less than 140 °F flashpoint) and leachable benzene content (greater than 0.5 mg/L based on TCLP testing). Therefore, RCRA recycling/reclamation regulations qualify as potential ARARs.

Recycling/reclamation of a RCRA hazardous waste is regulated under 40 CFR 266. Of particular interest is Subpart D, Hazardous Waste Burned for Energy Recovery. The regulations of this subpart apply to RCRA hazardous waste fuels that are burned for energy recovery in any boiler or industrial furnace that is not considered an incinerator.

A "boiler" is defined under 40 CFR 260.10 as an enclosed device using controlled flame combustion that has the following characteristics:

- Physical provisions for recovering and exporting thermal energy.
- Combustion chamber and primary energy recovery section(s) that are of integral design (e.g., facilities with waste heat recovery boilers attached to an incinerator are not boilers).
- Maintenance of, at a minimum, 60% thermal recovery efficiency.
- Exportation and utilization of at least 75% of the recovered energy (no credit is allowed for recovered heat used for internal uses such as preheating of combustion air or fuel, or driving combustion air fans or feedwater pumps).

An industrial furnace is defined under 40 CFR 260.10 as an enclosed device using controlled flame combustion to recover or produce materials or energy as an integral component of a manufacturing process (such as a cement kiln).

Finally, an incinerator is defined under 40 CFR 260.10 as any enclosed device using controlled flame combustion that neither meets the classification criteria for boilers or industrial furnaces. Under its "sham recycling" policy (48 FR 11157, 16 March 1983), EPA considers

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any hazardous waste with less than 5,000-8,000 Btu/lb heating value, as generated, to be incinerated rather than recycled/recovered. Therefore, any enclosed device using controlled flame combustion that burns such low heating value waste is considered to be an incinerator.

Under Current Subpart D regulations:

- Generators of RCRA hazardous waste fuel are subject to 40 CFR 262, Standards Applicable to Generators of Hazardous Waste. These requirements are outlined under Subsection 2.3.1.3.9.

- Transporters of RCRA hazardous waste fuel are subject to 40 CFR 263, Standards Applicable to Transporters of Hazardous Waste. These requirements are outlined under Subsection 2.3.1.3.10.

- Burners of RCRA hazardous waste fuel are subject to either applicable accumulation (up to 90 days) regulations (40 CFR 262.34) or storage (beyond 90 days) regulations (40 CFR 264, Subpart I for container storage). RCRA container management regulations are further discussed under Subsection 2.3.1.3.6.

EPA has previously published a proposed rule (52 FR 16982, 6 May 1987) entitled "Burning of Hazardous Waste in Boilers and Industrial Furnaces," along with a subsequent supplement to the proposed rule (54 FR 43718, 26 October 1989) with the final rule being recently issued (56FR 7134, 21 February 1991). Under the final rule scheduled to take effect in 21 August 1991, 40 CFR 266, Subpart D regulations would be expanded to regulate the burning of hazardous waste fuels in boilers and industrial furnaces. The rule would:

- Establish site-specific emission limits for 10 individual toxic metals (40 CFR 266.106). Emissions of carcinogenic metals (arsenic, beryllium, cadmium, and hexavalent chromium) are limited based on a 1 in 100,000 risk level. Emissions of non-carcinogenic metals (antimony, barium, lead, mercury, silver, and thallium) are limited to conservative levels designed to prevent adverse health effects.

- Establish site-specific risk-based emission limits for hydrogen chloride (HCl) and chlorine gas (40 CFR 266.107).

- Limit carbon monoxide (CO) emissions to a de minimis level (100 ppm by volume) to ensure high-combustion efficiency as a means to limit residual organic emissions commonly referred to as products of incomplete combustion (PICs) (40 CFR 266.104).

- Establish a 99.99% destruction and removal efficiency (DRE) requirement for each principal organic hazardous constituent (POHC) as currently required for incinerators (40 CFR 266.104).

- Limit emissions of particulate matter to 0.08 grains per day cubic foot of flue gas as currently required for incinerators (40 CFR 266.105).

These emission control regulations closely match those proposed in April 1990 for incinerators, as discussed in Subsection 2.3.1.3.2. In fact, EPA notes in its proposed rule for incinerators that it seeks to establish regulations to ensure that combustion controls and emission standards are identical for boilers, industrial furnaces, and incinerators. As such, the distinction between thermal treatment units becomes unimportant. Therefore, the final rule for boilers or industrial furnaces would apply regardless of whether the waste burned meets the minimal energy value of 5,000-8,000 Btu/lb cited in the EPA sham recycling policy (i.e., the final rule would supersede this policy).

The final boiler and industrial furnace rule does provide for a small quantity on-site burner exemption from the emission control regulations (40 CFR 266.108) if the following criteria are met:

- Quantity burned does not exceed specified limits based on the effective stack height of the device (in no case can it exceed 1,900 gallons per month).

- The maximum hazardous waste firing rate would be limited to 1% of the total fuel feed on a volume basis.

- The waste has a minimum heating value of 5,000 Btu/lb as generated.

2.3.1.3.2 Incineration

Incineration of landfilled waste material is a remedial action under consideration for the PICCO Resin Landfill site. Since the waste material may qualify as a RCRA hazardous waste as previously discussed, RCRA regulations governing incineration represent potential ARARs.

Incineration of a RCRA hazardous waste is regulated under 40 CFR 264, Subpart O. These regulations include provisions for:

- Waste feed analysis (40 CFR 264.341).
- Operating requirements (40 CFR 264.345). This includes a control of fugitive emissions either by keeping the combustion zone totally sealed or maintaining a combustion zone pressure lower than atmospheric pressure. In addition, an automatic cutoff system must be provided to stop the waste feed when operating conditions deviate from design conditions.
- Monitoring and inspections (40 CFR 264.347). This includes monitoring of the following operating parameters:
  - Combustion temperature
  - Waste feed rate
  - Combustion gas velocity
  - Carbon monoxide (CO) emissions
- Closure with disposal of all hazardous waste and residues, including ash, scrubber water, and scrubber sludge (40 CFR 264.351).
- Compliance with additional general TSD facility requirements (see Subsection 2.3.1.3.11).

In addition, the regulations set performance standards for incineration (40 CFR 264.342 and 343), which include:

- Achieving a destruction and removal efficiency (DRE) of 99.99% for each POHC in the waste feed.
- Reducing hydrogen chloride emissions to 1.8 kg/hr or 1% of the hydrogen chloride (HCl) in the stack gas before entering any pollution control device.
- Not releasing particulate matter in excess of 180 mg/m^3, corrected for the amount of oxygen in the stack gas.

The ability to meet these performance standards must be demonstrated during a trial burn period.

With respect to these performance standards, the EPA has recently proposed revisions to the RCRA Standards for Owners and Operators of Hazardous Waste Incinerators (40 CFR Parts 260, 261, 264, and 270). Under the proposed rule (55 FR 17862, 27 April 1990), the EPA would amend the hazardous waste incinerator regulations to improve control of toxic metal emissions, HCl emissions, and residual organic emissions.

With respect to toxic metals, at present, toxic metal emissions from incinerators are controlled indirectly by the 180 mg/m^3 limitation on particulate matter. Under some conditions, the particulate standard may not sufficiently control toxic metals to ensure adequate protection of human health based on EPA risk assessments. Therefore, proposed revisions would establish risk-based emission limits for individual toxic metals (Appendix VIII of 40 CFR Part 261). The limits would be calculated retroactively from ambient levels that the EPA believes poses acceptable health risks. To simplify this process, EPA has developed conservative screening limits based on terrain and effective stack height. If the screening limits are not exceeded, emissions do not pose unacceptable risk. However, if the screening limits are exceeded, site-specific dispersion analysis would be required to demonstrate that emissions would not result in an exceedance of acceptable ambient levels.

With respect to HCl emissions, as previously noted, EPA's present standard for control of acid gas requires that the rate of emission of HCl be no greater than the larger of 1.8 kg per hour or 1% of the HCl in the stack gas before entering any pollution control device. EPA believes that this standard may not be protective of public health in some instances. Thus, EPA is proposing to regulate HCl under the same risk-based approach proposed for metals. The risk-based controls would be used on a case-by-case basis to ensure that the existing technology-based standard is protective.

Finally, with respect to residual organic emissions, existing regulations control organic emissions by the DRE standard previously noted. This standard limits stack emissions of

POHCs to 0.01% of the quantity of the POHC fed to the incinerator. The standard considers a POHC to be destroyed (or removed in ash or scrubber water) if it is not present in the stack emissions. EPA's concern is that although the POHC itself may not be present at significant levels, PICs may be present at levels that could pose significant health risk. The complete combustion of all hydrocarbons to produce only water and carbon dioxide is theoretical and could occur only under ideal conditions. However, real-world combustion systems (e.g., incinerators) virtually always produce PICs, some of which could be toxic.

EPA believes that requiring incinerators to operate at high-combustion efficiency is a prudent approach to minimize the potential health risk posed by PIC emissions. Given that stack gas CO is a conventional indicator of combustion efficiency and a conservative indicator of combustion upsets (i.e., poor combustion conditions), proposed revisions would limit CO emissions to a de minimis level (100 ppm by volume) that ensures high-combustion efficiency and low unburned hydrocarbon emissions. In cases where the de minimis CO limit is exceeded, the owner or operator would be required to demonstrate that higher CO levels would not result in high hydrocarbon emissions.

2.3.1.3.3 Land Disposal Restrictions

Land disposal is defined to include, but not be limited to, any placement of a RCRA hazardous waste in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome or salt bed formation, or underground mine or cave. As a result, RCRA land disposal restrictions would apply at the PICCO Resin Landfill site to any RCRA hazardous waste removed and placed outside of the present Area of Contamination (AOC) or to an off-site TSD facility. At this time it has not been concluded that RCRA hazardous waste is present on-site but the possibility does exist. Therefore, land disposal restriction regulations are considered potential ARARs.

Land disposal of a RCRA hazardous waste is regulated under 40 CFR 268. As directed under SARA, EPA must promulgate treatment standards for all hazardous wastes. Established treatment standards are presented under Subpart D of 40 CFR 268. Wastes that meet these treatment standards may be directly land disposed. Wastes that do not meet these standards must be treated to meet the corresponding standard before they are placed in a land disposal unit. The treatment standards are expressed as either:

- A concentration level to be achieved (performance-based) utilizing any available technology to meet the standard.
- A specified Best Demonstrated Available Technology (BDAT) that must be used (technology-based).

Hazardous wastes that do not meet the treatment standards are prohibited from land disposal under Subpart C of 40 CFR 268. Furthermore, under Subpart E of 40 CFR 268, the following prohibitions are placed on storage of such restricted wastes:

- Generators may store such wastes in tanks or containers on-site solely for the purpose of the accumulation of such quantities of hazardous waste as necessary to facilitate proper recovery, treatment, or disposal. Requirements for generators are discussed under Subsection 2.3.1.3.9.
- TSD facilities may store such wastes in tanks or containers solely for the purpose of the accumulation of such quantities of hazardous waste as necessary to facilitate proper recovery, treatment, or disposal. Requirements for TSDs are discussed under Subsection 2.3.1.3.11.

As previously noted, the new TCLP rule identifying TC wastes became effective 25 September 1990. Under HSWA, any waste such as the TC wastes designated as hazardous after 8 November 1984 is considered "newly identified". Furthermore, Hazardous and Solid Waste Admendments (HSWA) mandate that EPA establish land disposal-related treatment standards within 6 months following the identification of the waste as hazardous. Therefore, treatment standards for the TC wastes were required to be established by 25 March 1991. At the date of this publication, however, EPA has not yet proposed treatment standards for the TC wastes.

Based upon standards promulgated for other characteristic wastes (40 CFR 268.40-44), including the former EP toxic waste category, the anticipated treatment standard is at the threshold level that caused the waste to be listed as a characteristic hazard (in this case, the TC value). Therefore, the anticipated treatment standard to be met to allow land disposal of a TC-benzene waste is 0.5 mg/L based on TCLP testing.

2.3.1.3.4 Landfilling

As previously noted, RCRA applies to hazardous waste activities conducted after the effective date of RCRA regulations. As such, RCRA landfill requirements do not apply to facilities closed prior to enactment of RCRA, such as the PICCO Resin Landfill site. However, any RCRA hazardous waste removed from the closed landfill and subsequently re-landfilled as a RCRA hazardous waste would be subject to RCRA landfilling regulations, as well as land disposal restrictions as discussed under Subsection 2.3.1.3.3.

Landfilling of an RCRA hazardous waste is regulated under 40 CFR 264 Subpart N. These regulations include provisions for:

- Design and operating requirements (40 CFR 264.301).
- Monitoring and inspection (40 CFR 264.303).
- Operation and Maintenance (40 CFR 304)
- Surveying and recordkeeping (40 CFR 264.309).
- Closure and post-closure care including installation of a final cover. (40 CFR 264.310).
- Special requirements for various specific wastes (40 CFR 264.312-317).
- Compliance with additional general TSD facility requirements (see Subsection 2.3.1.3.11).

General performance standards are outlined under design and operating requirements. Liner system performance standards include:

- Design, construction, and installation of liners to prevent migration of wastes out of the landfill to the adjacent soil or subsurface soil or groundwater during the active life of the landfill.
- Use of double liner construction.
- Use of materials that have appropriate chemical properties and sufficient strength to prevent failure.
- Placement upon a base that provides support to the liner.
- Use of installation methods that will cover all earth likely to be in contact with the waste or leachate.

Leachate collection and removal system performance standards include:

- Design, construct, maintain, and operate to collect and remove any leachate from the landfill.
    - Use dual system construction (both above and between the liners).
    - Ensure liner is chemically resistant to the waste managed or leachate expected in the landfill.
    - Ensure liner is of sufficient strength and thickness to prevent collapse under the pressure exerted by the overlying waste.
    - Design and operate to prevent clogging through the scheduled landfill closure.

Other design and operating requirements include:

- Run-on and run-off control systems capable of handling the peak flow from a 25-year storm.
- Control wind dispersal of particulates.

In addition to the Subpart N requirements, a groundwater monitoring program to detect potential releases from landfills is specified under 40 CFR 264.91 - 264.100.

2.3.1.3.5 Tank Management

Landfill leachate management at the site currently involves collection of the leachate by an interceptor trench (installed at the toe of the landfill in 1983) with the leachate routed through an oil/water separation treatment system. As previously discussed, since the waste material contains high levels of benzene, leachate from the landfill (particularly the non-aqueous portion) could contain benzene above the RCRA hazardous waste criteria of 0.5 mg/L based on TCLP testing. Therefore, RCRA hazardous tank management regulations qualify as potential ARARs for the oil/water separator.

In addition, as the existing oil/water separator is located partially underground, RCRA UST regulations also qualify as potential ARARs (USTs include tanks with at least 10% total volume below groundwater surface).

With respect to both RCRA hazardous waste and UST regulations, exemptions are cited (40 CFR 264.1, 265.1, and 280.10) for "any wastewater treatment tank system which is a part of wastewater treatment facility regulated under section 402 or 307(b) of the Clean Water Act." Therefore, since the oil/water separator represents a wastewater treatment tank system which is regulated under 307(b) of the CWA (pretreatment regulations, as discussed in Subsection 2.3.2 and 2.4.2), those RCRA tank regulations are not strictly applicable to the oil/water separator at the PICCO site.

If other tanks are utilized for proposed remedial action at the site, treatment of a RCRA hazardous waste in tank systems is regulated under 40 CFR 264, Subpart J, which also governs storage (greater than 90 days) of RCRA hazardous waste in tank systems. New RCRA tank treatment and/or storage systems (i.e., TSD units) are subject to the following requirements:

- Written design assessment (40 CFR 264.192(a)) reviewed and certified by an independent, qualified registered Professional Engineer attesting that the tank system has sufficient structural integrity and is acceptable for the storing and/or treating of hazardous waste.

- Installation inspection (40 CFR 264.192(b)) by either an independent, qualified installation inspector, or an independent, qualified registered Professional Engineer, to ensure that proper handling procedures were adhered to in order to prevent damage to the system during installation.

- Tank/ancillary equipment tightness testing (40 CFR 264.192(c)) to be performed prior to placement on-line.

- Ignitable waste requirements (40 CFR 264.198) for storage to prevent ignition. Storage in covered tanks must comply with buffer zone requirements specified by the National Fire Protection Association.

- Secondary containment and leak detection (40 CFR 264.193) for both the tank and the ancillary equipment. The system must have a capacity to contain 100% of the volume of the largest tank, along with an allocation for accumulation of rainwater.

- General operating requirements including controls and practices to prevent spills and overflows (40 CFR 264.194).

- Daily Inspections (40 CFR 264.195).

- Closure and post-closure care with removal of all wastes and residues and area decontamination. (40 CFR 264.197).

With regard to generator standards, it should be noted that accumulation (up to 90 days) of at least 1,000 kg (roughly 260 gallons) per month of a RCRA hazardous waste in tank systems is governed under 40 CFR 263.34 which cites applicable standards as those under 40 CFR 265, Subpart J. These standards are the same as those cited under 40 CFR 264, Subpart J, as outlined above.

Finally, as USTs are not considered under any proposed remedial alternative, UST regulations are not applicable to the PICCO site.

2.3.1.3.6 Container Management

Because container management of a potential RCRA hazardous waste, including the recovered non-aqueous portion of the landfill leachate, is a potential remedial alternative at the PICCO Resin Landfill site, RCRA requirements pertaining to container management may be considered relevant and appropriate.

Use and management of containers storing RCRA hazardous waste for greater than 90 days (i.e., TSD units) is regulated under 40 CFR 264, Subpart I. These regulations include provisions for:

- Maintaining condition of containers (40 CFR 264.171).
- Utilizing containers compatible with the hazardous waste to be stored (40 CFR 264.172).
- Container management, including keeping containers closed during storage, except to add or remove waste (40 CFR 264.173).
- Weekly inspections (40 CFR 264.174).
- Placement on a sloped, crack-free impervious base with a secondary containment system with a capacity of 10% of the total volume of all containers with free liquids (40 CFR 264.175).
- Special requirements for specific wastes (40 CFR 264.176 and 177). Separation of incompatible wastes by a dike or barrier, and storage of ignitible or reactive waste at least 50 ft from the property line.
- Closure with removal of all wastes and residues and area decontamination (40 CFR 264.178).

With regard to generator standards, accumulation (up to 90 days) of at least 1,000 kg (roughly 260 gallons) per month of a RCRA hazardous waste is governed under 40 CFR 262.34, which cites the applicable standards under 40 CFR 265, Subpart I. These standards are the same as those cited under 40 CFR 264, Subpart I, as outlined above, except that secondary containment is not required.

2.3.1.3.7 Waste Piles

Waste piles are defined under 40 CFR 260.10 as "any non-containerized accumulation of solid, non-flowing hazardous waste that is used for treatment or storage." As remedial actions involving excavation of waste materials (some of which may qualify as a RCRA

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hazardous waste) are considered for the PICCO site, waste pile regulations are potential ARARs. Waste piles are regulated under the land disposal Subpart L as well as under the land disposal restrictions (see Subsection 2.3.1.3.3). Subpart L requirements include:

- Design and operating requirements (40 CFR 264.251) which require a single liner and leachate collection system, run-on and run-off controls, and wind dispersal controls.
- Weekly inspection (40 CFR 264.254).
- Closure and post closure care (40 CDR 264.258) with removal of waste and residues and area decontamination.
- Special requirements for special wastes (40 CFR 264.256 and 257), addressing ignitable, reactive, and incompatible wastes, requiring pretreatment of ignitable or reactive wastes prior to placement in the pile and adequate separation of incompatible wastes.
- Compliance with additional general TDS facility requirements (see Subsection 2.3.1.3.11)

2.3.1.3.8 Land Treatment

Land treatment is a remedial option considered for oily waste streams such as those found at the PICCO site. Therefore, land treatment regulations under RCRA are potentially applicable to materials qualifying as a RCRA hazardous waste.

Land treatment of a RCRA hazardous waste is regulated under 40 CFR 264, Subpart M as well as under the land disposal restrictions (see Subsection 2.3.1.3.3). The Subpart M regulations call for establishment of a treatment program (40 CFR 264.271) that includes the following elements:

- Treatment demonstration to demonstrate prior to initial waste application that hazardous constituents placed in or on the designated treatment zone are degraded, transformed, or immobilized within the treatment zone.
- Design and operating requirements to maximize treatment efficiency, control runon and runoff, and control wind dispersal.

- Unsaturated zone monitoring of the soil and soil-pore liquid to determine whether hazardous constituents migrate out of the treatment zone.

The treatment zone is defined in 40 CFR 264.271 (c) as the portion of the unsaturated zone below and including the land surface in which the conditions necessary for effective degradation, transformation, or immobilization of hazardous constituents are to be maintained. The maximum depth of the treatment zone must be:

- No more than 5 ft from the initial soil surface.
- More than 3 ft above the seasonal high water table.

Weekly inspection (40 CFR 264.273 (g)) and closure and post-closure care requirements (40 CFR 264.280) are also included in the regulations. Compliance with additional general TSD facility requirements (see Subsection 2.3.1.3.11) is also mandated.

2.3.1.3.9 Generator Requirements

Generator requirements under RCRA apply to operations that accumulate solely (utilizing containers or tanks) RCRA-defined hazardous wastes generated on-site for less than 90 days prior to transport for proper treatment/disposal. Generators that accumulate RCRA hazardous waste beyond 90 days operate a RCRA storage facility which is subject to TSD facility requirements as discussed under Subsection 2.3.1.3.11. Generator requirements (40 CFR 262) are potential ARARs to the PICCO site for remedial actions involving removal/accumulation of materials qualifying as RCRA hazardous waste for subsequent off-site treatment/disposal. Specific requirements include the following:

- Use of the manifest system (Subpart B) to track hazardous waste continuously.

- Pre-transport requirements (Subpart C) in terms of proper packaging, labeling, marking, and placarding. In addition, reference is made to the proper accumulation requirements in containers and/or tanks. Container management requirements for generators is further discussed in Subsection 2.3.1.3.6, while tank management requirements for generators are discussed in Subsection 2.3.1.3.5.

- Recordkeeping and reporting requirements (Subpart D).

2.3.1.3.10 Transporter Requirements

As remedial actions considered for the PICCO site include potential transportation of RCRA-defined hazardous waste off-site, RCRA transporter requirements specified under 40 CFR 263 are potential ARARs.

The main provision identified under the regulation is compliance with the manifest system (Subpart B). Other transportation requirements addressed by DOT are discussed under Subsection 2.3.6.

2.3.1.3.11 TSD Facility Requirements

Treatment, Storage, and Disposal (TSD) facility requirements under RCRA apply to facilities which treat, dispose, or store (for greater than 90 days) RCRA hazardous waste. TSD requirements (40 CFR 264) are potential ARARs to the PICCO site for remedial actions involving TSD activities of on-site materials qualifying as RCRA hazardous wastes. Specific requirements include:

- General facility standards (Subpart B) including those for waste analysis, security, inspections, and personnel training.
- Preparedness and prevention standards (Subpart C) addressing facility design and operation, required equipment, testing and maintenance of required equipment, communication/alarm systems, and aisle space for container storage.
- Contingency plan and emergency procedures (Subpart D).
- Manifest system, recordkeeping, and reporting (Subpart E) to track hazardous waste continuously.
- Groundwater monitoring (Subpart F) for new landfill, land treatment, and waste pile units.

* Closure and post-closure requirements (Subpart G) requiring removal of waste and residuals with area decontamination.

* Use and management of containers (Subpart I), which is discussed further under Subsection 2.3.1.3.6.

* Tank systems (Subpart J), which is discussed further in Subsection 2.3.1.3.5.

* Waste piles (Subpart L), which is discussed further in Subsection 2.3.1.3.8.

* Land treatment (Subpart M), which is discussed further in Subsection 2.3.1.3.7.

* Landfills (Subpart N), which is discussed further in Subsection 2.3.1.3.4.

* Incinerators (Subpart O), which is discussed further in Subsection 2.3.1.3.2.

* Air emission standards for process vents (Subpart AA) which set standards for process vents associated with distillation, fractionation, thin-film evaporation, solvent extraction, or air/steam stripping operations involving RCRA hazardous wastes with organic concentrations of at least 10 ppm (weight basis).

* Air emission standards for equipment leaks (subpart BB) which sets standards for equipment that contains or contacts RCRA hazardous waste with organic concentrations of at least 10 ppm (weight basis).

2.3.2 Clean Water Act

The Clean Water Act (CWA), formerly known as the Water Pollution Control Act (33 USC 1251 et seq.), mandated EPA to establish regulations to protect the quality of surface waters across the nation. As such, it can be applied as an ARAR to the PICCO Resin Landfill site based on the potential discharge of the aqueous portion of landfill leachate to either a surface water or the local POTW. The continued discharge of separated aqueous fraction of the leachate to the POTW is the preferred option for this site; however, a summary discussion regarding ARARs for stream discharge is provided for completeness. In addition, potential remediation of groundwater aquifers will require discharge of treated groundwater, potentially to the unnamed stream or to the local POTW.

Under the CWA, two interrelated areas were identified for regulation:

- Establishment of water quality standards.
- Establishment of effluent standards (discharge limitations) intended to ensure compliance with applicable water quality standards.

Water quality standards represent chemical-specific requirements, while effluent standards are action-based requirements. Each is addressed separately below. In addition, location-specific requirements under the CWA concerning wetlands are also addressed. Limited wetland areas have been tentatively identified at the PICCO site.

2.3.2.1 Chemical-Specific Requirements

Under Section 303 of the CWA, the Commonwealth of Pennsylvania is mandated to establish a stream classification system and corresponding set of water quality standards for each classification. To aid in development of this system, federal water quality criteria documents have been published for 65 pollutants listed as toxic under the CWA.

The federal water quality criteria specified under 40 CFR 131 criteria are generally represented in categories that are aligned with different surface water use designations. Different water quality criteria have been developed based upon:

- Protection of human health, with consideration of two scenarios:
  - Water and fish ingestion.
  - Fish ingestion only.
- Protection of aquatic life (both freshwater and marine), against both acute toxicity and chronic toxicity effects.

These federal criteria are unenforceable guidelines that may be used by states to set surface water quality standards based on designated use of the specific surface water. Although these criteria were intended to represent a reasonable estimate of pollutant concentrations consistent with the maintenance of designated water uses, states can appropriately modify these values to reflect local conditions. The Commonwealth of Pennsylvania has utilized those federal guidelines to establish surface water quality standards. Therefore, ARARs associated with meeting surface water quality standards are addressed under the Pennsylvania Clean Streams Law, Subsection 2.4.2.

2.3.2.2 Location-Specific Requirements

Under Section 404 of the CWA, guidelines for specification of disposal sites for dredged or fill material have been promulgated under 40 CFR Part 230. These regulations address filling of wetland areas where wetlands are defined as (40 CFR 230.3): those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient for support, and that under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

The guiding principle of Part 230 is that degradation or destruction of wetlands should be avoided to the extent possible. If absolutely required, then adverse impacts must be minimized (40 CFR 230.10 (cd)).

2.3.2.3 Action-Specific Requirements

CWA regulations establish effluent standards for point source discharges as follows:

- Direct discharge to a surface water is governed by the National Pollutant Discharge Elimination System (NPDES) permitting requirements. (Section 402 of the CWA). Specific permitting requirements are contained under 40 CFR 125, while specific effluent guidelines and standards are given in 40 CFR 401. It should be noted that no categorical effluent guidelines or standards have been established for hazardous waste sites.

- Indirect discharge to a POTW is governed by pretreatment regulations. (Section 307(b) of the CWA). National pretreatment standards are addressed under 40 CFR 403. The standards specifically prohibit discharge of the following (40 CFR 403.5):

  - Ignitable or explosive wastewater.

  - Reactive or toxic fume-generating wastewaters.

  - Used oil.

  - Solvent waste.

  - Pollutants that pass through the POTW without treatment, interfere with POTW operations, contaminant POTW sludge, or endanger the health or safety of POTW workers.

NPDES discharge limitations are based upon meeting the following criteria:

- Location-specific federally approved state water quality standards (40 CFR 122.44 and 131.40).

- Action-specific Best Available Technology (BAT) economically achievable requirements to control toxic and nonconventional pollutants and Best Conventional Technology (BCT) requirements to control conventional pollutants (40 CFR 122.44(a)). However, technology-based limitations may be determined on a case-by-case basis.

Compliance with established limitations is based upon discharge monitoring of pollutant mass, effluent volume, and frequency of discharge (40 CFR 122.41). Approved sampling and test methods must be used for monitoring (40 CFR 136.1 - 136.4).

Pennsylvania-specific NPDES ARARs are addressed in Subsection 2.4.2. POTW discharge limitations are based upon meeting location-specific local sewer ordinances and pretreatment regulations. These municipality-specific ARARs are addressed Subsection 2.5, local ARARs.

2.3.3 Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) (42 USC 300f et seq.) mandated EPA to establish regulations to protect public health from contaminants in drinking water. As such, it can be applied as an ARAR source to the PICCO Resin Landfill site based on identification of the current limited local use and the potential future use of groundwater in the area surrounding the site as a potable water supply. Direct application of SDWA ARARs would be to the residential wells identified via the residential well survey conducted during the RI. With respect to potential application to identified groundwater zones:

- Unconsolidated zone groundwater - due to the limited saturated thickness in the unconsolidated zone and the seasonal variations in groundwater level, the volume of groundwater present in the unconsolidated soils is limited and is a poor potential water supply. Wells screened in the unconsolidated site and have reportedly gone dry during dry periods. Therefore, it is not likely that new wells in the unconsolidated zone would be utilized in the future as a potable water source since public water is available. the residential well survey conducted during the RI identified a single dug well in the unconsolidated zone located topographically downslope (i.e., potentially downgradient) from the site residential well #3. This residence is connected to public water and utilizes this well for outdoor uses (gardening, grass watering, etc.) only.

- Pittsburgh coal groundwater - No users of Pittsburgh Coal groundwater were identified during the residential well survey. Furthermore, it was noted that the background well for the Pittsburgh Coal had levels of metals exceeding drinking water standards. Specific standards exceeded include the MCL for chromium, and SMCLs for aluminum, iron, and manganese. The SMCLs were exceeded by an order of magnitude. It is therefore not realistic that the Pittsburgh Coal would be used in the future as a potable water source when public water is readily available.

- Deep bedrock groundwater - Deep monitoring wells drilled into the bedrock below the Pittsburg Coal within the site did not encounter significant groundwater and a core sample collected from this bedrock zone encountered no fractures. These data, relating to the bedrock below the Pittsburgh Coal, indicate that the deep bedrock below the site is not a aquifer (i.e., capable of sustaining a measurable yield of groundwater).

  Based on the residential well survey results, the deep bedrock may potentially yield enough water for residential use. Therefore, the deep bedrock mayn potentially be an aquifer unit off-site. To further evaluate its potential as an aquifer unit, additional investigation is proposed as a component of the remedial alternatives considered for the site. The proposed investigation involves drilling exploratory boreholes at two off-site downgradient locations with potential installation of monitoring wells.

Based on the above, application of SDWA ARARs would be to identified residential wells and potentially to the deep bedrock groundwater.

SDWA ARARs identified are chemical-specific or action-specific requirements as discussed individually below. No location-specific requirements were noted.

2.3.3.1 Chemical-Specific Requirements

The SDWA mandates EPA to establish regulations and standards to protect human health from contaminants in drinking water. EPA has promulgated primary and secondary drinking water regulations and standards applicable to public water systems. National Primary Drinking Water Standards (NPDWS) are established in 40 CFR 141 and are expressed as Maximum Contaminant Levels (MCLs) that are not to be exceeded in public water supplies. The MCLs are enforceable human health-based standards that consider available treatment technologies and cost of treatment. A complete listing of current SDWA MCLs is given in Table 2-5 for reference.

The SDWA (40 CFR Parts 142.40 and 142.50) allows public water suppliers to obtain exemptions and variances from complying with MCLs under certain situations. However, it must be shown that noncompliance will not result in an unreasonable risk to human health.

National Secondary Drinking Water Standards (NSDWS) are established in 40 CFR 143 and are expressed as Secondary Maximum Contaminant Levels (SMCLs) that should not be exceeded in public water supplies. The SMCLs are nonenforceable (on the federal level) aesthetic-based guidelines that consider available treatment technologies and cost of treatment. SMCLs are not included in the list of chemical-specific ARARs because they are

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Table 2-5

Current National Primary Drinking Water Standards

Contaminant	MCL (mg/L)
Volatile Organics	
Benzene	0.005
Carbon tetrachloride	0.005
para-Dichlorobenzene	0.075
1,2-Dichloroethane	0.005
1,1-Dichloroethylene	0.007
1,1,1-Trichloroethane	0.20
Trichloroethylene	0.005
Vinyl chloride	0.002
Trihalomethanes (sum of chloroform, bromoform, bromodichloromethane, dibromochloromethane)	0.10
o-Dichlorobenzene	0.6
cis-1,2-Dichloroethylene	0.07
trans-1-2-Dichloroethylene	0.1
1,2-Dichloroethylene	0.005
Ethylbenzene	0.7
Monochlorobenzene	0.1
Styrene	0.1
Tetrachloroethylene	0.005
Toluene	1.0
Xylene	10.0
Other Organics (Pesticides and PCBs)	
2,4-D	0.07
Endrin	0.0002
Lindane	0.0004
Methoxychlor	0.04
Toxaphene	0.003
2,4,5-TP (Silvex)	0.05
Alachlor	0.002
Atrazine	0.003
Carbofuran	0.04
Chlordane	0.002
Dibromochloropropane	0.0002
Ethylene dibromide	0.00005
Heptachlor	0.0004
Heptachlor epoxide	0.0002
Polychlorinated biphenyls (PCBs)	0.0005

Table 2-5

Current National Primary Drinking Water Standards
(continued)

Contaminant	MCL (mg/L)
Inorganics	
Asbestos	7×10^6 fibers/L
Arsenic	0.05
Barium	1.0
Cadmium	0.005
Chromium	0.1
Fluoride	4
Lead	0.05
Mercury	0.002
Nitrate (as N)	10
Nitrite (as N)	1
Selenium	0.05
Silver	0.05
Sodium and corrosion	No MCL; monitoring and reporting only
Radionuclides	
Beta particle and photon radioactive	4 mrem (annual dose equivalent)
Gross alpha particle activity	15 pCi/L
Radium-226 plus radium-228	5 pCi/L
Microbials	
Coliforms	<1/100 mL
Turbidity	1 ntu (up to 5 ntu)

not federally enforceable, but rather are intended to serve as guidelines for use by states in regulating water supplies.

In addition to the primary and secondary standards, EPA has established (40 CFR 141) Maximum Contaminant Level Goals (MCLGs). The MCLGs are non-enforceable guidelines based strictly on human-health considerations without regard for available treatment technologies and/or the cost of treatment. For a particular parameter, MCLGs are established by EPA at the time an MCL is established.

Table 2-6 summarizes the current and prepared SDWA MCLs, MCLGs, and SMCLs for the primary contaminants of concern at the PICCO site.

2.3.3.2 Action-Specific Requirements

Also included under the SDWA is the Underground Injection Control (UIC) program. The UIC program was established under Part C of the SDWA to protect underground sources of drinking water from endangerment by subsurface emplacement of fluids through wells.

There are five classes of injection wells defined by the regulation:

- Class I wells are wells that inject municipal or industrial wastewater (including hazardous waste) below the lowermost underground source of drinking water. Underground sources of drinking water are those currently serving as a public drinking water supply, or those that have the potential to serve as a public drinking water supply, and have less than 10,000 mg/L Total Dissolved Solids.

- Class II wells are wells that inject fluids related to oil and gas production.

- Class III wells are wells that inject fluids for the extraction of minerals.

- Class IV wells are wells that inject hazardous or radioactive waste into or above an underground source of drinking water. Class IV wells are banned by regulation.

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Table 2-6

Current and Proposed Federal Safe Drinking Water Act Standards
For Identified Compounds of Concern

Compound	MCL (ug/L)	MCLG (ug/L)	SMCL (ug/L)	Regulatory Status
Benzene	5	0	—	Final MCL/MCLG: no proposed SMCL
Toluene	1,000	1,000	40	Final MCL/MCLG proposed SMCL
Ethylbenzene	700	700	30	Final MCL/MCLG proposed SMCL
Xylenes	10,000	10,000	20	Final MCL/MCLG proposed SMCL
Styrene	100	100	—	Final MCL/MCLG; no proposed SMCL
Naphthalene	—	—	—	MCL/MCLG To Be proposed*; no proposed SMCL
2-Methylnaphthalene	—	—	—	No currently proposed regulation.

*Naphthalene is currently on a list of contaminants that must be monitored by public water suppliers. EPA intends to utilize this monitoring information to ultimately propose drinking water standards for naphthalene. However, no date has been set for such a proposal.

- Class V wells are wells used for other practices not included in the first four classes. Class V is subdivided into types ranging from industrial dry wells to aquifer remediation wells. The Environmental Protection Agency has not yet developed specific regulations for Class V wells.

Class II and III wells are not applicable to hazardous waste sites, while neither Class I or IV wells are proposed as any part of a remedial action for the PICCO site. Class V wells may be part of a remedial action involving groundwater remediation at the site if disposal of treated groundwater is to be performed via reinjection into site aquifer using injection wells. However, as noted above, specific regulations for Class V wells have not yet been developed by EPA.

2.3.4 Clean Air Act

The Clean Air Act (CAA) (42 USC 7401 et seq.) mandated EPA to establish regulations to protect ambient air quality. As such, it can be applied as an ARAR to the PICCO Resin Landfill site for remedial actions that potentially result in air emissions.

Under the CAA, three areas were identified for regulation:

- Establishment of National Ambient Air Quality Standards (NAAQS).
- Establishment of maximum emission standards as expressed under the National Emission Standards for Hazardous Air Pollutants (NESHAP).
- Establishment of maximum emission standards as expressed under the New Source Performance Standards (NSPS).

NAAQS and NESHAP represent chemical-specific requirements, while NSPS contains action-specific requirements. These are discussed separately below.

2.3.4.1 Chemical-Specific Requirements

NAAQS (40 CFR 50) have been developed by EPA for seven classes of pollutants: particulates, sulfur oxides, nitrogen oxides, hydrocarbons, oxidants (ozone), carbon monoxide, and lead. The NAAQS focuses on two levels of control: primary and secondary. The primary standards apply exclusively to the protection of human health, while the secondary standards apply to the prevention of property damage. Table 2-7 provides a listing of NAAQS. It should be noted that these standards are not emission (i.e., discharge) standards. Further, these are standards to be met for the ambient air, after allowing for mixing of the particular discharge with the ambient air. NAAQS attainment requirements are applicable only to major sources which are defined as emitting over 100 to 250 tons per year of regulated pollutants.

State Implementation Plans (SIP) are developed by individual states and contain the actual abatement requirements necessary to achieve compliance with the NAAQS. The appropriate Pennsylvania SIP is discussed in Subsection 2.4.4.

NESHAP Regulations (40 CFR 61) currently cover seven separate contaminants, including benzene. Subpart FF of 40 CFR 61 provides the national emission standard for benzene waste operations. However, application of this subpart is limited to owners and operators of chemical manufacturing plants, coke byproduct recovery plants, and petroleum refineries. Therefore, the regulations do not specifically apply as potential ARARs to hazardous waste sites such as the PICCO site.

2.3.4.2 Action-Specific Requirements

NSPS regulations (40 CFR 60) have been promulgated to cover a number of different types of facilities. Of concern for the PICCO Resin Landfill site would be those regulations listed under Subpart E, Standard of Performance for Incinerators. The operating standard listed (40 CFR 60.52) is that the air discharge of particulate matter shall not exceed 180 mg/dscm,

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Table 2-7

National Ambient Air Quality Standards (NAAQS)

Pollutant	Standard	Averaging Period	Regulatory Standard (a)
Sulfur oxides	Primary	12-month arith. mean	80 ug/cu. m (0.03 ppm)
	Primary	24-hour average (b)	365 ug/cu. m (0.14 ppm)
	Secondary	3-hour average (b)	1,300 ug/cu. m (0.5 ppm)
Particulate matter	Prim. & Sec.	Annual arith. mean	50 ug/cu. m
	Prim. & Sec.	24-hour average	150 ug/cu. m
Carbon monoxide	Prim. & Sec.	8-hour average	(10 mg/cu. m) 9 ppm (c)
	Prim & Sec.	1-hour average	(40 mg/cu. m) 35 ppm(c)
Ozone	Primary	Max. daily 1-hour avg.	(235 ug/cu. m) 0.12 ppm (d)
	Secondary	1-hour average	(235 ug/cu. m) 0.12 ppm (d)
Nitrogen oxides	Prim. & Sec.	12-month arith. mean	100 ug/cu. m (0.053 ppm)
Lead	Prim. & Sec.	Quarterly mean	1.5 ug/cu. m

NOTES:

(a) National short-term standards are not to be exceeded more than once in a calendar year.
(b) National standards are block averages rather than moving averages.
(c) National secondary standards for carbon monoxide have been dropped.
(d) Maximum daily 1-hour average: averaged over a 2-year period, the expected number of days above the standard must be less than or equal to one.

corrected to 12% CO_2. This provision applies to incinerators with a charging rate exceeding 50 tons per day. It should be noted that this performance standard for particulate matter matches that listed under the RCRA regulations for incinerators (see Subsection 2.3.1.3.2).

2.3.5 Occupational Safety and Health Act

The Occupational Safety and Health Act (OSHA) (29 USCA 651) resulted in creation of the Occupational Safety and Health Agency to protect worker safety and to administer regulatory control for worker safety.

Under OSHA, general industry standards have been promulgated under 29 CFR 1910. The action-specific requirements given under 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, specifically apply to the PICCO site. These requirements include provisions for:

- A written safety and health program that employers must develop and implement for employees involved in hazardous waste operations. The program shall be designed to identify, evaluate, and control safety and health hazards and provide for emergency response for hazardous waste operations (29 CFR 1910.120 (b)).

- Characterization and analysis of the hazardous waste site for the identification of specific site hazards and the determination of appropriate safety and health control procedures to protect employees from hazards (29 CFR 1901.120 (c)).

- Appropriate site control procedures to control employee exposure to hazardous substances before cleanup work begins (29 CFR 1910.120 (d)).

- Training of all employees and their supervisors working on-site who may be exposed to hazardous substances, health hazards or safety hazards. Employees cannot participate in or supervise field activities until they have been trained to a level required by their job function and responsibility. Refresher training must be performed annually (29 CFR 1910.120 (e)).

- A medical surveillance program instituted by employers for employees engaged in hazardous waste operations and emergency response. Annual medical examinations must be administered to employees who are or may be exposed to hazardous substances at or above permissible exposure limits or published exposure levels (29 CFR 1910.120 (f)).

- Implementation of engineering controls, work practices, and personal protection equipment to protect employees from exposure to hazardous substances (29 CFR 1910.120 (g)).

- Monitoring of hazardous substances where there may be a question of employee exposure to hazardous concentrations of the substance. Monitoring aids in the proper selection of engineering controls, work practices, and personal protective equipment so that employees are not exposed to levels that exceed permissible exposure limits or published exposure levels. Monitoring must be conducted upon initial entry at a site, periodically while work is being performed on-site, and on high-risk employees following site work (29 CFR 1910.120 (h)).

- An information program that advises employees, contractors and subcontractors engaged in hazardous waste operations of the nature, level, and degree of exposure likely as a result of participation in the operations (29 CFR 1910.120 (i)).

- Handling, transportation, labeling, and disposal of hazardous substances and contaminated soils, liquids, and other residues. Requirements for the opening and sampling of drums and containers and the handling of radioactive and shock sensitive wastes are also covered under this provision (29 CFR 1910.120 (j)).

- Decontamination of personnel, clothing, and equipment. Decontamination procedures must be developed, implemented, and communicated to employees before any employee or equipment enter areas on-site where potential exposure to hazardous substances exists (29 CFR 1910.120 (k)).

- Implementation of an emergency response plan to handle emergencies prior to the commencement of hazardous waste operations. The plan must be in writing and available for inspection by employees, OSHA personnel, and other government agencies (29 CFR 1910.120 (l)).

- Illustration of areas accessible to employees while work is in progress. Actual minimum illumination intensities are shown in Table H-120.1 of the provisions (29 CFR 1910.120 (m)).

- Sanitary facilities at temporary workplaces. Standards for potable water supplies, non-potable water supplies (such as for fire-fighting purposes), toilet facilities, sleeping quarters, food handling services, washing facilities, and showers and change rooms are contained in this subsection (29 CFR 1910.120(n)).

- Development and implementation of procedures for the introduction of effective new technologies and equipment designed for the improved protection of employees working with hazardous waste cleanup operations.

New technologies equipment, or control measures must be evaluated by employers to determine the effectiveness of the new methods before implementing their use on a large scale (29 CFR 1910.120 (o)).

- Operations conducted at TSD facilities. Employers at TSD facilities must provide and implement the same programs as required by other contractors and subcontractors including written safety and health programs, medical surveillance programs, decontamination programs, emergency response plans, and others (29 CFR 1910.120 (p)).

- Employers whose employees are engaged in emergency response to hazardous substance releases. Employers meeting this criteria must develop and implement certain safety and health requirements listed in this subsection (29 CFR 1910.120 (q)).

2.3.6 Hazardous Materials Transportation Act

Through the Hazardous Materials Transportation Act (49 USC 1801-1813), regulations regarding the transportation of hazardous materials were promulgated by the Department of Transportation (DOT) under 49 CFR Parts 107 and 171-177. Transportation of DOT-defined hazardous materials off-site is a potential remedial action for the PICCO site. The following action-specific regulatory requirements represent potential ARARs.

- Hazardous materials table (49 CFR 172.101) which lists DOT-designated hazardous materials and waste, along with a summary of basic shipping requirements.
- Required manifest information (49 CFR 172.101, 172.203, and 173) including proper shipping name, hazard classification, and identification number.
- Transportation mode requirements (49 CFR 172.101 and 174-177).
- Packaging, labeling, and marking requirements (49 CFR 172, 178, and 179).
- Transportation placarding requirements (49 CFR 172, Subpart F).

2.3.7 Wetlands Protection

Through Executive Order No. 11,990 regulations regarding protection of wetlands were promulgated by EPA under 40 CFR 6.302. Limited wetland areas have been tentatively identified at the PICCO site. The following action-specific regulatory requirements represent potential ARARs:

- Avoid adverse impacts associated with the destruction or loss of wetlands.
- Avoid new construction on wetlands unless no other practicable alternative exists.
- Prepare a wetlands assessment if wetlands will be affected.
- Minimize adverse impact on wetlands if no practicable alternative to the action exists.

2.4 STATE ARARs

State ARAR sources found to be potentially applicable to the PICCO site are discussed below and consist of the following:

- Pennsylvania Solid Waste Management Act (state level equivalent to federal RCRA)
- Pennsylvania Clean Streams Law (state level equivalent to federal CWA)
- Pennsylvania Safe Drinking Water Act (state level equivalent to federal SDWA)
- Pennsylvania Air Pollution Control Act (state level equivalent to federal CAA)
- Pennsylvania Dam Safety and Waterway Management Act
- Pennsylvania Stormwater Management Act.
- Pennsylvania Groundwater Remediation Policy

2.4.1 Pennsylvania Solid Waste Management Act

The Pennsylvania Solid Waste Management Act (Title 35 of the Pennsylvania Statutes, Subparagraph 6018.101-6018.1003) represents the state-level equivalent of the federal RCRA. Through this act, the Pennsylvania Environmental Quality Board, under Title 25 (Environmental Resources) of the Pennsylvania Code (PC), has established rules and regulations (given in Chapter 75) for:

- Management of residual (i.e., non-hazardous solid) waste (Subchapter C).
- Management of hazardous waste (Subchapter D).
- Siting of hazardous waste treatment and disposal facilities (Subchapter F).

Each of these areas is further discussed below.

2.4.1.1 Nonhazardous Solid Waste Management Regulations

Residual (i.e., nonhazardous solid) waste regulations are outlined under Subchapter C of Title 25 PC 75. Pertinent provisions under Subchapter C include:

- 75.21 - Processing and Disposal Area Permits: Sets forth general standards for all solid waste facilities.
- 75.30 - General Standards for Solid Waste Incinerator Facilities.
- 75.31 - General Standards for Hazardous Solid Waste.
- 75.37 - Standards for Fly Ash, Bottom Ash, or Slag Disposal Areas.
- 75.38 - General Standards for Industrial and Hazardous Waste Disposal Sites. Sets forth various design criteria for industrial and hazardous waste disposal sites.

In general, nonhazardous solid waste regulations apply to activities subsequent to the effective date of the regulations. Thus, nonhazardous solid waste disposed of in facilities like the PICCO Resin Landfill, which closed in 1964 prior to the State of Pennsylvania's adoption of nonhazardous solid waste regulations in 1971, do not have to be excavated and redisposed of to satisfy those regulations. However, nonhazardous solid wastes removed from closed facilities like the PICCO Resin Landfill are subject to applicable regulatory standards for management and disposal. Therefore, although the waste materials targeted for removal were disposed of in the PICCO Resin Landfill well before the regulatory enactment date, the regulations may be considered applicable for those nonhazardous solid wastes targeted for removal.

Therefore, these regulations represent ARARs to be considered applicable for remedial actions involving on-site processing and redisposal of residual (nonhazardous solid) waste, including nonhazardous residues remaining after waste treatment. Facility design standards may also be consulted if considered "relevant and appropriate" (as opposed to strictly "applicable") to remedial actions.

It should be noted that the state has recently (24 February 1990) proposed major revisions to residual waste regulations which will greatly increase requirements for disposal and handling. Under the proposed rule (Volume 20, Number 8 of the Pennsylvania Bulletin), the current residual waste regulations contained within Subchapter C of Title 25 PC 75 would be completely deleted. In its place, new regulations governing residual waste management would be added under Article IX of Title 25 - Residual Waste Management. Pertinent chapters (with regard to the PICCO site) from proposed Article IX include:

- Residual waste landfills (Chapter 288) which defines three classes (Class I, II, and III) of residual waste landfills based on the degree of potential for adverse effects (Class I having the highest degree of potential effects, while Class III having the lowest). Proposed design requirements include:

  - Class I: Double liner system with a leachate detection zone between the liners, and a leachate collection system above the top liner.

  - Class II: Single liner system with a leachate detection zone above the liner and a leachate collection system above the detection zone.

  - Class III: At least 1 ft of specified attenuating soil for every 4 ft of waste to be placed into the landfill, with a minimum of 4 ft of attenuating soil in all cases.

- Land application of residual waste (Chapter 291) which specifies general operating requirements along with additional requirements based upon whether the proposed operation is for agricultural utilization, land reclamation, or surface land disposal.

- Incinerators and other processing facilities (Chapter 297) which specifies general operating requirements for Class I processing facilities (any facility which is not Class II) and Class II processing facilities (transfer or composting facilities).

- Storage and transportation of residual waste (Chapter 299) which sets standards for container storage, tank storage (specifying that secondary containment is required), and storage piles (specifying that a liner system with leachate control is required).

General chemical-specific requirements for acceptable waste at residual landfills under the proposed rule are as follows:

- Class I:
  - Petroleum-based total oil and grease content cannot exceed 1% by dry weight.
- Class II:
  - Petroleum-based total oil and grease content cannot exceed 1% by dry weight.
  - Maximum containment concentration cannot exceed 50 times the corresponding drinking water standard.
  - pH must be between 5.0 and 12.5.
- Class III:
  - Petroleum-based total oil and grease content cannot exceed 1% by dry weight.
  - Maximum contaminant concentration cannot exceed 25 times the drinking water standard for metals and other cations, 10 times for all other contaminants.
  - pH must be between 5.5 and 9.5.

It should be noted that the proposed final rule for residual waste is expected to be issued in the fall of 1991.

2.4.1.2 Hazardous Waste Management Regulations

Under the current Pennsylvania hazardous waste identification regulations (25 PC 75. 261), the new Toxicity Characteristic (TC) designation for characteristic hazardous waste has yet to be promulgated. Until appropriate regulations are promulgated, potential TC wastes such as those which may be present at the PICCO Resin Landfill site will be governed under federal requirements under RCRA, as previously detailed in Subsection 2.3.1.

However, as it is anticipated that the TC regulations will be promulgated in the near future. Prior to implementation of a final remedial action at the site, Pennsylvania hazardous waste regulations are considered potential ARARs for the site. (As previously noted, these regulations may be considered applicable only to materials removed from the closed landfill site and which qualify as a hazardous waste.) Facility design standards may also be consulted if considered relevant and appropriate for other than hazardous wastes which contain significant concentrations of hazardous constituents.

Outlined in the following subsections are comparisons of action-specific requirements specified under the Pennsylvania hazardous waste regulations as compared to those specified under federal RCRA hazardous waste regulations, as previously presented in Subsection 2.3.1.3. Comparisons to location-specific (i.e., siting) requirements are given in Subsection 2.4.1.3.

Overall, the action-specific requirements specified under the Pennsylvania hazardous waste regulations are consistent with corresponding federal RCRA hazardous waste requirements. Where applicable, significantly more stringent requirements under Pennsylvania law are noted below.

2.4.1.2.1 Recycling/Reclamation

Pennsylvania regulations for recycling/reclamation of hazardous waste are contained under 25 PC 75.261(e). Under these regulations, recycling/reclamation of a hazardous waste as a fuel must be in accordance with all applicable air quality regulations. Pennsylvania air quality regulations are addressed in Subsection 2.4.4.

Federal RCRA recycling/reclamation regulations have been recently revised with promulgation of regulations governing furnaces and industrial boilers, a subject not addressed under current Pennsylvania regulations. Therefore, federal requirements are applicable as discussed under Subsection 2.3.1.3.1.

2.4.1.2.2 Incineration

Pennsylvania regulations for incineration of hazardous waste are consistent with regulatory requirements specified under federal RCRA hazardous waste regulations for incineration. Pennsylvania incineration regulations under 25 PC 75.264(W) include provisions consistent with corresponding federal requirements for:

- Waste feed analysis (75.264(W)(3)). A list of specific parameters to analyzed for is included under this citation.
- Operating requirements (75.264(W)(7).
- Monitoring and inspections (75.264(W)(9).
- Closure (75.264(W)(10)).
- Compliance with general TSD facility requirements (see Subsection 2.4.1.2.11).

In addition, the Pennsylvania regulations under 75.264(W)(6) set forth performance standards identical to the federal standards set under 40 CFR 264.343. These standards were previously presented in Subsection 2.3.1.3.2, along with a discussion of proposed EPA revisions to these standards.

2.4.1.2.3 Land Disposal Restrictions

Land disposal restriction regulations for hazardous waste have yet to be promulgated by the Commonwealth of Pennsylvania. As such, federal requirements are applicable, as previously discussed in Subsection 2.3.1.3.3.

2.4.1.2.4 Landfilling

As noted previously, Pennsylvania hazardous waste regulations apply only to materials removed from the closed landfill site and which qualify as a hazardous waste.

Pennsylvania hazardous waste regulations are consistent with regulatory requirements specified under federal RCRA hazardous waste regulations for landfilling. Pennsylvania regulations under 75.264 (v) include provisions consistent with corresponding federal requirements for:

- Design standards, including these for closure and post-closure care (75.264 (v) (3)).
- Operating standards, including monitoring and inspections requirements (75.264 (v) (4)).
- Compliance with general TSD facility requirements (see Subsection 2.4.1.2.11).

Specific design standards are given in the Pennsylvania regulations to help ensure that the general performance standards outlined under the federal regulations (40 CFR 264.301) are met.

2.4.1.2.5 Tank Management

As under federal RCRA regulations, Pennsylvania provides for exemption from tank management regulations for "captive" wastewater treatment units permitted under the CWA. "Captive" is defined as being located upon lands owned by the waste generator and operated solely to provide treatment of that generator's waste. As the oil/water separator qualifies under this exemption, state tank management regulations are not strictly applicable to the separator.

If additional tanks are utilized for proposed remedial action at the site, Pennsylvania hazardous waste regulations applicable to tanks become potential ARARs. These regulations are consistent with corresponding federal regulations in existence prior to passage of the HSWA legislation. With passage of HSWA, however, federal RCRA hazardous waste regulations regarding tanks were substantially upgraded. Therefore, the federal regulations as previously outlined under Subsection 2.3.1.3.5 take precedence for tank management.

2.4.12.6 Container Management

Pennsylvania hazardous waste regulations are consistent with regulatory requirements specified under federal RCRA hazardous waste regulations for container management. Pennsylvania hazardous waste regulations under 25 PC 75.264(q) for storing hazardous waste for more than 90 days (i.e., TSD units) include provisions consistent with corresponding federal requirements for:

- Maintaining condition of containers (75.264(q)(1)).
- Utilizing containers compatible with the hazardous wastes to be stored (75.264(q)(2)).
- Container management (75.264(q)(3,4)).
- Inspections (75.264(q)(5)).
- Secondary containment (75.264(q)(10-12)).
- Closure (75.264(q)(13)).
- Special requirements for specific wastes (75.264(q)(7-9, 14, 15)).

With respect to generator standards, accumulation (up to 90 days) of at least 1,000 kg (roughly 260 gallons) per month of a RCRA hazardous waste is governed under 25 PC 75.262(g) which cites the standards under 25 PC 75.265(q). These standards are the same as those cited under 25 PC 75.264(q), as outlined above. State standards are more strict than federal standards in that requirements for secondary containment are not waived for accumulation activities.

2.4.12.7 Waste Piles

Pennsylvania hazardous waste regulations are consistent with regulatory requirements specified under federal RCRA hazardous waste regulations for waste piles. Pennsylvania hazardous waste regulations under 25 PC 75.264 (t) include provisions consistent with corresponding federal requirements for:

- Design and operating requirements (75.264(t) (4 - 20)).
- Weekly inspections (75.264(t) (21)).
- Closure and post-closure (75.264(t) (34, 35)).
- Special requirements for special wastes (75.264(t) (37 - 39)).
- Compliance with general TSD facility requirements (see Subsection 2.4.1.2.11).

More specific design and operating standards are given in the Pennsylvania regulations to help ensure that the more general requirements outlined under the federal regulations (40 CFR 264.251) are met.

One additional requirement of note in the Pennsylvania regulations is development and use of a waste pile evaluation and repair (WPER) plan specified under 75.264(t) (25). The WPER plan addresses the following for waste pile liners:

- Testing and monitoring techniques.
- Integrity evaluation procedures.
- Repair techniques in the event of leakage.

2.4.1.2.8 Land Treatment

Pennsylvania hazardous waste regulations are consistent with regulatory requirements specified under federal RCRA hazardous waste regulations for land treatment. Pennsylvania hazardous waste regulations under 25 PC 75.264(u) include provisions consistent with corresponding federal requirements for:

- Treatment demonstration (75.264(u) (6) - (8)).

- Design and operating requirements (75.264(o) (9) - (15)).

- Weekly inspections (75.264(o) (16)).

- Unsaturated zone monitoring (75.264(o) (21)).

- Closure and post-closure requirements (75.264(o) (24, 25)).

- Compliance with general TSD facility requirements (see Subsection 2.4.12.11).

More specific design and operating standards are given in the Pennsylvania regulations to help ensure that the more general requirements outlined under the federal regulations (40 CFR 264.271) are met.

2.4.12.9 Generator Requirements

Pennsylvania hazardous waste regulations are consistent with regulatory requirements specified under federal RCRA hazardous waste regulations for generators. Pennsylvania hazardous waste regulations under 25 PC75.262 include provisions consistent with corresponding federal requirements for:

- Use of the manifest system (75.262(e)).

- Pre-transport requirements (75.262(f)). Container management requirements for generators are discussed under Subsection 2.4.12.6, while tank management requirements for generators are discussed in Subsection 2.4.12.5.

- Recordkeeping and reporting requirements (75.262(h) - (k)).

2.4.12.10 Transporter Requirements

Pennsylvania hazardous waste regulations are consistent with regulatory requirements specified under federal RCRA hazardous waste regulations for transporters. Pennsylvania hazardous waste regulations under 25 PC 75. 263 include provisions consistent with corresponding federal requirements for compliance with the manifest system (75.263(d)).

2.4.1.2.11 TSD Facility Requirements

Pennsylvania hazardous waste regulations are consistent with regulatory requirements specified under federal RCRA hazardous waste regulations for TSD facilities. Pennsylvania hazardous waste regulations under 25 PC 75.264 include provisions consistent with corresponding federal requirements for:

- General facility standards, including those for waste analysis (75.264(c)), security (75.264(d)), inspections (75.264(e)), and personnel training (75.264(f)).
- Preparedness and prevention standards (75.264(h)).
- Contingency plan (75.264(i)).
- Manifest system, recordkeeping, and reporting (75.264(j) - (m)).
- Groundwater monitoring for new landfill, land treatment, and waste pile units (75.264(n).
- Closure and post-closure requirements (75.264(o)).
- Use and management of containers (75.264(q)), which is discussed further in Subsection 2.4.1.2.6.
- Tank systems (75.264(r)), which is discussed further in Subsection 2.4.1.2.5.
- Waste piles (75.264(t)), which is discussed further in Subsection 2.4.1.2.7.
- Land treatment (75.264(u)), which is discussed further in Subsection 2.4.1.2.8.
- Landfills (75.264(v)), which is discussed further in Subsection 2.4.1.2.4.
- Incinerators (75.264(w)), which is discussed further in Subsection 2.4.1.2.2.

Recent federal regulations concerning air emission standards for process vents and equipment at RCRA TSD facilities have not yet been addressed under Pennsylvania regulations. Therefore, the federal regulations discussed under Subsection 2.3.1.3.11 take precedence.

2.4.13 Hazardous Waste Facility Siting Regulations

Hazardous waste facility siting regulations are outlined under Subchapter F of 25 PC 75. Under these regulations, certain exclusionary criteria are established that prohibit the siting of a new hazardous waste treatment or disposal facility in the excluded areas delineated under these criteria. Potentially applicable criteria are outlined and addressed below:

* Flood Hazard Areas (75.422) Prohibits treatment and incineration facilities from operating in sites in the 100-year floodplain or in an area larger than the area the flood of record has inundated. The PICCO Resin Landfill site is not within the 100-year floodplain as established by FEMA.

* Wetlands (75.423) Prohibits treatment and disposal facilities in wetland areas. The PICCO Resin Landfill site is not located in any known or suspected wetland areas. It should be noted that no known wetlands survey has been performed at the site.

* National Natural Landmarks and Historic Places (75.426) Prohibits treatment and disposal facilities from operating within national natural landmarks designated by the National Park Service or historic sites listed on the National Register of Historic Places. The PICCO Resin Landfill site is not located in any known or suspected national natural landmarks or historical places.

* Dedicated Lands in Public Trust (75.427) Prohibits treatment and disposal facilities from operating on lands in public trust including state, county, and municipal parks, units of the National Parks System, state forests, the Allegheny National Forest, state game lands, property owned by the Pennsylvania Historical and Museum Commission, a national wildlife refuge, national fish hatchery, or national environmental center. The PICCO Resin Landfill site is not located in any known or suspected dedicated land in public trust.

* Agricultural Areas (75.428) Prohibits treatment and disposal facilities from operating in agricultural areas established under the Pennsylvania Agricultural Areas Security Act or in farmlands identified as Class I agricultural land by the Soil Conservation Service. The PICCO Resin Landfill site is not located in any known or suspected agricultural area as defined above.

* Exceptional Value Waters (75.429) Prohibits treatment and disposal facilities from operating in watersheds of Exceptional Value Waters. The PICCO Resin Landfill site is not located in any known or suspected exceptional value watershed.

2.4.2 Pennsylvania Clean Streams Law

The Pennsylvania Clean Streams Law (Title 35 of the Pennsylvania Statutes, Subparagraph 691.1-691.1001) represents the state-level equivalent of the federal CWA. Through the Clean Streams Law, the Pennsylvania Environmental Quality Board, under Title 25 (Environmental Resources) of the Pennsylvania Code (PC), has established rules and regulations (referred to collectively as the Pennsylvania Water Resources Regulations) to control water pollution and protect water quality.

Applicable chapters from Title 25 of the PC include:

- Chapter 16 - Water Quality Toxics Management Strategy: This chapter sets forth human health and aquatic life criteria for toxic substances that the Pennsylvania DER is mandated to use in the development of effluent limits in NPDES permits.

- Chapter 92 - National Pollutant Discharge Elimination System: This chapter sets forth the provisions for administration and implementation of the NPDES program within Pennsylvania.

- Chapter 93 - Water Quality Standards: This chapter sets forth specific water quality criteria and designated water uses to be protected for each stream in Pennsylvania.

- Chapter 94 - This chapter sets forth provisions for municipalities to address pretreatment requirements for industrial wastes discharged to municipal sewage collection and treatment systems (POTWs). (Note: Local POTW pretreatment requirements are discussed under Subsection 2.5, Local ARARs).

- Chapter 95 - Wastewater Treatment Requirements: This chapter sets forth basic waste treatment requirements for all dischargers.

- Chapter 97 - Industrial Wastes: This chapter sets forth specific provisions for controlling various types of industrial waste discharges to the surface and groundwater, including indirect discharge to a POTW.

- Chapter 102 - This chapter sets forth requirements for the control of soil erosion and sedimentation resulting from earthmoving activities.

Chapter 16 and 93 represent chemical-specific requirements, while the remaining chapters cover action-specific requirements.

2.4.2.1 Chemical-Specific Requirements

Table 2-8 lists, from Chapter 16 (Appendix A, Table 1) the water quality criteria for toxic substances as of concern at the PICCO Resin Landfill site.

Table 2-9 lists, from Chapter 93, the specific water quality criteria for the identified potential receiving stream, the unnamed stream that crosses the PICCO Resin Landfill site and serves as a tributary to the Monongahela River. The designated water use to be protected is for warm water fish. It should be noted, however, that no warm water fish are present in the unnamed stream.

For remedial actions involving direct discharge to surface water, the above water quality criteria represent in-stream levels that must be met after allowing for initial mixing of the effluent discharge with the stream. It should be noted that this may be difficult to achieve due to the potential contribution of upstream contaminants from the off-site street, Maryland Avenue.

2.4.2.2 Action-Specific Requirements

Under Chapter 92, the Pennsylvania NPDES program is delineated. Discharge limitations from point sources are to be established based on meeting stream-specific water quality criteria after allowing for initial mixing of the effluent discharge with the stream.

Under Chapter 95, secondary treatment is specified as the minimum treatment for all waste streams (25 PC 95.2). Secondary treatment is defined as that which achieves effluent limitations resulting from application of "best practicable control technology currently available," as specified by Pennsylvania DER.

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Table 2-8

Pennsylvania Water Quality Criteria* for Identified Toxic Substances of Concern

		Fish & Aquatic Life Criteria		Human Health Criteria	
Alphanumeric Designation[1]	Chemical Name	Continuous Concentration (ug/L)	Maximum Concentration (ug/L)	Concentration (ug/L)	Criterion[b]
3V	Benzene	128	640	1	CRL
19V	Ethylbenzene	580	2,900	1,400	H
25V	Toluene	330	1,650	14,300	H
39B	Naphthalene	43	135	10	T&O

*From 25 PC 16, Appendix A, Table 1
[a]V = Volatile
B = Base neutral
[b]CRL = Cancer risk level criterion at 1×10^{-6}
H = Threshold effect human health criterion
T&O = Taste and odor criterion

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Table 2-9

Pennsylvania Stream-Specific Water Quality Criteria*

Parameter	Criteria Limit
Aluminum	Maximum 0.1 of the 96-hour LC_{50} for representative important species
Alkalinity	Minimum 20 mg/L as $CaCO_3$
Ammonia Nitrogen	Based on pH and temperature
Bacteria	200 coliforms/100 mL (5/1-9/30) 2,000 coliforms/100 mL (10/1 - 4/30)
Fluoride	2.0 mg/L (daily average)
Iron	0.3 mg/L dissolved iron (maximum) 1.5 mg/L total iron (daily average)
Manganese	1.0 mg/L (maximum)
Nitrite Plus Nitrate	10 mg/L as N (maximum)
Osmotic Pressure	50 milliosmoles/kilogram (maximum)
pH	6.0 - 9.0
Phenolics	0.005 mg/L (maximum)
Total Dissolved Solids (TDS)	500 mg/L (monthly average) 750 mg/L (maximum)
Dissolved Oxygen (DO)	5.0 mg/L (minimum daily average) 4.0 mg/L (minimum)
Temperature	Discharge may not cause more than a 2°F change in the receiving water body during a 1-hour period

*From 25 PC 93.7.
Applies to unnamed tributaries to the Monongahela River located from Mingo Creek to the Youghiogheny River, and Lobbs Run. Both have a designated protected water use for Warm Water Fish (WWF).

Under Chapter 97, industrial wastewater discharges to either the stream or the local POTW must meet the following standards:

- No discharge of acid wastes.
- Discharge of pH not less than 6.0 and not greater than 9.0.
- Not more than 7 mg/L of dissolved iron in the discharge.

Under Chapter 102, erosion and sedimentation control measures potentially required for earth-moving activities include: limiting exposed areas, surface water diversion, velocity control, stabilization, collection of runoff, and solids separation (102.11, 102.12). Control facilities potentially required for such activities include diversion terraces, interceptor channels, conveyance channels, and sedimentation basins (102.13).

All areas disturbed by a project must be stabilized to prevent accelerated erosion when the project is completed (102.22). After stabilization is completed, all unnecessary control facilities must be removed, the area regraded, and soils established (102.24).

Any person engaged in earth-moving activities must develop, implement, and maintain erosion and sedimentation control measures (§102.4).

2.4.3 Pennsylvania Safe Drinking Water Act

The Pennsylvania Safe Drinking Water Act (Title 35 of the Pennsylvania Statutes, Subparagraph 721.1-721.17) represents the state-level equivalent of the federal SWDA. Through this act, the Pennsylvania Environmental Quality Board, under Title 25 (Environmental Resources) of the Pennsylvania Code, has established rules and regulations (given in Chapter 109) for protecting the public from contaminants in drinking water.

The Pennsylvania regulations closely resemble the federal regulations previously addressed under Subsection 2.3.3. In terms of identified potential chemical-specific ARARs (MCLs, MCLGs, and SMCLs), the Pennsylvania regulations (25 PC 109.202) incorporate by reference corresponding federal regulations (40 CFR 141 and 143).

2.4.4 Pennsylvania Air Pollution Control Act

The Pennsylvania Air Pollution Control Act (Title 35 of the Pennsylvania Statutes, Subparagraphs 4001-4015) represents the state-level equivalent of the federal CAA. Through the Air Pollution Control Act, the Pennsylvania Environmental Quality Board, under Title 25 (Environmental Resources) of the Pennsylvania Code, has established rules and regulations (presented in Chapters 121 through 141) to control air pollution and protect ambient air quality.

Applicable chapters from 25 PC include:

- Chapter 122 - National Standards of Performance for New Stationary Sources: This chapter adopts the federal standards promulgated under 40 CFR 60, which was discussed in Subsection 2.3.4.

- Chapter 123 - Standards for Contaminants: This chapter sets forth emission standards from different sources for the following parameters: particulate matter, sulfur compounds, odor, and opacity. These standards are summarized in Table 2-10. Please also note the discussion under Subsection 2.5.2 which compares these standards to those established by the ACHD under Paragraphs 401 - 404.

- Chapter 124 - National Emission Standards for Hazardous Air Pollutants: This chapter adopts the federal standards promulgated under 40 CFR 61, which were discussed in Subsection 2.3.4.

- Chapter 129 - Standards for Sources of Volatile Organic Compounds: This chapter presents standards for specific sources, including storage tanks containing volatile organic compounds ranging in size from 2,000 to 40,000 gallons (25 PC 129.57), and those that are above 40,000 gallons (25 PC 129.56). Requirements for 2,000 to 40,000-gallon tanks consist of providing pressure relief valves as specified under 25 PC 129.57.

- Chapter 131 - Ambient Air Quality Standards: This chapter adopts the federal NAAQS promulgated under 40 CFR 50, which were presented in Table 2-7. In addition, other Pennsylvania-specific Ambient Air Quality Standards (PAAQS) are specified under 25 PC 131.3. These standards are presented in Table 2-11. It should be noted that these ambient air standards are not emission (i.e., discharge) standards. Rather, they are standards to be

Table 2-10

Pennsylvania Air Emission Standards

Parameter	Maximum Allowable Emissions	
Particulate Matter	0.1-0.4 lbs/million Btu of heat input (combustion units)	Dependent upon heat input; not applicable if heat input is equal to or less than 2.5×10^6 Btu.
	0.1 grains/dry standard cubic foot (incinerators)	Corrected to 12% carbon dioxide.
Sulfur Compounds	0.6 - 1.0 lbs/million Btu of heat input (combustion units)	Dependent upon heat input; not applicable if heat input is equal to or less than 2.5×10^6 Btu. Specifically applied to Allegheny County, Beaver Valley, and Monongahela Valley air basins.
	500 ppm sulfur oxides (all sources)	Expressed as SO_2 on a dry volume basis.
Odor Emissions	Incineration at a minimum of 1,200 °F for at least 0.3 seconds (or equivalent) (all sources)	Required when malodors are detectable outside the property on which the source is located.
Opacity	20% for 3 minutes out of every hour. 60% at any time. (all sources)	

Note: Combustion Units - Units such as furnaces or boilers used in the burning of fuel for the primary purpose of producing heat or power by indirect heat transfer.

Incinerators - Units primarily for the destruction of solid, liquid, or gaseous wastes by burning (does not include combustion units).

Table 2-11

Pennsylvania Ambient Air Quality Standards*

	Concentration Averages Over			
Contaminant	1 Year	30 Days	24 Hours	1 Hour
Settled Particulate (total)	0.8 $mg/cm^2/mo.$	1.5 $mg/cm^2/mo.$	--	--
Beryllium	--	0.01 ug/m^3	--	--
Sulfates (as H_2SO_4)	--	10 $ug./m.^3$	30 ug/m^3	--
Fluorides (total soluble, as HF)	--	--	5.0 ug/m^3	--
Hydrogen Sulfide	--	--	0.005 ppm	0.1 ppm

*See also the NAAQS listed in Table 2-7 that have been adopted by Pennsylvania.

met for the ambient air after allowing for mixing of the particular discharge with the ambient air. PAAQS attainment requirements are applicable only to major sources which emit over 100-250 tons of regulated pollutants per year.

Chapters 124 and 131 represent chemical-specific requirements, while the remaining chapters include action-specific requirements.

These rules and regulations will be considered as potential ARARs for remedial action at the PICCO Resin Landfill site. In addition, potential local ARARs from the Allegheny County Department of Health with regard to air pollution control are discussed in Subsection 2.5.2.

2.4.5 Pennsylvania Dam Safety and Waterway Management Act

The Pennsylvania Dam Safety and Waterway Management Act (32 PS 693.1 et seq.) governs the design, construction, maintenance, and supervision of dams, reservoirs, water obstructions, and encroachments. Through this Act, the Pennsylvania Environmental Control Board, under Chapter 105 Title 25 (Environmental Resources) at the Pennsylvania Code (PC), has established rules and regulations to address dam safety and encroachment issues, including protection of wetlands.

Potential ARARs identified for the PICCO site involve:

- Location-specific requirements relative to wetlands (limited wetland areas have been tentatively identified at the site).
- Action-specific requirements relative to outfall structures (potential stream discharge of treated groundwater may require an outfall structure).

Specific requirements for each are discussed further below.

2.4.5.1 Location-Specific Requirements

Under 25 PA 105.1, wetlands are defined as: Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs, and similar areas. The term includes, but is not limited to, wetland areas listed in the State Water Plan, the United States Forest Service Wetlands Inventory of Pennsylvania, the Pennsylvania Coastal Zone Management Plan, and a wetland area designated by a river basin commission (§105.1).

The Regulations apply a special set of criteria to projects that affect important wetlands. Important wetlands are defined as those that perform any of the following functions:

- Wetlands which serve important natural biological functions including food chain production; general habitat; and nesting, spawning, rearing, and resting sites for aquatic or land species.
- Wetlands set aside for study of the aquatic environment, sanctuaries, or refuges.
- The destruction or alteration of wetlands that would adversely affect natural drainage characteristics, sedimentation patterns, salinity distribution, flushing characteristics, natural water filtration processes, current patterns, or other environmental characteristics.
- Wetlands that are significant in shielding other areas from wave action, erosion, or storm damage.
- Wetlands that serve as valuable storage areas for storm and floodwaters.
- Wetlands that are prime and natural recharge areas. A prime recharge area is a location where surface and groundwater are directly interconnected.

Work is prohibited in, or within 300 ft of, an important wetland unless it is demonstrated that the public benefits of the project outweigh the damage to the wetlands resource and that the project is necessary to realize public benefits.

2.4.5.2 Action-Specific Requirements

Under 25 PA 105.449 and Appendix C of 25 PA 105, the following requirements for outfall structures to streams have been established:

- Each outfall structure shall be constructed in such a manner so that there is no interference with any navigation on the stream, migration of fish, or the passage of flood flows.
- Outfall structures shall not interfere with stream uses as designated under Title 25 Chapter 93 (Pennsylvania water resource regulations as discussed under Subsection 2.4.2).

- Outfall structures shall be properly maintained which includes the removal of any accumulation of debris.

- Outfall structures must have a pipe outfall diameter of 36 inches or less.

- Pollution of the waterway with harmful chemicals, fuels, oils, greases, bituminous materials, acid, and/or other harmful or polluting materials is prohibited.

- Drinking water intakes or reservoirs for public or private water supply users downstream within 5 miles of the outfall structure which may be affected by suspended solids and turbidity increases must be determined and notification made prior to construction.

2.4.6 Pennsylvania Stormwater Management Act

The Pennsylvania Stormwater Management Act (32 PS 680.1 et seq.) is designed to encourage watershed-wide planning and management of stormwater runoff, and to protect natural runoff systems and groundwater recharge areas (§680.2). Each county must develop a stormwater management plan for each watershed located within its boundaries.

All individual project stormwater management plans must be developed and implemented in accordance with the county-wide watershed plan (680.11 (a)). Therefore, the Allegheny County Stormwater Management Plan is a potential ARAR for remedial actions at the PICCO site requiring stormwater management. This plan is discussed further in Subsection 2.5.3.

2.5 LOCAL ARARs

Local ARAR sources found to be potentially applicable to the PICCO site are discussed below and consist of the following:

- West Elizabeth Sanitary Authority (WESA) POTW Pretreatment Effluent Limitations.
- Allegheny County Department of Health (ACDH) Air Pollution Control Regulations.
- Allegheny County Stormwater Management Regulations.

2.5.1 West Elizabeth Sanitary Authority POTW Pretreatment Effluent Limitations

The West Elizabeth Sanitary Authority (WESA) owns and operates a POTW that receives pretreated wastewater after oil/water separation of leachate generated from the PICCO landfill. WESA operates the POTW under NPDES Permit No. PA 0022331. WESA, in consultation with Hercules, agreed to the effluent limitations for the wastewater stream received from Hercules. The current effluent limitations are presented in Table 2-12.

For remedial actions involving discharge to the local WESA POTW, the required pretreatment levels will be duly considered as an action-specific ARAR in development and analysis of the remedial alternatives.

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Table 2-12

WESA POTW Pretreatment Effluent Limitation

Effluent Characteristics	Concentration Limit: Monthly Average	Concentration Limit: Daily Maximum	Quantity Limit: Daily Maximum
pH	7 S.U.	8.5 S.U.	--
COD	1,000 mg/L	1,300 mg/L	1,147 lb/day
BOD_5	250 mg/L	500 mg/L	441 lb/day
Oil and Grease	30 mg/L	50 mg/L	45 lb/day
Fluorides	30 mg/L	50 mg/L	45 lb/day
Fluoroborates	2,800 mg/L	3,500 mg/L	3,087 lb/day
Boron (Total)	273 mg/L	343 mg/L	302 lb/day
Phenol	50 mg/L	100 mg/L	88 lb/day
Total	90,000 gal/day	105,000 gal/day	--

Applicable to combined Hercules wastewater flow from both local Jefferson Plant as well as from the PICCO site. Flow rate from the PICCO site estimated to vary from the 1-5 gpm.

2.5.2 Allegheny County Health Department Air Pollution Regulations

The Allegheny County Health Department (ACHD), through its Bureau of Air Pollution Control, has established rules and regulations (Article XX; County Ordinance No. 16782) to control air pollution and protect ambient air quality.

Applicable paragraphs from Article XX includes:

- Paragraph 109 - Ambient Air Quality Standards: The standards cited match those corresponding state regulations (Chapter 131), which were previously discussed in Subsection 2.4.4. It should be noted that these ambient air standards are not emission (i.e., discharge) standards; rather, they are standards to be met for the ambient air after allowing for mixing of the particular discharge with the ambient air. Attainment requirements are applicable only to major sources which emit over 100-250 tons per year of regulated pollutants.

- Paragraphs 401-404 and 517 - Emission Standards: These paragraphs set forth emission standards for the following parameters: particulate matter; sulfur compounds; odor; opacity; and incinerator afterburners. These standards are presented in Table 2-13. They are similar to corresponding state regulations (Chapter 123) which were previously discussed in Subsection 2.4.4, with the following differences noted:

  1) ACHD standards for particulate matter and sulfur compounds apply to smaller combustion units (0.5 x 10^6 Btu heat input or greater) than the corresponding state standards, which apply 2.5 x 10^6 Btu heat input or greater.

  2) The ACHD standard for particulate matter from incinerators is based on the actual charging rate, as opposed to the single-value state limits of 0.1 grains per dry standard cubic foot.

  3) The ACHD does not specify distinct emission controls for odors as does the state regulations, which specifies incineration at a minimum of 1,200 °F for at least 0.3 seconds (or equivalent).

  4) The ACHD applies a more restrictive maximum opacity standard of 20% for incinerators as compared to the 60% state standard.

Table 2-13

ACHD Air Emission Standards

Parameter	Maximum Allowable Emissions	
Particulate Matter	0.08-0.4 lbs/million Btu of heat input (combustion units)	Dependent upon heat input; not applicable if heat input is equal to or less than 0.5 x 10^6 Btu.
	0-48 lbs/hour (incinerators)	Dependent upon actual charging rate. Up to 4 tons/hour charging rate, the limit is 0.125 lb/hour times the charging rate expressed in 100 lb/hour. At or above 4 tons per hour charging rate, the limit ranges from 10-48 lb/hour based on the charging rate.
Sulfur Compounds	0.6 - 1.0 lbs/million Btu of heat input (combustion units)	Dependent upon heat input; not applicable if heat input is equal to or less than 0.5 x 10^6 Btu.
	500 ppm sulfur oxides (incinerators)	Expressed as SO on a dry volume basis.
Odor Emissions	Numerical limits not specified	Controls required when malodors are detectable outside the property on which the source is located.
Opacity	20% for 3 minutes out of every hour. 60% at any time. (combustion units)	
	20% at any time (incinerators)	
Incinerator Afterburner	Afterburning residence time of at least 0.5 seconds at a minimum temperature of 250 °F above the auto-ignition temperature of any chemical refuse processed (incinerators).	

5) The ACHD specifies that incinerator afterburners must have a minimum residence time of 0.5 seconds at a minimum temperature of 250 °F above the auto-ignition temperature of any chemical refuse processed.

* Paragraph 507 - Volatile Organic Compound Storage Tanks: The standards cited match those cited in corresponding state regulations (Chapter 129), which were previously discussed in Subsection 2.4.4.

* Paragraph 514 - New Source Performance Standards: Like the corresponding state regulations (Chapter 122), this paragraph adopts the federal standards promulgated under 40 CFR 60, which were discussed in Subsection 2.3.4.

* Paragraph 515 - National Emission Standards For Hazardous Air Pollutants: Like the corresponding state regulations (Chapter 124), this paragraph adopts the federal standards promulgated under 40 CFR 61, which were discussed in Subsection 2.3.4.

* Paragraph 1002 - Waste-Derived Liquid Fuel: This paragraph cites standards for use of waste-derived liquid fuel in combustion units or incinerators. Applicable standards in terms of permissible fuel specifications and required direct emission reductions are summarized in Table 2-14.

Paragraphs 109 and 515 represent chemical-specific requirements while the remaining paragraphs address action-specific requirements.

Hercules currently operates at its Jefferson Plant five boilers under ACHD permits. On 13 March 1987, the ACHD granted amendment to the above operating permits to allow for the burning of collected "oil" from the oil/water separator at the PICCO site in accordance with Section 1002 of Article XX as discussed above. Based on the input rating of the boilers, they are subject to the fuel specifications and direct emission reduction requirements for large equipment as summarized in Table 2-14.

Table 2-14

ACHD Fuel Standards Under Section 1002 of Article XX

	Equipment Type	
Standard	Small (a) Equipment	Large (b) Equipment
Fuel Specification:		
Total Halogens	≤ 1,000 ppm	≤ 1,000 ppm (c)
Heat of Combustion	≥ 18,000 Btu/lb	≥ 8,000 Btu/lb
Arsenic	≤ 5 ppm	≤ 5 ppm
Cadmium	≤ 2 ppm	≤ 2 ppm
Chromium	≤ 10 ppm	≤ 10 ppm
Lead	≤ 100 ppm	≤ 100 ppm
PCBs	≤ 5 ppm	≤ 5 ppm
Ash	≤ 0.3%	≤ 0.3%
Bottom Sediment and Water	≤ 2.0%	≤ 2.0%
Flash Point	≥ 100°F	≥ 100°F
Direct Emissions Reduction Required:	99.0%	99.9%

(a) Small Equipment: Rated heat input of $\leq 1 \times 10^6$ Btu/hr.
(b) Large Equipment: Rated heat input of $> 1 \times 10^6$ Btu/hr.
(c) Limitation raised to ≤ 4,000 ppm for industrial/utility boilers or industrial furnaces with a rated heat input $\geq 5 \times 10^6$ Btu/hr if a direct emission reduction of ≥ 99.9 - 99.95% is achieved.

2.5.3 Allegheny County Stormwater Management Regulations

As mandated under the Pennsylvania Stormwater Management Act (discussed under Subsection 2.4.6), Allegheny County is currently in the process of developing a county-wide Stormwater Management Plan which addresses specific watersheds located in the county. This management plan and associated regulations are potential ARARs for remedial actions at the PICCO site requiring stormwater management.

2.6 TO BE CONSIDERED CRITERIA/GUIDANCE

Identified To Be Considered (TBC) criteria/guidance for the PICCO site consists of:

- Pennsylvania Groundwater Remediation Policy as stated in a recent guidance memorandum (Pennsylvania DER, 1990).

It should be noted that TBC criteria/guidance are not potential ARARs but are evaluated as appropriate for the PICCO site.

2.6.1 Pennsylvania Groundwater Remediation Policy

Pennsylvania DER is in the process of finalizing a comprehensive groundwater quality protection strategy. Until the groundwater quality protection strategy is finalized, the following principles are cited by Pennsylvania DER in a recent guidance memorandum (Pennsylvania DER, 1990) as applicable.

- The goal for remediation is to return the contaminated groundwater to the quality at the remediation site that existed prior to the activity or past or present releases which resulted in an increase to the concentration of contaminants, as best that can be determined. In the absence of background quality data, the quality goal should be established at the non-detectable level using current detection methods for the constituent(s) of concern.

- Recognizing that groundwater cleanup to a background quality is often not practical or feasible, provisions are made for establishing a cleanup goal of a quality less than background quality. The provisions require that compelling reasons must be put forth that technology does not exist to meet the background cleanup goal or, assuming that health and environmental protection levels have been achieved, that the financial burden of additional remediation so outweighs the environmental benefit that it would be an abuse of discretion to require cleanup to background quality at this time.

- Where a feasibility basis for not remediating the contaminated groundwater to background levels is convincingly established, the cleanup goal should be established at the highest quality that can feasibly be achieved. In no case should the cleanup goal be set at a quality less than human health or environmental protection levels, unless background quality is lower than the human health and environmental protection levels.

- Where technology does not currently exist to meet human health and environmental protection levels, the best quality improvements technologically feasible should be provided, new technologies should be sought and implemented as they become available, and other means of preventing human and environmental exposure should be implemented.

This policy guidance TBC will be considered with respect to the Pittsburgh Coal and unconsolidated zone aquifers located at the PICCO site.

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SECTION 3

DEVELOPMENT OF ALTERNATIVES

The development of remedial alternatives for the PICCO site involved the following elements:

- Identification and screening of technology types applicable to each general response action to eliminate from further consideration those technology types that cannot be implemented at the site based on the contaminants present, their physical matrix, and other site concerns or characteristics. Therefore, this screening is focused upon evaluation of technical implementability to eliminate those technology types that are clearly ineffective or unworkable at the PICCO site.

- Identification and evaluation of technology process options to select a representative process(es) for each technology type retained for consideration. Process options are evaluated based primarily on technical implementability and effectiveness along with consideration of institutional implementability and cost-effectiveness. One representative process option is selected, if possible, for each technology type to simplify subsequent development and evaluation of alternatives without limiting design flexibility. Although a specific process option is selected (if possible) for alternative development and evaluation, the process option selected is intended to represent the broader range of process options available within a general technology type.

- Assembly of the selected technologies and representative process options into alternatives representing a range of treatment and containment combinations, as appropriate.

The following types of alternatives have been developed to the extent practicable:

- A number of treatment alternatives ranging from one that would eliminate or minimize to the extent feasible the need for long-term management (including monitoring) at a site to one that would use treatment as a primary component of an alternative to address the principal threats at the site. Alternatives within this range typically differ in the type and extent of treatment used and the management requirements of treatment residuals or untreated wastes.

- One or more alternatives that involve containment of waste with little or no treatment, but protect human health and the environment by preventing potential exposure and/or reducing the mobility of contaminants.

- A limited action alternative that involves minimal institutional actions necessary to reduce the potential for exposure.

- A no action alternative.

Subsequent subsections detail the development of remedial alternatives for the FICCO site.

Subsection 3.1 identifies and then screens remedial technologies and associated process options based on identified potential response actions for the site. Subsection 3.2 develops media-specific alternatives based on screened technologies. These media-specific alternatives are subsequently screened (Subsection 4.1) and combined into comprehensive site alternatives (Subsection 4.2) for further detailed analysis (Section 5).

3.1 IDENTIFICATION AND SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS

Within this section, a full range of remedial technologies and corresponding process options are identified to address each potential general response action identified in Subsection 1.2.3. Table 3-1 summarizes available technologies for identified potential general response actions. Subsequent subsections discuss and evaluate (screen) the technologies and corresponding process options for a particular general response action. Evaluation of individual technology process options was performed to select a single (if possible) representative process for each technology type retained for further consideration. One representative process is selected, if possible, for each technology type to simplify the subsequent development and evaluation of alternatives without limiting flexibility during future (post-FS) remedial design. The representative process provides a basis for developing performance specifications during future (post-FS) preliminary design; however, the specific process actually used to implement the remedial action at a site may not be selected until the post-FS remedial design phase. In some cases more than one process option is selected for a technology type. This is done if two or more processes are sufficiently different in their performance that one would not adequately represent the other.

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Table 3-1

Available Technologies for Identified Potential General Response Actions

Potential Response Action	Available Technologies
No Action	No Action
Institutional Actions and Controls	Access Restrictions
Landfill Infiltration Controls	Grading Capping/Surface Sealing Revegetation Diversion/Collection Systems
Leachate and Groundwater Controls	Capping/Surface Sealing Subsurface Containment Barriers Subsurface Drains Recovery Wells
Excavation and Removal (Waste and Soils)	Excavation/Removal Dust/Vapor Control Grading Capping/Surface Sealing Revegetation
Treatment Solids (waste, soil) Leachate Groundwater	Biological Treatment Chemical Treatment Physical Treatment Stabilization/Solidification Thermal Treatment
Land Disposal	Land Disposal
Air Emissions Control (Oil/Water Separator)	Emissions Control Systems
Private Water Supply Actions and Controls*	Home Water Treatment Alternative Water Supply Access Restrictions

*Considered as a potential contingency action if future testing indicates changes in current conditions which warrant such a response action.

Primary screening criteria utilized consisted of:

- Technical implementability to eliminate those technologies/process options which are clearly ineffective or unworkable at the PICCO site based on the main contaminants present (i.e., BTXE and PAH compounds), their physical matrix, and other site concerns or characteristics. This represents the initial criteria utilized to screen technologies/process options for the PICCO site.

- Effectiveness, focusing on the following:

  - Ability to meet defined Remedial Action Objectives.

  - Reliability with respect to contaminant and conditions present. As part of the screening, the status of each technology/process option is specified as being either conventional/demonstrated or as noted otherwise.

  - Potential impacts to human health and the environment.

The effectiveness criteria represents the primary criteria utilized to evaluate available process options in order to select a single (if possible) process option that is representative of the particular technology type.

Second criteria utilized included:

- Administrative implementability to consider institutional aspects of implementability, such as the availability of services, equipment, and skilled workers to implement the technology/process option.

- Cost effectiveness, based on relative costs utilizing engineering judgement and available reference sources.

After screening the technologies and process options, they were classified into one of three general categories:

- Not applicable.
- Not recommended.
- Potentially applicable/retained for further analysis.

The "not applicable" category indicates that the technology/process option was screened out based on evaluation of technical implementability (i.e., the technology/process option) and does not adequately address chemical contaminants and/or other areas of concern at the site. The "not recommended" category indicates that although the technology/process option may be able to address a site concern (i.e., it met the initial evaluation criteria for technical implementability), its use is not recommended (and therefore, the technology/process option is screened out) based on evaluation of effectiveness, administrative implementability, and relative cost-effectiveness. None of the technology/process options falling into these two categories were retained for further analysis. The final category, "potentially applicable/retained for further analysis," indicates recommended technologies/process options that passed this initial screening as potentially being able to address identified site concerns while not being noted as having severe limitations with respect to effectiveness, implementability, and relative cost effectiveness. It is from this category that media-specific alternatives were developed, as detailed in Subsection 3.2.

Technology and corresponding process option identification was performed using the master list of remedial technologies specified in the approved Work Plan dated 18 September 1987. Screening of technologies and corresponding process options utilized available EPA informational sources (U.S. EPA, 1985b; U.S. EPA 1986a; U.S. EPA 1986b; U.S. EPA 1987a; U.S. EPA, 1987b; U.S. EPA, 1988b).

3.1.1 No Action

3.1.1.1 Technology Description

Under the no action response technology, no additional remedial action beyond the landfill leachate collection/treatment system currently in place would be implemented at the site, with the exception of site monitoring. The landfill contamination source would be left in place, and no changes in contaminant levels would be expected except those resulting from natural processes (i.e., leaching, weathering, or biodegradation). Leachate from the landfill would continue to be collected via the existing interceptor trench and treated via the existing oil/water separation system. Access to the site would be limited by the existing fence and locked gate security system. An environmental monitoring program would be implemented to better understand changes in site conditions over time and to potentially provide warning of increasing exposure or health threats. Monitoring activities would include physical inspection of the landfill and surrounding site surface for evidence of disruption/erosion and periodic environmental sampling of the site to track contaminant migration.

3.1.1.2 Technology Screening

In terms of effectiveness, the no action response technology will not result in complete attainment of remedial action objectives nor is it likely to result in significant reduction in exposure or health risk within the immediate foreseeable future. Some reduction of organic contaminants would occur over time by natural processes (including leachate removed by the existing interceptor trench), but the extent and rate are difficult to predict. Monitoring is useful for documenting conditions, but does not reduce risk by itself.

In terms of implementability, the no action response technology could be readily implemented as it would require minimal future commitment of resources.

In terms of cost, the no action response technology involves minimal cost consisting of:

- Leachate collection/treatment O&M costs.
- Site environmental monitoring costs.

3.1.1.3 Recommendation

This technology option will be retained for further consideration as required under the National Contingency Plan.

3.1.2 Institutional Actions and Controls

3.1.2.1 Technology/Process Option Description

Available technology for institutional-based response actions consists of access restrictions. Process options available for access restriction technology include site perimeter fencing, property deed notation, and groundwater restrictions. Site perimeter fencing involves the installation of a fence across easy access areas with locked access gates around the site boundaries to physically prevent property access. The PICCO site currently has in place a fence and locked gate security system. Property deed notation involves annotating the site deed to alert prospective property buyers to the presence of hazardous substances on-site. Groundwater restrictions involve designation of affected groundwater sources as nonpotable with corresponding restrictions on its use.

As with the no action response option, environmental monitoring would be implemented for institutional-based response actions. Leachate would also continue to be collected via the existing interceptor trench and treated via the existing oil/water separation system.

Table 3-2 provides a listing and brief description of these process options. The table also indicates the status of each as a remedial option (i.e., conventional/demonstrated or otherwise), a summary of screening comments, and whether the process option was retained for further analysis. Further discussion of the screening is provided below.

3.1.2.2 Technology/Process Option Screening

Screening of the three available process options for the access restriction technology previously listed for institutional response actions and controls resulted in all three being retained for further analysis as potentially applicable options for the PICCO site. Table 3-2 provides a summary of screening comments.

Table 3-2

Institutional Action and Control Technologies/Process Options

Technology	Process Option	Description	Status	Screening Comments[1]	Retained for Further Analysis
Access Restrictions	Fencing	Fence with locked access gates around the site boundaries to physically prevent property access.	Conventional, demonstrated	Potentially applicable; site currently has in place a fence and locked gate security system.	Yes
	Property Deed Notation	Annotation of the site deed indicating to prospective property buyers as to the presence of hazardous substances on-site.	Conventional, demonstrated	Potentially applicable.	Yes
	Groundwater Restrictions	Designation of the local groundwater as nonpotable with corresponding restrictions on its use.	Conventional, demonstrated	Potentially applicable.	Yes

[1]Based on evaluation of implementability, effectiveness, and relative cost-effectiveness.

In terms of effectiveness, the access restriction technology would prove effective in limiting future exposure of human receptors to site contaminants by restricting property access either physically (through site perimeter fencing and groundwater restrictions) and/or through legal channels (through property deed annotation alerting prospective purchasers to the presence of hazardous substances on-site and legal groundwater restrictions).

However, as with the no action response option, access restriction technology does not remediate the contaminants present at the site. Furthermore, the technology does not reduce toxicity, mobility, or volume of contaminated materials as preferred under SARA.

In terms of implementability, access restriction technology process options can be readily implemented. Property deed annotation and groundwater restrictions would involve nominal legal actions. The PICCO site has in place a fence and locked gate security system. Potential upgrading and periodic maintenance of the fence and gate system would be required. The cost of access restriction technology is minimal and consists of legal costs for property deed and groundwater restrictions and maintenance costs for site perimeter fencing repairs. Other associated costs include leachate collection/treatment, O&M costs, and site environmental monitoring costs.

3.1.2.3 Recommendation

The access restriction technology and its associated process options (site perimeter fencing, property deed notation, and groundwater restrictions) will be retained for further analysis.

3.1.3 Landfill Infiltration Controls

The PICCO site currently has a clay to silty clay soil cover ranging from 4 to 10 ft thick (6 ft on average) with grassy vegetation in place over the landfill that provides a barrier to direct waste contact as well as offering some infiltration control. This FS seeks to evaluate upgrading the existing controls or adding additional infiltration controls to provide for long-term effectiveness and greater efficiency.

With respect to amount of material to be addressed under infiltration control, the surface area of the landfill unit (including the dike, downslope soils located between the dike and the interceptor trench, and the interceptor trench) is estimated at approximately 91,000 ft^2 (10,000 yd^2) (see Table 1-7).

3.1.3.1 Technology/Process Option Description

Available technologies for infiltration control response actions include:

- Grading
- Capping/surface sealing
- Revegetation
- Diversion/collection

Process options available under the diversion/collection technology include:

- Dikes and berms.
- Channels (including ditches, waterways, swales, and diversions).
- Terraces and benches.
- Chutes and downpipes.
- Seepage/recharge basins and ditches.
- Sedimentation basins/ponds.
- Levees and floodwalls.

Many of the above process options are typically implemented together and in conjunction with other technologies to provide effective infiltration control.

Table 3-3 provides a list of these technologies and the corresponding process options along with a brief description of each technology/process option. The table also indicates the status of each technology/process option as a remedial option (i.e., conventional/demonstrated or otherwise), a summary of technology/process option screening comments, and whether the technology/process option was retained for further analysis.

Further discussion of the technology/process option screening is provided below.

Table 3-3

Landfill Infiltration Control Technologies/Process Options

Technology	Process Option	Description	Status	Screening Comments[1]	Retained for Further Analysis
Grading	---	Reshaping surface of waste disposal site to control infiltration, runoff, and erosion. Potential techniques include spreading, compaction, sacrification, and contouring.	Conventional, demonstrated	Potentially applicable; spreading and compaction are applicable techniques in conjunction with capping/ surface sealing technology.	Yes
Capping/Surface Sealing	---	Low-permeability surface barriers for waste disposal sites. Potential construction materials include soils, admixtures, synthetic geomembranes, chemical sealants/stabilizers, and multilayers.	Conventional, demonstrated	Potentially applicable; landfill soil cover now in place at the site.	Yes
Revegetation	---	Establishing vegetative cover to stabilize and prevent erosion of surface soil at waste disposal sites. Potential vegetation typically includes grasses.	Conventional, demonstrated	Potentially applicable; typically utilized in conjunction with grading and capping technologies; landfill soil cover at the site is presently vegetated.	Yes
Diversion/Collection Systems	Dikes and Berms	Well-compacted earthen ridges or berms constructed to divert stormwater flow to alternate drainage areas to prevent excessive erosion of newly constructed slopes.	Conventional, demonstrated	Potentially applicable; typically used as a temporary measure until more permanent drainage structures are installed and/or the constructed slope is stabilized with revegetation.	Yes

Table 3-3

Landfill Infiltration Control Technologies/Process Options (continued)

Technology	Process Option	Description	Status	Screening Comments[1]	Retained for Further Analysis
	Channels (including ditches, waterways, swales, and diversions)	Earthen depressions constructed to intercept and convey stormwater flow to alternate drainage areas and/or to reduce slope length. Ditches are all-earthen channels, while waterways are channels stabilized with vegetation or riprap. Swales are channels with relatively flat side slopes and have a vegetative cover for erosion control. Diversions are channels with a supporting dike or berm along the downhill edge.	Conventional, demonstrated	Potentially applicable; for channel slopes greater than 5%, vegetation or riprap typically required for stabilization.	Yes
	Terraces and Benches	Embankments constructed across long or steep slopes used to: 1) control erosion by reducing slope length (terraces); and/or 2) intercept and divert stormwater flow (benches).	Conventional, demonstrated	Potentially applicable; applicable to long and steep slopes above, on, or below the disposal site. Used in combination with drainage channels.	Yes
	Chutes and Downpipes	Structures constructed to convey collected surface water flows from one level to a lower level without excessive erosion. Chutes (flumes) are open channels with smooth linings, while downpipes (downdrains) are rigid pipes laid in slope areas.	Conventional, demonstrated	Potentially applicable; applicable to steep slopes, used in conjunction with other controls.	Yes

Table 3-3

Landfill Infiltration Control Technologies/Process Options (continued)

Technology	Process Option	Description	Status	Screening Comments[1]	Retained for Further Analysis
	Seepage/ Recharge Basins and Ditches	Excavated basin/ditch constructed to recharge intercepted stormwater flow downgradient from the site.	Conventional, demonstrated	Not applicable; existing valley stream effective for off-site recharge of local stormwater flow.	No
	Sedimentation Basins/Ponds	Basin structure constructed to remove suspended solids from surface flows through gravitational settling.	Conventional, demonstrated	Potentially applicable; for long-term erosion and sediment control, used in conjunction with other controls.	Yes
	Levees and Floodwalls	Flood protection structure that creates a barrier to confine floodwater to a floodway and protect structures behind the barrier. Levees are earthen embankments, while floodwalls are constructed of concrete.	Conventional, demonstrated	Not applicable; site is not subject to flooding.	No

[1]Based on evaluation of implementability, effectiveness, and relative cost-effectiveness.

3.1.3.2 Technology/Process Option Screening

Screening of the four available technologies previously listed for infiltration control response actions revealed all four to be potentially applicable to the PICCO site and all will be retained for further analysis. Table 3-3 provides a summary of technology/process option screening comments.

Grading followed by capping/surface sealing and revegetation are technologies typically used in combination to provide infiltration, runoff, and erosion control for waste containment-based remedial alternatives at landfill disposal sites similar to the PICCO site. Therefore, these technologies are considered potentially applicable and will be retained for further analysis.

Diversion/collection system technology is typically used in response actions for erosion control and/or interception and diversion of stormwater flow around landfill disposal sites similar to the PICCO site. Therefore, this technology is considered potentially applicable and will be retained for further analysis.

With respect to available options under diversion/collection system technology, the following process options were retained for further analysis as potentially applicable options for the PICCO site:

- Dikes and berms.
- Channels (including ditches, waterways, swales, and diversions).
- Terraces and benches.
- Chutes and downpipes.
- Sedimentation basins/ponds.

For purposes of subsequent remedial alternatives development, channels were selected as the representative process option for diversion/collection technology. It should be noted, however, that a combination of the above cited process options is often incorporated to form an overall diversion/collection system.

3.1.3.3 Recommendation

The potentially applicable technologies and corresponding process options retained for further analysis for landfill infiltration control response actions are as follows:

- Capping
- Grading
- Revegetation
- Diversion/collection
  - Channels (selected representative process option)
  - Dikes and berms
  - Terraces and benches
  - Chutes and downpipes
  - Sedimentation basins/ponds

3.1.4 Leachate and Groundwater Controls

The PICCO site currently has an interceptor trench in place (installed in 1983 as a remedial measure by Hercules) to collect leachate migrating through the lower landfill dike and into soils immediately downslope of the dike. The trench is keyed into the shallow bedrock to intercept seepage. The trench currently collects on average 760,000 gallons of leachate per year. This FS seeks to evaluate additional leachate and groundwater control (if needed) to aid in achieving defined remedial action objectives for landfill leachate and groundwater.

3.1.4.1 Technology/Process Option Description

Available technologies for leachate and subsurface control response actions include:

- Capping/surface sealing
- Subsurface containment barriers
- Subsurface drains
- Recovery wells

Process options available under recovery well technology include:

- Groundwater recovery wells
- Skimmer wells

Process options available under the subsurface containment barrier technology include:

- Slurry walls
- Grout curtains
- Injection grouting
- Sheet piling
- Bottom sealing

Table 3-4 provides a listing of these technologies and corresponding process options along with a brief description of each technology/process option. The table also indicates the status of each technology/process option as a remedial option (i.e., conventional/ demon-

Table 3-4

Leachate and Groundwater Control Technologies/Process Options

Technology	Process Option	Description	Status	Screening Comments[1]	Retained for Further Analysis
Capping/Surface Sealing	--	See Table 3-3. Surface containment will have an important beneficial effect on leachate and subsurface conditions.	Conventional, demonstrated	Potentially applicable; landfill soil cover now in place at the site.	Yes
Subsurface Drains	--	Trench drainage system used to intercept lateral flow and collect leachate by gravity flow. Piping is laid end to end at the trench bottom with gravel wrapped in filter fabric placed around the pipe. An impermeable liner may be placed on the downgradient side of the trench and keyed into bedrock for containment purposes.	Conventional, demonstrated	Applicable; interceptor trench installed in 1983 at the site with continuing operation ongoing. Trench utilizes pipe drainage wrapped in gravel and filter fabric. Impermeable liner keys into bedrock on downgradient side of trench.	Yes
Subsurface Containment Barriers	Slurry walls	Low-permeable vertical subsurface cut-off wall formed by filling an excavated trench with slurry material. The slurry is typically a soil-bentonite mixture, although cement-bentonite or reinforced concrete can be used for additional strength.	Conventional, demonstrated	Potentially applicable in some localized areas; and/or for temporary cut-off purposes during excavation activities; soil-bentonite typically offers widest range of chemical compatibilities and lowest permeability. Soil-bentonite option also would take advantage of low-permeable, fine-grained clay soil present at the site.	Yes

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Table 3-4
(Continued)

Technology	Process Option	Description	Status	Screening Comments[1]	Retained for Further Analysis
	Grout Curtains	Low-permeable vertical subsurface cut-off wall formed by injecting a liquid, slurry, or emulsion under pressure through inserted pipes. Potential grouts include chemical grouts and particulate (cement and/or bentonite) grouts.	Demonstrated	Not recommended; generally not applicable to fine-grained clay soils as present at the PICCO site. Such soils limit implementability and effectiveness. Slurry walls offer lower permeability alternative at less cost. Grouting best suited for sealing localized rock voids.	No
	Injection Grouting	Low-permeable local subsurface area cut-off formed by injecting a liquid, slurry, or emulsion under pressure through an inserted pipe. Potential grouts include chemical grouts and particulate (cement and/or bentonite) grouts.	Demonstrated	Potentially applicable in some localized areas. Not recommended for effectively sealing large subsurface void areas such as open mine shafts.	Yes
	Sheet Piling	Impermeable vertical subsurface cut-off wall constructed by driving lengths of interlock steel into the ground with a pile driver.	Conventional, demonstrated	Potentially applicable only in localized areas where there is sufficient overburden.	Yes
	Bottom Sealing	Impermeable horizontal subsurface barrier used to prevent downward migration of contaminants. Approaches include grout injection or slurry injection (block displacement) at depth under pressure through drilled injection holes.	Developmental, not demonstrated	Not recommended; technology effectiveness unknown due to developmental status. In addition, the valley forming the disposal site was strip-mined to bedrock prior to waste placement.	No

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Table 3-4
(Continued)

Technology	Process Option	Description	Status	Screening Comments[1]	Retained for Further Analysis
Recovery Wells	Skimmer Wells	Well point system used to recover floating product present by use of skimmer pumps.	Conventional, demonstrated	Potentially applicable; has been used for product recovery from wells located in the unconsolidated zone ground-water table. Offers means of providing product recovery from identified mine voids containing free product.	Yes
	Groundwater Recovery Wells	Well point system used to recover groundwater utilizing recovery pumps.	Conventional, demonstrated	Not applicable; technical implementability in question - see further discussion on technical infeasibility given in text. Skimmer wells offer a viable option to address groundwater concerns.	No

(1) Based on evaluation of implementability, effectiveness, and relative cost-effectiveness.

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treated or otherwise), a summary of technology/process option screening comments, and whether the technology/process option will be retained for further analysis. Further discussion of the technology/process option screening is provided in the following subsections.

3.1.4.2 Technology/Process Option Screening

Screening of the four available technologies previously listed for leachate and subsurface control response actions reveal them all to be potentially applicable to the PICCO site and all will be retained for further analysis. Table 3-4 provides a summary of technology/process option screening comments.

Capping/surface sealing technology is typically used to minimize infiltration (and therefore reduce leachate generation) at landfill disposal sites similar to the PICCO site. Therefore, this technology is considered potentially applicable and will be retained for further analysis.

Subsurface drain technology is currently in use at the site in the form of the existing interceptor trench used to collect leachate migrating through the lower landfill dike and into soils immediately downslope of the dike. Therefore, this technology is applicable and will be incorporated into development of remedial alternatives for the PICCO site.

Subsurface containment barrier technology is typically used for subsurface and leachate control for waste containment-based remedial alternatives at landfill disposal sites similar to the PICCO site. Therefore, this technology is considered potentially applicable and will be retained for further analysis. Potential process options identified include slurry walls, injection grouting, and sheet piling. Each option was identified as potentially applicable to localized areas around the site, and/or for temporary cut-off purposes during excavation activities. For purposes of remedial alternatives development, slurry walls were selected as the representative process option for subsurface containment barrier technology. Selection of slurry walls was based on its widespread successful application at other sites. It should be noted that subsurface containment barriers have limited applicability to the PICCO site due to the following factors:

- Subsurface containment barriers cannot technically be implemented at the site to address concerns in the Pittsburgh Coal zone. The Pittsburgh Coal groundwater and associated potential mine voids are overlain by a layer of relatively unfractured bedrock. Installation of subsurface containment barriers such as sheet piling or slurry walls through this layer of unfractured bedrock is considered technically infeasible. In addition, injection grouting cannot be used to effectively seal off large subsurface void areas such as mine voids.

- Subsurface containment barriers would have limited usefulness with regard to the unconsolidated groundwater zone at the site. The existing interceptor trench serves to intercept flow in the unconsolidated zone immediately downslope (southeast edge) of the landfill. Therefore, the remaining potential use of subsurface containment barriers lies in diverting flow in the unconsolidated zone upgradient of the landfill along its northwest edge. However, the landfill is located in a narrow, steep valley with shallow bedrock cropping out at the surface around the site, particularly along the sides (northeast and southwest edges) of the landfill. Therefore, this upgradient flow cannot be diverted around the landfill.

With respect to recovery well technology, the skimmer well process option is considered potentially applicable for product (leachate) recovery from identified mine voids containing free product. Therefore, this technology will be retained for further analysis.

Regarding the groundwater recovery process option, a detailed feasibility evaluation for potential groundwater recovery/remediation at the PICCO site was performed and is presented in Appendix A. This evaluation was put forth to address Pennsylvania's Groundwater Remediation Policy, identified under Subsection 2.6 as a TBC criteria/guidance. The evaluation addressed the following areas of concern:

- Exploratory drilling program. It was noted that to define the location of mine voids, pillars, barriers, and rubble piles, an exploratory borehole program could potentially require 820 boreholes on a grid spacing of 40 feet within the area of the plume. Most of the borings would need to be drilled in residential areas which would negatively affect residents' lives, cause significant damage to the surface environment, and could affect real estate values.

- Hydraulic conditions. Pumpage of groundwater from interconnected mine pools involves significantly different hydraulic conditions than groundwater pumpage from porous media. Capture zone analysis indicated that individual pumping wells in the Pittsburgh Coal would create small capture zones, with a calculated diameter of only 4.5 feet at a 50 gpm pumping rate from a 12-inch recovery well. Due to the difficulty in creating a significantly large cone of depression in an environment with essentially open-channel flow, it will be very difficult or impossible to create a hydrologic barrier to groundwater flow in the Pittsburgh Coal. The lowering of the water table in the area of a recovery well field would be offset by recharge from adjacent areas. Even at a relatively close recovery well spacing of 50 feet, complete control and recovery of groundwater flow would not be attained, assuming complete interconnection of mine voids, due to the small cone of depression for each well. Some contaminated water would continue to move downgradient.

  Furthermore, due to the large lateral extent of the Pittsburgh Coal upgradient and crossgradient of the dissolved phase plume (estimated to be approximately 1.8 square miles), there is an extremely large volume of water available to flow into the recovery field area and dilute contaminants being recovered. It is estimated that approximately 500 million gallons of water would be present within the existing Pittsburgh Coal mineworks upgradient and crossgradient from the plume.

- Recovery/Treatment System Requirements. In order to attempt to recover the dissolved phase plume, two lines of closely-spaced recovery wells, one near the leading edge of the plume and one in the area of the downgradient site property boundary, would be necessary. Additional recovery wells between the two rows of recovery wells would likely be necessary in order to optimize hydraulic control and attempt to recover the entire dissolved phase plume. Such a two-row recovery well field set at a relatively close space of 50 feet per well would result in 40 to 70 recovery wells, depending upon the number of recovery wells required between the two rows. At 50 gpm per well, this would result in a flow of 3 to 5 million gallons per day requiring treatment.

  A preliminary conceptualized treatment train consisted of:

  - Oil and suspended solids removal via an oil/water separator, self-enclosed to prevent uncontrolled releases of VOC.

  - Iron, manganese, and sulfide removal via addition of a chemical oxidant (such as chlorine) to precipitate iron and manganese, while converting odorous sulfides to non-odorous sulfates. Precipitated iron and manganese would be removed as a sludge in a clarifier unit.

  - Organics removal via packed-bed air stripping (for BTEX removal) followed by granular activated carbon (GAC) treatment (for PAH removal). Air stripping would result in air emissions requiring treatment prior to atmospheric releases.

From this treatment train, sludge and spent GAC will be generated, requiring disposal, potentially as a hazardous waste. Treated groundwater would need to be either reinjected into the mine voids or discharged to a surface water body. Discharge to the local POTW would likely not be possible due to the large flow.

In addition to the installation and operation of the treatment system, it would also be necessary to perform regular maintenance on the recovery wells in order to maintain the efficiency of the recovery system and to prevent fouling of pumps and wells by bacteria and inorganic precipitates, particularly iron. Given the natural poor quality of groundwater in coal seams (high in dissolved solids and metals), an intensive maintenance program would be required.

- <u>Potential Mine Subsidence</u>. If significant dewatering of the coal mine occurs, due to groundwater pumping, causing the water level in the mine to reach a level below the mean annual low water level, the reduction in the confining pressure of the water on coal pillars may cause a decrease in pillar strength. This could cause slumping of weathered coal from the sides of pillars and possibly failure of the pillars which support the roof rock. Pilot tests would be necessary to evaluate the potential for subsidence to be induced by a groundwater recovery system.

- <u>Natural Remediation Processes</u>. Research related to BNA and VOC contamination of groundwater in coal seams, caused by underground coal gasification (UCG) tests, indicates that natural processes are a potentially significant mechanism for the removal of organic compounds from groundwater (Humenick et al., 1982). The processes to which reductions in organic concentrations are attributed include biodegradation and adsorption of organic chemicals to coal. Research related to the coal adsorption phenomena indicate that coal can adsorb many types of organic compounds including phenol, naphthalene and benzene (Humenick et al., 1982 and 1987), which are compounds of concern in the groundwater at the PICCO site.

  Based upon the relatively high seepage velocity of 56.8 feet per day calculated for the Pittsburgh Coal in the site area (WESTON, March 1991) and the fact that seep samples downgradient of the plume generally did not detect landfill related constituents, it is assumed that the organic contaminants downgradient of the site are being adsorbed by the coal left in place and biodegraded at a rate which has allowed natural restoration of the groundwater to occur. This attenuation of the dissolved phase organic constituents by biodegradation and adsorption to coal has apparently resulted in a contaminant plume which is assumed to be at dynamic equilibrium. In other words, it is likely that movement of the leading edge of the plume further downgradient is not occurring due to natural processes which remove these trace levels of contaminants from the groundwater.

- Remediation Limitations. Research has indicated that restoration of groundwater to background conditions is very difficult and sometimes impossible. In 19 case studies documented by U.S. EPA, only two of the sites appeared to be approaching aquifer restoration (U.S. EPA, 1989). These two sites are in relatively simple hydrogeologic settings and the adequacy of the site characterization is questionable (U.S. EPA, 1989). In a complex hydrogeologic environment, such as the mined Pittsburgh Coal, many factors work against groundwater by pump and treat methods restoration. These include the problems with establishing a capture zone (discussed above), desorption of chemical constituents from the coal and clay and the existence of free phase product within the mine voids.

  These case studies indicate that plume containment and contaminant mass reduction are more realistic (and attainable) objectives in complex hydrogeologic settings such as the mined Pittsburgh Coal aquifer.

- Background Groundwater Quality. Even if it were technologically feasible to remove the organic contaminants from the groundwater, the background quality of the Pittsburgh Coal groundwater is very poor and the groundwater would not make a suitable water supply source without treatment. The Pittsburgh Coal groundwater in the background well TW-15 exceeds federal primary or secondary drinking water standards for four parameters. These parameters are aluminum, chromium, iron and manganese which, with the exception of chromium, exceed the federal drinking water standards by more than an order of magnitude. This information indicates that the background quality of the Pittsburgh Coal groundwater presents a potential health risk and is also of aesthetically poor quality.

  In conclusion, the negative impacts of the noise, odors, and general disruption of the community are believed to far outweigh the benefits of an attempt to treat the groundwater at the PICCO site since no present health risks to the environment or population have been determined. Additionally, it is believed that the overall objective of cleaning up groundwater to background concentrations would not be attained by such a recovery system due to the technological limitations described above.

From this evaluation, groundwater recovery/remediation was determined to be infeasible and impractical/inappropriate for the PICCO site.

3.1.4.3 Recommendation

The potentially applicable technologies and corresponding process options retained for further analysis for leachate and subsurface control response actions are as follows:

- Capping.
- Subsurface containment barriers (identified as potentially applicable to localized areas around the site, and/or for temporary cut-off purposes during excavation activities).
  - Soil/bentonite slurry walls (selected representative process option)
  - Injection grouting
  - Sheet piling
- Subsurface drains (existing interceptor trench).
- Recovery wells (skimmer wells).

3.1.5 Excavation and Removal

Potential excavation and removal response actions would apply to the landfill unit and/or downslope soils. With respect to the amount of material to be potentially addressed under excavation and removal, the volume of the landfill unit (including waste material, soil underlying the waste, soil cover, landfill dike, soil located between the dike and interception trench, and interception trench) is estimated at 92,000 yd^3 (137,000 tons) (see Table 1-7). Approximately one half (47,500 yd^3 or 77,000 tons) of this total is waste material. The amount of soils located downslope of the interceptor trench to be potentially addressed by excavation and removal is estimated at 23,000 yd^3 (31,000 tons) (see Table 1-8). Therefore, the potential total amount of waste and soil is estimated at 115,000 yd^3 (168,000 tons).

3.1.5.1 Technology/Process Options Description

Available technologies for response actions involving excavation and removal of waste and soils include:

- Excavation/removal
- Dust/vapor control
- Grading
- Capping/surface sealing
- Revegetation

No process options were noted for any of the technologies.

Table 3-5 provides a listing and brief description of these technologies. The table also indicates the status of each technology as a remedial option (i.e., conventional/demonstrated or otherwise), a summary of the technology screening comments, and whether the technology will be retained for further analysis. Further discussion of the technology screening is provided in the following subsections.

Table 3-5

Excavation and Removal Technologies/Process Options

Technology	Process Option	Description	Status	Screening Comments[1]	Retained for Further Analysis
Excavation/ Removal	--	Removal of surface and subsurface soils by mechanical means, typically backhoes, loaders, or dozers. Removed material may be stored, treated, or disposed of on-site or off-site.	Conventional, demonstrated	Potentially applicable; de-watering may be required in some locations to handle high moisture waste present in landfill.	Yes
Dust/Vapor Control	--	Control of fugitive airborne emissions of dust/particulates and vapors during excavation. Methods range from use of chemical suppressants, physical stabilizers, wind screens, and water spraying to use of flexible con-tainment structures complete with air emissions controls.	Conventional, demonstrated	Potentially applicable; use of a flexible containment structure complete with air emissions control may be required for excavation of waste material.	Yes
Grading	--	See Table 3-3; backfilling and grading may be required after excavation.	Conventional, demonstrated	Potentially applicable; spreading and compaction are applicable techniques in conjunction with capping/ surface sealing technology.	Yes
Capping/Surface Sealing	--	See Table 3-3; may be required after excavation and grading.	Conventional, demonstrated	Potentially applicable; cap system requirements dependent upon residual contaminant levels after excavation and backfill.	Yes
Revegetation	--	See Table 3-3.	Conventional, demonstrated	Potentially applicable; typically utilized in conjunction with grading and capping technologies; grasses and legumes are typically used.	Yes

[1]Based on evaluation of implementability, effectiveness, and relative cost-effectiveness.

3.1.5.2 Technology/Process Option Screening

Screening of the five available technologies previously listed for response actions involving excavation and removal of waste, surface soils, and sediments revealed all five to be potentially applicable to the PICCO site and all will be retained for further analysis. Table 3-5 provides a summary of technology screening comments.

The excavation and removal technology is commonly considered for sites similar to the PICCO site that involve waste materials and/or contaminated soils. Therefore, this technology is considered potentially applicable and will be retained for further analysis. As noted in Table 3-5, one concern would be the high moisture content (44% on average) of the waste material present in the landfill. Dewatering may be required for practical handling of the waste material.

Dust/vapor control is a technology commonly used in conjunction with excavation activities. Since excavation is judged to be a potentially applicable technology at the PICCO site, dust/vapor control is likewise considered potentially applicable and will also be retained for further analysis. As noted in Table 3-5, use of a flexible containment structure complete with air emissions control may be required for excavation of waste material. Due to the high percentage level of both volatile and semivolatile organic contaminants present in the waste material, excavation activities can result in significant air emission impacts. Organic vapor emissions is a major concern, particularly with respect to community effects due to the low odor threshold of the aromatic compounds of concern at the site. Therefore, staged excavation of the landfill under a flexible containment structure (i.e., self-supporting or inflatable dome) complete with air emissions controls may be required.

Grading followed by capping/surface sealing and revegetation are technologies typically used in combination to provide infiltration, runoff, and erosion control after excavation activities are conducted. Since excavation is considered to be a potentially applicable technology at the PICCO site, these associated technologies are also considered to be potentially applicable and will be retained for further analysis. As noted in Table 3-5, capping/surface sealing requirements would be dependent upon the residual contaminant levels remaining after excavation and backfill.

3.1.5.3 Recommendation

The potentially applicable technologies retained for further analysis for response actions involving excavation and removal of waste and soils, include:

- Excavation/removal
- Dust/vapor control
- Grading
- Capping/surface sealing
- Revegetation

3.1.6 Treatment

Potential treatment response actions would apply to solid media (waste or soils) and/or liquid media (landfill leachate from the interceptor trench drain and potentially from skimmer wells). As groundwater recovery was screened out as a potential process option under leachate and groundwater controls (see Subsection 3.1.4), treatment of groundwater is not evaluated as it is not applicable to the site. The particular chemical compounds of concern for both media are organic aromatic hydrocarbons, principally BTEX, naphthalene, and 2- methylnaphthalene.

With respect to the amount of solid media (waste and soil) to be potentially addressed under treatment, the volume of the landfill unit (including waste material), soil underlying the waste, soil cover, landfill dike, soil located between the dike and interceptor trench, and interceptor trench) is estimated at 92,000 yd^3 (137,000 tons) (see Table 1-7). The amount of soils located downslope of the interceptor trench to be potentially addressed by treatment is estimated at 23,000 yd^3 (31,000 tons) (see Table 1-8). Therefore, the potential total amount of waste and soil is estimated at 115,000 yd^3 (168,000 tons). Approximately 40% (47,500 yd^3 or 77,000 tons) of this total is waste material.

With respect to the amount of liquid media (leachate) to be potentially addressed under treatment, the current average leachate removal rate by the existing interceptor trench is estimated at 760,000 gallons per year (approximately 1.5 gallons per minute). After oil/water separation, approximately three drums (5,000 pounds) of "oil" (non-aqueous product) is currently recovered each week (approximately 1 gallon per hour) from the leachate entering the interceptor trench. The remaining separated aqueous fraction (approximately 751,000 gallons per year) is discharged to the local WESA POTW for biological treatment in an extended aeration activated sludge process under a contractual agreement.

The amount of additional leachate in the form of non-aqueous product that may be recovered via use of skimmer wells is unknown. For remedial alternatives development, it was assumed that an average of an additional three drums of "oil" would be recovered each week utilizing skimmer wells.

3.1.6.1 Technology/Process Option Description

Available technologies for response actions involving treatment of contaminants in both liquid and solid media include:

- Biological treatment
- Chemical treatment
- Physical treatment
- Stabilization/solidification
- Thermal treatment

Biological treatment technology involves the use of microbial activity to degrade biodegradable organics. Process options considered under the biological treatment technology include:

Process Option	Applicability
• Activated sludge	Leachate
• Trickling filter	Leachate
• Rotating biological disks	Leachate
• Anaerobic biodegradation	Leachate
• Aerated lagoons	Leachate
• Stabilization pond	Leachate
• Land application	Leachate and/or solids
• Bioreclamation (in situ biodegradation)	Leachate and/or solids
• Composting	Solids
• Slurry - phase biodegradation	Solids
• Solid - phase biodegradation	Solids

The chemical treatment technology involves processes that chemically alter the structure of target chemical compounds to reduce toxicity and/or mobility or that facilitate removal from the stream in which it is present. The process options considered under the chemical treatment technology include:

Process Option	Applicability
• Neutralization	Leachate
• Precipitation	Leachate
• Oxidation (UV/ozone/hydrogen peroxide)	Leachate
• Oxidation (chlorination)	Leachate
• Oxidation (electrolytic)	Leachate
• Hydrolysis	Leachate
• Reduction	Leachate
• Dechlorination	Leachate
• Extraction	Leachate and/or solids
• In situ chemical treatment	Leachate and/or solids

The physical treatment technology involves processes that separate a waste stream either by applying physical force or by changing the physical form of components to reduce toxicity and/or mobility or that facilitate removal from the stream in which it is present. The process options considered under the physical treatment technology include:

Process Option	Applicability
• Flocculation	Leachate
• Sedimentation	Leachate
• Carbon adsorption	Leachate
• Ion exchange	Leachate
• Reverse osmosis	Leachate
• Electrodialysis	Leachate
• Steam stripping	Leachate
• Aeration/air stripping	Leachate
• Gravity oil/water separation	Leachate
• Dissolved air flotation	Leachate
• Filtration	Leachate
• Permeable treatment beds	Leachate
• Soil washing	Solids
• In situ soil washing	Solids
• Low-temperature thermal stripping	Solids
• In situ volatilization	Solids
• In situ steam extraction	Solids
• Dewatering	Solids

The stabilization/solidification treatment technology involves the addition of various materials such as Portland cement or pozzolanic materials that combine physically and/or chemically to decrease the mobility of the waste constituents.

The thermal treatment technology involves processes that utilize high temperatures as the principal means for destroying or detoxifying target chemical compounds, particularly organic compounds. The process options considered under the thermal treatment technology include:

Process Option	Applicability
• Rotary kiln incineration	Leachate and/or solids
• Fluidized bed incineration	Solids (slurry, sludges)
• Multiple hearth incineration	Solids (sludges)
• Wet air oxidation	Leachate and/or solids
• Cement and lime kilns	Leachate
• Industrial boilers	Leachate
• Infrared incineration	Leachate
• Molten salt combustion	Leachate and/or solids
• Pyrolysis	Leachate and/or solids
• Plasma arc	Leachate and/or solids
• High-temperature fluid wall reactor/advanced electric reactor	Leachate and/or solids
• Vitrification	Solids
• In situ vitrification	Solids

Table 3-6 provides a listing of these technologies and corresponding process options along with a brief description of each technology/process option and its treatment applicability (leachate and/or solids). The table also indicates the status of each technology/process option as a remedial option (i.e., conventional/demonstrated or otherwise) and a summary of the technology/process option screening comments. Further discussion of the technology/process option screening is provided in the following subsections.

Table 3-4

Treatment Technologies/Process Options

Technology	Process Option	Applicability	Treatment Description	Status	Screening Comments[1]	Retained for Further Analysis
Biological Treatment	Activated Sludge	Leachate	Aerobic breakdown of biodegradable organics through microorganism activity (oxidation and hydrolysis). The liquid stream is introduced into an aeration basin where an active concentrated biomass is maintained with air mechanically supplied for microbial growth. Biosolids/liquid separation is subsequently performed in a clarification unit.	Conventional, demonstrated	Potentially applicable for treatment of the aqueous stream after oil/water separation pretreatment. Present treatment system for the leachate collected by the interceptor trench involves discharge of the separated aqueous stream to the local POTW, which utilizes the extended aeration activated sludge treatment process.	Yes
	Trickling Filter	Leachate	Aerobic breakdown of biodegradable organics through microorganism activity. The liquid stream is sprayed over a bed of rocks or synthetic media upon which a microbial slime is grown. Sloughed biosolids/liquid separation is subsequently performed in a clarification unit. Most efficient for removal of alcohols, phenols, phthalates, cyanides, and ammonia.	Conventional, but limited demonstration for treatment of hazardous waste constituents.	Not recommended due to effectiveness concerns and availability of more proven activated sludge process options for aerobic biological treatment.	No

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Table 3-6
(Continued)

Technology	Process Option	Applicability	Treatment Description	Status	Screening Comments[1]	Retained for Further Analysis
	Rotating Biological Disks	Leachate	Aerobic breakdown of biodegradable organics through microbial activity. The liquid stream is introduced into a basin where biological disks, typically 5 to 10 ft in diameter, are coated with a microbial film, and rotated through troughs containing the liquid. Approximately half of the rotating disk is submerged within the liquid at any one moment. Sloughed biosolids/liquid separation is subsequently performed in a clarification unit. Most efficient for removal of alcohols, phenols, phthalates, cyanides, and ammonia.	Conventional, but limited demonstration for treatment of hazardous waste constituents.	Not recommended due to effectiveness concerns and availability of more proven activated sludge process options for aerobic biological treatment.	No
	Anaerobic Biodegradation	Leachate	Anaerobic breakdown of biodegradable organics to methane and carbon dioxide through microorganism activity. The liquid stream is introduced into a closed vessel where an active biomass is maintained under an oxygen-deficient atmosphere. Used to treat aqueous waste with low to moderate levels of organics.	Conventional, demonstrated	Potentially applicable for treatment of the aqueous stream after oil/water separation pretreatment.	Yes

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Table 3-6
(Continued)

Technology	Process Option	Applicability	Treatment Description	Status	Screening Comments[1]	Retained for Further Analysis
	Aerated Lagoons	Leachate	Aerobic breakdown of biodegradable organics through microbial oxidation/hydrolysis and photosynthesis. The liquid stream is introduced into a lagoon (surface impoundment) where an active dilute biomass is present. Air is mechanically supplied for microbial growth. Biosolids/liquid separation is subsequently performed physically/chemically or in a clarification unit. Most efficient for removal of alcohols, phenols, phthalates, cyanides, and ammonia.	Conventional, demonstrated	Not recommended due to very limited land availability on-site and odor concerns restricting the implementability of this process option.	No
	Stabilization Pond	Leachate	Similar to aerated lagoon except air supply is via wind action, not mechanical aeration. As such, the pond depth is kept relatively shallow, typically 1 to 3 ft.	Conventional, demonstrated option.	Not recommended due to very limited land availability on-site restricting the implementability of this process	No
	Land Application	Leachate and/or Solids	Direct application of material onto land for natural microbial decomposition of biodegradable organic compounds. Utilized for removal of biological oxygen demand, suspended solids, and nutrients.	Conventional, demonstrated	Not recommended for either leachate or solids treatment. Land application technique can result in spreading contamination via infiltration and runoff if the compounds of concern are not effectively degraded by the microbes. Limited land availability at the site and odor concerns restrict the implementability of this process option.	No

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Table 3-6
(Continued)

Technology	Process Option	Applicability	Treatment Description	Status	Screening Comments(1)	Retained for Further Analysis
	Biorecla-mation (In situ Biodegrada-tion)	Leachate and/or Solids	In situ treatment technique promoting subsurface microbial growth (either indigenous or introduced aerobic or anaerobic bacteria) for microbial decomposition of biodegradable organic compounds. Oxygen and nutrients com-pounds. Oxygen and nutrients are supplied to the subsurface for enhanced microbial growth.	Demonstrated	Not recommended for leachate treatment; site conditions not suitable for imple-menting a controlled in situ recirculation system.	No
					Potentially applicable to soils; direct treatment of waste material may be limited due to high levels of BTEX and naphthalene.	Yes
	Composting	Solids	Natural microbial decomposition of biodegradable organics via storage of highly biodegradable and structurally firm material (chopped hay, wood chips) with a small percentage (less than 10%) of biodegradable waste. Passive and active aeration systems are used to ensure adequate microbial activity. Typically used for municipal wastewater sludge treatment.	Conventional, limited demon-stration for industrial waste treat-ment	Not recommended; typical open-air opera-tion can lead to uncontrolled release of volatile organics to the atmosphere. Also, very limited land availability on-site restricts the implementability of this process option.	No
	Slurry-Phase Biodegrada-tion	Solids	Microbial treatment of biodegradable organics in a large bioreactor mechan-ically agitated to provide intimate mixing and contacting of microorganisms (either indigenous or introduced aerobic	Developmental	Not recommended; slurrying requirement significantly increases effective waste volume. Very limited land avail-ability and odor concerns on-site restrict the implementability of this process option.	No

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Table 3-6
(Continued)

Technology	Process Option	Applicability	Treatment Description	Status	Screening Comments[1]	Retained for Further Analysis
			or anaerobic bacteria) with the material to be treated. To provide intimate mixing, the material must be slurried to at least 50% liquid by weight. Oxygen and nutrients are supplied to enhance microbial growth.			
	Solid-Phase Biodegradation	Solids	Microbial treatment of biodegradable organics in an aboveground system utilizing either indigenous or introduced aerobic or anaerobic bacteria. Oxygen and nutrients are supplied to enhance microbial growth.	Demonstrated in limited applications	Not recommended; very limited land availability and odor concerns on-site restrict the implementability of this process option.	No
Chemical Treatment	Neutralization	Leachate	Addition of a neutralizing agent (acid or base) to adjust pH of the liquid stream. Applied to treat waste acids or alkalides (bases).	Conventional, demonstrated	Not applicable as a stand-alone technology; acid or alkaline streams are not of concern at the PICCO site.	No
	Precipitation	Leachate	Addition of precipitation agents (typically lime or sodium sulfide) to alter ionic equilibrium to produce insoluble precipitates (hydroxides or sulfides) that can be subsequently removed via sedimentation or filtration. Used for removal of heavy metals, phosphate, sulfate, and fluoride. Results in a treated effluent and a sludge.	Conventional, demonstrated	Not applicable as a stand-alone technology; heavy metals, phosphate, sulfate, and fluoride are not of concern at the PICCO site.	No

Table 3-6
(Continued)

Technology	Process Option	Applicability	Treatment Description	Status	Screening Comments[1]	Retained for Further Analysis
	Oxidation (ultraviolet radiation/ ozone/hydrogen peroxide)	Leachate	Application of ultraviolet light and/ or ozone and/or hydrogen peroxide for oxidation degradation of organics. Applicable to aromatic and unsaturated hydrocarbons; not well suited for degrading saturated hydrocarbons. Most cost-effective for dilute streams containing a minimum of nontarget oxidizable compounds.	Conventional, demonstrated	Potentially applicable; for treatment of aqueous stream after oil/ water separation pretreatment; aromatic organic compounds of concern at the PICCO site are amenable to this treatment method.	Yes
	Oxidation (chlorination)	Leachate	Addition of chlorine under alkaline conditions for oxidative degradation of cyanide (both free and complex) waste streams with ultimate decomposition to carbon dioxide and nitrogen in a two-stage process.	Conventional, demonstrated	Not applicable; cyanide is not a concern at the PICCO site.	No
	Oxidation (electrolytic)	Leachate	Direct electrical current is applied to a cathode/anode system placed in a tank containing the liquid. Cyanide is destroyed while metals are plated out on the cathodes.	Demonstrated	Not applicable; cyanides and metals are not a concern at the PICCO site.	No
	Hydrolysis	Leachate	Displacement of a functional group on an organic compound with a hydroxyl group from water typically via acid- or base-catalyzed reactions. Used for degradation of amines, carbonates, alkyl halides, sulfuric and sulfonic acid esters, phosphoric and phosphonic acid esters, nitriles, and pesticides.	Conventional industrial process; developmental for hazardous waste treatment	Not applicable; treatment method not applicable to the aromatic organic compounds of concern at the PICCO site.	No

Table 3-6
(Continued)

Technology	Process Option	Applicability	Treatment Description	Status	Screening Comments[1]	Retained for Further Analysis
	Reduction	Leachate	Addition of a reducing agent (typically base metals such as iron, aluminum, zinc, and sodium compounds) to lower the oxidation state of metals (chromium, mercury, lead, and silver) to reduce toxicity or solubility.	Conventional, limited application at hazardous waste sites	Not applicable; metals are not a concern at the PICCO site.	No
	Dechlorination	Leachate	Addition of chemical reagents (typically glycol and/or alkali metal-based) to break apart or structurally rearrange chlorinated compounds. Developed for PCB-containing wastes.	Demonstrated in limited applications	Not applicable; chlorinated organic compounds are not a concern at the PICCO site.	No
	Extraction	Leachate	Addition of a chemical extraction solution (typically a dilute acid, and/or complexing/chelating coagulation agents for separation and/or treatment of specific constituents). Principal waste treatment application is for breaking of oil/water emulsions for subsequent oil/water separation. Heating may be required to break oil/water emulsions. Results in a treated effluent stream and a concentrated waste stream.	Conventional, demonstrated	Potentially applicable; for enhanced oil/water separation of leachate streams.	Yes

Table 3-6
(Continued)

Technology	Process Option	Applicability	Treatment Description	Status	Screening Comments[1]	Retained for Further Analysis
	In Situ Chemical Treatment	Leachate and/or Solids	In place addition of various treatment agents, including solvents, precipitating and neutralizing chemicals, and stabilizing agents. Typical application is for treatment of inorganics, particularly metals, via neutralization, precipitation, oxidation/reduction, or solidification/stabilization.	Demonstrated	Not applicable; inorganics are not a concern at the PICCO site.	No
	Soil Washing	Solids	Application of a liquid washing solution to extract constituents from sludge or excavated soil/waste. Potential washing solutions include water, organic solvents, water/chelating agents, water/surfactants, acids, and bases, depending on the specific constituent(s) to be removed.	Demonstrated in limited applications	Not recommended; due to implementability and effectiveness concerns; fine-grained PICCO site soils (clay) unfavorable. The organic compounds of concern are strongly held within the tight clay soil matrix, limiting this method's effectiveness. In addition, fine-grained clay particles will be difficult to remove from the washing fluid.	No
	In Situ Soil Washing	Solids	Soil washing applied to in-place soils/sediments/waste materials. The solvent or surfactant solution (or water) is injected or allowed to infiltrate into the area of concern to enhance constituent mobility, with subsequent active recovery of the wash. Typical application would be removal of soluble organics from permeable soils.	Developmental	Potentially applicable; natural soil flushing action currently occurring at the site with stormwater infiltration and subsequent movement through the landfill waste material and downslope surface soils to collection as leachate at the existing interceptor trench.	Yes

Table 3-6
(Continued)

Technology	Process Option	Applicability	Treatment Description	Status	Screening Comments[1]	Retained for Further Analysis
Physical Treatment	Flocculation	Leachate	Addition of a chemical flocculating agent (lime, alum, iron salts, polymers) followed by a rapid, then slow physical mixing sequence to effect agglomeration of fine suspended particles to larger settleable particles. Used primarily for precipitation of inorganics, particularly removal of metals as hydroxides or sulfides.	Conventional, demonstrated	Not applicable; inorganic compounds are not a concern at the PICCO site.	No
	Sedimentation	Leachate	Use of a settling vessel (surface impoundment, basin, or clarifier) to effect removal of suspended solids from the suspending liquid by gravitational force.	Conventional, demonstrated	Not applicable as a stand-alone technology; suspended solids are not a concern for leachate stream at the PICCO site, and flocculation treatment for removal of inorganics is not applicable to the PICCO site.	No
	Carbon Adsorption (activated carbon)	Leachate	Removal of low-solubility organic compounds through adsorption onto beds of activated carbon. Activated carbon provides a large internal pore surface area for surface attachment (adsorption) of organic molecules. Carbon bed must be periodically replaced or regenerated. Effective for removal of aromatics, aliphatic	Conventional, demonstrated	Potentially applicable for treatment of aqueous stream after oil/water separation pretreatment; aromatic organic compounds of concern at the PICCO site are amenable to this treatment method.	Yes

Table 3-6
(Continued)

Technology	Process Option	Applicability	Treatment Description	Status	Screening Comments[1]	Retained for Further Analysis
			chlorinated hydrocarbons, phenols, and chlorinated pesticides in single-phase aqueous streams. Clogging considerations dictate that suspended solids be below 50 ppm and oil and grease below 10 ppm.			
	Ion exchange	Leachate	Reversible process in which target ions are removed via exchange with exchange ions held by the exchange material (typically synthetic resins or natural clays/zeolites). Exchange material must be periodically replaced or regenerated. Used for removal of metallic elements, halides, cyanides, nitrates, carboxylics, sulfonics, and some phenols. Oil fouling can occur.	Conventional, demonstrated	Not applicable; treatment method not applicable to aromatic organic compounds of concern at the PICCO site.	No
	Reverse Osmosis	Leachate	Filtering separation process in which liquid is passed through a semipermeable membrane at a pressure greater than the osmotic pressure generated by dissolved materials present in the liquid stream. Results in a treated effluent stream and a concentrated waste stream. Used to remove dissolved organics/inorganics. Typically used in drinking water treatment applications.	Conventional, undemonstrated for hazardous waste treatment	Not recommended due to implementability and effectiveness concerns; most applicable to very dilute streams such as those encountered in drinking water treatment. Not suitable for streams with moderate or high organic concentrations that can dissolve the permeable membrane. Membrane surfaces are easily clogged by colloidal and organic matter present in the liquid stream. Most low-molecular weight dissolved organics are only partially removed by this method.	No

Table 3-6
(Continued)

Technology	Process Option	Applicability	Treatment Description	Status	Screening Comments[1]	Retained for Further Analysis
	Electro-dialysis	Leachate	Separation process in which liquid is passed through alternatively placed cation-permeable and anion-permeable membranes. An electrical potential is applied across the membranes to separate and remove ionic species. For purifying brackish water and recovering metal salts.	Demonstrated	Not applicable; metals are not a concern at the PICCO site.	No
	Steam Stripping	Leachate	Introduction of steam to the liquid stream in a packed or tray tower to effect fractional distillation via evaporation. For removal of volatile organic compounds with low water solubilities (such as chlorinated hydrocarbons and aromatics), hydrogen, sulfide, and ammonia, as well as semivolatile chlorinated aromatics, ketones, and alcohols. Subsequent condensation of the vapor stream blown through the liquid results in a concentrated waste stream.	Conventional, demonstrated	Potentially applicable for treatment of the aqueous stream after oil/water separation pretreatment; aromatic compounds present at the PICCO site are amenable to this treatment method; would typically not be used if air stripping is effective.	Yes
	Aeration/Air Stripping	Leachate	Mass transfer separation process where air is introduced to effect phase transfer from liquid to air. Volatile organic compounds with low water solubilites (such as chlorinated hydrocarbons and aromatics), hydrogen sulfide, and ammonia are efficiently transferred from the	Conventional, demonstrated	Potentially applicable for treatment of the aqueous stream after oil/water separation pretreatment; aromatic compounds present at the PICCO site are amenable to this treatment method. Volatile organic air emissions are a concern with this method.	Yes

Table 3-6
(Continued)

Technology	Process Option	Applicability	Treatment Description	Status	Screening Comments[1]	Retained for Further Analysis
			liquid to the air phase via this process. Aeration can be performed either under continuous liquid phase (i.e., an aeration basin) or continuous gas phase (i.e., a packed column condition).			
	Gravity Oil/ Water Separation	Leachate	Gravitational separation of immiscible liquids having sufficiently different densities, such as oil and water. The liquid flows into a vessel under quiescent conditions. The oil rises to the top where it is drawn off while the water is removed from the lower portion. Acid and/or heat may be added to break oil/water emulsions for adequate separation.	Conventional, demonstrated	Applicable; presently in use at the PICCO site for treatment of leachate collected by interceptor trench.	Yes
	Dissolved Air Flota- tion	Leachate	Separation process to remove insol- uble suspended fine particulates and/or oil and grease. The liquid is first saturated with air at high pressures in a retention chamber with subsequent transfer to a flotation chamber under atmospheric pressure. The reduced pressure results in a release of small air bubbles that carry fine particles, oil, and grease to the surface for removal via a skimmer mechanism, while the aqueous liquid flows off the bottom.	Conventional, demonstrated	Potentially applicable; for removal of oil and grease components. Volatile organic air emissions are a concern with this method; would typically not be used if physical oil/water separa- tion is effective.	Yes

Table 3-6
(Continued)

Technology	Process Option	Applicability	Treatment Description	Status	Screening Comments[1]	Retained for Further Analysis
	Filtration	Leachate	Separation process to remove suspended solids by forcing the liquid through a porous medium (typically a sand bed). Periodic filter regeneration through backwashing is required.	Conventional, demonstrated	Not applicable as a stand-alone technology; suspended solids are not a concern for leachate at the PICCO site, and flocculation treatment for removal of inorganics is not applicable to the PICCO site.	No
	Permeable Treatment Beds	Leachate	An excavated trench filled with a reactive, permeable medium to behave as a subsurface reactor. Potential reactive media include limestone (for neutralizing heavy metals via precipitation), zeolites/synthetic ion exchange resin (for heavy metal removal), glauconitic green sands (for heavy metal removal), and activated carbon (for nonpolar organics removal).	Developmental	Not recommended; only activated carbon option applicable to the aromatic organic compounds of concern at the PICCO site. Major implementability limitation is short treatment bed life due to difficulty in reactivating removal media in-place and fouling potential due to oil.	No
	Low-Temperature Thermal Stripping	Solids	Volatilization of organics via material placement under elevated temperatures (up to 450°F) in a thermal processor (indirect heat exchange).	Demonstrated	Potentially applicable; aromatic organic compounds of concern are amenable to this treatment method.	Yes
	In Situ Volatilization	Solids	In-place stripping of volatile organic compounds by mechanically drawing air through soil pore spaces by means of application of a vacuum through constructed soil vents.	Demonstrated	Not recommended due to implementability/effectiveness concerns; fine-grained PICCO site soils (clay) unfavorable for applying an effective vacuum for extraction purposes. Also, naphthalene has a relatively low volatility with respect to the volatile organic compounds normally removed with this process.	No

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Table 3-6
(Continued)

Technology	Process Option	Applicability	Treatment Description	Status	Screening Comments[1]	Retained for Further Analysis
	In Situ Steam Extraction	Solids	In-place steam-stripping of volatile organic compounds by injecting steam and hot air into the soil through hollow augers. The mixture heats the soil, evaporating off volatile compounds that are trapped at the surface and condensed to liquid form.	Developmental	Not recommended due to implementability/ effectiveness concerns; fine-grained PICCO site soils (clay) not conducive to air or steam circulation.	No
	Dewatering	Solids	Removal of liquid while concentrating suspended solids without changing the chemical characteristics of the materials. Various methods are available, including centrifugation, pressure filtration, vacuum filtration, vacuum pumping, thermal drying (evaporation), and drying beds. Facilitates handling of sludges and sediment.	Conventional, demonstrated	Potentially applicable for saturated soils and/or high moisture content waste material at the PICCO site; used as a pretreatment step in conjunction with other technologies/process options.	Yes
Stabilization/Solidification	--	Leachate and/or Solids	Addition of a stabilizing agent (either cement-based, pozzolanic or silicate-based, asphalt-based, thermoplastic-based, or organic polymer-based) to chemically/physically reduce the mobility of chemical constituents. Mobility is reduced through the binding of constituents into a stable, inert solid mass with low-permeability that resists leaching. Typically applied to inorganic waste streams. Organics interfere with the chemical bonding process.	Demonstrated	Not applicable for chemical fixation; organic compounds are not effectively immobilized and inorganic compounds are not a concern at the PICCO site.	No

Table 3-6
(Continued)

Technology	Process Option	Applicability	Treatment Description	Status	Screening Comments[1]	Retained for Further Analysis
Thermal Treatment	Rotary Kiln Incineration	Leachate and/or Solids	High-temperature (1,500 - 3,000°F) oxidation under controlled conditions (excess oxygen) to destroy organic constituents. A slightly inclined rotating refractory-lined horizontal cylinder is used for processing. Typically economical for high-inorganic content streams or wastes with a fusible ash content. Typically preferred for mixed solid residues. Liquid processing typically performed via nozzle injection into the combustor.	Conventional, demonstrated	Potentially applicable; aromatic organic compounds of concern at the PICCO site are amenable to this treatment method. For leachate, most cost-effective for treatment of non-aqueous "oil" phase after oil/water separation.	Yes
	Fluidized Bed Incineration	Solids (slurries, sludges)	High-temperature (850 - 1,800°F) oxidation under controlled conditions (excess oxygen) to destroy organic constituents. A refractory-lined vertical cylinder containing either a fixed or circulating bed of inert granular sand or sand-like material (size-crushed refractory) is used for processing. Combustion air introduced fluidizes the bed particles. The mixing action offers increased thermal efficiency while minimizing volatile metal emissions. Typically used for slurries or sludges. Not suitable for high-inorganic content streams, or highly viscous wastes or wastes with a fusible ash content. Feed	Conventional, demonstrated	Not recommended due to implementability concerns; limited application range to slurries or sludges with feed solids under 1 inch in size.	No

Table 3-6
(Continued)

Technology	Process Option	Applicability	Treatment Description	Status	Screening Comments[1]	Retained for Further Analysis
			solids typically must be no greater than 1 inch to permit proper fluidized bed mixing.			
	Multiple Hearth Incineration	Solids (sludges)	High-temperature (1,400 - 1,800°F) oxidation under controlled conditions (excess oxygen) to destroy organic constituents. A refractory-lined vertical cylinder with a rotating central shaft and a series of solid flat hearths is used for processing. Not suitable for highly chlorinated organics or wastes with a fusible ash content. Typically used for sewage sludges. Units are not readily transportable.	Conventional, demonstrated for sewage sludges	Not recommended due to implementability concerns; not mobile for on-site setup, ideal application range limited to sludges.	No
	Wet Air Oxidation	Leachate and/or Solids (sludges)	High-temperature (350 - 650°F) oxidation under controlled, pressurized conditions (300 - 3,000 psi) to destroy organic constituents. Elevated pressures are used to keep the liquid in a liquid state so that oxidation can occur at lower temperatures. The waste liquid is first mixed with compressed air. The mixture is then passed through a heat exchanger to raise the temperature to reaction conditions and then directed into the reaction pressure vessel. Used primarily for concentrated waste streams containing organics and oxidizable	Demonstrated for treatment of conventional wastewater treatment sludges in liquid form	Not recommended; due to availability of other thermal technology process options that are conventional and have demonstrated effectiveness for the aromatic organic compounds of concern at the PICCO site; not appropriate for solid residues.	No

Table 3-6
(Continued)

Technology	Process Option	Applicability	Treatment Description	Status	Screening Comments[1]	Retained for Further Analysis
			inorganics and for wastes not readily amenable to biological treatment. Typically used to treat biological wastewater treatment sludges.			
	Cement and Lime Kilns	Leachate	High-temperature (2,000 - 3,000°F) oxidation under controlled conditions (excess oxygen) to destroy organic constituents. This process option utilizes existing cement and lime manufacturing kilns, which consist of a rotating, refractory-lined horizontal cylinder used for processing raw materials. Liquid waste is added as a supplemental/alternative fuel in the process. Kiln temperatures and gas residence times are longer than conventional incinerators, providing high destruction efficiencies up to 99.9999 percent.	Conventional, demonstrated	Potentially applicable; aromatic organic compounds of concern at the PICCO site are amenable to this treatment method. Most cost-effective for treatment of non-aqueous "oil" phase after oil/water separation.	Yes
	Industrial Boilers	Leachate	High-temperature oxidation to destroy organic constituents. This process option utilizes existing industrial boilers that are used in steam generation for process usage and/or power generation. Liquid waste is added as a supplemental/alternative fuel in the process. Typically used to destroy waste oils, solvents, and other flammable, nonhalogenated organics, while	Conventional, demonstrated	Applicable; presently in use at the PICCO site for treatment of leachate recovered by the interceptor trench. Most effective (as currently done) for treatment of non-aqueous "oil" phase after oil/water separation.	Yes

Table 3-6
(Continued)

Technology	Process Option	Applicability	Treatment Description	Status	Screening Comments[1]	Retained for Further Analysis
			providing recovery of available heat value from the waste. Not suitable for highly chlorinated organics.			
	Infrared Incineration	Leachate and/or Solids	High-temperature (500 - 2,300°F) process employing silicon carbide elements to generate infrared thermal radiation to destroy organic constituents. Destruction can be either via oxidation (i.e., excess air is provided to operate in an incineration-type mode) or via pyrolysis (i.e., a deficient oxygen atmosphere is maintained).	Demonstrated in limited applications	Not recommended due to the availability of other thermal technology process options that are conventional and have demonstrated effectiveness for the aromatic compounds of concern at the PICCO site.	No
	Molten Salt Combustion	Leachate and/or Solids	High-temperature (1,400 - 1,800°F) oxidation under controlled conditions to destroy organic constituents. Liquid is introduced into a bed of molten alkali metal salts (typically sodium carbonate) with organic constituents undergoing catalytic destruction. Noted effectiveness for chlorinated hydrocarbons. Not suitable for waste with an ash content exceeding 20%.	Developmental	Not recommended due to the availability of other thermal technology process options that are conventional and have demonstrated effectiveness for the aromatic organic compounds of concern at the PICCO site.	No
	Pyrolysis	Leachate and/or Solids	High-temperature (1,000 - 1,700°F) application under controlled conditions (specifically an oxygen-deficient atmosphere) to pyrolize (as opposed to oxidize) organic wastes into combustible gases consisting of hydrocarbons,, hydrogen, and carbon	Demonstrated for rubber tire recycling	Not recommended due to the availability of other thermal technology process options that are conventional and have demonstrated effectiveness for the aromatic organic compounds of concern at the PICCO site. Also, transportable units are not readily available.	No

Table 3-6
(Continued)

Technology	Process Option	Applicability	Treatment Description	Status	Screening Comments[1]	Retained for Further Analysis
			monoxide. Inorganic constituents (salts, metals, particulates) will form a solid char during pyrolysis. Pyrolysis is not suitable for high-inorganic wastes. Typically applied to materials not conducive to conventional incineration or that contain volatile metals or recoverable residues.			
	Plasma Arc	Leachate and/or Solids	Extremely high-temperature (up to 9,000°F) application under controlled conditions (oxygen-deficient atmosphere) to pyrolyze (as opposed to oxidize) waste constituents into combustible gases. A plasma torch acts as one electrode, while a hearth at the bottom of the refractory-lined reactor vessel acts as the second electrode. Electricity is discharged between the electrodes and a small amount of gas is introduced into the discharge region through the torch. The gas is ionized into its plasma state and subsequently transfers energy to the waste liquid to cause pyrolysis.	Developmental; demonstrated on a pilot-scale	Not recommended due to the availability of other thermal technology process options that are conventional and have demonstrated effectiveness for the aromatic organic compounds of concern at the PICCO site.	No

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Table 3-6
(Continued)

Technology	Process Option	Applicability	Treatment Description	Status	Screening Comments(1)	Retained for Further Analysis
	High-Temperature Fluid Wall reactor (HTFWR/Advanced Electric Reactor (AER))	Leachate and/or Solids	Very high-temperature (4,000 - 5,000°F) application under controlled conditions (oxygen-deficient atmosphere) to pyrolyze (as opposed to oxidize) organic constituents to their elemental state. Inorganic compounds are melted and fused into vitreous solids under these high temperatures. Heating is supplied by large electrodes located in the jacket of the refractory-lined, tubular reactor vessel.	Developmental; demonstrated on a pilot-scale	Not recommended due to the availability of other thermal technology process options that are conventional and have demonstrated effectiveness for the aromatic organic compounds of concern at the PICCO site; not appropriate for solid residues.	No
	Vitrification	Solids	High-temperature (2,900 - 3,100°F) application under an oxygen-deficient atmosphere to pyrolize organic wastes into elemental gas (carbon monoxide and hydrogen) and carbon. Inorganic constituents become entrained in stable, inert glass and siliceous melts (the vitrous mass). Cited waste feed limitations include a maximum water content of 25% and a maximum organic content of 10%.	Developmental for industrial wastes	Not recommended due to the availability of other thermal technology process options that are conventional and have demonstrated effectiveness for the aromatic organic compounds of concern at the PICCO site.	No
	In Situ Vitrification	Solids	In-place joule-heating to 2,900 - 3,600°F to electrically melt soil/sludge/waste. Destroys organics via pyrolysis and binds inorganic waste compounds in a stable, inert glassy, solid matrix (the vitreous mass) resistant to leaching. Electrodes are inserted into the ground to provide the high electric current necessary to melt the material.	Developmental	Not recommended due to the availability of other thermal technology process options that are conventional and have demonstrated effectiveness for the aromatic organic compounds of concern at the PICCO site. In addition, an underground fire can start with flammable waste materials and coal deposits present at the site.	No

(1)Based on evaluation of implementability, effectiveness, and relative cost-effectiveness.

3.1.6.2 Technology/Process Option Screening

Screening of the five available technologies listed above for treatment response actions indicated that biological treatment, chemical treatment, physical treatment, and thermal treatment are potentially applicable for both leachate and solids treatment at the PICCO site. These four options should be retained for further analysis. Table 3-6 provides a summary of the technology screening comments.

Stabilization/solidification was determined not to be applicable for either leachate or solids treatment as this technology is geared towards the treatment of inorganic compounds, while the constituents of concern at the PICCO site are organic in nature. Organic compounds interfere with the chemical/physical bonding process promoted for waste immobilization under this technology; therefore organics are not effectively treated via immobilization under this technology. Research efforts indicate that levels of leachable organic contaminants are similar for both treated and untreated samples with loss of leachable VOCs due to release as air emissions during mixing rather than due to chemical/physical binding (U.S. EPA 1988d).

The biological treatment technology was found to be potentially applicable for both leachate and solids. For leachate, the biological treatment technology is potentially applicable for the treatment of the aqueous stream after oil/water separation pretreatment. The technology process options retained for further analysis include activated sludge (aerobic treatment) and anaerobic biodegradation. Other process options considered for leachate treatment were not recommended due to limited demonstration of effectiveness in hazardous waste treatment and/or due to very limited land availability on-site restricting implementation of the process options. For the purposes of remedial alternative development and evaluation, aerobic activated sludge was selected as the representative biological treatment process option. Such a treatment system is in current satisfactory operation at the site, with the separated aqueous stream being directed to the local POTW that utilizes an activated sludge treatment system. Anaerobic biodegradation will be retained as a potential substitute process option for biological treatment.

For solids treatment, the biological treatment technology process option selected for further analysis was bioreclamation (in situ biodegradation). Its potential applicability for treatment of the waste material may be limited due to the high levels of BTEX and naphthalene present. Other biological treatment process options considered for solids treatment were not recommended due to limited demonstration of effectiveness and/or due to very limited land availability on-site restricting implementation of the process options.

The chemical treatment technology was found to be potentially applicable for both leachate and solids. For leachate, screening of process options available under the chemical treatment technology resulted in the following potentially applicable process options being retained for further analysis:

- Oxidation (UV, ozone, hydrogen peroxide)
- Extraction (liquid/liquid)

Oxidation is potentially applicable to treatment of the aqueous phase after oil/water separation pretreatment of the leachate. Liquid/liquid extraction represents a means for achieving oil/water separation.

Oxidation represents a process option capable of destroying the constituents of concern, while liquid/liquid extraction is a separation and not a degradation treatment process option. Other chemical treatment process options considered for leachate treatment were found to be not applicable to the aromatic organic compounds of concern at the PICCO site.

For solids treatment, screening of the two process options available under the chemical treatment technology indicated that extraction was potentially applicable and will be retained for further analysis. The other chemical treatment process option for solids treatment, in situ chemical treatment, is not applicable to the aromatic organic compounds of concern at the PICCO site. It should be noted that the selected extraction process is a separation and not a degradative treatment process option.

The physical treatment technology was found to be potentially applicable for both leachate and solids. For leachate, screening of the process options available under the physical treatment technology resulted in the following potentially applicable process options being retained for further analysis:

- Carbon adsorption (activated carbon)
- Steam stripping
- Aeration/air stripping
- Gravity oil/water separation
- Dissolved air flotation

Carbon adsorption, steam stripping, and aeration/air stripping are each potentially applicable to treatment of the aqueous phase after oil/water separation pretreatment of the leachate. Gravity oil/water separation and dissolved air flotation each represent a means for achieving oil/water separation.

Other physical treatment process options considered for leachate treatment were found to be not applicable or not recommended for the PICCO site, as discussed in Table 3-6. The potentially applicable physical treatment process options retained for further analysis are separation processes and not degradation treatment processes.

For the purposes of remedial alternative development and evaluation, aeration/air stripping was selected as the representative physical treatment process option for treatment of recovered leachate after oil/water separation. Based on WESTON's previous experience with other sites containing the contaminants of concern present at the PICCO landfill (BTXE and naphthalene), air stripping is typically more cost-effective than either carbon adsorption or steam stripping. However, both carbon adsorption and steam stripping will be retained as potential substitute process options for physical treatment.

For the purposes of alternative development and evaluation, gravity oil/water separation was selected as the representative physical treatment oil/water separation process option. Such a separation system is currently in satisfactory operation at the site. DAF will be retained as a potential substitute process option for gravity oil/water separation treatment if additional treatment is required in the future.

For solids treatment, screening of the process options available under the physical treatment resulted in the following potentially applicable process options being retained for further analysis:

- In situ soil washing
- Low-temperature thermal stripping
- Dewatering

As noted in Table 3-6, dewatering is typically used as a pretreatment step in conjunction with other technologies/process options.

Other physical treatment process options considered for solids treatment were found not applicable or not recommended for the PICCO site, as discussed in Table 3-6. The potentially applicable physical treatment process options retained for further analysis are separation processes and not degradation treatment processes. For purposes of remedial alternatives development and evaluation, all three cited potentially applicable process options will be considered separately.

The thermal treatment technology was found potentially applicable for both leachate and solids. For leachate treatment, screening of the process options available under thermal treatment resulted in the following potentially applicable process options being retained for further analysis:

- Rotary kiln incineration
- Cement and lime kilns
- Industrial boilers

Each of these options is noted as being most cost-effective for treatment of non-aqueous product ("oil") after oil/water separation.

Other thermal treatment process options considered for leachate treatment were not recommended due to the availability of the thermal options listed above that are conventional and have demonstrated effectiveness for the aromatic organic compounds of concern at the PICCO site. Each of the thermal process options retained for further analysis offer treatment through thermal destruction of the compounds of concern.

For the purposes of remedial alternative development and evaluation, industrial boiler treatment was selected as the representative thermal treatment process option. Such a treatment system is in current operation at the site. Rotary kiln treatment and cement and lime kiln treatment will be retained as potential substitute process options for thermal treatment of non-aqueous portion of the leachate.

For solids, screening of the process options available under thermal treatment resulted in rotary kiln incineration being retained for further analysis as the recommended potentially applicable process option.

Other thermal treatment process options considered for solids treatment were not recommended due to limited demonstration status. The selected rotary kiln option is a fully developed and readily available process that has conventional demonstrated effectiveness for the aromatic organic compounds of the concern at the PICCO site. The selected rotary kiln thermal process option offers treatment through thermal destruction of the compounds of concern.

3.1.6.3 Recommendations

The potentially applicable technologies and associated process options retained for further analysis for treatment of leachate response actions include:

Technology/Process Option	Applicability
• Biological Treatment	
– Aerobic biodegradation (selected representative process option)	Aqueous phase

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	- Anaerobic biodegradation	Aqueous phase
• Chemical Treatment		
	- Oxidation (UV, ozone, hydrogen peroxide)	Aqueous phase
	- Extraction	Mixed aqueous/non-aqueous phases
• Physical Treatment		
	- Carbon adsorption (activated carbon)	Aqueous phase
	- Steam stripping	Aqueous phase
	- Aeration/air stripping (selected representative process option)	Aqueous phase
	- Gravity oil/water separation (selected representative process option)	Mixed aqueous/non-aqueous phase
	- Dissolved air flotation	Mixed aqueous/non-aqueous phase
• Thermal Treatment		
	- Rotary kiln incineration	Non-aqueous phase
	- Cement and lime kilns	Non-aqueous phase
	- Industrial boilers (selected representative process option)	Non-aqueous phase

The potential applicable technologies and associated process options retained for further analysis for treatment of solids (waste and soil) response actions include:

- Biological Treatment
  - In situ biodegradation
- Chemical Treatment
  - Extraction

* Physical Treatment

  - In situ soil washing
  - Low-temperature thermal stripping
  - Dewatering

* Thermal Treatment

  - Rotary kiln incineration

3.1.7 Land Disposal

Potential land disposal response actions would potentially apply to materials removed from the landfill unit and/or excavated downslope soils. With respect to the amount of material to be potentially addressed after excavation by land disposal, the volume of the landfill unit (including waste material, soil underlying the waste, soil cover, landfill dike, soil located between the dike and interceptor trench, and the interceptor trench) is estimated at 92,000 yd^3 (137,000 tons) (see Table 1-7). Approximately one half (47,500 yd^3 or 77,000 tons) of this total is waste material. The amount of soils located downslope of the interceptor trench to be potentially addressed after excavation by land disposal is estimated at 23,000 yd^3 (31,000 tons) (see Table 1-8). Therefore, the potential total amount of waste and soil is estimated at 115,000 yd^3 (168,000 tons).

An important consideration for any land disposal response action are potential institutional implementability limitations based on regulatory requirements. This is discussed further in subsequent subsections. The reader is also referred to Section 2, ARARs, for further details on regulatory requirements.

3.1.7.1 Technology/Process Option Description

The land disposal technology for land disposal response actions involves providing a long-term, environmentally secure repository for the disposal of removed contaminated materials and/or residues from treating such materials. Potential process options include:

- Secure landfill
- Secure vault
- Deep-well injection

A secure landfill is defined by design and operating standards identified under applicable regulations. Typical design standards may include a bottom multilayer liner system, leachate detection/collection systems, gas venting, and a top surface multilayer cover system. Regulatory-based design standards for hazardous waste landfills are discussed under

Subsections 2.3.1 and 2.4.1, while those for non-hazardous (residual waste) landfills are addressed in Subsection 2.4.1.

A secure vault is an aboveground version of a secure landfill. The outer containment structure is typically constructed of concrete with an internal bottom multilayer liner system, leachate detection/collection systems, gas venting, and a multilayer cover system.

Deep-well injection involves pressure well injection of material (in a liquid form or mixed with a stabilizing agent) deep underground into rock strata or salt domes.

Table 3-7 provides a list of these process options along with a brief description of each. The table also indicates the status of each process option as a remedial option (i.e., conventional/demonstrated or otherwise), a summary of screening comments, and whether the process option will be retained for further analysis. Further discussion of the screening is provided below.

3.1.7.2 Technology/Process Option Screening

Land disposal is a potentially applicable technology for the PICCO site and will be retained for further analysis. However, off-site land disposal may be limited to low-level and/or pretreated materials due to recent regulatory restrictions aimed at limiting land disposal. Potential land disposal regulatory restrictions are discussed as ARARs under Subsection 2.3.1. On-site land disposal is considered impractical due to the limited land availability on-site.

Screening of the three available process options for the land disposal technology resulted in secure landfill disposal being the one process option retained for further analysis. Table 3-7 provides a summary of the screening comments. Secure landfill disposal is a conventional, demonstrated process option potentially applicable to the PICCO site and will be retained for further analysis. As secure landfills cannot accept liquids or materials

Table 3-7

Land Disposal Technologies/Process Options

Technology	Process Option	Description	Status	Screening Comments[1]	Retained for Further Analysis
Land Disposal	Secure Landfill	Solid waste placement into a landfill with engineered design features, which can include a bottom multilayer liner system, leachate detection/collection systems, gas control and a top surface multilayer cover system. Secure landfills cannot accept liquids or materials containing free liquids.	Conventional, demonstrated	Potentially applicable, utilizing an off-site commercial landfill facility. May require pretreatment to meet applicable regulatory land disposal restrictions. Liquids or materials containing free liquids cannot be disposed of in this manner, and must be dewatered.	Yes
	Secure Vault	Aboveground version of a secure landfill. Outer containment structure typically constructed of concrete, with an internal bottom multilayer liner system, leachate detection/collection system, gas control, and a top surface multilayer cover system.	Limited Demonstration	Not recommended due to implementability concerns; no commercial vault disposal facilities are known, and the limited available land at the site restricts on-site construction of such a facility.	No
	Deep Well Injection	Pressure well injection of material (in a liquid form or mixed with a stabilizing agent) deep underground into rock strata or salt domes. Limited to liquid wastes, and is most applicable to liquids containing heavy metals that can be precipitated or chelated prior to injection.	Conventional, demonstrated in the petroleum and nuclear industries.	Not recommended due to implementability and effectiveness concerns; most applicable to heavy metals, acidic, or dissolved solids wastes which are not a concern at the PICCO site. May require pretreatment to meet restrictions under the Underground Injection Control (UIC) Program.	No

(1) Based upon evaluation of implementability, effectiveness, and relative cost.

containing free liquids, such materials will require dewatering prior to disposal. Pretreatment may also be required to meet potential land disposal restrictions.

Secure vaults represent a conventional, but not well-demonstrated, disposal option. As leachate is collected and removed, vaults are most applicable to solids, soils, and dewatered sludges. As no commercial vault disposal facilities are known and available land at the site limits on-site construction of such a facility, this option is not recommended due to these implementability concerns.

Deep-well injection is a conventional, demonstrated option in the petroleum and nuclear industries. However, recent regulatory restrictions under the Underground Injection Control (UIC) Program as part of the Safe Drinking Water Act seek to minimize disposal in this manner. A further discussion of potential regulatory restrictions for deep-well injection is given under Subsection 2.3.3. In addition, deep-well injection is limited to liquid wastes and is most applicable to liquids containing heavy metals that can be precipitated or chelated prior to injection. As the contaminants of concern at the PICCO site are organic compounds and not heavy metals, deep-well injection is not recommended as a disposal option due to these implementability and effectiveness concerns.

3.1.7.3 Recommendation

Land disposal will be retained as a potentially applicable response action technology. Disposal in a secure landfill will be retained for further analysis as a recommended process option.

3.1.8 Air Emissions Controls

Potential air emissions control response actions would apply to the existing oil/water separator located at the site which was identified in the site model as the specific point of concern with respect to existing site-related air emissions.

Because the emissions from the separator are fugitive in nature, the exact amount of media requiring potential remedial action is non-quantifiable.

3.1.8.1 Technology/Process Option Description

Available technologies for response actions involving air emissions control consist of air emissions control systems. Identified process options for this technology include:

- Emissions prevention systems
- Emissions treatment units

Emissions prevention systems include use of engineered features such as pressure relief valves to prevent uncontrolled releases of volatile contaminants into the atmosphere.

Emissions treatment systems are used to reduce air-borne contaminant levels present in acceptable levels prior to release into the atmosphere. Treatment systems typically consist of vapor-phase activated carbon units or thermal oxidizers.

Table 3-8 provides a list of the two process options available under emissions control system technology along with a brief description of each process option. The table also indicates the status of each process option (i.e., conventional/demonstrated or otherwise), a summary of process option screening comments, and whether the process option will be retained for further analysis. Further discussion of the process option screening is provided below.

Table 3-8

Air Emissions Control Technologies/Process Options

Technology	Process Option	Description	Status	Screening Comments[1]	Retained for Further Analysis
Air Emissions Control Systems	Emission Prevention Systems	Use of engineered features such as pressure valves to prevent uncontrolled releases into the atmosphere.	Conventional, demonstrated	Potentially applicable; replacement of existing separator within an upgraded enclosed unit recommended.	Yes
	Emissions Treatment Units	Use of treatment system such as vapor-phase activated carbon or thermal oxidation units to reduce airborne contaminants to acceptable levels prior to atmospheric release.	Conventional, demonstrated	Not recommended due to cost-effectiveness concerns; prevention process option generally preferable to treatment process option.	No

3.1.8.2 Technology/Process Option Screening

Screening of the two process options available under air emission control technology resulted in the emissions prevention process option being retained for further analysis. The other available process option, emissions treatment, was not retained due to cost-effectiveness concerns. In general, emissions prevention is preferable to treatment of generated emissions from both an effectiveness as well as a cost standpoint.

Table 3-8 provides a summary of the process option screening comments.

3.1.8.3 Recommendation

Air emissions control technology will be retained as potentially applicable for air emissions control response actions focusing on the existing oil/water separator at the site. Emissions prevention systems are retained as the representative process option under this technology.

3.1.9 Private Water Supply Actions and Controls

Although the results of the residential well survey conducted under the Remedial Investigation did not indicate site-related contamination of tested residential wells, private water supply response actions are considered as contingency actions which can potentially be put in place if future testing indicate changes in current conditions which warrant such a response action.

3.1.9.1 Technology Description

Available technologies for response actions involving private water supplies include:

- Home water treatment.
- Alternative water supplies.
- Access restrictions.

The home water treatment technology includes a variety of devices for point-of-use contaminant removal. The units utilize chemical or physical treatment methods to separate out or destroy contaminants. Most devices utilize granular activated carbon for treatment. Other possible treatment units include the use of distillation, activated alumina, reverse osmosis, ion exchange, ozonation, and ultraviolet irradiation.

Process options available under the alternative water supply technology include:

- Bottled water supply.
- Hookup to municipal water supply.
- Installation of new water supply well(s) into unaffected aquifer(s).

The access restrictions technology as applied to private water supplies involves the groundwater restrictions process options, whereby affected groundwater sources are legally designated as nonpotable with corresponding restrictions on its use.

3.1.9.2 Technology Screening

Screening of the three available technologies previously listed for the response actions involving private water supplies found each to be potentially applicable to the PICCO site, with all three being retained for further analysis.

With respect to the three process options available under the alternative water supply technology, all three will be retained for further analysis as potentially applicable options.

Bottled water supply or home treatment units are recommended for short-term response actions. Hookup to the local municipal supply system is recommended as the long-term response action. Installation of new private water supply wells into unaffected aquifers is recommended when hookup to the municipal water supply is not cost-effective. It should be noted the local municipal water supply system (Western Pennsylvania Water Company) currently services residents surrounding the site.

3.1.9.3 Recommendation

The potentially applicable technologies and the associated process options retained for further analysis for contingency response actions involving private water supplies include:

- Home water treatment.
- Alternative water supplies.
  - Bottled water
  - Municipal water
  - New groundwater supply wells
- Access restrictions.
  - Groundwater restrictions

As previously noted, private water supply response actions are considered contingency actions which can potentially be put in place if future testing indicates changes in current conditions which warrant such a response action.

3.1.10 Screening Summary

Table 3-9 provides a summary of the potentially applicable technologies and the associated process options retained for further analysis based on the initial screening performed. This table was utilized in formulating the proposed medium-specific alternatives for the PICCO site, as discussed in Subsection 3.2.

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Table 3-9

Potentially Applicable Technologies and Associated Process Options Retained for Further Analysis

General Response Action	Potentially Applicable Technology	Potentially Applicable Process Option
No Action	No Action	---
Institutional Actions and Controls	Access Restrictions	Perimeter Fencing*
		Property Deed Notation*
		Groundwater Restrictions*
Landfill Infiltration Controls	Capping	---
	Grading	---
	Revegetation	---
	Diversion/Collection Systems	Channels*
		Dikes and Berms
		Terraces and Benches
		Chutes and Down Pipes
		Sedimentation Basins/Ponds
Leachate and Groundwater Controls	Capping	---
	Subsurface Containment Barriers	Soil/Bentonite Slurry Wall*
		Sheet Piling
		Injection Grouting
	Subsurface Drains	Interception Trench*
	Recovery Wells	Skimmer Wells*
Excavation and Removal (waste and soils)	Excavation/Removal	---
	Dust/Vapor Control	---
	Grading	---
	Capping/Surface Sealing	---
	Revegetation	---

Table 3-9

Potentially Applicable Technologies and Associated Process Options Retained for Further Analysis (Continued)

General Response Action	Potentially Applicable Technology	Potentially Applicable Process Option
Treatment Leachate	Biological Treatment	Aerobic (Activated Sludge)*
		Anaerobic Biodegradation
	Chemical Treatment	Extraction*
		Oxidation*
	Physical Treatment	Aeration/Air Stripping*
		Carbon Adsorption
		Steam Stripping
		Gravity Oil/Water Separation*
		Dissolved Air Flotation
	Thermal Treatment	Industrial Boilers*
		Rotary Kiln
		Cement and Lime Kilns
Solids (waste and soils)	Biological Treatment	In Situ Biodegradation*
	Chemical Treatment	Extraction*
	Physical Treatment	In Situ Soil Washing*
		Low-Temperature Thermal Stripping*
		Dewatering*
	Thermal Treatment	Rotary Kiln*
Land Disposal	Land Disposal	Secure Landfill*
Air Emissions Control	Emissions Control Systems	Emissions Prevention Systems*
Private Water Supply Actions and Controls**	Home Water Treatment	Various Systems
	Alternative Water Supplies	Bottled Water
		Municipal Water
		New Supply Well
	Access Restrictions	Groundwater Restrictions

*Selected representative process option to be utilized in development of alternatives.
**Potential contingency action if future conditions warrant such a response action.

3.2 DEVELOPMENT OF MEDIUM-SPECIFIC ALTERNATIVES

Based on the environmental site model developed and remedial action objectives established for the PICCO site, the overall FS approach adapted was to initially develop medium-specific alternatives for identified media. These medium-specific alternatives are subsequently screened in Section 4. The medium-specific alternatives remaining after screening are then combined into comprehensive alternatives that address the site as a whole. These comprehensive alternatives are then subjected to detailed analysis, as presented in Section 5.

Development of remedial action objectives and associated general response actions identified the following as environmental media of concern:

- Waste material (landfill unit).
- Leachate (landfill unit).
- Soil (downslope of the landfill unit).
- Air (oil/water separator emissions).
- Groundwater (Pittsburgh Coal and Unconsolidated Zone).

Medium-specific alternatives developed are individually detailed below for each of the above environmental media. The medium-specific alternatives were developed based on consideration of the potentially applicable technologies and associated process options retained after screening for further analysis as listed in Table 3-9.

The retained technologies and selected representative process options were assembled into medium-specific alternatives representing a range of treatment and containment combinations, as appropriate. Due consideration was given to established remedial action objectives (see Subsection 1.2.3) and quantity of the specific media to be addressed as noted in the site model.

The following types of media-specific alternatives have been developed to the extent practicable:

- A number of treatment alternatives ranging from one that would eliminate or minimize to the extent feasible the need for long-term management (including monitoring) at a site to one that would use treatment as a primary component of an alternative to address the principle threats at the site. Alternatives within this range typically differ in the type and extent of treatment used and the management requirements of treatment residuals or untreated wastes.

- One or more alternatives that involve containment of waste with little or no treatment, but protect human health and the environment by preventing potential exposure and/or reducing the mobility of contaminants.

- A limited action alternative that involves minimal institutional actions necessary to reduce the potential for exposure.

- A no action alternative.

3.2.1 Waste Material Alternatives

Developed remedial alternatives addressing the landfill unit with respect to direct waste material control are defined in Table 3-10. For purposes of remedial alternatives development, waste material is defined as consisting of the "waste and adjacent contaminated soil forming the landfill unit, including the existing soil cover, soils underlying the waste, the landfill dike, soils located between the dike and the interceptor trench, and the interceptor trench itself." With respect to the amount of material to be potentially addressed, the volume of the landfill unit (including waste material, soil underlying the waste, soil cover, landfill dike, soil located between the dike and interceptor trench, and interceptor trench) is estimated at 92,000 yd^3 (137,000 tons) (see Table 1-7). Approximately one half (47,500 yd^3 or 77,000 tons) of this total is waste material.

The alternatives developed fall into the following basic categories:

- No action
- Limited action
- Containment
- Removal/disposal
- Removal/treatment
- In situ treatment

The no action alternative (Alternative WM-1) consists of a no action general response whereby no further remedial action with respect to waste material would be undertaken with the exception of site monitoring of the landfill unit. Potential monitoring activities include physical inspection for evidence of disruption/erosion of the landfill unit and periodic environmental sampling to track potential contaminant migration and to provide warning of increased exposure or health threats.

Current site controls (leachate collection via the existing interceptor trench with subsequent treatment and site access restriction via the existing fence and locked gate security system) would continue to be operated and maintained.

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Table 3-10

Waste Material Alternatives

Alternative	Type	General Response Actions Utilized	Technologies/Process Options Utilized (Representative Process Option(s) Noted in Parentheses)
WM-1	No Action	No Action	—
WM-2	Limited Action	Institutional Actions and Controls	Access Restrictions (Fencing, Deed Notation, Groundwater Restrictions)
WM-3	Containment	Landfill Infiltration Controls	Grading Capping/Surface Sealing Revegetation
		Leachate and Subsurface Controls	Diversion/Collection Systems (channels) Subsurface Containment Barriers (Slurry wall) - As Required Subsurface Drains (Leachate Interception Trench) Recovery Wells (Skimmer Wells)
		Institutional Actions and Controls	Access Restrictions (Fencing, Deed Notation, Groundwater Restrictions)
WM-4	Removal/Disposal	Excavation and Removal of Waste Material	Excavation/Removal Dust/Vapor Control Backfill/Grading Revegetation
	Land Disposal	Land Disposal	Land Disposal (Off-Site Secure Landfill)
WM-5A	Excavation/Treatment	Excavation and Removal of Waste Material	Excavation/Removal Dust/Vapor Control

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Table 3-10

Waste Material Alternatives
(continued)

Alternative	Type	General Response Actions Utilized	Technologies/Process Options Utilized (Representative Process Option(s) Noted In Parentheses)
		Backfill of Treated Material	Backfill/Grading Revegetation
		Solids Treatment - Waste Material	Physical Treatment (Dewatering) - As Required Physical Treatment (Low-Temperature Thermal Stripping)
WM-5B	Excavation/Treatment	Excavation and Removal of Waste	Excavation/Removal Dust/Vapor Control
		Solids Treatment-Waste Material	Physical Treatment (Dewatering) - As Required Thermal Treatment (Rotary Kiln Incineration)
		Backfill of Treated Material	Backfill/Grading Revegatation
WM-6A	In Situ Treatment	Solids Treatment - Waste Materials	In Situ Biodegradation
WM-6B	In Situ Treatment	Solids Treatment - Waste Materials	In Situ Soil Washing
		Leachate and Subsurface Controls	Subsurface Containment Barriers (Slurry Wall) - As Required Surface Drains (Interceptor Trench) Recovery Wells (Skimmer Wells)

The limited action alternative (Alternative WM-2) involves the utilization of institutional actions and controls as the general response action. As noted in Table 3-9, access restriction is the potentially applicable technology for institutional actions and controls.

The access restriction technology limits future exposure of human receptors by restricting property access either physically (through site perimeter fencing and groundwater restrictions) and/or through legal channels (through property deed annotation alerting prospective purchasers to the presence of hazardous substances on-site and legal groundwater restrictions). Future land use may also be restricted based on the type of potential human health risk involved.

As with the no action response action, environmental monitoring would be implemented for an institutional-based alternative. Current site controls, including leachate collection via the interception trench with subsequent treatment, would continue to be operated and maintained.

The containment alternative (Alternative WM-3) involves the utilization of the following general response actions:

- Landfill infiltration controls.
- Leachate and subsurface controls.
- Institutional actions and controls.

Under this alternative, the waste material is allowed to remain in place, but engineering controls are implemented to minimize and/or prevent contaminant migration into other environmental media (i.e., soil, groundwater, etc.). In addition, institutional controls would be utilized to limit future exposure of human receptors to site contaminants. Such controls involve the potentially applicable remedial technologies identified for the PICCO site in Table 3-9 for infiltration control, leachate/subsurface control, and institutional controls.

Based upon a review of this table, the containment alternative (Alternative WM-3) for waste material is defined as utilizing the following combination of remedial technologies (representative process options are noted in parentheses):

- Grading.
- Capping/surface sealing.
- Revegetation.
- Diversion/collection systems (channels).
- Subsurface containment barriers (slurry wall) as required for localized areas.
- Subsurface drains (interceptor trench).
- Recovery wells (skimmer wells).
- Access restrictions (fencing, property deed notation, and groundwater restrictions).

The removal/disposal alternative (Alternative WM-4) involves the utilization of the following general response actions:

- Excavation and removal of waste.
- Off-site land disposal (note - disposal facility may require and perform or arrange for off-site pretreatment prior to actual disposal).

Under this alternative, the waste material is removed via excavation with the material transported off-site for potential pretreatment with subsequent land disposal at a permitted land disposal facility. As discussed under ARARs (Section 2) RCRA land disposal restrictions may apply to this waste depending on TCLP test results. Treatment may be required (possibly for benzene reduction) prior to land disposal to meet treatment standards. Based upon a review of Table 3-9 for the potentially applicable technologies corresponding to the indicated general response actions, the removal/disposal alternative (Alternative

WM-4) is defined as utilizing the following combination of remedial technologies (representative process options are noted in parentheses):

- Excavation/removal.
- Land disposal (off-site secure landfill), following off-site material pretreatment as required.
- Dust/vapor control.
- Backfill/grading.
- Capping/surface sealing.
- Revegetation.

Finally, excavation/treatment alternatives (Alternatives WM-5A and WM-5B) involve the utilization of the following general response actions:

- Excavation and removal of waste.
- Solids treatment - waste material.
- On-site backfill of treated material.

Under these alternatives, the waste material is removed via excavation with the material treated to reduced contaminant levels and/or the mobility to acceptable levels. The treated material would then be backfilled on-site. Based upon a review of Table 3-9 for the potentially applicable technologies corresponding to the indicated general response actions, two excavation/treatment alternatives were defined as follows (representative process options are noted in parentheses):

- Excavation/removal.
- Physical treatment (dewatering) as required.
- Physical treatment (low-temperature thermal stripping) - Alternative WM-5A.
- Thermal treatment (rotary kiln incineration) - Alternative WM-5B.
- Dust/vapor control.
- Backfill/grading of treated material.
- Capping/surface sealing.
- Revegetation.

For each of the alternatives, dewatering of the waste material was identified as a potentially required pretreatment step to improve material handling and reduce fuel requirements. The alternatives differ in the type of treatment technology utilized.

Finally, in situ treatment alternatives (Alternatives WM-6A and WM-6B) involve the utilization of the following general response actions:

- Leachate and subsurface controls.
- Solids treatment - waste material.

Under these alternatives, the waste material is treated to acceptable levels in place via either a direct reduction in contaminant levels and/or via a separation/collection process. Leachate and subsurface controls are included as part of the separation/collection process. Based upon a review of Table 3-9 for the potentially applicable technologies corresponding to the indicated general response actions, the in situ alternatives (Alternatives WM-6A and WM-6B) are defined as utilizing the following combination of remedial technologies (representative process options are noted in parentheses):

- Biological treatment (in situ biodegradation) - Alternative WM-6A.
- Physical treatment (in situ soil washing) - Alternative WM-6B.
- Subsurface drains (interceptor trench) - Alternative WM-6B.
- Recovery wells (skimmer wells) - Alternative WM-6B.

Alternative WM-6A treats the contaminant of concern via biological degradation, while Alternative WM-6B represents physical separation/collection treatment.

3.2.2 Soil Alternatives

Developed remedial alternatives addressing soil are defined in Table 3-11. For purposes of remedial alternatives development, the soil considered consists of targeted soils located downslope of the interceptor trench. With respect to the amount of material to be potentially addressed, the amount of targeted soils located downslope of the interceptor trench is estimated at 23,000 yd^3 (31,000 tons) (see Table 1-8). The alternatives developed fall into the following general categories:

- No action
- Limited action
- Removal/disposal
- Removal/treatment
- In situ treatment

The no action alternative (Alternative S-1) consists of a no action general response whereby no further remedial action with respect to downslope soils would be undertaken, with the exception of site monitoring of downslope soils. Potential monitoring activities include physical inspection for evidence of disruption/erosion of downslope soils and periodic environmental sampling to track potential contaminant migration and to provide warning of increased exposure or health threats.

Current site controls (leachate collection via the existing interceptor trench with subsequent treatment and site access restriction via the existing fence and locked gate security system) would continue to be operated and maintained.

The limited action alternative (Alternative S-2) involves the utilization of institutional actions and controls as the general response action. As noted in Table 3-9, access restriction is the potentially applicable technology for institutional actions and controls.

The access restriction technology limits future exposure of human receptors by restricting property access either physically (through site perimeter fencing and groundwater restrictions) and/or through legal channels (through property deed annotation alerting

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Table 3-11

Soil Alternatives

Alternative	Type	General Response Actions Utilized	Technologies/Process Options Utilized (Representative Process Options Noted In Parentheses)
S-1	No Action	No Action	---
S-2	Limited Action	Institutional Actions and Controls	Access Restrictions (Fencing, Deed Notation, Groundwater Restrictions)
S-3	Containment	Consolidation of Soils into the Landfill	Soil Excavation Dust/Vapor Control Backfill/Grading
		Landfill Infiltration Controls	Grading Capping/Surface Sealing Revegetation
		Leachate and Subsurface Controls	Diversion/Collection Systems (channels) Subsurface Containment Barriers (Slurry Wall) - As required Subsurface Drains (Leachate Interceptor Trench) Recovery Wells (Skimmer Wells)
		Institutional Actions and Controls	Access Restrictions (Fencing, Deed Notation, Groundwater Restrictions)

Table 3-11

Soil Alternatives
(continued)

Alternative	Type	General Response Actions Utilized	Technologies/Process Options Utilized (Representative Process Options Noted In Parentheses)
S-4	Removal/Disposal	Excavation and Removal of Soils	Soil Excavation/ Removal Dust/Vapor Control Backfill/Grading
		Land Disposal	Land Disposal (Off-site Secure Landfill)
S-5A	Excavation/Treatment	Excavation and Removal of Soils	Soil Excavation/Removal Dust/Vapor Control
		Treatment - Soil	Physical Treatment (Dewatering) - As Required Physical Treatment (Low-Temperature Thermal Stripping)
		Backfill of Treated Material	Backfill/Grading

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Table 3-11

Soil Alternatives
(continued)

Alternative	Type	General Response Actions Utilized	Technologies/Process Options Utilized (Representative Process Option(s) Noted In Parentheses)
S-5B	Excavation/Treatment	Excavation and Removal of Soils	Soil Excavation/Removal Dust/Vapor Control
		Treatment - Soil	Physical Treatment (Dewatering) - As Required Thermal Treatment (Rotary Kiln Incineration)
		Backfill of Treated Material	Backfill/Grading
S-6A	In Situ Treatment	Treatment - Soil	Biological Treatment (In Situ Biodegradaion)
		Leachate and Subsurface Controls	Subsurface Containment Barriers (Slurry Walls) - As Required Recovery wells (Skimmer Wells)
S-6B	In Situ Treatment	Treatment - Soil	Physical Treatment (In Situ Soil Washing)
		Leachate and Subsurface Controls	Subsurface Containment Barriers (Slurry Walls) - As Required Recovery wells (Skimmer Wells)

prospective purchasers to the presence of hazardous substances on-site and legal groundwater restrictions). Future land use may also be restricted based on the type of potential human health risk involved.

As with the no action response option, environmental monitoring would be implemented for an institutional-based alternative. Current site controls, including leachate collection via the interceptor trench with subsequent treatment, would continue to be operated and maintained.

The containment alternative (S-3) involves the following general response actions:

- Consolidation of excavated downslope soils into the landfill.
- Landfill infiltration controls.
- Leachate and subsurface controls.
- Institutional actions and controls.

Under this alternative, excavation is used to transfer targeted downslope soils for subsequent incorporation into the landfill. Landfill incorporation would involve use of the following remedial technologies:

- Soil excavation.
- Dust/vapor control.
- Backfill/Grading.

After incorporation, engineering controls are implemented to minimize and/or prevent containment migration from the landfill into other environmental media (i.e., soil, groundwater, etc.). In addition, institutional controls would be utilized to limit future exposure of human receptors to site contaminants. Such controls involve the potentially applicable remedial technologies identified for the PICCO site in Table 3-9 for infiltration control, leachate/subsurface control, and institutional controls. Based upon a review of this table, the following combination of remedial technologies would be employed (representative process options noted in parentheses):

- Grading.
- Capping/surface sealing.
- Revegetation.
- Diversion/collection systems (channels).
- Subsurface containment barriers (slurry wall) - as required for localized areas.
- Subsurface drains (interceptor trench).
- Recovery well (skimmer wells).
- Access restrictions (fencing, property deed notation, and groundwater restrictions).

The removal/disposal alternative (Alternative S-4) involves the utilization of the following general response actions:

- Excavation and removal of targeted downslope soils.
- Off-site land disposal (note - disposal facility may require and perform or arrange for off-site pretreatment prior to actual disposal).

Under this alternative, targeted downslope soils are removed via soil excavation with the material transported off-site for potential pretreatment with subsequent disposal at a permitted landfill. Testing would be needed to determine whether RCRA land disposal restrictions would require that pretreatment be conducted prior to landfill disposal. The concentrations of the contaminants of concern (i.e., benzene) are much lower in the soils than in the waste and it is likely that TCLP concentrations will be less than the limits. Dewatering/draining/drying of the sediments may also be needed so that the land disposal requirements for no free liquids are met. Based upon a review of Table 3-9 for the indicated general response actions, the removal/disposal alternative (Alternative S-4) is defined as utilizing the following combination of remedial technologies (representative process options are noted in parentheses):

- Soil excavation/removal.
- Land disposal (off-site secure landfill), following off-site material pretreatment as required.
- Dust/vapor control.
- Backfill/grading.

The excavation/treatment alternatives (Alternatives S-5A and S-5B) involve the utilization of the following general response actions:

- Excavation and removal of targeted downslope soils.
- Solids treatment - soil.
- On-site backfill of treated material.

Under these alternatives, targeted downslope soils are removed via soil excavation with the material treated to reduce the containment levels and/or mobility to acceptable levels. The treated soil would then be backfilled on-site. Based upon a review of Table 3-9 for the indicated general response actions, two excavation/treatment alternatives were selected as follows (representative process options are noted in parentheses):

- Soil excavation/removal.
- Physical treatment (dewatering) - as required.
- Physical treatment (low-temperature thermal stripping) - Alternative S-5A.
- Thermal treatment (rotary kiln incineration) - Alternative S-5B.
- Dust/vapor control.
- Backfill/grading of treated material.

For each alternative, dewatering of the soil is noted as a potentially required pretreatment step to improve material handling and reduce fuel requirements. These alternatives differ in the mode of treatment technology employed.

Finally, the in situ treatment alternatives (Alternatives S-6A and S-6B) involve utilizing the following general response actions:

- Solids treatment for soil.

Under these alternatives, targeted downslope soils are treated to acceptable levels in place via either a direct reduction in containment levels and/or via a separation/collection process.

Based upon a review of Table 3-9 for the indicated general response actions, two in situ treatment alternatives were selected as follows:

- Biological treatment (in situ biodegradation) - Alternative S-6A.
- Physical treatment (in situ soil washing) - Alternative S-6B.
- Subsurface containment barriers (slurry walls as required) - Alternative S-6B.
- Recovery wells (skimmer wells) - Alternative S-6B.

Alterative S-6A treats the contaminants of concern via biological degradation, while Alternative S-6B represents physical separation/collection treatment.

3.2.3 Leachate Alternatives

Developed remedial alternatives addressing the landfill unit with respect to leachate management are defined in Table 3-12. For purposes of remedial alternatives development, these alternatives address management of the leachate produced from the landfill including floating product leachate detected in identified mine voids. Alternatives addressing minimizing leachate production (i.e., source containment/reduction) were previously discussed under the waste material alternatives discussed in Subsection 3.2.1. With respect to the amount of leachate to be potentially addressed, the current average leachate removal rate by the existing interceptor trench is estimated at 760,000 gallons per year (approximately 1.5 gallons per minute). After oil water separation, approximately three drums (5,000 pounds) of "oil" (non-aqueous product) is currently recovered each week (approximately 1 gallon per hour) from the leachate entering the interceptor trench.

The amount of additional leachate is the form of non-aqueous product that may be recovered via use of skimmer wells is unknown. For remedial alternatives development, it was assumed that an average of an additional three drums of "oil" would be recovered each week, utilizing skimmer wells.

The alternatives developed for leachate management fall into the following general categories:

- No action
- Limited action
- Collection/treatment

The no action alternative (Alternative L-1) consists of a no action general response whereby no further remedial action would be undertaken with the exception of site monitoring. Potential monitoring activities include physical inspection for evidence of disruption/erosion and periodic environmental sampling to track potential contaminant migration and to provide warning of increased exposure or health threats.

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Table 3-12

Leachate Alternatives

Alternative	Type	General Response Actions Utilized	Technologies/Process Options Utilized (Representative Process Option(s) Noted In Parentheses)
L-1	No Action	No Action	---
L-2	Limited Action	Institutional Actions and Controls	Access Restrictions (Fencing, Deed Notation, Groundwater Restrictions)
L-3A	Collection/Treatment	Leachate and Sub surface Controls	Subsurface Drains (Leachate Interceptor Trench) Recovery Wells (Skimmer Wells)
		Leachate Treatment ment	Physical Treatment of Trench Leachate (Gravity Oil/Water Separation) Chemical Treatment of Trench Leachate (Extraction) - As Required Thermal Treatment of Non-Aqueous "Oil" Phase (Industrial Boiler) Biological Treatment of Aqueous Phase (Activated Sludge)
L-3B	Collection/Treatment	Leachate and Sub-surface Controls	Subsurface Drains (Leachate Interceptor Trench) Recovery Wells (Skimmer Wells)
		Leachate Treatment	Physical Treatment of Trench Leachate (Gravity Oil/Water Separation) Chemical Treatment of Trench Leachate (Extraction) - As Required

Table 3-12

Leachate Alternatives
(continued)

Alternative	Type	General Response Actions Utilized	Technologies/Process Options Utilized (Representative Process Option(s) Noted In Parentheses)
			Thermal Treatment of Non-Aqueous "Oil" Phase (Industrial Boiler) Chemical Treatment of Aqueous Phase (Oxidation)
L-3C	Collection/Treatment	Leachate and Subsurface Controls	Subsurface Drains (Leachate Interceptor Trench) Recovery Wells (Skimmer Wells)
		Leachate Treatment	Physical Treatment of Trench Leachate (Gravity Oil/Water Separation) Chemical Treatment of Trench Leachate (Extraction) - As Required Thermal Treatment of Non-Aqueous "Oil" Phase (Industrial Boiler) Physical Treatment of Aqueous Phase (Aeration/Air Stripping)

Current site controls (leachate collection via the existing interceptor trench with subsequent treatment and site access restriction via the existing fence and locked gate security system) would continue to be operated and maintained.

The limited action alternative (Alternative L-2) involves the utilization of institutional actions and controls as the general response action. As noted in Table 3-9, access restriction is the potentially applicable technology for institutional actions and controls.

The access restriction technology limits future exposure of human receptors by restricting property access either physically (through site perimeter fencing and groundwater restrictions) and/or through legal channels (through property deed annotation alerting prospective purchasers to the presence of hazardous substances on-site and legal groundwater restrictions). Future land use may also be restricted based on the type of potential human health risk involved.

As with the no action response option, environmental monitoring would be implemented for an institutional-based alternative. Current site controls, including leachate collection via the interceptor trench with subsequent treatment, would continue to be operated and maintained.

The collection/treatment alternatives (Alternatives L-3A, B, and C) involve utilizing the following general response actions:

- Leachate and subsurface controls.
- Leachate treatment.

These alternatives differ in the type of treatment process used for the aqueous phase portion of the leachate. Upon review of Table 3-9 for the indicated general response actions, leachate collection can be accomplished via subsurface drains (interceptor trench) and skimmer wells (for product recovery from mine voids). For cost-effective leachate treatment, it was assumed that the collected leachate from the interceptor trench would first be separated into a nonaqueous "oil" phase and an aqueous phase. Both phases would then be separately treated as required to reduce contaminant concentrations to acceptable levels.

Upon review of Table 3-9, initial oil/water separation can be accomplished via the following technology/process options:

- Physical treatment.
  - Gravity oil/water separation
  - Dissolved air flotation (DAF)
- Chemical treatment.
  - Extraction

As previously discussed under screening of treatment technologies, for the purposes of alternative development and evaluation, gravity oil/water separation was selected as the representative physical treatment separation process option. Such a separation system is currently in satisfactory operation at the site. DAF will be retained as a potential substitute process option for gravity oil/water separation treatment if additional treatment is required in the future. Chemical treatment via extraction (i.e., chemical addition) is included on an as needed basis to aid in emulsion breaking and/or improving the physical separation process.

As previously discussed under screening of treatment technologies, of the leachate treatment technologies listed in Table 3-9, thermal treatment technology was the single technology retained for treatment of the high-concentration non-aqueous oil phase. Under the thermal treatment technology, three process options are listed in Table 3-9:

- Rotary kiln.
- Cement and lime kilns.
- Industrial boilers.

As previously discussed under screening of treatment technologies, for the purposes of alternative development and evaluation, industrial boiler treatment was selected as the representative thermal treatment process option. Such a treatment system is in current operation at the site. Rotary kiln treatment and cement and lime kiln treatment will be retained as potential substitute process options for thermal treatment of non-aqueous portion of the leachate.

As previously discussed under screening of treatment technologies, of the treatment technologies listed in Table 3-9, biological, chemical, or physical treatment technologies were retained for treatment of the aqueous phase. Process options listed in Table 3-9 for these treatment technologies are:

- Biological treatment
  - Aerobic (activated sludge)
  - Anaerobic biodegradation
- Chemical treatment
  - Oxidation
- Physical treatment
  - Carbon adsorption
  - Steam stripping
  - Aeration/air stripping

As previously discussed under screening of treatment technologies, for the purposes of alternative development and evaluation, aerobic activated sludge was selected as the representative biological treatment process option. Such a treatment system is in current satisfactory operation at the site, with the separated aqueous stream being directed to the local Publicly Owned Treatment Works (POTW) that utilizes an activated sludge treatment system. Anaerobic biodegradation will be retained as a potential substitute process option for biological treatment.

Likewise, aeration/air stripping was selected as the representative physical treatment process option. Based on WESTON's previous experience with other sites containing the contaminants of concern present at the PICCO landfill (BTXE and naphthalene), air

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stripping is typically more cost-effective than either carbon adsorption or steam stripping. However, both carbon adsorption and steam stripping will be retained as potential substitute process options for physical treatment.

Based on the above discussion, the collection/treatment alternatives are defined as utilizing the following combination of remedial technologies (representative process options are noted in parentheses):

- Subsurface leachate drains (interceptor trench).
- Recovery wells (skimmer wells) for product recovery from mine voids.
- Physical treatment (gravity oil/water separation) - for leachate collected by the interceptor trench.
- Chemical treatment of leachate (extraction) - as required for enhancing gravitational oil/water separation.
- Thermal treatment of oil phase (industrial boiler).
- Biological treatment of aqueous phase (activated sludge) - Alternative L-3A.
- Chemical treatment of aqueous phase (oxidation) - Alternative L-3B.
- Physical treatment of aqueous phase (aeration/air stripping) - Alternative L-3C.

The alternatives differ in the means selected for treatment of the separated aqueous phase (biological, chemical, or physical treatment technology).

3.2.4 Groundwater Alternatives

Developed remedial alternatives addressing groundwater are defined in Table 3-13. For purposes of remedial alternatives development, the focus is upon both Pittsburgh Coal and unconsolidated zone groundwater. Alternatives addressing leachate were previously put forth under Subsection 3.2.3. The alternatives developed for groundwater fall into the following categories:

- No action
- Limited action

No recovery/treatment alternative is put forth since groundwater recovery/treatment was ruled out as infeasible and impractical/inappropriate for subsurface control response actions (see Subsection 3.1.4 for details).

It should be noted that potential recovery of landfill leachate is considered under the leachate alternatives presented in Subsection 3.2.3.

The no action alternative (Alternative G-1) consists of a no action general response whereby no further remedial action would be undertaken with respect to groundwater with the exception of site monitoring of groundwater. Potential monitoring activities include physical inspection for evidence of general site disruption/erosion and periodic environmental sampling to track potential contaminant migration into groundwater, residential wells, and seeps and to provide warning of increased exposure or health threats.

Current site controls (leachate collection via the existing interceptor trench with subsequent treatment and site access restriction via the existing fence and locked gate security system) would continue to be operated and maintained. The limited action alternative (Alternative G-2) involves the utilization of institutional actions and controls as the general response action. As noted in Table 3-9, access restriction is the potentially applicable technology for institutional actions and controls.

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Table 3-13

Groundwater Alternatives

Alternative	Type	General Response Actions Utilized	Technologies/Process Options Utilized (Representative Process Option(s) Noted In Parentheses)
G-1	No Action	No Action	—
G-2	Limited Action	Institutional Actions and Controls	Access Restrictions (Fencing, Deed Notation, Groundwater Restrictions)

The access restriction technology limits future exposure of human receptors by restricting property access either physically (through site perimeter fencing and groundwater restrictions) and/or through legal channels (through property deed annotation alerting prospective purchasers to the presence of hazardous substances on-site and legal groundwater restrictions). Future land use may also be restricted based on the type of potential human health risk involved.

As with the no action response option, environmental monitoring would be implemented for an institutional-based alternative. Current site controls, including leachate collection via the interceptor trench with subsequent treatment, would continue to be operated and maintained.

3.2.5 Air Emissions Alternatives

Developed remedial alternatives addressing air are defined in Table 3-14. For purposes of remedial alternatives development, the focus is upon fugitive air emissions from the existing oil/water separator located at the site.

The alternatives developed fall into the following general categories:

- No action
- Limited action
- Control

The no action alternatives (Alternative A-1) consists of a no action general response whereby no further remedial action would be undertaken with regard to air emissions from the existing oil/water separator with the exception of site monitoring of the separator. Potential monitoring activities include physical inspection for evidence of deterioration of the separator and periodic environmental sampling to track potential contaminant emissions and to provide warning of increased exposure or health threats.

Current site controls (leachate collection via the existing interceptor trench with subsequent treatment and site access restrictions via the existing fence and locked gate security system) would continue to be operated and maintained.

The limited action alternative (Alternative A-2) involves the utilization of institutional actions and controls as the general response action. As noted in Table 3-9, access restriction is the potentially applicable technology for institutional actions and controls.

The access restriction technology limits future exposure of human receptors by restricting property access either physically (through site perimeter fencing and groundwater restrictions) and/or through legal channels (through property deed annotation alerting prospective purchasers to the presence of hazardous substances on-site and legal

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Table 3-14

Air Emissions Alternatives

Alternative	Type	General Response Actions Utilized	Technologies/Process Options Utilized (Representative Process Options Noted In Parentheses)
A-1	No Action	No Action	---
A-2	Limited Action	Institutional Actions and Controls	Access Restrictions (Fencing, Deed Notation, Groundwater Restrictions)
A-3	Control	Emissions Controls	Emissions Prevention Systems

groundwater restrictions). Future land use may also be restricted based on the type of potential human health risk involved.

As with the no action response option, environmental monitoring would be implemented for an institutional-based alternative. Current site controls, including leachate collection via the interceptor trench with subsequent treatment, would continue to be operated and maintained.

The emissions control alternative (A-3) involves using emissions control technology, specifically the emissions prevention process option to minimize potential air emissions from the separator.

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SECTION 4

INITIAL SCREENING OF ALTERNATIVES

Under this section, the medium-specific alternatives developed in Subsection 3.2 are initially screened based on the following criteria:

- Effectiveness (environmental and public health issues).
- Implementability (technical and institutional considerations).
- Relative cost-effectiveness.

Items considered under the general effectiveness evaluation include:

- Protection of human health and the environment.
- Reduction in toxicity, mobility, or volume.
- Short-term effectiveness during construction/implementation.
- Long-term effectiveness.
- Compliance with ARARs.

Items considered under the general implementability evaluation include:

- Technical feasibility with respect to construction, operation, and maintenance requirements.

- Administrative feasibility with respect to institutional aspects such as the availability of services, equipment, and skilled workers.

Finally, cost-effectiveness was evaluated based on establishment of relative capital and O&M costs utilizing engineering judgement and available reference sources.

The medium-specific alternatives remaining after screening are then combined into comprehensive alternatives that address the site as a whole. These comprehensive alternatives are then subjected to detailed analysis as presented in Section 5.

4.1 MEDIUM-SPECIFIC ALTERNATIVES SCREENING

4.1.1 Waste Material Alternatives

Table 4-1 provides a summary of the screening performed for the waste material remedial alternatives previously developed in Subsection 3.2.1. The alternatives retained for incorporation into comprehensive alternatives for detailed analysis consist of:

- Alternative WM-1, No Action, whereby no further action would be taken with respect to waste material with the exception of site monitoring of the landfill unit. Current landfill leachate collection/treatment and access control systems would be maintained.

- Alternative WM-2, Limited Action, whereby institutional-based access restrictions would be utilized to restrict general site access and thereby limit exposure to human receptors and limit future site use.

- Alternative WM-3, Waste Containment, whereby capping and subsurface barriers coupled with subsurface drains (i.e., the interceptor trench) and skimmer-type recovery wells would be utilized to contain/manage the waste material and institutional controls would be used to limit general access and future site use.

- Alternative WM-4, Off-site Landfill Disposal, whereby excavated materials are transported off-site for potential pretreatment with subsequent land disposal at an approved, permitted secure landfill.

- Alternative WM-5B, Thermal Treatment, whereby a rotary kiln incinerator would be utilized to thermally destroy organics contained in the excavated waste material. If determined to be suitable, treated material would be backfilled on-site, with a soil cover placed over the backfill.

- Alternative WM-6A, In Situ Biodegradation, whereby indigenous or introduced bacteria would be used to biodegrade organics contained in the waste material. The process is typically enhanced through the injection of nutrients and oxygen to promote microbial growth.

Alternatives WM-5A (Low-Temperature Thermal Stripping Treatment) and WM-6B (In Situ Soil Washing) were not retained due to effectiveness and/or implementability concerns with respect to the high concentrations of the waste material, as listed in Table 4-1. The ability to achieve low treatment levels is highly unlikely due to the high concentrations in the waste

Table 4-1
Waste Material Alternatives Screening

Alternative	Type - Description	Effectiveness (Environmental/ Public Health Issues)	Implementability (Technical/Institutional Issues)	Relative Cost	Screening Results
WM-1	No Action - No further remedial action with the exception of periodic site monitoring of the landfill unit of the landfill unit. Current leachate collection/ treatment and access control systems would be maintained.	Waste material volume and toxicity not reduced except through leachate collection and limited natural degradation processes.	Minimal future commitment of resources.	No capital cost. Low long-term O&M cost (disposal of collected leachate and site inspection and monitoring).	Retained for incorporation into comprehensive alternatives for detailed analysis as required under the NCP.
WM-2	Limited Action - Physical and/or legal access restrictions consisting of site perimeter fencing, property deed notation, and/or ground-water restrictions would be utilized to limit exposure to human receptors. Current leachate collection/treatment and access control systems would be maintained.	Waste material volume and toxicity not reduced except through leachate collection and limited natural degradation processes. Exposure to human receptors limited via institutional controls.	Minimal future commitment of resources.	Low capital cost (legal fees). Low long-term O&M cost (disposal of collected leachate, upkeep of security systems, inspection, and monitoring).	Retained for incorporation into comprehensive alternatives for detailed analysis.
WM-3	Containment - Capping and sub-surface barriers would be used to contain/manage the waste material with subsurface drains (i.e., the interceptor trench) and skimmer-type recovery wells used to collect generated landfill leachate.	Contain/manage material to minimize and/or prevent contaminant migration. Waste volume and toxicity not reduced except through leachate collection and limited natural degradation processes. Restrictions would be needed to limit future use of the site.	Landfill boundaries are well defined. Natural site features (strip-mined valley location, low-permeability clay soils) and existing remedial measures (leachate interceptor trench) greatly aid in implementing this alternative. Demonstrated remedial technologies utilized.	Moderate capital cost (including heavy equipment cost). Moderate short-term O&M cost. Moderate long-term O&M cost (including disposal of collected leachate, inspection, and monitoring).	Retained for incorporation into comprehensive alternatives for detailed analysis.
WM-4	Removal - Excavation of material with transport to an off-site permitted landfill for effective material isolation. Off-site material pretreatment would be performed as required prior to actual disposal.	Physically removes source material from the site, eliminating the contamination source. Transfer material from one site to another. Excavation activities would result in emission of volatile organic compounds to the atmosphere. Interceptor trench would be needed until leachate renovation is completed.	Landfill boundaries are well defined. Demonstrated remedial technologies utilized. Pre-treatment of the high-concen-tration waste would likely be required to meet land disposal restrictions and/or disposal facility permit conditions. Substantial surface water diversion controls would be required to prevent run-on during excavation activities. Sanitary sewer pipeline running along northern edge of the landfill may require relocation due to excavation activities.	Moderate capital cost (including excavation equipment rental cost). High short-term O&M (including transport and disposal costs). O&M costs for trench until leachate renovation is completed.	Retained for incorporation into comprehensive alternatives for detailed analysis.

Table 4-1

Waste Material Alternatives Screening
(continued)

Alternative	Type - Description	Effectiveness (Environmental/ Public Health Issues)	Implementability (Technical/Institutional Issues)	Relative Cost	Screening Results
W4-A	Excavation/Treatment - Excavation of waste material with physical treatment of volatile organics would be performed via low-temperature thermal stripping (LTTS) in a thermal processor unit with off-gas handling equipment (typically an after-burner providing high-temperature incineration). Dewatering of the waste material prior to processing would be performed, as required. If suitable, treated material would be backfilled on-site, with a soil cover placed over the backfill.	Volatile organic constituents would be transferred from solid to gas phase in the thermal processor with subsequent destruction in the afterburner. Excavation activities may result in emission of volatile organic compounds to the atmosphere. Interceptor trench would be needed until leachate excavation is completed.	Landfill boundaries are well defined for excavation. LTTS demonstrated for removal of lighter fuels (i.e., gasoline) from soil. Limited demonstration for removal of heavier petroleum hydrocarbons. Substantial surface water diversion controls required to prevent run-on during excavation activities. Sanitary sewer pipeline running along northern edge of the landfill may require relocation due to excavation activities.	Moderate capital cost (including equipment rental cost). High short-term O&M cost. O&M cost for trench until leachate excavation is complete. Possible additional costs for off-site disposal or further treatment.	Not retained for further analysis. Unlikely that low treatment level could be achieved.
W4-B	Excavation/Treatment - Excavation of waste material with thermal treatment utilizing a rotary kiln incinerator. Dewatering of the waste material prior to processing would be performed as required. (The waste material has a 40-50% moisture content). If suitable, treated material would be backfilled on-site, with a soil cover placed over the backfill.	Waste volume and toxicity would be effectively eliminated via thermal destruction of organics. Contamination source for the site would be effectively eliminated. Excavation activities would result in emission of volatile organic compounds to the atmosphere.	Landfill boundaries are well defined. Demonstrated remedial technologies would be utilized. Limited on-site area to set up unit. Auxiliary fuel would be required due to low heating value of waste material (2,000-4,000 Btu/lb). High ash content (60-70%) favors on-site backfill of treated material. Substantial surface water diversion controls would be required to prevent run-on during excavation activities. Sanitary sewer pipeline running along northern edge of the landfill may require relocation due to excavation activities.	Moderate capital cost (including excavation and treatment equipment rental cost). High short-term O&M cost (including transport/treatment cost). O&M cost for trench until leachate excavation is completed.	Retained for incorporation into comprehensive alternatives for detailed analysis.

Table 4-1

Waste Material Alternatives Screening (continued)

Alternative	Type - Description	Effectiveness (Environmental/ Public Health Issues)	Implementability (Technical/Institutional Issues)	Relative Cost	Screening Results
WM-6A	In Situ Treatment - In-place biological treatment using indigenous or introduced bacteria. The natural biodegradation process is typically enhanced by the injection of nutrients and oxygen (hydrogen peroxide is typically used as the oxygen source).	Contaminant levels would be reduced via microbial degradation of biodegradable organics. Treatability testing would be required to more accurately determine feasibility/effectiveness of treatment process. Effectiveness may be limited due to material variability and high concentrations.	High-concentration nature of waste material may be toxic to microbes. Required treatment time can vary widely; longer time requirement involved in treating high-concentration waste materials. Effective distribution system for air and nutrients would be required. High moisture content of waste (40-50%) provides water source for microbial growth.	Low capital cost. Moderate O&M cost, dependent upon treatment required.	Retained for incorporation into comprehensive alternatives for detailed analysis.
WM-6B	In Situ Treatment - In-place physical treatment via soil washing for extraction of organic compounds. A solvent or surfactant solution (or water) would be injected or allowed to infiltrate into areas of concern to enhance constituent mobility with subsequent recovery of the washing solution as leachate.	Effectively transfers contaminants from solid phase to liquid phase. Liquid phase would require collection and treatment. Ability to collect extract is questionable. Level of treatment that could be achieved is unknown.	Limited demonstration of soil flushing technology. Prolonged soil washing time would be required, involving treatment of high-concentration waste material. Large volume of leachate would require treatment produced in treating the high-concentration waste material.	Moderate capital cost (depending upon extracted liquid treatment requirements). Moderate to high O&M cost (depending upon liquid treatment/ disposal cost and time required to achieve treatment). Costs for off-site disposal or additional treatment may be high.	Not retained for further analysis. Soil/washing is a separation process that would result in a large volume leachate stream requiring treatment. Uncertain ability to collect/retrieve extract.

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material to be treated and the physical variability of the material. If treatment goals are not attained, additional treatment prior to off-site disposal would be required, rendering these options not cost effective.

4.1.2 Soil Alternatives Screening

Table 4-2 provides a summary of the screening performed for the downslope soil remedial alternatives previously discussed in Subsection 3.2.2.

The alternatives retained for incorporation into comprehensive alternatives for detailed analysis consist of:

- Alternative S-1, No Action, whereby no further action would be taken with respect to downslope soils, with the exception of site monitoring.
- Alternative S-2, Limited Action, whereby institutional-based access restrictions would be utilized to restrict general site access and thereby limit exposure to human receptors and limit future site use.

Other alternatives considered involving excavation of downslope soils (Alternatives S-3, Containment, S-4, Off-site Landfill Disposal, S-5A, Low-Temperature Thermal Stripping, and S-5B, Thermal Treatment) were not retained for further analysis primarily because the potential adverse impacts to the unconsolidated zone groundwater, unnamed site stream, and associated ecological community due to excavation outweigh potential benefits. Excavation of targeted downslope soil areas (see Figure 1-15) would result in destruction of the existing unconsolidated zone groundwater located in these areas. As the unnamed site was noted in the site model as primarily being fed by perched groundwater from the unconsolidated zone, adverse impacts will also be experienced by the site stream. Excavation in the general downslope soil area will also have significant adverse impacts on the site stream and associated ecological community due to the clearing activities required for excavation and transport vehicle operation.

In addition, limited benefits will be realized under these excavation alternatives. As delineated by the baseline RA, the current risk for downslope surface soils falls in the regulated risk range of 1 in 10,000 to 1 in 1,000,000 used to define remedial action objectives for downslope soils.

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Table 4-3
Soil Alternatives Screening

Alternative	Type - Description	Effectiveness (Environmental/ Public Health Issues)	Implementability (Technical/Institutional Issues)	Relative Cost	Screening Results
S-1	No Action - No further remedial action in regard to downslope soils with the exception of periodic site monitoring. Current leachate collection/treatment and access control systems would be maintained.	Soil media volume and toxicity not reduced except through limited natural degradation processes.	Minimal future commitment of resources.	No capital cost. Low long-term O&M cost (disposal of collected leachate).	Retained for incorporation into comprehensive alternatives for detailed analysis as required under the NCP.
S-2	Limited Action - Physical and/or legal access restrictions would consist of site perimeter fencing, property deed notation, and/or groundwater restrictions utilized to limit exposure to human receptors. Current leachate collection/ treatment and access control systems would be maintained.	Soil media volume and toxicity not reduced except through limited natural degradation processes. Exposure to human receptors would be limited via institutional controls.	Minimal future commitment of resources.	Low capital cost (legal fees). Low long-term O&M cost (disposal of collected leachate, upkeep of security system).	Retained for incorporation into comprehensive alternatives for detailed analysis.
S-3	Containment - Excavation of targeted downslope soils with subsequent consolidation into the landfill. Capping and subsurface barriers would be used to contain/manage the landfill, with subsurface drains (i.e., the interceptor trench) and skimmer-type recovery wells used to collect generated landfill leachate.	Contain/manage material to minimize and/or prevent contaminant migration. Waste volume and toxicity would not be reduced except through leachate collection and limited natural degradation process. Excavation would adversely impact the perched groundwater in the unconsolidated zone, unnamed site stream, and associated ecological community.	Landfill boundaries are well defined. Natural site features (strip-mined valley location, low-permeability clay soils) and existing remedial measures (leachate interceptor trench) would greatly aid in implementing this alternative. Demonstrated remedial technologies utilized.	Moderate capital cost (including heavy equipment rental costs). Moderate short-term O&M cost. Moderate long-term O&M cost (including disposal of collected leachate).	Not retained for further analysis; potential adverse impacts to perched groundwater in the unconsolidated zone, site stream, and associated ecological community due to excavation outweighing potential benefits.
S-4	Removal/Disposal - Excavation of targeted downslope soils with transport to an off-site permitted landfill for effective material isolation. Off-site material pretreatment would be performed as required prior to actual disposal.	Physically removes material from the site. Effectively transfers material from one site to another. Excavation activities may result in emission of volatile organic compounds to the atmosphere. Excavation would adversely impact the perched groundwater in the unconsolidated zone, unnamed site stream, and associated ecological community.	Targeted areas can be easily defined for excavation. Demonstrated remedial technologies would be utilized. Pretreatment of the soil may be required to meet land disposal restrictions and/or disposal facility permit conditions. Surface water diversion controls would be required to prevent run-on during excavation activities. Sanitary sewer pipeline running along the landfill may require relocation due to excavation activities.	Moderate capital cost (including excavation equipment costs). High short-term O&M cost (including transport and disposal costs). Low long-term O&M cost.	Not retained for further analysis; potential adverse impacts to perched groundwater in the unconsolidated zone, site stream, and associated ecological community due to excavation outweighing potential benefits.

Table 4-2

Soil Alternatives Screening (continued)

Alternative	Type - Description	Effectiveness (Environmental/ Public Health Issues)	Implementability (Technical/Institutional Issues)	Relative Cost	Screening Results
S-5A	Excavation/Treatment - Excavation of targeted downslope soils with physical treatment of volatile organics would be performed on-site via low-temperature thermal stripping (LTTS) in a thermal processor unit with off-gas handling equipment (typically an after-burner providing high-temperature incineration). Dewatering of the soils prior to processing would be performed as required. If suitable, treated material would be back-filled on-site, with a soil cover placed over the backfill.	Volatile organic constituents would be transferred from solid to gas phase in the thermal processor with subsequent destruction in the afterburner. Excavation activities may result in emission of volatile organic compounds to the atmosphere. Excavation would adversely impact the perched groundwater in the unconsolidated zone, unnamed site stream, and associated ecology community.	Targeted areas would be easily defined for excavation. LTTS demonstrated for removal of lighter fuels (i.e., gasoline) from soils. Limited demonstration for removal of heavier petroleum hydrocarbons. Surface water diversion controls would be required to prevent run-on during excavation activities. Sanitary sewer pipeline running along the northern edge may require relocation due to excavation activities.	Moderate capital cost (including equipment rental cost). High short-term O&M cost. No long-term O&M cost.	Not retained for further analysis. Potential adverse impacts to perched groundwater in the unconsolidated zone, site stream, and associated ecological community due to excavation outweigh potential benefits. In addition, unfavorable conditions for effective treatment exist due to the tight clay matrix of the soil and the presence of lower volatility PAH compounds, such as naphthalene.
S-5B	Excavation/Treatment - Excavation of targeted downslope soils with thermal treatment would be performed utilizing a rotary kiln incinerator. Dewatering of the soils prior to processing would be performed as required. If suitable, treated material would be backfilled on-site with a soil cover placed over the backfill.	Contaminant volume and toxicity effectively eliminated via thermal destruction of organics. Excavation activities may result in emission of volatile organic compounds to the atmosphere. Excavation would adversely impact the perched groundwater in the unconsolidated zone, unnamed site stream, and associated ecological community.	Targeted areas can be easily defined for excavation. Demonstrated remedial technologies utilized. Surface water diversion controls required to prevent run-on during excavation activities. Sanitary sewer pipeline running along the northern edge of the landfill may require relocation due to excavation activities.	Moderate capital cost (including excavation and treatment equipment rental cost). High short-term O&M cost. No long-term O&M cost.	Not retained for further analysis; potential adverse impacts to perched groundwater in the unconsolidated zone, site stream, and associated ecological community outweigh potential benefits.
S-6A	In Situ Treatment - In-place biological treatment using indigenous or introduced bacteria. The natural biodegradation process is typically enhanced by injecting nutrients and oxygen (hydrogen peroxide is typically used as the oxygen source).	Contaminant levels would be reduced via microbial degradation of biodegradable organics. Treatability testing would be required to more accurately determine feasibility/effectiveness of treatment process.	Low-permeability (clay) site soils would complicate effective distribution of oxygen, nutrients, and cultured microbes needed for degradation. Major rate limiting factor would be oxygen provision. Required treatment time can vary widely. Perched groundwater flow discharging to site stream complicates implementation with respect to necessary hydrogeologic flow control.	Low capital cost. Moderate O&M cost, depending upon length of treatment time.	Not retained for further analysis; site soils unfavorable for effective distribution of oxygen, nutrients, and cultured microbes due to the soil's low permeability. Perched groundwater flow discharging to site stream complicates implementation with respect to necessary hydrgeologic flow control.

Table 4-2

Soil Alternatives Screening
(continued)

Alternative	Type - Description	Effectiveness (Environmental/ Public Health Issues)	Implementability (Technical/Institutional Issues)	Relative Cost	Screening Results
S-6B AR303031	In Situ Treatment - In-place physical treatment via soil washing for extraction of organic compounds. A solvent or surfactant solution (or water) would be injected or allowed to infiltrate into areas of concern to enhance constituent mobility with subsequent recovery of the washing solution as leachate.	Effectively transfers contaminants from solid phase to liquid phase. Liquid phase will likely require treatment. Level of treatment that can be achieved is not known. Ability to collect extract is questionable, particularly with existing perched groundwater flow discharging into site stream.	Limited demonstration of soil washing technology. Low-permeability (clay) site soils are unfavorable for effective treatment. It is difficult to effectively strip-out target compounds as they are held tightly within the clay matrix. Perched groundwater flow discharging to site stream complicates implementation with respect to necessary hydrogeologic flow control.	Moderate capital cost (dependent upon extracted liquid treatment requirements). Moderate to high O&M cost (depending upon liquid treatment/disposal cost and time required to achieve treatment).	Not retained for further analysis. Site soils unfavorable for effective treatment due to their low permeability, which tightly holds contaminants in a clay matrix. Perched groundwater flow discharging to site stream complicates implementation with respect to necessary hydrogeologic flow control. Also, soil washing is a separation process that results in a liquid requiring treatment. Uncertain ability to collect/retrieve extract.

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The remaining alternatives considered (Alternatives S-6A, In Situ Biodegradation, and S-6B, In Situ Soil Washing) were not retained due principally to implementability concerns resulting from site conditions. Specifically, downslope soils are unsuitable for effective treatment conditions due to their low permeability (clay) nature, which tightly holds the organic contaminants with the clay matrix and greatly hinders effective distribution of required treatment materials. An additional complicating factor is the flow of perched groundwater through the unconsolidated soil zone with discharge to the site stream, which greatly hinders the ability to achieve the hydrogeologic flow control necessary to effectively implement these in situ alternatives.

4.1.3 Leachate Alternatives Screening

Table 4-3 provides a summary of the initial screening performed for the leachate remedial alternatives previously developed in Subsection 3.2.3. The alternatives retained for incorporation into comprehensive alternatives for detailed analysis include:

- Alternative L-1, No Action, whereby no further action would be taken with respect to landfill leachate, with the exception of site monitoring. Current landfill leachate collection/treatment and access control systems would be maintained.

- Alternative L-2, Limited Action, whereby institutional-based access restrictions would be utilized to restrict site access and thereby limit exposure to human receptors.

- Alternative L-3A, Biological Treatment/Thermal Treatment, involving processing the leachate from the interceptor trench through a gravity oil/water separator with the aqueous fraction being biologically treated via discharge to the local POTW-activated sludge system, while the non-aqueous "oil" fraction would be utilized as a fuel supplement in the local Hercules plant industrial boilers. Non-aqueous product recovered via the skimmer-type recovery well network would also be utilized as a fuel supplement in the local Hercules plant industrial boilers.

Alternative L-3B, Chemical Oxidation/Thermal Treatment, was not retained for further analysis as chemical oxidation of the aqueous phase may result in the discharge of intermediate breakdown compounds that may be of concern. Alternative L-3C, Air Stripping/Thermal Treatment, was not retained for further analysis as air stripping limitations for removal of less volatile PAH compounds from the aqueous phase is not likely to allow stream discharge meeting applicable water quality criteria. Odors may also occur as a result of air stripping and further treatment of the resultant air emissions stream would likely be required. Alternatives L-3B and L-3C are not considered as cost-effective as Alternative L-3A, Biological Treatment/Thermal Treatment.

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Table 4-3
Leachate Alternatives Screening

Alternative	Type - Description	Effectiveness (Environmental/ Public Health Issues)	Implementability (Technical/Institutional Issues)	Relative Cost	Screening Results
L-1	No Action - No further remedial action with respect to landfill leachate with the exception of periodic site monitoring. Current leachate collection/treatment and access control systems would be maintained.	Leachate volume and toxicity would not be reduced except through leachate collection and limited natural degradation processes.	Minimal future commitment of resources.	No capital cost. Low long-term O&M cost (disposal of collected leachate).	Retained for incorporation into comprehensive alternatives for detailed analysis as required under the NCP.
L-2	Limited Action - Physical and/or legal access restrictions would consist of site perimeter fencing, property deed notation, and/or groundwater restrictions utilized to limit exposure to human receptors. Current leachate collection/treatment and access control systems would be maintained.	Leachate volume and toxicity would not be reduced except through leachate collection and limited natural degradation processes. Exposure to human receptors would be limited via institutional controls.	Minimal future commitment of resources.	Low capital cost (legal fees). Low long-term O&M cost (disposal of collected leachate, upkeep of security system).	Retained for incorporation into comprehensive alternatives for detailed analysis.
L-3A	Collection/Treatment - Leachate would be collected via an interceptor trench and via use of skimmer-type recovery wells. The collected liquid from the trench would be first physically treated via gravity oil/water separation. The aqueous fraction would be biologically treated via an activated sludge system, while the non-aqueous "oil" fraction would be thermally treated as fuel supplement in an industrial boiler. Non-aqueous product recovered utilizing skimmer wells would also be thermally treated as fuel supplement in an industrial boiler.	For oil fraction, waste volume and toxicity would be effectively eliminated via thermal destruction of organics. For aqueous fraction, contaminants would be biologically degraded.	Interceptor trench and oil/water separator are existing units currently in use for leachate collection/treatment at the site. Existing site monitor wells could be utilized as skimmer wells. Separated aqueous fraction are currently discharged to local POTW for biological treatment via an activated sludge system. High heating value of separated waste oil makes it ideal for resource recovery as a fuel substitute. Separated waste oil is currently utilized as a fuel substitute in the local Hercules plant industrial boilers. Demonstrated remedial technologies utilized.	Low capital cost (assuming existing units are employed). Low O&M cost (assuming existing units are employed). Economic benefit for supplemental fuel use.	Retained for incorporation into comprehensive alternatives for detailed analysis.

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Table 4-3

Leachate Alternatives Screening
(continued)

Alternative	Type - Description	Effectiveness (Environmental/ Public Health Issues)	Implementability (Technical/Institutional Issues)	Relative Cost	Screening Results
L-3B	Collection/Treatment - Leachate would be collected via an interceptor trench and via use of skimmer-type recovery wells. The collected liquid from the trench would be first physically treated via gravity oil/water separation. The aqueous fraction would be treated via chemical oxidation prior to discharge, while the non-aqueous "oil" fraction would be thermally treated as a fuel supplement in an industrial boiler. Non-aqueous product recovered utilizing skimmer wells would also be thermally treated as a fuel supplement in an industrial boiler.	For oil fraction, waste volume and toxicity would be effectively eliminated via thermal destruction of organics. For aqueous fraction, contaminants would be destroyed via chemical breakdown (oxidation). Incomplete oxidation could result in discharge of intermediate breakdown compounds that may be of concern. Treatability testing would be required to determine feasibility/effectiveness of oxidation treatment process.	Interceptor trench and oil/water separator are existing units currently in use for leachate collection/treatment at the site. Existing site monitor wells could be utilized as skimmer wells. Chemical oxidation is noncompound-specific. Thus, nontarget compounds in the aqueous fraction would be oxidized and added to the oxidation unit loading. High heating value of separated waste oil makes it ideal for resource as a fuel substitute. Separated waste oil is currently utilized as a fuel substitute in the local Hercules plant industrial boilers.	Moderate capital cost (due to oxidation unit). Moderate to high O&M cost (due to oxidation unit energy consumption). Economic benefit for supplemental fuel use.	Not retained for further analysis. Potential problems with incomplete oxidation resulting in discharge of intermediate breakdown compounds that may be of concern. Not cost-effective compared to biological alternative treatment. Dissolved solids would interfere with oxidation and would reduce effectiveness or increase costs.
L-3C	Collection/Treatment - Leachate would be collected via an interceptor trench and via use of skimmer-type recovery wells. The collected liquid from the trench would first be treated via gravity oil/water separation. The aqueous fraction would be treated via aeration/air stripping, while the non-aqueous "oil" fraction would be thermally treated as a fuel supplement in an industrial boiler. Non-aqueous product recovered utilizing skimmer wells would also be thermally treated as a fuel supplement in an industrial boiler.	For oil fraction, waste volume and toxicity would be effectively eliminated via thermal destruction of organics. For aqueous phase, contaminants would be effectively separated out from the liquid phase to the air phase. Air emissions control would likely be required. Odors may be a concern if not properly controlled.	Interceptor trench and oil/water separator are existing units currently in use for leachate collection/treatment at the site. Existing site monitor wells could be utilized as skimmer wells. Packed column air stripping is well developed and often utilized for treatment of VOCs, including BTEX from aqueous streams. However, not as well suited for removal of PAH compounds due to lower volatility. High heating value of separated waste oil makes it ideal for resource recovery as a fuel substitute in the local Hercules plant industrial boilers. Conventional remedial technologies utilized.	Low capital cost. Moderate to high O&M cost (dependent upon potential air emissions control requirements). Economic benefit for supplemental fuel use.	Not retained for further analysis. Air stripping is a separation process, with contaminants either transferred to the atmosphere or requiring further treatment for ultimate destruction. Removal of less volatile PAH compounds and accompanying odors may be a concern. Not cost-effective compared to the biological treatment alternative.

With respect to the retained Alternative L-3A, Biological Treatment/Thermal Treatment, the ability of the local POTW to biologically treat the aqueous fraction of the leachate was assessed. The WESA POTW utilizes an activated sludge system for treatment. For the parameters of concern in the aqueous portion (see Table 1-6), the U.S. EPA Treatability Manual (U.S. EPA, 1980) indicates the following median removal efficiencies for activated sludge systems:

- BOD - 91%
- Oil and grease - 92%
- Benzene - >96%
- Ethylbenzene - >95%
- Naphthalene - >99%
- Phenol - 99%

Removal efficiencies were not noted for toluene, xylene, or z-methylnaphthalene (other compounds found present in the aqueous portion), but similar efficiencies as noted above for similar compounds (i.e., benzene, ethylbenzene, and naphthalene) would be expected. Therefore, removals on the order of 90 to 99% for parameters of concern would be expected to be achieved by the WESA POTW.

4.1.4 Groundwater Alternatives

Table 4-4 provides a summary of the screening performed for the groundwater alternatives previously developed in Subsection 3.2.1. Both alternatives considered (Alternative G-1, No Action, and Alternative G-2, Limited Action) were retained for incorporation into comprehensive alternatives for detailed analysis.

As previously discussed, no recovery/treatment alternative was developed for analysis since recovery/treatment was ruled out as infeasible and impractical/inappropriate under screening of technologies for subsurface and groundwater control response actions (see Subsection 3.1.4 for details).

In addition, as previously noted for identified groundwater zones:

- Unconsolidated zone groundwater - Due to the limited saturated thickness in the unconsolidated zone and the seasonal variations in groundwater level, the volume of groundwater present in the unconsolidated soils is limited and is a poor potential water supply. Wells screened in the unconsolidated site area have reportedly gone dry during dry periods. Therefore, it is not likely that new wells in the unconsolidated zone would be utilized in the future as a potable water source since public water is available. The residential well survey conducted during the RI identified a single dug well in the unconsolidated zone located topographically downslope (i.e., potentially downgradient) from the site (residential well #3). This residence is connected to public water and utilizes this well for outdoor uses (gardening, grass watering, etc.) only.

- Pittsburgh Coal groundwater - No users of Pittsburgh Coal groundwater were identified during the residential well survey. Furthermore, it was noted that the background well for the Pittsburgh Coal had levels of metals exceeding drinking water standards. Specific standards exceeded include the MCL for chromium, and SMCLs for aluminum, iron, and manganese. The SMCLs were exceeded by an order of magnitude. It is therefore not realistic that the Pittsburgh Coal would be used in the future as a potable water source when public water is readily available.

Table 4-4
Groundwater Alternatives Screening

Alternative	Type - Description	Effectiveness (Environmental/ Public Health Issues)	Implementability (Technical/Institutional Issues)	Relative Cost	Screening Results
L-1	No Action - No further remedial action with respect to groundwater the exception of periodic site monitoring. Current leachate collection/treatment and access control systems would be maintained.	Groundwater media volume and toxicity would not be reduced except through leachate collection and limited natural degradation processes.	Minimal future commitment of resources.	No capital cost. Low long-term O&M cost (disposal of collected leachate).	Retained for incorporation into comprehensive alternatives for detailed analysis as required under the NCP.
L-2	Limited Action - Physical and/or legal access restrictions would consist of site perimeter fencing, property deed notation, and/or groundwater restrictions utilized to limit exposure to human receptors. Current leachate collection/treatment and access control systems would be maintained.	Groundwater media volume and toxicity would not be reduced except through leachate collection and limited natural degradation processes. Exposure to human receptors would be limited.	Minimal future commitment of resources.	Low capital cost (legal fees). Low long-term O&M cost (disposal of collected leachate, upkeep of security system).	Retained for incorporation into comprehensive alternatives for detailed analysis.

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- Deep bedrock groundwater - Deep monitoring wells drilled into the bedrock below the Pittsburgh Coal within the site did not encounter significant groundwater and a core sample collected from this bedrock zone encountered no fractures. These data, relating to the bedrock below the Pittsburgh Coal, indicate that the deep bedrock below the site is not an aquifer (i.e., capable of sustaining a measurable yield of groundwater).

  Based on the residential well survey results, the deep bedrock may potentially yield enough water for residential use. Therefore, the deep bedrock may potentially be an aquifer unit off-site. To further evaluate its potential as an aquifer unit, additional investigation is proposed as a component of the remedial alternatives considered for the site. The proposed investigation involves drilling exploratory boreholes at two off-site downgradient locations with potential installation of monitoring wells.

4.1.5 Air Emissions Alternatives

Tables 4-5 provides a summary of the screening performed for the air emissions alternatives previously developed in Subsection 3.2.1. All three alternatives considered (Alternative A-1, No Action, Alternative A-2, Limited Action, and Alternative A-3, Emissions Control) were retained for incorporation into comprehensive alternatives for detailed analysis.

Table 4-8
Air Emissions Alternatives Screening

Alternative	Type - Description	Effectiveness (Environmental/ Public Health Issues)	Implementability (Technical/Institutional Issues)	Relative Cost	Screening Results
L-1	No Action - No further remedial action with regard to air emissions with the exception of periodic site monitoring. Current leachate collection/treatment and access control systems would be maintained "as is."	Air emissions volume and toxicity would not be reduced.	Minimal future commitment of resources.	No capital cost. Low long-term O&M cost (disposal of collected leachate).	Retained for incorporation into comprehensive alternatives for detailed analysis as required under the NCP.
L-2	Limited Action - Physical and/or legal access restrictions would consist of site perimeter fencing, property deed notation, and/or groundwater restrictions utilized to limit exposure to human receptors. Current leachate collection/ treatment and access control systems would be maintained "as is."	Oil/water separator air emissions volume and toxicity would not be reduced. Exposure to human receptors would be limited via institutional actions.	Minimal future commitment of resources.	Low capital cost (legal fees). Low long-term O&M cost (disposal of collected leachate, upkeep of security system).	Retained for incorporation into comprehensive alternatives for detailed analysis.
L-3	Emissions Control - Use of engineered controls (such as pressure relief valves) to establish an enclosed system which will prevent uncontrolled air emissions from the oil/water separator. Can be performed via either system retrofit or replacement.	Air emissions volume and toxicity would be reduced via prevention controls utilized.	System replacement favored over retrofitting existing separator.	Moderate capital cost. Low long-term O&M cost.	Retained for incorporation into comprehensive alternatives for detailed analysis.

4.1.6 Screening Summary

Table 4-6 provides a list of the medium-specific alternatives retained for detailed analysis. These medium-specific alternatives are combined into site-comprehensive alternatives, as detailed in Subsection 4.2.

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Table 4-6

Medium-Specific Alternatives Retained for Further Analysis

	Retained Alternatives	
Medium	No.	Type
Waste Material (Landfill Unit)	WM-1	No Action
	WM-2	Limited Action
	WM-3	Containment
	WM-4	Excavation/Off-Site Landfill Disposal
	WM-5B	Excavation/Thermal Treatment (Rotary Kiln Incineration)
	WM-6A	In Situ Biodegradation
Soil (Downslope of Landfill Unit)	S-1	No Action
	S-2	Limited Action
Leachate (Landfill Unit)	L-1	No Action
	L-2	Limited Action
	L-3A	Collection/Biological Treatment (Activated Sludge) of Aqueous Phase/Thermal Treatment (Industrial Boiler) for Non-Aqueous Oil Phase
Groundwater (Pittsburgh Coal and Unconsolidated Zone)	G-1	No Action
	G-2	Limited Action
Air Emissions (Oil/Water Separator)	A-1	No Action
	A-2	Limited Action
	A-3	Emissions Control

4.2 DEVELOPMENT OF COMPREHENSIVE SITE ALTERNATIVES

The medium-specific alternatives remaining after screening was performed, as detailed in Subsection 4.1, have been combined into comprehensive alternatives that address the PICCO site as a whole with respect to environmental issues and contaminant pathways. Development of the comprehensive site alternatives has been based on due consideration of the site model (Subsection 1.2.1.4) and remedial action objectives (Subsection 1.2.2). The following types of alternatives have been developed to the extent practicable:

- Treatment alternatives ranging from one that would eliminate or minimize to the extent feasible the need for long-term management (including monitoring) at a site to one that would use treatment as a primary component of an alternative to address the principal threats at the site. Alternatives within this range differ in the type and extent of treatment used and the management requirements of treatment residuals or untreated wastes.
- Alternatives that involve containment of waste with little or no treatment, but protect human health and the environment by preventing potential exposure and/or reducing the mobility of contaminants.
- A limited action alternative that involves minimal institutional actions necessary to reduce the potential for exposure.
- A no action alternative.

In addition to the above, under each alternative except Alternative 1 (No Action), the following is proposed to address special site concerns:

- Exploratory boreholes will be drilled into the deep bedrock at two downgradient off-site locations yet to be determined. The results of the RI indicated that the deep bedrock zone under the site does not act as a groundwater aquifer. The proposed exploratory program will investigate the viability of this zone to act as an aquifer at off-site locations. If significant groundwater is encountered at each location, the boreholes will be converted to deep bedrock monitoring wells (otherwise, the boreholes will be sealed with grout). These wells would then serve as permanent groundwater monitoring points which would be added to the routine quarterly monitoring program proposed under the alternatives for all groundwater monitoring wells at the site.

- As per discussions with U.S. EPA Region III and Pennsylvania DER, existing deep bedrock Monitoring Wells TW-5 and TW-6 will be properly abandoned via filling with grout. Both wells do not yield sufficient amounts of water for sampling purposes and there is concern that leakage from the upper casing may be occurring in TW-5.

- The lower landfill dike would be upgraded as required in response to the potential problems identified by the limited geotechnical analysis performed during the RI (see Subsection 3.2.3 of Part I for the Site Report for details). Based on this limited analysis, dike regrading to achieve a 3:1 slope is anticipated to yield acceptable minimum factors of safety.

- Potential private water supply action and control technologies/process options identified under Subsection 3.1.9 are included as contingency actions. Such actions would be used if future testing indicated changes in current conditions which warranted such a response action.

These comprehensive alternatives are detailed in Table 4-7 and consist of the following:

- Alternative 1 - No Action
- Alternative 2 - Limited Action
- Alternative 3 - Closure
- Alternative 4 - Excavation/Off-site Landfill Disposal
- Alternative 5 - Excavation/Thermal Treatment
- Alternative 6 - In Situ Biodegradation Treatment

Alternative 1 (No Action) is carried forth as required under the NCP. Alternative 2 (Limited Action) represents a limited remedial response utilizing institutional controls only. The remaining four alternatives carried forth were classified based on the remedial response action for the landfill unit present at the PICCO site. Alternative 3 proposes in-place closure using engineering controls to contain/manage the waste materials present via upgrade of the existing landfill unit. Alternative 4 proposes excavation of the landfill unit for transport off-site with pretreatment performed as required prior to secure landfill disposal at a permitted facility. Alternative 5 proposes treatment of landfill unit materials via thermal treatment (rotary kiln incineration) of excavated material. Alternative 6 proposes in situ treatment of landfill unit materials via biological treatment (in situ biodegradation).

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Table 4-7
Comprehensive Site Alternatives

	Retained Medium-Specific Alternatives		Comprehensive Site Alternatives					
Medium	Number	Type	No Action 1	Limited Action 2	Closure 3	Excavation/ Off-Site Landfill Disposal 4	Excavation/ Thermal Treatment 5	In Situ Biodegradation Treatment 6
Waste Material (Landfill Unit)	WM-1	No Action	X					
	WM-2	Limited Action		X				
	WM-3	Containment			X			
	WM-4	Excavation/Off-Site Landfill Disposal				X		
	WM-5B	Excavation/Thermal Treatment (Rotary Kiln Incineration)					X	
	WM-6A	In Situ Biodegradation						X
Soil (Downslope of landfill unit)	S-1	No Action	X					
	S-2	Limited Action		X	X	X	X	X
Leachate (Landfill Unit)	L-1	No Action	X					
	L-2	Limited Action		X				
	L-3A	Collection/Biological Treatment (Activated Sludge) of Aqueous Phase/Thermal Treatment (Industrial Boiler) for Non-aqueous Oil Phase			X	X	X	X
Pittsburgh Coal and Unconsolidated Zone	G-1	No Action	X					
	G-2	Limited Action		X	X	X	X	X
Air Emissions Control	A-1	No Action	X					
	A-2	Limited Action		X				
	A-3	Emissions Control			X	X	X	X

SECTION 5

DETAILED ANALYSIS OF ALTERNATIVES

The detailed analysis of alternatives consists of the analysis and presentation of relevant information required to allow decision-makers to select a site remedy. In this detailed analysis, each alternative under consideration has been assessed against the evaluation criteria specified in Subsection 5.1.

The alternatives were first independently analyzed without consideration of the other alternatives. The results of this analysis are presented in Subsection 5.2. A comparative analysis was then conducted to evaluate each alternative's relative performance in relation to the specific evaluation criteria. The results of this comparative analysis are presented in Subsection 5.3.

5.1 EVALUATION CRITERIA

In accordance with the NCP and U.S. EPA Superfund guidance documents, the following nine criteria are to be utilized for evaluation of each of the developed site alternatives that were selected for detailed analysis and represent the basis for comparing these alternatives:

- Compliance with ARARs.
- Overall protection of human health and the environment.
- Short-term effectiveness.
- Long-term effectiveness and permanence.
- Reduction of toxicity, mobility, and volume of contaminants.
- Implementability.
- Cost.
- State acceptance.
- Community acceptance.

The first two criteria (compliance with ARARs and overall protection of human health and the environment) are categorized as "threshold" criteria in that each alternative must meet them (or a variance obtained). The middle five criteria listed are categorized as the "primary balancing criteria" upon which the analysis is based. The final two criteria (state acceptance and community acceptance) are categorized as "modifying" criteria.

This FS report specifically addresses the first seven evaluation criteria for each of the alternatives developed for detailed analysis. The remaining two criteria (state acceptance and community acceptance) will be addressed in the ROD after comments on this FS report are received. The seven criteria utilized for detailed analysis are discussed further below, while the detailed analysis of each alternative is presented in subsequent sections.

5.1.1 Compliance with Applicable or Relevant and Appropriate Requirements

This criterion is used to determine how each alternative complies with ARARs, as previously detailed in Section 2. The chemical, location, and action-specific requirements are discussed along with any other appropriate criteria, advisories, and guidance as they apply to each alternative. Table 5-1 provides a summary listing of potentially applicable federal, state, and local ARARs as previously determined from the screening of ARAR sources performed in Section 2.

5.1.2 Short-Term Effectiveness

This evaluation criterion involves consideration of the short-term effectiveness of the alternative during construction and implementation. The evaluation focuses on the protection of the community and the on-site personnel during implementation of remedial measures, potential human health and environmental impacts, and the time required to achieve remedial response objectives.

5.1.3 Long-Term Effectiveness and Permanence

This evaluation criterion involves consideration of the long-term effectiveness and permanence of the alternative once it has been implemented. The evaluation focuses on

Table 5-1

Potentially Applicable ARARs

ARAR	Comments
I. <u>Chemical-Specific</u>	
A. Resource Conservation and Recovery Act (RCRA) 1. Identification and Listing of Hazardous Waste.	Potentially applicable to remedial actions involving solid waste removal including leachate removal. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.
B. Pennsylvania Solid Waste Management Act 1. Identification and Listing of Hazardous Waste.	Potentially applicable to remedial actions involving solid waste removal including leachate removal. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. EP toxicity/TCLP testing required to determine applicability.
C. Clean Water Act 1. Water Quality Criteria (Non-enforceable guidance).	Applicable to remedial actions involving discharge of treated groundwater to the unnamed site stream.
D. Pennsylvania Clean Streams Law 1. Water Quality Criteria including Toxic Management Strategy.	Applicable to remedial actions involving discharge of treated groundwater into the unnamed site stream.
E. Safe Drinking Water Act (SDWA)	Applicable to current limited use and future potential use of groundwater as a potable water supply.
1. National Primary Drinking Water Standards.	Applicable to current limited use and future potential use of groundwater as a potable water supply.
2. National Secondary Drinking Water Standards (Non-enforceable guidelines.	Applicable to current limited use and future potential use of groundwater as a potable water supply.

Table 5-1

Potentially Applicable ARARs
(continued)

ARAR	Comments
3. Maximum Contaminant Level Goals (Non-enforceable goals).	Applicable to current limited use and future potential use of groundwater as a potable water supply.
F. Pennsylvania Safe Drinking Water Act	Applicable to current limited use and potential future use of groundwater as a potable water supply. Cites by reference federal SDWA standards.
II. Location-Specific	
A. Resource Conservation and Recovery Act 1. Siting Criteria for Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable if a TSD facility is set up on-site to manage removed RCRA hazardous waste. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. TCLP testing required to determine applicability.
B. Pennsylvania Solid Waste Management Act 1. Siting Criteria for Hazardous Waste Treatment and Disposal Facilities.	Potentially applicable if a treatment and/or disposal facility is set up on-site to manage removed hazardous waste. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. EP toxicity/TCLP testing required to determine applicability.
C. Clean Water Act 1. Dredge or Fill Requirements.	Limited wetlands have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.
D. Executive Order on Protection of Wetlands	Limited wetlands have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.

Table 5-1

Potentially Applicable ARARs (continued)

ARAR	Comments
E. Pennsylvania Dam Safety and Waterway Management Act	Limited wetland areas have been tentatively identified at the site. Potentially appli-cable to remedial actions which may require filling of wetlands.
III. <u>Action-Specific</u>	
A. Resource Conservation and Recovery Act 1. Standards Applicable to Generators of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.
2. Standards Applicable to Transporters of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.
3. Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed wastes which qualify as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP prior testing required to determine applicability.

Table 5-1

Potentially Applicable ARARs
(continued)

ARAR	Comments
4. Standards for the Management of Specific Hazardous Waste and Specific Types of Hazardous Waste Management Facilities.	Potentially applicable to remedial actions involving reclamation of recyclable waste which qualify as hazardous under RCRA. May apply to recovered non-aqueous product. TCLP testing required to determine applicability.
5. Land Disposal Restrictions.	Potentially applicable to remedial actions involving removal of waste which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place or placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.
B. Pennsylvania Solid Waste Management Act - Residual (Non-Hazardous Solid) Waste Management	Applicable to remedial actions involving removal of solid wastes that qualify as residual wastes. Not applicable to wastes remaining in-place or placement occurred prior to regulatory enact-ment.
C. Pennsylvania Solid Waste Management Act - Hazardous Waste Regulations 1. Standards Applicable to Generators of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place or place-ment occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.
2. Standards Applicable to Transporters of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place or place-ment occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.

Table 5-1

Potentially Applicable ARARs (continued)

ARAR	Comments
3. Standards of Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed waste which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.
4. Standards for the Management of Specific Hazardous Waste and Specific Types of Hazardous Waste Management Facilities.	Potentially applicable to remedial actions involving reclamation of recyclable wastes which qualify as hazardous under RCRA. May apply to recovered non-aqueous product. EP Toxicity/TCLP testing required to determine applicability.
D. Occupational Safety and Health Act	Applicable to remedial actions (including monitoring) at hazardous waste sites.
E. Hazardous Materials Transportation Act 1. Hazardous Materials Transportation Regulations.	Applicable to remedial actions involving transportation of DOT-defined hazardous materials off-site, including recovered non-aqueous product.
F. Clean Water Act 1. National Pollutant Discharge Elimination System (NPDES).	Applicable to remedial actions involving discharge to the unnamed site stream.
2. National Pretreatment Standard.	Applicable to current discharge of aqueous fraction of treated leachate into local POTW.
G. Pennsylvania Clean Streams Law 1. Water Quality Management (WQM) Program.	Applicable to remedial actions involving point source discharges to surface waters.

Table 5-1

Potentially Applicable ARARs
(continued)

ARAR	Comments
2. Wastewater Treatment Requirements.	Applicable to remedial actions involving point source discharges.
3. Industrial Wastes.	Applicable to remedial actions involving point source discharges.
4. Erosion Control.	Applicable to remedial actions involving earth moving.
H. Pennsylvania Dam Safety and Waterway Manage- ment Act	
1. Outfall Structures.	Applicable to remedial actions involving point source discharges to streams.
I. WESA Pretreatment Effluent Limitations	Applicable; aqueous portion of leachate currently being discharged in accordance with the effluent limitations agreement.
J. Pennsylvania Stormwater Management Act	Applicable to remedial actions requiring stormwater management.
K. Allegheny County Stormwater Management Regulations	Applicable to remedial actions requiring stormwater management.
L. Safe Drinking Water Act	
1. Underground Injection Control (UIC) Regulations.	Applicable to remedial actions involving reinjection of groundwater or injection of treatment chemicals.
M. Clean Air Act	
1. New Source Performance Standards (NSPS).	Applicable to remedial actions involving incineration.
N. Pennsylvania Air Pollution Control Act	
1. Standards for Contaminants.	Applicable to remedial actions involving air emissions, principally incineration.

Table 5-1

Potentially Applicable ARARs (continued)

ARAR	Comments
2. New Source Performance Standards.	Applicable to remedial actions involving incineration.
3. Standards for Sources of VOCs.	Applicable to remedial actions utilizing storage tanks for VOC-containing wastes.
O. ACHD Air Pollution Control Regulations	
1. Air Emission Standards.	Applicable to remedial actions producing air emissions, principally incineration.
2. Waste-Derived Liquid Fuel Standards.	Applicable to current practice of utilizing recovered non-aqueous product as a fuel under ACHD permit.
3. New Source Performance Standards.	Applicable to remedial actions involving incineration.
4. Standards for Sources of VOCs.	Applicable to remedial actions utilizing storage tanks for VOC-containing wastes.

defining the extent and effectiveness (adequacy and reliability) of the controls that may be required to manage the residual risk remaining from untreated waste and/or treatment residues.

5.1.4 Overall Protection of Human Health and the Environment

This evaluation criterion involves consideration of the overall protection of human health and the environment. The overall assessment of protection draws on the assessments conducted for other evaluation criteria, particularly long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

Evaluation of the overall protectiveness of an alternative focuses on achievement of remedial action objectives and how risks posed through potential exposure routes are eliminated, reduced, or controlled through treatment, engineering, or institutional controls. This evaluation also allows for consideration of whether an alternative poses any unacceptable short-term or cross-media impacts.

5.1.5 Reduction of Toxicity, Mobility, and Volume of Contaminants

Consideration of this evaluation criterion is a result of recent statutory preference for selecting remedial actions that permanently and significantly reduce the toxicity, mobility, and volume of the contaminants and associated media.

The following factors are considered in this evaluation:

- The treatment process and materials to be treated.
- The amount of hazardous materials to be treated.
- The degree of expected reduction in toxicity, mobility, or volume.
- The degree to which treatment will be irreversible.
- The type and quantity of treatment residuals that remain after treatment.

5.1.6 Implementability

This criterion establishes the technical and administrative feasibility of implementing an alternative. Technical aspects evaluated for each alternative include: ability to construct and operate the technologies involved; reliability of the technologies involved; ease of undertaking additional remedial action; and ability to monitor the effectiveness of the remedy after completion of activities. Administrative concerns include establishing contact with appropriate agencies to implement remedial actions (e.g., obtaining approval for construction and operation of a treatment unit, and coordination with various agencies). Availability of materials and services needed is another factor considered, specifically in regard to availability of: treatment, storage, and disposal facilities; necessary equipment and specialists; and prospective technologies.

5.1.7 Cost

A remedial program must be implemented and operated in a cost-effective manner and must mitigate the environmental and human health concerns at the site. In considering the cost-effectiveness of the various alternatives, the following categories are evaluated:

- Capital Costs - These costs include direct (construction) and indirect (nonconstruction and overhead) costs. Direct costs include expenditures for equipment, labor, and materials necessary to install remedial actions. Indirect costs may be incurred for engineering, permitting, construction management, or other services not directly involved with installation of remedial alternatives, but necessary for completion of this activity.

- Operating and Maintenance (O&M) Costs - These costs include post-construction expenditures incurred to ensure effective implementation of the alternative. Such costs may include, but are not limited to, operating labor, maintenance materials and labor, rental equipment, auxiliary materials (e.g., chemicals) energy (fuel and electricity), disposal of residues, and administrative and insurance costs.

- Long-term costs - These costs include post cleanup or longer term costs such as site monitoring and inspection costs.

A present worth analysis is utilized for the cost evaluation utilizing a discount rate of 5% as recommended under the Superfund Program. To account for increases in estimated annual O&M costs due to inflation, a 5% uniform gradient factor was utilized for the present worth analysis. Cost sensitivity concerns are identified and discussed as required for each alternative.

The cost estimates presented in this report are order-of-magnitude level estimates. An order-of-magnitude cost estimate is defined by the American Association of Cost Engineers as an estimate performed without the benefit of preliminary design work with an assigned accuracy value of +50% to -30%. The cost estimates are based on a variety of information, including estimates from suppliers, construction unit costs, vendor information, conventional cost estimating guides, and prior experience. The Feasibility Study-level cost estimates shown have been prepared for guidance in project evaluation comparison and selection based on the information available at the time of the estimate. The actual costs of the project will depend on true labor and material costs, actual site conditions, competitive market conditions, final project scope, implementation schedule, and other variable factors. A significant uncertainty that would affect the cost is the actual volume of contaminated materials. Most of these uncertainties would similarly affect all of the costs presented in this Feasibility Study.

5.2 INDIVIDUAL ANALYSIS OF ALTERNATIVES

The assembled remedial action alternatives represent a range of distinct waste management strategies that address the human health and environmental concerns associated with the site. Although the selected alternative will be further refined as necessary during the predesign phase, the description of the alternatives and the analysis with respect to the seven criteria presented in Subsection 5.1 reflects the fundamental components of the various alternative waste management approaches considered for the PICCO site.

In subsequent subsections, primary components of each alternative are listed along with a technical description of these components. Following the technical description is a discussion of each alternative with respect to overall protection of human health and the environment; compliance with ARARs; long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and estimated cost.

5.2.1 Alternative 1: No Action

5.2.1.1 Description

The no action alternative provides a baseline for comparing existing site conditions with those resulting from implementation of other proposed alternatives.

Under the no action alternative, no additional remedial action beyond the landfill leachate collection/treatment system currently in place would be implemented at the site with the exception of site monitoring. Leachate from the landfill would continue to be collected via the existing interceptor trench and treated via the existing oil/water separation system with discharge of the aqueous portion to the WESA POTW and use of the non-aqueous fraction as a fuel in the local Hercules plant industrial boilers. Access to the site would be limited by the existing fence and locked gate security system at the point of access. An environmental monitoring program would be implemented to better understand changes in site conditions over time and to potentially provide warning of increased exposure or health threats. Monitoring activities include physical inspection of the landfill and the surrounding site surface for evidence of disruption/erosion and periodic environmental sampling of the site to track potential contaminant migration and to provide warning of increased exposure or health threats. The proposed monitoring program is presented in Table 5-2 and consists of the following components:

- Groundwater Monitoring - Based on quarterly RCRA groundwater sampling requirements under the post-closure care program for landfill disposal units. Sampling of all 19 current monitor wells at the site would be performed to track potential contaminant migration for the no action alternative.

- Stream Monitoring - Based on the current bimonthly sampling program in place for the site.

- Residential Well Monitoring - Based on semiannual sampling of the residential wells identified during the RI (it should be noted that 10 wells were sampled, while six other wells were identified during site reconnaissance, but were not sampled due to well inaccessibility or refusal of the property owner to allow sampling).

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Table 5-2

30-Year Site Monitoring Program (Applies to Alternatives 1 & 2)

Item Monitored	Monitoring Frequency [d]	Sampling Location Summary	Analytical Summary
Groundwater	Quarterly	19 wells[a]	BTXE, Naphthalene, and Petroleum Hydrocarbons
Seeps	Quarterly	Three seeps[b]	BTXE, Naphthalene, and Petroleum Hydrocarbons
Unnamed Stream	Bimonthly	One sample at site boundary	BTXE, Naphthalene, and Petroleum Hydrocarbons
Residential Wells	Annually	10 residences[c]	BTXE, Naphthalene, and Petroleum Hydrocarbons
General Site Conditions	Quarterly	NA	Log observations (date, time, weather, rainfall, findings, name, title, remarks)

[a]Based on sampling of all current site monitoring wells. Under Alternative 2, on-site deep bedrock Monitor Wells TW-5 and TW-6 will be abandoned, with potential replacement by two off-site deep bedrock monitor wells. Therefore, the cited total of 19 wells will probably not change.
[b]Three seep locations will be selected and consistently sampled.
[c]Based on the number of residences sampled during the RI.
[d]Quarterly and annual reports to be submitted.
Data to be reviewed annually for possible changes to sampling frequency and parameters.
NA - Not applicable.

- Seep Monitoring - Based on quarterly sampling of seeps to be conducted during the groundwater monitoring program sampling. It was assumed that the same three seeps would be selected and sampled during each sampling event.

- General Site Monitoring - To be conducted quarterly during the groundwater/seep sampling event. Site monitoring would include physical inspection of the landfill and the surrounding site surface for evidence of disruption/erosion.

The analytical parameters proposed are based on the identified key parameters for the site: BTXE, naphthalene, and petroleum hydrocarbons.

This proposed monitoring program may be subsequently modified with respect to sampling frequency and parameters based on periodic data review.

5.2.1.2 Compliance with Applicable or Relevant Appropriate Requirements

Table 5-3 provides an ARAR compliance summary for Alternative 1. Further discussion of specific ARARs determined to be potentially applicable to Alternative 1 under general topic headings (hazardous waste regulations, nonhazardous solid waste regulations, water quality regulations, drinking water regulations, air pollution regulations, and other miscellaneous regulations) is provided below.

In addition, it should be noted that under Alternative 1, the TBC criteria/guidance of Pennsylvania's groundwater remediation policy (cleanup to background or non-detectable levels) identified under Subsection 2.6 will not be met. However, as provided for in the policy statement, an evaluation is put forth under Appendix A indicating the technical feasibility of meeting the background/non-detect criteria. In any event, as TBCs are not ARARs, not meeting this TBC does not affect the remedial alternative evaluation criteria of ARAR compliance.

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Table 5-3

ARARs Compliance Summary for Alternative 1: No Action

ARAR	Comments	Alternative 1 No Action
I. Chemical-Specific		
A. Resource Conservation and Recovery Act (RCRA) 1. Identification and Listing of Hazardous Waste.	Potentially applicable to remedial actions involving solid waste removal including leachate removal. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Will meet (if applicable)
B. Pennsylvania Solid Waste Management Act 1. Identification and Listing of Hazardous Waste.	Potentially applicable to remedial actions involving solid waste removal including leachate removal. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. EP toxicity/ TCLP testing required to determine applicability.	Will meet (if applicable)
C. Clean Water Act 1. Water Quality Criteria (Non-enforceable guidance).	Applicable to remedial actions involving discharge of treated groundwater to the unnamed site stream.	Not Applicable
D. Pennsylvania Clean Streams Law 1. Water Quality Criteria including Toxic Management Strategy.	Applicable to remedial actions involving discharge of treated groundwater into the unnamed site stream.	Not Applicable
E. Safe Drinking Water Act (SDWA)	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available.

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Table 5-3

ARARs Compliance Summary for Alternative 1: No Action (continued)

ARAR	Comments	Alternative 1 No Action
1. National Primary Drinking Water Standards.	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available.
2. National Secondary Drinking Water Standards (Non-enforceable guidelines).	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available.
3. Maximum Contaminant Level Goals (Non-enforceable goals).	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available.
E. Pennsylvania Safe Drinking Water Act.	Applicable to current limited use and potential future use of groundwater as a potable water supply. Cites by reference federal SDWA standards.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available.

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Table 5-3

ARARs Compliance Summary for Alternative 1: No Action (continued)

ARAR	Comments	Alternative 1 No Action
II. Location-Specific		
A. Resource Conservation and Recovery Act 1. Siting Criteria for Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable if a TSD facility is set up on-site to manage removed RCRA hazardous waste. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. TCLP testing required to determine applicability.	Not Applicable
B. Pennsylvania Solid Waste Management Act 1. Siting Criteria for Hazardous Waste Treatment and Disposal Facilities.	Potentially applicable if a treatment and/or disposal facility is set up on-site to manage removed hazardous waste. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. EP toxicity/TCLP testing required to determine applicability.	Not Applicable
C. Clean Water Act 1. Dredge or Fill Requirements.	Limited wetlands have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.	Not Applicable
D. Executive Order on Protection of Wetlands	Limited wetlands have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.	Not Applicable
E. Pennsylvania Dam Safety and Waterway Management Act	Limited wetland areas have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.	Not Applicable

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Table 5-3

ARARs Compliance Summary for Alternative 1: No Action (continued)

ARAR	Comments	Alternative 1 No Action
III. Action-Specific		
A. Resource Conservation and Recovery Act 1. Standards Applicable to Generators of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Will meet (if applicable)
2. Standards Applicable to Transporters of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Will meet (if applicable)
3. Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed wastes which qualify as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP prior testing required to determine applicability.	Not Applicable
4. Standards for the Management of Specific Hazardous Waste and Specific Types of Hazardous Waste Management Facilities.	Potentially applicable to remedial actions involving reclamation of recyclable waste which qualify as hazardous under RCRA. May apply to recovered non-aqueous product. TCLP testing required to determine applicability.	Will meet (if applicable)

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Table 5-3

ARARs Compliance Summary for Alternative 1: No Action (continued)

ARAR	Comments	Alternative 1 No Action
5. Land Disposal Restrictions.	Potentially applicable to remedial actions involving removal of waste which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Not Applicable
B. Pennsylvania Solid Waste Management Act - Residual (Non-Hazardous Solid) Waste Management	Applicable to remedial actions involving removal of solid wastes that qualify as residual wastes. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment.	Not Applicable
C. Pennsylvania Solid Waste Management Act - Hazardous Waste Regulations 1. Standards Applicable to Generators of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)
2. Standards Applicable to Transporters of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)

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Table 5-3

ARARs Compliance Summary for Alternative 1: No Action (continued)

ARAR	Comments	Alternative 1 No Action
3. Standards of Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed waste which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.	Not Applicable
4. Standards for the Management of Specific Hazardous Waste and Specific Types of Hazardous Waste Management Facilities.	Potentially applicable to remedial actions involving reclamation of recyclable wastes which qualify as hazardous under RCRA. May apply to recovered non-aqueous product. EP Toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)
D. Occupational Safety and Health Act	Applicable to remedial actions (including monitoring) at hazardous waste sites.	Will meet
E. Hazardous Materials Transportation Act 1. Hazardous Materials Transportation Regulations.	Applicable to remedial actions involving transportation of DOT-defined hazardous materials off-site, including recovered non-aqueous product.	Will meet
F. Clean Water Act 1. National Pollutant Discharge Elimination System (NPDES).	Applicable to remedial actions involving discharge to the unnamed site stream.	Not Applicable
2. National Pretreatment Standards.	Applicable to current discharge of aqueous fraction of treated leachate into local POTW.	Will meet
G. Pennsylvania Clean Streams Law 1. Water Quality Management (WQM) Program.	Applicable to remedial actions involving point source discharges to surface waters.	Not Applicable

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Table 5-3

ARARs Compliance Summary for Alternative 1: No Action (continued)

ARAR	Comments	Alternative 1 No Action
2. Wastewater Treatment Requirements.	Applicable to remedial actions involving point source discharges.	Not Applicable
3. Industrial Wastes.	Applicable to remedial actions involving point source discharges.	Not Applicable
4. Erosion Control.	Applicable to remedial actions involving earth moving.	Not Applicable
H. Pennsylvania Dam Safety and Waterway Management Act		
1. Outfall Structures.	Applicable to remedial actions involving point source discharges to streams.	Not Applicable
I. WESA Pretreatment Effluent Limitations	Applicable; aqueous portion of leachate currently being discharged in accordance with the effluent limitations agreement.	Will meet
J. Pennsylvania Stormwater Management Act	Applicable to remedial actions requiring stormwater management.	Not Applicable
K. Allegheny County Stormwater Management Regulations	Applicable to remedial actions requiring stormwater management.	Not Applicable
L. Safe Drinking Water Act		
1. Underground Injection Control (UIC) Regulations.	Applicable to remedial actions involving reinjection of groundwater or injection of treatment chemicals	Not Applicable
M. Clean Air Act		
1. New Source Performance Standards (NSPS).	Applicable to remedial actions involving incineration	Not Applicable
N. Pennsylvania Air Pollution Control Act		
1. Standards for Contaminants.	Applicable to remedial actions involving air emissions, principally incineration.	Will meet

Table 5-3

ARARs Compliance Summary for Alternative 1: No Action (continued)

ARAR	Comments	Alternative 1 No Action
2. New Source Performance Standards.	Applicable to remedial actions involving incineration.	Not Applicable
3. Standards for Sources of VOCs.	Applicable to remedial actions utilizing storage tanks for VOC-containing wastes.	Not Applicable
C. ACHD Air Pollution Control Regulations		
1. Air Emission Standards.	Applicable to remedial actions producing air emissions, principally incineration.	Will meet
2. Waste-Derived Liquid Fuel Standards.	Applicable to current practice of utilizing recovered non-aqueous product as a fuel under ACHD permit.	Will meet
3. New Source Performance Standards.	Applicable to remedial actions involving incineration.	Not Applicable
4. Standards for Sources of VOCs.	Applicable to remedial actions utilizing storage tanks for VOC-containing wastes.	Not Applicable

Hazardous Waste Regulations

As noted in Section 2, some of the waste material contained in the landfill may potentially qualify as an RCRA characteristic hazardous waste under EPA's recently enacted Toxicity Characteristic (TC) for benzene. However, since the PICCO Resin Landfill was closed in 1964 prior to the 1976 enactment of RCRA, RCRA requirements do not strictly apply unless material qualifying as an RCRA hazardous waste is removed from the landfill. As the no action alternative does not involve removal of any waste material from the landfill beyond collected landfill leachate, RCRA requirements are not strictly applicable, with the potential exception of collected leachate.

As previously discussed, since the waste material contains a high level of benzene, (averaging 134 mg/kg with a maximum of 290 mg/kg noted) the leachate (particularly the non-aqueous portion) may qualify as an RCRA hazardous waste under TCLP testing for benzene. Recent testing of this non-aqueous fraction (see Table 1-6) revealed it to qualify as a RCRA characteristics hazardous waste for ignitability (D001) and leachable benzene (D018). The following represent potentially applicable ARAR requirements for landfill leachate which will be met under Alternative 1 assuming that it qualifies as an RCRA hazardous waste:

- Recycling/reclamation of the non-aqueous portion of the leachate via burning as a fuel would be subject to the requirements outlined in Subsections 2.3.1.3.1 and 2.4.1.2.1. The requirements of note for maintaining compliance with these ARARs include:
    - Managing containers in accordance with requirements outlined in Subsections 2.3.1.3.6 and 2.4.1.2.6.
    - Conducting energy recovery in accordance with the final rule "Burning of Hazardous Waste in Boilers and Industrial Furnaces" 21 August 1991, the date the final rule takes effect.
    - Complying with applicable air pollution regulations subsequently discussed below.
- Generator requirements outlined under Subsections 2.3.1.3.9 and 2.4.1.2.9.

- Transporter requirements outlined under Subsections 2.3.1.3.10 and 2.4.1.2.10.

Nonhazardous Solid Waste Regulations

As discussed previously in Subsection 2.4.1.1, these regulations apply to activities subsequent to the effective date of the regulations. Thus, since the PICCO Resin Landfill closed in 1964 prior to adoption of solid waste regulations by the Commonwealth of Pennsylvania in 1971, the requirements do not strictly apply unless material is removed from the landfill. As the no action alternative does not involve removal of any waste material from the landfill beyond collected landfill leachate, solid waste requirements are not strictly applicable.

Water Quality Regulations

Under the no action alternative, the aqueous fraction is discharged through the Jefferson Borough Sanitary Sewer System to the WESA POTW after oil/water separation of the collected landfill leachate. This is performed in accordance with applicable water quality ARARs consisting of the WESA pretreatment agreement requirements as previously outlined in Subsection 2.5, and the CWA national pretreatment standard addressed under Subsection 2.3.2.

Drinking Water Regulations

Under the no action alternative, drinking water regulations are applicable to local residential wells utilized as a potable water source.

Review of the RI residential well sampling results indicates that corresponding primary drinking water standards (MCLs) for the identified organic compounds of concern were not exceeded, indicating compliance with drinking water ARARs.

Air Pollution Control Regulations

Under the no action alternative, the separated non-aqueous fraction (oil) is burned as a fuel in the local Hercules plant industrial boilers after oil/water separation of collected landfill leachate. This is performed in accordance with applicable air pollution ARARs and under permit from the ACHD, as outlined in Subsection 2.5.2.

Other Miscellaneous Regulations

Other miscellaneous ARARs which will be met under Alternative 1 include:

- OSHA requirements outlined under Subsection 2.3.5 which apply to all activities, including monitoring, at hazardous waste sites.
- DOT hazardous materials transportation requirements addressed under Subsection 2.3.6 and applicable to off-site removal of recovered non-aqueous product.

5.2.1.3 Short-Term Effectiveness

This evaluation criterion involves consideration of the short-term effectiveness during construction and implementation of remedial actions. As the no action alternative does not involve construction or implementation of further remedial actions at the site, this criterion is not applicable to the no action alternative.

5.2.1.4 Long-Term Effectiveness and Permanence

Under the no action alternative, current contamination would be left in place and changes in contaminant levels would consist of those resulting from natural processes (i.e., leaching, weathering, biodegradation, or other natural attenuation processes), as well as from the engineered remedial system currently in place (i.e., the interceptor trench and the leachate treatment system). Therefore, the residual risk under this alternative is essentially the baseline risk established in the risk assessment for the site (Part II of the Site Report as summarized under Subsection 1.2.1.3) minus the reduction achieved by natural processes and the current in-place remedial system.

The no action alternative provides a relatively low degree of long-term effectiveness and permanence since, with the exception of collected leachate, all waste materials and associated contaminated media will remain at the site untreated, and under partial control.

5.2.1.5 Overall Protection of Human Health and the Environment

Under the no action alternative, the overall protection of human health and the environment can be evaluated quantitatively through the baseline risk assessment presented in Part II of the Site Report (summarized in Subsection 1.2.1.3). This baseline risk assessment includes both current and future use scenarios.

5.2.1.6 Reduction of Toxicity, Mobility, and Volume of Contaminants

Under the no action alternative, the current in-place leachate collection/treatment system provides for some contaminant reduction via removal of landfill leachate. In addition, the system reduces contaminant mobility by effectively capturing the leachate generated for subsequent treatment.

5.2.1.7 Implementability

This criterion is not applicable as no additional remedial actions will be implemented under the no action alternative.

5.2.1.8 Cost

The estimated cost for the no action alternative consists of:

- Leachate collection/treatment O&M costs.
- Site environmental monitoring costs.

Leachate collection/treatment O&M costs were estimated by Hercules at $50,000 per year based on current operating conditions. Site environmental monitoring costs were estimated at $53,000 per year based on the assumed monitoring program presented in Table 5-2. This cost includes sampling and analytical costs; it does not include reporting costs.

Table 5-4 provides a cost summary for Alternative 1. Using a present worth analysis at 5% compound interest over 30 years with a gradient factor of 5% of the total estimated annual O&M cost, the total present worth estimated cost of the no action alternative is $2,452,000.

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Table 5-4 Estimated Order of Magnitude Cost Summary for Alternative 1 - No Action			
	Quantity	Unit Cost ($/Unit)	Total Cost ($)
CAPITAL			
Subtotal - Direct Capital Cost			0
Indirect Capital Cost Items			
Engineering/Construction Management (15%)			0
Mobilization/Demobilization/Site Services (10%)			0
Overhead and Profit (15%)			0
Subtotal - Indirect Capital Cost			0
Subtotal - Direct/Indirect Capital Cost			0
Contingency (20%)			0
Total Estimated Capital Cost			0
OPERATING AND MAINTENANCE			
Leachate Collection/Treatment - Interceptor Trench	L.S.		50,000
Site Monitoring			
Groundwater	76/yr	400/sample	30,400
Seeps	12/yr	400/sample	4,800
Stream	6/yr	400/sample	2,400
Residential Wells	10/yr	400/sample	4,000
QA/QC Samples (10%)	11/yr	400/sample	4,400
Labor	230 hrs	30/hr	6,900
Subtotal - Site Monitoring			53,000
Total Estimated Annual O&M Cost			103,000
Present Worth of Annual O&M Cost (30 years @ 5% interest rate with 5% inflation gradient factor)			2,452,000
TOTAL ESTIMATED PROJECT COST			2,452,000

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5.2.2 Alternative 2: Limited Action

5.2.2.1 Description

The limited action alternative involves implementation of the following access restrictions:

- Site perimeter fencing.
- Property deed notation.
- Groundwater restriction.

Site perimeter fencing involves the installation of a fence with locked access gates around the site boundaries to physically prevent property access. The PICCO site currently has in place a fence and locked gate security system at the point of access. Supplemental fences will be installed to provide a fence encompassing easy access areas around the site perimeter. Property deed notation involves annotating the site deed to alert prospective property buyers to the presence of hazardous substances on-site. Groundwater restrictions involve designation of local groundwater sources as nonpotable with corresponding restrictions on its use. Future site use restrictions may also be required based on human health risk considerations.

As with the no action response option, environmental monitoring as previously outlined in Table 5-2 would be implemented for this limited action alternative. In addition, it is proposed to drill an exploratory borehole into the deep bedrock at two downgradient off-site locations yet to be determined. The results of the RI indicated that the deep bedrock zone under the site does not act as a groundwater aquifer. The proposed exploratory program will investigate the viability of this zone to act as an aquifer at off-site locations. If significant groundwater is encountered at each location, the boreholes will be converted to deep bedrock monitoring wells (otherwise, the boreholes will be sealed with grout). These wells would then serve as permanent groundwater monitoring points which would be added to the routine quarterly monitoring program proposed for all groundwater monitoring wells at the site.

In addition, existing on-site deep bedrock Monitoring Wells TW-5 and TW-6 will be properly abandoned via sealing with grout. Both wells do not yield sufficient amounts of water for sampling purposes and there is concern in the case of TW-5 that leakage may be occurring from the upper casing.

Leachate would continue to be collected via the existing interceptor trench and treated via gravitational oil/water separation with discharge of the aqueous portion to the WESA POTW and use of the non-aqueous fraction as a fuel in the local Hercules plant industrial boilers.

Under the limited action alternative, the lower landfill dike would be upgraded as required in response to the potential problems identified by the limited geotechnical analysis performed during the RI (see Subsection 3.2.3 of Part I for the Site Report for details). Based on this limited analysis, dike regrading to achieve a 3:1 slope is anticipated to yield acceptable minimum factors of safety.

In addition, identified potential private water supply actions and controls are retained as a contingency measure if future conditions warrant such a response action.

5.2.2.2 Compliance with Applicable and Relevant and Appropriate Requirements

Table 5-5 provides an ARAR compliance summary for Alternative 2. Further discussion of specific ARARs determined to be potentially applicable to Alternative 2 is provided below.

The limited action alternative would be similar to the no action alternative in terms of requirements for compliance with ARARs. Namely:

- Since the PICCO Resin Landfill closed in 1964 prior to enactment of either the solid or hazardous waste regulations, these regulations do not strictly apply as ARARs, except for materials removed from the landfill. As the limited action alternative does not involve removal of any waste material from the landfill beyond collected landfill leachate, solid or hazardous waste requirements are not strictly applicable.

Table 5-5

ARARs Compliance Summary for Alternative 2: Limited Action

ARAR	Comments	Alternative 2 Limited Action
I. Chemical-Specific		
A. Resource Conservation and Recovery Act (RCRA) 1. Identification and Listing of Hazardous Waste.	Potentially applicable to remedial actions involving solid waste removal including leachate removal. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Will meet (if applicable)
B. Pennsylvania Solid Waste Management Act 1. Identification and Listing of Hazardous Waste.	Potentially applicable to remedial actions involving solid waste removal including leachate removal. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. EP toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)
C. Clean Water Act 1. Water Quality Criteria (Non-enforceable guidance).	Applicable to remedial actions involving discharge of treated groundwater to the unnamed site stream.	Not Applicable
D. Pennsylvania Clean Streams Law 1. Water Quality Criteria including Toxic Management Strategy.	Applicable to remedial actions involving discharge of treated groundwater into the unnamed site stream.	Not Applicable

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Table 5-5

ARARs Compliance Summary for Alternative 2: Limited Action (continued)

ARAR	Comments	Alternative 2 Limited Action
E. Safe Drinking Water Act (SDWA)	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.
1. National Primary Drinking Water Standards.	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.

Table 5-5

ARARs Compliance Summary for Alternative 2: Limited Action (continued)

ARAR	Comments	Alternative 2 Limited Action
2. National Secondary Drinking Water Standards (Non-enforceable guidelines.	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.
3. Maximum Contaminant Level Goals (Non-enforceable goals).	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.

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Table 5-8

ARARs Compliance Summary for Alternative 2: Limited Action (continued)

ARAR	Comments	Alternative 2 Limited Action
F. Pennsylvania Safe Drinking Water Act	Applicable to current limited use and potential future use of groundwater as a potable water supply. Cites by reference federal SDWA standards.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.
II. Location-Specific		
A. Resource Conservation and Recovery Act 1. Siting Criteria for Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable if a TSD facility is set up on-site to manage removed RCRA hazardous waste. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. TCLP testing required to determine applicability.	Not Applicable

Table 5-5

ARARs Compliance Summary for Alternative 2: Limited Action (continued)

ARAR	Comments	Alternative 2 Limited Action
B. Pennsylvania Solid Waste Management Act 1. Siting Criteria for Hazardous Waste Treatment and Disposal Facilities.	Potentially applicable if a treatment and/or disposal facility is set up on-site to manage removed hazardous waste. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. EP toxicity/TCLP testing required to determine applicability.	Not Applicable
C. Clean Water Act 1. Dredge or Fill Requirements.	Limited wetlands have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.	Not Applicable
D. Executive Order on Protection of Wetlands	Limited wetlands have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.	Not Applicable
E. Pennsylvania Dam Safety and Waterway Management Act	Limited wetland areas have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.	Not Applicable

Table 5-5

ARARs Compliance Summary for Alternative 2: Limited Action (continued)

ARAR	Comments	Alternative 2 Limited Action
III. Action-Specific		
A. Resource Conservation and Recovery Act 1. Standards Applicable to Generators of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Will meet (if applicable)
2. Standards Applicable to Transporters of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Will meet (if applicable)
3. Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed wastes which qualify as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP prior testing required to determine applicability.	Not Applicable

Table 5-5

ARARs Compliance Summary for Alternative 2: Limited Action (continued)

ARAR	Comments	Alternative 2 Limited Action
4. Standards for the Management of Specific Hazardous Waste and Specific Types of Hazardous Waste Management Facilities.	Potentially applicable to remedial actions involving reclamation of recyclable waste which qualify as hazardous under RCRA. May apply to recovered non-aqueous product. TCLP testing required to determine applicability.	Will meet (if applicable)
5. Land Disposal Restrictions.	Potentially applicable to remedial actions involving removal of waste which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Not Applicable
B. Pennsylvania Solid Waste Management Act - Residual (Non-Hazardous Solid) Waste Management	Applicable to remedial actions involving removal of solid wastes that qualify as residual wastes. Not applicable to wastes remaining inplace as placement occurred prior to regulatory enactment.	Not Applicable

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Table 5-5

ARARs Compliance Summary for Alternative 2: Limited Action (continued)

ARAR	Comments	Alternative 2 Limited Action
C. Pennsylvania Solid Waste Management Act - Hazardous Waste Regulations 1. Standards Applicable to Generators of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)
2. Standards Applicable to Transporters of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)
3. Standards of Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed waste which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.	Not Applicable

Table 5-5

ARARs Compliance Summary for Alternative 2: Limited Action (continued)

ARAR	Comments	Alternative 2 Limited Action
4. Standards for the Management of Specific Hazardous Waste and Specific Types of Hazardous Waste Management Facilities.	Potentially applicable to remedial actions involving reclamation of recyclable wastes which qualify as hazardous under RCRA. May apply to recovered non-aqueous product. EP Toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)
D. Occupational Safety and Health Act	Applicable to remedial actions (including monitoring) at hazardous waste sites.	Will meet
E. Hazardous Materials Transportation Act 1. Hazardous Materials Transportation Regulations.	Applicable to remedial actions involving transportation of DOT-defined hazardous materials off-site, including recovered non-aqueous product.	Will meet
F. Clean Water Act 1. National Pollutant Discharge Elimination System (NPDES).	Applicable to remedial actions involving discharge to the unnamed site stream.	Not Applicable
2. National Pretreatment Standard.	Applicable to current discharge of aqueous fraction of treated leachate into local POTW.	Will meet

Table 5-5

ARARs Compliance Summary for Alternative 2: Limited Action (continued)

ARAR	Comments	Alternative 2 Limited Action
G. Pennsylvania Clean Streams Law		
1. Water Quality Management (WQM) Program.	Applicable to remedial actions involving point source discharges to surface waters.	Not Applicable
2. Wastewater Treatment Requirements.	Applicable to remedial actions involving point source discharges.	Not Applicable
3. Industrial Wastes.	Applicable to remedial actions involving point source discharges.	Not Applicable
4. Erosion Control.	Applicable to remedial actions involving earth moving.	Not Applicable
H. Pennsylvania Dam Safety and Waterway Management Act		
1. Outfall Structures.	Applicable to remedial actions involving point source discharges to streams.	Not Applicable
I. WBSA Pretreatment Effluent Limitations	Applicable; aqueous portion of leachate currently being discharged in accordance with the effluent limitations agreement.	Will meet
J. Pennsylvania Stormwater Management Act	Applicable to remedial actions requiring stormwater management.	Not Applicable

Table 5-5

ARARs Compliance Summary for Alternative 2: Limited Action (continued)

ARAR	Comments	Alternative 2 Limited Action
K. Allegheny County Stormwater Management Regulations	Applicable to remedial actions requiring stormwater management.	Not Applicable
L. Safe Drinking Water Act 1. Underground Injection Control (UIC) Regulations.	Applicable to remedial actions involving reinjection of groundwater or injection of treatment chemicals	Not Applicable
M. Clean Air Act 1. New Source Performance Standards (NSPS).	Applicable to remedial actions involving incineration	Not Applicable
N. Pennsylvania Air Pollution Control Act 1. Standards for Contaminants.	Applicable to remedial actions involving air emissions, principally incineration.	Will meet
2. New Source Performance Standards.	Applicable to remedial actions involving incineration.	Not Applicable
3. Standards for Sources of VOCs.	Applicable to remedial actions utilizing storage tanks for VOC-containing wastes.	Not Applicable

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Table 5-5

ARARs Compliance Summary for Alternative 2: Limited Action (continued)

ARAR	Comments	Alternative 2 Limited Action
G. ACHD Air Pollution Control Regulations		
1. Air Emission Standards.	Applicable to remedial actions producing air emissions, principally incineration.	Will meet
2. Waste-Derived Liquid Fuel Standards.	Applicable to current practice of utilizing recovered non-aqueous product as a fuel under ACHD permit.	Will meet
3. New Source Performance Standards.	Applicable to remedial actions involving incineration.	Not Applicable
4. Standards for Sources of VOCs.	Applicable to remedial actions utilizing storage tanks for VOC-containing wastes.	Not Applicable

- Management of landfill leachate is currently conducted by permit in accordance with the CWA national pretreatment standard and WESA POTW pretreatment requirements (for treatment of the aqueous phase) and ACHD air pollution and fuel burning requirements (for treatment of the non-aqueous phase). If the leachate (particularly the non-aqueous portion) qualifies as an RCRA hazardous waste, management of the non-aqueous phase would be subject to the following applicable hazardous waste requirements:

  - Recycling/reclamation ARARs including:

    Managing containers in accordance with the requirements outlined in Subsections 2.3.1.3.6 and 2.4.1.2.6.

    Conducting energy recovery in accordance with the final rule "Burning of Hazardous Waste in Boilers and Industrial Furnaces" by 31 August 1991, the date that the rule becomes effective.

    Complying with applicable ACHD air pollution regulations (Subsection 2.5.2).

  - Generator requirements outlined under Subsections 2.3.1.3.9 and 2.4.1.2.9.

  - Transporter requirements outlined under Subsections 2.3.1.3.10 and 2.4.1.2.10.

- Review of the RI residential well sampling results indicates that no corresponding primary drinking water standards (MCLs) for the identified organic contaminants of concern were exceeded, indicating compliance with drinking water ARARs for the organic compounds of concern.

- Compliance with OSHA requirements for hazardous waste operations (Subsection 2.3.5).

- Compliance with DOT hazardous material transportation requirements (Subsection 2.3.6) for off-site removal of recovered non-aqueous product.

In addition, it should be noted that under Alternative 2, the TBC criteria/guidance of Pennsylvania's groundwater remediation policy (cleanup to background or non-detectable levels) identified under Subsection 2.6 will not be met. However, as provided for in the policy statement, an evaluation is put forth under Appendix A indicating the technical infeasibility of meeting the background/non-detect criteria. In any event, as TBCs are not

ARARs, not meeting this TBC does not affect the remedial alternative evaluation criteria of ARAR compliance.

5.2.2.3 Short-Term Effectiveness

This evaluation criterion involves consideration of community/site personnel protection and environmental impacts during implementation of remedial actions. Under the limited action scenario, implementation would include supplemental fence installation activities to provide a fence encompassing easy access areas around the site perimeter. Since supplemental installation would occur at the site perimeter, site contaminants would not be encountered during such activities.

In addition, the lower landfill dike would be upgraded under the limited action alternative. During this limited activity, implementation of an air monitoring program would help ensure adequate protection of on-site personnel and the surrounding community. If required, on-site personnel would wear proper respiratory protection. Erosion and sediment controls would be implemented to address potential runoff concerns.

5.2.2.4 Long-Term Effectiveness and Permanence

Under the limited action alternative, current contamination would be left in place and changes in contaminant levels would consist of those resulting from natural processes (i.e., leaching, weathering, biodegradation, or other natural attenuation processes), as well as from the engineered remedial system currently in place (i.e., the interceptor trench and the leachate treatment system). Therefore, the residual risk under this alternative is essentially the baseline risk established in the risk assessment for the site (Part II of the Site Report as summarized in Subsection 1.2.1.5) minus the reduction achieved by natural processes and the current in-place remedial system.

The limited action alternative provides a relatively low degree of long-term effectiveness and permanence since, with the exception of collected leachate, all waste materials and associated contaminated media will remain at the site untreated and under partial control.

5.2.2.5 Overall Protection of Human Health and the Environment

Under the limited action alternative, protection is given via the access restrictions that limit future exposure of human receptors to site contaminants by restricting property access either physically (through site perimeter fencing and groundwater restrictions) and/or through legal channels (through property deed annotation alerting prospective purchasers to the presence of hazardous substances on-site and legal groundwater restrictions). Future site use restrictions may also be required based on human health risk considerations.

However, as with the no action response option, access restrictions do not remediate the contaminants present at the site.

5.2.2.6 Reduction of Toxicity, Mobility, and Volume of Contaminants

Under the limited action alternative, the current in-place leachate collection/treatment system provides for some contaminant reduction via removal of landfill leachate. In addition, the system reduces contaminant mobility by effectively capturing the leachate generated for subsequent treatment.

5.2.2.7 Implementability

Under the limited action alternative, access restrictions can be readily implemented. Property deed annotation and groundwater restrictions would involve nominal legal actions. The PICCO site has in place a fence and locked gate security system. Upgrading to provide a fence restricting easy access and periodic maintenance of the fence and gate system would be required. Upgrade of the lower landfill dike can be readily implemented.

5.2.2.8 Costs

The capital cost items for the limited action alternative consists of the cost for the following:

- Access controls
  - Upgrade of site fence system.
  - Legal costs for property deed notation and groundwater/land use restrictions.
- Upgrade of lower landfill dike.
- Exploratory borehole program with potential installation of two additional deep bedrock monitoring wells.
- Abandonment of Monitor Wells TW-5 and TW-6 via sealing with grout.

Operating and maintenance cost items include:

- Maintenance costs for the upgraded site fence system.
- Leachate collection/treatment O&M costs.
- Site environmental monitoring costs.

The cost estimate was performed based on the following assumptions:

- Fence system upgrading to encompass easy access areas would involve installation of up to approximately 5,000 linear ft of fencing. O&M costs for the fence maintenance were assumed at 5% of the installed cost per year.
- No costs are cited for groundwater restrictions or land use restrictions. These represent governmental-based actions to which direct costs cannot be assigned. Such restrictions may also be incorporated as part of the property deed annotation.
- Leachate collection/treatment O&M costs were estimated by Hercules at $50,000 per year based on current operating conditions.
- Site environmental monitoring costs were estimated at $53,000 per year based on the assumed monitoring program presented earlier in Table 5-2. This cost includes sampling and analytical costs; it does not include reporting costs. This

cost also assumes that the two proposed exploratory borings into the deep bedrock zone will be converted into monitoring wells and added to the proposed quarterly monitoring program for groundwater monitoring wells. The cost also considers abandonment of Monitoring Wells TW-5 and TW-6, which will reduce groundwater monitoring requirements.

Table 5-6 provides a cost summary for Alternative 2. Using a present worth analysis at 5% compound interest over 30 years with a gradient factor of 5% of the total estimated annual O&M cost, the total present worth estimated cost of the limited action alternative is $2,860,000.

Table 5-6

Estimated Order of Magnitude Cost Summary for Alternative 2 - Limited Action

	Quantity	Unit Cost ($/Unit)	Total Cost ($)
CAPITAL			
Access Controls			
Fence System Upgrade	5,000 L.F.	18/L.F.	90,000
Property Deed Notation	L.S.		3,000
Groundwater/Land Use Restrictions			0
Subtotal - Access Controls			**93,000**
Lower Dike Upgrade	L.S.		50,000
Deep Bedrock Exploratory Boreholes/Potential Monitoring Wells	2	12,500/each	25,000
Abandonment of Bedrock Monitoring Wells TW-5 and TW-6	2 wells	2,000/well	4,000
Subtotal - Direct Capital Cost			**172,000**
Indirect Capital Cost Items			
Engineering/Construction Management (15%)			26,000
Mobilization/Demobilization/Site Services (10%)			17,000
Overhead and Profit (15%)			26,000
Subtotal - Indirect Capital Cost			**69,000**
Subtotal - Direct/Indirect Capital Cost			**241,000**
Contingency (20%)			**48,000**
Total Estimated Capital Cost			**289,000**
OPERATING AND MAINTENANCE			
Leachate Collection/Treatment - Interceptor Trench	L.S.		50,000
Site Monitoring			
Groundwater	76/yr	400/sample	30,400
Seeps	12/yr	400/sample	4,800

[illegible]

Table 5-6

Estimated Order of Magnitude Cost Summary for Alternative 2 - Limited Action

	Quantity	Unit Cost ($/Unit)	Total Cost ($)
Stream	6/yr	400/sample	2,400
Residential Wells	10/yr	400/sample	4,000
QA/QC Samples (10%)	11/yr	400/sample	4,400
Labor	230 hrs	30/hr	6,900
Subtotal - Site Monitoring			**53,000**
Fence Maintenance (5% of installed cost)			4,500
Total Estimated Annual O&M Cost			**108,000**
Present Worth of Annual O&M Cost (30 years @ 5% interest rate with 5% inflation gradient factor)			**2,571,000**
TOTAL ESTIMATED PROJECT COST			**2,860,000**

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5.2.3 Alternative 3: Closure

5.2.3.1 Description

The closure alternative outlined in Table 5-7 incorporates a series of on-site remedial measures designed to achieve the remedial action objectives defined in Subsection 1.2.2 via:

- Upgrade of the existing landfill unit via capping and additional infiltration controls to minimize leachate generation.
- Institutional controls to limit access and future site use.
- Collection/treatment of landfill leachate to address potential groundwater contamination.
- Replacement of the oil/water separator with an enclosed system to prevent uncontrolled air emissions.
- Retention of identified potential private water supply actions and controls as a contingency measure if future conditions warrant such a response action.
- Periodic site monitoring.

Under this alternative, two options (A and B) are considered. The difference in the options is that Option B includes provisions for a potential skimmer-type recovery well network to recover non-aqueous product from the Pittsburgh Coal, while Option A does not.

The closure alternative and associated Options A and B were developed based on consideration of the following site-specific factors previously noted in the site model:

- Site drainage: The landfill unit is located in the middle of the steeply sloped valley, with drainage from the surrounding hillsides running toward the landfill, along with discharge from the storm drain located on Maryland Avenue. Thus, the closure alternative involves emphasis placed on upgrading the existing landfill cap and providing/upgrading associated infiltration controls to minimize potential leachate production.
- Existing interceptor trench: The existing interceptor trench, keyed into the underlying bedrock downslope of the lower landfill dike, provides an effective downslope barrier via interception of leachate seepage from the landfill toe. Therefore, the trench forms an important containment component in the closure alternative.

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Table 5-7

Alternative 3: Closure*

Medium	Type of Response	General Response Actions Utilized	Technologies/Process Options Utilized (Representative Process Options Noted in Parentheses)
Waste Material (Landfill Unit)	Containment	Landfill Infiltration Controls	Grading, Capping/Surface Sealing, Revegetation
		Leachate and Subsurface Controls	Diversion/Collection Systems (channels) Subsurface Drains (leachate interceptor trench), Recovery Wells (skimmer wells)
		Institutional Actions and Controls	Access Restrictions (fencing, deed notation, groundwater restrictions)
Soil (Downslope of Landfill Unit)	Limited Action	Institutional Actions and Controls	Access Restrictions (fencing, deed notation, groundwater restrictions)
Leachate (Landfill Unit)	Collection/Treatment	Leachate and Subsurface Controls	Subsurface Drains (leachate interceptor trench) Recovery Wells (skimmer wells)
		Leachate Treatment	Physical Treatment of Trench Leachate (gravity oil/water separation) Chemical Treatment of Trench Leachate (Extraction) - As Required Thermal Treatment of Non-Aqueous Oil Phase (Industrial Boiler) Biological Treatment of Aqueous Phase (Activated Sludge)
Groundwater (Pittsburgh Coal; unconsolidated zone)	Limited Action	Institutional Actions and Controls	Access Restrictions (fencing, deed notation, groundwater restrictions)
Air Emissions (Oil/Water Separator)	Control	Emissions Control	Emissions Prevention Systems

*NOTE: Option B includes all of the above components;
Option A includes all of the above components except for skimmer wells.

In addition, under both options, identified potential private water supply actions and controls are retained as a contingency measure if future conditions warrant such a response action.

- Mine voids: The area in and around the site has apparently been extensively deep mined in the past. The common mining practice of that era (room and pillar mining) resulted in a series of rooms (mine voids) separated by coal pillars which were left in place to aid in roof support of the mine. During the RI, mine voids with depths of 5 to 10 ft were encountered. Due to the apparent extensive deep mining activities, associated mine voids, and absence of any mine maps it would be difficult to effectively seal off the mine voids. As a viable alternative for addressing this possible pathway, the skimmer-type recovery well network to recover non-aqueous product is proposed under Option B as discussed below.

- Skimmer-type recovery well network (Option B): During the RI, floating product was encountered in Monitoring Wells TW-2 and TW-14 in mine voids on the western side of the landfill. The floating layer in TW-14 was thin and estimated at less than 1/4 inch. The extent or amount of floating product in these locations is not known and could not be determined since it is influenced by the mine voids. However, it was not encountered in wells further downgradient in the Pittsburgh Coal, and therefore appears to be limited to the area between the landfill and Circle Glenn Drive.

  This floating product would be a source of contaminants to the groundwater in the Pittsburgh Coal. As a result, removal of this floating product to the extent practical may be a viable remedial response measure. This is therefore included under Option B of this Alternative. "Skimmer wells" represent a method for removal of non-aqueous phase floating product from the groundwater. The viability, number, or design of skimmer wells along the western side of the landfill cannot be finalized at this time and should be investigated using a series of test borings to locate any additional pockets of floating material. Where a floating layer is encountered in a mine void in sufficient quantity to warrant recovery, the boring would be converted to a skimmer well.

  The most viable method for recovery of the floating layer would have to be determined by means of well testing. The floating material is viscous and may not be pumpable using conventional skimming pumps. It may also be of very limited extent and therefore would not justify a continuous skimming system. The total length of time for which floating product recovery would be practiced is also not known. However, it would continue until the floating layer diminishes to the point where it becomes impractical to continue this operation. Floating product in Monitoring Well TW-9 downslope of the landfill dike was localized and could only be recovered in small quantities (see Section 1.1.4 of the RI- Part II of the Site Report). For Monitoring Well TW-9 a periodic bailing of the well proved to be the most workable recovery system.

Table 5-7 provides a summary of Alternative 3 including both Options A and B. The main features of this alternative common to both options are as follows:

- The landfill would be capped utilizing a typical multilayer cap system according to typical landfill design standards. Figure 5-1 shows a schematic of the proposed multilayer cap. Similar capping would be performed on the area extending from the lower landfill dike downslope to the existing interceptor trench. In addition, grading and stormwater diversion/drainage system technology would be used to minimize infiltration, thereby minimizing leachate production. Stormwater runoff would be routed around the landfill via a drainage channel. Figure 5-2 is a schematic of general area capping and infiltration controls as proposed for the site.

- The existing oil/water separator for treating leachate collected by the interceptor trench would be replaced with an upgraded enclosed system to prevent uncontrolled air releases. Separated aqueous phase would continue to be discharged under permit to the WESA POTW, while separated non-aqueous product would be reclaimed as a fuel at the local Hercules plant industrial boilers in accordance with the ACHD permit and other regulatory requirements.

- Access restrictions would be implemented to further reduce potential exposure. This element would include property deed annotation, groundwater restrictions, and upgrade of the existing security system to provide a fence and locked gate system which restricts site access. Future site use restrictions may also be required based on human health risk consideration.

- Implementation of a 30-year limited site monitoring program as shown in Table 5-8.

- Exploratory boreholes will be drilled into the deep bedrock at two downgradient off-site locations yet to be determined. The results of the RI indicated that the deep bedrock zone under the site does not act as a groundwater aquifer. The proposed exploratory program will investigate the viability of this zone to act as an aquifer at off-site locations. If significant groundwater is encountered at each location, the borehole will be converted to deep bedrock monitoring wells (otherwise, the boreholes will be sealed with grout). These wells would then serve as permanent groundwater monitoring points which would be added to the routine quarterly monitoring program proposed for all groundwater monitoring wells at the site.

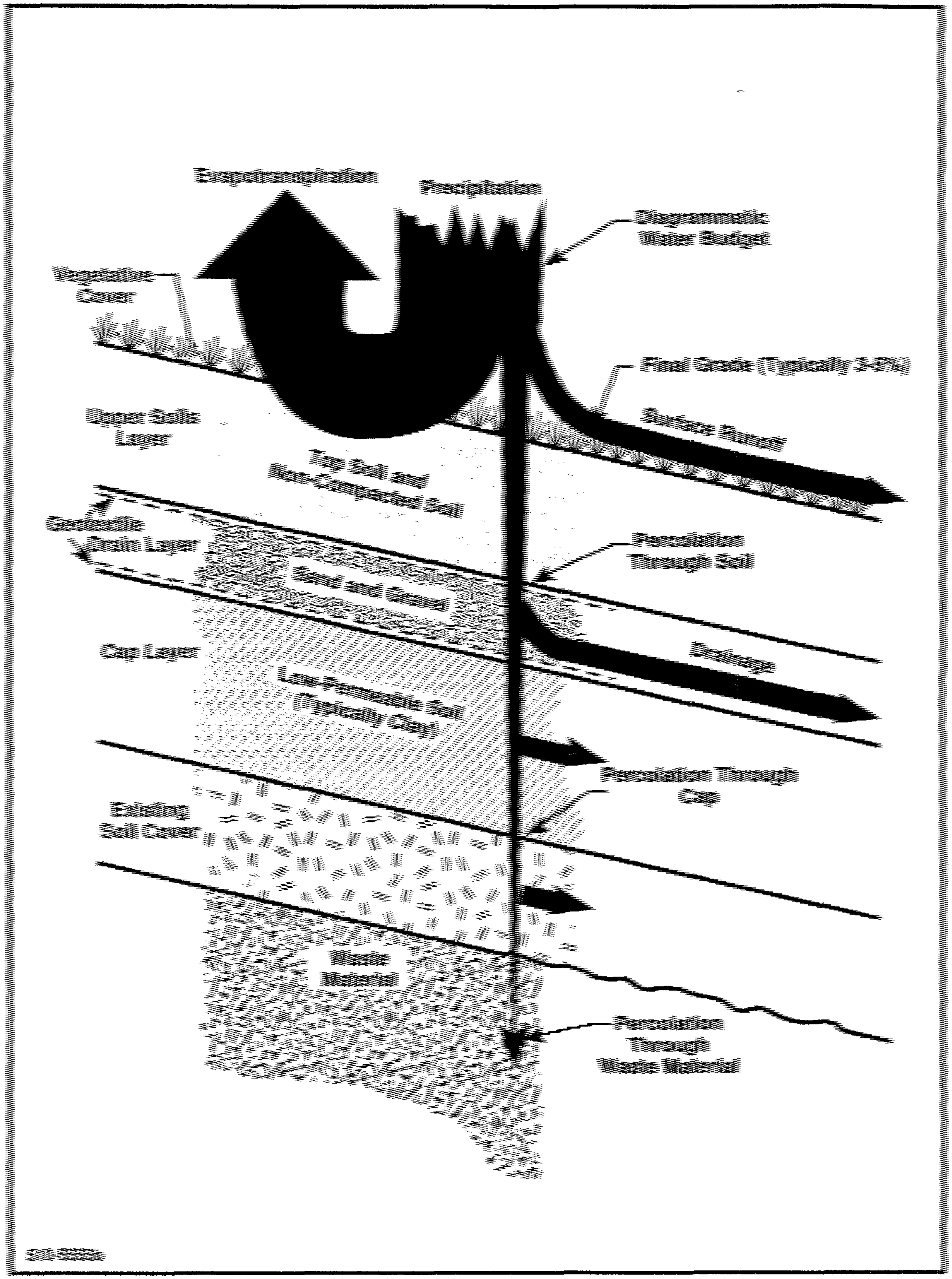

FIGURE 5-1 TYPICAL MULTILAYER CAP SYSTEM PROFILE

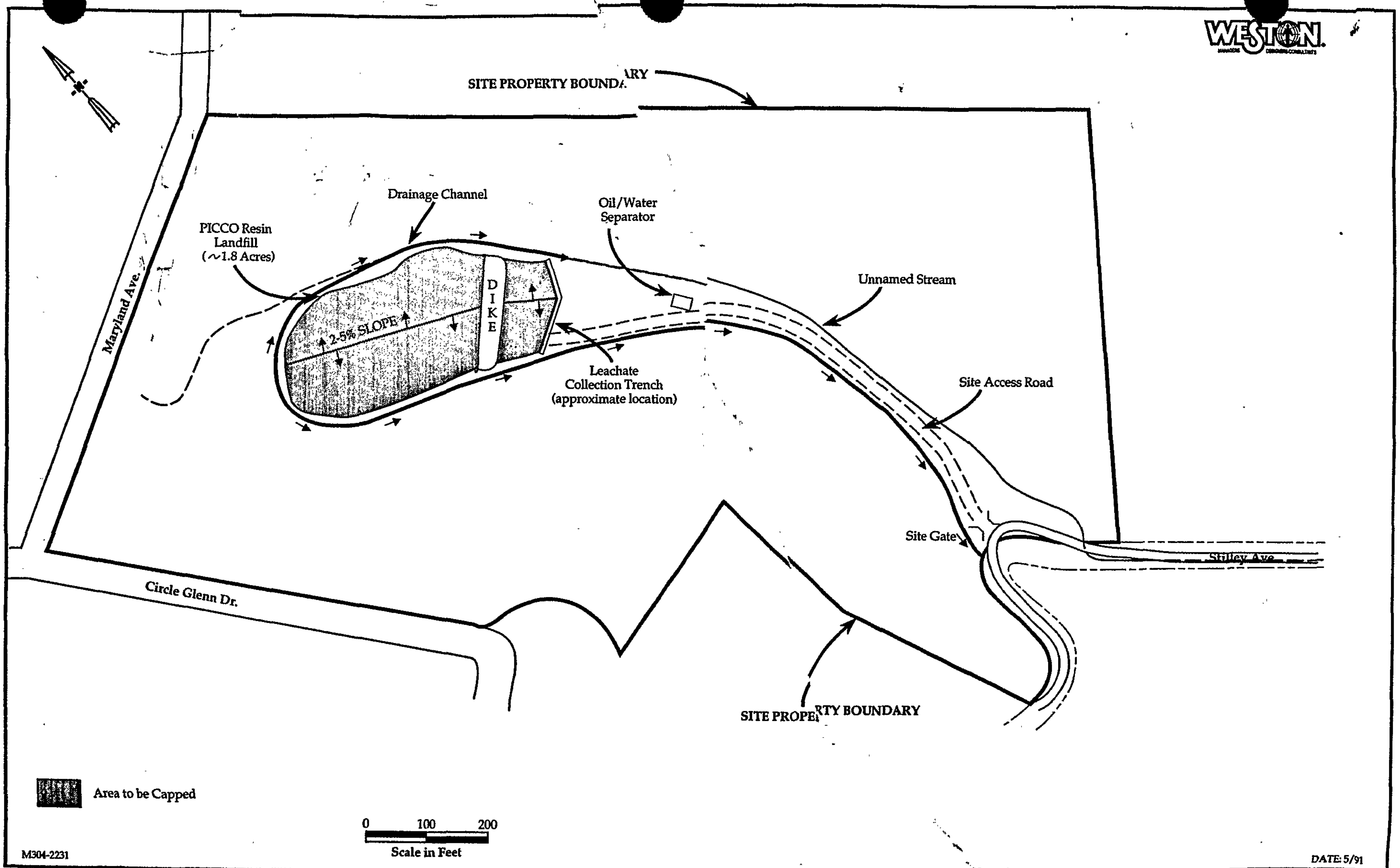

Figure 5-2 Plan View of Proposed General Landfill Capping and Infiltration Controls

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Table 5-8

30-Year Site Monitoring Program
(Applies to Alternatives 3)

Item Monitored	Monitoring Frequency [a]	Sampling Location Summary	Analytical Summary
Groundwater	Quarterly	8 monitor wells[b]	BTXE, Naphthalene, and Petroleum Hydrocarbons
Seeps	Quarterly	Three seeps	BTXE, Naphthalene, and Petroleum Hydrocarbons
Unnamed Stream	Bimonthly	One sample at site boundary	BTXE, Naphthalene, and Petroleum Hydrocarbons
Residential Wells	Annually	3 residences	BTXE, Naphthalene, and Petroleum Hydrocarbons
General Site Conditions	Quarterly	NA	Log observations (date, time, weather, rainfall, findings, name, title, remarks)

NA - Not Applicable

[a]Quarterly and annual reports to be submitted.
Data to be reviewed annually for possible changes to sampling frequency and parameters.
[b]Includes six existing wells and two future bedrock monitoring wells (which may be installed based on the proposed deep bedrock exploratory program).

In addition, existing deep bedrock Monitoring Wells TW-5 and TW-6 will be properly abandoned via sealing with grout. Both wells do not yield sufficient amounts of water for sampling purposes and there is concern in the case of TW-5 that leakage may be occurring from the upper casing.

- Site preparation would include:

  - A wetland investigation using methods outlined in the "Federal Manual for Identifying and Delineating Jurisdictional Wetlands" would be conducted by personnel properly trained in federal manual methodology.

  - Sanitary sewer relocation for the portion of the Jefferson Borough sanitary sewer that runs along the northeast border of the landfill. Sewer relocation would be performed as required to allow future access without unduly disturbing the constructed landfill cap system.

  - Lower dike upgrade to allow heavy construction equipment onto the dike area. This is based on the limited geotechnical analysis performed during the RI, which indicated a potential problem with such activities (see Subsection 3.2.3 of Part I of the Site Report). Based on this analysis, dike regrading to achieve a 3:1 slope is anticipated to yield an acceptable minimum factor of safety.

Under Option B of Alternative 3, the following is also proposed:

- Based on the results of additional field evaluations to confirm their viability and design, a series of skimmer-type recovery wells would be placed around the western perimeter of the landfill down-dip in the Pittsburgh Coal to recover non-aqueous phase floating product. A series of 20 test borings would be installed into the Pittsburgh Coal water table at approximately 30-ft intervals along the landfill perimeter, as indicated on a preliminary basis in Figure 5-3. At those locations where a free product layer is encountered, the test borings would be converted to skimmer wells. It is preferable that the wells penetrate open mine voids, as the RI results indicate the mine voids to be a preferred contaminant migration pathway. In addition, Monitoring Well TW-2, which was found to contain free product during the RI, would be converted into a skimmer well and TW-14 would be evaluated further to determine its viability for skimmer well conversion. Non-aqueous product would be collected from the skimmer wells either manually or via use of skimmer pumps, as appropriate. The skimmer systems would operate until the floating layer diminishes to the point where it is no longer practical to continue operation.

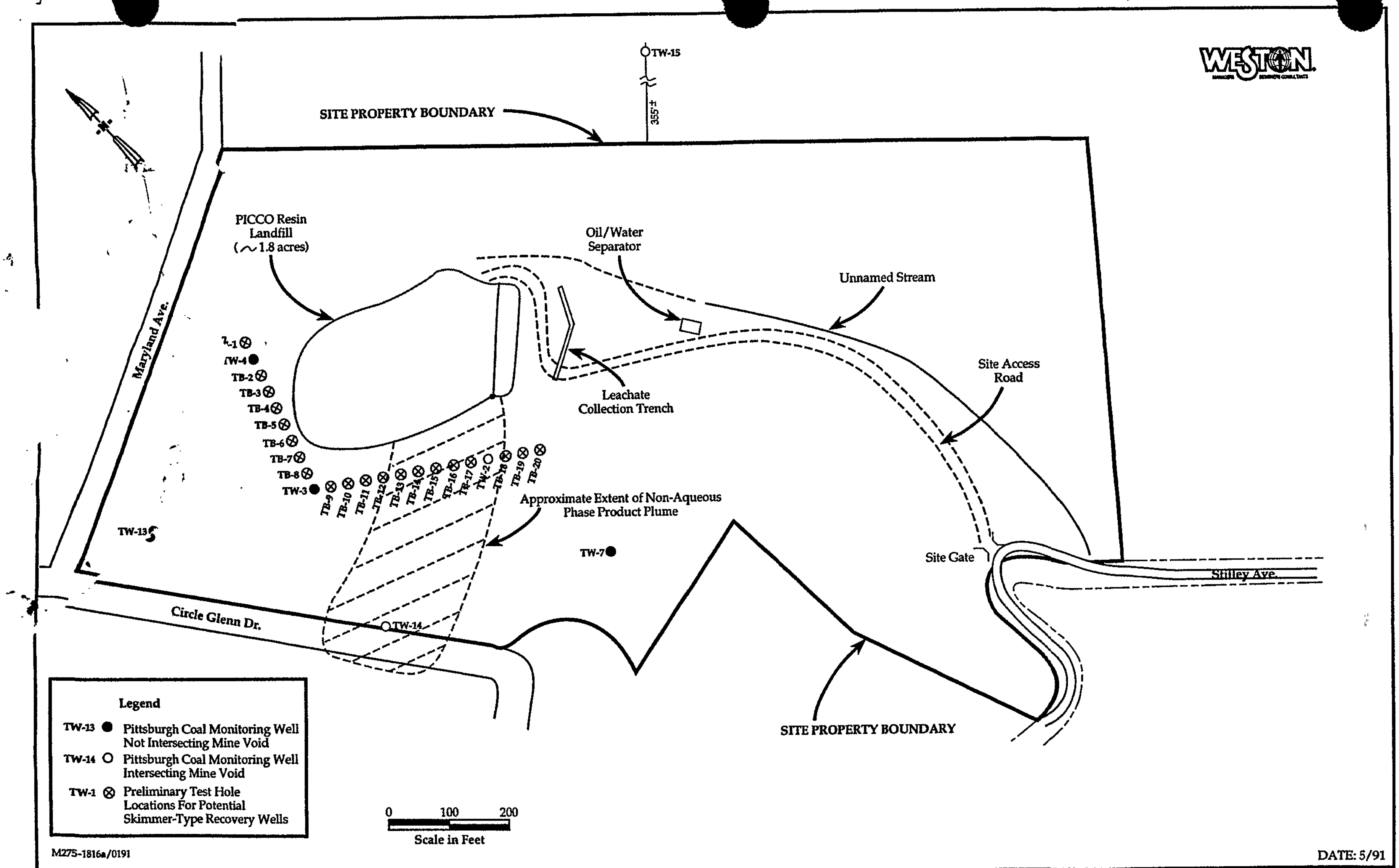

Figure 5-3 Preliminary Test Boring Locations For Potential Skimmer-Type Recovery Well Evaluation

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Collected non-aqueous product would be reclaimed as a fuel at the local Hercules plant industrial boilers in accordance with the ACHD permit and other regulatory requirements.

5.2.3.2 Compliance With Applicable or Relevant and Appropriate Requirements

Table 5-9 provides an ARAR compliance summary for Alternative 3. Further discussion of specific ARARs determined to be potentially applicable to Alternative 3 is provided below.

The following is noted with respect to ARAR compliance requirements under the closure alternative and associated Options A and B:

- Since the PICCO Resin Landfill closed in 1964 prior to enactment of solid or hazardous waste regulations, these regulations do not strictly apply as ARARs, except for removed materials. Therefore, since the closure alternative does not involve removal of any waste material beyond collected landfill leachate, RCRA solid or hazardous waste requirements are not strictly applicable.

- Management of landfill leachate is currently conducted by permit in accordance with the CWA national pretreatment standard and WESA POTW pretreatment requirements and ACHD air pollution requirements. If the leachate (particularly the non-aqueous portion) qualifies as an RCRA hazardous waste, management of the non-aqueous phase would be subject to the following applicable hazardous waste requirements:

    - Recycling/reclamation ARARs including:

        Managing containers in accordance with the requirements outlined in Subsections 2.3.1.3.6 and 2.4.1.2.6.

        Conducting energy recovery in accordance with the final rule "Burning of Hazardous Waste in Boilers and Industrial Furnaces" by 31 August 1991, the date that the rule becomes effective.

        Complying with applicable ACHD air pollution regulations (Subsection 2.5.2).

Table 5-9

ARARs Compliance Summary for Alternative 3: Closure

ARAR	Comments	Alternative 3 Closure
I. Chemical-Specific		
A. Resource Conservation and Recovery Act (RCRA) 1. Identification and Listing of Hazardous Waste.	Potentially applicable to remedial actions involving solid waste removal including leachate removal. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Will meet (if applicable)
B. Pennsylvania Solid Waste Management Act 1. Identification and Listing of Hazardous Waste.	Potentially applicable to remedial actions involving solid waste removal including leachate removal. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. EP toxicity/ TCLP testing required to determine applicability.	Will meet (if applicable)
C. Clean Water Act 1. Water Quality Criteria (Non-enforceable guidance).	Applicable to remedial actions involving discharge of treated groundwater to the unnamed site stream.	Not Applicable
D. Pennsylvania Clean Streams Law 1. Water Quality Criteria including Toxic Management Strategy.	Applicable to remedial actions involving discharge of treated groundwater into the unnamed site stream.	Not Applicable

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Table 5-9

ARARs Compliance Summary for Alternative 3: Closure (continued)

ARAR	Comments	Alternative 3 Closure
E. Safe Drinking Water Act (SDWA)	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.

Table 5-9

ARARs Compliance Summary for Alternative 3: Closure (continued)

ARAR	Comments	Alternative 3 Closure
1. National Primary Drinking Water Standards.	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.

Table 5-9

ARARs Compliance Summary for Alternative 3: Closure (continued)

ARAR	Comments	Alternative 3 Closure
2. National Secondary Drinking Water Standards (Non-enforceable guidelines.	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.

Table 5-9

ARARs Compliance Summary for Alternative 3: Closure (continued)

ARAR	Comments	Alternative 3 Closure
1. Maximum Contaminant Level Goals (Non-enforceable goals).	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.

Table 5-9

ARARs Compliance Summary for Alternative 3: Closure (continued)

ARAR	Comments	Alternative 3 Closure
F. Pennsylvania Safe Drinking Water Act	Applicable to current limited use and potential future use of groundwater as a potable water supply. Cites by reference federal SDWA standards.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.
II. Location-Specific		
A. Resource Conservation and Recovery Act 1. Siting Criteria for Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable if a TSD facility is set up on-site to manage removed RCRA hazardous waste. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. TCLP testing required to determine applicability.	Not Applicable

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Table 5-9

ARARs Compliance Summary for Alternative 3: Closure (continued)

ARAR	Comments	Alternative 3 Closure
B. Pennsylvania Solid Waste Management Act 1. Siting Criteria for Hazardous Waste Treatment and Disposal Facilities.	Potentially applicable if a treatment and/or disposal facility is set up on-site to manage removed hazardous waste. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. EP toxicity/TCLP testing required to determine applicability.	Not Applicable
C. Clean Water Act 1. Dredge or Fill Requirements.	Limited wetlands have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.	Wetlands Survey specified to determine applicability.
D. Executive Order on Protection of Wetlands	Limited wetlands have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.	Wetlands survey specified to determine applicability.
E. Pennsylvania Dam Safety and Waterway Management Act	Limited wetland areas have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.	Wetlands survey specified to determine applicability.

AR303114

Table 5-9

ARARs Compliance Summary for Alternative 3: Closure (continued)

ARAR	Comments	Alternative 3 Closure
III. <u>Action-Specific</u>		
A. Resource Conservation and Recovery Act 1. Standards Applicable to Generators of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Will meet (if applicable)
2. Standards Applicable to Transporters of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Will meet (if applicable)

Table 5-9

ARARs Compliance Summary for Alternative 3: Closure (continued)

ARAR	Comments	Alternative 3 Closure
3. Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed wastes which qualify as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP prior testing required to determine applicability.	Not Applicable
4. Standards for the Management of Specific Hazardous Waste and Specific Types of Hazardous Waste Management Facilities.	Potentially applicable to remedial actions involving reclamation of recyclable waste which qualify as hazardous under RCRA. May apply to recovered non-aqueous product. TCLP testing required to determine applicability.	Will meet (if applicable)
5. Land Disposal Restrictions.	Potentially applicable to remedial actions involving removal of waste which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Not Applicable

Table 5-9

ARARs Compliance Summary for Alternative 3: Closure (continued)

ARAR	Comments	Alternative 3 Closure
B. Pennsylvania Solid Waste Management Act - Residual (Non-Hazardous Solid) Waste Management	Applicable to remedial actions involving removal of solid wastes that qualify as residual wastes. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment.	Not Applicable
C. Pennsylvania Solid Waste Management Act - Hazardous Waste Regulations 1. Standards Applicable to Generators of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)
2. Standards Applicable to Transporters of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)

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Table 5-9

ARARs Compliance Summary for Alternative 3: Closure (continued)

ARAR	Comments	Alternative 3 Closure
3. Standards of Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed waste which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.	Not Applicable
4. Standards for the Management of Specific Hazardous Waste and Specific Types of Hazardous Waste Management Facilities.	Potentially applicable to remedial actions involving reclamation of recyclable wastes which qualify as hazardous under RCRA. May apply to recovered non-aqueous product. EP Toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)
D. Occupational Safety and Health Act	Applicable to remedial actions (including monitoring) at hazardous waste sites.	Will meet
E. Hazardous Materials Transportation Act 1. Hazardous Materials Transportation Regulations.	Applicable to remedial actions involving transportation of DOT-defined hazardous materials off-site, including recovered non-aqueous product.	Will meet

Table 5-9

ARARs Compliance Summary for Alternative 3: Closure (continued)

ARAR	Comments	Alternative 3 Closure
F. Clean Water Act		
1. National Pollutant Discharge Elimination System (NPDES).	Applicable to remedial actions involving discharge to the unnamed site stream.	Not Applicable
2. National Pretreatment Standard.	Applicable to current discharge of aqueous fraction of treated leachate into local POTW.	Will meet
G. Pennsylvania Clean Streams Law		
1. Water Quality Management (WQM) Program.	Applicable to remedial actions involving point source discharges to surface waters.	Not Applicable
2. Wastewater Treatment Requirements.	Applicable to remedial actions involving point source discharges.	Not Applicable
3. Industrial Wastes.	Applicable to remedial actions involving point source discharges.	Not Applicable
4. Erosion Control.	Applicable to remedial actions involving earth moving.	Will meet
H. Pennsylvania Dam Safety and Waterway Management Act		
1. Outfall Structures.	Applicable to remedial actions involving point source discharges to streams.	Not Applicable

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Table 8-9

ARARs Compliance Summary for Alternative 3: Closure (continued)

ARAR	Comments	Alternative 3 Closure
I. WESA Pretreatment Effluent Limitations	Applicable; aqueous portion of leachate currently being discharged in accordance with the effluent limitations agreement.	Will meet
J. Pennsylvania Stormwater Management Act	Applicable to remedial actions requiring stormwater management.	Will Meet
K. Allegheny County Stormwater Management Regulations	Applicable to remedial actions requiring stormwater management.	Will meet
L. Safe Drinking Water Act		
1. Underground Injection Control (UIC) Regulations.	Applicable to remedial actions involving reinjection of groundwater or injection of treatment chemicals	Not Applicable
M. Clean Air Act		
1. New Source Performance Standards (NSPS).	Applicable to remedial actions involving incineration	Not Applicable
N. Pennsylvania Air Pollution Control Act		
1. Standards for Contaminants.	Applicable to remedial actions involving air emissions, principally incineration.	Will meet
2. New Source Performance Standards.	Applicable to remedial actions involving incineration.	Not Applicable

Table 5-9

ARARs Compliance Summary for Alternative 3: Closure (continued)

ARAR	Comments	Alternative 3 Closure
3. Standards for Sources of VOCs.	Applicable to remedial actions utilizing storage tanks for VOC-containing wastes.	Not Applicable
O. ACHD Air Pollution Control Regulations 1. Air Emission Standards.	Applicable to remedial actions producing air emissions, principally incineration.	Will meet
2. Waste-Derived Liquid Fuel Standards.	Applicable to current practice of utilizing recovered non-aqueous product as a fuel under ACHD permit.	Will meet
3. New Source Performance Standards.	Applicable to remedial actions involving incineration.	Not Applicable
4. Standards for Sources of VOCs.	Applicable to remedial actions utilizing storage tanks for VOC-containing wastes.	Not Applicable

- Generator requirements outlined under Subsections 2.3.13.9 and 2.4.12.9.

- Transporter requirements outlined under Subsections 2.3.13.10 and 2.4.12.10.

- Review of the RI residential well sampling results indicates that no corresponding primary drinking water standards (MCLs) for the identified organic contaminants of concern were exceeded, indicating compliance with drinking water ARARs for the organic compounds of concern.

- Compliance with OSHA requirements for hazardous waste operations (Subsection 2.3.5).

- Compliance with DOT hazardous material transportation requirements (Subsection 2.3.6) for off-site removal of recovered non-aqueous product.

- Provision is made for conducting a formal wetlands survey to determine the potential applicability of wetlands regulations. Such regulations may apply if identified wetlands need to be filled in as part of this remedial alternative.

- Compliance with state and local stormwater management requirements given under Subsections 2.4.6 and 2.5.3, respectively.

In addition, it should be noted that under Alternative 3, the TBC criteria/guidance of Pennsylvania's groundwater remediation policy (cleanup to background or non-detectable levels) identified under Subsection 2.6 will not be met. However, as provided for in the policy statement, an evaluation is put forth under Appendix A indicating the technical infeasibility of meeting the background/non-detect criteria. In any event, as TBCs are not ARARs, not meeting this TBC does not affect the remedial alternative evaluation criteria of ARAR compliance.

5.2.3.3 Short-Term Effectiveness

This evaluation criterion involves consideration of community/site personnel protection and environmental impacts during implementation of remedial actions. Under both options proposed for the closure alternative, implementation would involve the following:

- The landfill would be capped along with the area extending from the lower landfill dike downslope to the existing interceptor trench. As this work does not involve intrusive activities into waste material, implementation concerns would be minimal. As with general construction projects, proper runoff controls would address potential impacts during implementation.

- The existing oil/water separator would be replaced with an upgraded enclosed system to prevent uncontrolled air releases. During replacement, implementation of an air monitoring program would help ensure adequate protection of on-site personnel and the surrounding community. If required, on-site personnel would wear proper respiratory protection. The existing separator would be kept on-line until the new system was ready for operation to minimize treatment system downtime.

- Under Option B of the closure alternative, implementation would also include a test boring program, followed by potential installation of a series of skimmer-type recovery wells along the western landfill perimeter. This work will be similar to well installation activities conducted during the RI. As such, implementation concerns would center on fugitive air emissions. These concerns would be addressed via use of an air monitoring program to help ensure adequate protection of on-site personnel and the surrounding community. If required, on-site personnel would wear proper respiratory protection.

5.2.3.4 Long-Term Effectiveness

Under both options proposed for the closure alternative, treatment of waste and/or contaminated media is not proposed other than the collection and treatment of leachate. Rather, engineering controls are utilized to manage the waste and the contaminated media on-site. Leachate production is addressed via minimization through installation of a landfill cap and infiltration controls, which will require periodic maintenance. As such, long-term maintenance and monitoring of the site is required, along with the use of institutional controls such as deed restrictions.

5.2.3.5 Overall Protection of Human Health and the Environment

Both options proposed under the closure alternative achieve the remediation objectives by reducing the risks posed through potential exposure routes as follows:

- Institutional controls to limit access and future site use.

- Leachate production from the landfill would be minimized via landfill capping and infiltration controls.

- Leachate produced from the landfill would be collected via the downslope interceptor trench to address potential groundwater contamination.

- Uncontrolled air emissions from the existing oil/water separator would be eliminated with installation of an enclosed system replacement.

Option B of the closure alternative also includes provisions for a potential skimmer-type recovery well network to recover non-aqueous product from the Pittsburgh Coal.

5.2.3.6 Reduction of Toxicity, Mobility, and Volume of Contaminants

Both options proposed under the closure alternative focus on reduction of the mobility of contaminants via engineered controls to contain waste materials and constituents on-site. This is to be achieved primarily through installation of a multilayer cap over the landfill. In addition, other containment controls proposed involving leachate recovery via the interceptor trench and through a potential skimmer-type recovery well system (proposed under Option B) also provide for a certain reduction in the volume of contaminants.

5.2.3.7 Implementability

Implementation of both options proposed under the containment alternative involves the following technical and/or administrative considerations:

- Construction of a multilayer landfill cap is a proven technology and is utilized at numerous other sites.

- The existing monitoring network established during the RI could be utilized for monitoring the closure alternative's effectiveness.

- Oil/water separation is a proven technology and is utilized in the remedial action system currently in use at the site.

- The interceptor trench for leachate recovery is an in-place, operating unit at the site.

- Permits are in place for treatment of collected leachate (a WESA pretreatment permit for aqueous discharge to the POTW and an ACHD permit for burning of non-aqueous leachate as a fuel in the local Hercules plant industrial boilers).

Under Option B of the closure alternative, additional field evaluations would be conducted to confirm the viability of a potential skimmer-type recovery well network prior to potential design and installation.

5.2.3.8 Costs

The capital cost items identified under the closure alternative include:

- Access controls.
  - Site fence upgrade.
  - Property deed notation.
  - Groundwater/land use restrictions.
- Site preparation.
  - Wetland investigation.
  - Sanitary sewer relocation.
  - Lower dike upgrade.
  - General site clearing/grubbing.
  - Run-on diversion/run-off controls.
- Site capping and infiltration controls.
- Field evaluation program and potential skimmer-type recovery well system for non-aqueous phase product recovery from Pittsburgh Coal (Option B only).
- Replacement of existing oil/water separator system.
- Exploratory borehole program with potential installation of two additional deep bedrock monitoring wells.
- Abandonment of existing on-site deep bedrock Monitoring Wells TW-5 and TW-6.

Operation and maintenance cost items identified under the containment alternative include:

* Leachate collection/treatment from potential skimmer-type recovery well network (Option B only).
* Site monitoring.
* Perimeter fence maintenance.
* Landfill cap and infiltration controls maintenance.
* Leachate collection/treatment from interceptor trench.

Table 5-10 provides a cost estimate summary for both options proposed under Alternative 3. Using a present worth analysis at 5% compound interest over 30 years with a gradient factor of 5% of the total estimated annual O&M cost, the total present worth estimated cost of the closure alternative is $3,127,000 under Option A and $4,348,000 under Option B.

The cost estimate was performed based on the following assumptions:

* Fence system upgrading to encompass easy access areas would involve installation of up to approximately 3,000 linear ft of fencing. O&M costs for the fence maintenance were assumed at 5% of the installed cost per year.
* No costs are cited for groundwater restrictions of land use restrictions. These represent governmental-based actions to which direct costs cannot be assigned. Such restrictions may also be incorporated as part of the property deed annotation.
* Site preparation costs involve estimated costs for a wetland investigation, potential sanitary sewer relocation (estimated at 400 linear ft), lower dike upgrade (estimated as involving regrading to a 3:1 slope), general site clearing, and construction of run-on diversion/run-off controls.
* Site capping and infiltration controls assume construction of the multilayer cap shown in Figure 5-1 and the associated infiltration controls shown in Figure 5-2. The area to be capped (the landfill proper and the area between the landfill toe and the interceptor trench) is estimated at 10,000 yd^2.

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Table 5-10

Estimated Order of Magnitude Cost Summary for Alternative 3 - Closure

	Quantity	Unit Cost ($/Unit)	Total Cost Option A ($)	Total Cost Option B ($)
CAPITAL				
Access Controls				
Fence System Upgrade	5,000 L.F.	18/L.F.	90,000	90,000
Property Deed Notation	L.S.		3,000	3,000
Groundwater/Land Use Restrictions			0	0
Subtotal - Access Controls			**93,000**	**93,000**
Site Preparation				
Wetland Investigation	L.S.		10,000	10,000
Sanitary Sewer Relocation	L.S.		25,000	25,000
Lower Dike Upgrade	L.S.		50,000	50,000
Clearing/Grubbing	10,000 yd^2	1/yd^2	10,000	10,000
Run-on Diversion/Run-off Controls	L.S.		10,000	10,000
Subtotal - Site Preparation			**105,000**	**105,000**
Site Capping and Infiltration Controls				
Site Grading	10,000 yd^2	1/yd^2	10,000	10,000
Site Capping	10,000 yd^2	26/yd^2	260,000	260,000
Seeding, Mulching	10,000 yd^2	1/yd^2	10,000	10,000
Erosion and Sediment Controls	L.S.		10,000	10,000
Drainage Channel	L.S.		10,000	10,000
Subtotal - Site Capping and Infiltration Controls			**300,000**	**300,000**
Skimmer-Type Recovery Well Network				
Field Evaluation Program	L.S.		0	10,000
Skimmer Well Units (Pump, Controls, Housing)	6 units	25,000/unit	0	150,000
Subtotal - Skimmer-Type Recovery Well Network			**0**	**160,000**
Oil/Water Separator Replacement	L.S.		30,000	30,000

Table 5-10 Estimated Order of Magnitude Cost Summary for Alternative 3 - Closure				
	Quantity	Unit Cost ($/Unit)	Total Cost Option A ($)	Total Cost Option B ($)
Deep Bedrock Exploratory Boreholes/Potential Monitoring Wells	2	12,500/each	25,000	25,000
Abandonment of Bedrock Monitoring Wells TW-5 and TW-6	2 wells	2,000/well	4,000	4,000
Subtotal - Direct Capital Cost			**557,000**	**717,000**
Indirect Capital Cost Items				
Engineering/Construction Management (15%)			84,000	108,000
Mobilization/Demobilization/Site Services (10%)			56,000	72,000
Overhead and Profit (15%)			84,000	108,000
Subtotal - Indirect Capital Cost			**224,000**	**288,000**
Subtotal - Direct/Indirect Capital Cost			**781,000**	**1,005,000**
Contingency (20%)			**156,000**	**201,000**
Total Estimated Capital Cost			**937,000**	**1,206,000**
OPERATING AND MAINTENANCE				
Leachate Collection/Treatment				
Interceptor Trench	L.S.		50,000	50,000
Skimmer Well Network	L.S.		0	40,000
Subtotal - Leachate Collection/ Treatment			**50,000**	**90,000**
Site Monitoring				
Groundwater	32/yr	400/sample	12,800	12,800
Seeps	12/yr	400/sample	4,800	4,800
Stream	6/yr	400/sample	2,400	2,400
Residential Wells	3/yr	400/sample	1,200	1,200
QA/QC Samples (10%)	6/yr	400/sample	2,400	2,400
Labor	120 hrs	30/hr	3,600	3,600
Subtotal- Site Monitoring			**27,200**	**27,200**

Table 5-10

Estimated Order of Magnitude Cost Summary for Alternative 3 - Closure

	Quantity	Unit Cost ($/Unit)	Total Cost Option A ($)	Total Cost Option B ($)
Fence Maintenance (5% of installed cost)			4,500	4,500
Landfill Cap/General Site Maintenance	L.S.		10,000	10,000
Total Estimated Annual O&M Cost			**92,000**	**132,000**
Present Worth of Annual O&M Cost (30 years @ 5% interest rate with 5% inflation gradient factor)			**2,190,000**	**3,142,000**
TOTAL ESTIMATED PROJECT COST			**3,127,000**	**4,348,000**

- Under Option B, costs are included for a test boring program and potential skimmer-type recovery well system installation. The skimmer well system assumed included a total of 12 skimmer wells. This is based on 50% conversion of 20 test borings into skimmer wells, as well as conversion of TW-2 and TW-14 to skimmer wells. Of these 12 skimmer wells, it was assumed that six (50%) would require installation of a skimmer pump for non-aqueous product recovery. This scenario is assumed for cost calculation purposes only; actual system design and installation is subject to the results from the test borings and field evaluations to be performed to support remedial design.

- Replacement of the existing oil/water separator includes installation of a similar unit self-enclosed to prevent uncontrolled air releases.

- Interceptor trench leachate collection/treatment costs were estimated by Hercules at $50,000 per year based on current operating costs.

- Site environmental monitoring costs were estimated at $27,200 per year based on the assumed monitoring program presented in Table 5-8. This cost includes sampling and analytical costs; it does not include reporting costs. This cost also assumes that the two proposed exploratory borings into the deep bedrock zone will be converted into monitoring wells and added to the proposed quarterly monitoring program for groundwater monitoring wells.

- Under Option B, the estimated present worth operating cost for the skimmer system assumes a 30-year period. Actual operations will be based on the ability to recover free product and may be less than 30 years.

5.2.4 Alternative 4: Excavation/Off-Site Disposal

5.2.4.1 Description

The excavation/off-site disposal alternative involves a series of on-site remedial measures designed to achieve the remedial action objectives outlined in Subsection 1.2.2 viz:

- Excavation of the landfill waste material for removal off-site to an appropriate permitted disposal facility.

- Institutional controls to limit access and future site use.

- Collection/treatment of landfill leachate to address potential groundwater contamination.

- Replacement of the oil/water separator with an enclosed system to prevent uncontrolled air emissions.

- Retention of identified potential private water supply actions and controls as a contingency measure if future conditions warrant such a response action.

- Periodic site monitoring.

Potential pretreatment of removed materials from the landfill unit would be arranged by the disposal facility as required to meet disposal permit conditions. Table 5-11 provides a summary of Alternative 4. The main features of this alternative are as follows:

- Landfill materials (soil cover, underlying waste material, underlying soils, lower landfill dike, soils located between the dike and the interceptor trench, and the interceptor trench) would be excavated, dewatered as required, and transported off-site to an approved permitted disposal facility. Potential pretreatment of removed materials would be arranged by the disposal facility as required to meet disposal permit conditions.

- Excavation activities will involve encountering groundwater. This collected water will require removal. This water will preferably be placed into the existing leachate collection/treatment system for disposal. If not, it will be properly disposed of off-site.

- After excavation, site restoration (backfill, grading, seeding, etc.) will be performed.

- Due to the high percentage level of both volatile and semivolatile organic contaminants present in the waste material, excavation activities can result in significant air emission impacts. Therefore, staged excavation of the landfill is assumed under a flexible containment structure (i.e., self-supporting or inflatable dome) complete with air emissions controls.

- Based on the results of additional field evaluations to confirm their viability and design, skimmer-type recovery wells would be placed around the western perimeter of the landfill down-dip in the Pittsburgh Coal to recover non-aqueous phase floating product (refer to the discussion under Subsection 5.2.3 for development rationale). A series of 20 test borings would be installed into the Pittsburgh Coal water table at approximately 30-ft-intervals along the landfill perimeter, as previously indicated on a preliminary basis in Figure 5-3. At those locations where a free product floating layer is encountered, the test borings would be converted to skimmer wells. It is preferable that the wells penetrate open mine voids, as the RI results indicate the mine voids to be a preferred contaminant migration pathway. In addition, Monitoring Well TW-2, which was found to contain free product during the RI, would be converted into a skimmer well and Monitor Well TW-14 would be evaluated further to determine viability for skimmer well conversion. Non-aqueous product would be collected from the skimmer wells either manually or via use of skimmer pumps, as appropriate. Collected non-aqueous product would be reclaimed as a fuel at the local Hercules plant industrial boilers in accordance with the ACHD permit and other regulatory requirements. The skimmer system would operate until the floating layer diminishes to the point where it is no longer practical to continue operation.

Table 5-11

Alternative 4: Excavation/Off-Site Disposal

Medium	Type of Response	General Response Actions Utilized	Technologies/Process Options Utilized (Representative Process Options Noted in Parentheses)
Waste Material (Landfill Unit)	Removal/Disposal	Excavation and Removal of Waste	Excavation/Removal Dust/Vapor Control
		Land Disposal	Pretreatment - As required Land Disposal (secure landfill)
		Backfill	Grading/Backfill Revegetation
Soil (Downslope of Landfill Unit)	Limited Action	Institutional Actions and Controls	Access Restrictions (fencing, deed notation, groundwater restrictions)
Leachate (Landfill Unit)	Collection/Treatment	Leachate and Subsurface Controls Leachate Treatment	Recovery Wells (skimmer wells) Subsurface Drains (interceptor trench) Physical Treatment of Trench Leachate (gravity oil/water separation), Chemical Treatment of Trench Leachate (extraction) - As Required Thermal Treatment of Non-Aqueous Oil Phase (industrial boiler), Biological Treatment of Aqueous Phase (activated sludge)
Groundwater (Pittsburgh Coal; Unconsolidated Zone)	Limited Action	Institutional Actions and Controls	Access Restrictions (fencing, deed notation, groundwater restrictions)
Air Emissions (Oil/Water Separator)	Control	Emissions Control	Emission Prevention Systems

In addition, identified potential private water supply actions and controls are retained as a contingency measure if future conditions warrant such a response action.

- Implementation of a 30-year limited site monitoring program is given in Table 5-12. In addition, it is proposed to drill an exploratory borehole into the deep bedrock at two downgradient off-site locations yet to be determined. The results of the RI indicated that the deep bedrock zone under the site does not act as a groundwater aquifer. The proposed exploratory program will investigate the viability of this zone to act as an aquifer at off-site locations. If significant groundwater is encountered at each location, the boreholes will be converted to deep bedrock monitoring wells (otherwise, the boreholes will be sealed with grout). These wells would then serve as permanent groundwater monitoring points which would be added to the routine quarterly monitoring program proposed for all groundwater monitoring wells at the site.

  In addition, existing deep bedrock Monitoring Wells TW-5 and TW-6 will be properly abandoned via sealing with grout. Both wells do not yield sufficient amounts of water for sampling purposes and there is concern in the case of TW-5 that leakage may be occurring from the upper casing.

- The existing oil/water separator for treating leachate collected by the interceptor trench would be replaced with an upgraded enclosed system to prevent uncontrolled air releases. Separated aqueous phase would continue to be discharged under permit to the WESA POTW, while separated non-aqueous product would be reclaimed as a fuel at the local Hercules plant industrial boilers in accordance with the ACHD permit and other regulatory requirements.

- Access restrictions would be implemented to further reduce potential exposure. This element would include property deed annotation, groundwater restrictions, and upgrade of the existing security system to provide a fence and locked gate system which restricts site access. Future site use restrictions may also be required based on human health risk considerations.

- Site preparation would include:

  - A wetland investigation using methods outlined in the "Federal Manual for Identifying and Delineating Jurisdictional Wetlands" would be conducted by personnel properly trained in federal manual methodology.

  - Sanitary sewer relocation for the portion of the Jefferson Borough sanitary sewer that runs along the northeast border of the landfill. Sewer relocation would be performed as required to allow excavation activities.

Table 5-12

30-Year Site Monitoring Program
(Applies to Alternatives 4 through 6)

Item Monitored	Monitoring Frequency[a]	Sampling Location Summary	Analytical Summary
Groundwater	Quarterly	8 monitor wells[b]	BTXE, Naphthalene, and Petroleum Hydrocarbons
Seeps	Quarterly	Three seeps	BTXE, Naphthalene, and Petroleum Hydrocarbons
Unnamed Stream	Bimonthly	One sample at site boundary	BTXE, Naphthalene, and Petroleum Hydrocarbons
Residential Wells	Annually	3 residences	BTXE, Naphthalene, and Petroleum Hydrocarbons
General Site Conditions	Quarterly	NA	Log observations (date, time, weather, rainfall, findings, name, title, remarks)

NA – Not Applicable
[a]Quarterly and annual reports to be submitted.
Data to be reviewed annually for possible changes to sampling frequency and parameters.
[b]Includes six existing wells and two future bedrock monitoring wells which may be installed based on the proposed deep bedrock exploratory program.

- Construction of diversion controls to address run-on from upslope and off-site areas.

- Access road improvements as required extending off-site to the paved portion of Stilley Avenue to allow for subsequent heavy truck traffic in and out of the site.

- Lower dike upgrade to allow heavy construction equipment onto the dike area. This is based on the limited geotechnical analysis performed during the RI, which indicated a potential problem with such activities (see Subsection 3.2.3 of Part I of the Site Report). Based on this analysis, dike regrading to achieve a 3:1 slope is anticipated to yield an acceptable minimum factor of safety.

5.2.4.2 Compliance with Applicable or Relevant and Appropriate Requirements

Table 5-13 provides an ARAR compliance summary for Alternative 4. Further discussion of specific ARARs determined to be potentially applicable to Alternative 4 is provided below.

Excavation and removal off-site for disposal of waste material and/or contaminated media would trigger applicable solid waste management regulations (as discussed in Subsection 2.4.1). In addition, removed waste material that exceeds the TCLP hazardous waste criteria for benzene (or other constituents) would be subject to RCRA hazardous waste regulations (as discussed in Subsection 2.3.1). Compliance with ARARs would be achieved via disposal of RCRA non-hazardous wastes at permitted facilities and disposal of RCRA hazardous wastes at permitted TSD facilities with appropriate pretreatment performed as required prior to disposal. Due to the variable nature of the waste material, it may not be possible or practical to separate RCRA hazardous from non-hazardous materials. Extensive sampling/testing would be required to address waste composition variability.

With respect to other ARAR compliance requirements potentially applicable:

- Management of landfill leachate is currently conducted by permit in accordance with the CWA national pretreatment standard and WESA POTW pretreatment requirements and ACHD air pollution requirements. If the

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Table 5-13

ARARs Compliance Summary for Alternative 4 - Excavation/Off-site Disposal

ARAR	Comments	Alternative 4 Excavation/Off-site Landfill Disposal
I. Chemical-Specific		
A. Resource Conservation and Recovery Act (RCRA) 1. Identification and Listing of Hazardous Waste.	Potentially applicable to remedial actions involving solid waste removal including leachate removal. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Will meet (if applicable)
B. Pennsylvania Solid Waste Management Act 1. Identification and Listing of Hazardous Waste.	Potentially applicable to remedial actions involving solid waste removal including leachate removal. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. EP toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)
C. Clean Water Act 1. Water Quality Criteria (Non-enforceable guidance).	Applicable to remedial actions involving discharge of treated groundwater to the unnamed site stream.	Not Applicable

Table 5-13

ARARs Compliance Summary for Alternative 4 - Excavation/Off-site Disposal (continued)

ARAR	Comments	Alternative 4 Excavation/Off-site Landfill Disposal
D. Pennsylvania Clean Streams Law 1. Water Quality Criteria including Toxic Management Strategy.	Applicable to remedial actions involving discharge of treated groundwater into the unnamed site stream.	Not Applicable
E. Safe Drinking Water Act (SDWA)	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.

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Table 5-13

ARARs Compliance Summary for Alternative 4 - Excavation/Off-site Disposal (continued)

ARAR	Comments	Alternative 4 Excavation/Off-site Landfill Disposal
1. National Primary Drinking Water Standards.	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.
2. National Secondary Drinking Water Standards (Non-enforceable guidelines.	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.

Table 5-13

ARARs Compliance Summary for Alternative 4 - Excavation/Off-site Disposal (continued)

ARAR	Comments	Alternative 4 Excavation/Off-site Landfill Disposal
3. Maximum Contaminant Level Goals (Non-enforceable goals).	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.
F. Pennsylvania Safe Drinking Water Act	Applicable to current limited use and potential future use of groundwater as a potable water supply. Cites by reference federal SDWA standards.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.

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Table 5-13

ARARs Compliance Summary for Alternative 4 - Excavation/Off-site Disposal (continued)

ARAR	Comments	Alternative 4 Excavation/Off-site Landfill Disposal
II. Location-Specific		
A. Resource Conservation and Recovery Act 1. Siting Criteria for Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable if a TSD facility is set up on-site to manage removed RCRA hazardous waste. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. TCLP testing required to determine applicability.	Not Applicable
B. Pennsylvania Solid Waste Management Act 1. Siting Criteria for Hazardous Waste Treatment and Disposal Facilities.	Potentially applicable if a treatment and/or disposal facility is set up on-site to manage removed hazardous waste. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. EP toxicity/TCLP testing required to determine applicability.	Not Applicable
C. Clean Water Act 1. Dredge or Fill Requirements.	Limited wetlands have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.	Wetlands Survey specified to determine applicability.

Table 5-13

ARARs Compliance Summary for Alternative 4 - Excavation/Off-site Disposal (continued)

ARAR	Comments	Alternative 4 Excavation/Off-site Landfill Disposal
D. Executive Order on Protection of Wetlands	Limited wetlands have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.	Wetlands survey specified to determine applicability.
E. Pennsylvania Dam Safety and Waterway Management Act	Limited wetland areas have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.	Wetlands survey specified to determine applicability.
III. Action-Specific		
A. Resource Conservation and Recovery Act 1. Standards Applicable to Generators of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Will meet (if applicable)

Table 5-13

ARARs Compliance Summary for Alternative 4 - Excavati n/Off-site Disposal (continued)

ARAR	Comments	Alternative 4 Excavation/Off-site Landfill Disposal
2. Standards Applicable to Transporters of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Will meet (if applicable)
3. Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed wastes which qualify as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP prior testing required to determine applicability.	Not Applicable
4. Standards for the Management of Specific Hazardous Waste and Specific Types of Hazardous Waste Management Facilities.	Potentially applicable to remedial actions involving reclamation of recyclable waste which qualify as hazardous under RCRA. May apply to recovered non-aqueous product. TCLP testing required to determine applicability.	Will meet (if applicable)

Table 5-13

ARARs Compliance Summary for Alternative 4 - Excavation/Off-site Disposal (continued)

ARAR	Comments	Alternative 4 Excavation/Off-site Landfill Disposal
5. Land Disposal Restrictions.	Potentially applicable to remedial actions involving removal of waste which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Will meet (if applicable)
B. Pennsylvania Solid Waste Management Act - Residual (Non-Hazardous Solid) Waste Management	Applicable to remedial actions involving removal of solid wastes that qualify as residual wastes. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment.	Will meet (if applicable
C. Pennsylvania Solid Waste Management Act - Hazardous Waste Regulations 1. Standards Applicable to Generators of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)

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Table 5-13

ARARs Compliance Summary for Alternative 4 - Excavation/Off-site Disposal (continued)

ARAR	Comments	Alternative 4 Excavation/Off-site Landfill Disposal
2. Standards Applicable to Transporters of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)
3. Standards of Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed waste which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.	Not Applicable
4. Standards for the Management of Specific Hazardous Waste and Specific Types of Hazardous Waste Management Facilities.	Potentially applicable to remedial actions involving reclamation of recyclable wastes which qualify as hazardous under RCRA. May apply to recovered non-aqueous product. EP Toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)

Table 5-13

ARARs Compliance Summary for Alternative 4 - Excavation/Off-site Disposal (continued)

ARAR	Comments	Alternative 4 Excavation/Off-site Landfill Disposal
D. Occupational Safety and Health Act	Applicable to remedial actions (including monitoring) at hazardous waste sites.	Will meet
E. Hazardous Materials Transportation Act 1. Hazardous Materials Transportation Regulations.	Applicable to remedial actions involving transportation of DOT-defined hazardous materials off-site, including recovered non-aqueous product.	Will meet
F. Clean Water Act 1. National Pollutant Discharge Elimination System (NPDES).	Applicable to remedial actions involving discharge to the unnamed site stream.	Not Applicable
2. National Pretreatment Standard.	Applicable to current discharge of aqueous fraction of treated leachate into local POTW.	Will meet
G. Pennsylvania Clean Streams Law 1. Water Quality Management (WQM) Program.	Applicable to remedial actions involving point source discharges to surface waters.	Not Applicable
2. Wastewater Treatment Requirements.	Applicable to remedial actions involving point source discharges.	Not Applicable

Table 5-13

ARARs Compliance Summary for Alternative 4 - Excavation/Off-site Disposal
(continued)

ARAR	Comments	Alternative 4 Excavation/Off-site Landfill Disposal
3. Industrial Wastes.	Applicable to remedial actions involving point source discharges.	Not Applicable
4. Erosion Control.	Applicable to remedial actions involving earth moving.	Will meet
H. Pennsylvania Dam Safety and Waterway Management Act		
1. Outfall Structures.	Applicable to remedial actions involving point source discharges to streams.	Not Applicable
I. WESA Pretreatment Effluent Limitations	Applicable; aqueous portion of leachate currently being discharged in accordance with the effluent limitations agreement.	Will meet
J. Pennsylvania Stormwater Management Act	Applicable to remedial actions requiring stormwater management.	Will Meet
K. Allegheny County Stormwater Management Regulations	Applicable to remedial actions requiring stormwater management.	Will meet

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Table 5-13

ARARs Compliance Summary for Alternative 4 - Excavation/Off-site Disposal (continued)

ARAR	Comments	Alternative 4 Excavation/Off-site Landfill Disposal
L. Safe Drinking Water Act		
1. Underground Injection Control (UIC) Regulations.	Applicable to remedial actions involving reinjection of groundwater or injection of treatment chemicals	Not Applicable
M. Clean Air Act		
1. New Source Performance Standards (NSPS).	Applicable to remedial actions involving incineration	Not Applicable
N. Pennsylvania Air Pollution Control Act		
1. Standards for Contaminants.	Applicable to remedial actions involving air emissions, principally incineration.	Will meet
2. New Source Performance Standards.	Applicable to remedial actions involving incineration.	Not Applicable
3. Standards for Sources of VOCs.	Applicable to remedial actions utilizing storage tanks for VOC-containing wastes.	Not Applicable

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Table 5-13

ARARs Compliance Summary for Alternative 4 - Excavation/Off-site Disposal (continued)

ARAR	Comments	Alternative 4 Excavation/Off-site Landfill Disposal
G. ACHD Air Pollution Control Regulations		
1. Air Emission Standards.	Applicable to remedial actions producing air emissions, principally incineration.	Will meet
2. Waste-Derived Liquid Fuel Standards.	Applicable to current practice of utilizing recovered non-aqueous product as a fuel under ACHD permit.	Will meet
3. New Source Performance Standards.	Applicable to remedial actions involving incineration.	Not Applicable
4. Standards for Sources of VOCs.	Applicable to remedial actions utilizing storage tanks for VOC-containing wastes.	Not Applicable

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leachate (particularly the non-aqueous portion) qualifies as an RCRA hazardous waste, management of the non-aqueous phase would be subject to the following applicable hazardous waste requirements:

- Recycling/reclamation ARARs including:

  Managing containers in accordance with requirements outlined in Subsections 2.3.1.3.6 and 2.4.1.2.6.

  Conducting energy recovery in accordance with the final rule "Burning of Hazardous Waste in Boilers and Industrial Furnaces" by 31 August 1991, the date that the rule becomes effective.

  Complying with applicable ACHD air pollution regulations (Subsection 2.5.2).

- Generator requirements outlined under Subsections 2.3.1.3.9 and 2.4.1.2.9.

- Transporter requirements outlined under Subsections 2.3.1.3.10 and 2.4.1.2.10.

- Review of the RI residential well sampling results indicates that no corresponding primary drinking water standards (MCLs) for the identified organic contaminants of concern were exceeded, indicating compliance with drinking water ARARs for the organic compounds of concern.

- Compliance with OSHA requirements for hazardous waste operations (Subsection 2.3.5).

- Compliance with DOT hazardous material transportation requirements (Subsection 2.3.6) for off-site removal of recovered non-aqueous product.

- Provision is made for conducting a formal wetlands survey to determine the potential applicability of wetlands regulations. Such regulations may apply if identified wetlands will need to be filled in as part of this remedial alternative.

- Compliance with state and local stormwater management requirements given under Subsection 2.4.6 and 2.5.3, respectively.

In addition, it should be noted that under Alternative 4, the TBC criteria/guidance of Pennsylvania's groundwater remediation policy (cleanup to background or non-detectable levels) identified under Subsection 2.6 will not be met. However, as provided for in the policy statement, an evaluation is put forth under Appendix A indicating the technical infeasibility of meeting the background/non-detect criteria. In any event, as TBCs are not ARARs, not meeting this TBC does not affect the remedial alternative evaluation criteria of ARAR compliance.

5.2.4.3 Short-Term Effectiveness

During implementation of the excavation/off-site disposal alternative, identified areas of concern include:

- Fugitive air emissions - Due to the high percentage level of volatile and semi-volatile aromatic hydrocarbons present in the waste material, excavation activities, particularly within the landfill, could result in significant air emission impacts. These impacts can be both health-related and nuisance-related. The odor threshold for the waste is very high. Situations can arise whereby levels are below human health standards but still create odor problems. To help address this issue, it is proposed that staged excavation of the landfill be accomplished under a flexible containment structure (i.e., a self-supporting or inflatable dome) complete with air emission controls. Utilization of additional dust and vapor control technologies would also help reduce potential emissions. On-site personnel would be required to wear proper respiratory protection, potentially Level B (self-contained breathing apparatus), due to the high concentration levels noted in the waste.

  In addition, air emission impacts can potentially occur during truck transport off the site, particularly with respect to the residential area along Stilley Avenue. Air tight transport vehicles would be required to address this concern.

- Truck traffic - Heavy truck traffic in and out of the site (estimated at potentially up to 8,000 20-ton vehicle trips based on a worst case scenario of required excavation) would significantly impact the local roadway network and local residential area on Stilley Avenue. At a minimum, access road improvement will likely be required within the site as well as off-site down to the paved portion of Stilley Avenue. Transient dust and odor problems due to truck traffic are also a concern.

- Runoff - Precipitation events can lead to contaminant runoff from the site during excavation activities. Construction of extensive diversion controls to address run-on from upslope and off-site areas will be required to address this concern.

- Groundwater encountered during excavation - This groundwater will require removal. The removed water would preferably be placed into the existing leachate collection/treatment system for disposal. If not, it would be properly disposed of off-site.

The estimated time required to achieve remedial response objectives under this alternative is 2 or more years. This is based on an assumed average excavation rate of fifteen 20-ton truckloads per day, 5 days per week. Factors to be considered with respect to implementation time include:

- Pretreatment requirements.
- Disposal facility acceptance limitations.
- Prevailing weather conditions.

5.2.4.4 Long-Term Effectiveness and Permanence

The off-site disposal alternative offers a high level of long-term effectiveness and permanence for the PICCO site through physical removal of landfilled waste materials.

5.2.4.5 Overall Protection of Human Health and the Environment

Overall protection of human health under the excavation/off-site disposal involves consideration of the trade-off between short-term effectiveness concerns versus the long-term benefits of physical removal of contaminated materials from the site. Substantial short-term effectiveness limitations have been noted, including fugitive air emissions, heavy truck traffic impacts, runoff concerns, and management of groundwater encountered during excavation activities. These limitations arise based mainly on two factors: the substantial volume of material potentially requiring excavation and the high percentage concentration levels of volatile and semivolatile aromatic compounds present in the waste material.

Balanced against these limitations are the benefits offered by physical removal of contaminated materials, particularly the waste material. However, the benefits are tempered by the fact that the baseline RA indicated that:

- Since the waste material is located under an existing soil cover averaging 6 feet in thickness, direct exposure is not considered likely.
- Overall, the results for the site did not indicate a current significant or substantial human health risk.

Based on consideration of the above, the possibility exists that the excavation/off-site disposal option may offer less overall protection of human health and the environment than no action at all.

5.2.4.6 Reduction of Toxicity, Mobility, and Volume of Contaminants

This alternative offers the maximum reduction in the toxicity, mobility, and volume of contaminants from the PICCO site via physical removal of targeted materials. However, it should be noted that with off-site disposal, the material removed from the PICCO site will ultimately be placed at another disposal site. At that disposal site, mobility would be reduced via containment in a secure landfill. Toxicity and volume reduction will not be achieved unless pretreatment is performed prior to disposal.

5.2.4.7 Implementability

Implementability concerns include the following:

- Identification of appropriate disposal facilities that will accept the targeted materials for disposal, along with their corresponding pretreatment requirements (if any) prior to disposal, and acceptance limitations (i.e., how may truckloads per day they can accept).
- Coordination and safety concerns with respect to transportation of the large volume of materials involved.

- Site access and local road conditions are likely incapable of managing the heavy truck traffic associated with this alternative without substantial road improvements. In particular, the site access road is relatively steep and in poor condition for heavy truck traffic.

- Coordination of landfill excavation work under a containment dome may be difficult due to space limitations and air quality concerns within the dome.

- Excavation within the landfill may be difficult to achieve due to the required depth (30 ft) combined with the safe angle of repose required for open-faced excavation (typically a 3:1 slope). A complicating factor would be the presence of groundwater within the landfill.

5.2.4.8 Costs

The capital cost items identified under the excavation/off-site disposal alternative include:

- Access controls.
  - Site fence upgrade
  - Property deed notation
  - Groundwater/land use restrictions

- Site preparation.
  - Sanitary sewer relocation
  - Lower dike upgrade
  - Wetland investigation
  - General site clearing/grubbing
  - Access road upgrade
  - Run-on diversion/run-off controls

- Excavation of landfill materials.

- Site restoration (backfill, grading, seeding, etc.).

- Transportation and off-site disposal of excavated materials.

- Field evaluation program and potential skimmer-type recovery well system for non-aqueous phase product recovery from Pittsburgh Coal.

- Replacement of existing oil/water separator.

- Exploratory borehole program with potential installation of two additional deep bedrock monitoring wells.

- Abandonment of existing deep bedrock Monitor Wells TW-5 and TW-6 via sealing with grout.

Operation and maintenance cost items identified consist of:

- Leachate collection/treatment.
- Site monitoring.
- Perimeter fence maintenance.

Table 5-14 provides a cost estimate summary for Alternative 4. Using a present worth analysis at 5% compound interest over 30 years with a gradient factor of 5% of the total estimated annual O&M cost, the total present worth estimated cost of Alternative 4 ranges from $25,558,000 to $300,239,000. The lower end of the range represents the case where no pretreatment is required prior to disposal, while the high end represents extensive pretreatment requirements. The cost estimate was performed based on the following assumptions:

- Fence system upgrading to encompass easy access areas would involve installation of up to approximately 5,000 linear ft of fencing. O&M costs for the fence maintenance were assumed at 5% of the installed cost per year.

- No costs are cited for groundwater restrictions of land use restrictions. These represent governmental-based actions to which direct costs cannot be assigned. Such restrictions may also be incorporated as part of the property deed annotation.

- Site preparation costs involve estimated costs for a wetland investigation, site drainage improvements, potential sanitary sewer relocation (estimated at 400 linear ft), lower dike upgrade (estimated to involve regrading to a 3:1 slope), general site clearing/grubbing, access road upgrade to handle heavy truck traffic, and run-on diversion/run-off controls.

- Excavation of landfill materials (soil cover, waste material, underlying soils, lower landfill dike, soils located between the dike and the interceptor trench, and the trench) assumes removal of up to 92,000 yd^3 (137,000 tons) of material. This is a worst case scenario assuming removal of soil underlying the landfill waste down to bedrock. Actual removal would be based on concentrations and may be less in quantity.

Table 5-14

Estimated Order of Magnitude Cost Summary for Alternative 4 - Excavation/Offsite Disposal

	Quantity	Unit Cost ($/Unit)	Total Cost ($)
CAPITAL			
Access Controls			
Fence System Upgrade	5,000 L.F.	18/L.F.	90,000
Property Deed Notation	L.S.		3,000
Groundwater/Land Use Restrictions			0
Subtotal - Access Controls			**93,000**
Site Preparation			
Wetlands Investigation	L.S.		10,000
Sanitary Sewer Relocation	L.S.		25,000
Lower Dike Upgrade	L.S.		50,000
Clearing/Grubbing	10,000 yd^2	1/yd^2	10,000
Access Road Upgrade	1,200 yd^2	16/yd^2	19,000
Run-on Diversion/Run-off Controls	L.S.		20,000
Subtotal - Site Preparation			**134,000**
Material Excavation			
Excavation	92,000 yd^3	15/yd^3	1,380,000
Dust/Vapor Controls (Inflatable Dome)	L.S.		2,500,000
Subtotal - Material Excavation			**3,880,000**
Site Restoration			
Backfill Excavated Soils	69,000 yd^3	12/yd^3	828,000
Site Grading	10,000 yd^2	1/yd^2	10,000
Seeding, Mulching	10,000 yd^2	1/yd^2	10,000
Erosion and Sediment Controls	L.S.		10,000
Subtotal - Site Restoration			**858,000**
Transportation and Disposal of Excavated Materials			
Transportation to Residual Waste Facility[a]	4,600 loads	1,100/load	5,060,000
Disposal at Residual Waste Facility[a]	137,000 tons	55/ton	7,535,000

Table 5-14

Estimated Order of Magnitude Cost Summary for Alternative 4 - Excavation/Offsite Disposal

	Quantity	Unit Cost ($/Unit)	Total Cost ($)
Transportation to RCRA TSD Facility[b]	4,600 loads	1,500/load	6,900,000
Treatment/Disposal[b]	137,800 tons	1,702.5/ton	234,613,000
Subtotal - Transport and Disposal of Excavated Materials			12,595,000[a] - 241,513,000[b]
Skimmer-Type Recovery Well Network			
Field Evaluation Program	L.S.		10,000
Skimmer Well Units (Pump, Controls, Housing)	6 units	25,000/unit	150,000
Subtotal - Skimmer-Type Recovery Well Network			160,000
Oil/Water Separator Replacement	L.S.		30,000
Deep Bedrock Exploratory Boreholes/Potential Monitoring Wells	2	12,500/each	25,000
Abandonment of Bedrock Monitoring Wells TW-5 and TW-6	2 wells	2,000/well	4,000
Subtotal - Direct Capital Cost			17,779,000[a] - 246,697,000[b]
Indirect Capital Cost Items			
Engineering/Construction Management (15%)[c]			778,000
Mobilization/Demobilization/Site Services (10%)[c]			518,000
Overhead and Profit (15%)[c]			778,000
Subtotal - Indirect Capital Cost Items			2,074,000
Subtotal - Direct/Indirect Capital Cost			19,853,000[a] - 248,771,000[b]
Contingency (20%)			3,971,000[a] - 49,754,000[b]

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Table 5-14

Estimated Order of Magnitude Cost Summary for Alternative 4 - Excavation/Offsite Disposal

	Quantity	Unit Cost ($/Unit)	Total Cost ($)
Total Estimated Capital Cost			**23,824,000[a]-298,525,000[b]**
OPERATING AND MAINTENANCE			
Leachate Collection/Treatment			
Skimmer Well Network	L.S.		40,000
Site Monitoring			
Groundwater	32/yr	400/sample	12,800
Seeps	12/yr	400/sample	4,800
Stream	6/yr	400/sample	2,400
Residential Wells	3/yr	400/sample	1,200
QA/QC Samples (10%)	6/yr	400/sample	2,400
Labor	118 hrs	30/hr	3,600
Subtotal - Site Monitoring			**27,200**
Fence Maintenance (5% of installed cost)			4,500
Total Estimated Annual O&M Cost			**72,000**
Present Worth of Annual O&M Cost (30 years @ 5% interest rate with 5% inflation gradient factor)			**1,714,000**
TOTAL ESTIMATED PROJECT COST			**25,538,000[a]-300,239,000[b]**

a Lower end of range represents disposal as a residual (non-hazardous) waste with no pretreatment required.
b Higher end of range represents disposal as a hazardous waste requiring extensive pretreatment (RCRA incinerator) to meet land disposal restrictions.
c Percentage applied to direct capital cost subtotal minus transport and disposal costs.

Excavation in the landfill is assumed to be performed under a flexible containment dome.

* Disposal costs were assumed to range from $55/ton (straight disposal without pretreatment) to $1,712.50/ton (extensive pretreatment prior to disposal). These costs along with cited transportation costs are based on an estimate provided by Chem-Waste Management which maintains potential disposal facilities in the area of the site.

* Excavation would involve encountering groundwater. This collected water would require removal. It was assumed that the water could be placed into the existing leachate collection/treatment system for disposal. If this is not possible, the water would be properly disposed of off-site at additional cost.

* Site backfill of excavated areas (estimated at up to 69,000 yd^3) assumes that a local borrow is available. The backfill volume was taken at 75% of the total volume of materials removed from the landfill, based on rough site regrading calculations.

* Skimmer well system costs include a field evaluation program and well installation. The skimmer well system assumed includes a total of 12 skimmer wells. This is based on 50% conversion of the 20 test borings into skimmer wells, as well as conversion of TW-2 and TW-14 to skimmer wells. Of these 12 skimmer wells, it was assumed six (50%) would require installation of a skimmer pump for non-aqueous product recovery. This scenario is assumed for cost calculation purposes only; actual system design and installation is subject to the results from the test borings and field evaluations which would be performed to support remedial design.

* Replacement of the existing oil/water separator includes installation of a similar unit self-enclosed to prevent uncontrolled air releases.

* Site environmental monitoring costs were estimated at $27,200 per year based on the assumed 30-year monitoring program presented in Table 5-12. This cost includes sampling and analytical costs; it does not include reporting costs. This cost also assumes that the proposed exploratory borings into the deep bedrock zone will be converted into monitoring wells and added to the proposed quarterly monitoring program for groundwater monitoring wells.

* The estimated present worth operating cost for the skimmer will network assumes a 30-year period. Actual operating will be based on the ability to recover free product and may be less than 30 years.

5.2.5 Alternative 5: Excavation/Thermal Treatment

5.2.5.1 Description

The excavation/thermal treatment alternative involves a series of on-site remedial measures designed to achieve the remedial action objectives in Subsection 1.2.2 via:

- Excavation of the landfill-related materials for thermal treatment.
- Institutional controls to limit access and future site use.
- Collection/treatment of landfill leachate to address potential groundwater contamination.
- Replacement of the oil/water separator with an enclosed unit to prevent uncontrolled air emissions.
- Retention of identified potential private water supply actions and controls as a contingency measure if future conditions warrant such a response action.
- Periodic site monitoring.

The treated material would be backfilled on-site, covered, and revegetated. The representative thermal treatment device is a rotary kiln incinerator. Because of the volume of material involved, use of a transportable incinerator is assumed. The land area requirements for a transportable incinerator (including support services) are approximately 2 acres. As noted in the site model, the site is located in a steeply sloped narrow valley. The only available flat area on the site which can meet the incinerator space requirements is the landfill itself. As this is not practical since the landfill is to be excavated under this alternative, an alternate set-up area is required. Therefore, due to the limited land availability at the site, it is assumed that the incinerator will be set up at the local Hercules Jefferson plant located approximately 4/5-mile away.

Table 5-15 provides a summary of Alternative 5. The main features of this alternative are:

- Landfill materials (soil cover, waste materials, underlying soils, dike, soils located between the dike and the interceptor trench, and the interceptor trench) would be excavated, dewatered as required, and transported to the local Hercules plant for processing in a transportable rotary kiln incineration system.

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Table 5-15

Alternative 5: Excavation/Thermal Treatment

Medium	Type of Response	General Response Actions Utilized	Technologies/Process Options Utilized (Representative Process Options Noted in Parentheses)
Waste Material (Landfill Unit)	Excavation/ Treatment	Excavation and Removal of Waste	Excavation/Removal Dust/Vapor Control
		Solids Treatment Waste Material	Physical Treatment (dewatering)- As required Thermal Treatment (Rotary Kiln Incineration)
		Backfill of Treated Material	Grading/Backfill Revegetation
Soil (Downslope of Landfill Unit)	Limited Action	Institutional Actions and Controls	Access Restrictions (fencing, deed notation, groundwater restrictions)
Leachate (Landfill Unit)	Collection/Treatment	Leachate Collection	Recovery Wells (skimmer wells)
			Subsurface Drains (interceptor trench)
		Leachate Treatment	Physical Treatment of Trench Leachate (gravity oil/water separation) Chemical Treatment of Trench Leachate (extraction) - As Required Thermal Treatment of Non-Aqueous Oil Phase (industrial boiler) Biological Treatment of Aqueous Phase (activated sludge)
Groundwater (Pittsburgh Coal; Unconsolidated Zone)	Limited Action	Institutional Actions and Controls	Access Restrictions (fencing, deed notation, groundwater restrictions)
Air Emissions (Oil/Water Separator)	Control	Emissions Control	Emissions Prevention Systems

In addition, identified potential private water supply actions and controls are retained as a contingency measure if future conditions warrant such a response action.

- After excavation, site restoration (backfill, addition of soil cover, grading, seeding, etc.) will be performed. Treated material will be utilized as a backfill source. Testing of the treated material to confirm its suitability as a backfill source would be performed as required.

- Excavation activities will involve encountering groundwater. This collected water will require removal. This water will preferably be placed into the existing leachate collective/treatment system for disposal. If not, it will be either thermally treated through processing through the incinerator system or properly disposed of off-site.

- Due to the high percentage level of both volatile and semivolatile organic contaminants present in the waste material, excavation activities can result in significant air emission impacts. Therefore, staged excavation of the landfill is assumed under a flexible containment structure (i.e., a self-supporting or inflatable dome) complete with air emissions controls.

- Based on the results of additional field evaluations to confirm their viability and design, skimmer-type recovery wells would be placed around the perimeter of the landfill down-dip in the Pittsburgh Coal to recover non-aqueous phase floating product (refer to the discussion under Subsection 5.2.3 for development rationale). A series of 20 test borings will be installed into the Pittsburgh Coal water table at approximately 30-ft-intervals along the landfill perimeter, as previously indicated on a preliminary basis in Figure 5-3. At those locations where a free product floating layer is encountered, the test borings would be converted to skimmer wells. It is preferable that the wells penetrate open mine voids, as the RI results indicate the mine voids to be a preferred contaminant migration pathway. In addition, Monitoring Well TW-2, which was found to contain free product during the RI, would be converted into a skimmer well and Monitoring Well TW-14 would be evaluated further to determine viability for skimmer well conversion. Non-aqueous product would be collected from the skimmer wells either manually or via use of skimmer pumps, as appropriate. Collected non-aqueous product would be reclaimed as a fuel at the local Hercules plant industrial boilers in accordance with the ACHD permit and other regulatory requirements. The skimmer system would operate until the floating layer diminishes to the point where is no longer practical to continue operation.

- Implementation of a 30-year limited site monitoring program as shown earlier in Table 5-12. In addition, it is proposed to drill an exploratory borehole into the deep bedrock at two downgradient off-site locations yet to be determined. The results of the RI indicated that the deep bedrock zone under the site does not act as a groundwater aquifer. The proposed exploratory program will investigate the viability of this zone to act as an aquifer at off-site locations. If significant groundwater is encountered at each location, the boreholes will be converted to deep bedrock monitoring wells (otherwise, the boreholes will be sealed with grout). These wells would then serve as permanent groundwater monitoring points which would be added to the routine quarterly monitoring program proposed for all groundwater monitoring wells at the site. In addition, existing deep bedrock Monitoring Wells TW-5 and TW-6 will be properly abandoned via sealing with grout. Both wells do not yield sufficient amounts of water for sampling purposes and there is concern in the case of TW-5 that leakage may be occurring from the upper casing.

- The existing oil/water separator for treating leachate collected by the interceptor trench would be replaced with an upgraded enclosed system to prevent uncontrolled air releases. Separated aqueous phase would continue to be discharged under permit to the WESA POTW, while separated non-aqueous product would be reclaimed as a fuel at the local Hercules plant industrial boilers in accordance with the ACHD permit and other regulatory requirements.

- Access restrictions would be implemented to further reduce potential exposure. This element would include property deed annotation, groundwater restrictions, and upgrade of the existing security system to provide a fence and locked gate system which restricts site access. Future site use restrictions may also be required based on human health risk consideration.

- Site preparation would include:

  - A wetland investigation using methods outlined in the "Federal Manual for Identifying and Delineating Jurisdictional Wetlands" would be conducted by personnel properly trained in federal manual methodology.

  - Sanitary sewer relocation for the portion of the Jefferson Borough sanitary sewer that runs along the northeast border of the landfill. Sewer relocation would be performed as required to allow excavation activities.

  - Construction of diversion controls to address run-on from upslope and off-site areas.

  - Access road improvements as required extending off-site to the paved portion of Stilley Avenue to allow for subsequent heavy truck traffic in and out of the site.

  - Lower dike upgrade to allow heavy construction equipment onto the dike area. This is based on the limited geotechnical analysis performed during the RI, which indicated a potential problem with such activities (see Subsection 3.2.3 of Part I of the Site Report). Based on this limited analysis, dike regrading to achieve a 3:1 slope is anticipated to yield an acceptable minimum factor of safety.

Figure 5-4 illustrates the layout of a typical rotary kiln incineration system. Excavated materials would be placed in a staging area for subsequent feeding into the rotary kiln for processing. Generated organic-free ash along with dust from air pollution control devices would be stockpiled for subsequent on-site disposal. Testing of the ash and dust would be performed as required to verify its acceptability for on-site backfilling. Scrubber waters generated from the air emissions control system would either be sprayed back onto the feed, used for ash cooling, or discharged to the local POTW in accordance with the Hercules WESA POTW discharge permit.

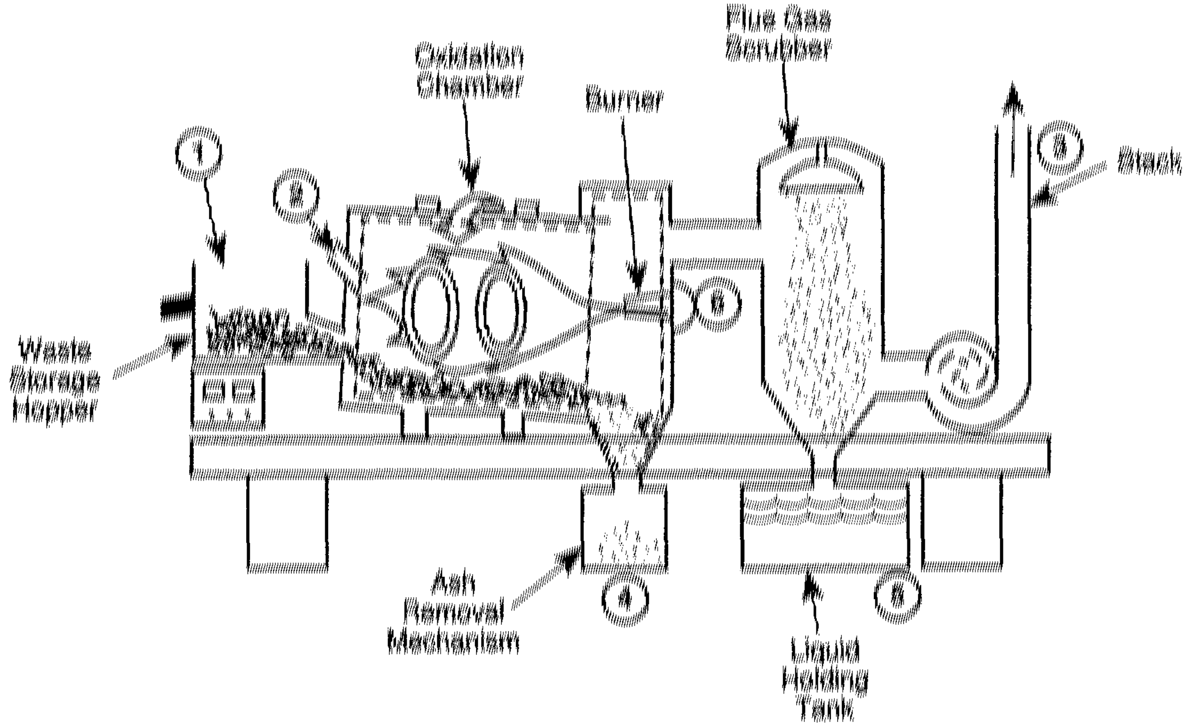
It should be noted that targeted soils would be expected to have a low Btu value and a high ash content. Testing of the waste material revealed it to also have a low Btu value (3,000 Btu/lb) and a high moisture content (44% on average). Therefore, incineration of the waste and soils will be difficult, requiring substantial auxiliary fuel. To reduce auxiliary fuel requirements, dewatering of the waste material may be attempted utilizing conventional methods such as vacuum filters, filter presses, or belt filters. However, it is questionable if the moisture content can be further reduced below 44%. Treatability testing may be required to assess the feasibility of dewatering the waste materials.

As this alternative entails incineration, it is assumed that the following action-specific ARARs would be met under actual implementation:

- Federal and state incineration and residue disposal regulations (Subsections 2.3.1.3 and 2.4.1). Hazardous waste incineration regulations would apply to materials that exceed the TCLP criteria.
- State and local air emission standards (Subsections 2.4.4 and 2.5.2).

5.2.5.2 Compliance with Applicable Relevant and Appropriate Requirements

Table 5-16 provides an ARAR compliance summary for Alternative 5.



Legend
1. Influent Waste
2. Combustion Air
3. Flue Gas
4. Residuals
5. Scrubber Water
6. Fuel

510-5555

DATE: 5/91

FIGURE 5-4 ROTARY KILN INCINERATOR SCHEMATIC

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Table 5-16

ARARs Compliance Summary for Alternative 5 - Excavation/Thermal Treatment

ARAR	Comments	Alternative 5 Excavation/Thermal Treatment
I. Chemical-Specific		
A. Resource Conservation and Recovery Act (RCRA) 1. Identification and Listing of Hazardous Waste.	Potentially applicable to remedial actions involving solid waste removal including leachate removal. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Will meet (if applicable)
B. Pennsylvania Solid Waste Management Act 1. Identification and Listing of Hazardous Waste.	Potentially applicable to remedial actions involving solid waste removal including leachate removal. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. EP toxicity/ TCLP testing required to determine applicability.	Will meet (if applicable)
C. Clean Water Act 1. Water Quality Criteria (Non-enforceable guidance).	Applicable to remedial actions involving discharge of treated groundwater to the unnamed site stream.	Not Applicable
D. Pennsylvania Clean Streams Law 1. Water Quality Criteria including Toxic Management Strategy.	Applicable to remedial actions involving discharge of treated groundwater into the unnamed site stream.	Not Applicable

AR303165

Table 5-16

ARARs Compliance Summary for Alternative 5 - Excavation/Thermal Treatment (continued)

ARAR	Comments	Alternative 5 Excavation/Thermal Treatment
E. Safe Drinking Water Act (SDWA)	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.
1. National Primary Drinking Water Standards.	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.

AR303167

Table 5-16

ARARs Compliance Summary for Alternative 5 - Excavation/Thermal Treatment (continued)

ARAR	Comments	Alternative 5 Excavation/Thermal Treatment
2. National Secondary Drinking Water Standards (Non-enforceable guidelines.	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.
3. Maximum Contaminant Level Goals (Non-enforceable goals).	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.

Table 5-16

ARARs Compliance Summary for Alternative 5 - Excavation/Thermal Treatment (continued)

ARAR	Comments	Alternative 5 Excavation/Thermal Treatment
F. Pennsylvania Safe Drinking Water Act	Applicable to current limited use and potential future use of groundwater as a potable water supply. Cites by reference federal SDWA standards.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.
II. Location-Specific		
A. Resource Conservation and Recovery Act 1. Siting Criteria for Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable if a TSD facility is set up on-site to manage removed RCRA hazardous waste. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. TCLP testing required to determine applicability.	Will meet (if applicable)

Table 5-16

ARARs Compliance Summary for Alternative 5 - Excavation/Thermal Treatment (continued)

ARAR	Comments	Alternative 5 Excavation/Thermal Treatment
B. Pennsylvania Solid Waste Management Act 1. Siting Criteria for Hazardous Waste Treatment and Disposal Facilities.	Potentially applicable if a treatment and/or disposal facility is set up on-site to manage removed hazardous waste. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. EP toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)
C. Clean Water Act 1. Dredge or Fill Requirements.	Limited wetlands have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.	Wetlands Survey specified to determine applicability.
D. Executive Order on Protection of Wetlands	Limited wetlands have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.	Wetlands survey specified to determine applicability.

AR303169

Table 5-16

ARARs Compliance Summary for Alternative 5 - Excavation/Thermal Treatment (continued)

ARAR	Comments	Alternative 5 Excavation/Thermal Treatment
B. Pennsylvania Dam Safety and Waterway Management Act.	Limited wetland areas have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.	Wetlands survey specified to determine applicability.
III. Action-Specific		
A. Resource Conservation and Recovery Act 1. Standards Applicable to Generators of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Will meet (if applicable)

Table 5-16

ARARs Compliance Summary for Alternative 5 - Excavation/Thermal Treatment (continued)

ARAR	Comments	Alternative 5 Excavation/Thermal Treatment
2. Standards Applicable to Transporters of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Will meet (if applicable)
3. Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed wastes which qualify as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP prior testing required to determine applicability.	Will meet (if applicable)
4. Standards for the Management of Specific Hazardous Waste and Specific Types of Hazardous Waste Management Facilities.	Potentially applicable to remedial actions involving reclamation of recyclable waste which qualify as hazardous under RCRA. May apply to recovered non-aqueous product. TCLP testing required to determine applicability.	Will meet (if applicable)

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AR303172

Table 5-16

ARARs Compliance Summary for Alternative 5 - Excavation/Thermal Treatment (continued)

ARAR	Comments	Alternative 5 Excavation/Thermal Treatment
5. Land Disposal Restrictions.	Potentially applicable to remedial actions involving removal of waste which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Will meet (if applicable)
B. Pennsylvania Solid Waste Management Act - Residual (Non-Hazardous Solid) Waste Management	Applicable to remedial actions involving removal of solid wastes that qualify as residual wastes. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment.	Will meet (if applicable
C. Pennsylvania Solid Waste Management Act - Hazardous Waste Regulations 1. Standards Applicable to Generators of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)

Table 5-16

ARARs Compliance Summary for Alternative 5 - Excavation/Thermal Treatment (continued)

ARAR	Comments	Alternative 5 Excavation/Thermal Treatment
2. Standards Applicable to Transporters of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)
3. Standards of Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed waste which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)
4. Standards for the Management of Specific Hazardous Waste and Specific Types of Hazardous Waste Management Facilities.	Potentially applicable to remedial actions involving reclamation of recyclable wastes which qualify as hazardous under RCRA. May apply to recovered non-aqueous product. EP Toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)

Table 5-16

ARARs Compliance Summary for Alternative 5 - Excavation/Thermal Treatment (continued)

ARAR	Comments	Alternative 5 Excavation/Thermal Treatment
D. Occupational Safety and Health Act	Applicable to remedial actions (including monitoring) at hazardous waste sites.	Will meet
E. Hazardous Materials Transportation Act 1. Hazardous Materials Transportation Regulations.	Applicable to remedial actions involving transportation of DOT-defined hazardous materials off-site, including recovered non-aqueous product.	Will meet
F. Clean Water Act 1. National Pollutant Discharge Elimination System (NPDES).	Applicable to remedial actions involving discharge to the unnamed site stream.	Not Applicable
2. National Pretreatment Standard.	Applicable to current discharge of aqueous fraction of treated leachate into local POTW.	Will meet
G. Pennsylvania Clean Streams Law 1. Water Quality Management (WQM) Program.	Applicable to remedial actions involving point source discharges to surface waters.	Not Applicable
2. Wastewater Treatment Requirements.	Applicable to remedial actions involving point source discharges.	Not Applicable

Table 5-16

ARARs Compliance Summary for Alternative 5 - Excavation/Thermal Treatment (continued)

ARAR	Comments	Alternative 5 Excavation/Thermal Treatment
3. Industrial Wastes.	Applicable to remedial actions involving point source discharges.	Not Applicable
4. Erosion Control.	Applicable to remedial actions involving earth moving.	Will meet
H. Pennsylvania Dam Safety and Waterway Management Act		
1. Outfall Structures.	Applicable to remedial actions involving point source discharges to streams.	Not Applicable
I. WESA Pretreatment Effluent Limitations	Applicable; aqueous portion of leachate currently being discharged in accordance with the effluent limitations agreement.	Will meet
J. Pennsylvania Stormwater Management Act	Applicable to remedial actions requiring stormwater management.	Will Meet
K. Allegheny County Stormwater Management Regulations	Applicable to remedial actions requiring stormwater management.	Will meet

Table 5-16

ARARs Compliance Summary for Alternative 5 - Excavation/Thermal Treatment (continued)

ARAR	Comments	Alternative 5 Excavation/Thermal Treatment
I. Safe Drinking Water Act		
1. Underground Injection Control (UIC) Regulations.	Applicable to remedial actions involving reinjection of groundwater or injection of treatment chemicals	Not Applicable
II. Clean Air Act		
1. New Source Performance Standards (NSPS).	Applicable to remedial actions involving incineration	Will meet
IV. Pennsylvania Air Pollution Control Act		
1. Standards for Contaminants.	Applicable to remedial actions involving air emissions, principally incineration.	Will meet
2. New Source Performance Standards.	Applicable to remedial actions involving incineration.	Will meet
3. Standards for Sources of VOCs.	Applicable to remedial actions utilizing storage tanks for VOC-containing wastes.	Not Applicable

Table 5-16

ARARs Compliance Summary for Alternative 5 - Excavation/Thermal Treatment (continued)

ARAR	Comments	Alternative 5 Excavation/Thermal Treatment
O. ACHD Air Pollution Control Regulations		
1. Air Emission Standards.	Applicable to remedial actions producing air emissions, principally incineration.	Will meet
2. Waste-Derived Liquid Fuel Standards.	Applicable to current practice of utilizing recovered non-aqueous product as a fuel under ACHD permit.	Will meet
3. New Source Performance Standards.	Applicable to remedial actions involving incineration.	Will meet
4. Standards for Sources of VOCs.	Applicable to remedial actions utilizing storage tanks for VOC-containing wastes.	Not Applicable

Under the excavation/treatment alternative, compliance with ARARs is achieved via proper engineering design and field implementation to meet the following action-specific requirements:

- Federal and state incineration and residue disposal regulations (see Subsections 2.3.1.3 and 2.4.1). Hazardous waste incineration and general TSD facility regulations would apply to materials that exceed the TCLP criteria.
- State and local air emission standards (see Subsections 2.4.4 and 2.5.2).

Hazardous waste regulations would apply to excavated landfilled materials that potentially exceed the TCLP criteria.

- Management of landfill leachate is currently conducted by permit in accordance with the CWA national pretreatment standard and WESA POTW pretreatment requirements and ACHD air pollution requirements. If the leachate (particularly the non-aqueous portion) qualifies as an RCRA hazardous waste, management of the non-aqueous phase would be subject to the following applicable hazardous waste requirements:
  - Recycling/reclamation ARARs including:

    Managing containers in accordance with requirements outlined in Subsections 2.3.1.3.6 and 2.4.1.2.6.

    Conducting energy recovery in accordance with the final rule "Burning of Hazardous Waste in Boilers and Industrial Furnaces" by 21 August 1991, the date that the rule becomes effective.

    Complying with applicable ACHD air pollution regulations (Subsection 2.5.2).
  - Generator requirements outlined under Subsections 2.3.1.3.9 and 2.4.1.2.9.
  - Transporter requirements outlined under Subsections 2.3.1.3.10 and 2.4.1.2.10.
- Review of the RI residential well sampling results indicates that no corresponding primary drinking water standards (MCLs) for the identified organic contaminants of concern were exceeded, indicating compliance with drinking water ARARs for the organic compounds of concern.
- Compliance with OSHA requirements for hazardous waste operations (Subsection 2.3.5).

- Compliance with DOT hazardous material transportation requirements (Subsection 2.3.6) for off-site removal of recovered non-aqueous product.

- Provision is made for conducting a formal wetlands survey to determine the potential applicability of wetlands regulations. Such regulations may apply if identified wetlands will need to be filled in as part of this remedial alternative.

- Compliance with state and local stormwater management requirements given under Subsections 2.4.6 and 2.5.3, respectively.

In addition, it should be noted that under Alternative 5, the TBC criteria/guidance of Pennsylvania's groundwater remediation policy (cleanup to background or non-detectable levels) identified under Subsection 2.6 will not be met. However, as provided for in the policy statement, an evaluation is put forth under Appendix A indicating the technical infeasibility of meeting the background/non-detect criteria. In any event, as TBCs are not ARARs, not meeting this TBC does not affect the remedial alternative evaluation criteria of ARAR compliance.

5.2.5.3 Short-Term Effectiveness

During implementation of the excavation/treatment alternative, identified areas of concern include:

- Fugitive air emissions - Due to the high percentage level of volatile and semi-volatile aromatic hydrocarbons present in the waste material, excavation activities, particularly within the landfill, could result in significant air emission impacts. These impacts can be both health-related and nuisance-related. The odor threshold for the waste is very high. Situations can arise whereby levels are below human health standards but still create odor problems. To help address this issue, it is proposed that staged excavation of the landfill be accomplished under a flexible containment structure (i.e., a self-supporting or inflatable dome) complete with air emission controls. Utilization of additional dust and vapor control technologies would also help reduce potential emissions. On-site personnel would be required to wear proper respiratory protection, potentially Level B (self-contained breathing apparatus), due to the high concentration levels noted in the waste.

  In addition, air emission impacts can potentially occur during truck transport off the site, particularly with respect to the residential area along Stilley Avenue. Air tight transport vehicles would be required to address this concern. Finally, air emissions impacts would arise during off-loading of materials and stockpiling/processing of materials through the incineration system. Concerns would arise with respect to impacts on Hercules workers present at the active Jefferson plant.

- Truck traffic - Heavy truck traffic in and out of the site (estimated at potentially up to 8,000 20-ton vehicle trips based on a worst case scenario of required excavation) would significantly impact the local roadway network and local residential area on Stilley Avenue. At a minimum, access road improvement will likely be required within the site as well as off-site down to the paved portion of Stilley Avenue. Transient dust and odor problems due to truck traffic are also a concern. In addition, disruption of activities at the active Jefferson plant is a concern.

- Runoff - Precipitation events can lead to contaminant runoff from the site during excavation activities. Construction of extensive diversion controls to address run-on from upslope and off-site areas will be required to address this concern.

- Groundwater encountered during excavation - This groundwater will require removal. The removed water would be preferably placed into the existing leachate collection/treatment system for disposal. If not, it would be either thermally treated through processing through the incinerator system or properly disposed of off-site.

Incinerator emissions would be controlled by an off-gas treatment system attached to the main process unit. Incinerator emissions would be subject to applicable federal, state, and local (ACHD) standards.

The estimated time required to achieve remedial response objectives under this alternative is 3 or more years. This is based on an assumed incinerator processing rate of 250 tons per day (10 tons per hour). Additional time was also factored in to account for downtime, weather constraints, trial burn, startup, and regulatory approval.

5.2.5.4 Long-Term Effectiveness and Permanence

The source treatment alternative offers a high level of long-term effectiveness and permanence through destruction of the organic contaminants of concern. Treatment residuals would consist of organic-free ash material.

5.2.5.5 Overall Protection of Human Health and the Environment

Overall protection of human health under the excavation/thermal treatment involves consideration of the trade-off between short-term effectiveness concerns versus the long-term benefits of thermal destruction of organics present in materials targeted for treatment. Substantial short-term effectiveness limitations have been noted, including fugitive air emissions, heavy truck traffic impacts, impacts on Hercules plant workers and operations, runoff concerns, and management of groundwater encountered during excavation activities. These limitations arise based mainly on two factors: the substantial volume of material potentially requiring excavation and the high percentage concentration levels of volatile aromatic compounds present in the waste material.

Balanced against these limitations are the benefits offered by thermal destruction of organics present in materials targeted for treatment, particularly the waste material. However, the benefits are tempered by the fact that the baseline RA indicated that:

- Since the waste material is located under an existing soil cover averaging 6 ft in thickness, direct exposure is not considered likely.
- Overall, the results for the site did not indicate a current significant or substantial human health risk.

Based on consideration of the above, the possibility exists that the excavation/thermal treatment option may offer less overall protection of human health and the environment than no action at all.

5.2.5.6 Reduction of Toxicity, Mobility, and Volume of Contaminants

This alternative offers the maximum reduction in the toxicity, mobility, and volume of contaminants via complete destruction of organics in the targeted materials.

5.2.5.7 Implementability

As previously noted, due to the large quantity of targeted materials involved, a transportable incineration system is assumed to implement this remedial alternative. Also, due to the lack of suitable land available for system setup, it is assumed that the incinerator will be set up at the Hercules plant located approximately 4/5 mile away.

Implementability concerns include:

- Potential disruption of normal activities at the active local Hercules plant due to incineration setup and operation.
- Coordination and safety concerns with respect to the transportation of the large volume of materials to the local plant.
- Site access and local road conditions are likely incapable of managing the heavy truck traffic associated with this alternative without substantial road improvements. In particular, the site access road is relatively steep and in poor condition for heavy truck traffic.
- Coordination of landfill excavation work under a containment dome may be difficult due to space limitations and air quality concerns within the dome.
- Excavation within the landfill may be difficult to achieve due to the required depth (approximately 30 ft) combined with the safe angle of repose required for open-faced excavation (typically a 3:1 slope). A complicating factor would be the presence of groundwater in the unconsolidated zone within the landfill.

In terms of technology availability, vendors are available who offer transportable rotary kiln incinerators capable of managing targeted materials. A trial burn may be necessary to verify that the incinerator can meet regulatory requirements.

5.2.5.8 Costs

The capital cost items identified under the excavation/thermal treatment alternative include:

- Access controls.
  - Site fence upgrade.
  - Property deed notation.
  - Groundwater/land use restrictions.
- Site preparation.
  - Wetland investigation.
  - Sanitary sewer relocation.
  - Lower dike upgrade.
  - General site clearing/grubbing.
  - Access road upgrade.
  - Run-on diversion/run-off controls.
- Excavation of landfill materials.
- Treatment of excavated materials via rotary kiln incineration.
- Site restoration (backfill, soil cover, grading, seeding, etc.).
- Field evaluation program and skimmer-type recovery well system for non-aqueous phase product recovery from the Pittsburgh Coal.
- Replacement of existing oil/water separator.
- Exploratory borehole program with potential installation of two additional deep bedrock monitoring wells.
- Abandonment of deep bedrock Monitor Wells TW-5 and TW-6 via sealing with grout.

Operating and maintenance cost items identified under this alternative consist of:

- Leachate collection/treatment.
- Site monitoring.
- Perimeter fence maintenance.

Table 5-17 provides a cost estimate summary for Alternative 5. Using a present worth analysis at 5% compound interest over 30 years with a gradient factor of 5% of the total estimated annual O&M cost, the total present worth estimated cost of the excavation/ thermal treatment alternative is $92,597,000 to $174,797,000 dependent on specific pretreatment/treatment requirements.

The cost estimate was performed based on the following assumptions:

- Fence system upgrading to encompass easy access areas would involve installation of up to approximately 5,000 linear ft of fencing. O&M costs for the fence maintenance were assumed at 5% of the installed cost per year.

- No costs are cited for groundwater restrictions of land use restrictions. These represent governmental-based actions to which direct costs cannot be assigned. Such restrictions may also be incorporated as part of the property deed annotation.

- Site preparation costs involve estimated costs for a wetland investigation, general site clearing, site drainage improvements, potential sanitary sewer relocation (estimated at 400 linear ft) lower dike upgrade (estimated to involve regrading to a 3:1 slope), general site clearing/grubbing, access road upgrade to handle heavy truck traffic, and run-on diversion/run-off controls.

- Excavation of landfill materials (soil cover, waste material, underlying targeted soil, lower dike soil located between the dike and the interceptor trench, and the trench) assumes removal of 92,000 yd^3 (137,000 tons). This is a worst case scenario assuming removal of soil underlying the landfill waste to bedrock. Actual removal would be based on concentrations and may be less in quantity. Excavation in the landfill is assumed to be performed under a flexible containment dome.

- Excavation would involve encountering groundwater. This collected water would require removal. It was assumed that the water could be routed through the existing leachate treatment system for disposal. If not possible, it will require either processing through the incinerator system or off-site disposal at additional cost.

- Site backfill of excavated areas assumes the use of treated materials (ash) as partial backfill. Based on the ash content of the waste material (40%) and associated soils (100%), the total ash produced would be 64,000 yd^3. An 18-inch thick soil cover would be placed over backfilled ash prior to revegetation. If testing of the ash indicated it to be unsuitable for on-site disposal, it would be disposed of off-site at an additional cost.

- Total site backfill (ash and cover soil) is estimated at 69,000 yd^3. This target backfill volume is based on rough site regrading calculations and represents 75% of the total volume of materials removed from the landfill.

Table 5-17

Estimated Order of Magnitude Cost Summary for Alternative 5 - Excavation/Thermal Treatment

	Quantity	Unit Cost ($/Unit)	Total Cost ($)
CAPITAL			
Access Controls			
Fence System Upgrade	5,000 L.F.	18/L.F.	90,000
Property Deed Notation	L.S.		3,000
Groundwater/Land Use Restrictions			0
Subtotal - Access Controls			**93,000**
Site Preparation			
Wetland Investigation	L.S.		10,000
Sanitary Sewer Relocation	L.S.		25,000
Lower Dike Upgrade	L.S.		50,000
Clearing/Grubbing	10,000 yd^2	1/yd^2	10,000
Access Road Upgrade	1,200 yd^2	16/yd^2	19,000
Run-on Diversion/Run-off Controls	L.S.		20,000
Subtotal - Site Preparation			**134,000**
Material Excavation			
Excavation	92,000 yd^3	15/yd^3	1,380,000
Dust/Vapor Controls (Inflatable Dome)	L.S.		2,500,000
Subtotal - Material Excavation			**3,880,000**
Site Restoration			
Backfill Incinerator Ash	64,000 yd^3	6/yd^3	384,000
Site Grading	10,000 yd^2	1/yd^2	10,000
Site Capping Over Ash Disposal Site (18" thick)	10,000 yd^2	10/yd^2	100,000
Seeding, Mulching	10,000 yd^2	1/yd^2	10,000
Erosion and Sediment Controls	L.S.		10,000
Subtotal - Site Restoration			**514,000**
Treatment of Excavated Materials			
Transportation to Local Hercules Plant	4,600 loads	100/load	460,000

Table 5-17

Estimated Order of Magnitude Cost Summary for Alternative 5 - Excavation/Thermal Treatment

	Quantity	Unit Cost ($/Unit)	Total Cost ($)
Treatment by Transportable Incinerator	137,000 tons	500-1,000/ton	68,500,000-137,000,000
Subtotal - Treatment of Excavated Materials			**68,960,000-137,460,000**
Skimmer-Type Recovery Well Network			
Field Evaluation Program	L.S.		10,000
Skimmer Well Units (Pumps, Controls, Housing)	6 units	25,000/unit	150,000
Subtotal - Skimmer-Type Recovery Well Network			**160,000**
Deep Bedrock Exploratory Boreholes/Potential Monitoring Wells	2	12,500/each	25,000
Oil/Water Separator Replacement	L.S.		30,000
Abandonment of Bedrock Monitoring Wells TW-5 and TW-6	2 wells	2,000/well	4,000
Subtotal - Direct Capital Cost			**73,800,000-142,300,000**
Indirect Capital Cost Items			
Engineering/Construction Management (15%)[a]			726,000
Mobilization/Demobilization/Site Services (10%)[a]			494,000
Overhead and Profit (15%)[a]			726,000
Subtotal - Indirect Capital Cost Items			**1,936,000**
Subtotal - Direct/Indirect Capital Cost			**75,736,000-144,236,000**
Contingency (20%)			**15,147,000-28,847,000**
Total Estimated Capital Cost			**90,883,000-173,083,000**
OPERATING AND MAINTENANCE			
Leachate Collection/Treatment			

Table 5-17

Estimated Order of Magnitude Cost Summary for Alternative 5 - Excavation/Thermal Treatment

	Quantity	Unit Cost ($/Unit)	Total Cost ($)
Skimmer Well Network	L.S.		40,000
Site Monitoring			
Groundwater	32/yr	400/sample	12,800
Seeps	12/yr	400/sample	4,800
Stream	6/yr	400/sample	2,400
Residential Wells	3/yr	400/sample	1,200
QA/QC Samples (10%)	6/yr	400/sample	2,400
Labor	118 hrs	30/hr	3,600
Subtotal - Site Monitoring			**27,200**
Fence Maintenance (5% of installed cost)			4,500
Total Estimated Annual O&M Cost			**72,000**
Present Worth of Annual O&M Cost (30 years @ 5% interest rate with 5% inflation gradient factor)			**1,714,000**
TOTAL ESTIMATED PROJECT COST			**92,597,000-174,797,000**

[a] Percentage applied to direct capital cost subtotal minus transportation/treatment cost.

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- Treatment costs were estimated to range from $500 to $1,000 per ton, depending upon specific requirements for pretreatment (such as waste material dewatering) and treatment (does the material qualify as a RCRA hazardous waste with associated strict treatment requirements).

- Skimmer well system costs include a field evaluation program and well installation. The skimmer well system assumed includes a total of 12 skimmer wells. This is based on 50% conversion of the 20 test borings into skimmer wells, as well as conversion of TW-2 and TW-14 to skimmer wells. Of these 12 skimmer wells, it was assumed six (50%) would require installation of a skimmer pump for non-aqueous product recovery. This scenario is assumed for cost calculation purposes only; actual system design and installation is subject to the results from the test borings and field evaluations which would be performed to support remedial design.

- Replacement of the existing oil/water separator includes installation of a similar unit self-enclosed to prevent uncontrolled air releases.

- Site environmental and monitoring costs were estimated at $27,200 per year based on the assumed 30-year monitoring program previously presented in Table 5-12. This cost includes sampling and analytical costs; it does not include reporting costs. This cost also assumes that the two proposed exploratory borings into the deep bedrock zone will be converted into monitoring wells and added to the proposed quarterly monitoring program for groundwater monitoring wells.

- The estimated present worth operating cost for the skimmer well network assumes a 30-year period. Actual operating will be based on the ability to recover free product and may be less than 30 years.

5.2.6 In Situ Biodegradation Treatment

5.2.6.1 Description

The in situ biodegradation treatment alternative involves a series of on-site remedial actions designed to achieve the remedial action objectives defined in Subsection 1.2.2 via:

- In-place biological treatment of landfilled waste material.
- Institutional controls to limit access and future site use.
- Collection/treatment of landfill leachate to address potential groundwater contamination.
- Replacement of the oil/water separator with an enclosed unit to prevent uncontrolled air emissions.
- Retention of identified potential private water supply actions and controls as a contingency measure if future conditions warrant such a response action.
- Periodic site monitoring.

Table 5-18 provides a summary of Alternative 6. The main features of this alternative are:

- A network of injection points or infiltration galleries would be established in the landfill area. An aqueous mixture of introduced microbes (if required), nutrients, (nitrogen, phosphorus, and trace metals), and oxygen source (typically hydrogen peroxide) would be injected (or infiltrated) into the area. The flow of water would contact targeted materials, promoting microbial degradation of organic compounds. Groundwater recovery (utilizing recovery wells and/or the interceptor trench) may be used to utilize the existing groundwater as the liquid medium for supplying the microbes, nutrients, and oxygen sources. Figure 5-5 provides a schematic of a typical in situ biodegradation system which utilizes an infiltration gallery to introduce the microbe/nutrient/oxygen source mixture.
- Based on the results of additional field evaluations to confirm their viability and design, skimmer-type recovery wells would be placed around the perimeter of the landfill down-dip in the Pittsburgh Coal to recover non-aqueous phase floating product (refer to the discussion under Subsection 5.2.3 for development rationale). A series of 20 test borings will be installed into the Pittsburgh Coal water table at approximately 30-ft-intervals along the landfill perimeter, as previously indicated on a preliminary basis in Figure 5-3. At those locations where a free product floating layer is encountered, the test borings would be converted to skimmer wells. It is preferable that the wells penetrate open mine voids, as the RI results indicate the mine voids to be a preferred contaminant migration pathway. In addition, Monitoring Well TW-2, which was found to contain free product during the RI, would be

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Table 5-18

Alternative 6: In Situ Biodegradation Treatment

Medium	Type of Response	General Response Actions Utilized	Technologies/Process Options Utilized (Representative Process Options Noted in Parentheses)
Waste Material (Landfill Unit)	In Situ Treatment	Solids Treatment Waste Material	In Situ Biodegradation
Soil (Downslope of Landfill Unit)	Limited Action	Institutional Actions and Controls	Access Restrictions (fencing, deed notation, groundwater restrictions)
Leachate	Collection/ Treatment	Leachate and Subsurface Controls	Subsurface Drains (leachate interceptor trench) Recovery Wells (skimmer wells)
		Leachate Treatment	Physical Treatment of Trench Leachate (gravity oil/water separation) Chemical Treatment of Trench Leachate (extraction) - As Required Thermal Treatment of Non-Aqueous Oil Phase (industrial boiler) Biological Treatment of Aqueous Phase (activated sludge)
Groundwater (Pittsburgh Coal; Unconsolidated Zone)	Limited Action	Institutional Actions and Controls	Access Restrictions (fencing, deed notation, groundwater restrictions)
Air Emissions (Oil/Water Separator)	Control	Emissions Control	Emissions Prevention Systems

In addition, identified potential private water supply actions and controls are retained as a contingency measure if future conditions warrant such a response action.

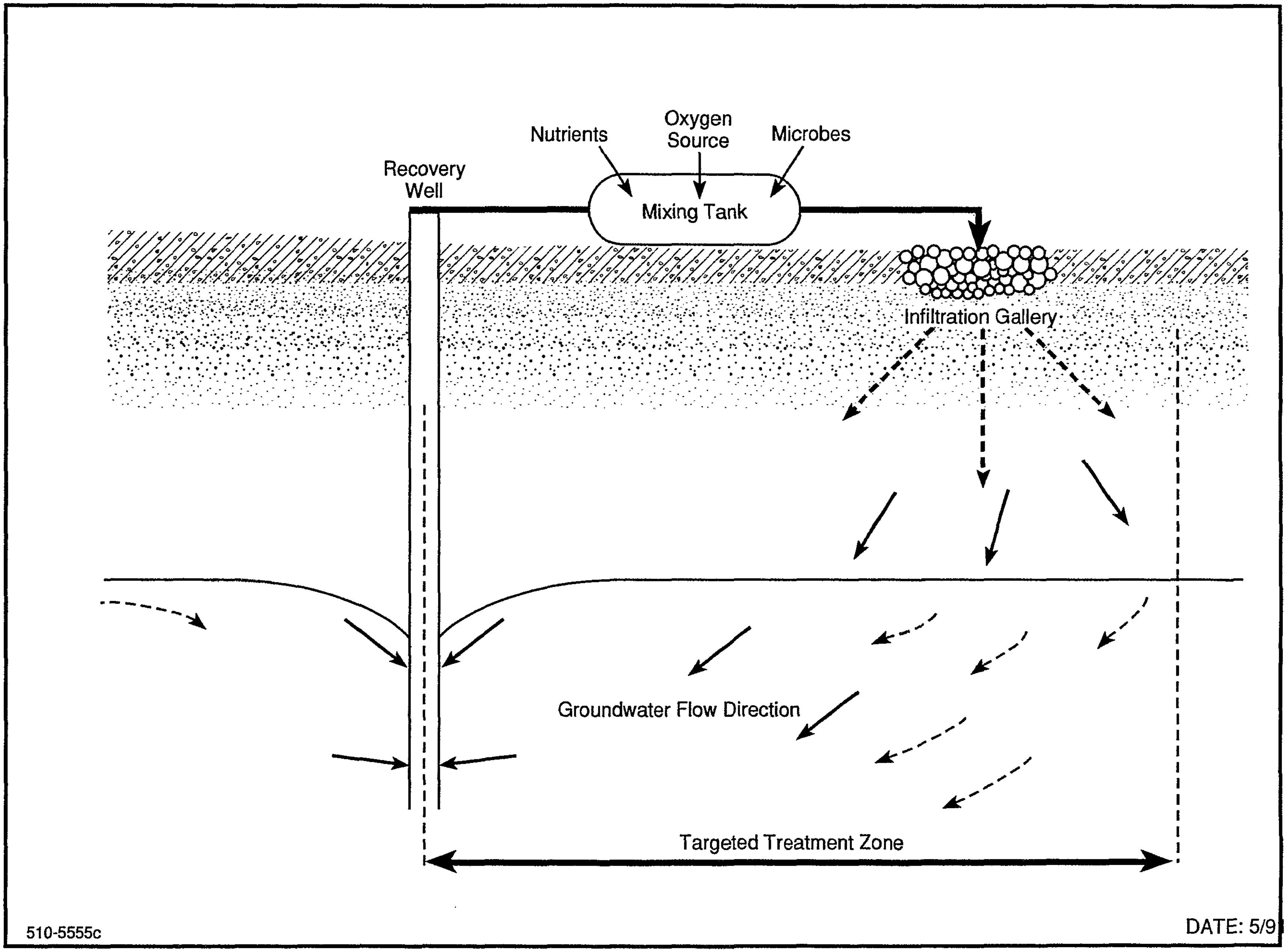

FIGURE 5-5 IN SITU BIODEGRADATION SYSTEM SCHEMATIC

converted into a skimmer well and Monitor Well TW-14 would be evaluated further to determine viability for skimmer well conversion. Non-aqueous product would be collected from the skimmer wells either manually or via use of skimmer pumps, as appropriate. Collected non-aqueous product would be reclaimed as a fuel at the local Hercules plant industrial boilers in accordance with the ACHD permit and other regulatory requirements. The skimmer system would operate until the floating layer diminishes to the point where it is no longer practical to continue operation.

- The existing oil/water separator for treating leachate collected by the interceptor trench would be replaced with an upgraded enclosed separator to prevent uncontrolled air releases. Separated aqueous phase would continue to be discharged under permit to the WESA POTW (or alternatively, used as the liquid media for introducing the microbe/nutrient/oxygen source treatment mixture), while separated non-aqueous product would be reclaimed as a fuel at the local Hercules plant industrial boilers in accordance with ACHD permit and other regulatory requirements.

- A wetland investigation using methods outlined in the "Federal Manual for Identifying and Delineating Jurisdictional Wetlands" would be conducted by personnel properly trained in federal manual methodology.

- The existing oil/water separator for treating leachate collected by the interceptor trench would be replaced with an upgraded enclosed system to prevent uncontrolled air releases. Separated aqueous phase would continue to be discharged under permit to the WESA POTW, while separated non-aqueous product would be reclaimed as a fuel at the local Hercules plant industrial boilers in accordance with the ACHD permit and other regulatory requirements.

- Access restrictions would be implemented to further reduce potential exposure. This element would include property deed annotation, groundwater restrictions, and upgrade of the existing security system to provide a fence and locked gate system which restricts site access. Future site use restrictions may also be required based on human health risk consideration.

- Implementation of a 30-year limited site monitoring program as shown in Table 5-12.

In addition, it is proposed to drill an exploratory borehole into the deep bedrock at two downgradient off-site locations yet to be determined. The results of the RI indicated that the deep bedrock zone under the site does not act as a groundwater aquifer. The proposed exploratory program will investigate the viability of this zone to act as an aquifer at off-site locations. If significant groundwater is encountered at each location, the borehole will be converted to deep bedrock monitoring wells (otherwise, the boreholes will be sealed with grout). These wells would then serve as permanent groundwater monitoring points which would be added to the routine quarterly monitoring program proposed for all groundwater monitoring wells at the site. In addition, existing deep bedrock Monitoring Wells TW-5 and TW-6 will be properly abandoned via sealing with grout. Both wells do not yield sufficient amounts of water for sampling purposes and there is concern in the case of TW-5 that leakage may be occurring from the upper casing.

AR303192

- Lower dike upgrade to address potential problems identified based on the limited geotechnical analysis performed during the RI (see Subsection 3.2.3 of Part I of the Site Report). Based on this limited analysis, dike regrading to achieve a 3:1 slope is anticipated to yield an acceptable minimum factor of safety.

The biological treatment process employs the biodegradable capabilities of natural and/or augmented microbial populations to degrade or transform the waste organics. In some cases, organics can be oxidized, under aerobic conditions, to carbon dioxide and water. In many cases, depending both upon the nature of the contaminants and the type of process, partial degradation or transformation may be achieved, with some residual organics remaining in the waste. In most cases, such residuals are of significantly lower toxicity than the original contaminant, and in many cases can be considered innocuous. Often the residuals themselves will be further degraded over time. It should be noted that the level of treatment achievable under Alternative 6 is not completely known at this time. Treatability testing is required to more accurately define achievable treatment levels. (This is considered further under the implementability evaluation criterion).

5.2.6.2 Compliance with Applicable or Relevant and Appropriate Requirements

Table 5-19 provides an ARAR compliance summary for Alternative 6.

In terms of ARAR compliance:

- Since the PICCO Resin Landfill closed in 1964 prior to enactment of either the solid or hazardous waste regulations, these regulations do not strictly apply as ARARs, except for materials removed from the landfill. As the in situ biodegradation alternative does not involve removal of any waste material from the landfill beyond collected landfill leachate, solid or hazardous waste requirements are not strictly applicable.

AR303194

Table 5-19

ARARs Compliance Summary for Alternative 6: In Situ Biodegradation

ARAR	Comments	Alternative 6 In Situ Biodegradation Treatment
I. Chemical-Specific		
A. Resource Conservation and Recovery Act (RCRA) 1. Identification and Listing of Hazardous Waste.	Potentially applicable to remedial actions involving solid waste removal including leachate removal. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Will meet (if applicable)
B. Pennsylvania Solid Waste Management Act 1. Identification and Listing of Hazardous Waste.	Potentially applicable to remedial actions involving solid waste removal including leachate removal. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. EP toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)
C. Clean Water Act 1. Water Quality Criteria (Non-enforceable guidance).	Applicable to remedial actions involving discharge of treated groundwater to the unnamed site stream.	Not Applicable
D. Pennsylvania Clean Streams Law 1. Water Quality Criteria including Toxic Management Strategy.	Applicable to remedial actions involving discharge of treated groundwater into the unnamed site stream.	Not Applicable

Table 5-19

ARARs Compliance Summary for Alternative 6: In Situ Biodegradation (continued)

ARAR	Comments	Alternative 6 In Situ Biodegradation Treatment
E. Safe Drinking Water Act (SDWA)	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsol-idated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.
1. National Primary Drinking Water Standards.	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsol-idated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.

Table 5-19

ARARs Compliance Summary for Alternative 6: In Situ Biodegradation (continued)

ARAR	Comments	Alternative 6 In Situ Biodegradation Treatment
2. National Secondary Drinking Water Standards (Non-enforceable guidelines.	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.
3. Maximum Contaminant Level Goals (Non-enforceable goals).	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.

Table 5-19

ARARs Compliance Summary for Alternative 6: In Situ Biodegradation (continued)

ARAR	Comments	Alternative 6 In Situ Biodegradation Treatment
F. Pennsylvania Safe Drinking Water Act	Applicable to current limited use and potential future use of groundwater as a potable water supply. Cites by reference federal SDWA standards.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.
II. Location-Specific		
A. Resource Conservation and Recovery Act 1. Siting Criteria for Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable if a TSD facility is set up on-site to manage removed RCRA hazardous waste. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. TCLP testing required to determine applicability.	Not Applicable

Table 5-19

ARARs Compliance Summary for Alternative 6: In Situ Biodegradation (continued)

ARAR	Comments	Alternative 6 In Situ Biodegradation Treatment
B. Pennsylvania Solid Waste Management Act 1. Siting Criteria for Hazardous Waste Treatment and Disposal Facilities.	Potentially applicable if a treatment and/or disposal facility is set up on-site to manage removed hazardous waste. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. EP toxicity/TCLP testing required to determine applicability.	Not Applicable
C. Clean Water Act 1. Dredge or Fill Requirements.	Limited wetlands have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.	Wetlands Survey specified to determine applicability.
D. Executive Order on Protection of Wetlands	Limited wetlands have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.	Wetlands survey specified to determine applicability.

Table 5-19

ARARs Compliance Summary for Alternative 6: In Situ Biodegradation (continued)

ARAR	Comments	Alternative 6 In Situ Biodegradation Treatment
E. Pennsylvania Dam Safety and Waterway Management Act	Limited wetland areas have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.	Wetlands survey specified to determine applicability.
III. Action-Specific		
A. Resource Conservation and Recovery Act 1. Standards Applicable to Generators of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Will meet (if applicable)

Table 5-19

ARARs Compliance Summary for Alternative 6: In Situ Biodegradation (continued)

ARAR	Comments	Alternative 6 In Situ Biodegradation Treatment
2. Standards Applicable to Transporters of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Will meet (if applicable)
3. Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed wastes which qualify as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP prior testing required to determine applicability.	Not Applicable
4. Standards for the Management of Specific Hazardous Waste and Specific Types of Hazardous Waste Management Facilities.	Potentially applicable to remedial actions involving reclamation of recyclable waste which qualify as hazardous under RCRA. May apply to recovered non-aqueous product. TCLP testing required to determine applicability.	Will meet (if applicable)

Table 5-19

ARARs Compliance Summary for Alternative 6: In Situ Biodegradation (continued)

ARAR	Comments	Alternative 6 In Situ Biodegradation Treatment
5. Land Disposal Restrictions.	Potentially applicable to remedial actions involving removal of waste which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Not Applicable
B. Pennsylvania Solid Waste Management Act - Residual (Non-Hazardous Solid) Waste Management	Applicable to remedial actions involving removal of solid wastes that qualify as residual wastes. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment.	Not Applicable
C. Pennsylvania Solid Waste Management Act - Hazardous Waste Regulations 1. Standards Applicable to Generators of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)

AR303201

Table 5-19

ARARs Compliance Summary for Alternative 6: In Situ Biodegradation (continued)

ARAR	Comments	Alternative 6 In Situ Biodegradation Treatment
2. Standards Applicable to Transporters of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)
3. Standards of Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed waste which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.	Not Applicable
4. Standards for the Management of Specific Hazardous Waste and Specific Types of Hazardous Waste Management Facilities.	Potentially applicable to remedial actions involving reclamation of recyclable wastes which qualify as hazardous under RCRA. May apply to recovered non-aqueous product. EP Toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)

Table 5-19

ARARs Compliance Summary for Alternative 6: In Situ Biodegradation (continued)

ARAR	Comments	Alternative 6 In Situ Biodegradation Treatment
D. Occupational Safety and Health Act	Applicable to remedial actions (including monitoring) at hazardous waste sites.	Will meet
E. Hazardous Materials Transportation Act 1. Hazardous Materials Transportation Regulations.	Applicable to remedial actions involving transportation of DOT-defined hazardous materials off-site, including recovered non-aqueous product.	Will meet
F. Clean Water Act		
1. National Pollutant Discharge Elimination System (NPDES).	Applicable to remedial actions involving discharge to the unnamed site stream.	Not Applicable
2. National Pretreatment Standard.	Applicable to current discharge of aqueous fraction of treated leachate into local POTW.	Will meet
G. Pennsylvania Clean Streams Law		
1. Water Quality Management (WQM) Program.	Applicable to remedial actions involving point source discharges to surface waters.	Not Applicable
2. Wastewater Treatment Requirements.	Applicable to remedial actions involving point source discharges.	Not Applicable

Table 5-19

ARARs Compliance Summary for Alternative 6: In Situ Biodegradation (continued)

ARAR	Comments	Alternative 6 In Situ Biodegradation Treatment
3. Industrial Wastes.	Applicable to remedial actions involving point source discharges.	Not Applicable
4. Erosion Control.	Applicable to remedial actions involving earth moving.	Will meet
H. Pennsylvania Dam Safety and Waterway Management Act		
1. Outfall Structures.	Applicable to remedial actions involving point source discharges to streams.	Not Applicable
I. WESA Pretreatment Effluent Limitations	Applicable; aqueous portion of leachate currently being discharged in accordance with the effluent limitations agreement.	Will meet
J. Pennsylvania Stormwater Management Act	Applicable to remedial actions requiring stormwater management.	Will Meet
K. Allegheny County Stormwater Management Regulations	Applicable to remedial actions requiring stormwater management.	Will meet

Table 5-19

ARARs Compliance Summary for Alternative 6: In Situ Biodegradation (continued)

ARAR	Comments	Alternative 6 In Situ Biodegradation Treatment
L. Safe Drinking Water Act		
1. Underground Injection Control (UIC) Regulations.	Applicable to remedial actions involving reinjection of groundwater or injection of treatment chemicals	Will meet
M. Clean Air Act		
1. New Source Performance Standards (NSPS).	Applicable to remedial actions involving incineration	Not Applicable
N. Pennsylvania Air Pollution Control Act		
1. Standards for Contaminants.	Applicable to remedial actions involving air emissions, principally incineration.	Will meet
2. New Source Performance Standards.	Applicable to remedial actions involving incineration.	Not Applicable
3. Standards for Sources of VOCs.	Applicable to remedial actions utilizing storage tanks for VOC-containing wastes.	Not Applicable

Table 5-19

ARARs Compliance Summary for Alternative 6: In Situ Biodegradation (continued)

ARAR	Comments	Alternative 6 In Situ Biodegradation Treatment
O. ACHD Air Pollution Control Regulations		
1. Air Emission Standards.	Applicable to remedial actions producing air emissions, principally incineration.	Will meet
2. Waste-Derived Liquid Fuel Standards.	Applicable to current practice of utilizing recovered non-aqueous product as a fuel under ACHD permit.	Will meet
3. New Source Performance Standards.	Applicable to remedial actions involving incineration.	Not Applicable
4. Standards for Sources of VOCs.	Applicable to remedial actions utilizing storage tanks for VOC-containing wastes.	Not Applicable

- Management of landfill leachate is currently conducted by permit in accordance with the CWA national pretreatment standard and WESA POTW pretreatment requirements (for treatment of the aqueous phase) and ACHD air pollution and fuel burning requirements (for treatment of the nonaqueous phase). If the leachate (particularly the non-aqueous portion) qualifies as an RCRA hazardous waste, management of the non-aqueous phase would be subject to the following applicable hazardous waste requirements:

  - Recycling/reclamation ARARs including:

    Managing containers in accordance with requirements outlined in Subsections 2.3.1.3.6 and 2.4.1.2.6.

    Conducting energy recovery in accordance with the final rule "Burning of Hazardous Waste in Boilers and Industrial Furnaces" by 31 August 1991, the date that the rule becomes effective.

    Complying with applicable ACHD air pollution regulations (Subsection 2.5.2).

  - Generator requirements outlined under Subsections 2.3.1.3.9 and 2.4.1.2.9.

  - Transporter requirements outlined under Subsections 2.3.1.3.10 and 2.4.1.2.10.

- Review of the RI residential well sampling results indicates that no corresponding primary drinking water standards (MCLs) for the identified organic contaminants of concern were exceeded, indicating compliance with drinking water ARARs for the organic compounds of concern.

- Compliance with OSHA requirements for hazardous waste operations (Subsection 2.3.5).

- Compliance with DOT hazardous material transportation requirements (Subsection 2.3.6) for off-site removal of recovered non-aqueous product.

- Provision is made for conducting a formal wetlands survey to determine the potential applicability of wetlands regulations. Such regulations may apply if identified wetlands need to be filled in as part of this remedial alternative.

- Compliance with state and local stormwater management requirements given under Subsections 2.4.6 and 2.5.3, respectively.

In addition, it should be noted that under Alternative 6, the TBC criteria/guidance of Pennsylvania's groundwater remedial policy (cleanup to background or non-detectable levels) identified under Subsection 2.6 will not be met. However, as provided for in the policy statement, an evaluation is put forth under Appendix A indicating the technical infeasibility of meeting the background/non-detect criteria. In any event, as TBCs are not ARARs, not meeting this TBC does not affect the remedial alternative evaluation criteria of ARAR compliance.

5.2.6.3 Short-Term Effectiveness

The non-intrusive nature of the in situ biodegradation remedial action is conducive to minimizing short-term impacts. However, due to the high concentrations involved, particularly in the waste material, biological treatment is likely to be an extended process. Engineering controls during implementation would be used to control short-term impacts. However, the potential for undesirable impacts increases with extended treatment requirements. In addition, it is possible that microbial activity may mobilize sorbed contaminants. This can lead to potential impacts if not properly controlled via recovery and/or interception.

5.2.6.4 Long-Term Effectiveness and Permanence

Because the biological alternative offers potential degradation and detoxification of the waste constituents, this alternative would provide a relatively high degree of long-term effectiveness, and would constitute a permanent resolution. It is possible that a diminishing level of residual microbial activity would persist following the actual remedial action, and such activity would contribute to the ultimate remedy. As long as residual nutrients (particularly added nitrogen) are recovered from the contaminated zone by recovery wells and/or the interceptor trench, the materials remaining after remediation would not negatively impact the groundwater or other environmental media.

5.2.6.5 Overall Protection of Human Health and the Environment

In situ biodegradation offers the potential for degradation and detoxification of contaminants, providing a long-term and permanent solution without the need for excavation. However, due to the high contaminant concentrations involved, particularly in the waste material, biological treatment is likely to be an extended process. Thus, the potential for undesirable impacts during implementation increases with extended treatment requirements. In addition, it is possible that microbial activity may mobilize sorbed contaminants. This can lead to potential impacts if not properly controlled via recovery and/or interception.

5.2.6.6 Reduction of Toxicity, Mobility, and Volume of Contaminants

As discussed previously, the biological treatment alternative would degrade some wastes completely, and residuals remaining from incomplete degradation would generally be of low toxicity. It is possible in certain instances that microbial activity may mobilize sorbed contaminants. In fact, mobilization of sorbed contaminants is a significant step in the biodegradative process. During implementation, any mobilized contaminants could be recaptured and treated in the aqueous phase. TCLP testing could be used to verify that hazardous constituents would not be mobilized from the final product.

5.2.6.7 Implementability

Two major factors must be considered in evaluating implementability. The first factor is the biodegradability of the contaminants in the waste matrix, and the second factor is the waste/soil matrix and site-specific conditions.

Presented below is a general discussion of implementability concerns. Treatability testing would be required to answer these concerns.

The organic waste constituents at the PICCO landfill site are generally biodegradable under appropriate conditions. In particular, BTEX compounds are relatively easily degraded, and process residuals are of little concern. In fact, treatment of BTEX compounds, often resulting from gasoline spills, is probably the widest application of soils bioremediation to date. Field and Wojtanowicz state, "...significant amounts of up to 19 different POHCs (Principle Organic Hazardous Constituents) including: benzene, ...ethylbenzene, chlorobenzene, and toluene have also been significantly biodegraded." ("Biological Treatment of Petrochemical Sludges," Field and Wojtanowicz, Remedial Action, Treatment and Disposal of Hazardous Waste. Proceedings of the Fifteenth Annual Research Symposium, Feb. 1990).

The BNA compounds present are also generally biodegradable; however, the rate of degradation for these more complex materials under most conditions would be substantially lower than for BTEX compounds. The BNAs at the PICCO site are among those often found at wood treating (i.e., creosote) facilities, and a reasonable amount of data concerning their biodegradation is available. Ahlert, Kosson, and Black state, "Biodegradation of 2- to 3-ring PAHs by pure microbial cultures has been demonstrated; naphthalene, phenanthrene, and anthracene have been shown to be assimilated quantitatively." ("Preliminary Results on the Anaerobic/Aerobic Biochemical Reactor for the Mineralization of Organic Contaminants Bound in Soil Fines," Ahlert, Kosson, and Black, Remedial Action, Treatment and Disposal of Hazardous Waste, Proceedings of the Fifteenth Annual Research Symposium, Feb. 1990).

However, the rate and effectiveness of biological treatment of PICCO waste materials may be affected by the high contaminant concentrations present in the waste. Some degradable contaminants may prove toxic or inhibitory to microorganisms at sufficiently high concentrations. In addition, the degradation of complex organics (such as certain BNA compounds) may be limited by their aqueous solubility. When contaminants exist as large aggregates, microbial activity, which occurs at the contaminant-water interface, may be limited by the surface area of the waste material itself. Based upon the contaminant concentrations and the physical description of the waste, these factors may limit the rate or extent of biological treatment achievable.

In terms of implementation, these factors may prove most significant in attempts at in situ bioremediation. This approach would foster microbial degradation of wastes in place by the injection of nutrients and oxygen upgradient of the waste. Downgradient recovery wells and/or the interceptor trench would be used to recover and possibly recirculate groundwater. Various modifications, including an aboveground biological treatment step for recovered groundwater, could be used to increase the rate of subsurface remediation.

However, the success of this approach would depend upon the physical and hydrogeological characteristics of the zone to be remediated. In general, in situ approaches are primarily applicable where the subsurface conditions are amenable to the controlled flushing of the contaminated zone with the treatment solution. The physical description of the wastes suggests that subsurface flushing may not be feasible. Additional data would be required to definitively address this possibility.

5.2.6.8 Cost

The capital cost items identified under Alternative 6 include:

- Access controls.
  - Fence system upgrade.
  - Property deed notation.
  - Groundwater/land use restrictions.
- Site preparation.
  - Wetland investigation.
  - Lower dike upgrade.
  - Clearing, grading, run-on, and run-off controls.
- In situ biodegradation treatment system.
- Field evaluation program and skimmer-type recovery well system for non-aqueous phase product recovery from the Pittsburgh Coal.
- Replacement of existing oil/water separator.
- Exploratory borehole program with potential installation of additional deep bedrock monitoring wells.
- Abandonment of deep bedrock Monitoring Wells TW-5 and TW-6 by sealing with grout.

Operation and maintenance cost items identified under this alternative include:

- Leachate collection/treatment.
- Site monitoring.
- Perimeter fence maintenance.

Table 5-20 provides a cost estimate summary for Alternative 6. Using a present month analysis at 5% compound interest over 30 years with a gradient factor of 5% of the total estimated annual O&M cost, the total present worth estimated cost of the alternative ranged from $11,785,000 to $19,985,000. The cost estimate was performed based on the following assumptions:

- Fence system upgrading to encompass easy access areas would involve installation of up to approximately 5,000 linear ft of fencing. O&M costs for the fence maintenance were assumed at 5% of the installed cost per year.

- No costs are cited for groundwater restrictions of land use restrictions. These represent governmental-based actions to which direct costs cannot be assigned. Such restrictions may also be incorporated as part of the property deed annotation.

- Site preparation costs included a wetland investigation, and upgrade of the lower dike (estimated to include grading to a 3:1 slope), general site grading clearing, and run-on/run-off controls.

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Table 5-20

Estimated Order of Magnitude Cost Summary for Alternative 6 - In Situ Biodegradation Treatment

	Quantity	Unit Cost ($/Unit)	Total Cost ($)
CAPITAL			
Access Controls			
Fence System Upgrade	5,000 L.F.	18/L.F.	90,000
Property Deed Notation	L.S.		3,000
Groundwater/Land Use Restrictions			0
Subtotal - Access Controls			**93,000**
Site Preparation			
Wetland Investigation	L.S.		10,000
Lower Dike Upgrade	L.S.		50,000
Grading/Clearing/Run-on and Run-off Controls	L.S.		10,000
Subtotal - Site Preparation			**70,000**
In Situ Biodegradation Treatment	137,000 tons	50/ton-100/ton	6,850,000-13,700,000
Skimmer-Type Recovery Well Network			
Field Evaluation Program	L.S.		10,000
Skimmer Well Units (Pump, Controls, Housing)	6 units	25,000/unit	150,000
Subtotal - Skimmer-Type Recovery Well Network			**160,000**
Oil/Water Separator Replacement	L.S.		30,000
Deep Bedrock Exploratory Boreholes/Potential Monitoring Wells	2	12,500/each	25,000
Abandonment of Bedrock Monitoring Wells TW-5 and TW-6	2 wells	2,000/well	4,000
Subtotal - Direct Capital Cost			**7,232,000-14,082,000**
Indirect Capital Cost Items			
Engineering/Construction Management (15%)[a]			57,000
Mobilization/Demobilization/Site Services (10%)[a]			38,000
Overhead and Profit (15%)[a]			57,000

1323.ad

Table 5-20

Estimated Order of Magnitude Cost Summary for Alternative 6 - In Situ Biodegradation Treatment

	Quantity	Unit Cost ($/Unit)	Total Cost ($)
Subtotal - Indirect Capital Cost Items			152,000
Subtotal - Direct/Indirect Capital Cost			7,384,000[a]- 14,234,000[a]
Contingency (20%)			1,477,000[a]- 2,847,000[a]
Total Estimated Capital Cost			8,861,000- 17,081,000
OPERATING AND MAINTENANCE			
Leachate Collection/Treatment			
Interceptor Trench	L.S.		50,000
Skimmer Well Network	L.S.		40,000
Subtotal - Leachate Collection/Treatment			90,000
Site Monitoring			
Groundwater	32/yr	400/sample	12,800
Seeps	12/yr	400/sample	4,800
Stream	6/yr	400/sample	2,400
Residential Wells	3/yr	400/sample	1,200
QA/QC Samples (10%)	6/yr	400/sample	2,400
Labor	120 hrs	30/hr	3,600
Subtotal - Site Monitoring			27,200
Fence Maintenance (3% of installed cost)			4,500
Total Estimated Annual O&M Cost			122,000
Present Worth of Annual O&M Cost (30 years @ 5% interest rate with 5% inflation gradient factor)			2,904,000
TOTAL ESTIMATED PROJECT COST			11,765,000- 19,985,000

a Percentage applied to direct capital cost subtotal minus treatment costs.

- In situ treatment costs (capital and O&M) are assumed to range from $50 to $100 per ton treated. This range was assumed due to the uncertainties related with in situ biodegradation and site-specific concerns previously outlined.

- Treatment volume was assumed at 92,000 yd^3 (137,000 tons). This includes landfill materials (soil cover, waste material, underlying soil, lower landfill dike, soil located between the dike and interceptor trench, and the interceptor trench).

- Skimmer well system costs include a field evaluation program and well installation. The skimmer well system assumed includes a total of 12 skimmer wells. This is based on 50% conversion of the 20 test borings into skimmer wells, as well as conversion of TW-2 and TW-14 to skimmer wells. Of these 12 skimmer wells, it was assumed six (50%) would require installation of a skimmer pump for non-aqueous product recovery. This scenario is assumed for cost calculation purposes only; actual system design and installation is subject to the results from the test borings and field evaluations which would be performed to support remedial design.

- Replacement of the existing oil/water separator assumes installation of a similar unit self-enclosed to prevent uncontrolled air releases.

- Site environmental monitoring costs were estimated at $27,200 per year based on the assumed 5-year monitoring program previously presented in Table 5-12. This cost includes sampling and analytical costs; it does not include reporting costs. This cost also assumes that the two proposed exploratory borings into the deep bedrock zone will be converted into monitoring wells and added to the proposed quarterly monitoring program for groundwater monitoring wells.

- The estimated present worth operating cost for the skimmer well network assumes a 30-year period. Actual operations will be based on the ability to recover free product and may be less than 30 years.

5.3 COMPARATIVE ANALYSIS

In the following analysis, the alternatives are evaluated in relation to one another for each of the evaluation criteria identified in Subsection 5.1. The purpose of this analysis is to identify the relative advantages and disadvantages of each alternative. These remedial alternatives, named after the primary remedial approach taken by each alternative are:

- Alternative 1: No action
- Alternative 2: Limited Action
- Alternative 3: Closure
- Alternative 4: Excavation/Off-site Disposal
- Alternative 5: Excavation/Thermal Treatment
- Alternative 6: In situ Biodegradation

Table 5-21 summarizes the comparison of alternatives in terms of the evaluation criteria. Relative ratings (qualitative) were assigned to each of the non-cost criteria. A "zero" (0) represents a baseline in which the alternative meets the particular evaluation criteria. A "plus" (+) represents that the alternative exceeds that particular evaluation criteria, while a "minus" (-) indicates that the alternative does not meet and/or there are potential limitations associated with that evaluation criterion. These relative ratings are to be used strictly to highlight certain issues associated with an alternative and not for numerical summation or rating. In addition, Table 5-21 contains the estimated total cost for implementing each of the alternatives. Where significant cost uncertainties were identified for a particular alternative, an estimated range of cost is provided.

5.3.1 Compliance with ARARs

Table 5-22 provides a comparative summary of the six alternatives in terms of compliance with ARARs previously identified in Section 2. Based upon this comparative analysis, all six alternatives were each judged to meet the ARAR compliance evaluation criterion as outlined in Table 5-22.

Table 5-21

Comparative Analysis of Alternatives

Alternative	Compliance with ARARs	Short-Term Effectiveness	Long-Term Effectiveness and Permanence	Protection of Human Health and the Environment	Reduction in Toxicity, Mobility, and Volume	Implementability	Estimated Present Worth Cost (Millions)
1 - No Action	0	N/A	--	--	--	N/A	$2.5
2 - Limited Action	0	+	--	--	--	+	$2.9
3 - Closure	0	+	0	+	0	+	$3.1 - Option A $4.3 - Option B (a)
4 - Excavation/Off-Site Disposal	0	--	+	--	+	--	$26 - $300 (b)
5 - Excavation/Thermal Treatment	0	--	+	--	+	--	$93 - $175 (c)
6 - In Situ Biodegradation Treatment	0	0	+	+	+	--	$12 - $20 (d)

LEGEND:

"+" = Alternative Exceeds Particular Evaluation Criterion.
"0" = Meets Particular Evaluation Criterion.
"--" = Does Not Meet and/or Has Potential Limitations Associated with Particular Evaluation Criterion.

NOTES:

(a) = Includes provisions for potential skimmer well network to recover non-aqueous product from the Pittsburgh Coal.
(b) = Based on potential pretreatment requirements prior to disposal.
(c) = Based on potential pretreatment/treatment requirements.
(d) = Based on variable site-specific biodegradability factors.

Table 5-22

ARARs Compliance Summary

ARAR	Comments	Alternative 1 No Action	Alternative 2 Limited Action	Alternative 3 Closure	Alternative 4 Excavation/Off-site Landfill Disposal	Alternative 5 Excavation/Thermal Treatment	Alternative 6 In Situ Biodegradation Treatment
I. Chemical-Specific							
A. Resource Conservation and Recovery Act (RCRA) 1. Identification and Listing of Hazardous Waste.	Potentially applicable to remedial actions involving solid waste removal including leachate removal. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)
B. Pennsylvania Solid Waste Management Act 1. Identification and Listing of Hazardous Waste.	Potentially applicable to remedial actions involving solid waste removal including leachate removal. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. EP toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)
C. Clean Water Act 1. Water Quality Criteria (Non-enforceable guidance).	Applicable to remedial actions involving discharge of treated groundwater to the unnamed site stream.	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
D. Pennsylvania Clean Streams Law 1. Water Quality Criteria including Toxic Management Strategy.	Applicable to remedial actions involving discharge of treated groundwater into the unnamed site stream.	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

Table 5-22

ARARs Compliance Summary (continued)

ARAR	Comments	Alternative 1 No Action	Alternative 2 Limited Action	Alternative 3 Closure	Alternative 4 Excavation/Off-site Landfill Disposal	Alternative 5 Excavation/Thermal Treatment	Alternative 6 In Situ Biodegradation Treatment
E. Safe Drinking Water Act (SDWA)	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsoli-dated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsoli-dated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone ground-water do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsol-idated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.

AR303219

Table 5-22

ARARs Compliance Summary (continued)

ARAR	Comments	Alternative 1 No Action	Alternative 2 Limited Action	Alternative 3 Closure	Alternative 4 Excavation/Off-site Landfill Disposal	Alternative 5 Excavation/Thermal Treatment	Alternative 6 In Situ Biodegradation Treatment
1. National Primary Drinking Water Standards.	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.

Table 5-22

ARARs Compliance Summary (continued)

ARAR	Comments	Alternative 1 No Action	Alternative 2 Limited Action	Alternative 3 Closure	Alternative 4 Excavation/Off-site Landfill Disposal	Alternative 5 Excavation/Thermal Treatment	Alternative 6 In Situ Biodegradation Treatment
2. National Secondary Drinking Water Standards (Non-enforceable guidelines.	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone ground-water do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.

Table 5-22

ARARs Compliance Summary
(continued)

ARAR	Comments	Alternative 1 No Action	Alternative 2 Limited Action	Alternative 3 Closure	Alternative 4 Excavation/Off-site Landfill Disposal	Alternative 5 Excavation/Thermal Treatment	Alternative 6 In Situ Biodegradation Treatment
5. Maximum Contaminant Level Goals (Non-enforceable goals).	Applicable to current limited use and future potential use of groundwater as a potable water supply.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.

AR303222

Table 5-22

ARARs Compliance Summary (continued)

ARAR	Comments	Alternative 1 No Action	Alternative 2 Limited Action	Alternative 3 Closure	Alternative 4 Excavation/Off-site Landfill Disposal	Alternative 5 Excavation/Thermal Treatment	Alternative 6 In Situ Biodegradation Treatment
F. Pennsylvania Safe Drinking Water Act	Applicable to current limited use and potential future use of groundwater as a potable water supply. Cites by reference federal SDWA standards.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.	Currently met for residential wells; Pittsburgh Coal and unconsolidated zone groundwater do not represent a realistic potential future potable water supply with public water readily available and proposed groundwater restrictions would prohibit such use.
II. Location-Specific							
A. Resource Conservation and Recovery Act 1. Siting Criteria for Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable if a TSD facility is set up on-site to manage removed RCRA hazardous waste. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. TCLP testing required to determine applicability.	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Will meet (if applicable)	Not Applicable

AR303223

Table 5-22

ARARs Compliance Summary (continued)

ARAR	Comments	Alternative 1 No Action	Alternative 2 Limited Action	Alternative 3 Closure	Alternative 4 Excavation/Off-site Landfill Disposal	Alternative 5 Excavation/Thermal Treatment	Alternative 6 In Situ Biodegradation Treatment
B. Pennsylvania Solid Waste Management Act 1. Siting Criteria for Hazardous Waste Treatment and Disposal Facilities.	Potentially applicable if a treatment and/or disposal facility is set up on-site to manage removed hazardous waste. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment. EP toxicity/TCLP testing required to determine applicability.	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Will meet (if applicable)	Not Applicable
C. Clean Water Act 1. Dredge or Fill Requirements.	Limited wetlands have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.	Not Applicable	Not Applicable	Wetlands Survey specified to determine applicability.	Wetlands Survey specified to determine applicability.	Wetlands Survey specified to determine applicability.	Wetlands Survey specified to determine applicability.
D. Executive Order on Protection of Wetlands	Limited wetlands have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.	Not Applicable	Not Applicable	Wetlands survey specified to determine applicability.	Wetlands survey specified to determine applicability.	Wetlands survey specified to determine applicability.	Wetlands survey specified to determine applicability.

Table 5-22

ARARs Compliance Summary (continued)

ARAR	Comments	Alternative 1 No Action	Alternative 2 Limited Action	Alternative 3 Closure	Alternative 4 Excavation/Off-site Landfill Disposal	Alternative 5 Excavation/Thermal Treatment	Alternative 6 In Situ Biodegradation Treatment
E. Pennsylvania Dam Safety and Waterway Management Act	Limited wetland areas have been tentatively identified at the site. Potentially applicable to remedial actions which may require filling of wetlands.	Not Applicable	Not Applicable	Wetlands survey specified to determine applicability.	Wetlands survey specified to determine applicability.	Wetlands survey specified to determine applicability.	Wetlands survey specified to determine applicability.
III. **Action-Specific**							
A. Resource Conservation and Recovery Act 1. Standards Applicable to Generators of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)

AR303226

Table 5-22

ARARs Compliance Summary (continued)

ARAR	Comments	Alternative 1 No Action	Alternative 2 Limited Action	Alternative 3 Closure	Alternative 4 Excavation/Off-site Landfill Disposal	Alternative 5 Excavation/Thermal Treatment	Alternative 6 In Situ Biodegradation Treatment
2. Standards Applicable to Transporters of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)
3. Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed wastes which qualify as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP prior testing required to determine applicability.	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Will meet (if applicable)	Not Applicable
4. Standards for the Management of Specific Hazardous Waste and Specific Types of Hazardous Waste Management Facilities.	Potentially applicable to remedial actions involving reclamation of recyclable waste which qualify as hazardous under RCRA. May apply to recovered non-aqueous product. TCLP testing required to determine applicability.	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)

Table 5-22

ARARs Compliance Summary (continued)

ARAR	Comments	Alternative 1 No Action	Alternative 2 Limited Action	Alternative 3 Closure	Alternative 4 Excavation/Off-site Landfill Disposal	Alternative 5 Excavation/Thermal Treatment	Alternative 6 In Situ Biodegradation Treatment
5. Land Disposal Restrictions.	Potentially applicable to remedial actions involving removal of waste which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. TCLP testing required to determine applicability.	Not Applicable	Not Applicable	Not Applicable	Will meet (if applicable)	Will meet (if applicable)	Not Applicable
B. Pennsylvania Solid Waste Management Act - Residual (Non-Hazardous Solid) Waste Management	Applicable to remedial actions involving removal of solid wastes that qualify as residual wastes. Not applicable to wastes remaining in-place as placement occurred prior to regulatory enactment.	Not Applicable	Not Applicable	Not Applicable	Will meet (if applicable	Will meet (if applicable	Not Applicable
C. Pennsylvania Solid Waste Management Act - Hazardous Waste Regulations 1. Standards Applicable to Generators of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)

Table 5-22

ARARs Compliance Summary (continued)

ARAR	Comments	Alternative 1 No Action	Alternative 2 Limited Action	Alternative 3 Closure	Alternative 4 Excavation/Off-site Landfill Disposal	Alternative 5 Excavation/Thermal Treatment	Alternative 6 In Situ Biodegradation Treatment
2. Standards Applicable to Transporters of Hazardous Waste.	Potentially applicable to remedial actions involving removal of waste (including leachate) which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)
3. Standards of Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities.	Potentially applicable to remedial actions utilizing on-site TSD units to manage removed waste which qualifies as hazardous under RCRA. Not applicable to wastes remaining in-place as placement occurred prior to RCRA enactment. EP Toxicity/TCLP testing required to determine applicability.	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Will meet (if applicable)	Not Applicable
4. Standards for the Management of Specific Hazardous Waste and Specific Types of Hazardous Waste Management Facilities.	Potentially applicable to remedial actions involving reclamation of recyclable wastes which qualify as hazardous under RCRA. May apply to recovered non-aqueous product. EP Toxicity/TCLP testing required to determine applicability.	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)	Will meet (if applicable)

Table 5-22

ARARs Compliance Summary (continued)

ARAR	Comments	Alternative 1 No Action	Alternative 2 Limited Action	Alternative 3 Closure	Alternative 4 Excavation/Off-site Landfill Disposal	Alternative 5 Excavation/Thermal Treatment	Alternative 6 In Situ Biodegradation Treatment
D. Occupational Safety and Health Act	Applicable to remedial actions (including monitoring) at hazardous waste sites.	Will meet	Will meet	Will meet	Will meet	Will meet	Will meet
E. Hazardous Materials Transportation Act 1. Hazardous Materials Transportation Regulations.	Applicable to remedial actions involving transportation of DOT-defined hazardous materials off-site, including recovered non-aqueous product.	Will meet	Will meet	Will meet	Will meet	Will meet	Will meet
F. Clean Water Act 1. National Pollutant Discharge Elimination System (NPDES).	Applicable to remedial actions involving discharge to the unnamed site stream.	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2. National Pretreatment Standard.	Applicable to current discharge of aqueous fraction of treated leachate into local POTW.	Will meet	Will meet	Will meet	Will meet	Will meet	Will meet
G. Pennsylvania Clean Streams Law 1. Water Quality Management (WQM) Program.	Applicable to remedial actions involving point source discharges to surface waters.	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2. Wastewater Treatment Requirements.	Applicable to remedial actions involving point source discharges.	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

Table 5-22

ARARs Compliance Summary (continued)

ARAR	Comments	Alternative 1 No Action	Alternative 2 Limited Action	Alternative 3 Closure	Alternative 4 Excavation/Off-site Landfill Disposal	Alternative 5 Excavation/Thermal Treatment	Alternative 6 In Situ Biodegradation Treatment
3. Industrial Wastes.	Applicable to remedial actions involving point source discharges.	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4. Erosion Control.	Applicable to remedial actions involving earth moving.	Not Applicable	Not Applicable	Will meet	Will meet	Will meet	Will meet
H. Pennsylvania Dam Safety and Waterway Management Act							
1. Outfall Structures.	Applicable to remedial actions involving point source discharges to streams.	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
I. WEZA Pretreatment Effluent Limitations	Applicable; aqueous portion of leachate currently being discharged in accordance with the effluent limitations agreement.	Will meet	Will meet	Will meet	Will meet	Will meet	Will meet
J. Pennsylvania Stormwater Management Act	Applicable to remedial actions requiring stormwater management.	Not Applicable	Not Applicable	Will Meet	Will Meet	Will Meet	Will Meet
K. Allegheny County Stormwater Management Regulations	Applicable to remedial actions requiring stormwater management.	Not Applicable	Not Applicable	Will meet	Will meet	Will meet	Will meet

Table 5-22

ARARs Compliance Summary (continued)

ARAR	Comments	Alternative 1 No Action	Alternative 2 Limited Action	Alternative 3 Closure	Alternative 4 Excavation/Off-site Landfill Disposal	Alternative 5 Excavation/Thermal Treatment	Alternative 6 In Situ Biodegradation Treatment
L. Safe Drinking Water Act							
1. Underground Injection Control (UIC) Regulations.	Applicable to remedial actions involving reinjection of groundwater or injection of treatment chemicals	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Will meet
M. Clean Air Act							
1. New Source Performance Standards (NSPS).	Applicable to remedial actions involving incineration	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Will meet	Not Applicable
N. Pennsylvania Air Pollution Control Act							
1. Standards for Contaminants.	Applicable to remedial actions involving air emissions, principally incineration.	Will meet	Will meet	Will meet	Will meet	Will meet	Will meet
2. New Source Performance Standards.	Applicable to remedial actions involving incineration.	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Will meet	Not Applicable
3. Standards for Sources of VOCs.	Applicable to remedial actions utilizing storage tanks for VOC-containing wastes.	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

Table 5-22

ARARs Compliance Summary
(continued)

ARAR	Comments	Alternative 1 No Action	Alternative 2 Limited Action	Alternative 3 Closure	Alternative 4 Excavation/Off-site Landfill Disposal	Alternative 5 Excavation/Thermal Treatment	Alternative 6 In Situ Biodegradation Treatment
G. ACHD Air Pollution Control Regulations							
1. Air Emission Standards.	Applicable to remedial actions producing air emissions, principally incineration.	Will meet	Will meet	Will meet	Will meet	Will meet	Will meet
2. Waste-Derived Liquid Fuel Standards.	Applicable to current practice of utilizing recovered non-aqueous product as a fuel under ACHD permit.	Will meet	Will meet	Will meet	Will meet	Will meet	Will meet
3. New Source Performance Standards.	Applicable to remedial actions involving incineration.	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Will meet	Not Applicable
4. Standards for Sources of VOCs.	Applicable to remedial actions utilizing storage tanks for VOC-containing wastes.	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

It should be noted that under each alternative, the TBC criteria/guidance of Pennsylvania's groundwater remediation policy (cleanup to background or non-detectable levels) identified under Subsection 2.6 will not be met. However, as provided for in the policy statement, an evaluation is put forth under Appendix A indicating the technical infeasibility of meeting the background/non-detect criteria. In any event, as TBCs are not ARARs, not meeting this TBC does not affect the remedial alternative evaluation criteria of ARAR compliance.

5.3.2 Short-Term Effectiveness

This evaluation criterion involves consideration of community and site personnel protection and environmental impacts during implementation of remedial actions.

As Alternative 1 involves no further remedial action, this criterion is not applicable. As Alternative 2 involves limited institutional-based remedial action, implementation would not entail significant adverse human or environmental impacts. Therefore, Alternative 2 is judged as exceeding this evaluation criterion. It should be noted that this judgement is strictly based on the limited nature of remedial action involved in implementing this alternative.

Comparative analysis of the remaining four alternatives indicated that:

- Alternative 6 offers a moderate relative degree of short-term effectiveness. The non-intrusive nature of the in-situ biodegradation remedial action proposed is conducive to minimizing short-term impacts. However, due to the high concentrations involved, particularly in the waste material, biological treatment is likely to be an extended process. Thus, the potential for undesirable impacts increases with extended treatment requirements. In addition, it is possible that microbial activity may mobilize sorbed contaminants. This can lead to potential impacts if not properly controlled via recovery and/or interception. Overall, this alternative was judged as meeting the evaluation criterion.

- Alternative 3 offers a high relative degree of short-term effectiveness. As the alternative does not involve intrusive activities into the landfill, little if any implementation impacts will occur with respect to waste material concerns. Overall, this alternative was judged as exceeding the evaluation criterion.

- Alternatives 4 and 5 offer a low relative potential degree of short-term effectiveness due to the intrusive activities into the waste material proposed under this alternative. Concerns center around potential fugitive air emissions of volatile organic compounds from unearthed waste materials, heavy truck traffic impacts, local residential area impacts, and safety concerns with respect to material transport to an off-site disposal facility (Alternative 4) or to the local Hercules plant for treatment by a transportable incinerator (Alternative 5). Both alternatives were judged to have major limitations associated with the short-term effectiveness evaluation criterion.

5.3.3 Long-Term Effectiveness and Permanence

This evaluation criterion involves consideration of the long-term effectiveness and performance of the alternative once it has been implemented. The evaluation focuses on defining the extent and effectiveness (adequacy and reliability) of the controls that may be required to manage the residual risk remaining from untreated waste and/or treatment residues.

Comparative analysis of the six alternatives indicated the following:

- Alternatives 1 and 2 provided the lowest degree of long-term effectiveness and permanence since, with the exception of leachate collected, treated, and removed from the site by the engineered remedial system in place, all waste materials and associated contaminated media will remain at the site untreated. Therefore, both alternatives were judged as having potential limitation with respect to this evaluation criterion.

- Alternative 3 offers a moderate degree of long-term effectiveness and permanence. Although treatment of the waste and/or contaminated media is not proposed (other than landfill leachate), engineered controls would be utilized to manage the waste and contaminated media on-site. This would include continued collection of leachate via the interceptor trench and potentially through skimmer-type recovery wells. Long-term maintenance and site monitoring would be required, along with the use of institutional controls such as deed restrictions. Overall, this alternative was judged as meeting the evaluation criterion.

- Alternatives 4, 5, and 6 offer the highest degree of long-term effectiveness and permanence. All three alternatives result in minimal waste remaining at the site, thereby minimizing monitoring, maintenance, and institutional control requirements. Alternative 4 minimizes remaining site contaminants through physical removal of targeted materials, Alternative 5 through thermal destruction of the organic contaminants of concern (residuals would consist of organic-free ash material which would be backfilled on-site), and Alternative 6 through biological degradation/detoxification of waste constituents. It should be noted that the level of treatment achievable under Alternative 6 is not known at this time. Treatability testing is required to more accurately define achievable treatment levels. The ability to treat in-place a highly variable waste and soil material matrix in the landfill must also be demonstrated. (This is considered further under the implementability evaluation criterion.) Overall, all three alternatives were judged as exceeding this evaluation criterion.

5.3.4 Overall Protection of Human Health and the Environment

This evaluation criterion involves consideration of the overall protection of human health and the environment. The overall assessment of protection draws on the assessments conducted for other evaluation criteria, particularly long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

Comparative analysis of the six alternatives indicated the following:

- Alternatives 1 and 2 offer the lowest degree of overall protection. Alternative 1, no action, can be quantitatively evaluated through the baseline risk assessment presented in Part II of the Site Report. The baseline RA results indicated potential concerns with carcinogenic human health risks and ecological risks (based on potential chronic toxicity identified for aquatic invertebrates in the unnamed site stream). Alternative 2, limited action, seeks to reduce human health risks via access restrictions to limit potential future exposure of human receptors. However, as with the no action alternative, remediation via containment and/or treatment is not proposed under this alternative. Overall, both alternatives were judged as having potential limitations with this evaluation criterion.

- Alternatives 4 and 5 also offer a relatively low degree of overall protection. This determination was arrived at due to short-term effectiveness concerns relative to intrusive excavation of waste material present in the landfill (fugitive VOC emissions, heavy truck traffic impacts, local residential area impacts, and safety concerns with respect to material transfer to either a disposal facility or to the local Hercules plant). Long-term effectiveness and permanence benefits relative to physical material removal (Alternative 4) or thermal destruction of organics (Alternative 5) are tempered due to the fact that the existing landfill cap already prevents direct waste contact and the baseline RA did not indicate a current significant or substantial human health risk. Therefore, the potential exists that Alternatives 4 and 5, which involve waste material excavation, may offer less overall protection of human health and the environment than the no action alternative. Overall, both alternatives 4 and 5 were judged as having major limitations with respect to the evaluation criterion.

- Alternatives 3 and 6 both offer a high degree of overall protection. Alternative 3 offers protection via engineered controls to upgrade the existing landfill unit to address the potential contaminant pathways via effective containment of waste materials. Alternative 6 offers protection via non-intrusive treatment of waste materials and contaminated soils. A major advantage of both alternatives is the fact that neither proposes any intrusive actions into the high concentration waste material present in the landfill. Overall, both alternatives were judged as exceeding this evaluation criterion.

5.3.5 Reduction of Toxicity, Mobility, and Volume of Contaminants

Consideration of this evaluation criterion is a result of recent statutory preference for selecting remedial actions that permanently and significantly reduce the toxicity, mobility, and volume of the contaminants and associated media. Comparative analysis of the six alternatives indicated the following:

- Alternatives 1 and 2 offer the lowest degree of contaminant reduction. Under both alternatives, the current in-place leachate collection/treatment system provides for limited reduction of contaminant mobility and volume via effectively capturing landfill leachate migrating into downslope soils for subsequent treatment. However, the landfilled waste material will remain in place under both alternatives and other potential migration pathways (i.e., the Pittsburgh Coal) and are not addressed under either alternative. Overall, both alternatives were judged as not meeting this evaluation criterion.

- Alternative 3 offers a moderate degree of contaminant reduction. Contaminant reduction is achieved mainly via reduction in mobility. This is accomplished via landfill capping and use of leachate recovery systems to address contaminant migration via downslope soils and the Pittsburgh Coal. Recovered leachate will be treated, representing toxicity/volume reduction. Overall, this alternative is judged as meeting the contaminant reduction criterion.

- Alternatives 4, 5, and 6 offer the highest degree in contaminant reduction at the site. These alternatives achieve contaminant reduction via toxicity and/or volume reduction. Alternative 4 offers near complete volume reduction via physical removal of waste material from the site. Alternative 5 virtually eliminates toxicity concerns via thermal destruction of organic contaminants present in targeted materials (residuals would consist of organic-free ash material). Alternative 6 offers toxicity reduction via biodegradation/detoxification of organics present in targeted materials.

  It should be noted that the level of treatment achievable under Alternative 6 is not completely known at this time. Treatability testing is required to more accurately define achievable treatment levels. (This is considered further under the implementability evaluation criterion.) Overall, all three alternatives were judged as exceeding this evaluation criterion.

5.3.6 Implementability

This criterion establishes the technical and administrative feasibility of implementing an alternative. As Alternative 1 involves no further remedial action, this criterion is not applicable. As Alternative 2 involves limited institutional-based remedial action, implementation would not entail significant efforts. Therefore, Alternative 2 is judged as exceeding this evaluation criteria. It should be noted that this judgement is strictly based on the limited nature of action involved in implementing this alternative.

Comparative analysis of the remaining four alternatives indicated the following:

- Alternative 3 (closure) offers a relatively high degree of implementability. Under this alternative, the existing landfill unit is utilized with upgrading provided by a multilayer cap system and leachate recovery systems (interceptor trench for downslope soils and a potential skimmer-type recovery well network for the Pittsburgh Coal) to address identified potential contaminant migration pathways. Overall, this option was judged as exceeding the evaluation criterion.

- Alternatives 4 and 5 offer a relatively low degree of implementability. Concerns with this alternative center on excavation of targeted materials with subsequent transport to an off-site disposal facility (Alternative 4) or to the local Hercules plant for treatment by a transportable incinerator (Alternative 5). Based on a worst case scenario with respect to targeted materials (92,000 yd^3), this would involve transport of approximately 4,500 20-yd^3 loads. This would involve significant impacts on the local road network and raise safety concerns with material transport. Additional concerns are raised with respect to the ability to excavate the landfill and adequately address air quality concerns. Overall, both alternatives were judged to have major limitations associated with this evaluation criterion.

- The implementability of Alternative 6 cannot be adequately evaluated without a treatability study. Concerns were raised in regard to the high contaminant concentrations present in the waste material, the biodegradation rate for BNA compounds such as naphthalene, and the waste/soil matrix. These factors will all affect the rate and effectiveness of in situ biodegradation proposed under this alternative. In addition, there is some uncertainty with respect to the ability to treat in-place a highly variable waste/soil mixture in the landfill. In general, the organic waste constituents present at the site are biodegradable under appropriate conditions. However, based on the concerns cited, implementability for this alternative was judged to have potential major limitations, pending further investigation.

5.3.7 Cost

A present worth analysis for the cost evaluation utilizes a discount rate of 5% as recommended under the Superfund Program. A uniform gradient factor of 5% was also applied to account for inflationary effects. The cost estimates presented in Table 5-21 are order-of-magnitude (+50 to -30%) level estimates. These costs are based on a variety of information, including estimates from suppliers, engineering and technical analysis unit costs, construction unit costs, vendor information, conventional cost estimating guides, and prior experience. The Feasibility Study-level cost estimates shown have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The actual costs of the project will depend on true labor and material costs, actual site conditions, competitive market conditions, final project scope, implementation schedule, and other variable factors. A significant uncertainty that would affect the cost is the actual volume of contaminated materials. Most of these uncertainties would similarly affect all of the costs presented in this Feasibility Study.

5.3.8 Analysis Summary

As noted in Table 5-21, Alternative 3, Closure is the only alternative noted as meeting or exceeding each of the non-cost evaluation criteria. All other alternatives considered were found to not meet and/or have potential limitations with at least one of the non-cost evaluation criteria.

APPENDIX A

FEASIBILITY EVALUATION FOR REMEDIATION OF GROUNDWATER AT THE PICCO RESIN LANDFILL SITE

In order to evaluate the feasibility for remediation of affected groundwater in the site area, the following areas of concern are individually addressed below:

- Exploratory Drilling Program
- Hydraulic Conditions
- Recovery/Treatment System Requirements
- Potential Mine Subsidence
- Natural Remediation Processes

During this feasibility evaluation, the mechanics of groundwater recovery from existing mine voids in the Pittsburgh Coal (the primary site concern with respect to groundwater) was evaluated. The following assumptions were made as part of this evaluation:

- The Pittsburgh Coal mine voids located in the site area are hydraulically connected.

- Coal left in place (in the form of pillars or barrier walls) has minimal influence on water movement within the mine. Mine voids are assumed to be interconnected by mine drifts, or other types of mine openings.

- The Pittsburgh Coal underclay is continuous and acts as an impermeable layer below the Pittsburgh Coal groundwater.

- Recognized mining methods of the time (room and pillar mining) typically resulted in 50% of the coal being left in place as pillars.

- The area of the dissolved phase plume, calculated from the approximate extent of dissolved phase contamination shown on Figure A-1, is estimated to be 1.3 million square feet.

- Groundwater present in the mine pool is approximately three feet deep.

A.1 Exploratory Drilling Program

In order to remediate the existing groundwater contamination in the Pittsburgh Coal to background levels, it would be necessary to implement an exploratory drilling program throughout the area of the dissolved plume (Figure A-1) in order to define the locations of mine voids, pillars, barriers and rubble piles. An excavation of a mined area of the Pittsburgh Coal seam upgradient (updip) of the site showed that coal pillars averaged 17 feet wide and 53 feet long with entries approximately 19 feet wide (Irani, et al., 1983-86). Assuming that the dimensions above are representative of the mine workings downgradient of the site, an exploratory drilling program, implemented to determine the locations of pillars with a 95% probability (for each pillar), would require 820 exploratory boreholes on a grid spacing of 40 feet within the area of the plume which is estimated to be approximately 1.3 million square feet. This does not infer that this grid would result in the location of 95% of all pillars. The probability of this would be much lower with the same grid spacing. Most of the borings would need to be drilled in residential areas which would negatively affect residents' lives, cause significant damage to the surface environment, and could affect real estate values.

In order to attempt to recover the dissolved phase plume, two lines of closely-spaced recovery wells, one near the leading edge of the plume and one in the area of the downgradient site property boundary, would be necessary. Additional recovery wells between the two rows of recovery wells would likely be necessary in order to optimize hydraulic control and attempt to recover the entire dissolved phase plume. Figure A-1 shows the conceptual plan for groundwater recovery in the Pittsburgh Coal.

A.2 Hydraulic Conditions

Since pumpage of groundwater from interconnected mine pools involves significantly different hydraulic conditions than groundwater pumpage from porous media, it was necessary to calculate the dimensionless Reynolds number (Re) in order to determine if a cone of depression would be generated at different pumping rates. The Reynolds number is a function of the velocity of the fluid, the diameter of the conduit through which flow is occurring and the kinematic viscosity of the

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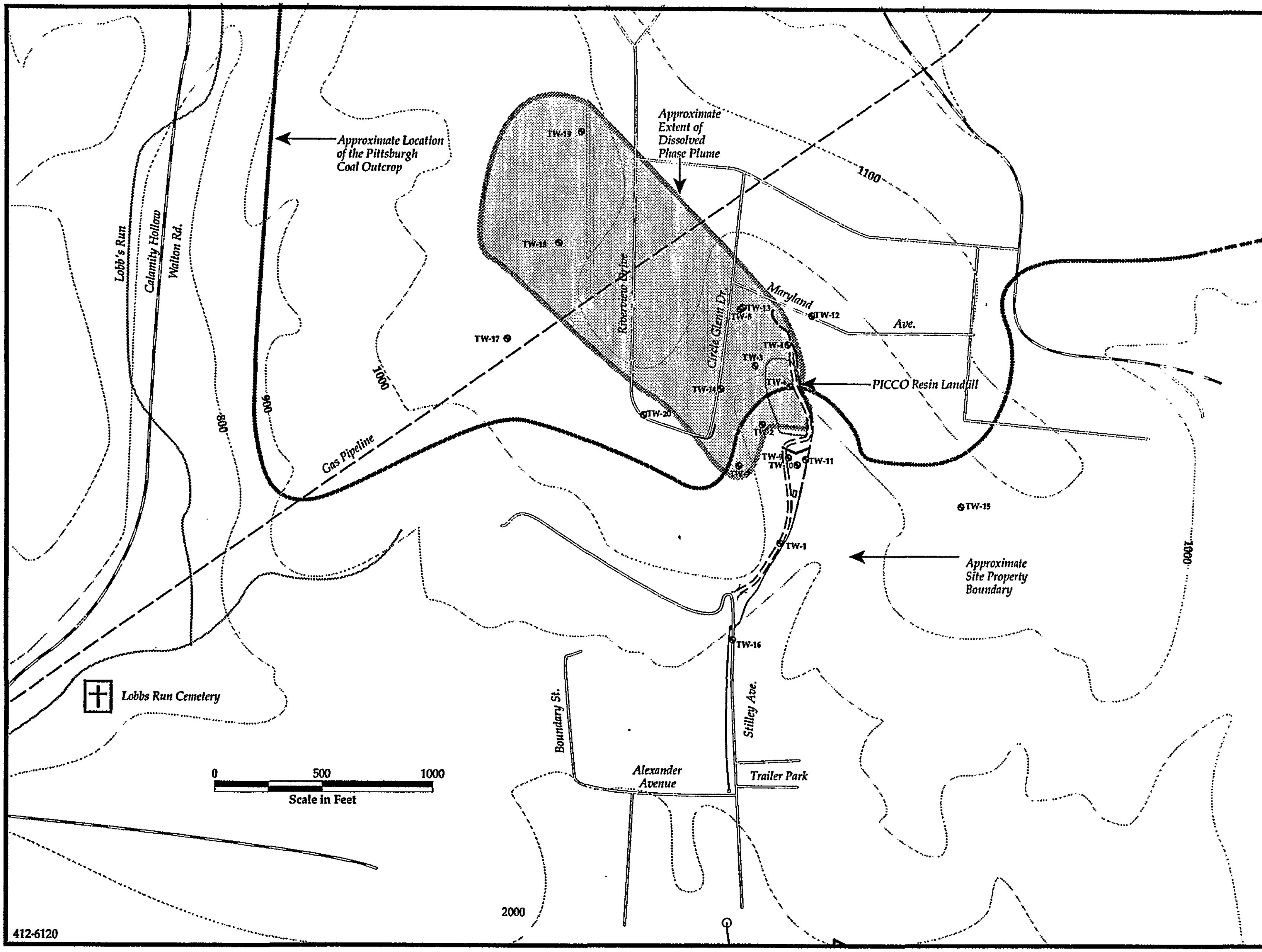

Figure A-1 Approximate Extent of Dissolved Phase Plume, PICCO Resin Landfill

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fluid. Reynolds number is represented by the following equation:

$$Re = \frac{VD}{v}$$

where:

> Re = Reynolds number (dimensionless)
> V = Velocity of the fluid (ft/min)
> D = Diameter of the conduit (ft)
> v = kinematic viscosity of the liquid (ft^2/min)

For the purpose of this evaluation, it was assumed that a twelve-inch diameter (0.79 square foot cross-sectional area) well would be installed to create a sump below the bottom of the Pittsburgh Coal in order to recover the mine pool water. Additionally, the kinematic viscosity of the mine pool water was taken as equal to that for uncontaminated water, 7.8×10^{-4} square feet per minute. The velocity of the water was determined by dividing the assumed flow rate by the cross-sectional area of the recovery well. Three different pumping rates, 5 gallons per minute (GPM), 50 GPM and 100 GPM (equivalent to 0.67, 6.7 and 13.3 cubic feet per minute) were evaluated. The calculations resulted in Reynolds numbers for the three pumping rates, of 1082, 10,820 and 21,641, respectively. A Reynolds number of less than 2,100 indicates that flow is laminar rather than turbulent. Therefore, flow at pumping rates of 50 GPM or higher will result in turbulent flow within the recovery well and may generate a cone of depression in an open mine void.

A capture zone analysis was conducted for the Pittsburgh Coal using an equation developed by Keely and Tsang (1983) for the determination of null points adjacent to pumping wells in an isotropic homogeneous porous medium. This analysis provides a conservative estimate concerning the potential drawdown which may occur if the presence of coal pillars and collapsed roof rock are affecting groundwater flow. For this calculation it is assumed that groundwater recovery from mine voids would be partially controlled by coal or collapsed rubble, and that the movement of groundwater would be similar to groundwater flow in a karst geologic setting. The capture zone equation is:

$$x = \frac{Q}{2\pi\, bKI}$$

where:

- R = Radius of the capture zone
- Q = Pumping discharge rate
- b = Saturated thickness of the aquifer
- K = Hydraulic Conductivity
- i = Hydraulic Gradient

For the Pittsburgh Coal, the following values were used to estimate the capture zone within mine voids:

- Q = 50 GPM, 100 GPM and 200 GPM
- b = 3 feet
- K = 13,400 ft/day (The upper range for cavernous carbonate rocks (Heath, 1982)
- i = 0.017 (Calculated from the Pittsburgh Coal groundwater flow map (WESTON RI Rpt., 1991).)

Based on the assumptions above, the following capture zones were estimated for different pumping rates within mine voids in the Pittsburgh Coal:

Table A-1
Capture Zone Summary

Pumping Rate	Estimated Capture Zone Diameter
50 GPM	4.5 feet
100 GPM	9.0 feet
200 GPM	18 feet

Due to the difficulty in creating a significantly large cone of depression in an environment with essentially open-channel flow, it will be very difficult or impossible to create a hydrologic barrier to groundwater flow in the Pittsburgh Coal. The lowering of the water table in the area of a recovery well field would be offset by recharge from adjacent areas. Even at a relatively close recovery well spacing of 50 feet, complete control and recovery of groundwater flow would not be attained, assuming complete interconnection of mine voids, due to the small cone of depression for each well. Some contaminated water would continue to move downgradient unless the well spacing was less than the diameter of the capture zone (4.5 feet at 50 GPM, 9 feet at 100 GPM, 18 feet at 200 GPM). The result of pumping two rows of closely spaced recovery wells at moderate to high pumping rates would be the recovery of some contaminants along with large volumes of uncontaminated groundwater from outside the plume boundary, which would be drawn into the recovery well field from areas crossgradient and upgradient of the plume. A recovery well field in which the leading edge recovery well row and the upgradient recovery well row were installed at a 50 foot spacing, would result in 40 to 70 recovery wells, depending on the number of recovery wells between the two rows which were necessary to optimize the system.

It would be necessary, after the start-up of any recovery well field in the Pittsburgh Coal mineworks, to modify the pumping rates based on system performance. If coal barrier walls or significant zones of collapsed roof material are present, it would probably be necessary to pump certain recovery wells at very low rates in order to avoid pumping of isolated areas dry. If the presence of barrier or collapse piles are prevalent throughout the area of the plume the pumping rate for the entire recovery well field may be an order of magnitude or more lower than the scenario described above. Any decrease in the well field pumping rate due to low sustainable yields will cause a corresponding decrease in the effectiveness of well field to capture contaminated groundwater.

Due to the large lateral extent of the Pittsburgh Coal upgradient and crossgradient of the dissolved phase plume (estimated to be approximately 1.8 square miles), there is an extremely large volume of water available to flow into the recovery field area and dilute contaminants being recovered. It is estimated that approximately 500 million gallons of water would be present within the existing Pittsburgh Coal mineworks upgradient and crossgradient from the plume. This figure assumes that three feet of groundwater is present in the Pittsburgh Coal and that 50 percent of the Pittsburgh Coal has been removed from this area. This estimate does not consider groundwater recharge to the Pittsburgh Coal from the overlying rock and soil which would be a function of precipitation and infiltration and would provide additional water which would be available to flow into the recovery well field.

A.3 Recovery/Treatment System Requirements

As previously discussed, a two-row recovery well field set at a relatively close spaced of 50 feet per well would result in 40 to 70 recovery wells, depending upon the number of recovery wells required between the two wells. If such a well field were installed and operated at a pumping rate of 50 GPM per well, there would be approximately 2,000 to 3,500 GPM (or 3 million to 5 million gallons of groundwater per day) which would need to be treated.

A preliminary groundwater treatment schematic is provided in Figure A-2. Extensive three-phase treatment would be required which would involve the following sequential steps:

- Oil and Suspended Solids Removal - In this initial treatment step, an oil/water separator would be utilized to separate out "oil" (non-aqueous product) present in the recovered groundwater. The oil would be reclaimed as a fuel in the local Hercules plant boilers under the existing ACHD permit. The separator can also serve to remove suspended solids as a bottom sludge from the separator. To prevent uncontrolled air releases of volatile organic compounds, the oil/water separator utilized would be a self-enclosed system.

- Iron, Manganese, and Sulfide Removal - Prior to treatment for organic removal, iron and manganese will need to be removed to prevent potential fouling of the air stripping column and granular activated carbon (GAC) unit. Total iron levels ranging from 0.7 to 189 mg/L were noted in groundwater samples from the Pittsburgh Coal, while total manganese levels varied from 0.2 to 4.5 mg/L. Fouling of stripper columns and/or GAC units becomes a concern at total iron and manganese levels above 1 to 5 mg/L. Removal of iron and manganese involves oxidation to produce precipitants which are subsequently removed in a filtration or clarification step.

  Oxidation can be performed via either chemical or air addition. Air addition, as typically practiced in an open-tower type aerator, is not applicable as volatile organics would be released in an uncontrolled fashion. Chemical addition involves one of oxidants, principally chlorine or potassium permanganate. Chlorine would be a preferable choice as in addition to iron and manganese oxidation, it will provide for oxidation of odorous sulfides to non-odorous sulfates, and will provide disinfection action to minimize potential biological growth in subsequent treatment phases. Removal of oxidized precipitants can be performed either via filtration or clarification. Due to the high iron levels present, direct filtration of the resultant precipitant is likely not viable. Instead, a clarification unit, such as a lamella separator, would be more appropriate.

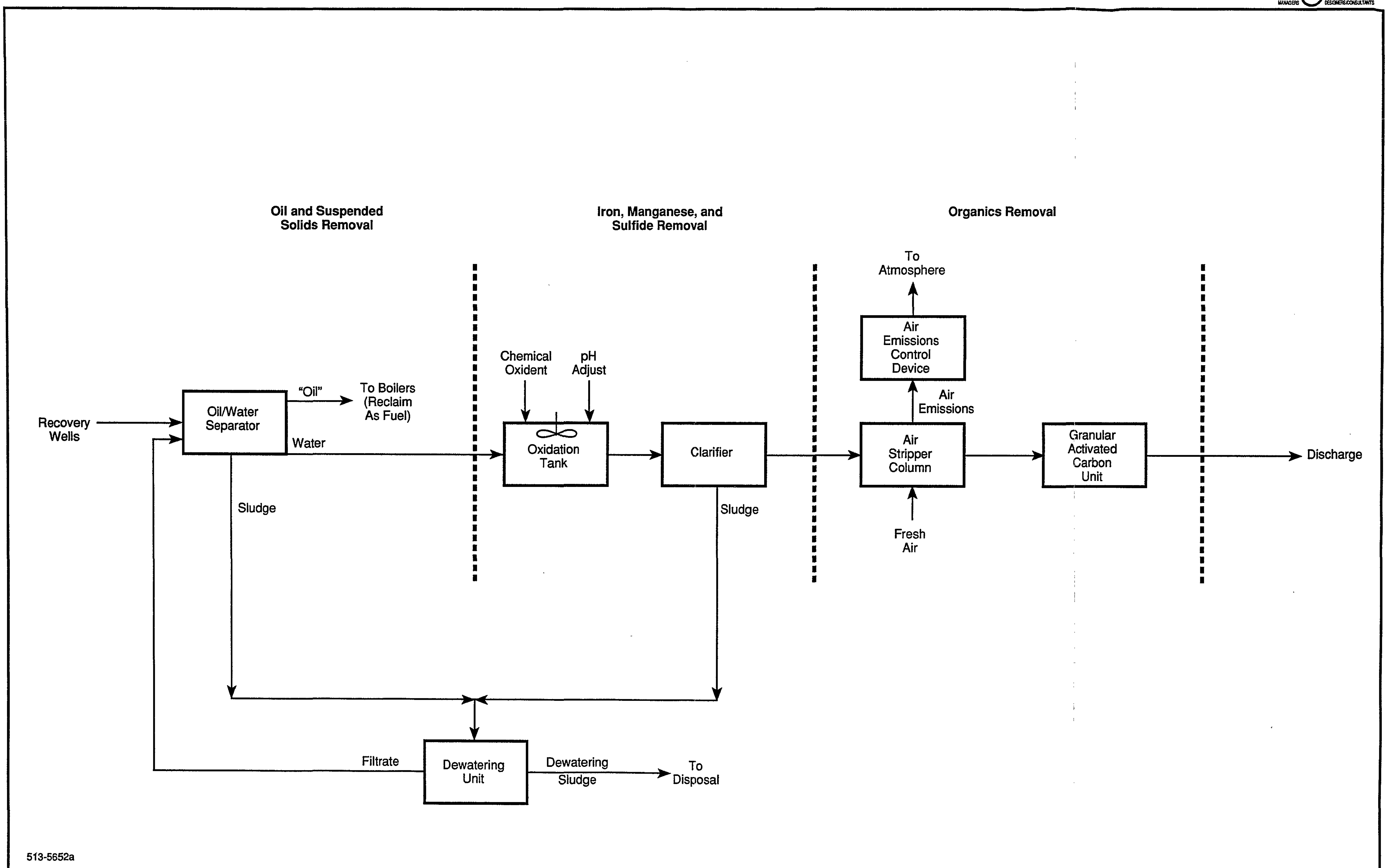

FIGURE A-2 PRELIMINARY GROUNDWATER TREATMENT SCHEMATIC

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- Organics Removal - In this final step, organics (principally BTEX and PAH compounds) would be removed via a packed-bed air stripping column (principally for removal of volatile organics such as BTEX) followed by a GAC unit (principally for removal of less volatile PAH compounds). This air stripping step would result in air emissions which would need to be treated by an emissions control device (such as vapor-phase GAC or a thermal oxidizer) prior to release to the atmosphere.

From this treatment train, the following residual streams will be produced requiring disposal:

- Sludge removed from the oil/water separator and from the clarifier unit will, after dewatering to remove excess water, require disposal. Depending upon the results of TCLP testing of the sludge, it may require disposal as a RCRA hazardous waste. A significant amount of sludge would be expected to be produced from this treatment train.

- Spent GAC (liquid-phase and potentially vapor-phase) will require periodic disposal.

It would also be necessary to either reinject the treated groundwater into the mine voids or discharge the water to a surface water body. Discharge to either the small unnamed site stream or to the local POTW would probably not be possible due to the large flow.

This type of groundwater recovery system would involve a large network of piping and pumping stations as well as a groundwater treatment plant near the residential area above the existing plume. In addition to the installation and operation of such a system, it would also be necessary to perform regular maintenance on the recovery wells in order to maintain the efficiency of the recovery system and to prevent fouling of pumps and wells by bacteria and inorganic precipitates, particularly iron. Given the natural poor quality of groundwater in coal seams (high in dissolved solids and metals), an intensive maintenance program would be required.

A.4 Potential Mine Subsidence

Another potential problem which could be created by active groundwater recovery from the Pittsburgh Coal is the possibility of inducing mine subsidence which could negatively impact the residential area above the mined coal. If significant dewatering of the coal mine occurs, causing the water level in the mine to reach a level below the mean annual low water level, the reduction in the confining pressure of the water on coal pillars may cause a decrease in pillar strength. This could cause slumping of weathered coal from the sides of pillars and possibly failure of the pillars which support the roof rock. It is also possible, however, that the drainage of pores in the coal pillars resulting from lowering of the water table would have a strengthening effect which would override the decrease in strength resulting from the decrease in confining pressure. Pilot tests would be necessary to evaluate the interaction between these two variables and to determine the potential for subsidence to be induced by a groundwater recovery system.

A.5 Natural Remediation Processes

Aquifers with high organic carbon content and/or high percentages of clay minerals are more adsorbent and tend to retain contaminants longer than aquifers with low organic carbon or clay content (USEPA, 1989). Based on these criteria, the Pittsburgh Coal should have an excellent adsorptive capacity since the groundwater in the coal is flowing through three types of geologic material types. These materials, in the order of increasing hydrologic significance, are:

1. Coal (composed primarily of organic carbon);

2. Collapsed rock overburden (composed of carbonaceous shale which is an organic, clay-rich sedimentary rock) and;

3. The "underclay" below the coal (composed of 90% - 100% clay minerals).

Research related to BNA and VOC contamination of groundwater in coal seams, caused by underground coal gasification (UCG) tests, indicates that natural processes are a potentially significant mechanism for the removal of organic compounds from groundwater (Humenick et al., 1982). The processes to which reductions in organic concentrations are attributed include biodegradation and adsorption of organic chemicals to coal. Research related to the coal adsorption phenomena indicate that coal can adsorb many types of organic compounds including phenol, naphthalene and benzene (Humenick et al., 1982 and 1987), which are compounds of concern in the groundwater at the PICCO site.

Based upon the relatively high seepage velocity of 56.8 feet per day calculated for the Pittsburgh Coal in the site area (WESTON, March 1991) and the fact that seep samples downgradient of the plume generally did not detect landfill related constituents, it is assumed that the organic contaminants downgradient of the site are being adsorbed by the coal left in place and biodegraded at a rate which has allowed natural restoration of the groundwater to occur. This attenuation of the dissolved phase organic constituents by biodegradation and adsorption to coal has apparently resulted in a contaminant plume which is assumed to be at dynamic equilibrium. In other words, it is likely that movement of the leading edge of the plume further downgradient is not occurring due to natural processes which remove these trace levels of contaminants from the groundwater. An ongoing monitoring program for the downgradient seeps is necessary to confirm this condition.

A.6 Summary

Research has indicated that restoration of groundwater to background conditions is very difficult and sometimes impossible. In 19 case studies documented by USEPA, only two of the sites appeared to be approaching aquifer restoration (USEPA, 1989). These two sites are in relatively simple hydrogeologic settings and the adequacy of the site characterization is questionable (USEPA, 1989). In a complex hydrogeologic environment, such as the mined Pittsburgh Coal, many factors work against of groundwater by pump and treat methods restoration. These include the problems with establishing a capture zone (discussed above), desorption of chemical constituents from the coal and clay and the existence of free phase product within the mine voids. In one of the USEPA case studies, for example, contaminant concentrations decreased during a six year pump and treat program, from in excess of 15 ppm total VOC to less than 0.1 ppm total VOC. After the recovery system was turned off, however, the contaminant concentrations steadily increased to concentrations in excess of the initial maximum concentrations, apparently due to the presence of free phase product and desorption of contaminants from the aquifer (USEPA, 1989).

This case study illustrates the problems in attempting complete aquifer restoration in a complex aquifer with free phase product. These data indicate that plume containment and contaminant mass reduction are more realistic (and attainable) objectives in complex hydrogeologic settings such as mined the Pittsburgh Coal aquifer.

In addition to the technical difficulty of attempting to recover groundwater from open mine voids, the installation of literally hundreds of exploratory borings and over 50 recovery wells and the maintenance of such an extensive well field would have a significant negative ecological impact upon surface environment in the residential area downgradient of the site.

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Even if it were technologically feasible to remove the organic contaminants from the groundwater, the background quality of the Pittsburgh Coal groundwater is very poor and the groundwater would not make a suitable water supply source without treatment. The Pittsburgh Coal groundwater in the background well TW-15 exceeds federal primary or secondary drinking water standards for four parameters. These parameters are aluminum, chromium, iron and manganese which, with the exception of chromium, exceed the federal drinking water standards by more than an order of magnitude. Table A-2 summarizes the background concentrations of these metals detected in monitoring well TW-15 and the federal maximum contaminant level (MCL) or secondary maximum contaminant level (SMCL) for each parameter. The SMCLs are non-enforceable standards which are generally not designed to be protective of human health but rather to measure the aesthetic quality of water (i.e., odor and color). The MCLs are enforceable regulatory standards designed to be protective of human health. Chromium is classified as a known human carcinogen (Federal Register 56:3527; 30 January, 1991) for which the MCL is exceeded in well TW-15. This information indicates that the background quality of the Pittsburgh Coal groundwater presents a potential health risk and is also of aesthetically poor quality.

In conclusion, the negative impacts of the noise, odors, and general disruption of the community are believed to far outweigh the benefits of an attempt to treat the groundwater at the site since no present health risks to the environment or population have been determined. Additionally, it is believed that the overall objective of cleaning up groundwater to background concentrations would not be attained by such a recovery system due to the technological limitations described above.

TABLE A-2

Summary of Background Groundwater Quality in the Pittsburgh Coal

Parameter	Background Well TW-15 (µg/L)	Maximum Contaminant Level (MCL) (µg/L)	Secondary Maximum Contaminant Level (SMCL) (µg/L)
Aluminum	15,000	N/A	200
Chromium III/VI	121	100	N/A
Iron	32,300	N/A	300
Manganese	1,830	N/A	50

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