EPA WORK ASSIGNMENT NUMBER: 181-21Z9
EPA CONTRACT NUMBER: 68-01-7250
EBASCO SERVICES INCORPORATED

FINAL
FEASIBILITY STUDY
REPORT

BEC TRUCKING SITE
VESTAL, NEW YORK

W.A. NO. 181-2LZ9

JULY 1989

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FINAL FEASIBILITY STUDY REPORT

BINGHAMPTON EQUIPMENT COMPANY
(BEC) TRUCKING SITE
VESTAL, NEW YORK

JULY 1989

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EXECUTIVE SUMMARY

INTRODUCTION

This Final Feasibility Study (FS) for the Binghamton Equipment Company (BEC) Trucking Site has been prepared for the United States Environmental Protection Agency (USEPA) under Work Assignment No. 181-2LZ9, dated September 21, 1987, under REM-III Contract No. 68-01-7250. This FS is based on the results of the remedial field investigation conducted by REM III personnel in the summer and fall of 1988. A discussion of the remedial field investigation is provided in the Final Remedial Investigation (RI) Report for the BEC Trucking Site (Ebasco, 1989).

PURPOSE OF THE FEASIBILITY STUDY

This study was conducted in order to identify and characterize remedial alternatives for the BEC Trucking Site located in Vestal, New York. Based on the RI risk assessment, one remedial action objective was identified: limit exposure to carcinogenic poly-aromatic hydrocarbons (cPAH) contaminated soil. The FS addresses the reduction of risks resulting from remediation of the contaminated soil.

SITE BACKGROUND

The BEC Trucking Site is an open lot of 3.5 acres located in the Town of Vestal, Broome County, New York. The area surrounding the site is primarily commercial/industrial, although a residential trailer park containing approximately 360 inhabitants lies approximately 400 feet to the west. The site is currently being used for open storage and for sawmill-type operations by the present owner.

Prior to the mid-1960s the site was an unimproved marshland (a portion of the marsh still exists to the west of the site). After the marsh was filled with fly ash and soil, the site was operated as a truck maintenance/body fabrication facility. As a result of these operations, waste hydraulic oil and waste motor oil were reportedly generated. In addition, thinners and solvents were utilized during truck body fabrication/painting operations.

In 1982, approximately 50 drums (half of which were empty) were found on-site. These drums, containing what appeared to be petroleum and chemical products were removed in August 1983. In addition, stained soil underlying these drums was excavated and placed into four drums which currently remain on-site.

In January 1983, it was requested that the site be added to the

National Priority List (NPL) with a preliminary Hazard Ranking System (HRS) score of 37.52. This score was not based on analytical data collected at the site, but rather the potential for exposure to lead contaminated groundwater in surrounding areas. Lead was found on-site in the surface drums which were subsequently removed; however, lead was not found in the groundwater prior to ranking the site on the NPL, nor has lead been detected above remedial action levels in groundwater samples collected during the USEPA REM III RI. If an HRS Model was completed with the currently available data, it would not score high enough to be listed on the NPL.

REMEDIAL INVESTIGATION RESULTS

The RI identified three areas of concern at the site with respect to protection of human health: benzene in groundwater, arsenic in groundwater, and cPAHs in surface soils. The areal extent of contamination at the site resulting from these chemicals is very limited.

Benzene was detected in one on-site monitoring well. As a result of the field investigation there is no on-site source for the benzene detected in the groundwater from this well. The likelihood that the benzene is originating from an identified off-site oil seep at Kay Terminals is high. REM-III personnel observed the oil seep along the eastern edge of the drainage ditch which flows along the northern and eastern boundaries of the site towards the marsh. The volatile organic contaminants found at this location exhibited a "BTX" pattern similar to the ones observed in Monitoring Well 3 and the soil borings collected during well installation.

Arsenic was detected only in Monitoring Well 2A at 54 ug/l (total non-filtered arsenic) just above the Federal MCL Standard of 50 ug/l. Data indicates that arsenic is leaching from the fly ash fill material into the groundwater. However, there is no evidence of off-site migration of arsenic in groundwater. The fly ash was deposited approximately 25 years ago and was considered as an environmentally safe non-hazardous material. This material was not used during BEC Trucking's operations and was not a consideration in the application of the Hazard Ranking System Model. Theoretical calculations have shown that as little as 10 mg/kg of arsenic in soil will result in levels of arsenic in groundwater exceeding the MCL. Arsenic levels in the fly ash samples from the site were measured as high as 111 mg/kg.

cPAHs were detected in two distinct locations: the low lying area adjacent to and within the drainage ditch and the southeast corner of the site near the Stewart Road entrance.

Overall, the risk to human health resulting from these contaminants is relatively low. The average and worst case cancer risk levels are shown below:

Contaminant	Worst Case Lifetime Cancer Risk	Average Case Lifetime Cancer Risk
Arsenic in Groundwater	2.91E-03	3.88E-04
Benzene in Groundwater	5.77E-06	1.83E-06
Carcinogenic PAHs in Surface Soil and Sediments	1.01E-04	9.37E-08

The average case scenario is based on conservative assumptions such as periodically accessing the BEC Trucking Site over an entire lifetime and consuming two liters of groundwater a day over an entire lifetime. The worst case scenario, which is a result of the maximization of all variables in the risk calculations, serves as an upper bound for the risk assessment and does not represent a realistic risk to human health.

As can be seen from the above results, exposure to arsenic and benzene in groundwater are contributing the greatest portion of the risk. These results are based on the future use of shallow on-site groundwater as potable water which, due to the nature of the aquifer and availability of a municipal water supply, is an unlikely scenario. More importantly, the arsenic in the groundwater is leaching from the fly ash fill material. In addition, the benzene in the groundwater is the result of an off-site source. Since fly ash is known to contain high levels of arsenic (USEPA, 1988) and is used extensively in the area as fill material this represents a background situation.

REMEDIAL ACTION OBJECTIVES

The risk assessment indicated that the primary exposure concerns at the site were future use consumption of groundwater contaminated with arsenic or benzene and direct contact with cPAH contaminated surface soils. Current information indicates that the benzene in the groundwater/soil at the site is originating from the neighboring Kay Terminals and the arsenic is leaching from the fly ash fill material which is ubiquitous to the site area; consequently, groundwater remediation was not considered as an objective for the BEC Trucking Site. The remedial action objective for the BEC Trucking Site was defined as follows:

- o Limit current and future human exposure to cPAH contaminated surface soil.

Risk based cleanup levels, corresponding to a lifetime cancer risk of 10^{-6}, were calculated as 14,200 ug/kg for cPAHs in soils. Only one surface soil location contained cPAHs above this clean-up level. SS-33 contained 14,800 ug/kg of cPAHs, although a duplicate sample collected from this same location contained only 10,200 ug/kg. By addressing the area immediately surrounding this sample location, it may be possible to achieve 10^{-6} risk based cleanup levels for cPAHs in surface soils however, the risk to human health will only be marginally reduced.

IDENTIFICATION OF REMEDIAL ALTERNATIVES

A literature search was conducted to compile a list of technologies that might be appropriate for use at the BEC Trucking Site. A technology screening was then performed based on the effectiveness and implementability of technologies with respect to the remedial action objective. The technologies that passed the screening process were then compiled into remedial alternatives. Due to the relatively low number of remedial alternatives which were developed, an alternative screening was not performed. The four alternatives were then fully evaluated based on the following nine criteria:

1) Overall protection of human health and the environment,

2) Compliance with ARARs,

3) Long-term effectiveness and permanence,

4) Reduction of toxicity, mobility or volume,

5) Short-term effectiveness,

6) Implementability,

7) Cost,

8) State acceptance, and

9) Community acceptance.

REMEDIAL ALTERNATIVE DESCRIPTIONS

A concise summary of the potential remedial alternatives evaluation is provided below.

Remedial Alternative 1 No Further Action

Under this alternative, no further action would be taken to remove or contain the cPAH contaminated soils. Institutional controls such as fencing, paving, and deed restrictions or site monitoring may be addressed in the Record of Decision (ROD).

The lifetime cancer risk associated with the cPAHs in the soil is 9.37 x E-08 and 1.01E-04 for the average and worst case scenarios respectively. The worst case basis maximizes several factors which are highly unlikely to occur (i.e. maximum wind speed for year round). The 10^{-6} risk based cleanup level was calculated as 14,200 ug/kg for cPAHs in soils. Only one soil sample (SS-33/14,800 ug/kg) exhibited a concentration which exceeded this level. A second sample was taken at the same location (SS-33-D) exhibited a concentration of 10,200 ug/kg of cPAHs. The average of the two samples is 12,500 ug/kg which does not exceed the risk based action level.

Remedial Alternative 2 - Excavation/Off-Site RCRA Landfilling

All soil with cPAH concentrations above remedial action levels will be excavated and disposed of in an off-site RCRA landfill. The excavated areas would be backfilled, graded and revegetated. No further monitoring or O&M would be performed at the site.

Excavation and off-site disposal is the second most costly alternative and will reduce the risk associated with direct contact with cPAH contaminated soil.

Remedial Alternative 3 - Capping

This alternative involves the installation of a soil cover over the area of cPAH contaminated soil. The objective of the cap is to minimize the risk of direct exposure to the contaminated soil. Migration of cPAH contaminants into the groundwater is restricted by the relatively non-permeable underlying fly ash and the natural tendency for cPAHs to tightly bind to soils.

Following confirmation of the horizontal extent of the cPAH contaminated soil, one foot of compacted soil would be placed on top of the area. One foot of sand would be placed on the compacted soil, followed by one foot of top soil. A two-foot border, which will taper from the cap elevation to the original elevation, would be installed to promote drainage and prevent erosion. Revegetation would be required subsequent to top soil placement. O&M costs would include cap maintenance.

Remedial Alternative 4 - Excavation/Off-Site Incineration

This alternative involves excavating the area of cPAH contaminated soil, transporting the waste off-site to an incinerator facility and disposing of the incinerated waste (ash) in an off-site RCRA hazardous waste landfill. The excavated area would be backfilled with clean soil and revegetated. This alternative would protect the public health from exposure to the cPAH contaminated soil by removing the soils from the site and then destroying a significant percentage of the cPAHs in the soil by incineration.

This alternative is the highest cost alternative. There are no O&M costs required for this alternative.

1.0 PURPOSE AND ORGANIZATION OF THE REPORT

This Feasibility Study (FS) Report for the Binghamton Equipment Company (BEC) Trucking Site in Vestal, New York has been prepared by the U.S. Environmental Protection Agency (USEPA) with assistance from the REM III Team in response to Work Assignment No. 181-2LZ9 dated September 21, 1987, under Contract No. 68-01-7250. This report has been prepared in accordance with the Final Remedial Investigation/Feasibility Study (RI/FS) Work Plan dated March 11, 1988.

The purpose of this report is to identify and characterize remedial alternatives for the site that are consistent with the goals of the 1986 Superfund Amendment and Reauthorization Act (SARA), the 1980 Comprehensive Environmental Reponse, Compensation and Liability Act (CERCLA), and the Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (OWSER Directive 9355.3-01; October 1988). This FS is based on information collected during the RI for the site. This information is documented in the Final RI Report for the BEC Trucking Site.

This FS Report consists of four sections: The Introduction, Section 1.0, provides background information and a summary of the results of the RI including a discussion of the nature and extent of contamination, contaminant fate and transport, and the baseline risk assessment.

In Section 2.0 remedial action objectives and general response actions are identified based on Applicable or Relevant and Appropriate Requirements (ARARs) and the RI Risk Assessment. The identification and screening of technologies and the selection of representative process options is also described.

In Section 3.0 remedial alternatives are developed, described and screened. Section 4.0 contains a detailed analysis of the alternatives including the assessment of each alternative using the nine evaluation criteria from the RI/FS guidance. This section also includes a comparison of alternatives and a summary of the detailed analysis.

1.1 BACKGROUND INFORMATION

The background information presented below is summarized from the RI Report. The source of much of the following information is BEC Trucking field investigation activities conducted at the site between June 1988 and January 1989 by REM III personnel. Field investigation activities included: topographic surveying and mapping, geophysical and soil gas surveying, test pit excavation, surface water/sediment sampling, surface/subsurface soil sampling, monitoring well installation/sampling, and hydrogeologic testing.

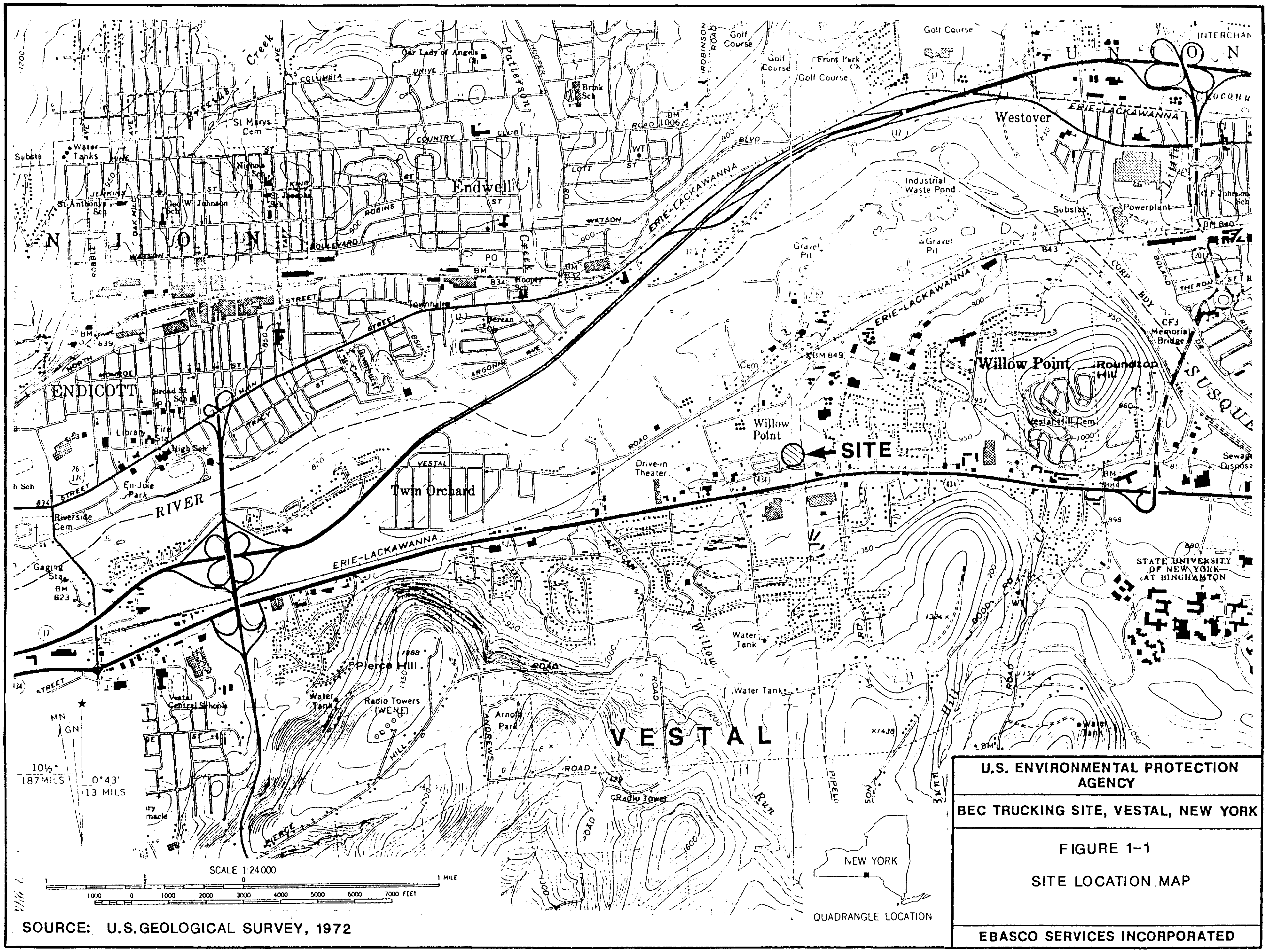
1.1.1 Site Description

The BEC Trucking Site is an open lot of approximately 3.5 acres located in the Town of Vestal, Broome County, New York (Figure 1-1). The site can be located on the western border of the United States Geologic Survey (USGS) Binghamton West, New York 7.5 minute topographic quadrangle map. The area surrounding the site is primarily industrial and commercial. As shown in Figure 1-2, the site is bordered by: Stewart Road to the south, other properties (open lots) owned by Lou Korchak to the east and north, and a marsh and Stewart's Trailer Park to the west. A petroleum tank farm and distribution terminal (Kay Terminals) is located near the eastern border of the site.

The BEC Trucking Site is situated within the generally flat lying plain of the glaciated Susquehanna River valley, at an average elevation of 845 feet above mean sea level (see Figure 1-3). The study area is located at the base of the steep southern wall of the glacial valley. The top of the valley wall rises approximately 500 feet above the level of the site. The valley floor slopes gently northwest from the site toward the Susquehanna River. The river flows in a westerly direction within a wide meander arching from northeast to northwest of the site. The closest reach of the river is approximately 4400 feet away in a direction north-northwest of the site. Review of the USGS topographic quadrangle maps of the area did not indicate any direct surface water courses between the site and the Susquehanna River. The site does not lie within the 100 or 500 year flood plain of the Susquehanna River.

The site drains into a marshy area located to the northwest and west of the site and continues flowing to the west behind the Stewart Trailer Park. Field observations show that the western marsh area also receives surface water runoff from the south side of Stewart Road. The Town of Vestal Water District No. 4 well field is near the southern bank of the Susquehanna River, about 4,000 feet north of the site.

The project site is predominantly flat-lying, relatively sparsely vegetated and surrounded by a drainage ditch to the east and north and a marsh area to the west and northwest. Briars and brush are common along the northwestern area of the site bordering the marsh. Surface water flowing in the perimeter ditch discharges at the northwest corner of the site and ultimately flows in a westerly direction behind Stewart's Trailer Park where there it becomes stagnant. The central portion of the site which is surrounded by the drainage ditch and marsh was once former marshland which has been extensively filled. Soils exposed at the surface of the site are imported fill materials composed of medium to dark brown sandy silt with gravel and cobbles. Neither the presence of leachate nor the presence of stressed vegetation have been observed at the site.



SOURCE: U.S.GEOLOGICAL SURVEY, 1972

U.S. ENVIRONMENTAL PROTECTION AGENCY

BEC TRUCKING SITE, VESTAL, NEW YORK

FIGURE 1–1

SITE LOCATION MAP

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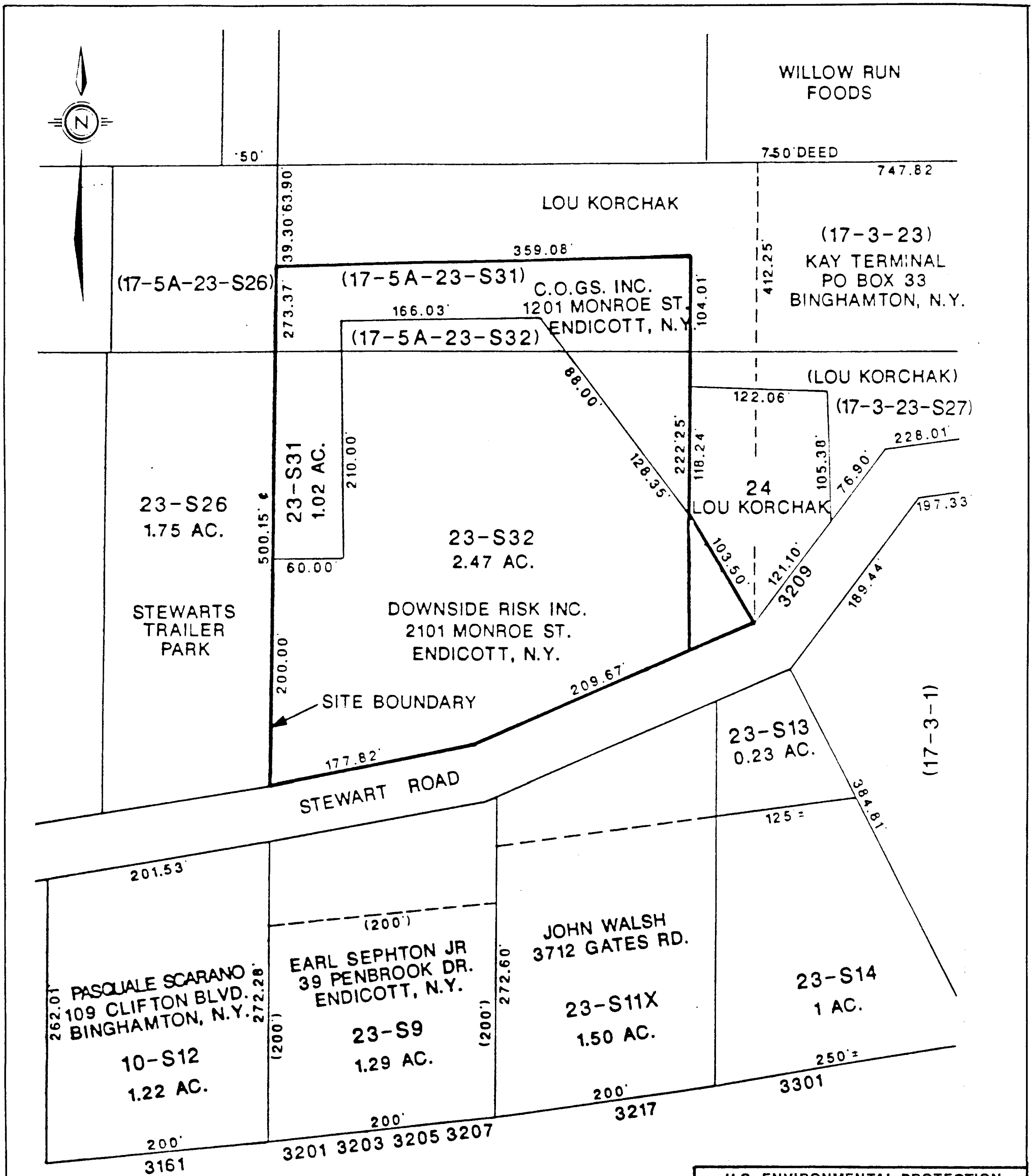

SOURCE: VESTAL TAX ASSESSMENT OFFICE
September 29, 1969
Revised November 13, 1986

U.S. ENVIRONMENTAL PROTECTION AGENCY

BEC TRUCKING SITE, VESTAL, NEW YORK

FIGURE 1-2

TAX MAP

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U.S. ENVIRONMENTAL PROTECTION AGENCY

BEC TRUCKING SITE, VESTAL, NEW YORK

FIGURE 1-3

SITE TOPOGRAPHY

SOURCE: U.S. GEOLOGICAL SURVEY, 1976

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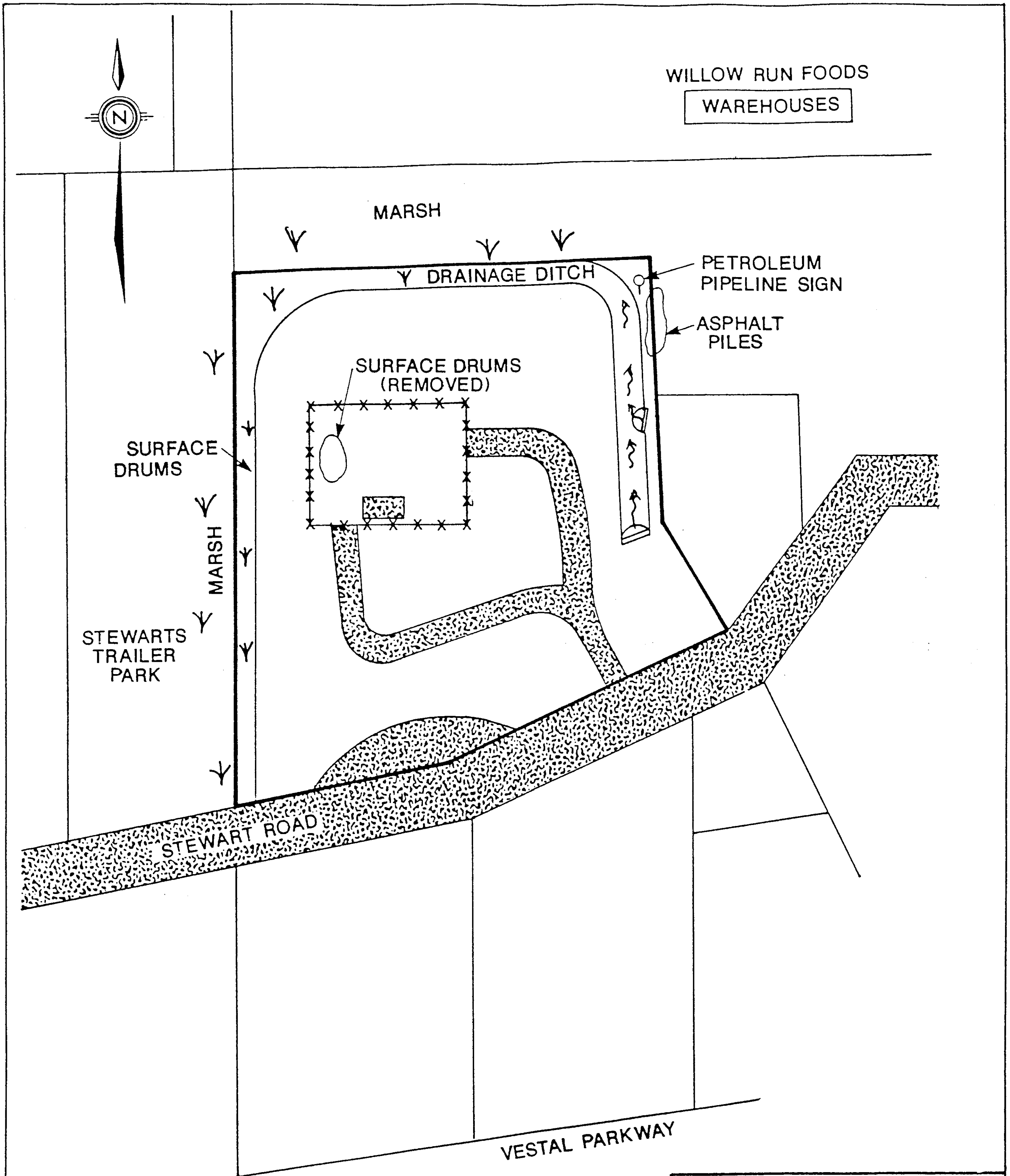
Geologically, the site is located in the glaciated portion of the Appalachian Plateau Physiographic Province. Bedrock underlying the site is Late Devonian age Falls Group. This interbedded shale and sandstone is encountered 42 feet below the surface at the BEC Trucking Site. Overlying the bedrock is a sequence of unconsolidated deposits ranging from silty clay to gravel to fill. The bedrock and unconsolidated aquifers at the site are hydrogeologically connected. Depth to groundwater ranges from three to eleven feet below the surface at the site. Groundwater flows to the northwest toward discharge points in the marsh. The groundwater is in direct contact with the fill material below much of the site.

The site is used as an open storage area and for sawmilling-type operations by the present owner. A schematic of the current site layout is given in Figure 1-4. Inspections of the property by REM III personnel in October and December, 1987 revealed stockpiles of construction materials across the site (wooden pallets, cinder blocks, metal beams, railroad ties, fence posts), several large truck and trailer bodies in the eastern and central part of the site, rolls of wire mesh fencing stored within a fenced area in the west central part of the site, and a metal storage shed within the fenced area. Miscellaneous trash debris (tires, shopping carts, empty rusted drums and small cans) were noted along the northern and western edge of the fill area and within the marsh. Some of the discarded cans were labeled as driveway sealer. Small empty solvent cans were observed in the northeastern part of the site. Additionally, four drums containing soil excavated from around the former on-site drum storage area were observed on the west side of the fenced area. The drums were not covered and ponded rainwater was noted on the top of the soil. A representative from the New York State Department of Environmental Conservation (NYSDEC) who participated in the REM III site visit indicated that the approximate location of the former surface drum storage area coincides with the area located within the western part of the fenced area, and extends out beyond the west side of the fence. A site visit by REM III personnel on April 20, 1989 revealed the initiation of sawmilling-type operations at the site. The metal storage shed holds a large bandsaw and piles of logs and cut lumber are scattered over the site.

Signs indicating the presence of a petroleum pipeline beneath the site were noted. Review of the USGS quadrangle map (Figure 1-3) suggests that the main pipeline is oriented in a north-south direction and is located beneath the western part of the site. Another pipeline, branching off of the main pipeline runs in an east-west direction north of the site.



U.S. ENVIRONMENTAL PROTECTION AGENCY

BEC TRUCKING SITE, VESTAL, NEW YORK

FIGURE 1-4

GENERALIZED MAP OF THE BEC TRUCKING SITE

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At the time of the REM III investigation, an oil seep from Kay Terminals (located adjacent to the eastern side of the property) was observed to enter the eastern drainage ditch. Subsequent to this observation by REM III personnel, the NYSDEC has investigated the Kay Terminals property. During a test pit investigation free petroleum product was observed in the subsurface, thus accounting for the observed oil seep.

Kay Terminals primarily operates as a petroleum tank farm. The facility has a SPDES permit (NY-010 8740) to discharge 50 gallons per day of storm water from the dike area into the on-site (BEC Trucking) drainage ditch subsequent to oil/water separation. Kay Terminals is prohibited to receive wastes or wastewaters from other facilities for treatment and/or discharge. Currently, the permit specifies that the discharge be monitored and limited by the permittee for flow (monitor only), oil and grease (15 mg/l max.), pH (6.5 - 8.5), benzene (0.001 mg/l max.), toluene (0.050 mg/l max.), and xylene (0.050 mg/l max.). A minimum measurement frequency of monthly is specified. Prior to 1982, the discharge was monitored and limited for only oil and grease. Kay Terminals has utilized a surface water discharge since July 27, 1981, previously a subsurface discharge was employed.

1.1.2 Site History

Prior to the mid 1960's, the BEC Trucking Site was an unimproved marshland property owned by the Stewart family. A member of the Stewart family (Paul Standish) reported to REM III personnel during an interview that his father sold the property to Haial Trucking (which later became BEC Trucking) in the mid 1960's. Upon purchase of the property, Haial Trucking proceeded to fill the marsh land with fly ash or similar material, possibly supplied by the local power company. Complete information regarding the physical characterization of the ash or its exact source is not available. Up to 10 feet of this material was dumped across the site to bring the pre-existing grade up to a level above the marsh. This was then covered with natural imported silt, sand, and gravel fill material that is currently exposed at the surface of the site. A one acre marshland area remains unfilled on the western and northwestern edge of the property and a surface drainage ditch traverses the eastern and northern perimeter of the site.

Haial Trucking used the approximately 3.5 acre site for storing trucks and tankers. BEC Trucking, successor to Haial Trucking, was involved in truck body fabrication and maintenance of large trucks. A property located immediately south of Stewart Road, toward Vestal Parkway, is the site of two industrial buildings which also housed BEC Trucking operations. According to the

NYSDEC, BEC Trucking had several municipal contracts for maintenance work with local cities and towns. Quantities of waste hydraulic oil and waste motor oil were reportedly generated as a result of this operation. BEC Trucking also painted the truck bodies they fabricated and paint thinner was used in this process. According to a former supplier, Auto Finishes and Supply Co. (per NYSDEC report), approximately one drum of enamel reducer per month was sold to the BEC Trucking firm. BEC Trucking routinely stored their drums containing waste engine oil, cutting oil, and other liquid waste materials on the site. On September 1, 1981, Bankruptcy Court took possession of the BEC Trucking property.

Concern for contamination at the BEC Trucking property began in May 1982. The Town of Vestal found evidence of possible on-site illegal dumping of miscellaneous debris and the improper storage of approximately 50 drums, 25 containing what appeared to be petroleum and chemical products (the other 25 drums were empty). This discovery led to a NYSDEC inspection of the site. In June 1982, the Vestal Code Enforcement Office received an anonymous phone call from a person claiming to be a former employee of BEC Trucking. Previous investigations indicated that BEC Trucking disposed of liquid waste in the marsh area and that cleaning effluent from the steam cleaning of chemical tankers, to be worked on by BEC Trucking, was commonly discharged to the ground surface at the site.

In January 1983, a composite sample was obtained from 8 drums found at the site. Analysis of this waste oil sample revealed a total organic halides (TOX) concentration of 1.4 ppm. The EP Toxicity analysis performed for this sample also indicated concentrations of lead (44.6 ppm) and cadmium (1.14 ppm) which exceeded EPA criteria for hazardous waste determination. TOX data do not allow characterization of the nature of the specific halogenated species measured.

The site was purchased by COGS, Inc. in February 1983, following a foreclosure auction on the property. A portion of the property was transferred to Downside Risk, Inc. in April 1983, and a small parcel of the property was purchased from COGS in July 1986 by James Walsh, but has subsequently been transferred back to Downside Risk Inc. In November 1986, John E. Walsh, the current site owner, purchased all outstanding stock of COGS, Inc. and Downside Risk Inc.

Remediation at the site to date has consisted of removal of the approximately 50 surface drums (mentioned above) and excavation of soil in the vicinity of the surface drums into four drums. In August 1983, COGS Inc. contracted with a NYSDEC approved waste oil hauler to remove the on-site drums containing liquid.

other empty drums were removed for disposal to a scrap yard. According to the current site owner, stained soil was excavated and placed in four drums which currently remain at the site. The type and extent of any groundwater, surface water, soil or sediment contamination was not characterized previous to the current EPA REM III investigation.

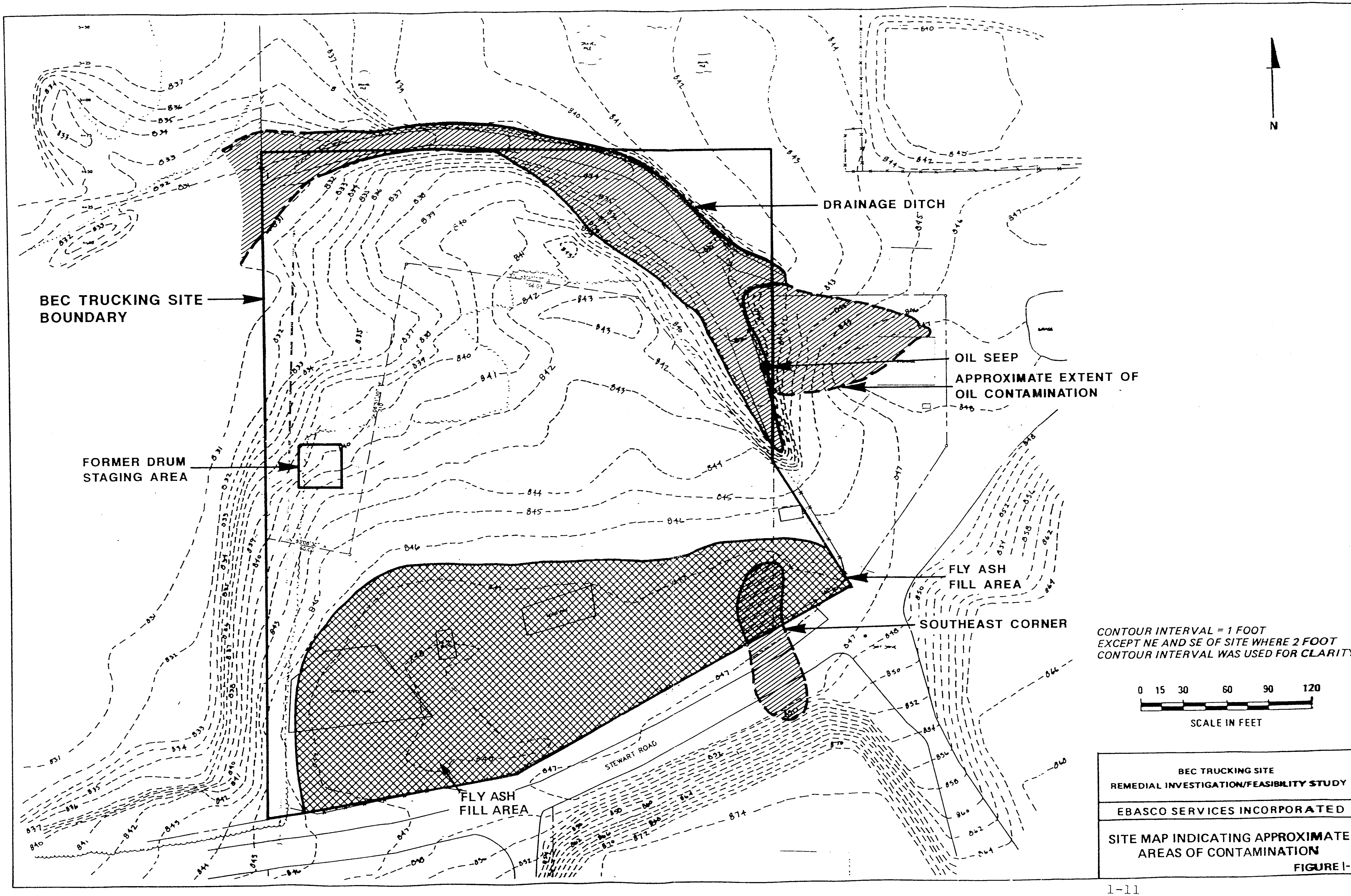
In January 1983, it was requested that the site be added to the National Priority List (NPL) with a preliminary Hazard Ranking System (HRS) score of 37.52. Analytical data was not collected in the generation of this score. The score was based upon the potential for exposure to the surrounding area (especially via groundwater contamination pathways) as the result of activities which allegedly occurred on site. The primary groundwater contaminant used to generate the HRS score was lead. Lead was found on-site in the surface drums which were subsequently removed; however, lead was not found in the groundwater prior to ranking the site on the NPL nor has lead been found, above remedial action levels, in groundwater samples collected during the EPA REM-III RI. If an HRS Model was completed with the currently available data, the site would not score high enough to be listed on the NPL.

1.2 NATURE AND EXTENT OF CONTAMINATION

In order to meet the objectives of the RI/FS for the BEC Trucking Site a field investigation was conducted at the site by USEPA REM-III personnel during the summer and fall of 1988. The field investigation consisted of a number of investigative methods including: geophysical surveying, soil gas surveying, excavating test pits, surface water/sediment sampling, surface and subsurface soil sampling, monitoring well installation and groundwater sampling. A result of the field investigation was an estimate of the current nature and extent of contamination in the previously described former drum staging area. The field investigation results also revealed four areas of contaminated soil on the site (southeast corner of site, oil seep, drainage ditch and fly ash fill area, See Figure 1-5). In addition, a number of sampling results indicated isolated areas of elevated levels of specific contaminants (e.g., arsenic, polyaromatic hydrocarbons (PAHs)).

Former Drum Staging Area

This area, in the central western portion of the BEC Trucking Site was essentially free of contamination. Following removal of the abandoned drums on-site, the underlying soil allegedly was excavated and placed into drums which remain on site. A composite soil sample collected from these drums revealed low levels (5-25 ug/kg) of ketones, 790 ug/kg of total xylene, and approximately 90,000 ug/kg of saturated and unknown hydrocarbons.



BEC TRUCKING SITE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

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SITE MAP INDICATING APPROXIMATE AREAS OF CONTAMINATION

FIGURE 1-5

Southeast Corner of Site

This area of contamination in the southeast corner of the site adjacent to Stewart Road was initially identified through the use of soil gas analysis and historical aerial photographs. Positive results obtained through soil gas analysis were confirmed by laboratory analyses of samples collected in this area. Volatiles (ethyl benzene and xylenes at 11 to 830 ug/kg and 27 to 780 ug/kg respectively) and low molecular weight semi-volatiles (alkyl naphthalenes) were detected in subsurface soil samples. PAH contamination was detected in both surface and subsurface soil samples. Elevated levels of inorganic contamination in the form of lead were detected in two subsurface samples. Samples SS-01 and SB-01, collected off-site, immediately across Stewart Road revealed elevated levels of lead and low molecular weight aromatic compounds (PAHs and alkylbenzene). Personnel from the neighboring Kay Terminals facility indicated that the cleaning of tank trucks had occurred at the top of the steep embankment just south of this sample location. Aerial photographs taken during the late 1960s revealed a possible spill in this area. The upper portion of this area is not located on the BEC Trucking Site.

Fly Ash Fill Area

Fly ash has routinely been used in the past as a fill material throughout the town of Vestal. The fly ash fill area covering the BEC Trucking Site stretches from off-site Sample SB-01 across Stewart Road to the southeast corner of the site and westward towards the central portion of the BEC Trucking Site. Fly ash fill samples were marked by elevated levels of arsenic measured in on-site samples (ranging from 50-111 mg/kg). The background arsenic concentration in soil at the site is 16 mg/kg. The arsenic in this fill area is likely leaching into the groundwater and causing the slightly elevated arsenic concentrations in groundwater samples from Monitoring Well 2A. The direction of groundwater flow is northwest; from the fly ash fill material towards Monitoring Well 2A. Historical information does not indicate the use of arsenic in any on-site operations.

Drainage Ditch

Contamination was also detected adjacent to, and within, the drainage ditch of the BEC Trucking Site. Contaminants detected in this area consisted primarily of PAHs and lead although some volatile organics were also detected. Elevated PAH concentrations were detected in sediment (14 mg/kg to 44 mg/kg) and soil (10 mg/kg) samples. Lead concentrations above background were also detected in sediments and soils with levels ranging from 90 mg/kg to 992 mg/kg. A likely source of this contamination is runoff from Vestal Highway and Kay Terminals via the drainage ditch which could result in the deposition of lead which was originally a component of gasoline. These contaminants could also be originating from the oil seep which enters the drainage ditch at the central eastern border of the site.

Oil Seep

Sediment and surface water samples taken adjacent to an oil seep, which has been investigated by NYSDEC Spill Response personnel and shown to originate from the neighboring Kay Terminal property, contained elevated levels of lead, volatile organics and PAHs. The sediment sample contained 410 ug/kg of xylenes, 94 ug/kg of toluene, 16 ug/kg of ethylbenzene, 11 ug/kg of benzene, 8 ug/kg of 4-methyl-2-pentanone, 344 ug/kg of lead and a total PAH concentration of 8350 ug/kg. The surface water sample contained 60 ug/l of xylenes, 65 ug/l of toluene, 25 ug/l of benzene, 6 ug/l of ethylbenzene, but only 7.2 ug/l of lead and no PAHs. Contaminants detected in these oil seep samples result from an off-site source and therefore have not been addressed by the RI risk calculations or the FS alternatives evaluation.

Selected Isolated Instances of Elevated Contaminant Levels

- A surface soil sample in the northwest corner of the site exhibited the highest level of total non-carcinogenic PAH's (310,000 ug/kg) found in surface soils at the site.

- At the location of Monitoring Well 3 (See Figure 1-6 for sample locations), a soil boring sample collected at a depth of 4 to 6 feet exhibited elevated levels of benzene, toluene, ethylbenzene and xylenes. These compounds are often associated with the remnants of a gasoline spill.

- A groundwater sample from Monitoring Well 3 revealed low concentrations of benzene (3 ug/l) and total xylenes (5 ug/l). The benzene concentration is less than the Federal MCL of 5 ug/l but greater than the New York State standard of "non-detect". There currently are no Federal standards for total xylenes in groundwater; however, the New York State Department of Health has promulgated a drinking water standard for xylene of 5 ug/l.

- Groundwater samples from off-site Monitoring Well 4 revealed 3 ug/l of 1,1,1-trichloroethane during the first round of groundwater sampling and 4 ug/l during the second round. This compound was not detected on the BEC Trucking Site and the underlying aquifer is known to be contaminated with 1,1,1-trichloroethane in other locations from other sources.


MW #4
SB 18-01
SB 18-02
GW 04
GRAVEL PILE
WATER
N
SW 03
SD 03
SG #3
SS 23
SG #2
SS 34
SW 04
SD 04
SS 05
SB 03
SWAMP
MW #3
SB 16-01
SB 16-02
GW 03
SS 25
SB 09
MW #5
SB 15-01
SB 15-02
GW 05
SS 24
SW 06
SD 06
SW 05
SD 05
SS 13
SB 07
SS 18
SS 19
SS 26
HEADWALL
SS 10
TP #9
DIESEL FUEL VALVE
GRASS
TP #7
SS 06
SS 20
STORAGE
SS 04
SW 02
SD 02
TP #8
SS 11
SG #1
TP #5
TP #4
SS 36
SB 04
SB 05
SS 14
SS 27
SB 10
TP #6
FUEL PUMP ISLAND
SW 07
SD 07
GW 02A/MW #2A
MW #2B
SB 17-01
SB 17-02
SB 17-03
GW 02B
TP #1
SW 01
SD 01
SS 35
SS 07
SS 15
SS 21
SS 28
SS 03
SB 02
SS 12
SS 31
SB 12
CONCRETE BLOCKS
SS 16
SB 08
SS 29
SB 11
SS 33
SB 03-01
SB 03-02
SB 03-03
TP #3
TP #2
SS 32
SB 13
SB 19
SB 21-01
SB 21-02
WOOD PILE
SS 08
SS 22
SS 30
SB 20
METAL BLDG
BEC TRUCKING SITE BOUNDARY
SCRAP STEEL AREA
DIRT DRIVE
SS 17
SS 01
SB 01
MW #1
SB 14-01
SB 14-02
GW 01
STEWART ROAD
SS 09
SB 06
SS 02
EXPLANATION
SS SURFACE SOIL SAMPLE
SS SURFACE SOIL COLLOCATE
SB SHALLOW SUBSURFACE SOIL SAMPLE
SB SHALLOW SUBSURFACE SOIL COLLOCATE
MW MONITORING WELL
TP TEST PIT
SW SD SURFACE WATER AND SEDIMENT SAMPLE
SG STREAM GAUGE
SS SEDIMENT SAMPLE
GW GROUND WATER SAMPLE
CONTOUR INTERVAL = 1 FOOT
EXCEPT NE AND SE OF SITE WHERE 2 FOOT
CONTOUR INTERVAL WAS USED FOR CLARITY
0 15 30 60 90 120
SCALE IN FEET
U.S. ENVIRONMENTAL PROTECTION AGENCY
BEC TRUCKING SITE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
EBASCO SERVICES INCORPORATED
SITE MAP WITH SAMPLE LOCATIONS AND GRID
FIGURE 1-6

- Groundwater samples from shallow on-site Monitoring Well 2A exhibited an elevated level of total arsenic of 54 ug/l and dissolved arsenic of 38 ug/l. This higher value exceeds both the Federal standard of 50 ug/l and the New York State standard of 25 ug/l. Arsenic was not detected in the deep well (Monitoring Well 2B) adjacent to Monitoring Well 2A. As previously indicated, the arsenic detected in the groundwater samples from Monitoring Well 2A is probably a result of leaching from the fly ash fill, since no other on-site source of arsenic was detected.

1.3 CONTAMINANT FATE AND TRANSPORT SUMMARY

The primary mechanisms for transport of contaminants from the BEC Trucking Site are surface run-off, groundwater migration, wind erosion and volatilization from soil. Due to the geography/hydrogeology of the site, contaminants transported by surface run-off and groundwater migration are expected to discharge into the marsh while airborne contaminants are expected to rapidly disperse.

1.3.1 Groundwater

Groundwater at the site generally flows in a northwest direction eventually discharging into the marsh. Low molecular weight organic compounds can infiltrate into groundwater by the movement of water through contaminated soil. Once in the groundwater, the rate of contaminant transport is determined, in part, by partitioning between the mobile aqueous phase and the stationary soil particles that are in contact with the groundwater.

The majority of the organic compounds detected on-site are PAHs. These compounds, with high octanol/water coefficients will remain preferentially in the organic soil medium of the unsaturated zone. This is evidenced by the fact that PAHs were not detected in the groundwater. Other organic compounds detected on site, primarily alkylbenzenes, have lower octanol/water coefficients and are more likely to be present in groundwater. This is evidenced by trace amounts of these chemicals being found in groundwater samples from an on-site monitoring well.

Migration of metals through the unsaturated zone and in groundwater is dependent on inorganic speciation. Speciation, in turn, is influenced by environmental conditions such as pH, the oxidizing or reducing conditions of the environmental medium, presence of other anions or cations in the soil or water, and microbial activity. Most metals, notably lead and arsenic which were detected at the site, will be bound tightly to the soil by complexation interactions with soil constituents such as clays. Of the inorganic compounds detected on-site, only arsenic was detected in groundwater samples from the on-site monitoring wells.

1.3.2 Surface Water

As a result of precipitation events, contaminants in the surface soils can migrate into the marsh and drainage ditch through sediment transport or by dissolution. The high molecular weight PAHs and lead detected in surface soils would be expected to migrate via sediment transport while some low molecular weight PAHs and monocyclic aromatics can be solubilized and transported in the aqueous phase. The lighter monocyclic aromatics, such as benzene, would be expected to volatilize in the turbulent flow associated with heavy run-off and rapidly disperse. The remaining chemicals are expected to settle preferentially in the sediments, eventually being deposited in the marsh.

1.3.3 Air

Contaminants found at or near the surface may be released into the air either through volatilization or wind erosion. In order to model the release of volatiles from soil, an equation based on diffusion coefficients was utilized. For estimation of windborne soil concentrations a more rigorous model (Cowherd et al, 1984) was utilized. These models have shown that contaminants are expected to disperse rapidly during transport.

1.4 RISK ASSESSMENT SUMMARY

As part of the USEPA REM-III RI performed for the BEC Trucking Site, an assessment was made of the potential impacts of contaminants at the site on human health or the environment. This baseline assessment is equivalent to an evaluation of the no-action alternative and therefore enables a determination to be made of whether remedial actions are necessary for the site.

The primary chemicals of concern at the BEC Trucking Site are PAHs, alkylbenzenes and lead. The site is located in a primarily industrialized area, although a trailer park with a population of approximately 360 people is located less than a quarter of a mile to the west. The marsh area on and near the site may be easily accessed by local residents. Although the site itself is surrounded by an intermittent chain link fence, this fence is not secure. The site is currently being used on an occasional basis for the storage of assorted supplies and milling of lumber. Considering the land-use in the area, further industrial development is the most likely future use scenario for the site.

Exposure pathways considered in the risk assessment were direct contact (dermal absorption and inadvertent ingestion) of surface soils and sediments by children and adults that may access the site or marsh; inhalation exposures to the same population; and air exposures to nearby residents. In addition, workers currently coming onto the site were evaluated for direct contact of surface soils and inhalation of on-site contaminants due to erosion or volatilization. In the future use scenario, industrial development of the site resulted in increased exposures for workers. Groundwater use by nearby and on-site residents was also evaluated as part of the future use scenario.

Risks from these exposures were evaluated first by comparing concentrations of chemicals in the contaminated exposure medium (e.g., groundwater) at points of potential exposure to State or Federal environmental standards or criteria that were identified as "Applicable or Relevant and Appropriate Requirements" (ARARs). Since comparison values were not available for all chemicals and exposure pathways, a quantitative risk assessment was also performed.

Quantitative risk assessment involves the calculation of intakes (doses) by potentially exposed populations based on assumed exposure scenarios. These intakes are then combined with reference doses (RfDs) or cancer potency factors to derive estimates of non-carcinogenic hazard or excess lifetime cancer risks of the potentially exposed populations.

For non-carcinogens, results are presented as a ratio of the intake of each chemical to its RfD, and as the hazard index, which is the sum of the ratios of the intake of each chemical to its RfD. If the hazard index exceeds unity, there is an indication that health hazards might result from such exposures. In the case of carcinogens, the excess lifetime cancer risk was estimated; the risk level of 10^{-6} (i.e., one excess cancer per million population exposed for a lifetime) was used as an initial benchmark.

The results of the ARAR comparison indicate that geometric mean values for the inorganic chemicals in groundwater are all below Federal ARARs. Maximum reported concentrations for arsenic in groundwater exceed the MCL. Maximum concentrations for lead and benzene exceed the MCL goal but not the MCL. The maximum concentration of benzene in groundwater exceeds the New York State Standard of "non-detect".

A summary of all contaminants which pose a significant risk to human health (cancer risk greater than 10^{-6} or hazard index greater than unity) in either an average case or a worst case scenario is provided in Table 1-1.

The greatest risk associated with any one current use scenario was direct contact (dermal absorption, ingestion, and inhalation) with carcinogenic PAH contaminated soils. This results in a lifetime cancer risk of 6.91×10^{-8} for residents and 1.01×10^{-7} for workers under an average case scenario.

TABLE 1-1

BEC TRUCKING SITE - FEASIBILITY STUDY

Summary of RI Risk Assessment

Lifetime Cancer Risk Greater than 10^{-6} or Hazard Index Greater than 1

NEARBY RESIDENTS

Pathway	Matrix Type	Lifetime Cancer Risk Worst Case	Lifetime Cancer Risk Average Case
Carcinogenic PAHs			
Ingestion	Soil	1.27E-05	3.38E-08
	Sediment	1.12E-05	1.06E-08
Dermal Absorption	Soil	1.67E-05	3.52E-08
	Sediment	1.48E-05	1.10E-08
Inhalation	Fugitive Dust	3.68E-05	3.37E-11
	On-Site Dust	9.20E-06	1.52E-12
Benzene			
Ingestion	Groundwater	2.60E-06	9.54E-07
Inhalation	Vapors while showering	3.17E-06	8.71E-07
Arsenic (Carcinogenic Effects)			
Ingestion	Groundwater	2.91E-03	3.88E-04
Arsenic (Non-Carcinogenic Effects)			
Ingestion	Groundwater	3.09E+00*	3.09E-01*
Lead (Non-Carcinogenic Effects)			
Ingestion	Groundwater	1.18E+00*	2.88E-01*

*Chronic Effect Hazard Index

ON-SITE WORKERS

(Current Use Scenario)

Pathway	Matrix Type	Lifetime Cancer Risk** Worst Case	Lifetime Cancer Risk** Average Case
Carcinogenic PAHs			
Ingestion	Soil	9.52E-06	1.89E-08
Dermal Absorption	Soil	3.97E-05	8.18E-08
Inhalation	On-Site Dust	2.96E-05	3.09E-12

** 40 years exposure

Under a worst case scenario, the lifetime cancer risk for workers and residents as a result of direct contact with carcinogenic PAHs is 7.88×10^{-5} and 7.54×10^{-5} respectively. The only other current use exposure scenario contributing significantly to the total lifetime cancer risk for residents is direct contact with carcinogenic PAHs in drainage ditch sediments. The risk due to this exposure is 2.16×10^{-8} in the average case and 2.60×10^{-5} under a worst case scenario.

The excess lifetime cancer risk to nearby residents of the BEC Trucking Site , attributable to site conditions under current conditions, is 9.07×10^{-8} under an average case scenario. This excess cancer risk is in addition to background cancer rates that are the result of normal, day-to-day activities. This lies outside of the established risk based remedial action range of 10^{-4} to 10^{-7}. Workers, who are expected to access the site far more frequently than nearby residents, incur a slightly greater lifetime cancer risk of 1.01×10^{-7}. Although this falls just within the remedial action range, it is well below the 10^{-6} benchmark used in assessing risk. It should be noted that the assumptions utilized for the average case scenario, such as periodically accessing the site over an entire lifetime or drinking two liters of groundwater a day over an entire lifetime, represent very conservative assumptions. These assumptions have a tendency to focus in on a small population group and, as a result, overestimate the risks to the local population as a whole.

The excess lifetime cancer risks, attributable to site conditions, to nearby residents and workers under a current use, worst case exposure scenario are 1.01×10^{-4} and 7.89×10^{-5} respectively. This excess cancer risk is in addition to normal background cancer rates. Although these values lie within the risk based remedial action range of 10^{-4} to 10^{-7}, they both exceed the 10^{-6} benchmark used in assessing risk. Worst case exposure scenarios are a result of the maximization of all variables used in the risk calculations. The results effectively serve as an upper boundary for the risk assessment. Although results obtained in this manner are theoretically possible, the probability they apply to even the smallest segment of the potentially exposed population is extremely small.

Assumptions for the future use scenario remained identical to those under the current use scenario with the exception that workers are expected to access the site five days a week. The future use scenario also includes groundwater use. Exposure to contaminants in groundwater could occur either due to ingestion or, in the case of volatiles, inhalation of vapors while showering. Contributing the majority of the risk in this scenario is the ingestion of arsenic in groundwater which provides a risk of 3.88×10^{-4} in the average case, and

2.91×10^{-3} under a worst case scenario. Benzene, detected at low concentrations in one on-site monitoring well, contributes an average case cancer risk of 1.8×10^{-6} and a worst case cancer risk of 5.77×10^{-5} as a result of ingestion and inhalation while showering.

Due to inclusion of groundwater consumption, future use cancer risks, attributable to site conditions, for nearby residents have increased. This is almost entirely a result of the arsenic detected in one on-site monitoring well. However, the arsenic has been shown to be leaching from the fly ash fill material which was used fill the site to its present grade. This represents a regional situation since fly ash has been used extensively as fill material throughout the site area. Fly ash is known to contain concentrations of arsenic as high as 279 mg/kg (USEPA, 1988). Furthermore, elevated background levels of arsenic in Broome County soils is currently being investigated by NYDOH personnel. Benzene, the only other contaminant presenting a lifetime cancer risk of greater than 1×10^{-6}, is likely to be originating from the neighboring Kay Terminals property.

Although groundwater consumption was included in the future use risk calculations, any such use is considered unlikely due to the following reasons:

- The site is currently zoned industrial.
- New residents will generally be connected to the Town of Vestal municipal water system.
- The groundwater beneath the site discharges into the marsh.
- Future potable water wells would likely utilize the uncontaminated bedrock aquifer.

When examining the cancer risk associated with the BEC Trucking Site, it is important to consider the assumptions and data used to generate the results. Because the primary contaminants detected at the BEC Trucking Site were lead and PAHs, it is not surprising that these chemicals are providing the majority of the risk in a current use scenario. However, despite the widespread nature of these contaminants, the cancer risk remains well below 1×10^{-6} and the hazard is orders of magnitude below unity in a current use, average case scenario for both workers and residents.

It is important to point out that these estimates of risk to human health presented in this section tend to be over protective and are not precise estimates of risk. In general, the exposures evaluated assume much more extensive contact with site contaminants than is currently occurring, or are likely to occur in the future, and as such are conservative, i.e., tend to overestimate exposure and risk. In addition, the health effects criteria that have been combined with exposure to estimate risk incorporate margins of uncertainty. Hence, final estimates of exposure and risk will be near to or higher (often much higher) than the upper end of the actual range of exposure and risk, and are presented solely to guide the decisions regarding remedial action at the BEC Trucking Site.

1.5 REMEDIAL INVESTIGATION CONCLUSIONS

The results of the baseline risk assessment for the BEC Trucking Site indicate that the site generally presents minimal risks to public health or the environment. The primary chemicals detected on-site (alkylbenzenes, lead and PAHs) are not presenting a significant risk to human health. The chemicals which contribute the greatest risk to human health do so only in a future use scenario which includes groundwater consumption. Furthermore, these chemicals are the result of a regional background situation (arsenic) and an off-site source (benzene), and are not the result of site specific activities. The results of the RI identified no further data gaps regarding the BEC Trucking Site.

2.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

2.1 INTRODUCTION

This Feasibility Study (FS) is prepared following the basic methodology outlined in the National Contingency Plan (NCP) with consideration of the requirements outlined in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and in Section 121 of the Superfund Amendments and Reauthorization Act (SARA). Although the revised NCP is pending, USEPA has issued interim final guidance on performance of RI/FSs in the form of a guidance document (USEPA Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, October 1988). This guidance, in addition to the provisions of SARA Section 121, has been used as the basis for development of the FS.

The Feasibility Study (FS) process under CERCLA/SARA retains the basic approach for remedial alternatives screening and evaluation outlined in the previous USEPA Feasibility Study Guidance Document (USEPA, June 1985a). SARA Section 121 has modified the FS process to emphasize the development of remedial alternatives that meet the following conditions:

- Protect human health and the environment.
- Provide permanent solutions to contamination problems and long-term effectiveness.
- Meet Applicable or Relevant and Appropriate Requirements (ARARs) on a federal, state or local level.

The emphasis on permanent solutions is directed primarily to source control actions that eliminate long-term operation and maintenance by permanently reducing the mobility, toxicity, and/or volume of the hazardous substances.

The FS methodology is summarized here and described in further detail under the appropriate sections of this FS. The following steps have been used in the FS:

- Establish remedial action objectives (Section 2.2).
- Determine contaminated areas and volumes and identify general response actions to meet remedial action objectives, including no action (Section 2.3).
- Identify remedial technologies under each general response action with emphasis on permanent solutions (Section 2.4).
- Screen remedial technologies based on technical considerations, and then use those technologies to develop remedial alternatives (Sections 2.4 and 3.1).

- o Screen remedial alternatives according to effectiveness and implementability (Section 3.2).

- o Perform a detailed evaluation of the remedial alternatives based on short-term effectiveness; long-term effectiveness and permanence; reduction of toxicity, mobility, and volume; implementability; cost; compliance with ARARs; overall protection of human health and the environment; and state and community acceptance (Section 4.2).

- o Perform a comparative evaluation between remedial alternatives (Section 4.3).

2.2 REMEDIAL ACTION OBJECTIVES

Remedial action objectives for the cleanup of the BEC Trucking Site are developed in this section. For each matrix of concern (groundwater, soil, surface water and sediment), the contaminants of interest and allowable exposures based on the risk assessment are presented and Applicable or Relevant and Appropriate Requirements (ARARs) are discussed.

2.2.1 Surface Soil

The primary contaminants detected in surface soil at the BEC Trucking Site were lead and carcinogenic PAHs. As described in the risk assessment of the RI Report (Section 6.0) the only contaminant that may pose a significant risk to human health in either a worst case or an average case scenario are carcinogenic PAHs. The cumulative lifetime cancer risk as a result of all exposure scenarios to carcinogenic PAHs in surface soils is 7.52×10^{-8} for the average case and 9.81×10^{-5} for the worst case.

No ARARs were found to exist for PAHs in soil; consequently, risk based cleanup levels based on the RI risk assessment were evaluated. Table 2-1 presents risk based carcinogenic PAH soil cleanup levels within the remedial action range for worst and average case scenarios relative to direct contact and ingestion of surface soils over an entire lifetime. The worst case scenario represents an upper boundary of the risk assessment and is generally not used to calculate remedial clean-up levels. Average case scenarios are based on realistic conservative assumptions and are generally used to calculate remedial clean-up levels.

Based on a lifetime cancer risk of 10^{-7}, a clean-up level of 1,420 ug/kg can be established. This would require addressing the entire southeast corner of the site and much of the central

TABLE 2-1
BEC TRUCKING SITE - FEASIBILITY STUDY

SOIL CLEANUP LEVELS FOR CARCINOGENIC PAHs
DIRECT CONTACT/INGESTION PATHWAYS

Lifetime Carcinogenic Risk Level	Risk Based Soil Cleanup Level (ug/kg)	
	Worst Case	Average Case
10^{-4}	50,500 *	1,420,000 *
10^{-5}	5,050 **	142,000 *
10^{-6}	505	14,200 **
10^{-7}	50.5	1,420 **

* Exceeds both geometric mean concentration and maximum concentration found on-site.

** Exceeds geometric mean concentration found on-site.

portions. However, the clean-up level corresponding to a lifetime cancer risk of 10^{-6} is 14,200 ug/kg. This concentration is exceeded in only one surface soil sample (SS-33). In addition, a duplicate sample collected at this same location revealed only 10,200 ug/kg of carcinogenic PAHs. If the average of these two results were used, then the clean-up level corresponding to a 10^{-6} lifetime cancer risk is not exceeded anywhere on site. Clean-up levels corresponding to 10^{-5} and 10^{-4} lifetime cancer risks are not approached at the BEC Trucking Site.

Table 2-2 summarizes the soil cleanup levels required to achieve the various cancer risks resulting from inhalation of airborne surface soils contaminated with carcinogenic PAHs. This pathway has been addressed separately because much of the BEC Trucking Site is vegetated and not subject to entrainment processes. Worst case exposure scenarios for the inhalation pathway result in cleanup levels slightly lower than the worst case direct contact/ingestion scenario. For the dust inhalation pathway (average case scenario) the 10^{-4} and 10^{-5} lifetime cancer risk levels are not achievable; the cleanup levels corresponding to 10^{-6} and 10^{-7} lifetime cancer risks are 220,000,000 ug/kg and 22,000,000 ug/kg respectively. These concentrations are orders of magnitude greater than the highest cPAH concentrations detected on-site. As discussed in the RI risk assessment, the contaminated area used to generate dust inhalation risk levels was the southeast corner of the site. This is an open area near the entrance to the site subject to the highest volume of vehicle traffic. Consequently, this area is expected to present significantly more risk due to dust inhalation than anywhere else on site.

Based on an average case scenario for carcinogenic PAHs, a risk based cleanup range can be established as 1,420-1,420,000 ug/kg. Since this level is exceeded in localized surface soil samples corresponding to the 10^{-7} and 10^{-6} lifetime cancer risks and limiting exposure to carcinogenic PAHs will be considered as a remedial action objective.

2.2.2 Groundwater

The primary contaminants detected in groundwater were lead, arsenic and benzene. In each instance, these contaminants were detected in one isolated monitoring well sample. Total lead was detected in Monitoring Well 5 at 29 ug/l. This concentration is below the Federal MCL of 50 ug/l, but slightly above the New York State groundwater standard of 25 ug/l. Monitoring Well 5 is located off-site and hydraulically downgradient of the site. Lead was not detected in the filtered groundwater sample from Monitoring Well 5. Since generally only dissolved metals are

TABLE 2-2
BEC TRUCKING SITE - FEASIBILITY STUDY

SOIL CLEANUP LEVELS FOR CARCINOGENIC PAHs
DUST INHALATION PATHWAYS

Lifetime Carcinogenic Risk Level	Risk Based Soil Cleanup Level (ug/kg) Worst Case	Average Case
10^{-4}	17,000 *	Risk Levels not Achievable
10^{-5}	1,700	Risk Levels not Achievable
10^{-6}	170	220,000,000 *
10^{-7}	17	22,000,000 *

* Exceeds soil concentration used to generate suspended soil concentrations.

mobile in groundwater systems, the lead detected in Monitoring Well 5 can be assumed to be originating from the immediate area around the well. Therefore, since the lead is not associated with the site, it will not be addressed as a remedial objective. Undissolved lead detected in upgradient and on-site monitoring wells ranged from 3-8 ug/l, which are well below the ARARs.

Benzene was detected in Monitoring Well 3 at 3 ug/l. As with lead, this concentration is below the Federal MCL of 5 ug/l, but above the New York State standard for groundwater of "non-detect." Although the benzene was detected in an on-site monitoring well, the source of contamination appears to be originating off-site. Sediment and surface water samples collected adjacent to the Kay Terminals oil seep, approximately 200 ft upgradient of Monitoring Well 3, revealed the same pattern of "BTX" contamination as was detected in the groundwater sample from Monitoring Well 3 and the soil boring samples collected during well installation. Due to the pattern of contamination and the proximity of the Kay Terminals discharge to the monitoring well, reduction of benzene concentrations in groundwater will not be addressed as a remedial objective.

Arsenic was detected in Monitoring Well 2A at levels of 54 ug/l (unfiltered) and 38 ug/l (dissolved). The total arsenic concentration exceeds both the Federal MCL of 50 ug/l and the New York State groundwater standard of 25 ug/l. Arsenic was also detected in on-site, subsurface soil samples at concentrations ranging from 76-111 mg/kg. As described in the RI Report, elevated concentrations of arsenic were generally detected in subsurface samples which contained fly ash. The primary area of fly ash fill material lies to the south and southeast of Monitoring Well 2A. In addition, Sample SB-08, which contained the highest concentration of arsenic detected on-site, lies approximately 80 ft directly upgradient from Monitoring Well 2A. Because the majority of arsenic detected in groundwater samples from Monitoring Well 2A was undissolved, it is apparent that the arsenic is leaching into the groundwater from the fly ash and migrating in the direction of groundwater flow. The concentration of arsenic in measured groundwater at the site is also supported by literature references which provide an average EP Toxicity value of 80 ug/l for arsenic leaching from fly ash (USEPA 1988).

Fly ash has been used as fill material extensively in the Town of Vestal. Historical data indicates the fly ash was utilized for road fill in the immediate area of the site, including Stewart and Ash Roads. Data collected at the BEC Trucking Site and obtained from literature sources (USEPA, 1988) indicate that elevated levels of arsenic are generally associated with fly ash. Remediation of the fly ash and associated arsenic contaminated groundwater at the site would not address this regional situation.

Due to widespread usage of fly ash as fill material in the site area, slightly elevated levels of arsenic in groundwater can be considered a regional background situation. Since remediation to below background levels is impractical, arsenic in groundwater is not addressed as a remedial action objective. Other factors which support the exclusion of arsenic in groundwater as a remedial action objective include:

- o Arsenic was detected in only one groundwater sample for an on-site monitoring well at a level of 54 ug/l.

- o The arsenic concentration detected above the MCL was in an unfiltered groundwater sample.

- o Arsenic has not migrated off-site. Groundwater samples from downgradient monitoring wells do not exhibit detectable levels of arsenic.

- o Elevated levels of arsenic in the groundwater have been detected at other NPL sites in the Vestal Area (i.e. Robintech). These elevated levels may be naturally occurring or site related. Currently the state of New York is investigating the relatively high levels of naturally occurring arsenic in soils of Broome County.

2.2.3 <u>Surface Water</u>

The primary contaminants detected in surface water were volatile organics originating from the Kay Terminals oil seep and lead. Water quality criteria as developed by the USEPA and New York State were exceeded for some inorganic chemicals detected in the marsh and/or drainage ditch at the BEC Trucking Site. Table 2-3 presents the surface water criteria that were used in addressing contaminants at the BEC Trucking Site. Federal water quality criteria currently exist as guidelines only, while the New York State Class D Surface Water Standards are promulgated regulations. In addition, federal water quality criteria for water and fish ingestion were determined not to apply because the water in the marsh and drainage ditch does not contain fish and is not utilized as a source of drinking water. New York State Class D Surface Water Standards were exceeded only for copper, iron, lead, mercury and zinc.

Lead was detected at elevated levels on-site; however, the highest concentrations detected in the drainage ditch sediments were measured immediately downstream and adjacent to the Kay Terminals oil seep. This indicates that the Kay Terminals' discharge into the drainage ditch may be contributing to the lead contamination. In addition, because the drainage ditch is

TABLE 2-3

BEC TRUCKING SITE - FEASIBILITY STUDY

FEDERAL AND NEW YORK STATE SURFACE WATER CRITERIA (ug/l)

	Federal Water Quality Criteria				New York State Class D
Chemical	Fresh Water Acute	Fresh Water Chronic	Water & Fish Ingestion	Fish Ingestion Only	Surface Water Standard
Benzene	5,300	--	0.67	40	--
Toluene	17,500	--	14,300	424,000	--
Ethylbenzene	32,000	--	1,400	3,280	--
Arsenic (III)	360	190	0.002 **	0.018 **	360 **
Arsenic (V)	850	48	--	--	--
Barium	--	--	1,000	--	--
Chromium (III)	1,700 *	210 *	170,000	3,433,000	1,736 *
Chromium (VI)	16	11	50	--	16
Copper	18 *	12 *	--	--	18 *
Iron	--	1,000	300	--	300
Lead	82 *	3.2 *	50	--	82.6 *
Manganese	--	--	50	100	--
Mercury	2.4	0.012	0.144	0.146	--
Nickel	1,400 *	160 *	13.4	100	1,844 *
Vanadium	--	--	--	--	190
Zinc	120 *	110 *	--	--	321 *

*Based on 100 ppm hardness.

**Total arsenic (form unspecified).

actually discharging stormwater from Vestal Highway, Jenson Road, Stewart Road and Kay Terminals into the marsh, lead that is originating from off-site non-point sources will tend to concentrate in the marsh. It should be further noted that the only surface water samples containing elevated lead levels also were the only surface samples which contained elevated amounts of particulate matter. Consequently, the lead detected in the surface water samples appears to be primarily associated with the sediments in the drainage ditch and reduction of lead concentrations in surface water is not considered as a remedial action objective for surface water.

Reduction of surface water concentrations for the other inorganic chemicals which exceed New York State Surface Water Standards has not been included as a remedial action objective for the following reasons:

- The New York State Surface Water Standard for copper, zinc, and mercury was exceeded only in samples SW-04 and SW-05. These two samples were the only surface water samples with elevated levels of suspended solids.

- Sample SW-05 was collected immediately adjacent to SW-06. SW-06 did not reveal levels of metals above New York State Surface Water Standards (a clear aliquot of SW-06 was collected).

- Iron, copper, zinc, and mercury were not detected at elevated levels in other media elsewhere on-site.

No organic contaminants detected in surface water at the BEC Trucking Site were found to exceed Federal water quality criteria for the protection of aquatic organisms. Benzene was found to exceed Federal water quality criteria for fish and water ingestion but did not exceed the Federal standard for fish ingestion only. However, as mentioned previously, the on-site surface water was not found to contain fish and is not used for human consumption. In addition, the organic contaminants detected in the drainage ditch are a result of the Kay Terminals oil seep and reduction of their concentrations are not considered as remedial objectives.

Since the organic contaminants detected in surface water were a result of the Kay Terminals oil seep, they were not included in the RI Report risk assessment. Remediation of the Kay Terminals spill should eliminate any future contamination of the drainage ditch due to this source. In addition, inorganic chemicals detected in surface water were not included in the RI risk assessment due to the effectiveness of the skin as a barrier to the dermal uptake of metals and the unlikelihood of any incidental ingestion of surface water. Consequently, only surface water standards can be used in setting remedial action objectives. Despite the fact that some surface water standards have been exceeded, due to the reasons described above, reduction of surface water contaminant concentrations at the BEC Trucking Site is not considered as a remedial action objective.

2.2.4 Sediments

Due to the likelihood of dermal absorption of PAHs in sediments and the incidental ingestion of sediments deposited on the hands, the sediment exposure pathway was modeled as part of the RI risk assessment. The only contaminant detected in sediments found to be a concern in the risk assessment were carcinogenic PAHs. Although elevated lead levels were found in some sediment samples, the RI risk assessment determined that they pose an insignificant risk to human health.

Table 2-4 summarizes the sediment cleanup levels required to achieve the various lifetime cancer risks resulting from dermal absorption and ingestion of sediments contaminated with carcinogenic PAHs. Because no ARARs exist for PAHs in sediments, risk based cleanup levels will be used exclusively in determining remedial action objectives. Carcinogenic PAHs were detected in SD-01, the upgradient sediment sample collected from the bottom of the culvert which discharges into the drainage ditch and in Samples SS-25, SS-26 and SS-34, which were collected in a low-lying area that, during periods of increased water flow, are part of the drainage ditch. This area is characterized by sediment deposits and channels. The concentration of cPAHs in these samples ranged from 770 to 26,300 ug/kg. With the exception of the clean-up level corresponding to a lifetime cancer risk of 10^{-7} (2,840 ug/kg), the concentrations of carcinogenic PAHs in drainage ditch sediments are below risk based clean-up levels; consequently, reduction of cPAH concentrations in sediments is not considered as a remedial action objective.

2.3 GENERAL RESPONSE ACTIONS

2.3.1 Determination of Contaminated Areas and Volumes

In the previous section, the following remedial action objective was established:

- Limit current and future human exposure to surface soils contaminated with carcinogenic PAHs.

This remedial action objective was determined by comparing on-site contaminant levels with risk based cleanup levels which were developed based on the RI risk assessment. Essentially two criteria were used in selecting the remedial action objectives.

TABLE 2-4
BEC TRUCKING SITE - FEASIBILITY STUDY

SEDIMENT CLEANUP LEVELS FOR CARCINOGENIC PAHs
DIRECT CONTACT/INGESTION PATHWAYS

Lifetime Carcinogenic Risk Level	Soil Cleanup Level(ug/kg) Worst Case	Average Case
10^{-4}	101,000 *	2,840,000 *
10^{-5}	10,100 *	284,000 *
10^{-6}	1,010 **	28,400 *
10^{-7}	101	2,840 *

* Exceeds maximum concentration found on-site.

** Exceeds geometric mean concentration found on-site.

- The contaminant concentration must result in a lifetime cancer risk which exceeds 10^{-6} under an average case exposure scenario.

- The contaminant must be originating from a site specific source.

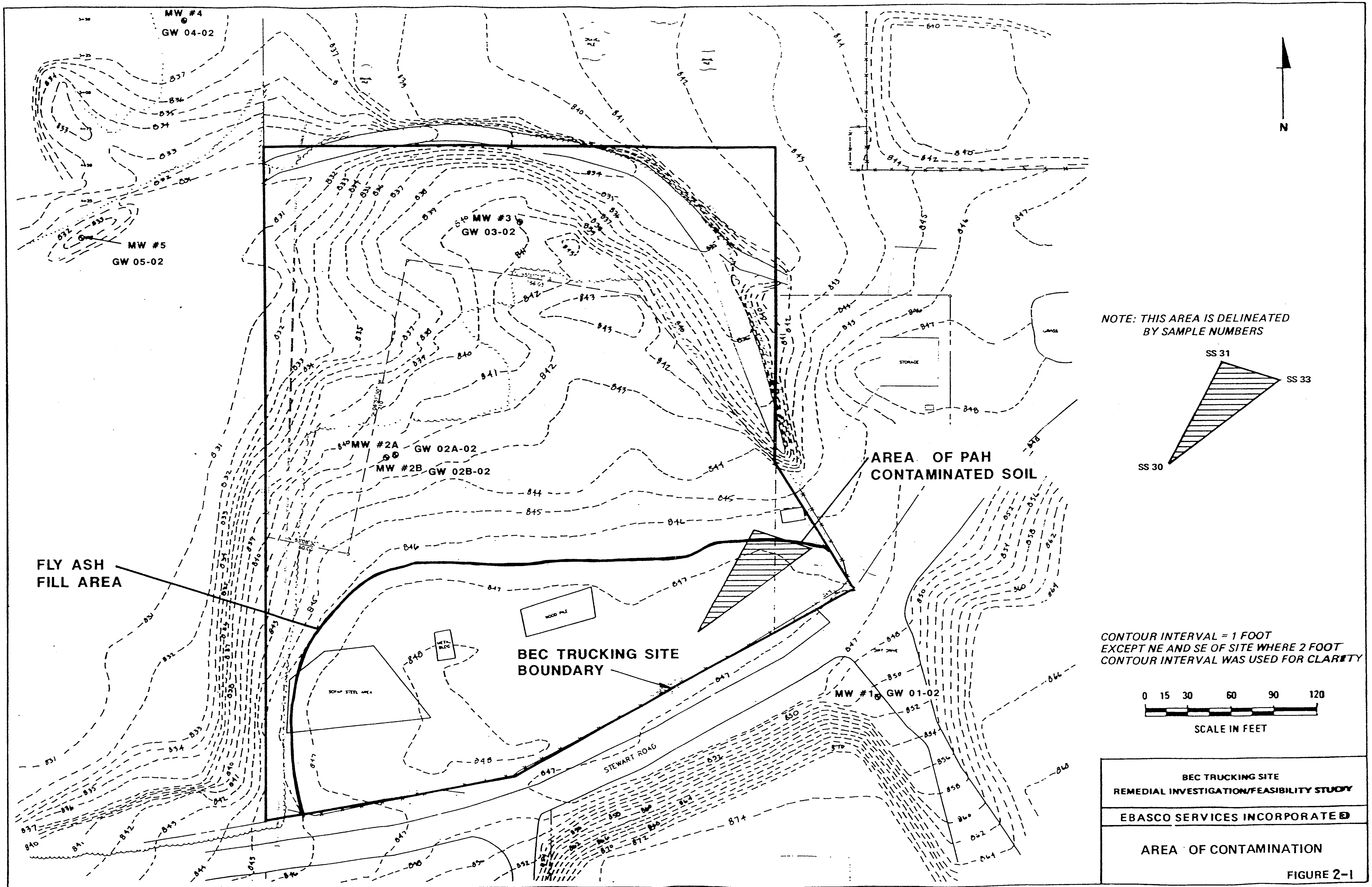
In order to estimate areas and volumes of soil potentially requiring remediation, risk based cleanup levels were utilized along with adjacent sample concentrations.

As mentioned earlier, the 10^{-6} risk based cleanup level for carcinogenic PAHs in surface soil is 14,200 ug/kg. Only one surface soil sample (SS-33) collected at the BEC Trucking Site exceeded this level. SS-33 was collected in the far southeastern corner of the BEC Trucking Site, approximately 25 feet due north of the Stewart Road entrance. This sample, collected in duplicate contained 14,800 and 10,200 ug/kg of total carcinogenic PAHs, respectively.

Although concentrations of carcinogenic PAHs exceeded risk based cleanup levels in one instance, a comparison to background concentrations is useful. Carcinogenic PAHs are ubiquitous in soils and are produced by most combustion processes, including coal combustion and forest and agricultural fires. Anthropogenic PAHs may be found even in isolated areas because of long range transport in the atmosphere and subsequent deposition. Based on data compiled from IARC (1973), White and Vanderslice (1980) and EPA (1980), total cPAH concentrations can range from 20 to 260 ppb. A study of Jones et al (1989) of PAHs in Welsh soils showed levels of cPAHs in selected urban soils ranging from 80-21,000 ug/kg with a geometric mean of 700 ug/kg (cPAHs at the BEC Trucking Site ranged from ND-14,800 ug/kg with a geometric mean of 982 ug/kg). The background sample (SS-02) collected along Stewart Road was found to contain 370 ug/kg of cPAHs. From this background data, it is apparent that levels of cPAHs detected at the BEC Trucking Site are marginally above or at background concentrations.

As described in Section 4.0 of the RI Report, soil sample location SS-33 represents the highest concentration of localized cPAH concentration. In order to accurately determine the volume of cPAH contaminated soil which potentially needs to be remediated, a detailed extent of contamination study in the area immediately surrounding SS-33 would be necessary. However, for the purposes of this FS some conservative soil volumes will be estimated.

In the southeast corner of the BEC Trucking Site, elevated levels of cPAHs were detected in numerous surface soil samples. However, only SS-33 was above the 10^{-6} risk based cleanup level. In order to determine the area of soil which exceeds



MW #4
GW 04-02
MW #3
GW 03-02
MW #5
GW 05-02
MW #2A
GW 02A-02
MW #2B
GW 02B-02
MW #1
GW 01-02
AREA OF PAH
CONTAMINATED SOIL
FLY ASH
FILL AREA
BEC TRUCKING SITE
BOUNDARY
STEWART ROAD
N
NOTE: THIS AREA IS DELINEATED
BY SAMPLE NUMBERS
SS 31
SS 33
SS 30
CONTOUR INTERVAL = 1 FOOT
EXCEPT NE AND SE OF SITE WHERE 2 FOOT
CONTOUR INTERVAL WAS USED FOR CLARITY
0 15 30 60 90 120
SCALE IN FEET
BEC TRUCKING SITE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
EBASCO SERVICES INCORPORATED
AREA OF CONTAMINATION
FIGURE 2-1

this clean-up level, the two closest sample locations with carcinogenic PAHs at a level greater than 10% of the risk based cleanup level were selected. This corresponds to samples SS-30 (4,240 ug/kg) and SS-32 (6,170 ug/kg). A triangle was then drawn (see Figure 2-1) encompassing SS-30, SS-31 and SS-33 (T-1) in the southeast corner of the BEC Trucking Site. This triangle conservatively represents an area of PAH contamination which may require remediation. The area of T-1 was found to be 2,362.5 ft^2.

In order to determine the depth to which potential remediation is required, subsurface soil samples were evaluated with respect to cPAH concentration. Subsurface soil samples in the southeast corner of the site exhibited a significant decrease in cPAH concentration relative to surface samples. Sample SB-03-01, collected at a depth of 1-2 ft in the center of T-1 revealed only 920 ug/kg of cPAHs. Based on subsurface soil data, it is apparent that cPAH contamination is limited to surface soils; consequently, remediation would only need to address soil down to the depth at which surface soil samples were collected, 0-1.5 ft. This results in an estimated soil volume of 3,544 ft^3.

2.3.2 Selection of General Response Actions

General response actions have been identified for the remedial action objective outlined in Section 2.2. The following four general response actions will be incorporated into Section 2.4.

- o No Further Action
- o Removal
- o Containment
- o Treatment

2.4 IDENTIFICATION AND SCREENING OF TECHNOLOGY TYPES

The purpose of this FS is to evaluate remedial technologies and alternatives which address the remedial action objective. A list of technologies was identified based on the general response actions. An initial screening was conducted on these technologies based on two criteria, effectiveness and implementability. A field of potentially applicable technologies was developed from this screening. Representative process options were then selected for each of the technologies which passed the screening. These technologies and process options were used as the basis for the derivation of alternatives.

The identification and initial screening of potential remedial technologies, organized according to the four response actions is presented in Table 2-5.

TABLE 2-5

BEC TRUCKING SITE - FEASIBILITY STUDY

Initial Screening of Technologies and Process Options

General Response Action	Remedial Technology	Process Options	Description	Screening Comments
No Further Action	None	N/A	No remedial action taken.	Required as a baseline consideration by the NCP. No Action is applicable.
No Further Action with one or more Institutional Controls	Deed Restrictions	N/A	Deeds for property in the area would include restrictions on construction, excavation, and removal of materials from the site.	Effectiveness: Restrictions on excavation and removal of materials from the site would prevent potential increases in risks associated with the carcinogenic PAHs in the soil. Implementation: There are no guarantees that deed restrictions will be strictly enforced in the long term, however, they are implementable. Screening Comments: This institutional control is applicable.
	Fencing		Construction of a fence to limit access to the site.	Effectiveness: This would limit exposure to specific contaminated areas and therefore minimize risks for dermal absorption. Implementation: Site conditions are not prohibitive for fence installation. A variety of vendors may be used. Screening Comments: This institutional control is applicable.
	Paving/ Landscaping		Asphalt or cement cover, addition of topsoil with revegetation.	Effectiveness: Paving/landscaping would address direct contact and dust inhalation pathways associated with the carcinogenic PAHs. Implementation: The technology is proven and a variety of vendors maybe used. Site conditions are not prohibitive for this technology. Screening Comments: This institutional control is applicable.

TABLE 2-5
BEC TRUCKING SITE - FEASIBILITY STUDY
Initial Screening of Technologies and Process Options
(cont'd)

General Response Action	Remedial Technology	Process Options	Description	Screening Comments
Removal	Excavation and Hauling	N/A	This technology involves the removal and hauling of contaminated soil off-site. Clean soil or rock would be used as backfill in areas where soil is removed. Excavation could be accomplished using backhoes or other heavy equipment.	Effectiveness: Excavation would provide removal of areas of contamination. This would eliminate current on-site sources of contamination and would address the remedial response objective. . Implementability: Excavation is a standard technology with a good record of performance. It involves the use of commonly available equipment. Health and safety procedures must be followed to prevent exposures by workers or the nearby population to contaminants during excavation. Screening Comments: Excavation is applicable.

TABLE 2-5

BEC TRUCKING SITE - FEASIBILITY STUDY

Initial Screening of Technologies and Process Options

(cont'd)

General Response Action	Remedial Technology	Process Options	Description	Screening Comments
Containment	Capping		A wide variety of materials can be used to cover contaminated soil and sediments in order to minimize leaching of contaminants or reduce the risks associated with direct exposure. Cover materials may be inert materials such as silt, clay, or sand or active materials such as gypsum.	Effectiveness: A properly maintained cap would address direct contact and dust inhalation pathways. Implementability: Construction of a soil cap is a proven technology and could be accomplished by numerous contractors. Screening Comments: The technology is applicable.
	Off-site Landfill		This technology would involve the disposal of material designated as a hazardous waste in a RCRA (40 CFR Part264) type facility. The facility must have a RCRA permit. Transportation of the material would require a manifest.	Effectiveness: This technology would provide secure disposal of contaminated soil which would address direct exposures. Implementability: A suitable RCRA permitted landfill is accessible. Screening Comments: Potentially applicable for carcinogenic PAH contaminated soil.
	On-site Landfill		Design and construction of RCRA landfill.	Effectiveness: This technology would be effective in eliminating risks associated with direct contact with soils contaminated with carcinogenic PAHs. Implementability: The proximity of the groundwater to the surface, the seasonal fluctuations of groundwater elevations, and the size of the site combine to provide a significant deterrent to the construction of an on-site landfill. Screening Comments: Due to the non-implementability, this option is not applicable.

TABLE 2-5

BEC TRUCKING SITE - FEASIBILITY STUDY

Initial Screening of Technologies and Process Options

(cont'd)

General Response Action	Remedial Technology	Process Options	Description	Screening Comments
Treatment	Vacuum Extraction		Through the creation of a vacuum and use of a pressure gradient, volatiles in the soil percolate and diffuse through the air spaces between the soil particles to the high vacuum pumps.	Effectiveness: The technology is effective in removing volatile organic compounds from relatively porous soil; however, due to the relatively low levels of contamination, the minimal volume and the low volatility of the contaminated soil, the use of this technology is not effective. Implementability: Full scale mobile units for vacuum extraction are currently available and have been demonstrated on CERCLA wastes. Screening Components: The technology is not considered for further evaluation since it is not feasible.
	Insitu Chemical Treatment		Using an auger mixing/chemical injection system, soil is treated in place. Injected substances may include solvents, precipitating and neutralizing chemicals and stabilizing agents.	Effectiveness: The process would not be effective for the cPAHs detected on site. Implementability: The system is commercially available although tests are continuing to be performed on NPL sites. Screening Comments: The process is not effective in achieving the remedial action objective; therefore, it is not applicable.

TABLE 2-5

BEC TRUCKING SITE - FEASIBILITY STUDY

Initial Screening of Technologies and Process Options

(cont'd)

General Response Action	Remedial Technology	Process Options	Description	Screening Comments
Treatment (Cont'd)	On-site Soil Washing		The process extracts contaminants from sludge or soil materials using a liquid medium such as water as the washing solution. This process can be used on excavated soils that are fed into a washing unit.	Effectiveness: The process can be used for both metals and organics; however, the relatively low levels of cPAHs detected in the on-site soil result in an unfavorable concentration driving force for extraction. Implementability: The technology is commercially available and would be implemented at the site. Screening Comments: The technology does not satisfy both criteria, therefore, it is not applicable.
	Insitu Soil Washing		In situ soil washing is a process applied to unexcavated soils using a groundwater extraction reinjection system which extracts contaminants from the soil.	Effectivenss: The process can be used for both metals and organics; however, the relatively low levels of contaminants in the on-site soil result in an unfavorable concentration driving force for extraction. Implementability: The technology is primarily used for contamination in subsurface soils. Since cPAHs were predominantly detected in shallow soil (less than 1.5' depth), the technology is not implementable. Screening Comments: The technology is not applicable.

TABLE 2-5
BEC TRUCKING SITE - FEASIBILITY STUDY
Initial Screening of Technologies and Process Options
(cont'd)

General Response Action	Remedial Technology	Process Options	Description	Screening Comments
Treatment (Cont'd)	Thermal Oxidation	Rotary Kiln - Off-site	Contaminated soil is incinerated in a controlled atmosphere.	Effectiveness: This technology is used to incinerate halogenated and nonhalogenated solids, sludges, soils, slurries and liquids. Implementability: Thermal incinceration processing methods are standard, well developed and proven, and are implementable. Incineration may be performed both off-site or on-site. On-site thermal oxidation would be difficult due to on-site space limitations. Screening Comments: Thermal oxidation is a potentially applicable technology.
	Low Temperature Thermal Stripping		The system processes contaminated soil through a pug mill or rotary drum system equipped with heat transfer surfaces.	Effectiveness: This system is normally used to remove high concentrations of volatile organic compounds. The minimal volume, low concentrations and semi-volatility of cPAH contaminated soil causes the application of this process to be prohibitive. Implementability: A pilot system constructed of off the shelf components has been tested on soils on at least one CERCLA site. Screening Comments: This process is not applicable due to its lack of effectiveness.

TABLE 2-5

BEC TRUCKING SITE - FEASIBILITY STUDY

Initial Screening of Technologies and Process Options

(cont'd)

General Response Action	Remedial Technology	Process Options	Description	Screening Comments
Treatment (cont.)	On-site Solidification/ Stabilization		The contaminated soil is excavated using heavy equipment. The soil is then mixed on-site with cement or similar additives. The waste is then encapsulated into the rigid matrix of the hardened concrete.	Effectiveness: Cement solidication is most suitable for immobilizing metals. Solidificaiton/stabilization solely will not eliminate the risks associated with direct exposure to cPAHs. Implementability: Commercial cement mixing and handling equipment are generally used for on-site solidification in conjunction with excavation equipment. Treatability tests would be required to develop the proper mixture concentration. Screening Comments: The process is not effective; therefore, it is not applicable.

2.4.1 Screening of Remedial Technologies and Process Options

This section presents descriptions and screenings of technologies which may be applicable to the carcinogenic PAHs in the soil.

Evaluation and screening of remedial action technologies is based on the following criteria:

- Effectiveness:

  Effectiveness is the capability of the technology to contribute to the fulfillment of the remedial action objective; the protection of human health and the environment; and the ability of the technology to handle the estimated areas or volumes of contaminated medium.

- Implementability:

  Implementability consists of the evaluation of the technical and institutional feasibility based on site-specific conditions, past performance record and the availability of vendors, contractors, mobile units, etc.

All of the items in each criteria do not apply directly to each technology, and therefore each item is addressed only where appropriate.

Screening evaluations at this stage focus on effectiveness and implementability with less effort directed at cost evaluations. Technologies are not eliminated solely on a basis of cost; however, process cost in relation to remediation volume is a factor in the evaluation. Each technology presented in this section does not necessarily stand alone since the technologies are subsequently combined with other processes into remedial action alternatives as described in Section 3.0 and 4.0. Table 2-6 provides a summary of the initial technology screening.

For each technology, one representative process is generally selected so that the size of the matrix of candidate technologies is manageable to facilitate the subsequent development of alternatives. The specific process actually used to implement the remedial action at the site will be selected during the remedial design phase and may differ from the selected representative process in the FS.

2.4.2 Summary of Identification and Screening of Technology Types and Selection of Process Options

All of the four general response actions were identified with remedial technologies that will address the remedial action objective. The rationale for the retention or elimination of a

TABLE 2-6
BEC TRUCKING SITE - FEASIBILITY STUDY
Results of Technology Screening

General Response Action Remedial Technology	Remedial Response Objective
I No Further Action	
.1 NFA	--
II No Further Action with Institutional Controls	
.1 Deed Restrictions	Accepted
.2 Fence Construction	Accepted
.3 Paving/Landscaping	Accepted
III Removal	
.1 Excavation	Accepted
IV Containment	
.1 Capping	Accepted
.2 Off-site Landfill	Accepted
.3 On-site Landfill	Rejected

TABLE 2-6
BEC TRUCKING SITE - FEASIBILITY STUDY
Results of Technology Screening
(cont'd)

General Response Action Remedial Technology	Remedial Response Objectives
V Treatment	
.1 Vacuum Extraction	Rejected
.2 Insitu Chemical Treatment	Rejected
.3 On-site Soil Washing	Rejected
.4 Insitu Soil Washing	Rejected
.5 Low Temperature Thermal Stripping	Rejected
.6 Thermal Oxidation	Accepted
.7 On-site Solidification/Stabilization	Rejected

particular technology based on the two screening criteria of effectiveness and implementability was described in the screening comments section of Table 2-5 and also are described below.

2.4.2.1 No Further Action

The "No Further Action" scenario is considered in the FS to provide a baseline to which other remedial technologies and alternatives may be compared. The selection of a process option is not applicable for the "No Further Action" general response action.

2.4.2.2 Removal

Removal would consist of excavation of the area of material which has been identified as having concentrations of carcinogenic PAHs above the risk based action level. The area based on a carcinogenic risk level of 10^{-6} is shown on Figure 2-1. The assumed depth of soil is approximately 1.5 ft.

The use of construction equipment such as backhoes would constitute the most likely representative process option for excavation. During the process of excavation health and safety requirements for airborne contaminants will be observed. This technology would be used in conjunction with other technologies.

2.4.2.3 Containment

Containment consists of two remedial technologies, capping and off-site landfilling. A representative process option for capping would be installation of a soil cover over the area of contamination. This process option would satisfy the remedial action objective. A soil cap may be used to cover the area which exhibits concentrations of cPAHs above the action level in surficial soil.

The remedial technology of off-site landfilling would consist of the use of a RCRA permitted landfill as a process option. This option would be used in conjunction with excavation and hauling. Off-site landfilling would address the remedial action objective. The removal of the soils exhibiting cPAH concentrations above the action levels would eliminate the risk associated with direct exposure to the soil. A representative landfill was identified within the proximity of Buffalo/Niagara Falls area which would accept the soils containing cPAHs. Currently, the land disposal ban does not affect the soils on the BEC Trucking Site. It is anticipated that the land ban will not have an effect on the cPAH soil because levels of contamination are below the proposed treatment range of 20 ppm.

2.4.2.4 Treatment

Thermal oxidation or incineration was the only potentially applicable treatment remedial technology which emerged from the screening process. Incineration is a thermal treatment technology that uses controlled flame combustion in an enclosed reactor to decompose hazardous wastes. Incineration reacts to organic solids, liquids, and gases at high temperatures in the presence of oxygen. Carbon and hydrogen waste components are converted to CO_2 and H_2O, respectively, while most of the chlorine is converted to HCl. Other combustion products are also formed in smaller quantities and may include carbon monoxide, nitrogen oxides, trace metals, and products of incomplete combustion. Incineration produces a solid waste stream from the incombustible portion of the original waste material which is removed as bottom and fly ash. Depending on the original waste stream, process residuals/effluents may require further treatment and/or disposal.

Rotary kiln, fluidized, bed and infrared are three types of incineration processes which may be applicable to the site. The rotary kiln is one of the most common and versatile types of incinerators used in hazardous waste applications and is capable of burning a broad range of hazardous gases, liquids, solids and slurries; therefore, it was chosen as the representative process option.

Incineration can be accomplished on-site or off-site. On-site incineration is not considered further primarily because the volume of soil to be treated is small such that the unit cost for on-site incineration would be much higher than the unit cost for off-site incineration. Also, since the site is located in a relatively populated area, the permitting of an on-site incinerator would be difficult.

Incineration achieves the remedial action objective. Soil containing concentrations of cPAHs above the action level would be treated. This treatment would destroy the cPAHs in the soil and thereby reduce the risks associated with direct contact with soils containing cPAHs.

2.4.2.6 Rejected Technologies

Numerous remedial technologies that were identified within each of the general response action categories were eliminated from further consideration because of site specific characteristics.

The on-site soil cleanup level for cPAHs is 14,200 ug/kg to achieve a lifetime cancer risk of 10^{-6}. Only one soil sample exhibited a concentration above this action level, SS-33 (14,800 ug/kg). Adjacent samples were significantly below the action level. This low level of contamination and minimal volume of soil requiring remediation resulted in the elimination of several treatment technologies such as vacuum extraction, on-site soil washing, low temperature thermal stripping, bioreclamation, and solidification/stabilization.

In-situ soil washing is generally considered for treating contaminated soil at depth in combination with a pump and treat system for groundwater. Since the elevated concentrations of cPAHs at the BEC Trucking Site are present in shallow soil only, and a groundwater pump and treat system is not required, in-situ soil washing was excluded.

The depth to groundwater ranged from approximately 6 ft at Monitoring Well 1 to 7 ft at Monitoring Well 2B. The proximity of the water table to the surface excludes on-site landfilling.

Remedial technologies such as in-situ chemical treatment and thermoplastic solidification are not applicable to the type of contaminants which were detected on-site (carcinogenic PAHs in soils); therefore, these technologies were eliminated from further consideration.

Table 2-7 is a summary of the remedial technologies with a representative process indicated, which passed the initial screening and will be used in the development of alternatives.

TABLE 2-7
BEC TRUCKING SITE - FEASIBILITY STUDY
REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS RETAINED

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTION
No Further Action	None	N/A
Removal	Excavation	N/A
Containment	Capping	Soil Cap Off-Site Landfill
Treatment	Thermal Oxidation	Off-Site Rotary Kiln Incineration

3.0 DEVELOPMENT AND SCREENING OF ALTERNATIVES

In this section the general response actions and process options selected to represent the various technology types will be combined to form remedial alternatives. Due to the relatively low number of alternatives, the screening of alternatives step is not required. The detailed analysis and comparison of the alternatives is included in Section 4.0.

3.1 DEVELOPMENT OF ALTERNATIVES

Based on the identification and screening of technologies in Section 2.0, four general response actions were retained for development of remedial alternatives as shown in Table 2-7. Included in these general response actions are the following process options:

- Capping with the soil membrane;
- RCRA hazardous waste landfill; and
- Rotary kiln incineration

From these process options, four remedial alternatives have been developed:

- Alternative 1 - No Further Action
- Alternative 2 - Excavation/Off-site RCRA Landfilling
- Alternative 3 - Capping
- Alternative 4 - Excavation/Off-site Incineration

The rationale for the development of these alternatives is to completely evaluate all three of the process options which passed the initial screening.

3.2 SCREENING OF ALTERNATIVES

Typically, in this section of the Feasibility Study, potential alternatives are screened, based on effectiveness, implementability, and cost to reduce the list of alternatives requiring subsequent detailed analysis. However, due to the low number of alternatives, a screening of alternatives is not necessary. In order to streamline the FS and to provide a more concise evaluation of alternatives, this tier of screening will be eliminated and all four alternatives will be retained for detailed analysis in Section 4.0.

4.0 DETAILED ANALYSIS OF ALTERNATIVES

4.1 INTRODUCTION

The remedial alternatives developed in Section 3.0 are described and evaluated in detail in this section. The detailed analysis of remedial alternatives provides information needed to facilitate comparison among alternatives as well as the final selection of a remedial alternative. The following nine criteria are used for the detailed analysis:

- o Short-term Effectiveness
- o Long-term Effectiveness
- o Reduction of Mobility, Toxicity, or Volume
- o Implementability
- o Cost
- o Compliance with ARARs
- o Overall Protection
- o State Acceptance
- o Community Acceptance

Factors considered for each evaluation criterion are summarized and presented in Table 4-1. Of the nine evaluation criteria, the first seven are evaluated in detail. Although preliminary assessments of state and community acceptance criteria are provided, an evaluation of state and community acceptance will be developed in the Record of Decision (ROD) following the public comment period.

4.2 ALTERNATIVE ANALYSIS

4.2.1 Alternative 1 - No Further Action

4.2.1.1 Description

This alternative is considered in the detailed analysis to provide a baseline for comparison of other remedial alternatives. This alternative involves taking no further action at the BEC Trucking Site to remove, remediate, or contain the cPAH contaminated soils. Institutional controls such as paving, fencing, and deed restrictions may be implemented at the site to reduce the risk to public health from exposure to the cPAH contaminated soils. Institutional controls may be recommended in the ROD.

4.2.1.2 Assessment

o Short-term Effectiveness:

This alternative does not provide short-term protection of human exposure to the cPAH contaminated soils. However, the

TABLE 4-1

BEC TRUCKING SITE - FEASIBILITY STUDY

FACTORS FOR DETAILED ANALYSIS OF ALTERNATIVES

Short-Term Effectiveness	Long-Term Effectiveness	Reduction of Toxicity, Mobility, or Volume	Implementability
Time until protection is achieved.	Reduction of existing risks.	Amount of hazardous material destroyed or treated.	Ability to operate and construct the technology.
Short-term reliability of technology.	Magnitude of future risks.	Degree of expected reductions in toxicity, mobility, and volume.	Ability to phase into operable units.
Protection of community during remedial actions.	Long-term reliability.	Degree to which treatment is irreversible.	Ease of undertaking additional remedial actions, if necessary.
Protection of workers during remedial actions.	Prevention of future exposure to residuals.	Type and quantities of residuals remaining after treatment.	Ability to monitor effectiveness of remedy.
	Potential need for replacement.		Availability of treatment, storage, and disposal services and capacity.
			Availability of necessary equipment and specialists.

TABLE 4-1

BEC TRUCKING SITE - FEASIBILITY STUDY

FACTORS FOR DETAILED ANALYSIS OF ALTERNATIVES

(cont'd)

Cost	Compliance with ARARs	Overall Protection	State Acceptance*	Community Acceptance*
Development and construction costs.	Compliance with contaminant-specific ARARs.	How alternative provides human health and environmental protection.	Features of the alternative the state supports.	Features of the alternative the community supports.
Operating costs for implementing remedial action.	Compliance with location-specific ARARs.		Features of the alternative the state has reservations about.	Features of the alternative the community has reservations about.
Other capital and short-term costs until remedial action is complete.	Compliance with action-specific ARARs.		Features of the alternative the state strongly opposes.	Features of the alternative the community strongly opposes.

* Preliminary assessments in FS. To be fully assessed in the ROD.

contaminated soils are restricted to a localized area and the risk to human health and the environment is at the lower limits of the risk-based action range. Since there is no remedial action involved with this alternative, protection of workers and the community during remedial actions is not a consideration.

o <u>Long-term Effectiveness:</u>

This alternative does not provide reduction of existing or future health risks associated with exposure to the cPAH contaminated soils. However, over time the cPAHs in the surface soil will undergo aerobic biodegradation with indigenous microorganisms. This natural process will tend to reduce concentrations of cPAHs in the long-term.

The concentration of cPAH contaminants on-site are already at the lower limits of the 10^{-6} risk based action level. From a health based standpoint, the existing risk on-site is within the general range of levels normally recommended by the USEPA as the remediation goal.

The no further action alternative will not impact fish and wildlife since there is no remedial action involved with this alternative. The cPAHs are not expected to migrate to the wetlands if left in place since they are generally immobile.

o <u>Reduction of Toxicity, Mobility, or Volume:</u>

This alternative does not reduce the toxicity, mobility, or volume of cPAHs in soil.

o <u>Implementability:</u>

There are no implementability considerations associated with this alternative.

o <u>Cost:</u>

The total present worth of Alternative 1 is $0.00. A cost summary is presented in Table 4-2.

o <u>Compliance with ARARs</u>:

Action-specific ARARs are not applicable because no activities are involved with this alternative.

o <u>Overall Protection:</u>

This alternative would not achieve the remedial action objectives of protecting the public health from possible exposure risks associated with the cPAH contaminated soils. However, as previously stated, the concentration of cPAH on-site are at the lower limit of the risk-based action level.

TABLE 4-2

BEC TRUCKING SITE - FEASIBILITY STUDY
ALTERNATIVE 1 - NO FURTHER ACTION

Activity	Estimated Quantities	Unit Price	1989 Cost ($)
I. Capital Cost			
A. Direct Cost	0	0	0
B. Indirect Cost	0	0	0
II. Present Worth of O&M Cost			
III. Net Present Worth of No Action Alternative			0

o State and Community Acceptance:

The state and community may accept the no further action alternative at the BEC Trucking Site since mean contaminant levels of cPAHs in soil are below the risk-based remedial action range.

4.2.2 Alternative 2 - Excavation/Off-Site RCRA Landfilling

4.2.2.1 Description

This alternative involves excavating the area of cPAH contaminated soil. The area proposed to be excavated is shown in Figure 2-1. The estimated volume of soils contaminated with cPAHs is approximately 130 cubic yards. This alternative involves excavating the contaminated soils, placing the excavated materials in trucks, transportation of the material and disposal in an off-site permitted RCRA landfill. The excavation volumes would be finalized during the design phase.

Prior to excavation, the extent of cPAH contaminated soil would be determined by soil sampling and analysis. Approximately 15 samples would be collected in the contaminated area indicated in Figure 2-1. Upon delineation of the exact extent of contamination, site preparation would commence. Site preparation would include securing areas for vehicles and equipment. Support facilities, consisting of three temporary office trailers, would also be required for this alternative. Utilities hook-ups to the trailers would be required.

The 130 cubic yards of material will be excavated using a backhoe and placed directly into trucks. Approximately 10 truck loads of material will be transported to Model City, New York (approximately 250 miles from the site) for disposal.

The material will be periodically wetted during excavation and handling as necessary, to minimize fugitive dust generation. A water supply must be located or transported to the site to facilitate dust control and revegetation activities.

Upon completion of the excavation, clean soil (~130 cubic yards) would be transported to the site as backfill for the excavated area. This backfill material would be graded and vegetated to promote original drainage patterns and erosion prevention. Any non-contaminated area disturbed by the implementation of this alternative would also be regraded and revegetated.

Presently there is sufficient landfill capacity to hold the contaminated material removed from the site. An EPA-approved RCRA landfill is located near the site in Model City, New York.

4.2.2.2 Assessment

- Short-term Effectiveness:

Protection of public health from exposure to the cPAH contaminated soil would be achieved upon excavation of the contaminated area.

Dust may be generated and contaminants may be released during excavation activities. Dust and/or vapor control procedures would be required. Perimeter air monitoring may be required to document the effectiveness of these controls in protecting the community from adverse air emissions.

Workers would be required to wear protective equipment (Level C) during activities where they may be exposed to hazardous materials. Air monitoring will be performed in work areas to monitor the breathing zone.

Because this alternative involves off-site transportation of waste, there is a potential exposure risk to the community if a spill occurred as a result of a transportation accident. Once the on-site remedial activities begin, excavation, removal and transportation would take approximately one week during which time the risks previously identified would be present both on-site and off-site.

- Long-term Effectiveness:

There would be no remaining long-term risks associated with this alternative and no long-term management, operation, or maintenance requirements because the contaminated soil would be completely removed from the site.

Assuming the facility receiving the soil is properly designed and operated according to RCRA and state regulations for hazardous waste disposal facilities, the risks posed by disposal in an off-site landfill should be minimal.

This alternative is anticipated to have minimal impact on the fish and wildlife resources at the site. Fish have not been observed in the intermittent drainage ditch or marsh in the site area. The site area is not a prime wildlife environment due to its industrial/suburban character. The excavation, removal and backfilling operations associated with this alternative will not significantly change the site environment with regards to fish and wildlife habitat.

- Reduction of Toxicity, Mobility and Volume:

With respect to the BEC Trucking Site, complete removal of the cPAH contaminated soil from the site is a permanent remedial action which reduces the overall toxicity, mobility and volume of contamination at the site.

With respect to off-site disposal of the cPAH contaminated soils, this alternative would not reduce the toxicity or volume of the contamination and does not provide a permanent treatment remedial action. Disposal of the soil in an off-site, RCRA hazardous waste landfill would marginally reduce the mobility of contaminants in the waste by placing the waste in a double-lined, multi-layer capped landfill with a leachate detection and collection/treatment system.

The only residuals remaining after implementation of this alternative would be fluids generated during decontamination activities. Depending on contaminant concentrations, decontamination fluids would either be hauled to a local sewage treatment plant or offsite hazardous waste treatment facility.

- <u>Implementability:</u>

The technologies proposed for this alternative are all demonstrated and commercially available. The USEPA must obtain hazardous waste generator status for the site for the removed hazardous materials. The waste must be manifested and transported by a licensed hazardous waste transporter, and the receiving disposal facility must be RCRA permitted.

- <u>Cost</u>:

The total present worth of Alternative 2 is $106,150 as presented in Table 4-3. There will be no operating and maintenance costs, as all wastes will have been shipped off-site. There will be no five-year review cost. Presently, land band restrictions do not apply. Detailed alternative costs and calculations are shown in Appendix A and Appendix B respectively.

- <u>Compliance with ARARs:</u>

OSHA standards (29 CFR, Parts 1910, 1926 and 1904), especially standards governing worker safety during hazardous waste operations (29 CFR Part 1910) would have to be followed during all site work.

During site work, Federal and New York State air emission requirements must be considered. If air emission limits are exceeded, dust suppressants must be applied to control fugitive dust emissions.

There are no location-specific ARARs associated with this remedial alternative.

Transportation of the waste to a RCRA permitted hazardous waste landfill must be completed in compliance with federal regulations applicable to generators and transporters of hazardous wastes (40 CFR Parts 262 and 263) as well as with New

TABLE 4-3

BEC TRUCKING SITE - FEASIBILITY STUDY

COST ESTIMATE

ALTERNATIVE 2 - EXCAVATION/OFF-SITE RCRA LANDFILLING

Activity	Estimated Quantities	Unit Price	1989 Cost ($)
Soils Containing PAHs			
I. Capital Cost			
A. Direct Cost			
o Site Preparation & Utility Hookup		L.S.	10,500
o Excavation	130 CY	$24/CY	3,120
o Transportation	250MIx10Trucks	4.00/MI/Truck	10,000
o Disposal	195 Tons	152/ton	29,640
o Soil Sampling	6 MD	500	3,000
o Soil Sampling Lab Analyses	15 Samples	700 $/sample	10,500
o Regrading & Backfill & Topsoil	130 CY	45 $/CY	5,850
o Revegetation	2,400 SF	.25/SF	600
Subtotal:			73,210
B. Indirect Costs			
o H&S @ 5% of Direct Cost			3,660
o Bid & Scope Contingency @ 20% of Direct Cost			14,640
o Permitting & Legal @ 10% of Direct Cost			7,320
o Engineering Services @ 10% of Direct Cost			7,320
Total Capital Cost:			106,150
II. Present Worth of Annual O&M			-0-
III. Net Present Worth of Excavation/Off-site RCRA Landfilling Alternative			106,150

York regulations. In addition, off-site transportation of the waste must comply with Federal (49 CFR Parts 107, 171-179) and state DOT regulations pertaining to transportation of hazardous materials.

The facility receiving the waste must be in compliance with RCRA (40 CFR Part 264) and state regulations and standards for owners and operators of hazardous waste treatment, storage, and disposal facilities and must be properly permitted (40 CFR Part 265).

- <u>Overall Protection:</u>

This alternative would achieve the remedial action objective of protecting the public health from exposure risks (ingestion, inhalation, and dermal contact) associated with the cPAH contaminated soil and would provide a permanent remedial solution.

- <u>State and Community Acceptance:</u>

The state and community may accept this remedial alternative for the cPAH contaminated soils since they would be removed from the site. The community and state may have reservations concerning off-site shipments of contaminated material through the area.

4.2.3 Alternative 3 - Capping

4.2.3.1 Description

This alternative involves the installation of a soil cover over the area of cPAH contaminated soil. The objective of the cap is to minimize the risk of direct exposure to the contamination. In addition, the cap will also minimize the migration of contaminants via surface water runoff. Migration of cPAH contaminants into the groundwater is restricted by the relatively non-permeable underlying fly ash and the natural tendency for cPAHs to adsorb to soils.

Site preparation activities would include: securing parking areas for vehicles and equipment, mobilizing support facilities, and securing utilities.

The cap would cover an area of approximately 2,362 square feet. Sampling would be conducted during the design phase for approximately three days to confirm the extent of cPAH contamination.

Upon delineation of the area of contamination, one foot of compacted soil would be placed over the contaminated soil. One foot of sand would be placed on the compacted soil followed by one foot of topsoil. The cap will have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present on site. A two-foot border, which will taper from the cap elevation to the original elevation, would be installed to promote drainage and prevent erosion. Revegetation will be required subsequent to topsoil placement.

4.2.3.2 Assessment

- <u>Short Term Effectiveness</u>:

Protection of public health from exposure to the cPAH contaminated soil area would immediately be achieved upon installation of the soil cap. Workers may be required to wear protective equipment (Level C) during activities where they may be exposed to hazardous material. Installation of the cap would take approximately one week during which time the risk previously identified would be present at the site.

- <u>Long Term Effectiveness</u>:

The long term effectiveness of this alternative is a direct result of the service life expectancy of the cap. Upon cap failure, risk to public health from exposure to the cPAH contaminated soil would increase. Cap failure could be prevented by a diligent maintenance program.

This alternative is anticipated to have minimal impact on the fish and wildlife resources at the site. Fish have not been observed in the intermittent drainage ditch or marsh in the site area. The site area is not a prime wildlife environment due to its industrial/suburban character. Addition of a soil cap with indigenous vegetation will not significantly change the site environment with regards to fish and wildlife habitat.

- <u>Reduction of Toxicity, Mobility or Volume</u>:

This alternative would not reduce the toxicity or volume of cPAH contaminants in the soil. This alternative would provide some reduction in the mobility of contaminant by reducing contact of surface runoff with contaminated soils.

- <u>Implementability</u>:

The technologies proposed for capping are all demonstrated and commercially available. Since all of the remediation will occur on site, no permits are anticipated to be required. Construction of the cap may require land use restrictions. Deed restriction and long term monitoring will require administrative effort.

- <u>Cost</u>

The net present worth of Alternative 3 is $97,295, as presented in Table 4-4. Total capital costs associated with the

TABLE 4-4

BEC TRUCKING SITE - FEASIBILITY STUDY

COST ESTIMATE

ALTERNATIVE 3 - CAPPING

Activity	Estimated Quantities	Unit Price	1989 Cost ($)	
Capping CPAH Contaminated Soil				
I. Capital Cost				
A. Direct Cost				
o Site Preparation	L.S.	10,500	10,500	
o 3 ft Cap - Spread and Compact	88 CY	215 CY	18,920	
o Revegetation	2,400 SF	.25	600	
o Soil Sampling	6 MD	500	3,000	
o Sampling Lab Analyses	15 Samples	700	10,500	
Subtotal:			43,520	
B. Indirect Costs				
o H&S @ 5% of Capital			2,180	
o Bid & Scope Contingency @ 20%			8,700	
o Permitting & Legal @ 10%			4,350	
o Engineering & Services @ 15%			6,530	
Total Capital Cost:				65,280
II. Present Worth of Annual O&M Costs				
A. Soil Cap Maintenance @ 2.5% of Installation Costs			1,630	
Total Annual O&M:			1,630	
B. Present Worth of O&M			25,060	
C. Present Worth of Five-Year Review	6 Reviews	2,500/review	6,955	
Present Worth O&M:				32,015
III. Net Present Worth of Capping Alternative				97,295

installation of a soil cap is $65,280. Total O&M expenditures of $32,015 include maintenance of the soil cap and reviews at five-year intervals. Detailed alternative costs and calculations are shown in Appendix A and Appendix B respectively.

o <u>Compliance with ARARs</u>

Since the cap is designed as a permanent protective measure, it must meet the RCRA closure requirements (40 CFR Parts 264.228, 264.258 and 264.310) or New York closure requirements.

OSHA standards (29 CFR, Parts 1910, 1926 and 1904), especially standards governing worker safety during hazardous waste operations (29 CFR Part 1910) would have to be followed during all site work.

During site work Federal and New York State air emission requirements must be considered.

There are no location-specific ARARs associated with this remedial alternative.

o <u>Overall Protection</u>

This alternative would achieve the remedial action objective of protecting the public health from exposure risks (ingestion, inhalation and dermal contact) associated with the cPAH contaminated soil area.

o <u>State and Community Acceptance</u>

Although direct exposure to the cPAHs is reduced by covering the soil under two feet of material the state and community may havereservations about leaving the contaminated soils on-site.

4.2.4 <u>Alternative 4 - Excavation/Off-site Incineration</u>

4.2.4.1 Description

This alternative involves excavating the area of cPAH contaminated soil, transporting the waste off-site to an incinerator facility and disposing of the incinerated waste (ash) by the incinerator facility in an off-site RCRA hazardous waste landfill. This alternative would protect the public health from exposure to the cPAH contaminant by removing the soils from the site and then destroying a significant percentage of the cPAHs.

During the design phase, the exact extent of cPAH contaminated soil would be determined by soil sampling and analysis.

Approximately 15 soil samples would be collected in the area of contamination.

Upon delineation of the extent of contamination, site preparation would begin. Site preparation includes: securing parking areas for personal vehicles and equipment, mobilizing support facilities, and securing utilities.

Following delineation and site preparation, excavation will commence. Approximately 130 cubic yards of soil would be excavated, then loaded into trucks and transported to a RCRA-approved incinerator. Estimated transportation quantities for bulk shipment is 2,500 miles. Material would be transported to Model City, New York, which is located approximately 250 miles from the site. Upon receipt of the shipment a trial burn would be conducted prior to rotary kiln incineration. An estimated decrease in soil volume of 20 percent as a result of incineration would yield 116 cubic yards of ash. This ash would be disposed in a permitted off-site landfill.

The excavated areas, approximately 2,400 square feet, would be backfilled with 130 cubic yards of clean topsoil and revegetated.

4.2.4.2 Assessment

o <u>Short-term Effectiveness</u>

Protection of public health from exposure to the cPAHs would be achieved upon removal of the area of contaminated soil. If the facility receiving the waste is properly designed and operated according to RCRA and state regulations for hazardous waste incinerators, the risks posed by incineration of the soil in an off-site facility should be minimal. If the landfill is in compliance with RCRA and state regulations, the risk posed by disposal of the ash in an off-site landfill should be minimal.

Dust may be generated during excavation activities. Dust and/or vapor control procedures could be required. Perimeter air monitoring may be required to document the effectiveness of these controls in protecting the community from adverse air emissions. Workers will be required to wear protective equipment (Level C) during activities where they may be exposed to hazardous materials. Air monitoring will be performed in work areas to monitor the breathing zone.

Because this alternative involves off-site transportation of the contaminated soil there is a potential exposure risk to the community if a spill occurred as a result of a transportation accident.

Once the on-site remedial activities begin, excavation, transportation, and incineration would take approximately one month, depending on the availability and distance to the incinerator, during which time the risks previously identified would be present both on-site and off-site.

o <u>Long-term Effectiveness:</u>

There would be no remaining long-term risks associated with this alternative and no long-term management, operation, or maintenance requirements, because the cPAH contaminated soils would be completely removed from the site.

If the facility receiving the residual ash is properly designed and operated according to RCRA and state regulations for hazardous waste disposal facilities, the risks posed by disposal of the ash in an off-site landfill should be minimized.

This alternative is anticipated to have minimal impact on the fish and wildlife resources at the site. Fish have not been observed in the intermittent drainage ditch or marsh in the site area. The site area is not a prime wildlife environment due to its industrial/suburban character. The excavation, removal, and backfilling operations associated with this alternative will not significantly change the site environment with regards to fish and wildlife habitat.

o <u>Reduction of Toxicity, Mobility, or Volume</u>

Removal of the cPAH contaminated soil from the site followed by incineration of the waste is a permanent remedial action which reduces the overall toxicity, mobility, and volume of contamination at the site. All of the cPAH contaminants in the soil would be reduced to below the risk-based remedial action levels and the soil volume would be reduced by approximately 20 percent.

The only on-site residuals remaining after implementation of this alternative would be fluids generated during decontamination activities. Depending on contaminant concentrations, decontamination fluids would either be hauled to a local sewage treatment plant or hauled to an off-site hazardous waste treatment facility.

o <u>Implementability</u>

The technologies proposed for excavation, incineration, and off-site landfilling are demonstrated and commercially available. No permits are anticipated to be required for on-site activities. The USEPA must obtain hazardous waste generator status for the site. The waste must be manifested and transported by a licensed hazardous waste transporter, and the receiving incinerator and disposal facilities must be RCRA permitted.

o <u>Cost</u>

The present worth of Alternative 4 is $485,370, as depicted in Table 4-5. No O&M costs are anticipated. Five-year reviews will not be required. Detailed alternative costs are shown in Appendix A.

o <u>Compliance with ARARs</u>

OSHA standards (29 CFR, Parts 1910, 1926, and 1904), especially standards governing worker safety during hazardous waste operations (29 CFR Part 1910) would have to be followed during all site work.

During site work, Federal and New York air emission requirements must be considered. If emission limits are exceeded, dust suppressants must be applied to control fugitive dust emissions.

If the residual ash is considered to be a hazardous waste (40 CFR Part 261), the ash would be subject to control under RCRA Subtitle C (40 CFR Part 268) requirements for the land disposal of hazardous wastes.

There are no location-specific ARARs associated with this remedial alternative.

Off-site transportation of the contaminated soil and other treatment residuals must be completed in compliance with Federal regulations applicable to generators and transporters of hazardous wastes (40 CFR Parts 262 and 263) as well as with New York regulations. In addition, off-site transportation of the waste and residuals must comply with Federal (49 CFR Parts 107, pp 171-179) and state DOT regulations pertaining to transportation of hazardous materials.

RCRA incinerator regulations (40 CFR Part 264, Subpart 0) are applicable to the off-site incinerator facility and include performance standards and operating, monitoring and inspection requirements. The incinerator must be a RCRA permitted facility. The facilities receiving the ash and other treatment residuals must also be in compliance with RCRA (40 CFR Part 264) and state regulations and standards for owners and operators of hazardous waste treatment, storage, and disposal facilities and must be properly permitted (40 CFR Part 265).

o <u>Overall Protection</u>

This alternative would achieve the remedial action objective of protecting the public health from exposure risks (ingestion, inhalation, and dermal contact) associated with the cPAHs and would provide a permanent remedial solution to the area of cPAH contamination with respect to the BEC Trucking Site.

TABLE 4-5

BEC TRUCKING SITE - FEASIBILITY STUDY

COST ESTIMATE

ALTERNATIVE 4 - EXCAVATION/OFF-SITE INCINERATION

Activity	Estimated Quantities	Unit Price	1989 Cost ($)
Excavation/Off-site Incineration			
I. Capital Cost			
A. Direct Cost			
o Site Preparation	L.S.	10,500	10,500
o Excavation	130 CY	$24 CY	3,120
o Transportation	10trucksx250miles	3.85 MI/Truck	9,625
o Incineration by Bulk	195 Ton	1,300	253,500
o Waste Characterization	LS	50,000	50,000
o Soil Sampling	6 MD	500	3,000
o Soil Sampling, Lab Analyses	15 Samples	700 $/sample	10,500
o Regrading & Backfill & Topsoil	130 CY	45/CY	5,850
o Revegetation	2,400 S.F.	.25	600
Subtotal:			346,695
B. Indirect Costs			
o H&S @ 5% of Direct Costs			17,335
o Bid & Scope Contingency @ 15%			52,000
o Permitting & Legal @ 10%			34,670
o Engineering Services @ 10%			34,670
Total Capital Cost:			485,370
II. Present Worth of Annual O&M Costs			-0-
III. Net Present Worth of Excavation/Off-Site Incineration Alternative			485,370

o State and Community Acceptance

The state and community may accept this alternative.

4.3 COMPARISON AMONG ALTERNATIVES

o Short-Term Effectiveness

With the exception of **Alternative 1**, No Further Action, all remedial alternatives would provide protection of public health from exposure to cPAH contaminated soil in the short term.

Alternative 2, Excavation/Off-site RCRA Landfilling, and **Alternative 3**, Capping, could be implemented in the shortest time period, approximately one week. **Alternative 4**, Excavation/ Off-site Incineration, would require the longest periods of time to implement since a trial burn treatability study of the cPAH contaminated soil would be required. Once on-site activities begin, all alternatives could be implemented in a short amount of time (less than one month) due to the relatively small quantity of waste.

Because there would be dust released during excavation and material handling activities, **Alternatives 2 through 4** would require control measures to minimize the short-term risks to workers and the community during on-site remedial actions.

o Long-Term Effectiveness

With respect to long-term reliability, all alternatives with the possible exception of Alternative 1 (No Further Action) would satisfy the remedial objective.

Alternative 1, No Further Action, does not address the cPAH contaminated soil; however, natural biodegradation may reduce cPAH levels below remedial action levels.

Alternative 2, Excavation/Off-site RCRA Landfilling, **Alternative 3**, Capping, and **Alternative 4**, Excavation/Off-site Incineration, address the contaminated soil and present a permanent solution. The resistance of a soil cap to physical degradation is an uncertainty of the capping alternative. **Alternative 4** would provide the maximum long-term effectiveness for the contaminated soils since the cPAHs would be permanently destroyed. The risk posed by off-site landfilling in **Alternatives 2** and **4** should be minimal.

o Reduction of Toxicity, Mobility, or Volume

Alternative 1, No Further Action, would not initially reduce the toxicity, mobility, or volume of the cPAH contaminated soil at the BEC Trucking Site.

Alternative 2, Excavation/Off-site RCRA Landfilling, would reduce the toxicity, volume and mobility of cPAH contaminated soil with respect to the BEC Trucking Site. With respect to the off-site disposal in a RCRA landfill, the toxicity or volume is not reduced, but mobility of the contaminants would be reduced.

Alternative 3, Capping, would not reduce the volume of toxicity of cPAH on-site but would reduce mobility by eliminating contact with surface water and/or runoff.

Alternative 4, Excavation/Off-Site Incineration, would reduce the toxicity, mobility and volume of the cPAHs with respect to the site. With respect to the receiving facility, the toxicity would be reduced by cPAH destruction, volume could be reduced up to 20 percent via incineration and mobility of residual cPAHs in the ash would be reduced due to placement in a RCRA landfill.

o <u>Implementability</u>

The technologies proposed for all alternatives are, in general, demonstrated and commercially available. **Alternative 4** would require a treatability trial burn. Hazardous waste generator status would be required for **Alternative 2 and Alternative 4.** With respect to ease of implementability, **Alternative 3** would be most readily implementable because this alternative does not involve excavation or transportation of waste.

o <u>Cost</u>

Overall, the least costly alternative is **Alternative 1,** No Further Action. **Alternative 2**, Excavation/Off-site Landfilling, and **Alternative 3**, Capping, are intermediate cost alternatives, while **Alternative 4**, Excavation/Off-site Incineration, is the most costly. Detailed remedial alternative costs are presented in Appendix A.

o <u>Compliance with ARARs</u>

Alternatives 2 through 4 involve some on-site activities and therefore must comply with OSHA standards (29 CFR, Parts 1910,1926 and 1904) for worker protection during remediation. **Alternatives 2 and 4** require compliance with various transportation of hazardous waste requirements including: RCRA hazardous waste generator and transporter regulation; New York hazardous waste generator and transporter regulations; and Federal and New York State Department of Transportation (DOT) regulations. **Alternatives 2 and 4** would require compliance with the Clean Air Act and the New York Air Pollution Regulation. **Alternative 3** would require compliance with RCRA and New York State landfill closure requirements.

o Overall Protection

With the exception of **Alternative 1**, No Further Action, all alternatives would achieve the remedial objective of protecting the public health from exposure risks (ingestion, inhalation, and dermal contact) associated with the cPAHs in soil. **Alternatives 2 and 4** would achieve a permanent solution, with respect to the site, since the contaminated soils would be removed. The permanence of **Alternative 3** would depend on the durability of the soil cover.

o State and Community Acceptance

The state and community may support **Alternative 1**, considering the cPAHs level in soil is marginally above the 10^{-6} risk based cleanup level for cPAHs of 14,200 ppb. **Alternatives 2 through 4** may be accepted by the state and community as remedial alternatives for reducing exposure to the cPAHs in the soil. **Alternatives 2 and 4** may be more desirable since the cPAH would be removed from the site.

4.4 SUMMARY OF DETAILED ANALYSIS

Table 4-6 provides a summary and comparison of each alternative with respect to the nine criteria.

TABLE 4-6

BEC TRUCKING-SITE FEASIBILITY STUDY

SUMMARY MATRIX FOR DETAILED EVALUATION OF ALTERNATIVES

SHORT - TERM EFFECTIVENESS

NUMBER 1	NUMBER 2	NUMBER 3	NUMBER 4
No Further Action	Excavation/Off-Site RCRA Landfilling	Capping	Excavation/Off-Site Incineration
Would not reduce risk; however, the contaminated soils are concentrated in a small area and the present risk to human health and the environment is at the lower limit of the risk based action range.	Protection of public health by removal of the cPAH contaminated soils would be achieved immediately following the action.	Protection of public health from exposure to the cPAH contaminated soils would be achieved immediately following the action.	Protection of public health by removal of the cPAH contaminated soils would be achieved immediately following excavation and hauling.

TABLE 4-6

BEC TRUCKING SITE-FEASIBILITY STUDY

SUMMARY MATRIX FOR DETAILED EVALUATION OF ALTERNATIVES

(CONT'D)

LONG-TERM EFFECTIVENESS

NUMBER 1 No Further Action	NUMBER 2 Excavation/Off-Site RCRA Landfilling	NUMBER 3 Capping	NUMBER 4 Excavation/Off-Site Incineration
Natural biodegradation may reduce cPAH levels below remedial action levels.	There would be no remaining long-term risks and no remaining long-term management, operation or maintenance for the BEC Trucking site. The risks posed off site disposal in a RCRA Landfill should be minimal.	Potential risk from cPAH contaminated soils exists should the cap fail due to unforeseen storms or vandalism.	There would be no remaining long-term risks and no remaining long-management, operation, or maintenance for the cPAH contaminated area. The risks posed by off-site disposal in a RCRA Landfill should be minimal.

TABLE 4-6

BEC TRUCKING SITE-FEASIBILITY STUDY

SUMMARY MATRIX FOR DETAILED EVALUATION OF ALTERNATIVES

(CONT'D)

REDUCTION OF TOXICITY, MOBILITY OR VOLUME

NUMBER 1 No Further Action	NUMBER 2 Excavation/Off-Site RCRA Landfilling	NUMBER 3 Capping	NUMBER 4 Excavation/Off-Site Incineration
This alternative does not initially reduce the toxicity, volume, or mobility of cPAHs in soil.	With respect to the BEC Trucking Site, complete removal of the waste areas reduces the overall toxicity, mobility and volume of contamination at the site. With respect to the off-site disposal in a RCRA Landfill, the toxicity or volume is not reduced; but the mobility of the contaminants would be reduced through placement in a double-lined, multi-layer capped landfill with leachate detection and collection/treatment system. Residual fluids from decontamination procedures would be generated.	This alternative does not reduce the toxicity or volume of cPAH contaminants in the soil, but would provide some reduction in mobility of contaminants by minimizing migration of contaminants by surface water run-off.	With respect to the site, complete removal of the cPAH contaminant soils reduces the overall toxicity, mobility and volume of contamination at the site. With respect to the offsite disposal of a RCRA landfill the toxicity of the waste would be reduced by removing cPAH contaminants, volume would be reduced approximately 20%, and mobility would be reduced since the waste would be disposed on a RCRA permitted landfill. Residual fluids from decontamination procedures would be generated.

TABLE 4-6

BEC TRUCKING SITE-FEASIBILITY STUDY

SUMMARY MATRIX FOR DETAILED EVALUATION OF ALTERNATIVES

(CONT'D)

IMPLEMENTABILITY

NUMBER 1 No Further Action	NUMBER 2 Excavation/Off-Site RCRA Landfilling	NUMBER 3 Capping	NUMBER 4 Excavation/Off-Site Incineration
Not Applicable	EPA must obtain hazardous waste generator status for the site. The waste must be transported by a licensed hazardous waste transporter and the receiving disposal facility must be RCRA permitted.	No permits are anticipated to be required for onsite activities. Available Technology	No permits are anticipated to be required for onsite activities. EPA must obtain hazardous waste generator status for the site. The waste must be transported by a licensed hazardous waste transporter the receiving disposal facility must be RCRA permitted. Services and materials available.

TABLE 4-6

BEC TRUCKING SITE-FEASIBILITY STUDY

SUMMARY MATRIX FOR DETAILED EVALUATION OF ALTERNATIVES

(CONT'D)

COST

NUMBER 1 No Further Action	NUMBER 2 Excavation/Off-Site RCRA Landfilling	NUMBER 3 Capping	NUMBER 4 Excavation/Off-Site Incineration
0	$106,150	$97,295	$485,370

TABLE 4-6

BEC TRUCKING SITE-FEASIBILITY STUDY

SUMMARY MATRIX FOR DETAILED EVALUATION OF ALTERNATIVES

(CONT'D)

COMPLIANCE WITH ARARs

NUMBER 1 No Further Action	NUMBER 2 Excavation/Off-Site RCRA Landfilling	NUMBER 3 Capping	NUMBER 4 Excavation/Off-Site Incineration
Not Applicable	Fugitive emissions during remediation. o Federal - Clean Air Act - 40 CFR 264:RCRA - 40 CFR 50:NAAQS o New York Air Pollution Regulations - 6NYCRR Part 373 - 6NYCRR Part 211 Worker protection during remediation. o OSHA (29CFR Parts 1910, 1926 and 1904) Transportation of hazardous waste off-site. o RCRA hazardous waste generator and transporter regulations. o New York hazardous waste generator and transporter regulations. o Federal and State DOT transportion regulations.	RCRA closure requirements. New York closure requirements. Worker protection during remediation. o OSHA (29 CFR Parts 1910, 1926 and 1904) Fugitive emissions during remediation. o Federal - Clean Air Act - 40 CFR 264:RCRA - 40 CFR 50:NAAQS o New York Air Pollution Regulations - 6NYCRR Part 373 - 6NYCRR Part 211	Fugitive emissions during remediation. o Federal - Clean Air Act - 40 CFR 264:RCRA - 40 CFR 50:NAAQS o New York Air Pollution Regulations - 6NYCRR Part 373 - 6NYCRR Part 211 Worker protection during remediation. o OSHA (29 CFR Parts 1910, 1926 and 1904) Transportation of hazardous waste off-site. o RCRA hazardous waste generator and transporter regulations. o New York hazardous waste generator and transporter regulations. o Federal and State DOT transportion regulations.

TABLE 4-6

BEC TRUCKING SITE-FEASIBILITY STUDY

SUMMARY MATRIX FOR DETAILED EVALUATION OF ALTERNATIVES

(CONT'D)

OVERALL PROTECTION

NUMBER 1 No Further Action	NUMBER 2 Excavation/Off-Site RCRA Landfilling	NUMBER 3 Capping	NUMBER 4 Excavation/Off-Site Incineration
Does not initially achieve action objectives.	Achieves remedial action objective for cPAH contaminated soils.	Achieves remedial action objective for cPAH contaminated soils.	Achieves remedial action objective for cPAH contaminated soils.

TABLE 4-6
BEC TRUCKING SITE-FEASIBILITY STUDY
SUMMARY MATRIX FOR DETAILED EVALUATION OF ALTERNATIVES
(CONT'D)

STATE AND COMMUNITY ACCEPTANCE

NUMBER 1 No Further Action	NUMBER 2 Excavation/Off-Site RCRA Landfilling	NUMBER 3 Capping	NUMBER 4 Excavation/Off-Site Incineration
State and community may accept. Since cPAH concentration levels are below the risk based remedial action range.	State and community may accept. Since cPAH contaminated soils are removed from the site, however off-site transportation maybe of concern.	State and community may accept, however there may be reservation regarding leaving the contaminated soil on-site.	State and community may accept. Since cPAH contaminated soils are removed from the site, however off-site transportation maybe of concern.

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APPENDIX A

REMEDIAL ALTERNATIVE COSTS

R

CLIENT :
PROJECT : BEC TRUCKING
LOCATION: BINGHAMTON N Y
OFS NO. : EPA 4236.960/940
PREP. BY:

EBASCO CONSTRUCTORS INC.
210 CLAY AVE LYNDHURST
NEW JERSEY

CODE OF ACCOUNT NUMBER	WORK ITEM	QUANTITY	UNIT	MATERIAL COST		LABOR COST				CONST EQUIPT COST		SUBTOTAL COST	MARKUP INDIRECT & FEE	TOTAL WITH MARKUP	UNIT COST
				UNIT	TOTAL	UNIT M/HR	MAN HOURS	COMP RATE	TOTAL	UNIT	COST				
	ALTERNATIVE C-1 (NO ACTION)													0	

CLIENT :
PROJECT : BEC TRUCKING
LOCATION: BINGHAMTON N Y
OFS NO. : EPA 4236.960/940
PREP. BY:

EBASCO CONSTRUCTORS INC.
210 CLAY AVE LYNDHURST
NEW JERSEY

CODE OF ACCOUNT NUMBER	WORK ITEM	QUANTITY	UNIT	MATERIAL COST UNIT	MATERIAL COST TOTAL	LABOR COST UNIT M/HR	LABOR COST MAN HOURS	LABOR COST COMP RATE	LABOR COST TOTAL	CONST EQUIPT COST UNIT	CONST EQUIPT COST COST	SUBTOTAL COST	MARKUP INDIRECT & FEE	TOTAL WITH MARKUP	UNIT COST
	==================================				0		0		0		0	0	0	0	
	(EXCA & OFF-SITE RCRA LANDFILLING)				0		0		0		0	0	0	0	
					0		0		0		0	0	0	0	
I	SITE PREPARATION				0		0		0		0	0	0	0	
	PARKING AREA ON SITE OR ADJ TO ST				0		0		0		0	0	0	0	
					0		0		0		0	0	0	0	
	EQUIPMENT PARKING AREA				0		0		0		0	0	0	0	
	SITE MAY BE UTILIZED AS IS OR AREA				0		0		0		0	0	0	0	
	ADJACENT TO STUART ROAD.				0		0		0		0	0	0	0	
	PERMIT MAY BE REQUIRED				0		0		0		0	0	0	0	
					0		0		0		0	0	0	0	
II	SUPPORT FACILITIES				0		0		0		0	0	0	10,500	
	3 TRAILERS :				0		0		0		0	0	0	0	
	EPA/DEC ENGINEERING	1	MON		0		0		0		0	0	0	900	300
	HEALTH & SAFETY	1	MON		0		0		0		0	0	0	4,500	1500
	CONTRACTOR	1	MON		0		0		0		0	0	0	900	300
	SITE WORK, UTILITY HOOK UP ETC	1	LS		0		0		0		0	0	0		8400
					0		0		0		0	0	0	0	
					0		0		0		0	0	0	0	
III	SOIL EXCA W/OFF-SITE LANDFILL				0		0		0		0	0	0	0	
					0		0		0		0	0	0	0	
					0		0		0		0	0	0	0	
A	PAHs EXCAVATION (INCL TOPSOIL)				0		48		1,440		1,050	2,490	623	73,203	
	PAHs EXCAVATION (INCL TOPSOIL)		CY		0		0		0		0	0	0	0	
	LOAD TO TRUCK (TRUCK BY OTHERS)				0		0		0		0	0	0	0	
	BACKHOE CAT 205 @ 1 EA (INCL IN	3	DY		0	16	48	30	1,440	350	1,050	2,490	623	3,113	10.73
	AND OUT)				0		0		0		0	0	0	0	
					0		0		0		0	0	0	0	
	TRANXPORTATION				0		0		0		0	0	0	0	
	(130 CY X 1.5 /20 = 10 TRUCKS)				0		0		0		0	0	0	0	
	(250 MILE TO MODEL CITY N Y)				0		0		0		0	0	0	0	
					0		0		0		0	0	0	0	
	~~(BY CEEBS 718-873-42~~00)				0		0		0		0	0	0	0	
	~~(FRANK ZEE) $3.85 LOAD~~ MILE				0		0		0		0	0	0	0	
	(PER TRUCK LOAD = 20 TON)	2500	L/M		0		0		0		0	0	0	10,000	4.00
					0		0		0		0	0	0	0	
	DISPOSAL (TIPPING FEE)				0		0		0		0	0	0	0	
	MODEL CITY, NY				0		0		0		0	0	0	0	
					0		0		0		0	0	0	0	
		195	TON		0		0		0		0	0	0	29,640	152
					0		0		0		0	0	0	0	

CLIENT :
PROJECT : BEC TRUCKING
LOCATION: BINGHAMTON N Y
OFS NO. : EPA 4236.960/940
PREP. BY:

EBASCO CONSTRUCTORS INC.

210 CLAY AVE LYNDHURST

NEW JERSEY

CODE OF ACCOUNT NUMBER	WORK ITEM	QUANTITY	UNIT	MATERIAL COST		LABOR COST				CONST EQUIPT COST		SUBTOTAL COST	MARKUP INDIRECT & FEE	TOTAL WITH MARKUP	UNIT COST
				UNIT	TOTAL	UNIT M/HR	MAN HOURS	COMP RATE	TOTAL	UNIT	COST				
	(EXCA & OFF-SITE LANDFILLING (CONT)														
	SAMPLING: LAB ANALYSIS FEE ONLY				0		0		0		0	0	0	0	
	(SOIL CONTAMINATE W/PAH)				0		0		0		0	0	0	0	
		15	EA		0		0		0		0	0	0	10,500	700
	SAMPLING LABOR 2 MEN @ 3 DAY	6	MD		0		0		0		0	0	0	3,000	500
					0		0		0		0	0	0		
	REGRADING & BACKFILL & TOPSOIL	130	CY		0		0		0		0	0	0	5,850	
					0		0		0		0	0	0		
	REVEGETATION (SEEDING)	2,400	SF		0		0		0		0	0	0	600	.25
					0		0		0		0	0	0	0	
					0		0		0		0	0	0	0	

CLIENT :
PROJECT : BEC TRUCKING
LOCATION: BINGHAMTON N Y
OFS NO. : EPA 4236.960/940
PREP. BY:

EBASCO CONSTRUCTORS INC.

210 CLAY AVE LYNDHURST

NEW JERSEY

CODE OF ACCOUNT NUMBER	WORK ITEM	QUANTITY	UNIT	MATERIAL COST		LABOR COST				CONST EQUIPT COST		SUBTOTAL COST	MARKUP INDIRECT & FEE	TOTAL WITH MARKUP	UNIT COST
				UNIT	TOTAL	UNIT M/HR	MAN HOURS	COMP RATE	TOTAL	UNIT	COST				
II	SUPPORT FACILITIES SAME AS C-2				0		0		0		0	0	0	10,500	
					0		0		0		0	0	0	0	
III	CAPPING (SOIL CONTAMINATED W/PAHs)	264	CY		4,840		120		3,600		6,675	15,115	3,779	33,020	124.98
	SOIL 12" SPREAD & COMPACT	88	CY	15	1,320		0		0		0	1,320	330	1,650	
	SAND 12" SPREAD & COMPACT	88	CY	20	1,760		0		0		0	1,760	440	2,200	
	TOPSOIL 12" SPREAD	88	CY	20	1,760		0		0		0	1,760	440	2,200	
	DOZER D6 @ 1 EA	5	DY		0	8	40	30	1,200	555	2,775	3,975	994	4,969	
	GRADER 120G @ 1 EA	5	DY		0	8	40	30	1,200	530	2,650	3,850	963	4,813	
	ROLLER 10-14 TON @ 1 EA	5	DY		0	8	40	30	1,200	250	1,250	2,450	613	3,088	
		2400			0		0		0		0	0	0	0	
	REVEGETATION (SEEDING)		SF		0		0		0		0	0	0	600	.25
					0		0		0		0	0	0	0	
	SAMPLING LAB ANALYSIS FEE ONLY	15	EA		0		0		0		0	0	0	10,500	700
	(SOIL PAHs)				0		0		0		0	0	0	0	
	SAMPLING LABOR	6	MD		0		0		0		0	0	0	3,000	500
					0		0		0		0	0	0	0	

Inspections
PRESENT WORTH ANALYSIS
ALTERNATIVE 2 - CAPPING

YEAR	0	1	2	3	4	5	6
ANNUAL $		0	0	0	0	2500	0
PRESENT WORTH		0.00	0.00	0.00	0.00	1960.00	0.00

7	8	9	10	11	12	13	14
0	0	0	2500	0	0	0	0
0.00	0.00	0.00	1535.00	0.00	0.00	0.00	0.00

15	16	17	18	19	20	21	22
2500	0	0	0	0	2500	0	0
1202.50	0.00	0.00	0.00	0.00	942.50	0.00	0.00

23	24	25	26	27	28	29	30
0	0	2500	0	0	0	0	2500
0.00	0.00	737.50	0.00	0.00	0.00	0.00	577.50

TOTAL 6955

O&M
PRESENT WORTH ANALYSIS
ALTERNATIVE 2 - CAPPING

YEAR	0	1	2	3	4	5	6
ANNUAL $		1630	1630	1630	1630	1630	1630
PRESENT WORTH		1551.76	1478.41	1408.32	1341.49	1277.92	1215.98

7	8	9	10	11	12	13	14
1630	1630	1630	1630	1630	1630	1630	1630
1158.93	1103.51	1051.35	1000.82	953.55	907.91	863.90	823.15

15	16	17	18	19	20	21	22
1630	1630	1630	1630	1630	1630	1630	1630
784.03	746.54	710.68	678.08	645.48	614.51	585.17	557.46

23	24	25	26	27	28	29	30
1630	1630	1630	1630	1630	1630	1630	1630
531.38	505.30	480.85	458.03	436.84	415.65	396.09	376.53

TOTAL 25059.62

CLIENT :
PROJECT : BEC TRUCKING
LOCATION: BINGHAMTON N Y
OFS NO. : EPA 4236.960/940
PREP. BY:

EBASCO CONSTRUCTORS INC.

210 CLAY AVE LYNDHURST

NEW JERSEY

CODE OF ACCOUNT NUMBER	WORK ITEM	QUANTITY	UNIT	MATERIAL COST UNIT	MATERIAL COST TOTAL	LABOR COST UNIT M/HR	LABOR COST MAN HOURS	LABOR COST COMP RATE	LABOR COST TOTAL	CONST EQUIPT COST UNIT	CONST EQUIPT COST COST	SUBTOTAL COST	MARKUP INDIRECT & FEE	TOTAL WITH MARKUP	UNIT COST
	ALTERNATIVE C-4 EXCA W/INCINERATION				0		0		0		0	0	0	0	
	===================================				0		0		0		0	0	0	0	
					0		0		0		0	0	0	0	
I	SITE PREPARATION SAME AS C-2				0		0		0		0	0	0	0	
					0		0		0		0	0	0	0	
II	SUPPORT FACILITIES SAME AS C-2				0		0		0		0	0	0	10,500	
					0		0		0		0	0	0	0	
III	PAHs EXCAVATION (INCL TOPSOIL)	130	CY		0		0		0		0	0	0	3,113	
	LOAD TO TRUCK (TRUCK BY OTHERS)				0		0		0		0	0	0	0	
	BACKHOE CAT 205 @ 1 EA (INCL IN	3	DY		0	16	48	30	1,440	350	1,050	2,450	623	0	
	AND OUT)				0		0		0		0	0	0	0	
					0		0		0		0	0	0	0	
IV	INCINERATION BY BULK				0		0		0		0	0	0		
	TRANSPORATION				0		0		0		0	0	0	0	
???	400 MILE ONE WAY X 195 TON/20 TON	2,500	L/M		0		0		0		0	0	0	9625	4.00
	(CLEVLAND OHIO)				0		0		0		0	0	0	0	
					0		0		0		0	0	0	0	
					0		0		0		0	0	0	0	
					0		0		0		0	0	0	0	
					0		0		0		0	0	0	0	
					0		0		0		0	0	0	0	
					0		0		0		0	0	0	0	
	CLEVELAND OHIO GSX TAKE BULK				0		0		0		0	0	0	0	
	$800/TON				0		0		0		0	0	0	0	
	($1300 WASTE CHARACTERIZATION				0		0		0		0	0	0	0	
	TRIAL BURN				0		0		0		0	0	0	50,000	
					0		0		0		0	0	0	0	
					0		0		0		0	0	0	0	
					0		0		0		0	0	0	0	
	INCINERATION BY BULK	195	TON		0		0		0		0	0	0	253,500	1300
					0		0		0		0	0	0	0	
V T					0		0		0		0	0	0		

APPENDIX B

CALCULATIONS

EBASCO SERVICES INCORPORATED

BY ______ DATE 5/10/89 SHEET 1 OF ______

CHKD. BY ______ DATE ______ OFS NO. ______ DEPT. NO. ______

CLIENT EPA

PROJECT BEC TRUCKING

SUBJECT FEASIBILITY STUDY

CALCULATIONS

ALTERNATIVE 1 - NO ACTION

I GROUNDWATER SAMPLING WELLS

- GROUNDWATER SAMPLING

3 EXISTING WELLS

1 ROUND = 3 SAMPLES, 1 ROUND TAKEN PER YEAR

1 ROUND = 2 MEN FOR 1 DAY = 2 MD

REPORT = 1 MD = 8 HRS

581 2-88

EBASCO SERVICES INCORPORATED

BY ______ DATE ______ SHEET 2 OF ______

CHKD. BY ______ DATE ______ OFS NO. ______ DEPT. NO. ______

CLIENT EPA

PROJECT BEC TRUCKING

SUBJECT FEASIBILITY STUDY

CALCULATIONS (CONT)

ALTERNATIVE 2 EXCAVATION AND OFFSITE RCRA LANDFILLING

I. CPAH CONTAMINATED SOIL

AREA BOUNDED BY SS31 - SS33 - SS30

$A = \frac{1}{2} BH$

$= \frac{1}{2}(52.5')(90') = 2362.5 \, ft^2$

ASSUMED DEPTH = 1.5'

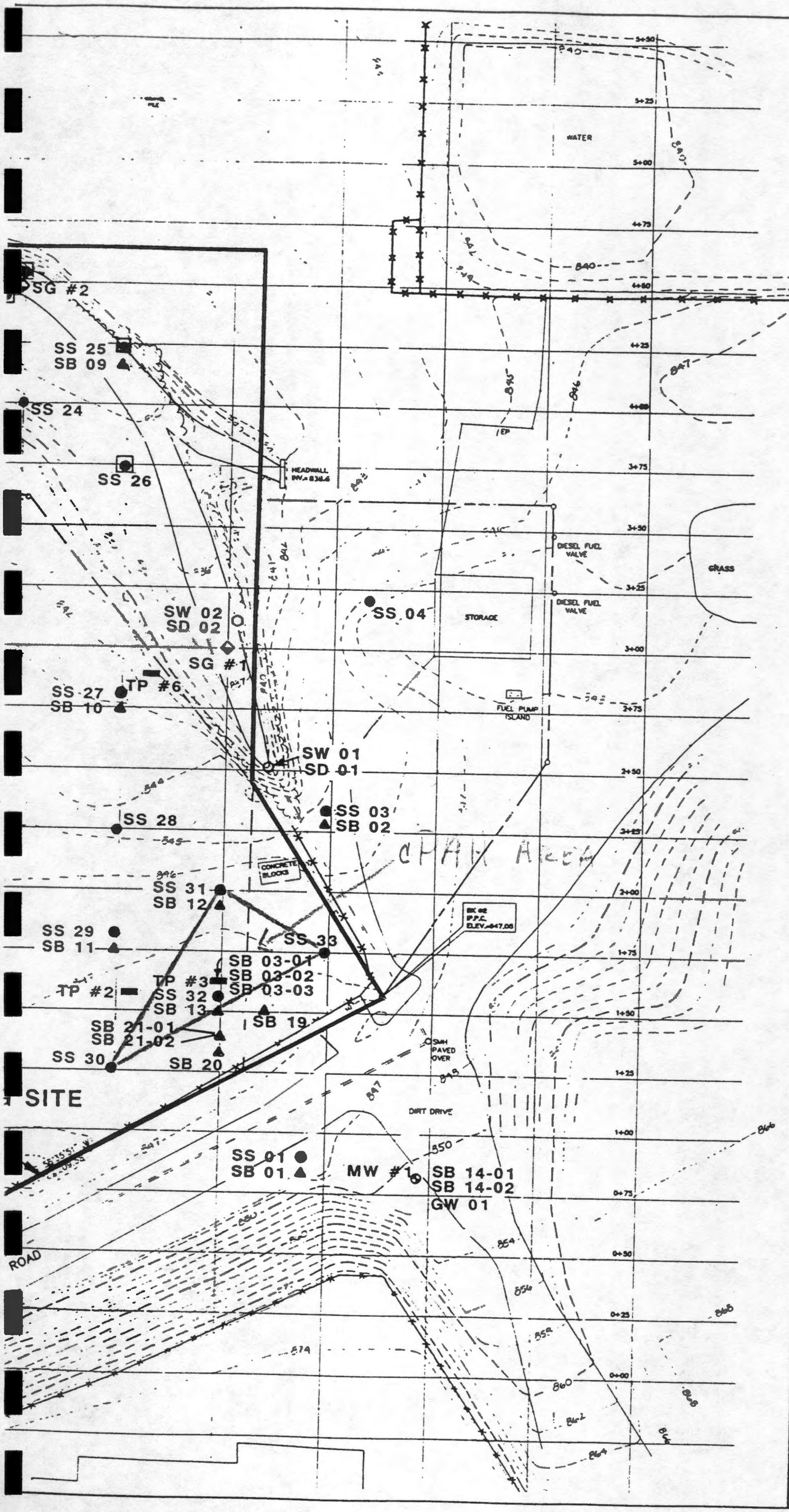
Volume = $(2362.5)(1.5) = 3543 \, ft^3$

$3543 \, ft^3 \times \frac{1 \, CY}{27 \, ft^3} =$ **130 CY**

$130 \, CY \times 1.5 \, \frac{TON}{CY} =$ **195 T**

TRANSPORTATION

$195 \, T \times \frac{1 \, TRUCK}{20 \, T} =$ **10 TRUCKS**



N

EXPLANATION

- ● SS — *SURFACE SOIL SAMPLE*
- ◉ SS — *SURFACE SOIL COLLOCATE*
- ▲ SB — *SHALLOW SUBSURFACE SOIL SAMPLE*
- ◬ SB — *SHALLOW SUBSURFACE SOIL COLLOCATE*
- ⊕ MW — *MONITORING WELL*
- ▬ TP — *TEST PIT*
- ○ SW SD — *SURFACE WATER AND SEDIMENT SAMPLE*
- ◆ SG — *STREAM GAUGE*
- ▣ SS — *SEDIMENT SAMPLE*
- GW — *GROUND WATER SAMPLE*

CONTOUR INTERVAL = 1 FOOT
EXCEPT NE AND SE OF SITE WHERE 2 FOOT
CONTOUR INTERVAL WAS USED FOR CLARIT

0 15 30 60 90 120

SCALE IN FEET

U.S. ENVIRONMENTAL PROTECTION AGENCY
BEC TRUCKING SITE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

EBASCO SERVICES INCORPORATED

SITE MAP WITH SAMPLE LOCATIONS AND GRID

FIGURE 2-

EBASCO SERVICES INCORPORATED

BY ______ DATE ______ SHEET ______ OF ______

CHKD. BY ______ DATE ______ OFS NO. ______ DEPT. NO. ______

CLIENT ______

PROJECT ______

SUBJECT ______

CAPPING

p.25 THICKNESS

CRITERION ~~FOR~~ OF ADEQUACY FOR COVERAGE OVER IRREGULAR SOLID WASTE

$T \geq 2R$

T = COVER THICKNESS

R = Relief, vertical distance between high point and low point of waste

R = 1.5'

$\therefore$ $T \geq 3.0'$

FREEZE THAW

DEPTH OF FREEZE THAW = 30-32" $\therefore$ 36" CAP IS OKAY

p. 28

PERMEABILITY

NOT A CONCERN DUE TO FLY ASH UNDERNEATH