National Aeronautics and Space Administration

PLUM BROOK STATION

PRELIMINARY ASSESSMENT
VOLUME III

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APPENDIX F. UST AREA ANALYTICAL DATA

PBS003-[redacted]
15

NASA LEWIS RESEARCH CENTER
PLUM BROOK STATION

FINAL WORK PLAN

FOR THE

UST CORRECTIVE ACTIONS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

AUGUST 1990

PREPARED BY

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EXECUTIVE SUMMARY

In 1989, Ebasco Environmental (Ebasco) developed an Underground Storage Tank Compliance Program for the NASA Lewis Research Center and Plum Brook Station to comply with federal regulations for underground storage tanks (USTs) promulgated in December of 1988 (40 CFR Part 264). The program identified the number of USTs located at both research facilities, provided a brief description of the age, contents, and historical usage of the tanks, and outlined the UST removal and/or replacement options which were available to NASA in order to comply with the regulations over a 3-year period.

Nineteen USTs at NASA Plum Brook Station were identified as requiring study or follow-up action under the UST Compliance Program. Fourteen of these USTs were removed during July through December of 1989, in the following order: 8 tanks at the Garage & Maintenance Area (Buildings 7121, 7131, and 7132); 2 tanks at the Space Power Facility (Building 1411); 1 tank at the Pump Station (Building 8133); and 3 tanks at the Nuclear Reactor Building (Building 1131). Closure assessments were performed at each tank location, in accordance with UST permanent closure requirements, and included the sampling and analysis of soils underlying each tank, the excavation pit sidewalls, and the excavated soils. The Bureau of Underground Storage Tank Regulation (BUSTR) was the implementing regulatory agency which had jurisdiction over tank closure activities at NASA PBS. The analytical results of the closure assessments at the Garage & Maintenance Area (the first group of tanks removed) indicated that corrective actions to remove contamination were required. A preliminary remediation effort at Building 7132 was undertaken which included the removal of 1,320 cubic yards of soil and the installation of four groundwater monitoring wells. Following these activities, further sampling and analytical results indicated that moderate levels of contamination remained. BUSTR then directed that an additional eighteen inches of soil be removed. This directive was met.

The subsequent tank removals at each of the other three locations also indicated that corrective actions were required to address contamination resulting from the leaked USTs. Bulk soils were removed which were visually determined to be contaminated. Given the confirmation of contamination by the closure assessment soil analyses, soil gas surveys were conducted at the Garage & Maintenance Area, the Space Power Facility, and the Pump Station to qualitatively define the areal extent of petroleum hydrocarbon and volatile organic contamination at the sources and in the surrounding soil and groundwater. Soil gas surveys were not conducted at the Nuclear Reactor Building (Building 1311), as the USTs at that location had not yet been scheduled for removal at the time the soil gas surveys were conducted. Because the contaminated soils and groundwater present at a number of the tank areas was determined to be hazardous, and BUSTR's regulatory jurisdiction is limited to USTs that contain or contained petroleum products, regulatory jurisdiction for these tanks was turned over to the Ohio

Environmental Protection Agency's (OEPA's) Northwest District Office by BUSTR. It was, therefore, determined that all coordination with BUSTR was to be handled by the OEPA as necessary.

The tank closure assessments, limited installation of groundwater monitoring wells, and soil gas surveys identified significant areas of contamination which warrant a corrective actions investigation and possible subsequent remediation of the impacted soil and groundwater. NASA reviewed the collected data, and gave consideration to the appropriate methods of addressing the site contamination. In such cases, the implementing agencies may use statewide numerical standards to establish cleanup levels at specific sites contaminated by leaking USTs. Alternatively, the extent of remediation required may be based on a site-specific risk analysis which considers potential exposure pathways and human and ecological receptors. Based on what is known about each of the tank areas, there were, and continue to be inherent problems with meeting the statewide numerical standard if the OEPA stand is to clean up to background levels (as it has indicated). These problems are primarily associated with the unavailability of remedial technologies to achieve cleanup to background (which for some contaminants is interpreted as "non-detection"). NASA, therefore, developed a plan to conduct a site characterization and remediation project which establishes site-specific risk-based cleanup targets, rather than the generic standards. This approach is preferred, as more realistic cleanup levels can be achieved through the implementation of currently available remedial fixes while an acceptable level of target risk can be achieved and documented.

The overall project is patterned after a traditional RCRA Remedial Investigation and Feasibility Study (RI/FS), although this format is not strictly required as NASA PBS is not "under orders" of the OEPA. The desirability and practicality of establishing an OEPA Administrative Order at PBS, where multiple groups are and have been historically involved with the USTs, was not clear at the time of the inception of this project. Adopting the traditional OEPA RI/FS format for this project was seen as a way of expediting their review of work products and project deliverables. The purpose of the UST Corrective Actions RI/FS is to characterize the contamination at PBS in soils, groundwater, and surface water, and to evaluate the currently available remedial alternatives for effectively addressing this contamination in a timely manner. The overall project has been divided into three phases, according to the logical grouping of tasks and activities, to facilitate the interim review process required for all parties to reach a level of concurrence:

Phase I:	Preliminary Site Characterization, and RI Work Plan Development;
Phase II:	Remedial Investigation Implementation and Analysis and Baseline Risk Assessment; and
Phase III:	Feasibility Study and Corrective Actions Plan Development.

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1 SOIL SAMPLE CONCENTRATIONS FOR UST REMOVALS

1.0 INTRODUCTION

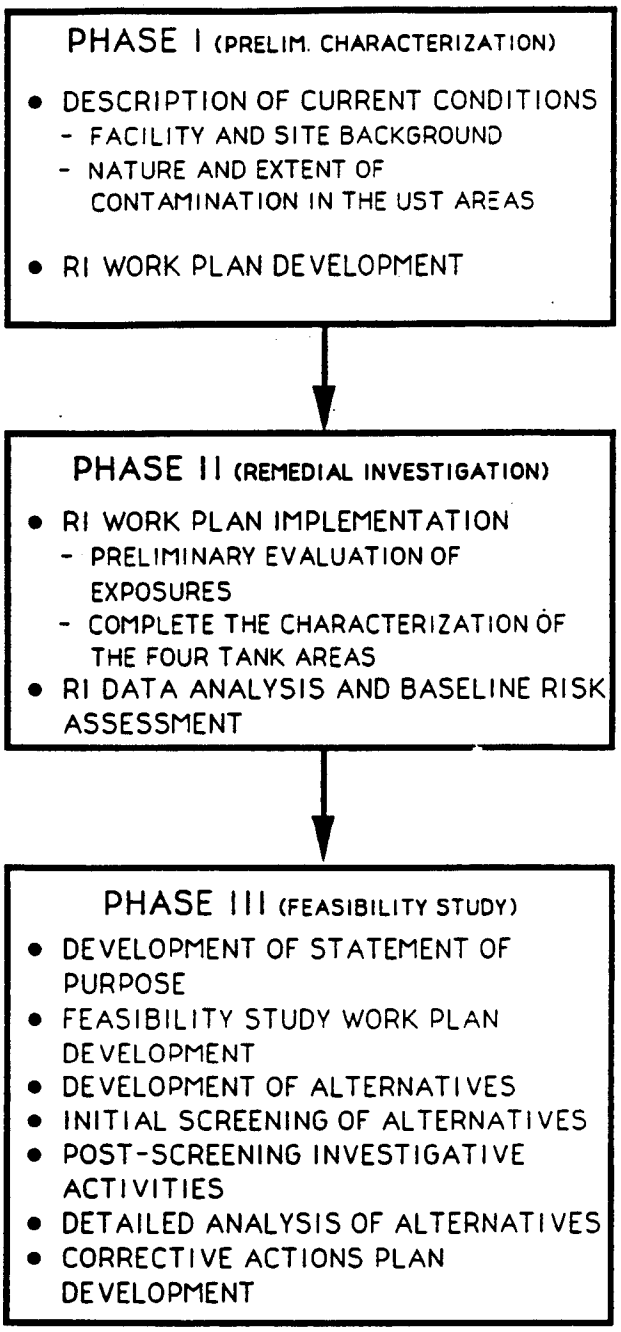
The National Aeronautics and Space Administration (NASA) is submitting this Work Plan for a UST Corrective Actions Remedial Investigation/Feasibility Study (RI/FS) at the NASA Plum Brook Station (PBS), located in Sandusky, Ohio. The purpose of this Work Plan is to specifically describe how NASA will provide the technical support to conduct a corrective actions investigation of the nature and extent of contamination released from fourteen (14) underground storage tanks (USTs) that were removed from PBS during July through December of 1989, and an evaluation of appropriate remedial alternatives to address residual contamination at the former tank locations. The Work Plan presents NASA's technical scope of work for the overall UST Corrective Actions RI/FS, as well as the anticipated levels of effort required.

Due to the magnitude and likely duration of the effort necessary to complete this work, a 3-phased approach to the overall project has been adopted. NASA is currently undertaking the first phase of the work described. The project was divided into three phases (See Figure 1-1), according to the logical grouping of tasks and activities, to facilitate the interim review process required for all parties to reach a level of concurrence with the deliverables associated with each phase (See Figure 1-2):

Phase I:	Preliminary Site Characterization, and RI Work Plan Development;
Phase II:	Remedial Investigation Implementation and Analysis and Baseline Risk Assessment; and
Phase III:	Feasibility Study and Corrective Actions Plan Development.

Phase I focuses on the collection of available site data to provide preliminary characterization of each of the four tank areas. These data will be gathered through a review of historical use, current conditions, previous investigations and inspections, and other relevant activities relative to the needs of the remedial investigation, as well as a limited field sampling effort designed to investigate potential contaminant migration and determine if the RCRA Appendix IX analyses (recommended by Ohio Environmental Protection Agency (OEPA) RI/FS guidance) can be justifiably limited or reduced. Based on the preliminary site characterization data, an RI Work Plan will be developed to incorporate only those investigative activities, potential migration pathways (e.g., soils, groundwater, etc.), and analytical parameters required to complete the characterization of the four tank areas.

Phase II activities include the implementation of the RI Work Plan developed during Phase I. The investigation will be designed to complete the characterization of the four tank areas, define the sources of contamination, define the degree and extent of contamination, and identify actual or potential receptors at each



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FLOW CHART OF THE 3 PHASES OF THE OVERALL UST CORRECTIVE ACTIONS RI/FS PROJECT

FIGURE 1-1

WORK TASK	PROJECT DELIVERABLE REQUIRED UPON THE COMPLETION OF WORK TASK
PHASE I: PRELIMINARY CHARACTERIZATION	
WORK TASK 1: DESCRIPTION OF CURRENT CONDITIONS	
WORK TASK 2: RI WORK PLAN DEVELOPMENT →	PRELIMINARY REPORT AND RI WORK PLAN
PHASE II: REMEDIAL INVESTIGATION	
WORK TASK 3: RI WORK PLAN IMPLEMENTATION →	MONTHLY TECHNICAL PROGRESS REPORTS
WORK TASK 4: RI DATA ANALYSIS AND BASELINE RISK ASSESSMENT →	RI REPORT
PHASE III: FEASIBILITY STUDY	
WORK TASK 5: DEVELOPMENT OF STATEMENT OF PURPOSE →	STATEMENT OF PURPOSE
WORK TASK 6: FEASIBILITY STUDY WORK PLAN DEVELOPMENT →	FEASIBILITY STUDY WORK PLAN
WORK TASK 7: DEVELOPMENT OF ALTERNATIVES	
WORK TASK 8: INITIAL SCREENING OF ALTERNATIVES	
WORK TASK 9: POST-SCREENING INVESTIGATIVE ACTIVITIES	
WORK TASK 10: DETAILED ANALYSIS OF ALTERNATIVES →	FS REPORT
WORK TASK 11: CORRECTIVE ACTIONS PLAN DEVELOPMENT →	UST CORRECTIVE ACTIONS PLAN

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RELATIONSHIP BETWEEN INDIVIDUAL WORK TASKS AND PROJECT DELIVERABLES

FIGURE 1-2

area. The data collected during these field activities, in addition to the data collected under all previous site investigations, will be analyzed to adequately define the nature and extent of contamination, potential threat to human health and the environment, and provide a baseline from which the evaluation of the feasibility study can build.

Phase III is comprised of the individual work tasks associated with the performance of a comprehensive feasibility study. The purpose of conducting the feasibility study is to document the databases and procedures used in identifying, developing, screening, and evaluating the remedial alternatives which will address the contamination found to be present at the PBS site which is related to the former USTs.

The Work Plan is divided into three sections. The following subsections detail the site background and present a summary of the existing data on the nature and extent of the observed contamination at the four tank areas. Section 2 presents a discussion of the technical approach for this project, which has been divided into eleven major Work Tasks. A discussion of each phase is presented with a breakdown of the Work Tasks associated with each phase. Section 3 summarizes the project deliverables to be submitted throughout the performance of the overall project, as well as the schedule for the Phase I work.

In addition, a number of documents were prepared as required to perform the Phase I work. These Phase I "stand alone" documents accompany this Work Plan, and include the following:

- Phase I Sampling and Analysis Plan (detailed field sampling activities to be implemented during Phase I);
- Phase I Health and Safety Plan (HASP);
- Phase I Project Management Plan (project organization and personnel responsibilities);
- Phase I Data Collection Quality Assurance Plan (data quality objectives and QA/QC requirements); and
- Phase I Data Management Plan (reporting requirements and document formats to be employed for this project).

These documents will be revised and modified as necessary during the development of the RI Sampling and Analysis Plan (SAP) (to be implemented under Phase II), and resubmitted along with the SAP as the RI Work Plan project deliverable (Refer to Section 3.0).

The phases and individual tasks of the UST Corrective Actions RI/FS are designed to collect the data necessary to finalize the characterization of the sites in order to support remedial alternative/option selection efforts, and to facilitate the subsequent designation of risk-based remediation levels and methodologies. This investigation will address steps to immediately manage the contamination resulting from releases from

FINAL WORK PLAN

- Outlines the Objectives, Scope and Nature of the Activities to be Performed Throughout the Overall Project -

- **Sampling and Analysis Plan** - Describes the field sampling and analytical activities to be conducted and their justification *

- **Health and Safety Plan** - Describes the personnel protective equipment and procedures to be employed and their justification *

- **Program Management Plan** - Describes the overall project management organization, key groups and individuals, and their roles and responsibilities *

- **Data Collection and Quality Assurance Plan** - Describes the procedures and techniques to be employed during the collection, processing, and reporting of information relating to the project to ensure its quality *

- **Data Management Plan** - Describes the data documentation vehicles and formats to be employed during the collection, evaluation, and presentation of information relating to the project to ensure data traceability *

* Attached documents relate to Phase I activities; Plans will be revised during Work Task 2 [RI Work Plan Development] to reflect activities to be defined at that point

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INTERRELATIONSHIP OF PROJECT DOCUMENTS

FIGURE 1-2A

the fourteen USTs, and provide information to support the detailed engineering and remedial design efforts required to achieve the clean-up targets established through risk assessment. The fourteen (14) USTs have been combined into four (4) tank areas due to their relative proximity. The risk assessment and remedial alternative evaluation tasks outlined as part of the technical approach (Refer to Section 2.0) will be conducted for each of these designated tank areas. The strategy for the overall UST Corrective Actions RI/FS will be expanded upon further in the sections that follow.

1.1 Project Objectives

The principal objective of the federal and state-mandated UST corrective actions requirements is the cleanup of contaminated soil and groundwater that result from leaks or spills at UST system locations. In addition to actions to mitigate the immediate health and environmental impacts of contaminants released from leaking USTs, a characterization of the extent of adverse impacts to nearby people and biota, as well as in soils, groundwater, and nearby surface water is necessary to protect against long term, chronic risks.

The tank closure assessments, limited installation of groundwater monitoring wells, and soil gas surveys identified significant areas of contamination which warrant investigation and possible, subsequent remediation of the impacted resources. In such cases, the implementing agencies may use statewide numerical standards to establish cleanup levels at specific sites contaminated by leaking USTs. Alternatively, the extent of remediation required may be based on a site-specific risk analyses which considers potential exposure pathways and human and ecological receptors (40 CFR Part 264). Accordingly, the Ohio Northwest District Office of the Environmental Protection Agency (OEPA) requires that the contamination from the fourteen (14) subject PBS UST systems be remediated to measurable, background concentration levels, or to a level established and substantiated by site-specific risk-based criteria.

With this goal in mind, NASA has developed this Work Plan to perform a UST Corrective Actions RI/FS to identify the nature and extent of the contamination present at each of the four tank areas, and evaluate appropriate remedial technologies that could be implemented at each site. The investigation will focus on the development of risk-based remediation targets through the performance of an extensive site study which will include: the collection of data to complete the characterization of the sites; baseline risk assessments at each tank area; and remedial option identification and evaluation. The justification for this approach is further supported by the fact that the NASA PBS site is a large, secure federal facility (with restricted access) with preliminarily

identified contaminant plumes contained well within the boundaries of the facility, and the little or no use of local groundwater under the reasonable, current and future use scenarios associated with PBS.

Alternative remediation technologies have various strengths and weaknesses, and, as such, must be evaluated for any application according to site-specific criteria. These criteria include: nature of contamination; media to be remediated; regulatory clean-up requirements; relative risk from residual contamination; and cost-effectiveness. The implementation of remedial alternatives at each of the excavation sites may involve the treatment or containment of contaminated soils and groundwater. Each remedial action considered will achieve a demonstrated level of treatment or containment efficiency, leaving a certain level of residual contamination and risk. Residual contamination may lead to exposures and risks through direct contact or contaminant migration. The objective of the UST Corrective Actions RI/FS is to determine the most effective and appropriate remedial alternatives to address the nature and extent of contamination identified at each of the sites which, upon implementation, will result in an "acceptable" level of residual risk to the environment, PBS employees, and the public.

The designation of acceptable risk-based remediation targets is a multi-phase effort. Initially, a significant amount of background data must be collected concerning the contaminant levels in surface and subsurface soils and groundwater (Phase I). To some extent, this has been initiated through the performance of the closure assessments, the installation of the monitoring wells at Building 7132, and the soil gas surveys. These activities are described in the sections that follow. The implementation of interim measures to abate contaminant migration has occurred through the removal of gross contamination and backfilling of the excavated pits with limestone or clean sand at each of the previously excavated pits. The UST Corrective Actions RI/FS must consider possible contaminant migration pathways and the potential impacts of these contaminants. The development and implementation of an extensive RI field sampling program will be required to complete the characterization of each of the sites (Phase II). Once this information has been collected and evaluated, remedial alternatives will be developed, screened, and analyzed in light of the surface and subsurface features of each site and the observed patterns of contamination (Phase III). The level of overall residual risk for each proposed remedial alternative will be quantified and compared to criteria of acceptable risk. Only the remedial alternatives resulting in acceptable levels of risk will be considered further. Lastly, the most cost-effective remedial alternatives or designs for achieving acceptable levels of overall risk will be identified.

The purpose of the Corrective Actions RI/FS is to characterize the contamination which has resulted from leaking UST systems formerly

located at four (4) separate tank areas at PBS in soils, groundwater, and surface water, and to evaluate the currently available remedial alternatives for effectively addressing this contamination. A detailed analysis of remedial alternatives for the UST sites will be performed in order to select appropriate methods for managing the associated risks to human health and the environment. Previously, the tank areas were assessed during tank closure activities, and during a field program conducted upon closure which included limited soil excavation and soil sampling at each of the four tank areas, groundwater monitoring well installation and one round of groundwater sampling at Building 7132, and soil gas surveys at the Garage & Maintenance Area, the Space Power Facility, and the Pump Station. The additional characterization activities addressed in this Work Plan focus on determining the extent of current contamination, and the potential for off-site migration of contaminants which could affect human and environmental receptors. Additional site characterization activities will be performed to characterize the four separate UST sites sufficiently, and to enable various remedial options to be evaluated.

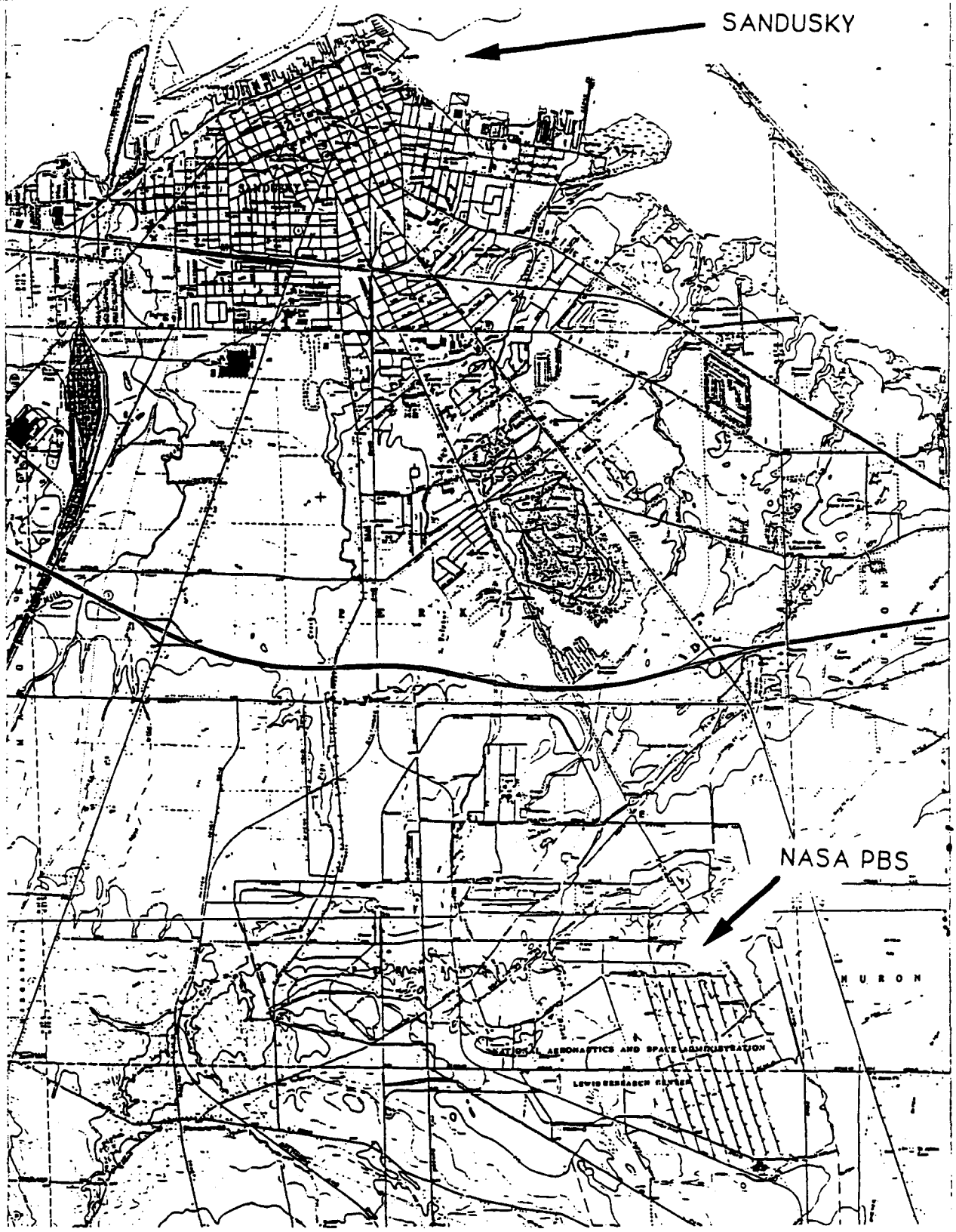
1.2 Project Background

NASA PBS is located approximately seven miles south of Sandusky, Ohio (Figure 1-3). Initially, the facility was opened as an ordnance manufacturing plant in the 1940s, but became a research center for NASA in 1962. Buildings at the facility include those designated for equipment maintenance, pump stations, research facilities (which include the largest chamber for conducting experiments in a vacuum), and a closed a nuclear reactor.

Nineteen (19) USTs at PBS were identified as requiring study under a UST Compliance Program developed by Ebasco Environmental (Ebasco) in 1989. During July through December of 1989, fourteen (14) of these USTs were removed at NASA PBS, in accordance with this program, as identified in Table 1-1. The previous locations of the USTs described in Table 1-1 are illustrated relative to the entire PBS facility in Figure 1-4, and by tank area in Figures 1-5, 1-6, 1-7, and 1-8. Activities conducted following removal of the USTs included the performance of closure assessments, an initial remediation effort at Building 7132, and soil gas surveys at three (3) of the four UST system locations (noted on Table 1-1 with an asterisk (*)). These activities are described in the following subsections.

1.3 Closure Assessment Results

Closure assessments were performed at each of the excavation areas (as shown in Figures 1-5 through 1-8) during tank removal



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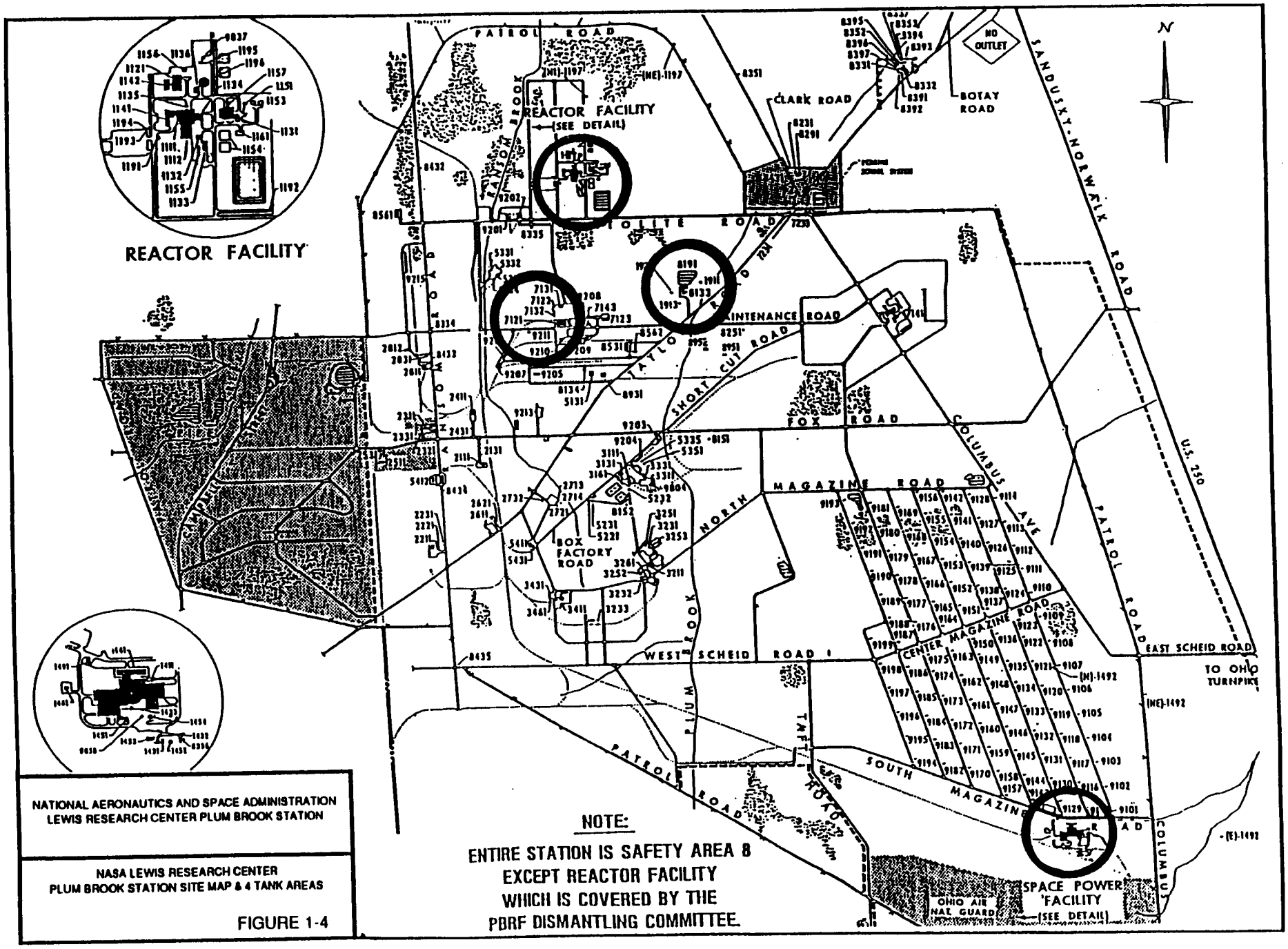
TOPOGRAPHIC MAP OF THE PBS FACILITY

FIGURE 1-3

NORTH

TABLE 1-1
PBS USTs Removed During the 1989 Calendar Year

Location	No. of Tanks	Capacity (Gallons)	Contents
Garage & Maintenance Area *:			
Building 7121	1	3,000	waste oil & solvents
	3	700	acetone, TCE, and TCA, respectively;
Building 7131	1	1,500	waste oil
Building 7132	3	9,000	gasoline
	1	8,000	diesel fuel (removed 7-16-90)
Space Power Facility *:			
Building 1411	2	1,000	waste oil + solvents
			fuel oil
Pump Station *:			
Building 8133	1	750	gasoline/diesel
Nuclear Reactor Building:			
Building 1131	2	7,900	gasoline/diesel and fuel oil
	1	500	waste oil & solvents



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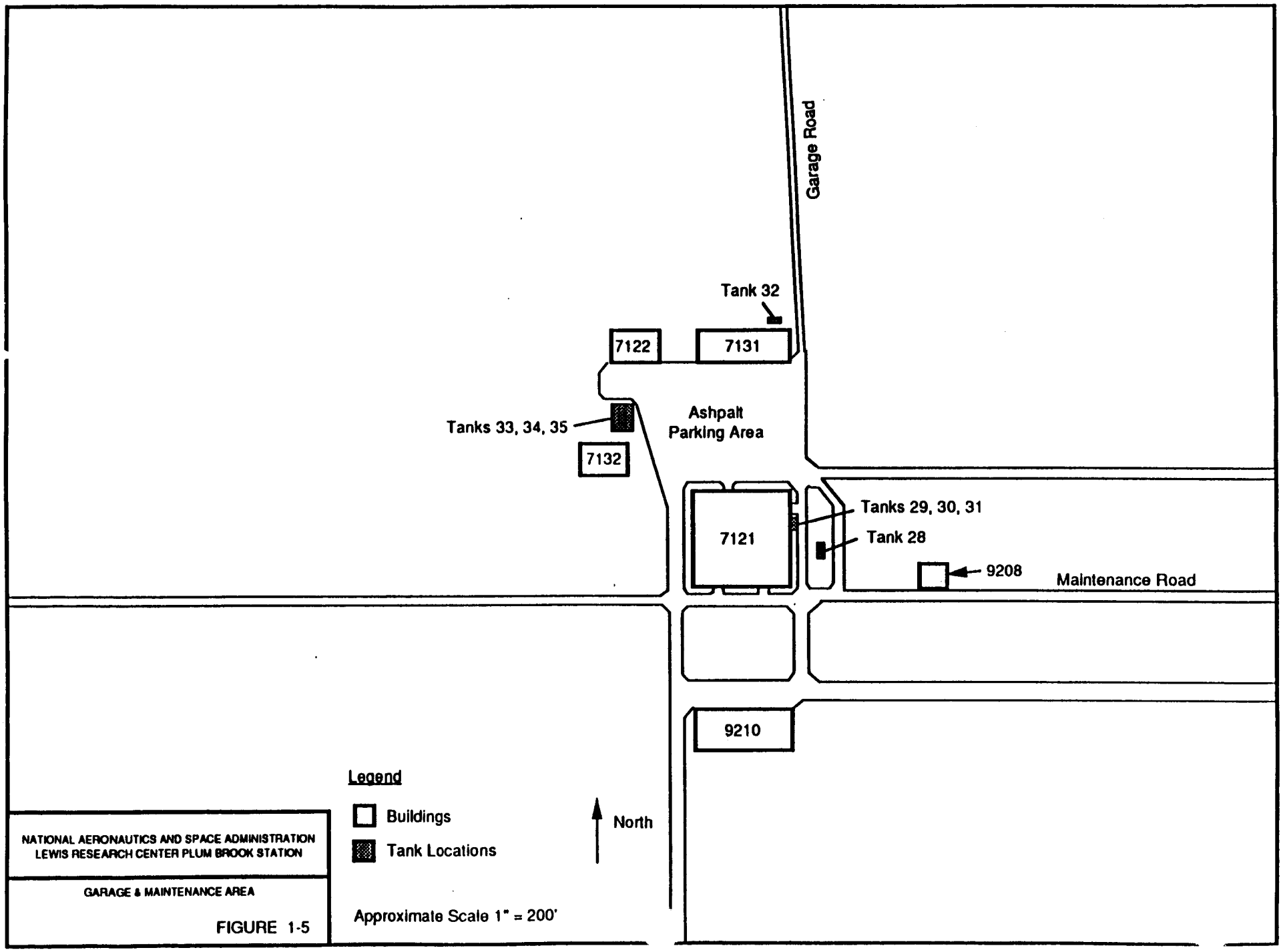
NASA LEWIS RESEARCH CENTER
PLUM BROOK STATION SITE MAP & 4 TANK AREAS

FIGURE 1-4

NOTE:

ENTIRE STATION IS SAFETY AREA 8
EXCEPT REACTOR FACILITY
WHICH IS COVERED BY THE
PBRF DISMANTLING COMMITTEE.



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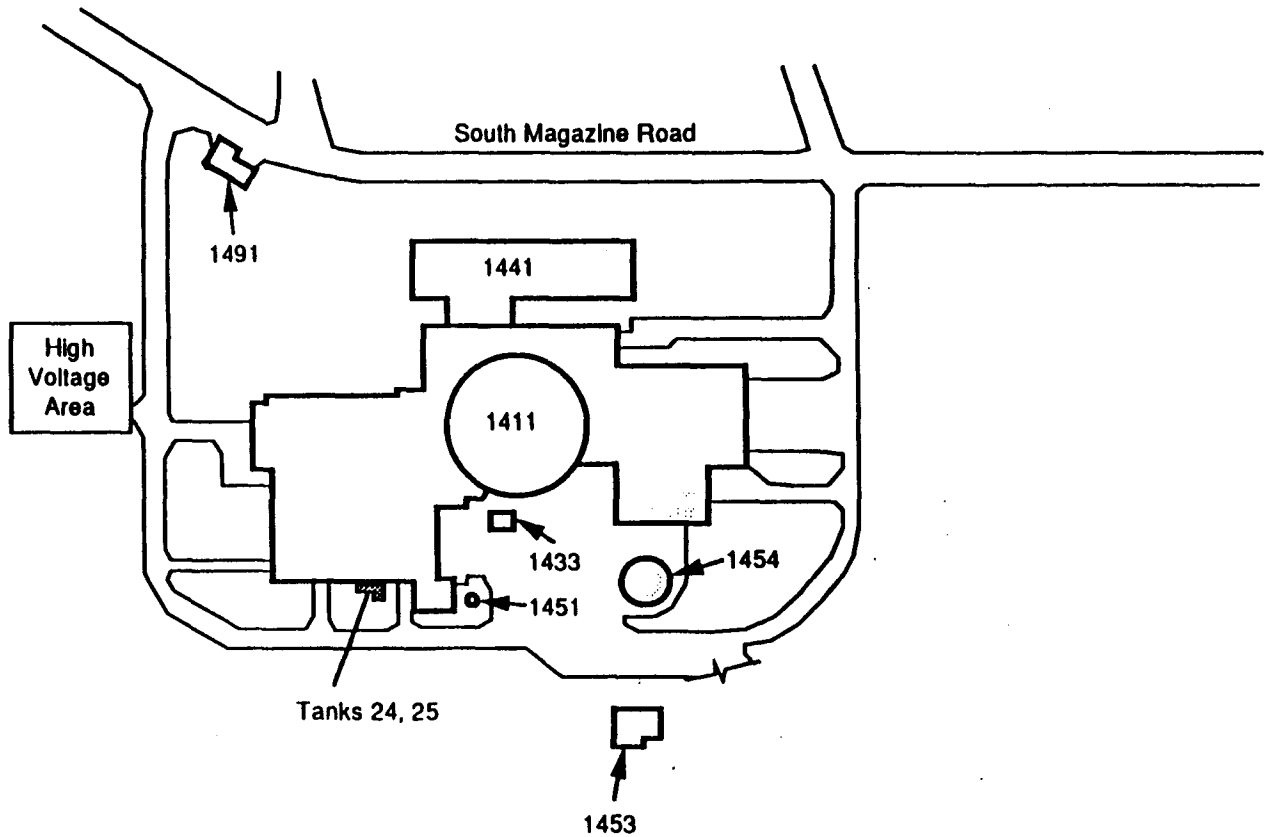
GARAGE & MAINTENANCE AREA

FIGURE 1-5



Legend

Buildings

Tank Locations

North

Approximate Scale 1" = 200'

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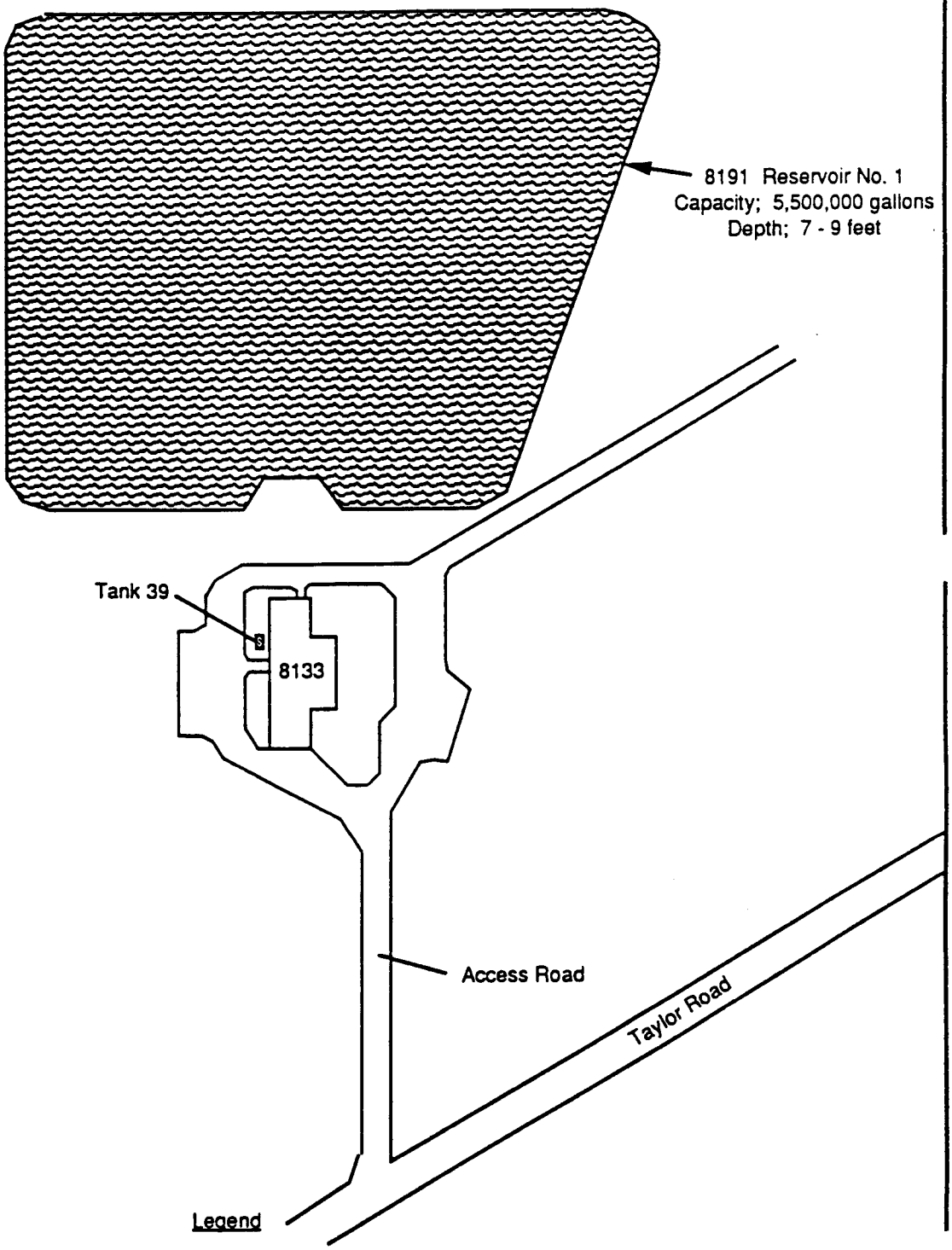
SPACE POWER FACILITY

FIGURE 1-6



Legend

- Buildings
- Tank Location
- Reservoir

North

Approximate Scale 1" = 100'

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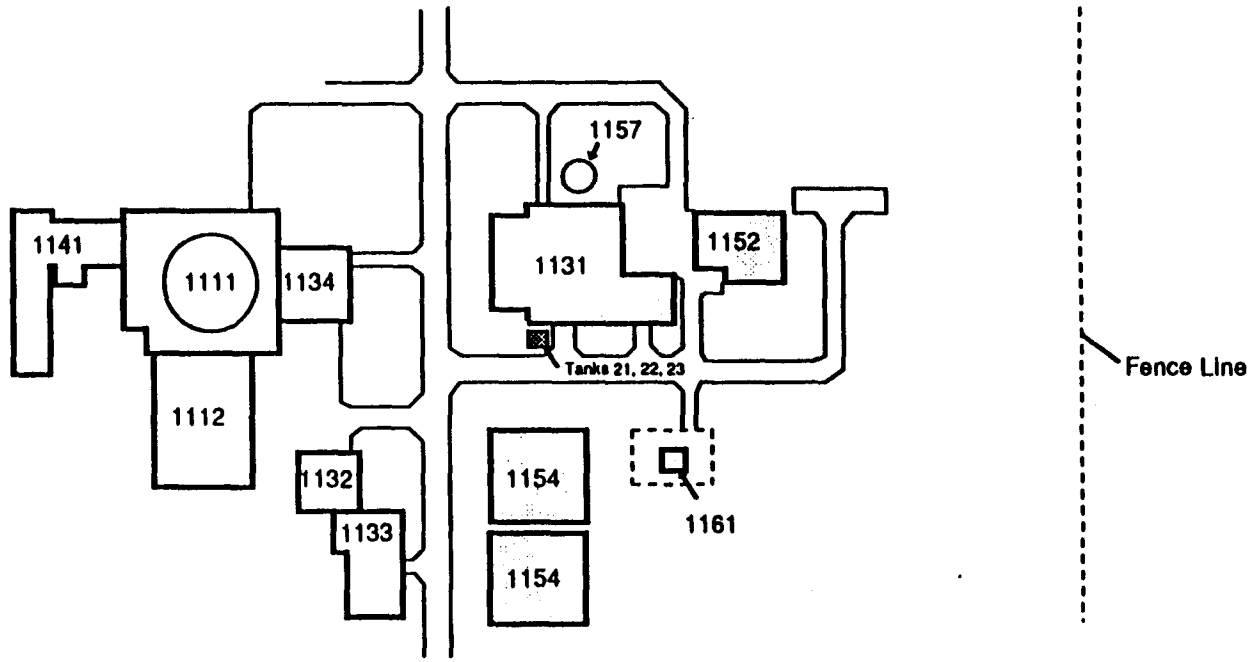
PUMP STATION

FIGURE 1-7



Legend

Buildings

Tank Location

---- Fence

North

Approximate Scale 1" = 200'

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REACTOR FACILITY

FIGURE 1-8

operations, as required by federal UST regulations, to determine whether a release (i.e., spill or leak) had occurred during the active life of the tanks, and if so, what levels of contamination were present in the soils surrounding and underlying the tanks. Soil samples were collected from the bottom of each excavation pit, the pit sidewalls, and the excavated soils.

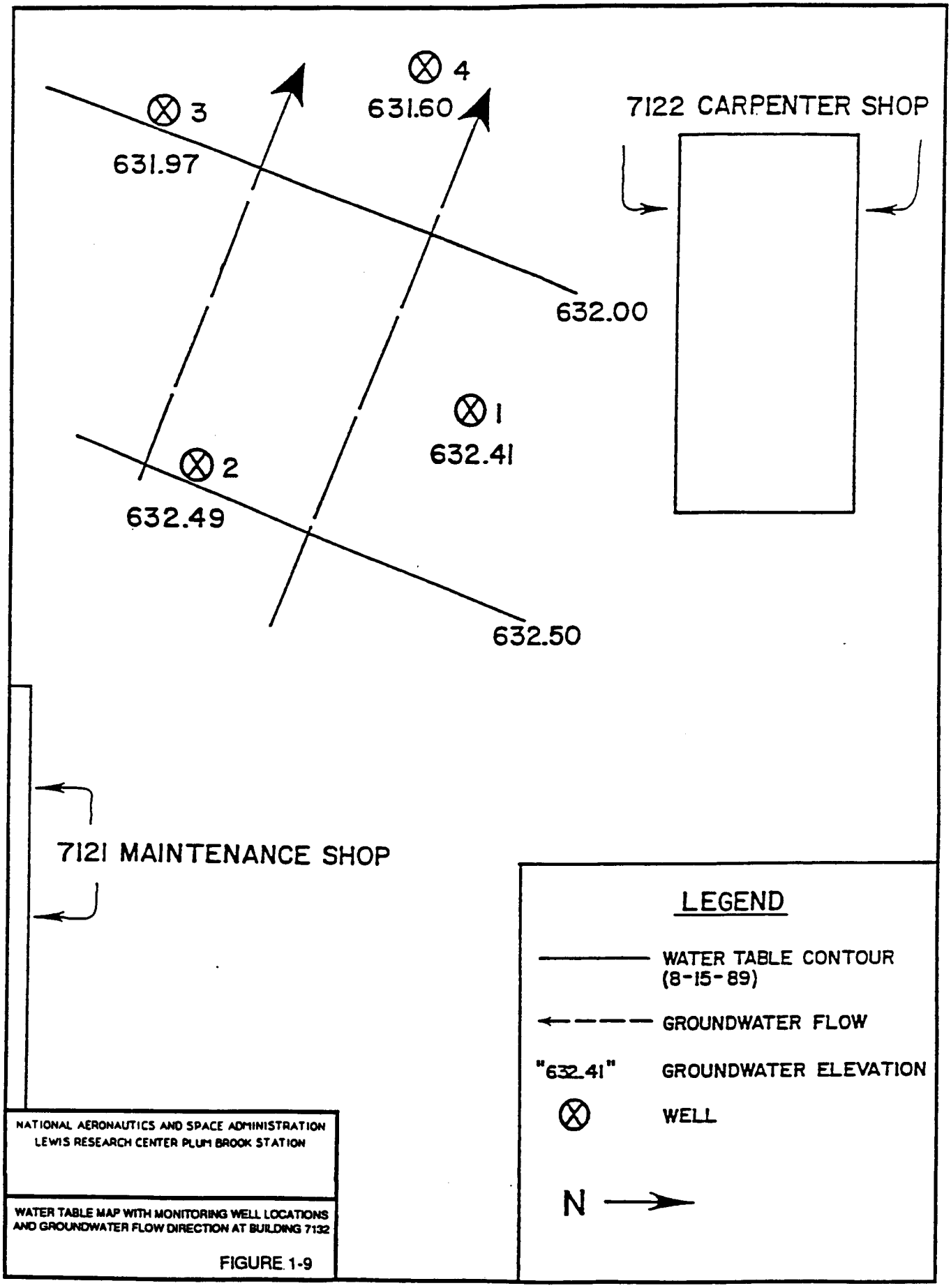
The analyses performed were for specific parameters selected to be indicative of a release from the USTs. For example, soils from tank excavation areas which had USTs reported to have contained petroleum products were analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX), total petroleum hydrocarbons (TPH), EP Toxicity lead (Pb), and flashpoint. Soils from tank excavation areas which had USTs that contained waste oil and solvents were analyzed for volatile organic compounds (VOCs), BTEX, and flashpoint. The performance of the tank closure assessments indicated that varying degrees of contamination were present at each of the eight (8) excavation sites among the four (4) tank areas (Refer to Table 1-1). The soils excavated during tank removal operations at Building Nos. 7121, 7131, 1411, and 1131 were considered hazardous, and were subsequently stored and disposed as such. Summary tables of the soil sampling and analyses performed during the closure assessments for these USTs are presented in Appendix 1.

1.4 Initial Remediation Effort at Building 7132

Based on the analytical results of the tank closure assessments, an initial remediation effort was performed. The objective of this effort, implemented at Building 7132 (Garage & Maintenance Area), was to remove contamination that could be visually observed, detected by odor, and/or measured by a Photoionization Detector (PID) within its 0-1 ppm detection range. Approximately 1,320 cubic yards of soil were excavated by this method in an effort to remove the contamination that was present. Following the excavation activities, soils from the excavation pit bottom and sidewalls were sampled. The analytical results indicated that moderate levels of contamination remained. Benzene was detected in one area of the pit at 420 parts per billion (ppb), while TPH was detected in the excavation pit in concentrations up to 200 parts per million (ppm).

How deep were the wells - are they in the same hydrologic unit?

In order to characterize the degree or general extent of contamination present in the waterbearing geologic unit beneath Building 7132, four (4) groundwater monitoring wells were installed. The locations of these monitoring well are shown in Figure 1-9. After one round of sampling, analyses of the groundwater collected from Well Nos. 2, 3, and 4 indicated no contamination above detection limits. However, groundwater from Well No. 1, located northwest of the previous pump island location


4
631.60
3
631.97
7122 CARPENTER SHOP
632.00
1
632.41
2
632.49
632.50
7121 MAINTENANCE SHOP
LEGEND
WATER TABLE CONTOUR (8-15-89)
GROUNDWATER FLOW
"632.41"
GROUNDWATER ELEVATION
WELL
N
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WATER TABLE MAP WITH MONITORING WELL LOCATIONS AND GROUNDWATER FLOW DIRECTION AT BUILDING 7132
FIGURE 1-9

(Refer to Figure 1-9), was found to contain BTEX and benzene was detected in a concentration of 58 ppb. The groundwater analytical results are presented in Table 1-2. No free or "floating" product was encountered. The data collected from the well installations indicated that the groundwater underlying the Garage and Maintenance Area flows in a northwest direction. The directive of the Ohio State Fire Marshal's Bureau of Underground Storage Tank Regulation (BUSTR) for removal of the remaining soil contamination called for the excavation of an additional eighteen (18) inches of soil before this site could be backfilled. NASA PBS responded to this directive on November 22, 1989 by performing the soil excavation and backfilling with clean, well-sorted sand. NASA is aware that they must address any groundwater contamination associated with this site, though the soil contamination at this location has been remediated.

1.5 Soil Gas Surveys

Given the confirmation of contamination by the closure assessments, soil gas surveys were conducted at the Garage & Maintenance Area, the Space Power Facility, and the Pump Station to qualitatively define the horizontal (areal) extent of petroleum hydrocarbon and volatile organic contamination at the source and surrounding soil and groundwater. Soil gas surveys were not conducted at the Nuclear Reactor Building (Building 1311), as the USTs at that location had not yet been scheduled for removal when the soil gas surveys were conducted.

Soil gas surveys detect the presence of volatile organic vapors present in the vadose zone. These vapors can come from various sources. The vapors can be created by an equilibrium set up when there is contamination associated with the soil. Volatile organics do not have a high affinity for most soils, and they will usually be associated with the water that is wetting the soil surface. There will be a natural partitioning of a given volatile organic compound between its liquid state and gaseous state. Many factors affect this partitioning such as ions in solution, temperature, pressure, moisture content, the movements of wetting fronts, etc.

The vapors can also be present due strictly to vapor migration from a soil source. If there is a soil source present, volatile organic compound vapors will migrate due to diffusion, convection, and concentration gradients. In other words, with soil gas analysis one can detect this type of vapor migration (realizing that if a soil sample was collected in this area there would not be any soil contamination present).

Vapors can also be present due to vapor migration from contaminated groundwater. The vapors will migrate due to the same factors mentioned above, and they will be detected in soil gas. In simple

TABLE 1-2
Building 7132 Groundwater Monitoring Well Analytical Results

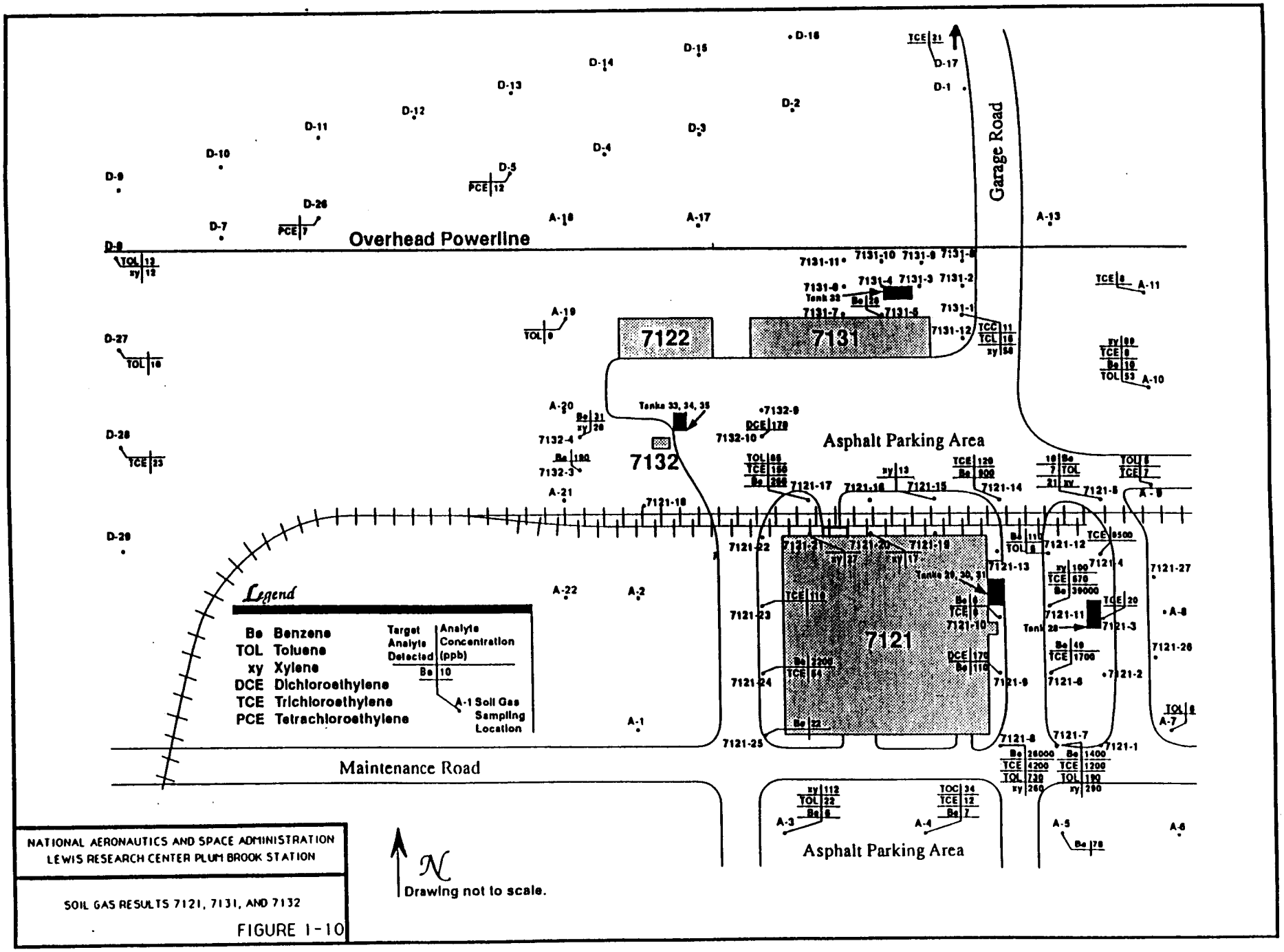
Concentrations of TPH are in mg/l and volatile concentrations (BTEX) are in micrograms/kg					
mg/liter	PBS-GW-01-011	PBS-GW-02-009	PBS-GW-03-010	PBS-GW-04-012	PBS-GW-04-013
Total Petroleum	u	u	u	u	u
Hydrocarbons (TPH)					
micrograms/liter	PBS-GW-01-011	PBS-GW-02-009	PBS-GW-03-010	PBS-GW-04-012	PBS-GW-04-013
Benzene	58	u	u	u	u
Toluene	0.4	u	u	u	u
Ethylbenzene	1.6	J .18	u	u	u
Total Xylenes	6.1	u	u	u	u
u	Undetected				
J	Below detection limits; Estimated Value				

groundwater systems one can distinguish what is occurring in the vadose zone, but due to all of the variables involved, one cannot back-calculate and determine quantitatively how much contamination is in soils or groundwater. In the case of Plum Brook Station, the system is more complicated, and all of the aforementioned factors could be contributing to what is detected in the soil gas. Therefore, an attempt was made to distinguish what was occurring qualitatively.

In general, groundwater contamination is represented in soil gas by concentrations that are relatively the same over a given area and then drop off at a given boundary. These concentrations are usually low or <50 ppb, but in some cases may be higher. If the concentrations are near the detection limit for the compound in question, the concentrations will be sporadic. Conversely, soil contamination is usually represented by soil gas concentrations that are of a significantly higher magnitude at points in a given area, with steep concentration gradients surrounding the sampling point (i.e., a two-order decrease in magnitude concentration within a distance of 100 feet).

Appropriate sampling grids were developed to characterize each tank area, to the extent possible, and in an effort to "bound" the extent of the contaminant plume. A number of subsurface conduits and structures are located at each of the tank areas. These conduits include surface drainage culverts and pipes, sanitary sewer lines, and natural gas lines. Consequently, each of the proposed soil gas sampling points were first approved by NASA PBS upon review of underground utilities drawings and survey of the affected areas with a magnetometer. A total of 112 soil gas samples were collected. Steel probes of 5/8-inch diameter were advanced 3 to 4 feet into the ground at each of the sampling locations. Soil gas samples were collected by using a hand-operated vacuum pump. After sampling extraction, the soil gas was injected into a portable gas chromatograph (GC). The GC was calibrated to qualitatively identify benzene, toluene, xylene, dichloroethylene (DCE), trichloroethylene (TCE), and tetrachloroethylene (PCE). These parameters were designated for analysis as they are indicative of petroleum product and organic contamination. All applicable QA/QC protocols were followed during sample procurement, transport, and analyses. The analytical results obtained through the performance of the soil gas surveys indicated that varying degrees of contamination were present at each of the tank areas. The results of the soil gas surveys are presented on tank area maps shown in Figures 1-10, 1-11, and 1-12.

As seen in Figure 1-10, the soil gas samples collected from the Garage & Maintenance Area generally indicated low-level contamination from fuel products and volatile organic compounds. Relatively high levels of fuel product and volatile organic contamination were detected at Building 7121. Contaminant



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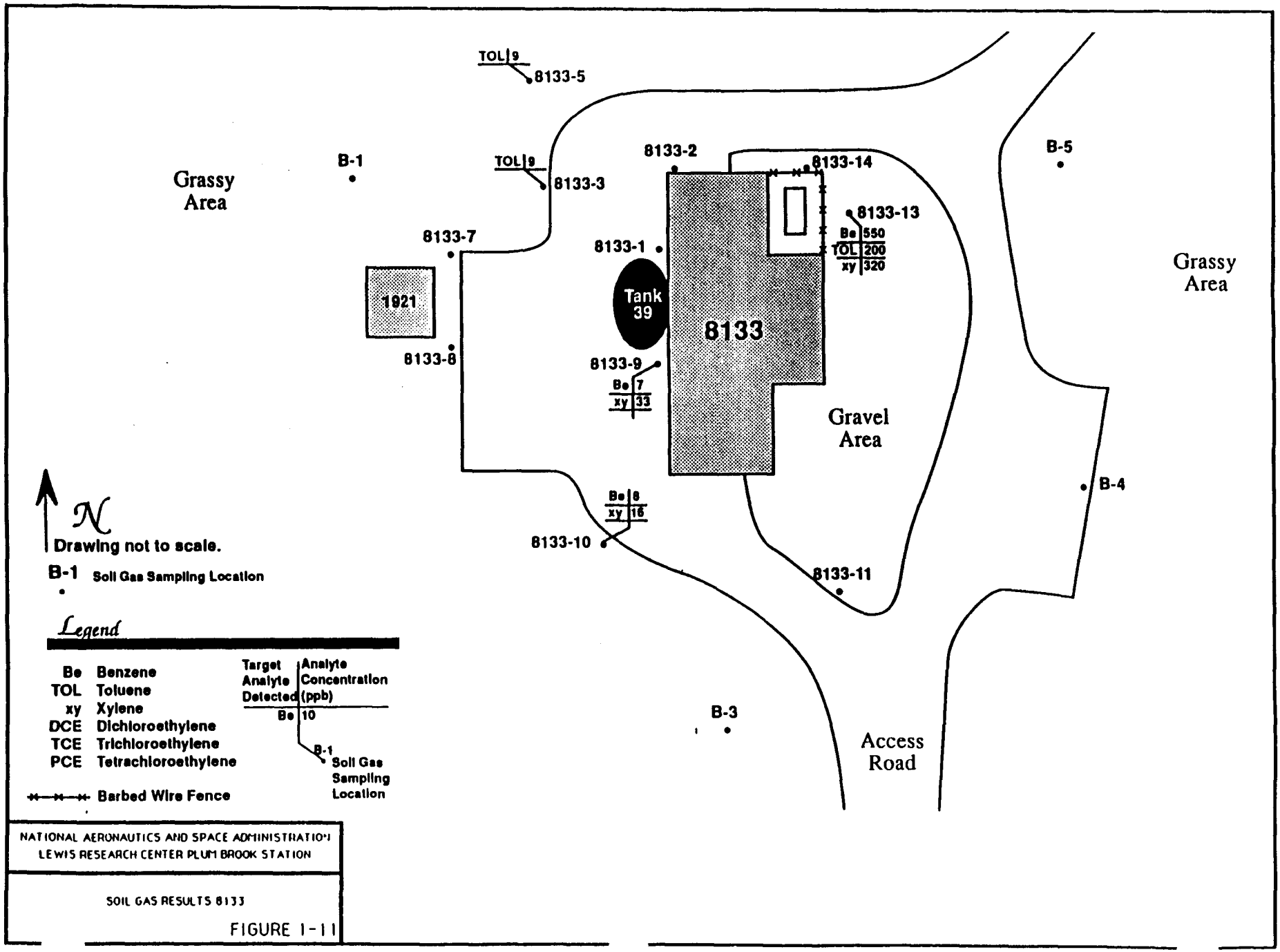
SOIL GAS RESULTS 7121, 7131, AND 7132

FIGURE 1-10


TOL 9
8133-5
B-1
Grassy Area
TOL 9
8133-3
8133-2
8133-14
B-5
8133-13
Be 550
TOL 200
xy 320
8133-7
8133-1
Tank 39
8133
1921
8133-8
8133-9
Be 7
xy 33
Gravel Area
Grassy Area
B-4
Be 8
xy 16
8133-10
8133-11
N
Drawing not to scale.
B-1 Soil Gas Sampling Location
Legend
Be Benzene
TOL Toluene
xy Xylene
DCE Dichloroethylene
TCE Trichloroethylene
PCE Tetrachloroethylene
Target Analyte Detected
Analyte Concentration (ppb)
Be 10
B-1
Soil Gas Sampling Location
Barbed Wire Fence
B-3
Access Road
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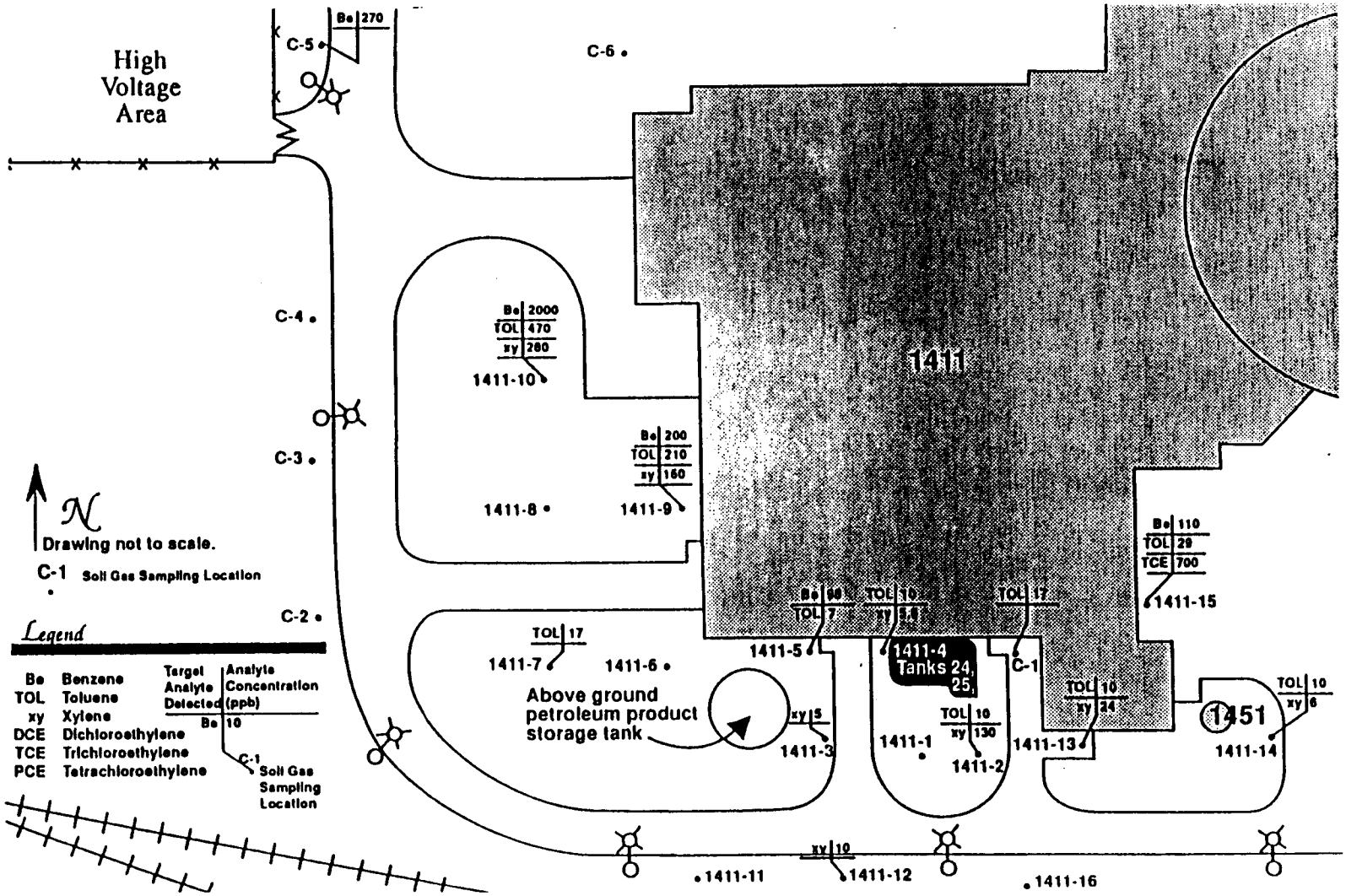
SOIL GAS RESULTS 8133

FIGURE 1-11



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SOIL GAS RESULTS 1411

FIGURE 1-12

migration appeared to follow subsurface utilities, such as the 8-inch sanitary sewer line which runs north and south on the east side of Building 7121, as well as the foundation of the building.

The soil gas performed at Building 7131 indicated that the contaminant plume was confined to an area immediately surrounding the original tank location. This was illustrated by the soil gas samples collected on the north side of the building, and the non-detection of contaminants at these points. The samples collected adjacent to the excavation site at Building 7132 were indicative of vapor migration through soils and low-level groundwater contamination. This finding demonstrated the need for additional groundwater sampling at the four (4) wells already installed at this location. In addition, low-level volatile organic contamination was detected in the grassy field in the northwest section of the sampling grid. The low levels of contamination, in conjunction with the shape and areal extent of the contamination, was suggestive of a groundwater plume which appears to be migrating in the same direction (northwest) as the known groundwater flow in this area (Refer to Figure 1-10).

The soil gas samples collected at the Space Power Facility (Building 1411) indicated contamination from fuel product. The highest contaminant concentrations were detected on the west side of the building. Soil gas contamination with high benzene concentrations, in conjunction with the shape and areal extent of contamination, was suggestive of a groundwater plume which appears to be flowing in a northwest direction. This was illustrated by the presence of only benzene in Sample C-5, as the lighter volatiles migrate in groundwater at a faster rate leaving the heavier volatiles such as toluene and xylene behind (Refer to Samples 1411-9 & 1411-10, Figure 1-11).

The majority of the soil gas samples collected at the Pump Station (Building 8133) indicated fuel product contamination. The highest concentration detected in the soil gas at this site was Sample 8133-13 (See Figure 1-12), which was indicative of localized contamination in the soil. This conclusion was drawn as the immediate, surrounding sampling points did not detect the presence of contamination. The enclosed storage area adjacent to Sample 8133-13 may possibly be the source of contamination and the detection of volatiles at this location unrelated to the UST system leak. All other samples where contaminants were detected indicated low-level soil or groundwater contamination.

2.0 TECHNICAL APPROACH

The tank closure assessments, limited installation of groundwater monitoring wells, and soil gas surveys identified significant areas of contamination which warrant a corrective actions investigation and possible subsequent remediation of the impacted soil and groundwater. NASA reviewed the collected data, and gave consideration to the appropriate methods of addressing the site contamination. As stated previously, the Ohio Environmental Protection Agency (OEPA) may use statewide numerical standards to establish cleanup levels at specific sites contaminated by leaking USTs. Alternatively, the extent of remediation required may be based on a site-specific risk analysis which considers potential exposure pathways and human and ecological receptors. Based on what is known about each of the four (4) subject tank areas at PBS, there were, and continue to be inherent problems with meeting the statewide numerical standard if the OEPA stand is to clean up to background levels (as it has indicated). These problems are primarily associated with the unavailability of remedial technologies to achieve cleanup to background (which for some contaminants is interpreted as "non-detection"). NASA, therefore, developed a plan to conduct a site characterization and remediation project which establishes site-specific risk-based cleanup targets, rather than the generic standards. This approach is preferred, as more realistic cleanup levels can be achieved through the implementation of currently available remedial fixes, while an acceptable level of target risk can be achieved and documented.

The overall project is patterned after a traditional RCRA Remedial Investigation and Feasibility Study (RI/FS), although this format is not strictly required as NASA PBS is not "under orders" of the OEPA. The purpose of the Corrective Actions RI/FS is to characterize the contamination at PBS in soils, groundwater, and surface water, and to evaluate the currently available remedial alternatives for effectively addressing this contamination in a timely manner. The overall project has been divided into three phases, according to the logical grouping of tasks and activities, to facilitate the interim review process required for all parties to reach a level of concurrence. The following subsections detail the various elements of the NASA PBS UST Corrective Actions RI/FS.

2.1 Phase I: Preliminary Characterization

2.1.1 Work Task 1: Description of Current Conditions

NASA will review the historical use of the site, and its current conditions, relative to the needs of the remedial investigation at each of the four tank areas as described below. As part of this Task, the Phase I Sampling and Analysis Plan (SAP) accompanying this document will be implemented. The data gathered during

previous investigations (as discussed earlier in Section 1.0), site inspections, and other relevant activities will be reviewed and considered.

A Draft and Final Preliminary Report, which summarizes the findings of the various elements of Work Task 1 (See Sections 2.1.1.1, 2.1.1.2, and 2.1.1.3 below), will be submitted as described under Section 3.1.1 of this Work Plan. All relevant studies or investigations, which were conducted previous to the performance of Work Task 1, also will be summarized and referenced. The purpose of the Preliminary Report is to provide sufficient background data to affect a somewhat comprehensive preliminary characterization of the four tank areas, and detail the baseline data framework from which NASA will build the remainder of the RI/FS project.

2.1.1.1 Facility and Site Background

Information concerning the regional location, pertinent area boundary features, general site physiography, hydrology, geology, and current and historic land and water uses will be collected and summarized. The general history of the facility relative to the use of the site for storage of various materials in the fourteen USTs, which are the focus of this study, will be defined. The available data concerning in these topical areas will be reviewed to develop the following items:

A. Maps depicting the following elements:

At the PBS facility:

- o Geographic location;
- o Property lines;
- o Topography and surface drainage depicting all waterways, water features, drainage patterns, and surface water containment areas;
- o General types of vegetative cover at the site; their areal extent; the quality of the vegetation as wildlife habitat, food source for wildlife, or migration corridor for wildlife; facility features that would tend to attract wildlife; and the animals that use the site;
- o Surrounding land use and demographics; and
- o The location of all public, private, and industrial production and groundwater monitoring wells within a four mile radius of the site.

At each of the four (4) tank areas:

- o All adjacent tanks, buildings, underground utilities, paved areas, easements, and other pertinent features;

- All known solid or hazardous waste treatment, storage, or disposal (TSD) areas; and
- All known past and present underground storage tanks and associated piping.

B. A description of regional hydrogeology/geology in the vicinity of the site, to include:

- Depth to bedrock and lithology;
- Characteristics of major stratigraphic units and the depositional environment;
- The average yield of water wells within a four-mile radius;
- Direction of groundwater flow in regional aquifer systems;
- Identification and characterization of recharge and discharge areas, including amount;
- Regional geomorphology, including locations of surface water bodies; and
- Structural features such as jointing, faulting, and folding.

C. A succinct history and description of ownership and operation of the target USTs at each tank area.

D. Dates or periods of past recorded UST product and waste spills to include, to the extent possible:

- Identification of spilled materials;
- Amount spilled;
- Location of spills; and
- Description of response efforts.

E. Summary of any past UST-related enforcement actions.

2.1.1.2 Nature and Extent of Contamination in the UST Areas

A. Data Review

NASA will examine all available information relative to the nature and extent of contamination in the four tank areas. NASA will review all indicated sources of contaminant release at each tank area, and assess the current degree and extent of contamination to include:

- Available monitoring data and qualitative information on locations and known levels of contamination;

- Potential contaminant migration pathways indicated to be significant, including information on geology, pedology, hydrogeology, physiography, hydrology, water quality, meteorology, and air quality; and

- Potential impact(s) on human health and the environment, including demography, groundwater and surface water uses, land uses, and the presence of significant wildlife populations or habitats.

B. Phase I Sampling and Analysis Plan Implementation

NASA will implement the Phase I Sampling and Analysis Plan (SAP) accompanying this Work Plan. One purpose of these Phase I limited sampling activities is to collect quantitative data concerning potential contaminant migration (i.e., possible surface water pathways, sediment deposition in drainage ditches, etc.) which, should they be shown to be significant, may directly impact the development of the RI Work Plan to be implemented during Phase II. A second objective of the initial sampling effort is to determine the background concentrations of contaminants in the soils of the four tank areas.

Additionally, the Phase I sampling activities will help to provide the rationale for performing Target Compound List (TCL) analyses instead of the RCRA Appendix IX analyses (recommended by OEPA RI/FS guidance) during the Phase II RI field sampling activities, and the information needed to determine if the proposed TCL analyses can be justifiably limited or reduced even further. Though the RI/FS guidelines provided to NASA by the OEPA Northwest District Office indicate that RCRA Appendix IX analyses is to be performed on all field samples collected during the Corrective Actions RI/FS, NASA believes that analyses of the TCL compounds and TPH are sufficient to both complete the characterization of the four tank areas during the RI and perform the risk assessment. This decision was based on a comparative analysis of the compounds listed under Appendix IX vs. those compounds under the TCL (See Table 2-1). The Appendix IX list contains a full "laundry list" of compounds which is quite comprehensive, while the TCL compounds include those which have been designated by the federal Superfund program as those "of concern." The Appendix IX compounds which will be eliminated from analytical consideration, by performing the analysis of only those compounds on the TCL, were reviewed in terms of available toxicological information. It was determined that the majority of compounds not on the TCL list had very little available toxicological data, and/or those compounds which had available toxicological data would not be of significant concern. NASA believes that the exclusion of these compounds will not significantly detract from the intent of the more comprehensive RCRA Appendix IX list, and the risk assessment (Work Task 5) can be appropriately tailored to consider the lack of data concerning the missing compounds.

In accordance with the Phase I Sampling and Analysis Plan, NASA will complete soil borings at each of the four tank areas. The maximum number of Phase I soil borings will be limited to fourteen (14) tank source or "contaminated" area borings, eight (8)

TABLE 2-1 (page 1 of 5)
APPENDIX IX VS. TCL LIST COMPOUNDS

COMMON NAME	APPENDIX IX	TARGET COMPOUND LIST
ORGANICS		
acenapthene	X	X
acenaphthylene	X	X
acetone	X	X
acetonitrile	X	
acetophenone	X	
2-acetylaminofluorene	X	
acrolein	X	
acrylonitrile	X	
aldrin	X	X
4-aminobiphenyl	X	
aniline	X	
anthracene	X	X
aramite	X	
Aroclor 1016	X	X
Aroclor 1221	X	X
Aroclor 1232	X	X
Aroclor 1242	X	X
Aroclor 1248	X	X
Aroclor 1254	X	X
Aroclor 1260	X	X
benzene	X	X
benzidine	X	
benz(a)anthracene	X	X
benzo(b)fluoranthene	X	X
benzo(k)fluoranthene	X	X
benzoic acid	X	X
benzo(ghi)perylene	X	X
benzo(a)pyrene	X	X
benzyl alcohol	X	X
alpha-BHC	X	X
beta-BHC	X	X
delta-BHC	X	X
gamma-BHC	X	X
bis(2-chloroethoxy)methane	X	X
bis(2-chloroethyl)ether	X	X
bis(2-chloroisopropyl) ether	X	X
bis(2-ethylhexyl)phthalate	X	X
bromodichloromethane	X	X
bromomethane	X	X
4-bromophenyl phenyl ether	X	X
butyl benzyl phthalate	X	X
2-sec-butyl-4,6-dinitrophenol	X	
carbon disulfide	X	X
carbon tetrachloride	X	X
chlordane	X	X
p-chloroaniline	X	X
chlorobenzene	X	X
chlorobenzilate	X	
2-chloro-1,3-butadiene	X	
p-chloro-m-cresol	X	X
chlorodibromomethane	X	X

TABLE 2-1 (page 2 of 5)
APPENDIX IX VS. TCL LIST COMPOUNDS

COMMON NAME	APPENDIX IX	TARGET COMPOUND LIST
chloroethane	X	X
2-chloroethyl vinyl ether		
chloroform	X	X
chloromethane	X	X
2-chloronaphthalene	X	X
2-chlorophenol	X	X
4-chlorophenyl phenyl ether	X	X
3-chloropropene	X	
chrysene	X	X
meta-cresol	X	
ortho-cresol	X	X
para-cresol	X	X
4,4'DDD	X	X
4,4'DDE	X	X
4,4'DDT	X	X
diallate	X	
dibenzo(a,h)anthracene	X	X
dibenzofuran	X	X
1,2-dibromo-3-chloropropane	X	
1,2-dibromoethane	X	
dibromomethane	X	
di-n-butyl phthalate	X	X
m-dichlorobenzene	X	X
o-dichlorobenzene	X	X
p-dichlorobenzene	X	X
3,3'-dichlorobenzidine	X	X
trans-1,4-dichloro-2-butene	X	
dichlorodifluoromethane	X	
1,1-dichloroethane	X	X
1,2-dichloroethane	X	X
1,1-dichlorethylene	X	X
trans-1,2-dichloroethylene	X	X
dichloromethane	X	X
2,4-dichlorophenol	X	X
2,4-dichlorophenoxyacetic acid	X	
1,2-dichloropropane	X	
cis-1,3-dichloropropene	X	X
trans-1,3-dichloropropene	X	X
dieldrin	X	X
diethyl phthalate	X	X
0,0-diethyl-0-2-pyrazinyl	X	X
phosphorothioate	X	
dimethoate	X	
3,3-dimethoxybenzidine	X	
p-dimethylaminoazobenzene	X	
7,12-dimethylbenz(a)anthracene	X	
alpha, alpha-dimethylphenethylamine	X	
2,4-dimethylphenol	X	
dimethyl phthalate	X	X
m-dinitrobenzene	X	X
4,6-dinitro-o-cresol	X	
2,4-dinitrophenol	X	X
2,4-dinitrotoluene	X	X
2,6-dinitrotoluene	X	X

TABLE 2-1 (page 3 of 5)
APPENDIX IX VS. TCL LIST COMPOUNDS

COMMON NAME	APPENDIX IX	TARGET COMPOUND LIST
di-n-octyl phthlate	X	X
1,4-dioxane	X	
diphenylamine	X	
1,2-diphenylhydrazine		
di-n-propylnitrosamine	X	X
disulfoton	X	
endosulfan sulfate	X	X
endosulfan I (alpha)	X	X
endosulfan II (beta)	X	X
endrin	X	X
endrin aldehyde	X	
endrin ketone		X
ethyl benzene	X	X
ethyl cyanide	X	
ethyl methacrylate	X	
ethyl methanesulfonate	X	
famphur	X	
fluoranthene	X	X
fluorene	X	X
heptachlor	X	X
heptachlor epoxide	X	X
hexachlorobenzene	X	X
hexachlorobutadiene	X	X
hexachlorocyclopentadiene	X	X
hexachlorodibenzo-p-dioxins	X	
hexachlorodibenzofurans	X	
hexachlorethane	X	X
hexachlorophene	X	
hexachlorpropene	X	
2-hexanone	X	X
indeno(1,2,3-cd)pyrene	X	X
iodomethane	X	
isobutyl alcohol	X	
isodrin	X	
isophorone	X	X
isosafrole	X	
kepone	X	
methacrylonitrile	X	
methapryiline	X	
methoxychlor	X	X
3-methylcholanthrene	X	
methyl ethyl ketone	X	X
methyl methacrylate	X	
methyl methanesulfonate	X	
2-methylnapthalene	X	X
methyl parathion	X	
4-methyl-2-pentanone	X	X
naphthalene	X	X
1,4-naphthoquinone	X	
1-naphthylamine	X	
m-nitroaniline	X	
o-nitroaniline	X	
p-nitroaniline	X	

TABLE 2-1 (page 4 of 5)
APPENDIX IX VS. TCL LIST COMPOUNDS

COMMON NAME	APPENDIX IX	TARGET COMPOUND LIST
nitrobenzene	X	X
2-nitrophenol	X	X
4-nitrophenol	X	X
4-nitroquinoline 1-oxide	X	
N-nitrosodi-n-butylamine	X	
N-nitrosodiethylamine	X	
N-nitrosodimethylamine	X	
N-nitrosodiphenylamine	X	X
N-nitrosomethylethylamine	X	
N-nitrosomorpholine	X	
N-nitrosopiperidine	X	
N-nitrosopyrrolidine	X	
5-nitro-o-toluidine	X	
parathion	X	
pentachlorobenzene	X	
pentachlorodibenzo-p-dioxins	X	
pentachlorodibenzofurans	X	
pentachloroethane	X	
pentachloronitrobenzene	X	
pentachlorophenol	X	X
phenacetin	X	
phenanthrene	X	X
phenol	X	X
p-phenylenediamine	X	
phorate	X	
2-picoline	X	
pronamide	X	
pyrene	X	X
pyridine	X	
safrole	X	
silvex	X	
styrene	X	X
2,4,5-T	X	
1,2,4,5-tetrachlorobenzene	X	
2,3,7,8-tetrachlorodibenzo-p-dioxin	X	
tetrachlorodibenzo-p-dioxins	X	
tetrachlorodibenzofurans	X	
1,1,1,2-tetrachloroethane	X	
1,1,2,2-tetrachloroethane	X	X
tetrachloroethylene	X	X
2,3,4,6-tetrachlorophenol	X	
tetraethyldithiopyrophosphate	X	
toluene	X	X
o-toluidene	X	
toxaphene	X	X
tribromomethane	X	X
1,2,4-trichlorobenzene	X	X
1,1,1-trichloroethane	X	X
1,1,2-trichloroethane	X	X
trichloroethylene	X	X
trichloromonofluoromethane	X	
2,4,5-trichlorophenol	X	X
2,4,6-trichlorophenol	X	X

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APPENDIX IX VS. TCL LIST COMPOUNDS

COMMON NAME	APPENDIX IX	TARGET COMPOUND LIST
1,2,3-trichloropropane	X	
0,0,0-triethyl phosphorothioate	X	
sym-trinitrobenzene	X	
vinyl acetate	X	X
vinyl chloride	X	X
total xylenes	X	X
METALS		
aluminum		
antimony	X	X
arsenic	X	X
beryllium	X	X
cadmium	X	X
calcium		X
chromium	X	X
cobalt	X	X
copper	X	X
iron		X
lead	X	X
magnesium		X
manganese		X
mercury	X	X
nickel	X	X
potassium		X
selenium	X	X
silver	X	X
sodium		X
thallium	X	X
tin	X	
vanadium	X	X
zinc	X	X
MISCELLANEOUS		
cyanide	X	X
phenols		
sulfide	X	

background soil borings, and 1 soil boring along the 8-inch sewer line at the Garage & Maintenance Area (total of 23 borings). "Contaminated" or tank source boring placement was determined based on the results of the soil gas surveys (i.e., the given number of "contaminated" borings, designated to be completed per tank area, were located in correspondence to the highest hits of soil gas analytes detected). Thus, the four (4) tank source soil borings at the Garage & Maintenance Area, for example, are located at the four (4) soil gas sampling points with the highest detected volatile organic compound concentrations.

Groundwater monitoring wells will be installed at the fourteen (14) tank source and eight (8) background soil boring locations (Total of 22); however, only one (1) tank source and one (1) background monitoring well location per tank area will be developed and the groundwater sampled (Total of 8). NASA believes that the development and sampling of these eight (8) wells is sufficient to preliminarily characterize the "contaminated" and background groundwater conditions at each of the four (4) tank areas. The remaining groundwater monitoring wells will be developed and sampled during the more comprehensive RI field activities to be conducted under Phase II.

NASA also will conduct a limited sediment and surface water investigation to examine potential contaminant migration via surface runoff and surface water flow. The investigation will include sampling of sediments in drainage channels in the vicinity of the four tank areas, at locations to be determined in the field, and surface water in the Retention Basin north of Building 8133.

The maximum number of Phase I soil samples requiring TCL and TPH analyses will be limited to 23 soil boring samples and their associated QA/QC field duplicate, field blank, and trip blank samples as outlined below:

<u>Soil Matrix Samples</u>

- 14 composite samples from tank areas (4 composite samples at the Garage & Maintenance Area, the Space Power Facility, and the Nuclear Reactor Building and 2 composite samples from the Pump Station);
- 8 background composite samples (1 composite from each of 8 background locations); and
- 1 composite sample from the soils along the 8-inch sanitary sewer line at the Garage & Maintenance Area.

Soil Matrix QA/QC Samples

- o 2 field duplicates from two randomly selected soil boring locations (NOTE: these field duplicates also will serve as matrix spike samples);
- o 2 field blanks (rinsate) collected during soil boring operations; and
- o 4 trip blanks.

The maximum number of Phase I groundwater samples requiring TCL and TPH analyses will be limited to 8 monitoring well samples and their associated QA/QC field duplicate, field blank, and trip blank samples as outlined below:

Groundwater Matrix Samples

- o 4 groundwater samples (one sample from one tank source or "contaminated" monitoring well location per tank area); and
- o 4 groundwater samples (one sample from one background monitoring well location per tank area).

Groundwater Matrix QA/QC Samples

- o 3 field duplicates from two randomly selected monitoring well locations (NOTE: these field duplicates also will serve as matrix spike samples);
- o 3 field blanks (rinsate) collected during monitoring well sampling operations; and
- o 3 trip blanks.

The maximum number of sediment samples requiring TCL and TPH analyses will be limited to 4 samples and their associated QA/QC duplicate, field blank, and trip blank samples as outlined below:

Sediment Matrix Samples

- o 4 sediment samples from potentially affected drainage channels.

Sediment Matrix QA/QC Samples

- o 1 field duplicate from one of the four randomly selected sediment sampling points (NOTE: these field duplicates also will serve a matrix spike samples);

- o 1 field blank (rinsate) during sediment sampling operations; and
- o 1 trip blank.

The maximum number of surface water samples requiring TCL and TPH analyses will be limited to 1 sample and its associated QA/QC duplicate, field blank, and trip blank samples:

Surface Water Matrix Samples

- o 1 surface water grab sample from the Retention Basin north of Building 8133.

Surface Water Matrix QA/QC Samples

- o 1 field duplicate from one of the two randomly selected surface water sampling points;
- o 1 field blank (rinsate) collected during surface water sampling operations; and
- o 1 trip blank.

Discretionary QA/QC Samples

Four (4) QA/QC samples have been set aside in the event that the field sampling activities exceed the anticipated schedule. These samples would assure adherence to the 1 trip blank per day protocol employed during the performance of all field operations.

2.1.1.3 Implementation of Interim Measures

As part of this subtask, NASA will review the interim measures which have been, or are currently being undertaken at the four tank areas. This review will consider the:

A. Objectives of the interim measures, such as:

- o Mitigation of potential threat to human health and the environment;
- o Design/construction, and operation/maintenance requirements; and
- o Monitoring.

B. Appropriateness of any additional interim remedial actions suggested by OEPA, in terms of the following:

- o Actual or potential exposure to human and environmental receptors;
- o Actual or potential contamination of drinking water supplies or sensitive ecosystems;
- o Levels of contaminants in soils at or near the surface that may migrate;
- o Other factors that may pose threats to public health or welfare (fire, explosion, etc.).

2.1.2 Work Task 2: RI Work Plan Development

Based on the review of available facility and site background data, and the data collected through the preliminary characterization activities of Work Task 1 (See Section 2.1.1), NASA will develop an RI Work Plan which will be implemented during Phase II of the overall UST Corrective Actions RI/FS. As part of this Task, NASA will conduct a preliminary evaluation of exposures and draw upon this evaluation and the data needs for the Feasibility Study to develop the RI Sampling and Analysis Plan. In addition, NASA will revise and modify the Phase I Health and Safety Plan (HASP), Phase I Program Management Plan, Phase I Data Collection Quality Assurance Plan, and Phase I Data Management Plan accompanying this document relative to the investigative activities to be conducted under Phase II. These revised Plans will be submitted, along with the RI/FS Sampling and Analysis Plan, as the Draft and Final RI Work Plan described in Section 3.1.2 of this document.

2.1.2.1 Preliminary Evaluation of Exposures

A. Role in RI/FS Scoping and Planning

A preliminary evaluation of known contaminant conditions and potential migration and transport mechanisms will be conducted for the four tank areas. The results of this initial examination play a role in the development of the RI Work Plan, as well as the overall project. The focus of the evaluation will be to identify potentially unacceptable long or short term human health (public or PBS worker) or ecological risks, on or off the site, that may be attributable to the products and hazardous substances that have been found at the four tank areas. Secondly, the evaluation will be aimed at preliminarily identifying reasonable and probable scenarios to be considered under the "No Action" analyses and

assessments to be conducted as part of the evaluation of remedial alternatives.

A conceptual site model, based on potential public and NASA PBS employee exposures and the site characteristics, will be developed according to the U.S. EPA's Guidance for Conducting RI/FSs Under CERCLA (1988) and used as a framework within which potential impacts on human health and the nearby environment can initially be examined and evaluated. This framework will be structured to facilitate the identification of the following:

- Likely sources and mechanisms of contaminant releases (e.g., leaching of contaminants);
- The environmental medium or media through which the released contaminants may be transported or dispersed from their initial point of release (e.g., percolation of contaminants down through soils with precipitation into the groundwater); and
- Exposure points or routes of human or environmental exposure (e.g., drinking or coming into direct contact with contaminated groundwater).

After compiling the data associated with the various components of the conceptual site model (drawing on the closure assessments, groundwater investigation, soil gas surveys, and preliminary site characterization information), the potential pathways identified will be examined to determine if any immediate public health or ecological risks appear to exist at the site or in the nearby vicinity. A number of factors will be considered in this preliminary examination:

- The characteristics and distribution of the contaminants which have been documented to be at or near the four tank areas;
- The foreseeable uses of the man-made or natural resources that may be affected by contaminants released at the sites;
- The species of wildlife and potential habitats in the area; and
- Comparisons of the measured contaminant levels and concentrations, at key points in the exposure routes, to standards and criteria established for the protection of public health or environmental resources.

Uncertainties about the quality or representativeness of the existing data will be identified. These uncertainties will most likely be related to either: the nature and extent of the contamination from the four (4) tank areas; the occupational or public uses of the land, groundwater, or surface waters in the vicinity of the tank areas; or the health-based standards and criteria judged to be applicable to these sites and the scenarios under consideration.

All exposure pathways indicated to be potentially significant, based on this evaluation, or exposure pathways which cannot be adequately or conclusively demonstrated as insignificant (given the known contamination and site activities), will be assessed in more detail during Phase II of the Corrective Actions RI/FS. The data needed to complete these risk-related analyses and more completely establish the baseline risks associated with the four (4) tank areas will be identified, so that the assessments can be conducted according to the established OEPA guidance and procedures. A significant portion of the sampling and analytical testing proposed in the RI Work Plan (See Section 2.1.2.2) will be justified on the basis of the need for the information in the risk-related analyses to be performed.

B. Conceptual Site Model

Working from the known data concerning the operation and condition of the USTs at the four (4) tank areas, prior to and upon removal (as outlined in Sections 1.2 through 1.5), information concerning the likely sources of contamination, pathways of possible migration, and susceptible receptors will be used to develop a conceptual site model to structure the evaluation of potential impacts to the NASA PBS workers, the public, and the surrounding wildlife and environment. This conceptual model, to be submitted as an element of the RI Work Plan, will be enhanced and refined upon during the RI data analysis and baseline risk assessment (See Work Task 4, Section 2.2.2) and throughout the feasibility study (See Work Tasks 5 through 10, Section 2.3).

2.1.2.2 RI Sampling and Analysis Plan

Specifications for the following tasks, anticipated during the field activities to be conducted during Phase II, will be addressed in the RI Sampling and Analysis Plan and include the following:

- Determination of media to be sampled;
- Selection of appropriate sampling locations;
- Selection of a sufficient number of sampling points;
- Determination of frequency of sampling and length of sampling period;
- Selection of type(s) of samples to be collected;
- Representativeness of selected media;
- Selection of analytical parameters;
- Representativeness of selected analytical parameters;
- Surface soil sampling procedures;
- Boring installation procedures;
- Split-spoon sampling;
- Construction materials and techniques involved with the installation of monitoring wells and well development;

- o Sampling containers and sample preservation, storage, and transportation;
- o Methods for collection of QA/QC field duplicate, field blank, and trip blank samples;
- o Calibration of field devices;
- o Decontamination procedures; and
- o Documentation and chain-of-custody.

The purpose of the RI Sampling and Analysis Plan is to collect data of sufficient quantity and quality to complete the characterization of the horizontal and vertical extent of contamination present at each of the four UST areas. The RI Sampling and Analysis Plan will describe the procedures necessary to perform the following subtasks:

1. Subcontracting (Subtask 2A);
2. Mobilization and Demobilization (Subtasks 2B and 2H);
3. Environmental Setting Characterization (Subtask 2C);
4. Source Characterization (Subtask 2D);
5. Contamination Characterization (Subtask 2E);
6. Potential Receptor Identification (Subtask 2F); and
7. Site Survey (Subtask 2G).

2.1.2.2.1 Subcontracting (Subtask 2A)

The following subcontracts will be required:

- o A drilling subcontract for auger boring, continuous split-spoon soil sampling, monitoring well installation, and well development;

- o A laboratory subcontract for providing analytical services for samples collected during the investigation;

- o A subcontract for the surveying of sampling and monitoring well locations and associated elevations upon completion of the field investigation; and

- o A drafting subcontract for the development of maps and figures of the tanks areas.

2.1.2.2.2 Mobilization and Demobilization (Subtasks 2B and 2H)

These subtasks will consist of field personnel orientation, equipment mobilization, staking of sample locations, and demobilization. Equipment mobilization will include the order and purchase of all sampling equipment needed for the RI field investigation. Coordination of subcontractors with NASA PBS and

LeRC will be established and maintained throughout the initiation of on-site activities.

Locations for the soil borings and groundwater monitoring wells will be staked at the start of the site operations. Clearance for each drilling location will be obtained through NASA PBS. Each location will be approved prior to the initiation of drilling activities. Equipment will be demobilized at the completion of each phase of field activities, as necessary. Equipment demobilization may include, but will not be limited to, sampling equipment, drilling subcontractor equipment, and health and safety decontamination equipment.

2.1.2.2.3 Environmental Setting Characterization (Subtask 2C)

NASA will collect information to supplement and verify the existing information concerning the environmental setting at the site. As part of this effort, NASA will characterize the following:

A. Regional Hydrogeology

NASA will evaluate the regional hydrogeologic characteristics in the vicinity of the facility.

B. Site Hydrogeology

NASA will evaluate site-specific hydrogeologic conditions at the site. The evaluation will be based on the data collected from sampling activities, and will include:

1. Boring installation and soil sampling to provide:

   a. An accurate classification and of the consolidated and unconsolidated stratigraphic units from the ground surface down to the base of the uppermost aquifer, to include (as appropriate):

      - Hydraulic conductivity;
      - Porosity and bulk density;
      - Rock and soil types (utilizing the Unified Soil Classification System);
      - Grain size distribution curves;
      - Thickness;
      - Lateral extent;
      - Moisture content; and
      - Soil pH.

   b. Characterization of the soil and rock units above the water table in the vicinity of the contaminant releases, to include:

- o SCS soil classification;
- o Surface soil distribution;
- o Soil profile;
- o Infiltration; and
- o Evapotranspiration.

c. Characterize the geomorphology and structural geology at the site.

2. Installation of groundwater monitoring wells, well development, and groundwater sampling to:

a. Characterize the occurrence of groundwater, to include:

- o Identification of the uppermost aquifer system;
- o Identification of all significant saturated zones above the uppermost aquifer system;
- o Depth to the water table;
- o Vertical/horizontal hydraulic conductivity and groundwater flow direction/rates of the uppermost and all strata above the uppermost aquifer;
- o Description of the interconnection between the saturated zones and the uppermost aquifer, and any surface water, seeps, and springs;
- o Description of recharge and discharge areas within the tank area boundaries;
- o Temporal fluctuations in groundwater levels, and their effects on groundwater flow direction; and
- o Identification of high permeability zones.

b. Develop hydrogeologic cross sections showing the extent of hydrogeologic units.

c. Describe the man-made influences that may affect the hydrogeology of the site such as pipelines, french drains, ditches, unlined and lined ponds, lagoons, septic tanks, NPDES-permitted outfalls, retention areas, and utility lines.

C. Surface Water and Sediment

NASA will finalize the characterization of the surface water bodies and sediment in the vicinity of the four (4) tank areas to the extent warranted. Such characterization will include the following information:

Any surface water and sediment sampling and analysis, in addition to that conducted during the implementation of the Phase I Sampling and Analysis Plan, necessary to provide:

- o Description of the temporal and permanent surface water bodies;

- o Description of the chemistry of the natural surface water and sediments; and
- o Description of physical characteristics of sediments.

D. Air

NASA will describe the climate in the vicinity of the site relative to the following parameters:

- o Annual and monthly rainfall averages;
- o Monthly temperature averages and extremes;
- o Wind speed and direction;
- o Relative humidity/dew point;
- o Atmospheric pressure;
- o Evaporation data; and
- o Development of inversions.

Additionally, NASA, to the extent required to support Phases II and III of the overall Corrective Actions RI/FS, will establish the existence of any of the following topographic and man-made features which affect air flow and emission patterns:

- o Ridges, hills, or valleys;
- o Surface water bodies;
- o Wind breaks and forestation; and
- o Buildings.

2.1.2.2.4 Source Characterization (Subtask 2D)

NASA will collect data concerning the contamination at the tank areas including: type, quantity, physical form, disposition, and site characteristics affecting the release. This effort will include quantification of the following characteristics:

A. UST Area Characteristics:

- o Location of area;
- o Design features;
- o Known operating practices;
- o Period of operation;
- o Age of UST when removed;
- o General physical conditions;
- o Method used to close the UST.

B. Known or Estimated Waste Characteristics:

- o Hazardous classification;
- o Quantity; and
- o Chemical composition.

C. Known or Estimated Physical and Chemical Characteristics:

- o Physical form;
- o Physical description;
- o General chemical class;
- o Molecular weight;
- o Density;
- o Boiling point;
- o Viscosity;
- o Solubility in water;
- o Cohesiveness of the wastes;
- o Vapor pressure; and
- o Flash point.

D. Known or Estimated Migration and Dispersal Characteristics of the Waste:

- o Sorption;
- o Biodegradability, bioconcentration, and biotransformation;
- o Photodegradation rates;
- o Hydrolysis rates; and
- o Chemical transformations.

2.1.2.2.5 Contamination Characterization (Subtask 2E)

NASA will collect analytical data on soils, groundwater, sediment, and surface water (as necessary) at or adjacent to the previous tank locations. The data will be of sufficient quantity and quality to define the extent, origin, direction, and rate of movement of contaminant plumes. NASA will address the following types of contamination at the site:

A. Soil Contamination

NASA will conduct an investigation to include soil borings and soil sampling and analysis to characterize the contamination of soil and rock units in the vicinity of the contaminant release. This investigation will provide the following information:

- o Vertical and horizontal extent of contamination;
- o Chemical characteristics of the soil within the source areas and plume to include:
  - Solubility;
  - Speciation;
  - Adsorption;
  - Leachability;
  - Exchange capacity;
  - Biodegradability;
  - Hydrolysis;

- Photolysis; and
- Oxidation.

o Specific contaminant concentrations; and
o Velocity and direction of contaminant movement.

B. Groundwater Contamination

NASA will conduct a groundwater investigations to locate and characterize any plumes of migrating contamination in the groundwater underlying the four tank areas. The investigations will include monitoring well installation to characterize and quantify the groundwater quality in the uppermost aquifer and all significant zones of saturation or permeable zones that may act as pathways for contaminant migration. The investigations will provide data to address the following:

o Horizontal and vertical extent of any immiscible or dissolved plume(s) originating from the site;
o Horizontal and vertical direction of contamination movement;
o The velocity of contaminant movement;
o Horizontal and vertical concentration profiles of constituents in the plume(s);
o Evaluation of factors influencing the plume movement; and
o Prediction of future contaminant movement.

C. Sediment and Surface Water Contamination

NASA will conduct a sediment and surface water investigation, to the extent needed, to determine the human health and ecological consequence due to releases at the four tank areas.

D. Subsurface Gas Contamination

NASA will conduct an investigation, as warranted, to characterize the subsurface gasses emitted from hazardous constituents in the groundwater.

2.1.2.2.6 Potential Receptor Identification (Subtask 2F)

As part of this subtask, NASA will collect information about the human populations and environmental systems that may be susceptible to exposures to contaminants at the tank areas. Data concerning observable effects in ecosystems also may be obtained if warranted. The following characteristics will be identified:

A. Current uses and possible future uses of groundwater:

o Type of use (e.g., drinking water source: municipal vs. residential, etc.) and

- o Location of groundwater users, including wells and discharge areas.

B. Current uses and possible future uses of significant surface waters located on or draining the areas around the former tank locations:

- o Domestic and municipal;
- o Recreational;
- o Agricultural;
- o Industrial; and
- o Ecological.

C. Human use or access to the four tank areas and adjacent areas, including:

- o Occupational;
- o Recreational;
- o Residential;
- o Commercial;
- o Zoning; and
- o Relationship between population locations and prevailing wind direction.

D. Biota in surface waters on, adjacent to, or potentially affected by the four tank areas

E. Ecology features that may be influenced by the four tank areas

F. Demographic profile of the people who use or who have access to the areas under study, including:

- o Age;
- o Sex; and
- o Sensitive subgroups.

2.1.2.2.7 Site Survey (Subtask 2G)

Upon completion of the RI field activities of Phase II, final sampling locations, monitoring well locations, and well casing elevations will be established by a surveying subcontractor. A site map with the surveyed sampling and monitoring well locations and elevations will be prepared.

2.1.2.3 RI Health and Safety Plan

NASA will revise and modify the Phase I Health and Safety Plan (HASP) accompanying this Work Plan to protect the personnel

involved in the Phase II RI field investigations and people in nearby areas. The HASP will identify problems or hazards that may be encountered and their solution. Safety procedures to be followed to protect third parties also will be specified. The major elements of the HASP will include the following:

- Description of the known hazards, and an evaluation of the risks associated with the UST release and with each activity to be conducted during Phase II;
- Listing of key personnel;
- Delineation of work area(s), including a map;
- Description of levels of protection to be worn by personnel in the work area, for the various tasks involved in the performance of the RI;
- Description of medical monitoring program;
- Description of standard operating procedures (SOPs) established to assure the proper use and maintenance of personal protective equipment (PPE);
- The establishment of procedures to control site access;
- Description of decontamination procedures for personnel and equipment;
- Establishment of site emergency procedures;
- Availability of emergency medical care for injuries and toxicological problems;
- Description of requirements for environmental monitoring (e.g., air and personnel monitoring, etc.);
- Specification of any routine and special training required for site personnel involved in Phase II field activities; and
- Establishment of procedures for protecting workers from weather-related problems.

The HASP will be consistent with the following requirements and guidelines:

- NIOSH Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (1985);
- Section 111(c)(6) CERCLA;
- EPA Order 1440.1 and 1440.3;
- EPA Occupational Health and Safety Manual;
- EPA Interim Standard Operating Safety Procedures;
- OSHA regulations contained in 29 CFR 1910 and 1926;
- State and local regulations;
- Site conditions; and
- NASA Headquarters and PBS Health and Safety Requirements

2.1.2.4 RI Program Management Plan

Under this subtask, NASA will revise and modify the Phase I Program Management Plan accompanying this Work Plan to outline the technical approach, schedules, budget, and personnel involved in

the implementation of the Phase II RI activities. The Plan will include a description of the qualifications of the personnel performing/directing the RI, including subcontractor personnel. The Plan also will document the overall management approach to the remedial investigation.

2.1.2.5 RI Data Collection Quality Assurance Plan

NASA will revise and modify the Phase I Data Collection Quality Assurance Plan accompanying this Work Plan to detail the following elements of Phase II:

- o Description of the intended uses for the data, and the necessary level of precision and accuracy for the intended uses;
- o Description of the methods and procedures to be used to assess the precision, accuracy, and completeness of the measurement data;
- o Quality Assurance/Quality Control (QA/QC) procedures;
- o Identification of responsible party to act as sample custodian at the laboratory authorized to sign for incoming field samples, obtain documents of shipment, and verify the data entered onto sample custody records;
- o Provision for laboratory sample custody logs consisting of serially numbered lab-tracking report sheet;
- o Specification of laboratory sample custody procedures for sample handling, storage, and dispersement for analysis;
- o Analytical procedures to include:
  - Scope and application of the procedure;
  - Sample matrix;
  - Potential interferences;
  - Method detection limits; and
  - Calibration techniques and frequency.

2.1.2.6 RI Data Management Plan

NASA will revise and modify the Phase I Data Management Plan accompanying this Work Plan to document and track Phase II RI investigation data and results. The Plan will identify and set up data documentation materials and procedures, project file requirements, and project-related progress reporting procedures and documentation. The Plan also will present the format to be used to present the raw and processed data and conclusions of the investigation.

2.2 Phase II: Remedial Investigation

2.2.1 Work Task 3: RI Work Plan Implementation

NASA will implement the RI Work Plan, developed during Phase I, as described in Section 2.1.2.2 of this document. The investigation conducted will be designed to complete the characterization of the four tank areas, define the sources of contamination, define the degree and extent of contamination, and identify actual or potential receptors at each area. The implementation of the RI Work Plan will result in the collection of data of adequate technical quality to support the health-based risk assessment and ecological impact assessment, as well as aid in the development and evaluation of the remedial action alternatives during the feasibility study to be conducted under Phase III. Monthly technical progress reports will be submitted by NASA during the performance of the RI, as described in Section 3.2.1 of this Work Plan.

2.2.2 Work Task 4: RI Data Analysis and Baseline Risk Assessment

NASA will analyze the data collected under all previous site investigations. The objective of this task is to adequately describe the nature and extent of contamination, potential threat to human health and the environment, and provide a baseline from which the evaluation of the feasibility study can build. The findings of the RI Data and Analysis effort and Baseline Risk Assessment will be summarized in a Draft and Final RI Report, submitted as described in Section 3.2.2 of this Work Plan.

2.2.2.1 Data Analysis

NASA will analyze all chemical and physical data once it has been verified to be of acceptable accuracy and precision. Data evaluation will be initiated upon receipt of validated data from the RI field investigation (See Work Task 3, Section 2.2.1 above), and after sample analysis/data validation of laboratory analyses is completed.

These analyses will be aimed at identifying and characterizing all significant sources and potential pathways of contaminant migration. Analyses will be performed to both qualitatively and quantitatively consider the extent of contamination in relation to the representative background areas for each tank area. Data will be summarized into a number of usable formats for data manipulation, depending on the current needs. Data evaluation activities may include data reduction and tabulation, calculation of aquifer characteristics, statistical analyses, evaluation of

geochemical and hydrogeochemical interactions, groundwater modeling, environmental fate and transport modeling, and preparation of schematic diagrams, cross-sections, and maps.

The analytical data will be reviewed to evaluate contaminant distributions and the adequacy of the database for the risk assessment and feasibility study. The results will be reviewed with the OEPA to verify that the database is sufficient for the intended purposes. If additional sampling should be shown to be required, an evaluation will be made in coordination with the OEPA to determine the scope and implementation of an additional phase of investigation.

2.2.2.2 Risk Assessment

The preliminary evaluation of the possible exposures to contaminants associated with the four (4) tank areas at NASA PBS (as discussed in Section 2.1.2.1 of this Work Plan, and to be submitted as an element of the RI Work Plan), is designed to be an initial examination of the various elements of the baseline risk assessment analyses that are required to be performed as part of the RI/FS. After the RI field sampling and analytical investigations at the site have been completed, and the collected data have been validated, these risk assessment activities will be initiated. Initially, the required level of detail for specific risk assessment analyses will be determined in consideration of the nature of the newly collected data. It is anticipated that the risk assessment activities will constitute an extension and further quantification of the initial analyses performed as part of the preliminary evaluation described earlier in this document.

Other potential risks associated with the tank areas also may be identified, and subsequently assessed, based on the findings of the RI. It is anticipated that any active or passive sources of contamination associated with the four specified areas of the PBS site will have been identified, and that the current level and extent of contamination will have been quantitatively characterized or generally bounded. To systematically examine the resulting risks due to contaminant migration and human and environmental exposure, the risk assessment activities will be conducted according to the guidelines specified by the U.S. EPA in the Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Interim Final) (USEPA, 1989) and Environmental Evaluation Manual (Interim Final) (USEPA, 1989). The most current versions of these documents and appropriate state and federal policies on risk reduction will be referred to at the time of the performance of the risk assessment activities.

In accordance with these guidelines and their associated procedures, five subtasks (which were initiated as part of the

preliminary evaluation of exposures) may be required as part of the baseline risk assessment activities, depending in part on what is discovered during the RI field activities:

- Identification of chemicals of potential concern from among the set of contaminants found to be at the site. This identification process will consider: the circumstances associated with compounds detected by the analyses of the samples collected in the various site media; the concentrations of these detected compounds relative to naturally occurring (background) levels at the site; tentatively identified compounds historically related to the site; and transformation products of chemicals demonstrated to be present.

- Identification of contaminant migration pathways to points where critical human or ecological exposures could occur. This identification will include: characterizing the physical setting of all active and passive sources of contamination at the site; identifying potentially exposed populations; and identifying potential exposure pathways.

- Estimation of concentrations of the chemicals of potential concern at exposure points by considering their fate and transport along the identified migration pathways.

- Comparison of projected concentrations to applicable or relevant and appropriate requirements (ARARs) established to protect the public health or the environment.

- Quantitative risk characterization, including: a detailed assessment of human intakes; contaminant form; toxicity; and category of impact (e.g., carcinogenic or non-carcinogenic).

A discussion of the various risk assessment subtasks is presented below to provide an indication of the nature of the activities that are anticipated to be required for the RI/FS. For example, current uncertainties regarding the potential significance of a particular pathway or exposure route will be eliminated or greatly reduced by the information to be collected during the implementation of both the Phase I Sampling and Analysis Plan and Phase II RI Work Plan, enabling an appropriate approach for assessing the level of risk associated with a given pathway or exposure route to be developed and implemented. Some of the potential exposure pathways identified in the Conceptual Site Model are likely to be shown to be insignificant, and will require a minimum of further study and documentation. Other findings may justify a detailed quantitative analysis of additional pathways and potential risks in a somewhat expanded scope.

A. Selection and Characterization of the Contaminants of Potential Concern

The first step in selecting appropriate contaminants of potential concern will be a comprehensive review and compilation of the existing sampling and testing data and a review of the new information collected during the Phase II RI. It is critical that all pertinent information be compiled for review and interpretation before a set of contaminants are selected for use in the RI/FS risk analyses. Specific criteria, specified in the Human Health Evaluation Manual, will be used to screen the full set of contaminants detected at the site to arrive at the appropriate set for the risk analyses. These criteria relate to the circumstances of detection of a particular substance, its relation to the history of the site, and the anticipated behavior of chemicals in the environment. In addition, considerations relating to toxicity, mobility, persistence, and bioaccumulation may be considered in screening.

The selection of a set of chemicals for use in the risk-related analyses will be based on a screening of the chemicals found to be present at the site according to these criteria, as dictated by the federal Superfund guidelines for assessing human health risks (U.S. EPA, 1989). This screening procedure will be documented and included as part of the RI Report. Once this set of chemicals has been identified, their physical, chemical, and toxicological characteristics will be compiled and reviewed to provide a solid understanding from which to consider and evaluate possible pathways of migration and exposure routes.

B. Identification of Exposure Pathways

An exposure pathway, as was discussed in Section 2.1.2.1 of this document, is defined by four basic and necessary elements:

- A source and mechanism of chemical release to the environment (e.g., leachate from underground wastes);
- An environmental transport medium to receive and hold/carry the released chemicals (e.g., groundwater);
- A point of potential human or environmental contact with the contaminated medium (e.g., a groundwater production well); and
- An exposure route at the exposure point (e.g., drinking the water).

Based on the currently available data, the principal sources of contamination at the site are the spilled or leaked fuels or waste solvents from the four (4) identified tank areas at the PBS site. Given the preliminary evaluation of risks performed, the most likely ways for released contaminants to have migrated from these

sources in the past, or to migrate in the future, is by groundwater transport.

C. Estimation of Exposure Point Concentrations

Concentrations of each of the indicator chemicals in the appropriate media of concern will be estimated at the critical exposure points (e.g., in the local soils and groundwater where human or ecological exposures could take place). This activity may involve estimating the quantities of the contaminants or buried wastes that may be released to the environment over time, and predicting the environmental transport and fate of each chemical of concern in the identified medium. Cross-media transportation and migration may also need to be quantitatively evaluated. Deriving these concentrations may involve the direct evaluation of field sampling data or the modeling of various physical and chemical environmental processes, such as leaching, percolation through the soil, groundwater movement, or chemical volatilization and release, depending on the conditions encountered at the site. Available federal guidance will be drawn upon in the performance of these analyses, including the Superfund Exposure Assessment Manual (U.S. EPA, 1987). Evaluations of any significant air pathways and corresponding exposures will consider the available interim final guidance provided by the Air/Superfund National Technical Guidance Study Series (U.S. EPA, 1989), as appropriate. Again, the most current version of any federal guidance will be relied on in these analyses. Additionally, the Exposure Factors Handbook (U.S. EPA, 1989) will be used, as appropriate, to determine modeling inputs when site-specific information cannot be practically developed.

D. Comparison to Applicable or Relevant and Appropriate Requirements (ARARs)

The projected concentrations of the indicator chemicals at the exposure points must be compared to location- and contaminant-specific ARARs to judge the magnitude and extent of the risks to the public and the environment (including plants, animals, and ecosystems). At the present time, the U.S. EPA considers the Maximum Contaminant Levels (MCLs) developed under the Safe Drinking Water Act (SDWA), the Federal Ambient Water Quality Criteria (AWQC), the National Ambient Air Quality Standards (NAAQS), and state (e.g., Ohio) environmental regulations to be among the standards or criteria that are potential ARARs for use in assessing the risks associated with contaminated sites. As such, these federal criteria and elements of the Ohio Administrative Code and the Ohio Revised Code will be key ARARs to be used in this review and assessment. NASA will coordinate the OEPA Northwest District Office to develop a set of ARARs to be considered for the PBS site. The set of potential risk and health-based ARARs will be reviewed and reevaluated over the course of the RI/FS project in association with representatives from the OEPA. The document, CERCLA

Compliance With Other Laws Manual (U.S. EPA, 1988), will be used as an aid in identifying other potentially pertinent ARARs.

E. Quantitative Risk Estimation

A quantitative assessment of the risks associated with the site will be conducted according to the previously cited risk assessment guidelines and procedures. Given the number and types of contaminants present in the groundwater and the soil, it is clear that promulgated regulatory criteria for comparison to measured or predicted exposure point contaminant concentrations will not be available for many contaminant/media combinations. Consequently, a full quantitative assessment of the human health impacts of the site will then be required as the framework within which all risk analysis activities must be conducted. Published references and guidance will be drawn upon to relate the measured or predicted exposure point concentrations in various media to human intakes and resulting health effects under various scenarios for both carcinogens and non-carcinogens. The Superfund Exposure Assessment Manual (U.S. EPA, 1987) and the Exposure Factors Handbook (U.S. EPA, 1989) also will be drawn upon during this subtask, as needed, to supplement the available site-specific information.

For non-carcinogens, a hazard index (i.e., the ratio of the calculated intake level to an established acceptable intake level) will be calculated for all non-carcinogenic contaminants for each exposure pathway in which they are indicated to play a role. Hazard indices greater that 1 would reflect a possible human health concern. Hazard indices will then be summed for multiple contaminants across appropriate pathways, provided there is a commonality of toxicological effect for each non-carcinogen being summed. For the carcinogens, the calculated intake levels will be multiplied by each carcinogenic contaminant's cancer potency factor and summed to obtain a lifetime cancer risk. This approach assumes, in accordance with the available guidance, that the cancer risks for the various contaminants is additive. The overall lifetime cancer risk estimates will then be compared to U.S. EPA's recommended target risk range of 10^{-4} to 10^{-6} (as revised in the Final National Contingency Plan (NCP) Target Risk Levels, 1990). An analysis of sensitivities and uncertainties also will be conducted.

An ecological risk assessment in some level of detail may be required, or key environmental receptors at the PBS site may need to be explicitly considered, in the risk analyses conducted for the RI/FS. The RI Work Plan will include a number of soil, sediment, and water samples which will help to define the magnitude and type of potential ecological impact and the corresponding level of analysis that is warranted. The new data and information collected during the RI will be assessed relative to the available federal guidance, which includes Risk Assessment Guidance for Superfund - Environmental Evaluation Manual (U.S. EPA, 1989) and Ecological

Assessment of Hazardous Waste Sites: A Field and Laboratory Reference (U.S. EPA, 1989). In light of this information and guidance, an agreement will be reached with representatives of the OEPA as to the scope and format of ecological risk assessment that should be performed. Should a qualitative evaluation be indicated, the follow-up activities listed below may be conducted:

- Summarize existing information on the presence of environmental populations on or near the site (both terrestrial and aquatic);
- Document actual or potential threat of damage to the environment; and
- Address qualitatively actual or potential adverse ecological effects of the observed contaminants.

2.2.3 Remedial Action Performance/Clean-Up Targets

Having completed the assessment of the contaminant sources and probable releases from the four tank areas at the PBS site, and potential routes for human exposures to the indicator contaminants under the "No Action" scenario (which is the projection of the level of risk associated with the site assuming no remediation or further mitigative activity), remedial action performance goals and specific media clean-up targets will be developed. The baseline risk assessment information relating to chemical releases, significance of particular routes of human exposure, human exposure points, and the level and timing of risks due to the site will then be used as inputs to identify and evaluate the proposed remedial alternatives. Public health considerations will be used to develop target chemical concentrations in soil, sediments, and groundwater for each remedial alternative, as needed. Comparisons will then be made of the residual health and ecological risks projected to be associated with each remedial alternative.

The steps undertaken to develop the risk-based target concentration goals, relative to remedial alternatives for managing and controlling the migration of site contamination, will include:

- Reevaluation of Chemicals of Potential Concern Used For The Baseline Assessment of Risks - The set of chemicals adopted for the assessment of the baseline tank area risks will be reexamined to determine its continued appropriateness for subsequent analyses of remedial action scenarios. The reevaluation will determine if the original set of contaminants must be modified due to differences among the chemicals relative to treatability, chemical class, or propensity to be released from specific remedial alternatives.

- Identification of Potential Exposure Pathways - Building on the set of exposure pathways identified for the baseline risk assessments, the exposure pathways applicable to the various remedial alternatives and remedial action scenarios will be identified. The remedial action scenario pathways may need to be different than the corresponding "No Action" scenario pathways to account for the net effect of the remedial technology or option being evaluated. Certain exposure routes may be eliminated by a particular control strategy while new, less significant exposure routes and pathways may be created by the remedial activity. Therefore, each remedial alternative remaining after initial screening will be examined to establish the sources of contaminant releases, affected transport media, corresponding human exposure points, and overall exposure routes associated with their implementation.

- Determination of Target Concentrations at Human Exposure Points - Each indicator chemical of relevance to the remedial alternatives exposure pathways will be quantitatively analyzed to develop a target concentration range for each chemical at the identified points of human exposure. These targets are likely to include concentrations of the pertinent contaminants in the site soil and groundwater that will be projected to result in acceptable health risks given the exposure routes identified for that alternative. As not all of the likely chemicals of potential concern for the PBS site tank areas are expected to have established ARARs for all media of practical concern, these target concentrations will be based on the available toxicity and chemical intake data for each chemical under the proposed scenario conditions. This information will be used to establish clean-up target concentrations in the contaminated media which will limit site carcinogenic risks to the range of 10^{-4} to 10^{-6} for any individual as mandated by agency policy. ARARs that have been established will be drawn on to the extent possible in establishing these target concentrations. Judgment and remedial technology design considerations will be used to best apportion the total desired carcinogenic risk reduction among the various carcinogens at the site, and among the set of exposure routes identified for each remedial alternative.

  Given these target concentrations, corresponding release rates can be back-calculated for evaluations of source control remedial alternatives. Appropriate environmental fate and transport models will be used in this effort, drawing on the modeling performed for the baseline assessment of risks to the greatest extent possible. The uncertainties associated with the use of standard fate and transport models will be considered in defining acceptable release rates for each alternative.

- Assessment of Chronic Risks Due to Non-Carcinogens - Once the carcinogenic risk levels associated with the remedial alternative have been considered, exposures to the non-carcinogenic contaminants at the site will be forward-calculated to ensure that they also will be at acceptable levels. The target concentrations or clean-up goals in the affected media will be adjusted downward to lead to acceptable non-carcinogenic exposures, if necessary. The Chronic Hazard Index will be used in this evaluation.

- Assessment of Potential Short-Term Health Effects of Remedial Alternatives - The short-term health effects associated with each remedial alternative will be considered to determine which management practices may be appropriate to implement in conjunction with each remedial alternative. Recommendations to limit the release and migration of contamination during remedial activities will be developed to limit and control short-term exposures and health-risks to acceptable levels.

2.2.4 Treatability Investigations

Treatability studies to collect data on technologies preliminarily identified during the RI, and to aid in the alternative development process, may be conducted as appropriate to provide additional information for evaluating remedial technologies. The need for treatability testing should be identified as early in the RI/FS process as possible. However, the decision to conduct these activities must be made by weighing the cost and time required to complete the investigation against the potential value of the information in resolving uncertainties associated with selection of a remedial action.

For this reason, treatability investigations have been detailed under Phase II of the RI/FS process. If warranted, the treatability investigations will be initiated under Phase II in order to prevent any delays in Phase III (Feasibility Study) scheduling which may result from treatability investigation lead times. Also, information collected during Phase I and the early stages of Phase II will be needed to support the decision on treatability testing. Treatability investigation activities should be scheduled during a time frame which will allow the information gathered by their performance to be available upon completion of Work Task 7, Development of Alternatives, which is detailed in Section 2.3.3 of this Work Plan.

Therefore, NASA would meet with the OEPA to discuss the need and suggested scope of the treatability investigations to be performed when the preliminary RI analytical results become available. Should bench-scale or pilot-scale studies be required, they will be considered an alternate phase investigation. For these reasons,

no schedule provisions are included for treatability testing in this Work Plan. The following paragraphs provide an overview of the types of treatability studies that may be used, their specific purposes, and important factors that will need to be considered when contemplating their use.

2.2.4.1 Objectives of Treatability Investigations

Treatability studies are conducted primarily to achieve the following:

- Provide sufficient data to allow treatment alternatives to be fully developed and evaluated during the detailed analysis and to support the remedial design of a selected alternative; and
- Reduce costs and performance uncertainties for treatment alternatives to acceptable levels so that a remedy can be selected.

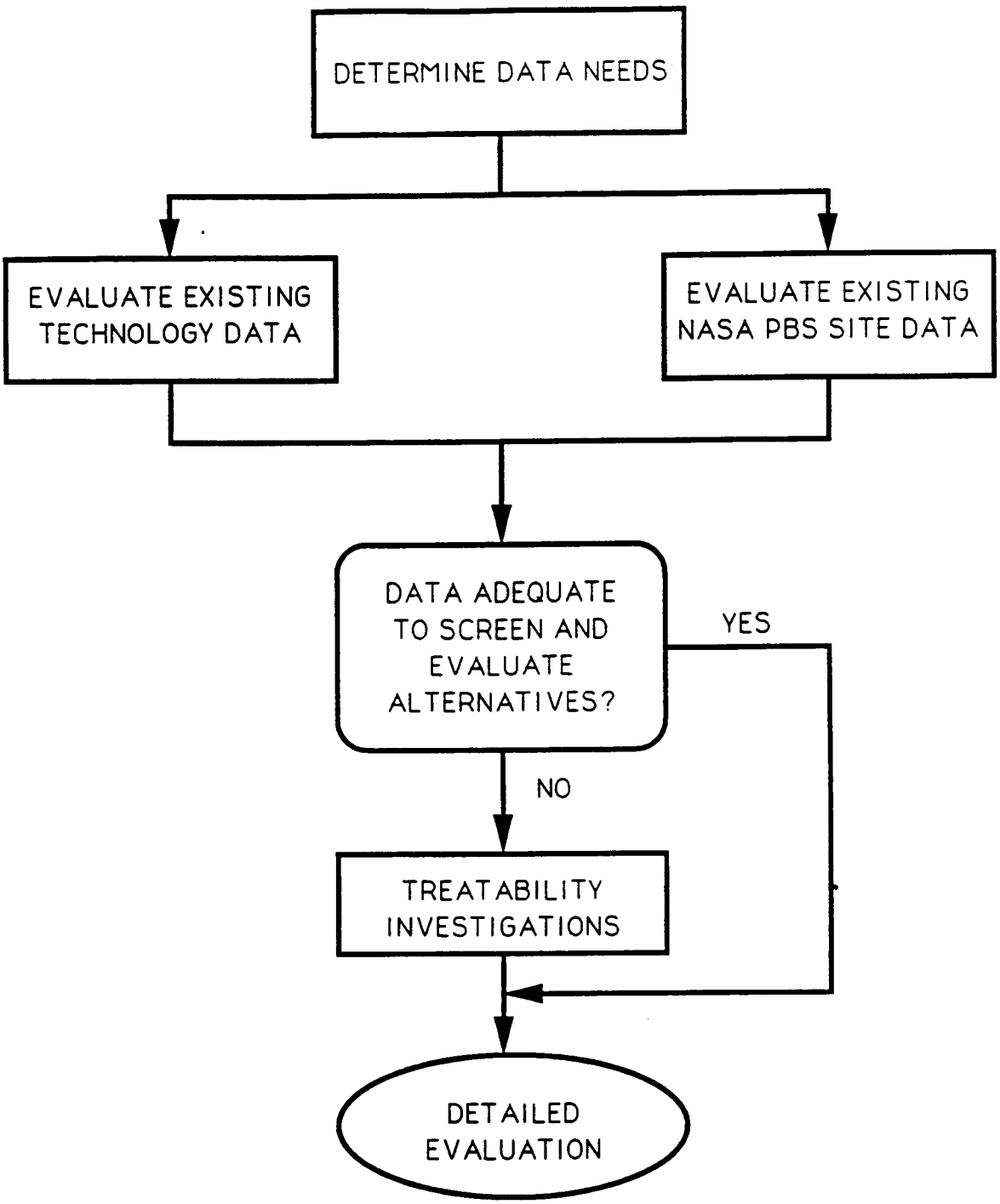
2.2.4.2 Overview of Treatability Investigations

The decision process for treatability investigations is shown conceptually in Figure 2-1 and consists of the following steps:

- Determining data needs;
- Reviewing existing data on the site and available literature on technologies to determine if existing data are sufficient to evaluate alternatives;
- Performing treatability tests, as appropriate, to determine performance, operating parameters, and relative costs of potential remedial technologies under the conditions specific to the site; and
- Evaluating the data to ensure that data quality objectives (DQOs) are met.

2.2.4.3 Determination of Data Requirements

To the extent possible, data required to assess the feasibility of technologies should be gathered during the implementation of the RI Work Plan. Because data requirements will depend on the specific treatment process and the contaminants and matrices being considered, the results of the Phase II RI will influence the types of alternatives developed and screened, which will in turn



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LEWIS RESEARCH CENTER PLUM BROOK STATION

TREATABILITY INVESTIGATIONS FLOW CHART

FIGURE 2-1

influence additional data needs. The data collected during site characterization, however, will not always be adequate for assessing the feasibility of remedial technologies, and, in fact, the need for detailed data from treatability tests may not become apparent until the initial screening of alternatives has been completed (Work Task 8, Initial Screening of Alternatives, detailed in Section 2.3.4 of this Work Plan).

A description of data requirements for selected technologies is presented in Table 2-2. The "Technology Screening Guide for Treatment of Contaminated Soils and Sludges" (USEPA guidance document, under development) summarizes data needs for a larger number of available and innovative technologies. The Superfund Innovative Technology Evaluation (SITE) program is another source to assist with the identification of data needs and to obtain performance information on innovative technologies.

Additional data needs can be identified by conducting a more exhaustive literature survey than was originally conducted when potential technologies were first being identified. The objectives of a literature survey would be to:

- Determine whether the performance of those technologies under consideration have been sufficiently documented on similar wastes considering the scale of the operation (e.g., bench, pilot, or full) and the number of times the technologies have been used;

- Gather information on relative costs, applicability, removal efficiencies, O&M requirements, and implementability of the candidate technologies; and

- Determine testing requirements for bench or pilot studies, if required.

2.2.4.4 Treatability Testing

Certain technologies have been demonstrated sufficiently so that site-specific information collected during site characterization is adequate to evaluate and cost those technologies without conducting treatability investigations. For example, a groundwater investigation usually provides sufficient information from which to size a packed tower air stripper and prepare a comparative cost estimate. Other examples of when treatability testing may not be necessary include:

TABLE 2-2
Typical Data Requirements for Selected Remediation Technologies

TECHNOLOGY	CONTAMINATED MATRIX	TYPICAL DATA REQUIREMENTS
THERMAL DESTRUCTION	SOILS	MOISTURE CONTENT HEAT VALUE CHLORINE CONTENT DESTRUCTION EFFICIENCY
	LIQUIDS	HEAT VALUE CONCENTRATION OF METALS DESTRUCTION EFFICIENCY
AIR STRIPPING	GROUNDWATER	CONCENTRATION OF VOLATILES CONCENTRATION OF NON-VOLATILES CONTAMINANT REMOVAL EFFICIENCIES
METAL HYDROXIDE PRECIPITATION	GROUNDWATER	METALS CONCENTRATION CONTAMINANT REMOVAL EFFICIENCIES SLUDGE GENERATION RATE/COMPOSITION
IN SITU VAPOR EXTRACTION	SOILS	SOIL TYPE PARTICLE SIZE DISTRIBUTION CONCENTRATION OF VOLATILES PRESENCE OF NON-VOLATILES CONTAMINANT REMOVAL EFFICIENCIES

- A developed technology is well proven on similar applications;
- Substantial experience exists with a technology employing treatment of well-documented waste materials (e.g., air stripping or carbon adsorption of groundwater containing organic compounds for which treatment has previously been proven effective); and
- Relatively low contaminant removal efficiencies are required, and data are already available.

Frequently, technologies have not been sufficiently demonstrated or characterization of the waste alone is insufficient to predict treatment performance or to estimate the size and cost of appropriate treatment units. Furthermore, some treatment processes are not sufficiently understood for performance to be predicted, even with a complete characterization of the wastes. When treatment performance is difficult to predict, an actual testing of the process may be the only means of obtaining the necessary data.

Treatability investigations performed during the RI/FS would be used to adequately evaluate a specific technology, including evaluating performance, determining process sizing, and estimating costs, in sufficient detail to support the remedial alternative selection process. Treatability testing in the RI/FS would not be used solely to develop detailed design or operating parameters that are more appropriately developed during remedial design. Treatability testing can be performed by using bench-scale or pilot-scale techniques. However, in general, treatability investigations would include the following steps:

- Preparing an appropriate work plan for the bench or pilot studies;
- Performing the bench or pilot studies;
- Evaluating data from these studies; and
- Preparing a brief report documenting the results of the testing.

2.3 Phase III: Feasibility Study

2.3.1 Work Task 5: Development of Statement of Purpose

Work Task 5 is the first task of the Corrective Actions Feasibility Study. NASA will evaluate the current status of the overall project with regard to the data collected in Phases I and II. Justifications for changes to this overall Work Plan, if necessary, will be based on the findings of the RI and baseline risk assessment. NASA will develop a site-specific Statement of Purpose for the remedial response. The Statement will identify the actual

or potential exposure pathways that will be addressed by remedial alternatives. The Statement of Purpose will be submitted, as described in Section 3.3.1 of this Work Plan, prior to continuing the remaining tasks of the Feasibility Study.

2.3.2 Work Task 6: Feasibility Study Work Plan Development

NASA will develop a Feasibility Study Work Plan that includes the detailed technical approach, described in Sections 2.3.3 through 2.3.5 below, personnel requirements, and schedules which will be submitted to OEPA for review and concurrence as described in Section 3.3.2 of this Work Plan. The various Work Tasks of the Feasibility Study will be undertaken to the extent and level of detail necessary to answer the questions at hand and progress in the identification of a suitable and effective remedial alternative. The nature and purpose of these tasks are outlined below.

2.3.3 Work Task 7: Development of Alternatives

The purpose of the Feasibility Study is to document the databases and procedures used in identifying, developing, screening, and evaluating remedial alternatives which will address the contamination which related to the former USTs. The objective of the Feasibility Study is to develop and evaluate a range of remedial alternatives that will protect public health and the environment from risks associated with this contamination.

The Feasibility Study will be performed according to the basic methodology outlined in the National Contingency Plan (NCP), with consideration of the new requirements outlined in Section 121 of the Superfund Amendments and Reauthorization Act (SARA) of 1986. USEPA has issued interim guidance on the performance of an RI/FS (U.S. EPA 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, will be used as the basis for the development of the Feasibility Study.

The FS process under SARA retains the basic approach for remedial alternative screening and evaluation outlined in the previous USEPA Feasibility Study Guidance Document (U.S. EPA, 1988). SARA Section 121 has modified the FS process to emphasize the development of remedial alternatives that meet the following conditions:

- Protect human health and environment;
- Provide permanent solutions to contamination problems and long-term effectiveness; and

- o Meet Applicable or Relevant and Appropriate Requirements (ARARs) on a federal level, or a state level if the state requirements are more stringent.

The emphasis on the development of permanent solutions is directed toward remedial actions to control the contaminant source. These remedial actions should eliminate long-term operation and maintenance at the PBS site by permanently reducing the mobility, toxicity, and/or volume of any remaining hazardous substances.

2.3.3.1 Development of Remedial Action Objectives

Remedial action objectives consist of medium-specific or operable unit (tank area)-specific goals for protecting human health and the environment. These objectives will be as specific as possible without limiting the range of alternatives that could be developed. The remedial action objectives will be based on:

- o The description of the current situation including review of existing data;
- o Information gathered during the Remedial Investigation;
- o Public health and environmental concerns in terms of exposure routes and receptors;
- o Identification of an acceptable level or range of levels for each exposure route;
- o The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) guidance governing remedial action, 40 CFR 300, Section 300.68;
- o Interim and draft guidance from USEPA; and
- o Any other applicable cleanup standards defined in SARA Section 121 or by the State.

The preliminary remedial action objectives, expressed in terms of medium of interest and target clean-up levels, will be discussed in the RI Work Plan. Preliminary clean-up objectives will be confirmed in formal consultation with the OEPA following completion of the baseline risk assessment.

2.3.3.2 Development of General Response Actions

Following the establishment of the remedial action objectives, general response actions that may be taken to achieve exposure limits specified by the remedial action objectives will be determined. General response actions are medium-specific and may include treatment, containment, excavation, disposal, institutional actions, or a combination of these. Preliminary response actions are discussed in Section 2.2.2.1 of this Work Plan, and will be summarized in the Draft and Final RI Work Plan submittal.

2.3.3.3 Identification of Volumes or Areas of Media

During the development of alternatives, an initial determination of the areas or volumes of contaminated soils and groundwater will be made. The general response actions can then be applied to these areas or volumes. The response actions or volumes may be refined once further information from the FS becomes available. The volumes or areas addressed by the alternatives will be reviewed with respect to the remedial action objectives to ensure that the alternatives can be assembled to reduce exposure to within protective levels.

2.3.3.4 Identification and Screening of Remedial Technologies and Process Options

In this step, potential media-specific treatment and disposal technologies and process options identified for the general response actions will be screened solely with respect to short-term technical implementability. During this screening step, process options and/or entire technology types may be eliminated from further consideration.

Alternatives developed from the remedial action objective may include the following:

- Source control treatment alternatives that would eliminate the need for long-term management (including monitoring);
- Treatment that reduces the toxicity, mobility, or volume of the waste;
- Containment of waste with little or no treatment; and
- No-action alternative.

2.3.3.5 Evaluation of Process Options

The evaluation of process options will incorporate considerations from three broad criteria: effectiveness, implementability, and cost. The review will place greater emphasis on effectiveness with less effort directed at implementability and cost to preserve a range of alternatives for further analysis. Whenever appropriate, innovative technologies will be carried through this phase of the screening.

The considerations for the evaluation of process options are identical to the factors identified for detailed screening which will be performed under Work Task 10, Detailed Analysis of Alternatives, discussed in Section 2.3.6 of this Work Plan. The rationale for eliminating a process option will be documented in the FS Report (See Section 2.3.6).

Effectiveness

This evaluation of specific technology processes will include the following:

- o Considerations of the potential effectiveness of process options in attaining identified contaminant goals and in handling the estimated areas or volumes;
- o Determining the effectiveness of the process options in protecting human health and the environment; and
- o Determining the reliability of the process with respect to the contaminants and conditions at the site.

Implementability

Implementability encompasses both the technical and institutional feasibility of implementing a technology process. This evaluation may include the following:

- o The ability to comply with approval from government agencies;
- o Compliance with location- and action-specific ARARs that have been established;
- o The availability of treatment, storage and disposal services, and capacity; and
- o The availability of necessary equipment and skilled workers to implement the chosen technology.

Cost Evaluation

Cost evaluation will play a very limited role in this evaluation process, since it is based on relative capital and operation and maintenance (O&M) costs, not on detailed estimates. The costs of construction and any long-term O&M costs will be based on present-worth analysis. Financial considerations during this evaluation will only be used to screen between process options relative to other process options in the same technology type. Cost factors will not be used to distinguish between treatment and non-treatment options.

2.3.3.6 Assembly of Alternatives

Following the evaluation of process options and general response actions, the process options chosen to represent the various technology types for each media type will be combined for the site as a whole. Assembly of alternatives may include remediation of different volumes and/or areas of the PBS site and one or more general response actions for each medium. General response actions will be combined to form a range of site-wide alternatives. A description of each alternative will be included in the FS Report

(See Section 2.3.6). These descriptions may include, for example, the following information:

- Location of areas to be excavated or contained;
- Approximate volumes of soil and/or groundwater to be excavated and collected;
- Approximate location of interceptor trenches, potential water hook-ups, and connections to local publicly owned treatment works (POTW); and
- Management options for the treatment residual contamination.

2.3.3.7 Alternative Definition

Before this screening phase of the FS process is initiated, statewide alternatives will have to be assembled based on media-specific protectiveness and cost-effectiveness considerations. Normally, few details of the individual process options will have been identified and no technology system sizes or performance time frames will have been characterized. In addition, interactions between media, which may influence remediation activities, will have yet to be fully addressed. At this point in the process, some details of the alternatives will be identified to form the basis for screening, evaluation, and comparison.

The following considerations will be defined and developed as they apply to each alternative:

- Extent or volume of contaminated soil or groundwater;
- Required size and configuration of on-site extraction and treatment systems or containment structures;
- Time frame in which treatment, containment, or removal goals can be achieved;
- Rates or flows of treatment systems;
- Spatial requirements for constructing treatment or containment technologies or for staging construction materials or excavated soil or waste;
- Distances to disposal sites; and
- Required permits for off-site actions and imposed limitations including action-, location-, and chemical-specific ARARs.

2.3.4 Work Task 8: Initial Screening of Alternatives

The purpose of the initial screening of alternatives is to reduce the number of alternatives that will undergo a more thorough and extensive analysis. If needed, the alternatives will be evaluated on a general basis to determine their effectiveness, implementability, and cost. Evaluations performed at this time

will be sufficiently detailed to distinguish among alternatives and build on the evaluations of process options performed earlier.

Effectiveness

The following considerations will be evaluated for each alternative:

- o Overall protectiveness of human health and the environment;
- o Reduction in toxicity, mobility, or volume; and
- o Short-term and long-term component of protectiveness.

Implementability

The evaluation will consist of the following components:

- o Technical feasibility; and
- o Administrative feasibility.

Cost

The following cost estimates (+50 percent to -30 percent) will be considered:

- o Comparative cost estimates for alternatives with relative accuracy;
- o Capital and O&M costs including costs that would be incurred over the duration of the remedial action; and
- o Present-worth analysis.

Innovative Technologies

Technologies are classified as innovative if they are fully developed but lack sufficient cost or performance data for routine use at Superfund sites. In many cases, it may not be possible to evaluate alternatives which incorporate innovative technologies on the same basis as available technologies, because insufficient data exist on innovative technologies. Innovative technologies will be carried through the screening phase if the alternative offers a potential for:

- o Better treatment performance or implementability;
- o Fewer adverse impacts than other available approaches; and
- o Lower costs.

A decision will have to be made, based on the screening evaluation, as to which alternatives should be retained for further analysis. Alternatives selected for further evaluation should preserve a range of treatment and containment technologies initially developed. The alternatives selected for further evaluation will be agreed upon by NASA and the OEPA in a formal consultation. Procedures for evaluating, defining, and screening alternatives

will be documented in the FS report (See Section 2.3.6), showing the rationale behind the selection process.

2.3.5 Work Task 9: Post-Screening Investigative Activities

NASA will re-evaluate the data collected up to this point in the FS process, and determine if supplemental field sampling and investigative activities, additional testing, or other information gathering are indicated to be necessary. Action-specific ARARs will be identified or verified, and supplemental data needs will be determined. If supplemental site characterization activities are found to be necessary, an addendum to the RI Work Plan will be developed and submitted to the OEPA for concurrence prior to implementation, as outlined in Section 3.3.3 of this Work Plan.

2.3.6 Work Task 10: Detailed Analysis of Alternatives

The detailed analysis of alternatives will provide a presentation of relevant information needed to allow the selection of a site remedy. The performance of this Task will culminate in the submittal of the Draft and Final Feasibility Report, as described in Section 3.3.4 of the Work Plan.

The OEPA will review the results of the detailed analysis of the alternatives developed under Work Task 10, and the selection of a preferred alternative. The lowest cost alternative that is technologically feasible and reliable, and which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare, and the environment will be considered the preferred alternative. The following considerations will be used as a basis for selection:

- Overall protection of human health and the environment;
- Compliance with legal requirements;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume;
- Short-term effectiveness;
- Implementability;
- Compliance with ARARs;
- State acceptance; and
- Community acceptance.
- Cost.

2.3.6.1 Refinement of Remedial Alternative Definitions

If necessary, each alternative will be defined with respect to the volumes or areas of contaminated soil, groundwater, and sediment to be addressed, the technologies to be used, and any performance requirements associated with those technologies.

2.3.6.2 Individual Analysis of Alternatives

The alternatives that remain after the preliminary evaluation will be subjected to detailed analysis. The analysis will take into account overall protection of human health and the environment, compliance with ARARs, long-term effectiveness and permanence, reduction of toxicity, mobility, or volume, short-term effectiveness, implementability, cost, state acceptance, and community acceptance. These factors are outlined in somewhat more detail below.

Overall Protection of Human Health and the Environment

A final assessment will be made to check whether each alternative that meets the requirements is protective of human health and the environment. The emphasis of this analysis will be on long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

Compliance with ARARs

Federal and state responses to the alternatives array submittal will be considered in the detailed analysis of alternatives. Each alternative will be analyzed in view of the contaminant-specific, action-specific, and location-specific requirements identified during the ARAR review.

Long-Term Effectiveness and Performance Evaluation

Long-term effectiveness addresses the results of the remedial action in terms of residual risk after response objectives have been met. The components of long-term effectiveness will be identified for each alternative as follows:

- Magnitude of remaining risk from untreated waste or treatment residuals;
- The adequacy and suitability of controls that are used to manage treatment residuals or untreated wastes; and
- The long-term reliability of management controls for providing continued protection from residuals.

Reduction of Toxicity, Mobility, or Volume through Treatment

Contaminant reduction will aim to reduce the mobility, toxicity, or volume of the contaminants. The analysis will favor treatment technologies that produce permanent solutions, such as alternative treatment technologies or resource recovery technologies.

Short-Term Effectiveness Evaluation

Short-term effectiveness includes the effectiveness of the alternatives during construction and implementation phases until remedial response objectives are met. Protective measures will be evaluated for the following areas of concern:

- Protection of surrounding community environment and site workers during construction of the alternative;
- Protection of community and environment from hazardous substances remaining after implementation of the alternative; and
- Protection of workers during operation and maintenance of the alternative.

Implementability

Implementation analysis would review the technical and administrative feasibility of the alternative and the availability of the technology.

Technical Feasibility

Technical feasibility would consider:

- Constructability of the technology;
- Relation to additional remedial action;
- Ability to monitor the effectiveness of the remedy; and
- Ease of maintenance of equipment.

Administrative Feasibility

Administrative feasibility will examine the likelihood of favorable community response and the ability of related agencies to obtain approval for site access and to coordinate activity related to the project.

System Availability

The review of system availability will indicate whether or not the necessary equipment and/or specialists are available. If the solution requires long-term operation of a treatment, storage, and disposal (TSD) service, then the review must assure that long-term capacity will be available.

Cost

The financial analysis will consider the cost associated with the following aspects of the project:

- o Capital costs associated with development and construction;
- o Operation and maintenance; and
- o Present-worth analysis.

State Acceptance

This section of the detailed evaluation will likely be limited to the analysis of formal comments made by the OEPA during previous phases of the RI/FS. Documentation in the FS report will include such details as meetings, opportunities for agency review, and transmittal of comments between NASA and the OEPA.

Community Acceptance

This section will address those features of the alternatives that the community supports, has reservations about, or opposes.

2.3.6.3 Comparative Evaluation of Acceptable Alternatives

The analysis performed for each alternative will be ranked to aid in developing a recommendation. The relative performance of each alternative will be evaluated in relation to each specific evaluation criterion. The advantages and disadvantages of each alternative relative to one another will be identified. The comparative analysis of the alternatives will include a description of the following:

- o Strengths and weaknesses of the alternatives relative to one another with respect to each of the nine principal evaluation criterion;
- o How reasonable variations of key uncertainties could change the expectations of their relative performance;
- o Differences between the alternatives measured either qualitatively or quantitatively; and
- o Substantive differences among the alternatives.

Innovative technologies will include a description of their potential advantages in cost or performance and the degree of uncertainty in their expected performance. This ranking system will provide each consideration a weight to allow a cost-benefit analysis to be performed.

2.3.6.4 Cost-Effectiveness Analysis

A cost-benefit analysis may be performed on the alternatives so that selection of an alternative can be made that provides the most cost-effective alternative with a favorable balance between protection of public health, welfare, and the environment.

2.3.6.5 Decision Analysis (Sensitivity Analysis)

A sensitivity analysis, used in conjunction with the cost-benefit analysis, may be used to compare the alternatives for selection as the preferred alternative. The variables to be considered in the analysis and the ranges of possible variability to be examined will be established on the basis of all available system cost and performance information.

2.3.7 Work Task 11: Corrective Actions Plan Development

NASA may develop a Corrective Actions Plan, as required by the implementing agency, which addresses the remediation of each of the four (4) tank areas investigated under the RI/FS. The Federal Underground Storage Tanks Regulations (40 CFR Parts 280 and 281) indicate that the results of all site characterization, exposure assessments, and evaluation of remedial alternatives are to be included in a Corrective Actions Plan. However, because the information pertaining to the required elements of the Corrective Actions Plan will have been submitted throughout the RI/FS process (See Section 3.0 of this Work Plan), a Corrective Actions Plan may not be required. Determinations relative to the performance of Work Task 11 will be made in coordination with representatives of NASA, the OEPA, and BUSTR upon submittal of the Final FS Report. If required, the Corrective Actions Plan will be submitted as described in Section 3.3.5 of this Work Plan.

3.0 PROJECT SUBMITTALS AND SCHEDULE

In accordance with OEPA guidance, NASA will submit project reports or deliverables throughout the performance of the UST Corrective Actions RI/FS. The following subsections outline the submittals to be developed and submitted by NASA under Phases I, II and III. The various elements and procedures to be followed have also been detailed. A summary of the project submittals has been included as Table 3-1.

3.1 Phase I Submittals

3.1.1 Preliminary Report

A Draft and Final Preliminary Report, which summarizes the findings of the various elements of Work Task 1 (Refer to Sections 2.1.1.1, 2.1.1.2, and 2.1.1.3), will be submitted by NASA to the OEPA Northwest District Office. All relevant studies or investigations, which were conducted previous to the performance of Work Task 1, also will be summarized and referenced. The purpose of the Preliminary Report is to provide sufficient background data to affect a somewhat comprehensive preliminary characterization of the four tank areas. Additionally, the Preliminary Report will detail the baseline data framework from which NASA will build the remainder of the RI/FS project.

3.1.2 RI Work Plan

Based on the review of available facility and site background data, and the data collected through the preliminary characterization activities of Work Task 1 (See Section 2.1.1), NASA will develop an RI Work Plan which will be implemented during Phase II of the overall UST Corrective Actions RI/FS. As part of this Task, NASA will conduct a preliminary evaluation of exposures and draw upon this evaluation and the data needs for the Feasibility Study to develop the RI Sampling and Analysis Plan (SAP). In addition, NASA will revise and modify the Phase I Health and Safety Plan (HASP), Phase I Program Management Plan, Phase I Data Collection Quality Assurance Plan, and Phase I Data Management Plan accompanying this document relative to the investigative activities to be conducted under Phase II. These revised Plans will be submitted, along with the RI/FS Sampling and Analysis Plan, as the Draft and Final RI Work Plan. NASA will submit the Draft RI Work Plan at the same time the Draft Preliminary Report (summarizing the findings of Work Task 1) is submitted, in accordance with OEPA RI/FS guidance. Upon receipt of all anticipated comments from the OEPA Northwest District Office, NASA will revise the RI Work Plan and submit it in its final format, along with the Final Preliminary Report. Upon

TABLE 3-1
Summary of Project Deliverables

PHASE I: PRELIMINARY CHARACTERIZATION	
• PRELIMINARY REPORT	• SUMMARIZES THE FINDINGS OF THE VARIOUS ELEMENTS OF WORK TASK I • SUMMARIZES AND REFERENCES ALL RELEVANT STUDIES OR INVESTIGATIONS WHICH WERE CONDUCTED PREVIOUS TO THE PERFORMANCE OF WORK TASK I • PROVIDES SUFFICIENT BACKGROUND DATA TO AFFECT A SOMEWHAT COMPREHENSIVE PRELIMINARY CHARACTERIZATION OF THE FOUR TANK AREAS • DETAILS THE BASELINE DATA FRAMEWORK FROM WHICH NASA WILL BUILD THE REMAINDER OF THE RI/FS PROJECT
• RI WORK PLAN	• INCLUDES A PRELIMINARY EVALUATION OF EXPOSURES AND DRAWS UPON THIS EVALUATION AND THE DATA NEEDS OF THE FEASIBILITY STUDY TO DEVELOP THE RI SAMPLING AND ANALYSIS PLAN • REVISES AND MODIFIES THE PHASE I HEALTH AND SAFETY PLAN (HASP), PHASE I PROGRAM MANAGEMENT PLAN, PHASE I DATA COLLECTION QUALITY ASSURANCE PLAN, AND PHASE I DATA MANAGEMENT PLAN RELATIVE TO THE INVESTIGATIVE ACTIVITIES TO BE CONDUCTED UNDER PHASE II
PHASE II: REMEDIAL INVESTIGATION	
• MONTHLY TECHNICAL PROGRESS REPORTS	• SUBMITTED DURING THE PERFORMANCE OF THE RI, AND INCLUDES IDENTIFICATION OF SITE AND ACTIVITY, STATUS OF WORK AT THE SITE AND PROGRESS TO DATE; PERCENTAGE OF COMPLETION, DATA GENERATED TO DATE, DIFFICULTIES ENCOUNTERED DURING THE REPORTING PERIOD; ACTIONS TAKEN TO RECTIFY PROBLEMS, ACTIVITIES PLANNED FOR THE FOLLOWING MONTH; AND ANY CHANGES IN PERSONNEL
• RI REPORT	• REPORTS THE ANALYSES OF THE DATA COLLECTED UNDER ALL PREVIOUS SITE INVESTIGATIONS TO ADEQUATELY DESCRIBE THE NATURE AND EXTENT OF CONTAMINATION, POTENTIAL THREAT TO HUMAN HEALTH AND THE ENVIRONMENT, AND PROVIDES A BASELINE FROM WHICH THE EVALUATION OF THE FEASIBILITY STUDY CAN BUILD • PRESENTS THE FINDINGS OF THE RI DATA AND ANALYSIS EFFORT AND BASELINE RISK ASSESSMENT
PHASE III: FEASIBILITY STUDY	
• STATEMENT OF PURPOSE	• IDENTIFIES THE ACTUAL OR POTENTIAL EXPOSURE PATHWAYS THAT WILL BE ADDRESSED BY REMEDIAL ALTERNATIVES
• FEASIBILITY STUDY WORK PLAN	• PROVIDES THE DETAILED TECHNICAL APPROACH OF THE FEASIBILITY STUDY, AS WELL AS PERSONNEL REQUIREMENTS AND SCHEDULES
• ADDENDUM TO RI WORK PLAN	• PROVIDES REVISIONS AND MODIFICATIONS TO THE RI WORK PLAN, AS NECESSARY
• FS REPORT	• PRESENTS THE FINDINGS OF THE WORK TASKS ASSOCIATED WITH THE FEASIBILITY STUDY • DETAILS THE DEVELOPMENT OF REMEDIAL ALTERNATIVES, DEFINITION OF REMEDIAL ACTION OBJECTIVES, GENERAL REMEDIAL RESPONSE ACTIONS; IDENTIFICATION OF VOLUMES OR AREAS OF MEDIA, IDENTIFICATION AND SCREENING OF TECHNOLOGY PROCESS OPTIONS, EVALUATION OF PROCESS OPTIONS; ASSEMBLY OF ALTERNATIVES AND ALTERNATIVE DEFINITION, AND INITIAL, POST-SCREENING, AND DETAILED ANALYSIS OF ALTERNATIVES
• UST CORRECTIVE ACTIONS PLAN	• DETAILS [illegible] TECHNICAL APPROACH AND ASSOCIATED PROJECT COSTS AND SCHEDULE NECESSARY TO REM[illegible]E THE CO[illegible]IATION BY EMPLOYING THE SELECTED REMEDIAL ALTERNATIVES

concurrence with the Final RI Work Plan, NASA will be able to initiate the elements of Phase II as described in this document.

3.2 Phase II Submittals

3.2.1 Progress Reports

Monthly technical progress reports will be submitted by NASA to the OEPA during the performance of the RI. For each completed subtask, NASA will submit progress reports which contain the following elements, as appropriate:

- Identification of site and activity;
- Status of work at the site and progress to date;
- Percentage of completion;
- Data generated to date;
- Difficulties encountered during the reporting period;
- Actions taken to rectify problems;
- Activities planned for the following month; and
- Any changes in personnel.

The monthly progress reports will list target and actual completion dates for each activity, including project completion, and will provide an explanation of any deviation from the milestones in the RI Work Plan schedule.

3.2.2 RI Report

NASA will analyze the data collected under all previous site investigations to adequately describe the nature and extent of contamination, potential threat to human health and the environment, and provide a baseline from which the evaluation of the feasibility study can build. The findings of the RI Data and Analysis effort and Baseline Risk Assessment will be summarized in a Draft RI Report, submitted upon the completion of Work Tasks 3 and 4, for OEPA review. The RI Report will be submitted in its final format, incorporating the comments received on the Draft RI Report.

Treatability studies may be conducted as appropriate to provide additional information for evaluating remedial technologies. If warranted, the treatability investigations will be scheduled during a time frame which will allow the information gathered by their performance to be available upon completion of Work Task 7 (See Section 2.3.3). If conducted, NASA will submit a summary report at the time the Final RI Report is submitted, under separate cover, to describe the results of the treatability investigations.

3.3 Phase III Submittals

3.3.1 Statement of Purpose

NASA will evaluate the current status of the overall project with regard to the data collected in Phases I and II. Justifications for changes to the UST Corrective Actions Work Plan, if necessary, will be based on the findings of the RI and baseline risk assessment (Work Tasks 3 and 4). NASA will develop a site-specific Statement of Purpose for the remedial response. The Statement will identify the actual or potential exposure pathways that will be addressed by remedial alternatives. The Statement of Purpose will be submitted by NASA to the OEPA for concurrence before initiating the tasks of the Feasibility Study.

3.3.2 Feasibility Study Work Plan

NASA will develop a Feasibility Study Work Plan that includes the detailed technical approach of the FS described in Sections 2.3.3 through 2.3.5. Personnel requirements, as well as schedules to perform the work, will also be detailed. The Feasibility Study Work Plan will be submitted by NASA to the OEPA for review and concurrence prior to implementation.

3.3.3 Addendum to RI Work Plan (if necessary)

NASA will submit an addendum to the RI Work Plan, as necessary, based on the results of the project completed through Work Task 8. The modified RI Work Plan will reflect the comments of the OEPA Northwest District Office prior to implementation.

3.3.4 FS Report

NASA will prepare a Draft and Final FS Report to present the findings of the work tasks associated with the feasibility study. The report will detail the FS conducted by NASA, to include:

- Development of Remedial Alternatives;
- Definition of Remedial Action Objectives;
- General Remedial Response Actions;
- Identification of Volumes or Areas of Media;
- Identification and Screening of Technology Process Options;
- Evaluation of Process Options;
- Assembly of Alternatives and Alternative Definition; and
- Initial, Post-Screening, and Detailed Analysis of Alternatives.

The FS Report will be submitted in Draft form to the OEPA Northwest District Office for review. The FS Report will thereafter be submitted in its final format, incorporating the comments received on the Draft FS Report.

3.3.5 UST Corrective Actions Plan (if required)

NASA will submit a Draft and Final Corrective Actions Plan to address the remediation of each of the four (4) tank areas. The Corrective Actions Plan will incorporate the findings of the RI/FS, and detail the technical approach, and associated project costs and schedule, necessary to remediate the contamination by employing the selected remedial alternatives. OEPA concurrence with the Draft Corrective Actions Plan will be requested prior to its submittal as a final document. As stated in Section 2.3.7, because the information pertaining to the required elements of the Corrective Actions Plan will have been submitted throughout the RI/FS process, a Corrective Actions Plan may not be required. Determinations relative to the development of a Corrective Actions Plan will be made in coordination with representatives of NASA, the OEPA, and BUSTR upon submittal of the Final FS Report.

3.4 Submission Summary

Six (6) copies of all reports will be provided by NASA for submittal to the OEPA. Four (4) of the six (6) copies of each report will be provided for submittal to the OEPA Northwest District Office, and two (2) copies will be provided for submittal to the OEPA Central District Office (as directed by the OEPA Northwest District Office).

3.5 Project Schedule

The project scheduling of the Phase I Work Tasks and submittal of project deliverables is presented in Figure 3-1. Scheduling of activities under the RI/FS format is dependent upon the timely review of project submittals by the OEPA Northwest District Office throughout the course of the project. Meetings associated with the review of project submittals are anticipated, and have been included in the project schedule.

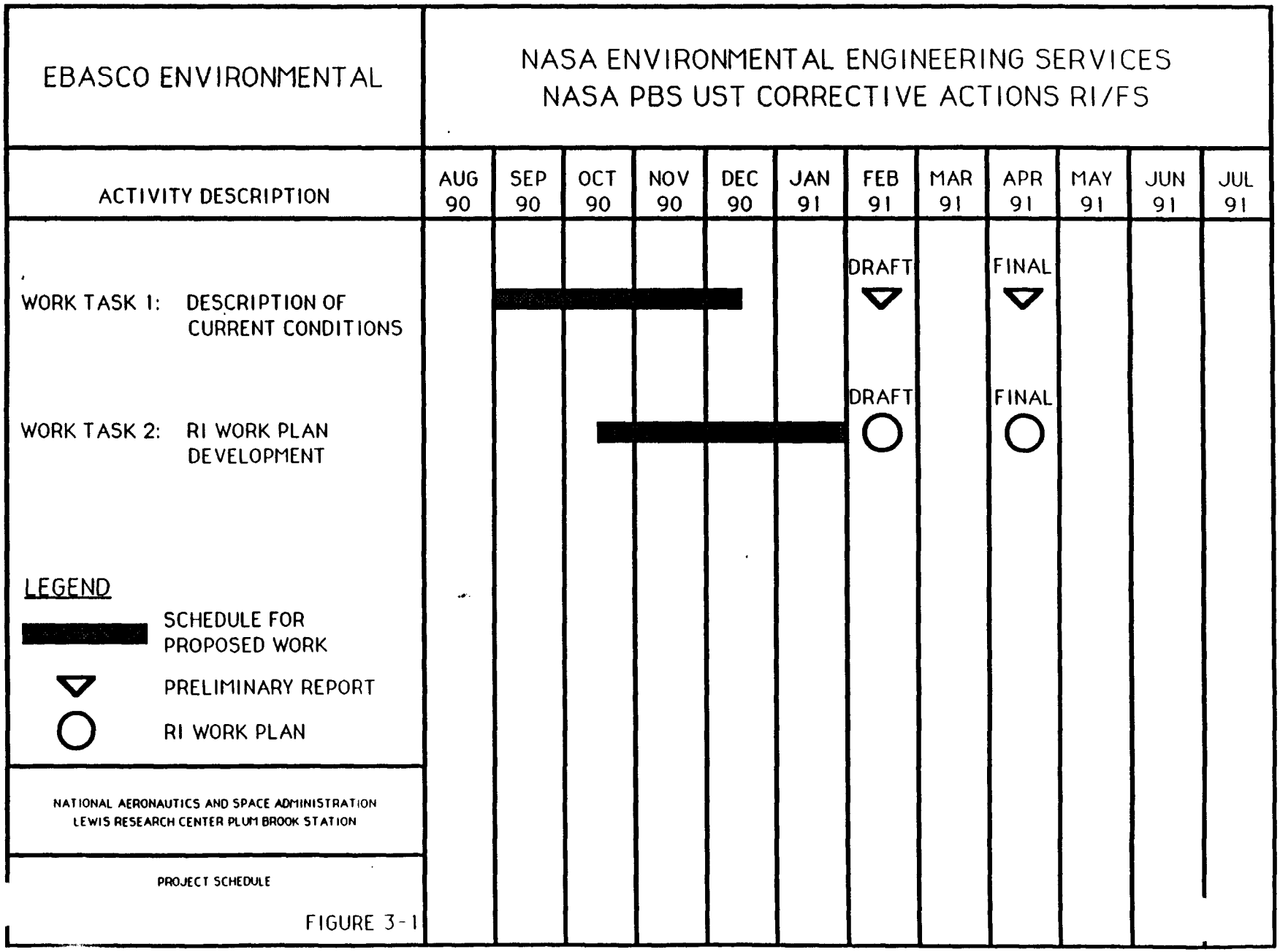

EBASCO ENVIRONMENTAL
NASA ENVIRONMENTAL ENGINEERING SERVICES
NASA PBS UST CORRECTIVE ACTIONS RI/FS
ACTIVITY DESCRIPTION
AUG 90
SEP 90
OCT 90
NOV 90
DEC 90
JAN 91
FEB 91
MAR 91
APR 91
MAY 91
JUN 91
JUL 91
WORK TASK 1: DESCRIPTION OF CURRENT CONDITIONS
DRAFT
FINAL
WORK TASK 2: RI WORK PLAN DEVELOPMENT
DRAFT
FINAL
LEGEND
SCHEDULE FOR PROPOSED WORK
PRELIMINARY REPORT
RI WORK PLAN
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LEWIS RESEARCH CENTER PLUM BROOK STATION
PROJECT SCHEDULE

FIGURE 3-1

4.0 REFERENCES

1. Ebasco Services, Inc., Site Assessment for Tanks 33, 34, and 35 at Plum Brook Station, August 1989.

2. Ebasco Services, Inc., Site Assessment for Tanks 24, 25, 28, 29, 30, 31, 32, and 39 at Plum Brook Station, December 1989.

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4. Ebasco Environmental, Soil Gas Survey at the Garage & Maintenance Area, Space Power Facility, and Pump Station, December 1989.

5. Environmental Protection Agency, Occupational Health and Safety Manual.

6. Environmental Protection Agency, Interim Standard Operating Safety Procedures.

7. National Institute of Occupational Safety and Health (NIOSH), Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, 1985.

8. National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) Section 300.68.

9. Ohio Environmental Protection Agency, Generic Statement of Work, Remedial Investigation/Feasibility Study, State Version, 1989.

10. U.S. Environmental Protection Agency, Guidance for Conducting RI/FSs Under CERCLA, 1988.

11. U.S. Environmental Protection Agency, Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Interim Final), 1989.

12. U.S. Environmental Protection Agency, Environmental Evaluation Manual (Interim Final), 1989.

13. U.S. Environmental Protection Agency, Superfund Exposure Assessment Manual, 1987.

14. U.S. Environmental Protection Agency, National Technical Guidance Study Series, 1989.

15. U.S. Environmental Protection Agency, Exposure Factors Handbook, 1989.

16. U.S. Environmental Protection Agency, CERCLA Compliance with Other Laws Manual, 1988.

17. U.S. Environmental Protection Agency, Ecological Assessment of Hazardous Waste Sites: A Field and Laboratory Reference, 1989.

18. U.S. Environmental Protection Agency, "Technology Screening Guide for Treatment of Contaminated Soils and Sludges," 1990.

19. U.S. Environmental Protection Agency, Feasibility Study Guidance Document, 1988.

20. 29 Code of Federal Regulations (CFR) Parts 1910 and 1926, 1990.

APPENDIX 1
SOIL SAMPLING ANALYTICAL RESULTS

SOIL SAMPLE CONCENTRATIONS FOR USTS
BUILDING 7121, TANK NO. 28

Soil Sample Concentrations for Sample Points at the NASA Plum Brook Station
Building 7121 (Tank 28) Underground Storage Tank Removal

Samples SS-5 through SS-7 were taken from the pit bottom, SS-8, and SS-9 were taken from the excavated soils

Concentrations of TPH are in mg/kg and volatile concentrations are in micrograms/kg

mg/kg	7121-SS-5	7121-SS-6	7121-SS-7	7121-SS-8	7121-SS-9
Total Petroleum Hydrocarbons (TPH)	67	u	u	284	192

micrograms/kg	7121-SS-5	7121-SS-6	7121-SS-7	7121-SS-8	7121-SS-9
Dichlorodiflouromethane	na	u	u	u	u
Chloromethane	u	u	u	u	u
Vinyl Chloride	u	u	u	u	u
Bromomethane	u	u	u	u	u
Chloroethane	u	u	u	10	u
Trichlorofluoromethane	7	3	13	28	13
1,1 Dichloroethene	J 8	u	u	19	44
Methylene Chloride	45	231	249	141	141
trans-1,2-Dichloroethene	na	u	u	2	J 1
1,1 Dichloroethane	47	12	20	254	1214
cis-1,2 Dichloroethene	na	60	28	32	188
2,2 Dichloropropane	na	u	u	u	u
Chloroform	na	u	u	J 1	J 1
Bromochloromethane	na	u	u	u	u
1,1,1-Trichloroethane	1100	496	203	6043	7770
1,1 Dichloropropene	u	u	u	u	u
Carbon Tetrachloride	140	93	36	431	J 1
1,2 Dichloroethane	u	3	u	4	96
Benzene	u	u	u	J 1	J 14
Trichloroethene	1000	1605	1335	3674	21142
1,2 Dichloropropane	u	u	u	u	u
Bromodichloromethane	u	u	u	u	J 1
Dibromomethane	na	u	u	u	u
Toluene	J 25	23	2	82	1101
1,1,2-Trichloroethane	J 6	4	4	15	212
1,3 Dichloropropane	na	u	u	u	u
Tetrachloroethene	160	192	157	3048	10048
Dibromochloromethane	u	u	u	u	u
1,2-Dibromomethane-EDB	na	u	u	u	u
Chlorobenzene	u	u	u	u	u
Ethylbenzene	u	3	J 1	86	411
1,1,1,2-Tetrachloroethane	na	u	u	u	u
m & p -Xylenes	J 3	4	u	55	395
o-Xylene	J 2	2	u	6	137
Styrene	u	u	u	u	u

u Undetected
J Below detection limits; Estimated Value
na Not tested

micrograms/kg	7121-SS-5	7121-SS-6	7121-SS-7	7121-SS-8	7121-SS-9
1,1,2,2-Tetrachloroethane	J 1	u	u	u	4
Isopropylbenzene	na	u	u	2	10
Bromoform	u	u	u	u	u
1,2,3- Trichloropropane	na	u	u	u	u
n-Propylbenzene	na	u	u	3	31
Bromobenzene	na	u	u	u	u
1,3,5 Trimethylbenzene	na	5	u	22	442
4-Chlorotoluene	na	u	u	u	u
2-Chlorotoluene	na	u	u	u	u
tert-Butylbenzene	na	u	u	2	40
1,2,4 Trimethylbenzene	na	6	u	15	479
sec-Butylbenzene	na	u	u	u	8
p-Isopropyltoluene	na	u	u	u	22
1,3 Dichlorobenzene	u	u	u	u	u
1,4 Dichlorobenzene	u	u	u	u	J 1
n-Butylbenzene	na	u	u	u	u
1,2 Dichlorobenzene	u	u	u	u	u
1,2-Dibromo-3-Chloropropane	na	u	u	u	u
1,2,4 Trichlorobenzene	na	u	u	u	1
Hexachlorobutadiene	na	u	u	u	u
Naphthalene	na	20	1	88	268
1,2,3 Trichlorobenzene	na	u	u	55	2
Acetone	J 28	na	na	na	na
Acrylonitrile	u	na	na	na	na
Acrolein	u	na	na	na	na
Carbon Disulfide	u	na	na	na	na
1,2-Dichloroethene (Total)	19	na	na	na	na
2-Butanone	u	na	na	na	na
Vinyl Acetate	u	na	na	na	na
trans-1,3-Dichloropropene	u	na	na	na	na
cis-1,3-Dichloropropene	u	na	na	na	na
2-Chloroethylvinylether	u	na	na	na	na
4-Methyl-2-Pentanone	u	na	na	na	na
2-Hexanone	u	na	na	na	na
u	Undetected				
J	Below detection limits; Estimated Value				
na	Not tested				

SOIL SAMPLE CONCENTRATIONS FOR USTS
BUILDING 7121, TANK NOS. 29, 30, 31

Soil Sample Concentrations for Sample Points at the NASA Plum Brook Station
Building 7121 (Tanks 29, 30, 31) Underground Storage Tank Removals

Samples SS-1 and SS-2 were taken from the pit bottom, SS-3 and SS-4 were taken from the excavated soils

Concentrations of TPH are in mg/kg and volatile concentrations are in micrograms/kg

mg/kg	7121-SS-1	7121-SS-2	7121-SS-3	7121-SS-4
Total Petroleum Hydrocarbons (TPH)	u	u	No Sample	287

micrograms/kg	7121-SS-1	7121-SS-2	7121-SS-3	7121-SS-4
Chloromethane	u	u	u	u
Bromomethane	u	u	u	u
Vinyl Chloride	J 3	u	u	u
Chloroethane	34	u	u	u
Methylene Chloride	J 4	J 4	u	J 2
Acetone	380	u	u	u
Acrylonitrile	u	u	u	u
Acrolein	u	u	u	u
Trichlorofluoromethane	J 4	J 3	u	J 3
Carbon Disulfide	J 1	u	u	J 2
1,1 Dichloroethene	J 2	u	J 6	13
1,1 Dichloroethane	70	J 3	J 8	9
1,2 Dichloroethene	J 3	u	u	u
Chloroform	u	u	u	u
1,2 Dichloroethane	J 3	u	u	u
2-Butanone	86	u	u	u
1,1,1-Trichloroethane	12	150	490	610
Carbon Tetrachloride	u	22	69	94
Vinyl Acetate	u	u	u	u
Bromodichloromethane	u	u	u	u
1,2 Dichloropropane	u	u	u	u
trans-1,3 Dichloropropane	u	u	u	u
Trichloroethene	55	200	58	110
Dibromochloromethane	u	u	u	u
1,1,2-Trichloroethane	u	u	u	J 1
Benzene	u	u	u	u
cis-1,3 Dichloropropene	u	u	u	u
2-Chloroethylvinylether	u	u	u	u
Bromoform	u	u	u	u
4-Methyl-2-Pentanone	u	u	u	u
2-Hexanone	u	u	u	J 7
Tetrachloroethene	J 2	J 6	J 5	8
1,1,2,2-Tetrachloroethane	u	u	u	u
Toluene	J 2	J 2	u	J 1
Chlorobenzene	J 1	u	u	J 1

u Undetected
J Below detection limits; Estimated Value

micrograms/kg	7121-SS-1	7121-SS-2	7121-SS-3	7121-SS-4		
Ethylbenzene	J 1	u	u	u		
Styrene	u	u	u	u		
m-Xylene	J 2	u	u	u		
o&p-Xylene	J 1	u	u	u		
1,3 Dichlorobenzene	J 2	u	u	u		
1,2 Dichlorobenzene	J 1	u	u	u		
1,4 Dichlorobenzene	J 2	u	u	u		
u	Undetected					
J	Below detection limits; Estimated Value					

SOIL SAMPLE CONCENTRATIONS FOR USTS
BUILDING 7131, TANK NO. 32

Soil Sample Concentrations for Sample Points at the NASA Plum Brook Station
Building 7131 (Tank 32) Underground Storage Tank Removals

Samples SS-1, SS-2 and SS-3 were taken from the pit bottom, SS-4 and SS-5 were taken from the excavated soil

Concentrations of TPH are in mg/kg and volatile concentrations are in micrograms/kg

mg/kg	7131-SS-1	7131-SS-2	7131-SS-3	7131-SS-4	7131-SS-5
Total Petroleum Hydrocarbons (TPH)	120	244	191	u	193

micrograms/kg	7131-SS-1	7131-SS-2	7131-SS-3	7131-SS-4	7131-SS-5
Dichlorodiflouromethane	u	u	u	u	u
Chloromethane	u	u	u	u	u
Vinyl Chloride	u	u	u	u	u
Bromomethane	u	u	u	u	u
Chloroethane	u	u	u	u	u
Trichlorofluoromethane	u	u	u	u	17
1,1 Dichloroethene	u	u	u	u	u
Methylene Chloride	7	u	7	6	70
trans-1,2-Dichloroethene	u	u	u	u	u
1,1 Dichloroethane	u	u	u	u	40
cis-1,2 Dichloroethene	u	u	u	u	u
2,2 Dichloropropane	u	u	u	u	u
Chloroform	u	u	u	u	u
Bromochloromethane	u	u	u	u	u
1,1,1-Trichloroethane	3	3	6	23	10
1,1 Dichloropropene	u	u	u	u	u
Carbon Tetrachloride	u	u	u	J 2	J 1
1,2 Dichloroethane	u	u	u	u	370
Benzene	u	u	u	u	u
Trichloroethene	372	359	606	464	728
1,2 Dichloropropane	u	u	u	u	u
Bromodichloromethane	u	u	u	u	u
Dibromomethane	u	u	u	u	u
Toluene	u	u	J 1	1	u
1,1,2-Trichloroethane	u	u	u	u	u
1,3 Dichloropropane	u	u	u	u	u
Tetrachloroethene	u	u	u	17	u
Dibromochloromethane	u	u	u	u	u
1,2-Dibromomethane-EDB	u	u	u	u	u
Chlorobenzene	u	u	u	u	u
Ethylbenzene	u	u	u	u	2
1,1,1,2-Tetrachloroethane	u	u	u	u	u
m-Xylene	u	u	u	u	2
o&p-Xylene	u	u	u	u	u
Styrene	u	u	u	u	u

u Undetected

J Below detection limits; Estimated Value

micrograms/kg	7131-SS-1	7131-SS-2	7131-SS-3	7131-SS-4	7131-SS-5
1,1,2,2-Tetrachloroethane	u	u	u	u	u
Isopropylbenzene	u	u	u	u	u
Bromoform	u	u	u	u	u
1,2,3- Trichloropropane	u	u	u	u	u
n-Propylbenzene	u	u	u	u	u
Bromobenzene	u	u	u	u	u
1,3,5-Trimethylbenzene	u	u	u	u	366
4-Chlorotoluene	u	u	u	u	u
2-Chlorotoluene	u	u	u	u	u
tert-Butylbenzene	u	u	u	u	u
1,2,4-Trimethylbenzene	u	u	u	J 1	349
sec-Butylbenzene	u	u	u	u	u
p-Isopropyltoluene	u	u	u	u	u
1,3 Dichlorobenzene	u	u	u	u	u
1,4 Dichlorobenzene	u	u	u	u	u
n-Butylbenzene	u	u	u	u	u
1,2 Dichlorobenzene	u	u	u	u	u
1,2-Dibromo-3-Chloropropane	u	u	u	u	u
1,2,4-Trichlorobenzene	u	u	u	u	u
Hexachlorobutadiene	14	u	u	u	u
Napthalene	J 4	J 3	J 1	J 1	159
1,2,3-Trichlorobenzene	18	u	u	u	u
u	Undetected				
J	Below detection limits; Estimated Value				

SOIL SAMPLE CONCENTRATIONS FOR USTS
BUILDING 7132, TANK NO. 33, 34, AND 35

Soil Sample Concentrations for Sample Points at the NASA Plum Brook Station
Building 7132 (Tanks 33, 34, 35) Underground Storage Tank Removals

All soil samples were taken from the pit bottom

Concentrations of TPH are in mg/kg and volatile concentrations (BTEX) are in micrograms/kg

mg/kg	7132-1-1	7132-1-2	7132-1-3	7132-2-1	7132-2-2	7132-2-3	7132-3-1	7132-3-2	7132-3-3
Total Petroleum Hydrocarbons (TPH)	35	341.7	48.5	616.6	56.6	503	29	186	258.8

micrograms/kg	7132-1-1	7132-1-2	7132-1-3	7132-2-1	7132-2-2	7132-2-3	7132-3-1	7132-3-2	7132-3-3
Benzene	55	320	14000	43000	3400	<2200	<140	120	<4
Toluene	18	39	8700	30000	550	2900	1100	56	<4
Ethylbenzene	20	200	3600	11000	<420	<2200	280	150	4.9
Total Xylenes	79	1100	19000	96000	5200	7600	5100	1900	12

u Undetected
J Below detection limits; Estimated Value

SOIL SAMPLE CONCENTRATIONS FOR USTS
BUILDING 8133, TANK NO. 39

Soil Sample Concentrations for Sample Points at the NASA Plum Brook Station						
Building 8133 (Tank 39) Underground Storage Tank Removal						
Samples SS-1 and SS-2 were taken from the excavated soils, sample SS-3 was taken from the pit bottom						
Concentrations of TPH are in mg/kg and volatile concentrations (BTEX) are in micrograms/kg						
mg/kg	8133-SS-1	8133-SS-2	8133-SS-3			
Total Petroleum	655	u	u			
Hydrocarbons (TPH)						
micrograms/kg	8133-SS-1	8133-SS-2	8133-SS-3			
Benzene	1400	62	J 0.19			
Toluene	4400	15	u			
Ethylbenzene	7200	103	0.77			
Total Xylenes	16000	65	0.94			
u	Undetected					
J	Below detection limits; Estimated Value					

SOIL SAMPLE CONCENTRATIONS FOR USTS
BUILDING 1411, TANK NOS. 24 AND 25

Soil Sample Concentrations for Sample Points at the NASA Plum Brook Station
Building 1411 (Tanks 24 and 25) Underground Storage Tank Removals

Samples SS-1 through SS-6 were taken from the pit bottom, SS-7, SS-8, and SS-9 were taken from the excavated soils

Concentrations of TPH are in mg/kg and volatile concentrations are in micrograms/kg

mg/kg	1411-SS-1	1411-SS-2	1411-SS-3	1411-SS-4	1411-SS-5	1411-SS-6	1411-SS-7	1411-SS-8	1411-SS-9
Total Petroleum Hydrocarbons (TPH)	244	411	2030	686	243	317	1120	93	1050

micrograms/kg	1411-SS-1	1411-SS-2	1411-SS-3	1411-SS-4	1411-SS-5	1411-SS-6	1411-SS-7	1411-SS-8	1411-SS-9
Dichlorodiflouromethane	u	u	u	u	u	na	na	u	na
Chloromethane	u	u	u	u	u	u	u	u	u
Vinyl Chloride	u	u	u	u	u	u	u	u	u
Bromomethane	u	u	u	u	u	u	u	u	u
Chloroethane	u	u	u	u	u	u	u	u	u
Trichlorofluoromethane	19	93	u	13	u	J 3	5	u	J 3
1,1 Dichloroethene	22	18	u	u	u	u	u	u	u
Methylene Chloride	12	4	3	113	164	J 3	3	8	J 4
trans-1,2-Dichloroethene	u	17	u	u	u	na	na	11	na
1,1 Dichloroethane	228	68	36	2	93	26	J 3	220	21
cis-1,2 Dichloroethene	8	362	u	u	u	na	na	195	na
2,2 Dichloropropane	u	u	u	u	u	na	na	u	na
Chloroform	u	u	u	u	u	na	na	u	na
Bromochloromethane	u	u	u	u	u	na	na	u	na
1,1,1-Trichloroethane	503	121	601	13	1254	15	6	7	27
1,1 Dichloropropene	u	u	u	u	u	u	u	u	u
Carbon Tetrachloride	100	23	119	J 1	213	u	u	u	u
1,2 Dichloroethane	u	3	u	2	u	u	u	5	u
Benzene	2	J 1	u	u	u	J 1	u	11	J 2
Trichloroethene	1087	775	313	898	1432	27	40	407	72
1,2 Dichloropropane	u	u	u	u	u	u	u	u	u
Bromodichloromethane	u	u	u	u	u	u	u	u	u

u	Undetected
J	Below detection limits; Estimated Value
na	Not tested

micrograms/kg	1411-SS-1	1411-SS-2	1411-SS-3	1411-SS-4	1411-SS-5	1411-SS-6	1411-SS-7	1411-SS-8	1411-SS-9
Dibromomethane	u	u	u	u	u	na	na	u	na
Toluene	16	9	u	2	u	u	u	J 1	8
1,1,2-Trichloroethane	u	u	11	u	u	u	u	u	u
1,3 Dichloropropane	u	u	u	u	u	na	na	u	na
Tetrachloroethene	342	16	2	70	u	u	u	u	u
Dibromochloromethane	u	u	u	u	u	u	u	u	u
1,2-Dibromomethane-EDB	u	u	u	u	u	na	na	u	na
Chlorobenzene	u	u	u	u	u	u	u	u	u
Ethylbenzene	45	25	u	1	u	u	u	16	23
1,1,1,2-Tetrachloroethane	u	u	u	u	u	na	na	u	na
m & p -Xylenes	43	25	u	J 1	u	u	J 1	u	16
o-Xylene	23	33	u	u	u	u	J 1	J 2	26
Styrene	u	u	u	u	u	u	u	u	u
1,1,2,2-Tetrachloroethane	u	u	u	u	u	u	u	u	u
Isopropylbenzene	31	8	u	u	u	na	na	11	na
Bromoform	u	u	u	u	u	u	u	u	u
1,2,3- Trichloropropane	u	u	u	u	u	na	na	u	na
n-Propylbenzene	76	23	u	u	u	na	na	21	na
Bromobenzene	u	u	u	u	u	na	na	u	na
1,3,5 Trimethylbenzene	496	328	2	8	u	na	na	43	na
4-Chlorotoluene	u	u	u	u	u	na	na	3	na
2-Chlorotoluene	u	u	u	u	u	na	na	3	na
tert-Butylbenzene	70	29	u	u	u	na	na	7	na
1,2,4 Trimethylbenzene	541	225	2	11	u	na	na	48	na
sec-Butylbenzene	37	17	u	u	u	na	na	17	na
p-Isopropyltoluene	74	55	u	u	u	na	na	34	na
1,3 Dichlorobenzene	u	u	u	u	u	u	u	u	u
1,4 Dichlorobenzene	u	u	u	u	u	u	u	u	u
n-Butylbenzene	u	u	u	u	u	na	na	u	na
1,2 Dichlorobenzene	u	8	u	u	u	u	u	u	u
1,2-Dibromo-3-Chloropropane	u	u	u	u	u	na	na	u	na
1,2,4 Trichlorobenzene	u	J 1	u	10	u	na	na	u	na
Hexachlorobutadiene	u	u	u	u	u	na	na	u	na
Naphthalene	1094	992	100	26	22	na	na	110	na
u	Undetected								
J	Below detection limits; Estimated Value								
na	Not tested								

micrograms/kg	1411-SS-1	1411-SS-2	1411-SS-3	1411-SS-4	1411-SS-5	1411-SS-6	1411-SS-7	1411-SS-8	1411-SS-9
1,2,3 Trichlorobenzene	u	3	u	u	u	na	na	40	na
Acetone	na	na	na	na	na	22	35	na	54
Acrylonitrile	na	na	na	na	na	u	u	na	u
Acrolein	na	na	na	na	na	u	u	na	u
Carbon Disulfide	na	na	na	na	na	u	u	na	J 1
1,2-Dichloroethene (Total)	na	na	na	na	na	J 3	u	na	J 3
2-Butanone	na	na	na	na	na	u	u	na	u
Vinyl Acetate	na	na	na	na	na	u	u	na	u
trans-1,3-Dichloropropene	na	na	na	na	na	u	u	na	u
cis-1,3-Dichloropropene	na	na	na	na	na	u	u	na	u
2-Chloroethylvinylether	na	na	na	na	na	u	u	na	u
4-Methyl-2-Pentanone	na	na	na	na	na	u	4	na	J 10
2-Hexanone	na	na	na	na	na	J 9	19	na	39
u	Undetected								
J	Below detection limits; Estimated Value								
na	Not tested								

SOIL SAMPLE CONCENTRATIONS FOR USTS
BUILDING 1131, TANK NOS. 21, 22, AND 23

TABLE 3

Page 1 of 2

Soil Sample Concentrations for Samples Taken at the NASA Plum Brook Station

Building 1131 (Reactor Facility) Underground Storage Tank Removals

Samples SS-1 through SS-6 were taken from the pit bottom, SS-7, SS-8, and SS-9 were taken from the excavated soils, and samples SS-10 and SS-11 were taken from the pit bottom after approximately 4 feet of additional soil was removed

Concentrations of TPH are in mg/kg and volatile concentrations are in micrograms/kg

	1131-SS-1	1131-SS-2	1131-SS-3	1131-SS-4	1131-SS-5	1131-SS-6	1131-SS-7	1131-SS-8	1131-SS-9	1131-SS-10	1131-SS-11
Total Petroleum Hydrocarbons (TPH) (mg/kg)	1980	293	190	u	3050	762	801	3570	1590	114	u
Volatile Organics (ug/kg)	**1131-SS-1**	**1131-SS-2**	**1131-SS-3**	**1131-SS-4**	**1131-SS-5**	**1131-SS-6**	**1131-SS-7**	**1131-SS-8**	**1131-SS-9**	**1131-SS-10**	**1131-SS-11**
Dichlorodiflouromethane	u	J 36	u	u	u	u	J 24	J 36	u	u	61
Chloromethane	u	u	u	u	u	u	u	u	u	u	u
Vinyl Chloride	u	u	u	u	u	u	u	u	u	u	u
Bromomethane	u	u	u	u	u	u	u	u	u	u	u
Chloroethane	u	u	u	u	u	u	u	u	u	990	105
Trichlorofluoromethane	u	J 120	u	u	u	u	J 112	u	u	u	20
1,1 Dichloroethene	u	u	u	u	u	u	u	u	u	u	u
Methylene Chloride	u	446	u	u	503	u	426	205	u	25	109
trans-1,2-Dichloroethene	u	u	u	u	u	u	u	u	u	u	17
1,1 Dichloroethane	482	4483	u	u	u	u	u	u	u	6120	673
cis-1,2 Dichloroethene	u	u	u	u	u	u	u	u	u	u	165
2,2 Dichloropropane	u	u	u	u	u	u	u	u	u	u	u
Chloroform	u	u	u	u	u	u	u	u	u	J 1	u
Bromochloromethane	u	u	u	u	u	u	u	u	u	u	u
1,1,1-Trichloroethane	197	423	891	u	u	u	u	u	J 123	u	u
1,1 Dichloropropene	u	u	u	u	u	u	u	u	u	u	u
Carbon Tetrachloride	u	u	J 91	u	u	u	u	u	u	u	u
1,2 Dichloroethane	u	u	u	u	u	u	u	u	u	178	u
Benzene	u	J 28	u	J 32	J 16	u	J 25	J 25	u	J 2	u
Trichloroethene	589	577	u	u	836	u	846	u	1019	u	997
1,2 Dichloropropane	u	u	u	u	u	u	u	u	u	u	u
Bromodichloromethane	u	u	u	J 23	u	u	u	u	u	u	u

u Undetected

J Below quantitation limits; Estimated Value

TABLE 3 Continued	Soil Sample Concentrations for Samples Taken at the NASA Plum Brook Station										
Page 2 of 2	Building 1131 (Reactor Facility) Underground Storage Tank Removals										
Volatile Organics (ug/kg)	1131-SS-1	1131-SS-2	1131-SS-3	1131-SS-4	1131-SS-5	1131-SS-6	1131-SS-7	1131-SS-8	1131-SS-9	1131-SS-10	1131-SS-11
Dibromomethane	u	u	u	u	u	u	u	u	u	u	u
Toluene	u	J 26	u	J 17	J 23	u	J 27	J 41	u	J 2	6
1,1,2-Trichloroethane	u	u	u	143	u	u	u	u	u	u	u
1,3 Dichloropropane	u	u	u	u	u	u	u	u	u	u	u
Tetrachloroethene	u	677	1043	u	u	u	u	u	u	u	u
Dibromochloromethane	u	u	u	u	u	u	u	u	u	u	u
1,2-Dibromomethane-EDB	u	u	u	u	u	u	u	u	u	u	u
Chlorobenzene	u	u	u	u	u	u	u	u	u	u	u
Ethylbenzene	311	431	u	1093	329	u	548	543	140	11	11
1,1,1,2-Tetrachloroethane	u	u	u	u	u	u	J 41	375	u	J 2	u
m & p -Xylenes	430	240	u	739	566	u	647	1115	J 38	19	4
o-Xylene	204	J 80	u	413	170	u	424	703	u	14	J 1
Styrene	u	u	u	u	u	u	u	u	u	u	u
1,1,2,2-Tetrachloroethane	u	u	u	194	u	463	231	283	u	5	12
Isopropylbenzene	J 84	u	u	u	128	u	176	380	u	10	u
Bromoform	u	u	u	u	u	u	u	u	u	u	u
1,2,3- Trichloropropane	u	u	u	u	u	u	u	u	u	9	u
n-Propylbenzene	235	J 71	u	u	289	u	369	612	u	12	u
Bromobenzene	u	u	u	u	u	u	u	u	u	u	u
1,3,5 Trimethylbenzene	1775	692	269	528	1685	166	2953	4365	178	106	u
4-Chlorotoluene	u	u	u	u	u	u	u	u	u	u	u
2-Chlorotoluene	u	u	u	u	u	u	u	u	u	u	u
tert-Butylbenzene	288	183	240	129	422	u	645	618	u	23	15
1,2,4 Trimethylbenzene	2470	1000	598	1122	2348	270	3909	4413	204	115	u
sec-Butylbenzene	290	125	J 67	u	430	u	682	858	u	11	u
p-Isopropyltoluene	639	337	u	u	806	u	1503	1854	u	27	u
1,3 Dichlorobenzene	u	u	u	u	u	u	u	u	u	J 2	u
1,4 Dichlorobenzene	u	u	u	u	u	u	u	u	u	J 2	u
n-Butylbenzene	u	u	u	u	u	u	u	u	u	u	u
1,2 Dichlorobenzene	u	u	u	u	u	u	u	J 31	u	u	u
Dibromo-3-Chloropropane	u	u	u	u	u	u	u	u	u	u	u
1,2,4 Trichlorobenzene	575	185	218	u	u	u	u	u	193	3	u
Hexachlorobutadiene	404	J 82	u	u	u	u	u	u	u	u	u
Naphthalene	4550	3070	3523	4935	6332	1743	7801	13388	1255	548	223
1,2,3 Trichlorobenzene	1025	143	490	385	J 45	178	J 115	198	u	5	6
u	Undetected										
J	Below quantitation limits; Estimated Value										

PB5003-34

Sverdrup | Sverdrup Technology, Inc.

MEMORANDUM

File: Removal

Date: March 1, 1990

To: Plum Brook Environmental Program Committee

From: Jack Ross

Subject: Radiological Analysis of Soil Removed During the Building 1131 UST Removal Project at PBRF

Hydrocarbon Contaminated Soil from the above referenced UST Project was submitted for radiological analysis on 1/12/90 to Teledyne Isotopes Laboratories in Westwood, New Jersey. Five soil samples each were collected at four elevations...near surface, -4', -8', and -12'. These 20 samples were compared to five background soil samples taken approximately 1 mile away adjacent to the east parking lot of the Engineering Building (7141).

The results of these analyses indicate that only natural background radioactivity is present in the soil removed from this project. No radiological contamination from PBRF operations was observed. A copy of this report is attached for information. To facilitate interpretation of data I have presented this information in the following data groupings.

	picacuries/gram (dry weight)	
Background Samples	Gross Alpha	Gross Beta
Minimum	10	33
Maximum	18	36
Average	12	35
No. Samples	(5)	(5)
Surface Soil		
Minimum	L.T. 4	30
Maximum	14	36
Average	11	34
No. Samples	(5)	(5)
4' Depth		
Minimum	8.4	32
Maximum	14	35
Average	11	34
No. Samples	(5)	(5)

	picacuries/gram (dry weight)	
	Gross Alpha	Gross Beta
8' Depth		
Minimum	12	32
Maximum	20	39
Average	15	34
No. Samples	(5)	(5)
12' Depth		
Minimum	9.9	33
Maximum	14	35
Average	12	34
No. Samples	(5)	(5)

cc: NASA/A. Bower
NASA/H. Pfanner
NASA/R. Kozar
NASA/W. Brown
NASA/H. McCune
NASA/R. Kanney
SVER/D. Morrison
SVER/M. Smith
SVER/D. Young

TELEDYNE ISL

REPORT OF ANALYSIS

DELIVERED FEB - 1990

RUN DATE 02/27/90

WORK ORDER NUMBER	CUSTOMER P.O. NUMBER	DATE RECEIVED	DELIVERY DATE	PAGE
4-0746	NAS3-25517	01/12/90	02/14/90	1

DON YOUNG
SVERDRUP TECHNOLOGY INC
PLUMBROOK DIVISION
6100 COLUMBUS AVE
SANDUSKY OHIO 44870

S O I L

TELEDYNE SAMPLE NUMBER	CUSTOMER'S IDENTIFICATION	STA NUM	COLLECTION-DATE START DATE	START TIME	STOP DATE	STOP TIME	NUCLIDE	ACTIVITY (PCI/GM DRY)	NUCL-UNIT-% U/M *	MID-COUNT TIME DATE	MID-COUNT TIME TIME	VOLUME - UNITS ASH-WGHT-% *	LAB.
90101	LUST A		01/OR				GR-A	9.3 +-4.8 E 00		01/25			3
							GR-B	3.5 +-0.3 E 01		01/25			3
90102	LUST B		01/OR				GR-A	1.4 +-0.6 E 01		01/25			3
							GR-B	3.3 +-0.3 E 01		01/25			3
90103	LUST C		01/OR				GR-A	1.4 +-0.6 E 01		01/25			3
							GR-B	3.4 +-0.3 E 01		01/25			3
90104	LUST D		01/OR				GR-A	L.T. 4. E 00		01/25			3
							GR-B	3.6 +-0.3 E 01		01/25			3
90105	LUST E		01/OR				GR-A	1.1 +-0.5 E 01		01/25			3
							GR-B	3.0 +-0.3 E 01		01/25			3
90106	LUST 4A		01/OR				GR-A	1.2 +-0.5 E 01		01/25			3
							GR-B	3.2 +-0.3 E 01		01/25			3
90107	LUST 4B		01/OR				GR-A	1.3 +-0.5 E 01		01/25			3
							GR-B	3.4 +-0.3 E 01		01/25			3
90108	LUST 4C		01/OR				GR-A	1.4 +-0.6 E 01		01/25			3
							GR-B	3.5 +-0.3 E 01		01/25			3
90109	LUST 4D		01/OR				GR-A	8.4 +-4.6 E 00		01/25			3
							GR-B	3.4 +-0.3 E 01		01/25			3
90110	LUST 4E		01/OR				GR-A	8.9 +-4.7 E 00		01/25			3
							GR-B	3.3 +-0.3 E 01		01/25			3

TELEDYNE ISOTOPES

REPORT OF ANALYSIS

SUB DATE 02/27/90

WORK ORDER NUMBER	CUSTOMER P.O. NUMBER	DATE RECEIVED	DELIVERY DATE	PAGE 2
4-0746	9A53-25517	01/12/90	02/14/90	

DON YOUNG
SVERDRUP TECHNOLOGY INC
PLUMBROOK DIVISION
6100 COLUMBUS AVE
SANDUSKY OHIO 44870

S O I L

TELEDYNE SAMPLE NUMBER	CUSTOMER'S IDENTIFICATION	STA NUM	COLLECTION DATE START DATE	START TIME	STOP DATE	STOP TIME	NUCLIDE	ACTIVITY (PCI/GM DRY)	NUCL-UNIT-% U/M *	MID-COUNT TIME DATE	MID-COUNT TIME TIME	VOLUME - UNITS ASH-WGHT-% *	LAB.
90111	LUST 8A		01/08				GR-A	1.2 +-0.5 E 01		01/25			3
							GR-B	3.4 +-0.3 E 01		01/25			3
90112	LUST 8B		01/08				GR-A	2.0 +-0.7 E 01		01/25			3
							GR-B	3.9 +-0.3 E 01		01/25			3
90113	LUST 8C		01/08				GR-A	1.6 +-0.6 E 01		01/25			3
							GR-B	3.4 +-0.3 E 01		01/25			3
90114	LUST 8D		01/08				GR-A	1.2 +-0.5 E 01		01/25			3
							GR-B	3.3 +-0.3 E 01		01/25			3
90115	LUST 8E		01/08				GR-A	1.5 +-0.6 E 01		01/25			3
							GR-B	3.2 +-0.3 E 01		01/25			3
90116	LUST 12A		01/08				GR-A	1.1 +-0.5 E 01		02/19			3
							GR-B	3.5 +-0.3 E 01		02/19			3
90117	LUST 12B		01/08				GR-A	1.1 +-0.5 E 01		02/19			3
							GR-B	3.5 +-0.3 E 01		02/19			3
90118	LUST 12C		01/08				GR-A	1.4 +-0.6 E 01		02/19			3
							GR-B	3.4 +-0.3 E 01		02/19			3
90119	LUST 12D		01/08				GR-A	1.4 +-0.6 E 01		02/19			3
							GR-B	3.3 +-0.3 E 01		02/19			3
90120	LUST 12E		01/08				GR-A	9.9 +-5.1 E 00		02/19			3
							GR-B	3.5 +-0.3 E 01		02/19			3

TELEDYNE ISO

REPORT OF ANALYSIS

RUN DATE 02/27/90

WORK ORDER NUMBER	CUSTOMER P.O. NUMBER	DATE RECEIVED	DELIVERY DATE	PAGE 3
4-0766	NAS3-25517	01/12/90	02/14/90	

DON YOUNG
SVERDRUP TECHNOLOGY INC
PLUMBROOK DIVISION
6100 COLUMBUS AVE
SANDUSKY OHIO 44870

S O I L

TELEDYNE SAMPLE NUMBER	CUSTOMER'S IDENTIFICATION	STA NUM	COLLECTION-DATE START DATE	TIME	STOP DATE	TIME	NUCLIDE	ACTIVITY (PCI/GM DRY)	NUCL-UNIT-% U/M *	MID-COUNT TIME DATE	TIME	VOLUME - UNITS ASH-WGHT-% *	LAB.
90121	LUST SURF BKGD A		01/OR				GR-A	1.0 +-0.5 E 01		02/19			3
							GR-B	3.5 +-0.3 E 01		02/19			3
90122	LUST SURF BKGD B		01/OR				GR-A	1.8 +-0.7 E 01		02/19			3
							GR-B	3.5 +-0.3 E 01		02/19			3
90123	LUST SURF BKGD C		01/OR				GR-A	1.0 +-0.5 E 01		02/19			3
							GR-B	3.3 +-0.3 E 01		02/19			3
90124	LUST SURF BKGD D		01/OR				GR-A	1.3 +-0.6 E 01		02/19			3
							GR-B	3.5 +-0.3 E 01		02/19			3
90125	LUST SURF BKGD E		01/OR				GR-A	1.1 +-0.6 E 01		02/19			3
							GR-B	3.6 +-0.3 E 01		02/19			3

LAST PAGE OF REPORT

Bcampbell
APPROVED BY B. CAMPBELL 02/27/90

SEND 1 COPIES TO SV100S DON YOUNG

2 - GAS LAB. 3 - RADIO CHEMISTRY LAB. 4 - GE(LI) GAMMA SPEC LAB. 5 - TRITIUM GAS/L.S. LAB. 6 - ALPHA SPEC LAB.

PB5003-41

EBASCO ENVIRONMENTAL
A Division of EBASCO SERVICES INCORPORATED

EBASCO

5000 Bradenton Avenue, Suite 200, Dublin, OH 43017, (614) 761-2004, Fax (614) 761-2116

January 31, 1991

Mr. Ronald Zurawski, P.E.
Project Manager
NASA Lewis Research Center
Mail Stop 501-8, Building 501
21000 Brookpark Road
Cleveland, Ohio 44135

SUBJECT: Transmittal of Copies of the Final Report on the Site Assessment Performed for Former Underground Storage Tank Numbers 7132-1, 7132-2 and 7132-3 at the Plum Brook Station

Dear Ron:

Attached are six copies of the Final Report on the site assessment performed for the three former underground storage tanks at the Garage and Maintenance Area at the Plum Brook Station that you requested in our recent telephone conversation.

As always, give me a call if you have any questions about this report or if I can be of any further assistance.

Sincerely,

Ron Marnicio

Ronald J. Marnicio, Ph.D., P.E.
Principal Engineer, Columbus Operations

RJM:ls

Attachments

SITE ASSESSMENT FOR TANKS #7132-1, #7132-2 AND #7132-3

AT PLUM BROOK STATION

FOR THE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LEWIS RESEARCH CENTER

PLUM BROOK STATION
SANDUSKY, OHIO

FINAL REPORT

DECEMBER 1989

EBASCO SERVICES INC.
255 BRADENTON AVENUE
DUBLIN, OHIO 43017

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APPENDICES

Appendix A - Laboratory Results of the Initial Site Investigation

Appendix B - Laboratory Results of the Groundwater Investigation

Appendix C - Laboratory Results of the Excavated Soils Investigation

1.0 Introduction

On July 5, 1989, the permanent closure-by-removal of three 9,000 gallon steel underground storage tanks was performed at the NASA Plum Brook Station Garage and Maintenance Area (Building No. 7132). These three tanks (#7132-1, #7132-2 and #7132-3) contained petroleum fuels. Gasoline was stored in Tanks #7132-1 and #7132-2 and diesel fuel was stored in Tank #7132-3. All three tanks were installed in 1942. Tank #7132-2 was in service until the week prior to removal. Tanks #7132-1 and #7132-3 had been taken out of service earlier due to suspected leakage. The tanks were removed in order to comply with a notice from the State Fire Marshal's Office.

2.0 Site Assessment

During tank removal, a site assessment of the area was performed. This assessment included a visual site inspection, soil and water sampling, and inspection of the tanks after removal. The contents of this site assessment are based on guidelines obtained from the Office of the State Fire Marshall, Bureau of Underground Storage Tank Regulation (BUSTR).

After obtaining the results from the first sampling event, it was decided that further investigation was necessary. In order to more fully assess the extent of contamination of the groundwater and soils at the site, four groundwater monitoring wells were installed. Undisturbed soil samples were collected during borehole construction.

2.1 Visual Inspection

The three tanks were located in a grassy area near Building No. 7132, which is off Maintenance Road at the NASA Plum Brook Station. The tanks were located in a common pit just west of a large paved area. There was no evidence of spillage in the grass, and evidence of only minor spillage at the Pump Island and on the surrounding asphalt.

After the tanks were removed, they were inspected by John Graves, of the Inspection Division of the State Fire Marshal's Office. Several pits from tank corrosion were noted on each tank. Tank #7132-3 had a hole in it at the seam at the top of the vent end of the tank. A dark area with a sheen was noted in the soil about five feet west of the fill end of Tank #7132-1. A sample was taken in this area and sent to the laboratory for analysis. A large portion of the asphalt coating of Tank #7132-3 separated from the tank and remained in the pit when the tank was removed. It was speculated that spillage from the top of the tank had seeped between the steel and the asphalt coating, causing them to separate. Several corrosion pits were noted on this tank. Mr. Graves noted that the pits found on the tank were probably caused by the tank being placed on rocks instead of

sand.

2.2 Sampling and Analysis of Tank Pit Soils

The purpose of collecting and analyzing these soils was twofold. First, representative samples were collected from the Tank Pit bottom to determine whether the soils were contaminated or clean. These samples would be used to decide if more soils must be removed from the pit. Secondly, samples were taken from the soil removed from the pit and piled nearby in order to determine the levels of contamination present. The results of these analyses would be used to determine if these soils would have to be considered a solid or hazardous waste, and how much soil would be classified as each type. According to Greg White of the State Fire Marshal's Office, the clean-up goals that would apply were "non-detectable" levels or local background concentrations for total petroleum hydrocarbons (TPH) and benzene, toluene, ethylbenzene, and xylene (BTEX).

After tank removal, nine soil samples were collected from the Tank Pit bottom for laboratory analysis. These samples were analyzed for BTEX and TPH. These samples were collected with a stainless steel soil coring device, manufactured by Art's Manufacturing and Supply. The soil samples were placed in clean glass sample jars, labeled, and placed in a cooler on ice (at approximately 4° C) for storage and shipment to the laboratory. The soil corer was washed in a mild solution of laboratory grade detergent and distilled water, then rinsed with distilled water, between each sample.

Samples were taken on July 5, 1989 from the bottom of the Tank Pit near the ends of each tank and in areas where apparent leakage or contamination occurred (See Figure 1). A sample was not collected at the vent end of Tank #7132-1, because the wall of the excavation collapsed before a sample could be collected. The initial nine samples were delivered to the Burgess and Niple Laboratory in Columbus, Ohio, on the morning of July 6, 1989.

A week later, a small sample of soil and water was collected from the east end of the pit

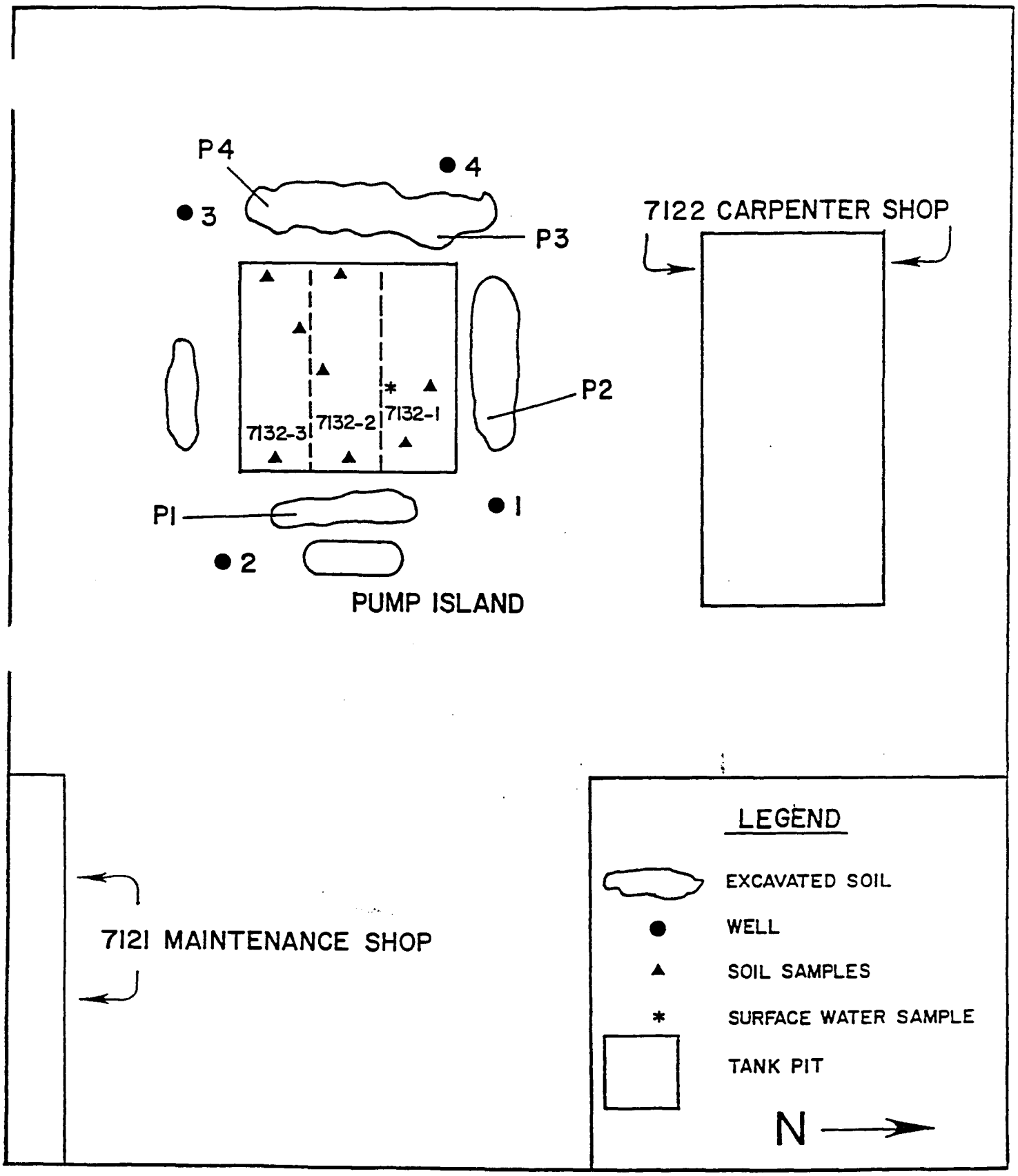

Figure 1: Site Location Map

where a rust colored seep was observed. A sample of the soils under the Pump Island also was collected. These samples were packed and stored, as stated above, and transported to the Burgess and Niple Laboratory.

Samples taken from the excavated soil piled around the Tank Pit were analyzed for BTEX, TPH, EP Toxicity for Lead, and Flash Point. These samples were collected with a stainless steel spoon, and placed in clean glass sample jars. The jars were labeled and placed in coolers, as stated above. These samples were shipped overnight to the Hittman Ebasco Laboratory in Columbia, Maryland.

Additional soil samples were taken during borehole installation. Lake Drilling Company of Cleveland, Ohio, drilled the boreholes, collected the soil samples, and installed the groundwater monitoring wells. All drilling, sampling and well installation activities were supervised by an Ebasco hydrogeologist. All wells were installed to Ebasco specifications and were approved by NASA prior to installation.

Borehole installation was accomplished using a CME 75 drill rig, with 4.25 inch I.D. hollow stem augers. Formation samples were taken by a 2.0 foot x 1.5 inch O.D. split spoon which was driven ahead of the lead auger flight by a 140 lb. hammer. A record of hammer blows per six inch interval was kept each time the split spoon was used.

Continuous samples were taken at each borehole, so that the soils making up the capillary fringe and the top of the aquifer were screened and sampled. All formation samples were screened for the presence of total VOCs using an HNu photo-ionization detector (PID) with an 11.7 eV lamp. The HNu readings were recorded in the field log.

Formation samples were described in the field by an Ebasco hydrogeologist. The Burmister (1951) system of soil classification was used to describe sample texture and grain size. The samples were placed in clean, labeled jars and will be retained by Ebasco for 60 days. The following notations were made in the field book for each sample:

1) Sample location/number;

2) Sample depth;
3) Soil recovery;
4) Soil type;
5) Color;
6) Gross petrology;
7) Moisture content;
8) Bedding or structure (if present);
9) Odor (if any);
10) Organic content/contamination; and
11) Advance rate/blow count.

The drill rig and all drilling and sampling equipment were decontaminated by a high pressure, high temperature power washer prior to commencement of work at the first borehole, and between successive boreholes. The split spoons were decontaminated between samples to prevent cross contamination by washing with a mild solution of laboratory grade detergent and distilled water. After washing, the split spoons were rinsed with distilled water.

2.3 Surface Water Sampling

One water sample was collected during the initial site assessment. Excavation of Tank #7132-1 began on June 28th (according to the original schedule), and stopped shortly thereafter. The small excavation was left open until July 5, and it collected rain water over the weekend (July 1 to July 4). When the tank was further excavated and removed on July 5, this water flowed into the pit bottom. There was no hydrocarbon sheen evident on the surface of the water at the time of tank removal. However, some groundwater seepage into the pit was observed near Tank #7132-1. This seepage zone was located near the northeast corner of the excavation, about eight and a half feet below land surface (8.5' bls). Because groundwater was evident near the bottom of the excavation, a sample was collected for analysis. The water was collected directly into the sample jar, and placed on ice in the cooler. This sample was analyzed for TPH and BTEX.

On July 12, two additional water samples were taken from the Tank Pit. There was a hydrocarbon sheen on the water surface at the time of sample collection. These water samples were stored, as noted above, and then transported to the Burgess and Niple Laboratory.

2.4 Monitoring Well Construction

The monitoring wells were constructed using two inch I.D. seamless, threaded, flush-joint Type-1 polyvinyl chloride (PVC) screen and riser. The screen in each well consists of a single ten foot length of PVC with 0.01 inch slots. The screens and riser were decontaminated prior to installation using a high pressure hot water power washer.

The annulus around the screened intervals was packed with Ohio No. 4 washed quartz sand (0.04-0.08 inch diameter) to a minimum distance of one foot above the top of the screen. A one and a half foot thick bentonite seal, consisting of 3/8" bentonite pellets, was placed above the sand pack. The pellets were allowed to hydrate prior to grouting the annular space, in order to minimize the possibility of grout contamination occurring within the well.

A neat cement grout was placed into the annular space above the bentonite seal up to the surface of the ground. A flush mount road box with a lockable lid was installed within the cement.

2.5 Groundwater Sampling

The primary objective of this sampling program was to obtain samples that were representative of existing environmental conditions at the site. Prior to the sampling event, Ebasco personnel ensured that all proper field procedures were followed, all available site information was reviewed, and all arrangements with the analytical lab had been made. In addition, each piece of field equipment was inspected to ensure that it was

in proper working order.

The groundwater samples were analyzed for BTEX and TPH. The clean-up standards given by the State Fire Marshal's Office were the same as those for soils: "non-detectable" levels or local background concentrations. Field bianks also were analyzed for the same parameters as part of the Ebasco QA/QC procedures.

The static water level and depth of each well were determined using an electronic water level gauge. Well volumes were calculated, and the wells were prepared for purging and sampling. All measurements were taken to an established measuring point that has been surveyed and marked on the well casing. All measurements were recorded to plus or minus 0.01 foot.

Decontamination of the water level measurement equipment included:

1) Removal of all sediment, etc., from the entire length of cable required to determine depth of well with a lint-free paper towel while the cable was rewound; and
2) Thorough rinsing of all exposed cable and the probe with generous amounts of distilled water.

At least three well volumes were evacuated from each of these wells before sample collection. After purging each well, a groundwater sample was collected. General handling procedures for sampling included the following:

- Bail ropes were placed into plastic buckets lined with new garbage bags while the wells were purged and sampled. The bails were thoroughly cleaned and decontaminated prior to purging and sampling the first well, and between the purging and sampling of subsequent wells;

- Sample bottles were filled directly from the sampling device with a minimal amount

of air contact and without allowing the sampling equipment or personnel to contact the inside of the bottles;

- Bottle caps were carefully removed so that the inside of the cap was not touched. Caps were not placed on the ground;

- All sample bottles were placed into a cooler with ice until shipment. Samples were shipped to the analytical laboratory on the following day. Sample temperature was maintained as close to 4° C as possible during all phases of sample handling and shipment; and

- Descriptions of sample appearance were recorded in the field book. Characteristics such as color, odor, clarity, incomplete sampling, etc., were documented.

After collection of the sample, the bottles were capped and wiped clean before being placed into the shuttle. Full chain-of-custody documentation was utilized during all phases of sample collection, handling and shipment.

2.6 Air Monitoring

An HNu photo-ionization detector was used on-site to monitor both ambient conditions and the soil removed from the Tank Pit. Ambient air concentrations ranged from 0.0 ppm (upwind) to ~15 ppm (downwind). The volatile concentrations encountered in the air were higher during ventilation of the two gasoline tanks (#7132-1 and #7132-2). Concentrations of volatile organics given off by the excavated soils ranged from 0.0 ppm to 10.0 ppm. Most soils did not show any volatile organic concentrations based on the HNu readings. The HNu was not used to screen the samples that were sent to the laboratory.

3.0 Data Analysis

Results of the laboratory analyses are presented in the three following sections. Each section represents a different portion of the investigation. The first section addresses the soil and water samples from the Tank Pit and Pump Island. The second section deals with soil samples collected from borehole installation and water samples collected from the wells completed in those boreholes. The third section contains results of soils analyses of the soils excavated from the Tank Pit and stored adjacent to the pit. Laboratory reporting sheets are contained in Appendices A, B and C. In Appendices B and C, the sample ID numbers consist of a ten digit alpha-numeric string (e.g., PBS-SS-P3-016). The first three letters of each sample ID number are "PBS" for Plum Brook Station. The second grouping of letters defines type of sample: SS = soil sample, GW = groundwater. The third grouping indicates that the sample is from a numbered well (01 = Well #1; 02 = Well #2, etc.) or from a pile of excavated soil (P1, P2, P3 or P4). The last grouping is the sequential number of the sample.

3.1 Results from the Initial Sampling of the Tank Pit and Pump Island

The laboratory results of the initial sampling event (Refer to Appendix A) show that petroleum contamination existed in the soil surrounding the tanks and in the water in the pit. The levels of total petroleum hydrocarbons varied from 29 mg/kg at the vent end of the diesel tank (#7132-3) to 616.5 mg/kg at the vent end of the middle tank (#7132-2). Benzene concentrations ranged from <4 ug/kg at Tank #7132-3 to 43,000 ug/kg at the vent end of Tank #7132-2. Toluene ranged from <4 ug/kg (Tank #7132-3) to 30,000 ug/kg (Tank #7132-2). Ethylbenzene concentrations ranged in value from 4.9 ug/kg (Tank #7132-3) to 11,000 ug/kg (Tank #7132-2). Xylene values ranged from 12 ug/kg (also Tank #7132-3) to 96,000 ug/kg (also at Tank #7132-2).

The analyses of the water that had collected in the Tank Pit (taken 7/12/89) showed that the BTEX constituents in the water were not detected: <2 ug/l for each constituent. The results of the total petroleum hydrocarbon analyses showed some contamination, with a

TPH concentration of 56.2 mg/l.

The results of the analyses of the soil taken from beneath the Pump Island show very high concentrations of petroleum products, with 2,800 ug/kg, 54,000 ug/kg, 47,000 ug/kg, and 400,000 ug/kg of the BTEX compounds, respectively, and a value of 2,817 mg/kg for TPH. These values are not surprising, considering the pump was found to be leaking, and that the soils were capped with asphalt, which would not allow out-gassing of the lighter petroleum hydrocarbons from the soils.

3.2 Soil and Groundwater Results From Well and Groundwater Sampling

Results of the analyses of the soils collected during borehole construction (Refer to Appendix B) indicated elevated levels of BTEX in soils from Boreholes 1 and 3. The other sample results showed only slight elevations or not-detected (detection limits indicated with a "U" next to the number).

The laboratory analyses showed only very slightly elevated levels of total petroleum hydrocarbons. The range for TPH was <38 mg/l to 51 mg/l. A value of 38 mg/l at Borehole 4 and a value of 51 mg/l at Borehole 2 were the only values above detection limit among the eight samples analyzed.

Analyses of the groundwater from the four wells installed around the Tank Pit (Refer to Appendix B) showed elevated levels of BTEX in Well #1:

Benzene	58. ug/l
Ethylbenzene	0.4 ug/l
Toluene	1.6 ug/l
Xylene	6.1 ug/l

All other groundwater showed no elevated levels of the BTEX constituents, with all concentrations being below the detection limits. The results for TPH in groundwater showed <1.0 mg/l for all samples.

3.2.1 Groundwater Flow Direction

After obtaining surveyed locations and elevations of the four wells, a water table contour map with groundwater flow direction was made, based on water level data taken on August 15, 1989.

The resultant map (See Figure 2) shows that Well #2 is the most up-gradient well, and that Well #4 is the most down-gradient well. Local groundwater flow in the area of the Tank Pit is to the WNW. Thus, one would expect Well #4 to be the most impacted well if gross contamination at the site had occurred.

3.3 Excavated Soil

The soils sampled in this portion of the assessment were analyzed for BTEX, TPH, EP Toxicity for Lead, and Flash Point. Appendix C contains the results of these analyses.

BTEX analyses from P1, P2, P3 and P4 showed only slightly elevated levels of these constituents. The values for benzene ranged from 0.22 ug/kg to 1.3 ug/kg. Values for ethylbenzene ranged from 0.22 ug/kg to 10 ug/kg. Values for toluene ranged from 0.22 ug/kg to 0.47 ug/kg. Total xylene concentrations ranged from 0.22 ug/kg to 5.1 ug/kg. None of these values indicated gross contamination by petroleum products.

Total petroleum hydrocarbon analyses results showed elevated levels of TPH at P1, P2 and P3. These values ranged from 76 ug/kg to 83 ug/kg, and were slightly higher than the TPH values found in the undisturbed soils collected from the four boreholes. Results at P4 showed unusually high concentrations of TPH at 621 mg/kg.

Acceptable levels of both flash point (ignitability) and lead content were measured: no flash <200° F and lead concentration <500 ug/l in the leachate for each of the four samples.

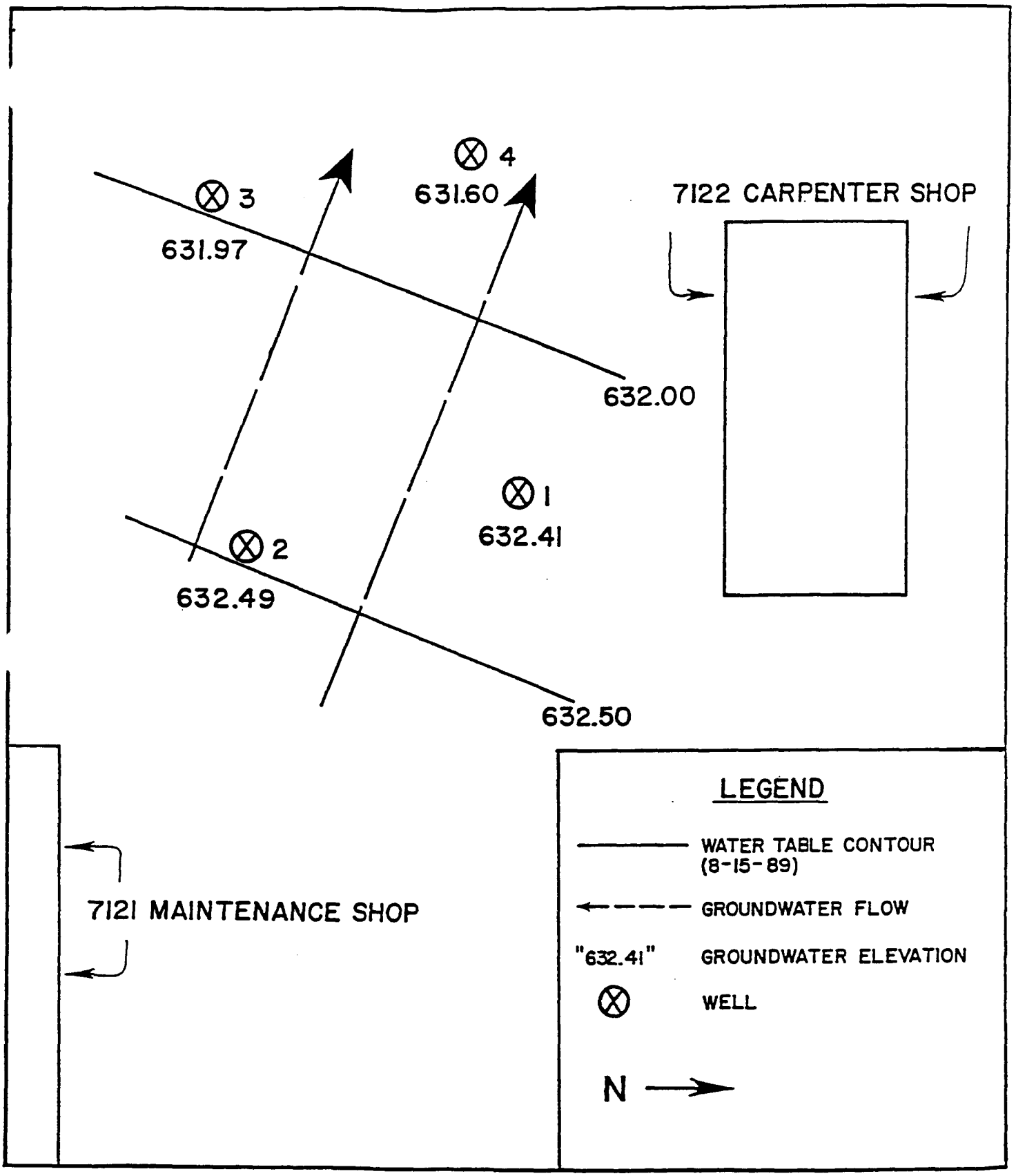

Figure 2: Water Table Map with Ground Water Flow Direction

4.0 Discussion and Recommendations

The visual observation during the assessment, combined with the results of the field screening with the HNu and the laboratory analyses, showed that some leakage of petroleum products has occurred at this site. The petroleum products were more evident in the Tank Pit soils and in the soils from the borehole installation than they were in groundwater. In fact, only Well #1 showed elevated concentrations of petroleum products in the groundwater, with elevated BTEX concentrations. Of these constituents, only benzene exceeded the maximum contaminant level (MCL) set forth as a part of the Safe Drinking Water Act (SDWA). All other constituents were well below the MCLs in Well #1 and in the other wells.

The soils analyses from the boreholes showed that some total petroleum hydrocarbons are present in the soils. Because of the geology of the site, which includes petroliferous shales and limestones of the Silurian and Devonian periods, there may be measurable background concentrations of petroleum hydrocarbons in this area. The depositional environment of the underlying bedrock allowed for the formation and "storage" of crude petroleum in the rock formations. These naturally occurring petroleum hydrocarbons may explain why there are TPH levels of 38 to 51 mg/kg in Boreholes 1, 2, and 3, while showing no trace or low levels of fuel additives (BTEX).

Because some soil contamination in the pit is evident, and because the water which has collected in the pit is somewhat contaminated, it is recommended that the water in the pit be pumped out, treated and discharged into the sanitary sewer at the site, or pumped out and transported to a treatment/disposal facility. Once the water has been removed, the remaining contaminated soils in the pit should be removed and, with the soil previously excavated, be transported for disposal at a licensed sanitary landfill.

Once the contaminated soils in the pit have been removed, another set of soil samples must be collected and analyzed to confirm clean closure. Once the remaining soils are shown to be clean, the pit should be backfilled with clean soil.

Also, soils from the area beneath and around the Pump Island must be excavated and disposed. These soils may require treatment, due to the high concentrations of petroleum products found. As in the case of the Tank Pit, re-sampling the soils beneath the Pump Island will be required to confirm clean closure. The removal/sampling procedure will have to be repeated until acceptable levels of BTEX and TPH are obtained.

It is apparent from groundwater sampling that there has been very localized impact on groundwater. Only groundwater from Well #1 showed any constituent above the minimum contaminant levels (MCLs) established by the Safe Drinking Water Act. Benzene was measured at 58 ug/l, while the MCL for benzene is 5 ug/l.

After determining groundwater flow directions, it is clear that Well #1 was most likely contaminated by leakage and spillage from the Pump Island. Well #1 is located directly down-gradient from the Pump Island

Because there is some indication of groundwater impact, and because a single grab sample does not adequately define groundwater quality, it is strongly recommended that monthly groundwater sampling be conducted over a 4 month period, and that quarterly sampling be conducted for one year thereafter. This sampling program will provide the necessary data to determine whether the local groundwater quality improves over time.

In summary, the following actions are recommended:

1) Remove, treat and dispose of the water in the Tank Pit;
2) Remove remaining contaminated soils from the pit and from the Pump Island;
3) Dispose of all contaminated soils;
4) Re-sample the soils in the bottom of the Tank Pit and below the Pump Island;
5) When clean closure is confirmed, fill the Tank Pit and Pump Island pit with clean material; and
6) Monitor groundwater monthly for 4 months, then quarterly for a year.

APPENDIX A

LABORATORY RESULTS OF THE INITIAL SITE INVESTIGATION

Burgess & Niple, Limited
Engineers and Architects
5085 Reed Road • Columbus, OH 43220 • (614) 459-2050
Columbus Fax. (614) 451-1385

b&n 1912

LABORATORY ANALYSIS REPORT

WATER LAB APPROVAL #4030
BACTERIA LAB APPROVAL #639

EBASCO SERVICES, INC.
255 BRADENTON AVENUE
SUITE 150
DUBLIN, OH 43017-2546

JULY 17, 1989

PROJECT NAME:	BLANKET NUMBER LAB	DATE COLLECTED:	7/ 5/89
PROJECT NUMBER:	1800	DATE RECEIVED:	7/ 6/89
SAMPLE NUMBER:	5035	DATE COMPLETED:	7/17/89
SAMPLE DESCRIPTION:	EBASCO 7132-3 DIESEL		

BTEX		*SEE REMARK
TOTAL PETROLEUM HYDROCARBONS	258.8	MG/KG

REMARKS:

*BENZENE: <4 UG/KG
*TOLUENE: <4 UG/KG
*ETHYL BENZENE: 4.9 UG/KG
*XYLENE: 12 UG/KG
RESULTS WERE CALLED TO STEVE WILLIAMS 7-13-89 AT 2:00 PM
MG/KG RESULTS ARE REPORTED ON A WET WEIGHT BASIS

PLEASE NOTE:
We provide many analyses other than those noted on this report.
We would welcome any inquiry into expanded services.

Burgess & Niple, Limited
Engineers and Architects
5085 Reed Road • Columbus, OH 43220 • (614) 459-2050
Columbus Fax. (614) 451-1385

b&n 1912

LABORATORY ANALYSIS REPORT

WATER LAB APPROVAL #4032
BACTERIA LAB APPROVAL #339

EBASCO SERVICES, INC.
255 BRADENTON AVENUE
SUITE 150
DUBLIN, OH 43017-2546

JULY 17, 1989

PROJECT NAME:	BLANKET NUMBER LAB	DATE COLLECTED:	7/ 5/89
PROJECT NUMBER:	1800	DATE RECEIVED:	7/ 6/89
SAMPLE NUMBER:	5036	DATE COMPLETED:	7/17/89
SAMPLE DESCRIPTION:	EBASCO - 7132-3 DIESEL FILL END		

BTEX		*SEE REMARK
TOTAL PETROLEUM HYDROCARBONS	186	MG/KG

REMARKS:

*BENZENE: 120 UG/KG
*TOLUENE: 56 UG/KG
*ETHYL BENZENE: 150 UG/KG
*XYLENE: 1900 UG/KG
MG/KG RESULTS ARE REPORTED ON A WET WEIGHT BASIS
RESULTS WERE CALLED TO STEVE WILLIAMS 7-13-89 AT 2:00 PM

PLEASE NOTE:
We provide many analyses other than those noted on this report.
We would welcome any inquiry into expanded services.

Burgess & Niple, Limited
Engineers and Architects
5085 Reed Road • Columbus, OH 43220 • (614) 459-2050
Columbus Fax. (614) 451-1385

b&n 1912

LABORATORY ANALYSIS REPORT

WATER LAB APPROVAL #4032
BACTERIA LAB APPROVAL #839

JULY 17, 1989

EBASCO SERVICES, INC.
255 BRADENTON AVENUE
SUITE 150
DUBLIN, OH 43017-2546

PROJECT NAME: BLANKET NUMBER LAB
PROJECT NUMBER: 1800
SAMPLE NUMBER: 5037
SAMPLE DESCRIPTION: EBASCO - 7132-3
DIESEL VENT END

DATE COLLECTED: 7/ 5/89
DATE RECEIVED: 7/ 6/89
DATE COMPLETED: 7/17/89

BTEX		*SEE REMARK
TOTAL PETROLEUM HYDROCARBONS	29	MG/KG

REMARKS:

*BENZENE: <140 UG/KG
*TOLUENE: 1100 UG/KG
*ETHYL BENZENE: 280 UG/KG
*XYLENE: 5100 UG/KG
RESULTS WERE CALLED TO STEVE WILLIAMS 7-13-89 AT 2:00 PM
MG/KG RESULTS ARE REPORTED ON A WET WEIGHT BASIS

PLEASE NOTE:
We provide many analyses other than those noted on this report.
We would welcome any inquiry into expanded services.

Burgess & Niple, Limited
Engineers and Architects
5085 Reed Road • Columbus, OH 43220 • (614) 459-2050
Columbus Fax. (614) 451-1385

b&n 1912

LABORATORY ANALYSIS REPORT

WATER LAB APPROVAL #4032
BACTERIA LAB APPROVAL #639

JULY 17, 1989

EBASCO SERVICES, INC.
255 BRADENTON AVENUE
SUITE 150
DUBLIN, OH 43017-2546

PROJECT NAME: BLANKET NUMBER LAB
PROJECT NUMBER: 1800
SAMPLE NUMBER: 5038
SAMPLE DESCRIPTION: EBASCO - 7132-2
MIDDLE TANK

DATE COLLECTED: 7/ 5/89
DATE RECEIVED: 7/ 6/89
DATE COMPLETED: 7/17/89

BTEX		*SEE REMARK
TOTAL PETROLEUM HYDROCARBONS	503	MG/KG

REMARKS:

*BENZENE: <2200 UG/KG
*TOLUENE: 2900 UG/KG
*ETHYL BENZENE: <2200 UG/KG
*XYLENE: 7600 UG/KG
RESULTS WERE CALLED TO STEVE WILLIAMS 7-13-89 AT 2:00 PM
MG/KG RESULTS ARE REPORTED ON A WET WEIGHT BASIS

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LABORATORY ANALYSIS REPORT

WATER LAB APPROVAL #4032
BACTERIA LAB APPROVAL #839

EBASCO SERVICES, INC.
255 BRADENTON AVENUE
SUITE 150
DUBLIN, OH 43017-2546

JULY 17, 1989

PROJECT NAME: BLANKET NUMBER LAB
PROJECT NUMBER: 1800
SAMPLE NUMBER: 5039
SAMPLE DESCRIPTION: EBASCO - 7132-2
MIDDLE TANK FILL END

DATE COLLECTED: 7/ 5/89
DATE RECEIVED: 7/ 6/89
DATE COMPLETED: 7/17/89

BTEX		*SEE REMARK
TOTAL PETROLEUM HYDROCARBONS	56.6	MG/KG

REMARKS:

MG/KG RESULTS ARE REPORTED ON A WET WEIGHT BASIS
*BENZENE: 3400 UG/KG
*TOLUENE: 550 UG/KG
*ETHYL BENZENE: <420 UG/KG
*XYLENE: 5200 UG/KG
RESULTS WERE CALLED TO STEVE WILLIAMS 7-13-89 AT 2:00 PM

PLEASE NOTE:
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LABORATORY ANALYSIS REPORT

WATER LAB APPROVAL #4030
BACTERIA LAB APPROVAL #339

EBASCO SERVICES, INC.
255 BRADENTON AVENUE
SUITE 150
DUBLIN, OH 43017-2546

JULY 17, 1989

PROJECT NAME:	BLANKET NUMBER LAB	DATE COLLECTED:	7/ 5/89
PROJECT NUMBER:	1800	DATE RECEIVED:	7/ 6/89
SAMPLE NUMBER:	5034	DATE COMPLETED:	7/17/89
SAMPLE DESCRIPTION:	EBASCO 7132-2 VENT END		

BTEX		*SEE REMARK
TOTAL PETROLEUM HYDROCARBONS	616.6	MG/KG

REMARKS:

*BENZENE: 43000 UG/KG
*TOLUENE: 30000 UG/KG
*ETHYL BENZENE: 11000 UG/KG
*XYLENE: 96000 UG/KG
RESULTS WERE CALLED TO STEVE WILLIAMS 7-13-89 AT 2:00 PM
MG/KG RESULTS ARE REPORTED ON A WET WEIGHT BASIS

PLEASE NOTE:
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We would welcome any inquiry into expanded services.

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LABORATORY ANALYSIS REPORT

WATER LAB APPROVAL #4032
BACTERIA LAB APPROVAL #839

EBASCO SERVICES, INC.
255 BRADENTON AVENUE
SUITE 150
DUBLIN, OH 43017-2546

JULY 17, 1989

PROJECT NAME:	BLANKET NUMBER LAB	DATE COLLECTED:	7/ 5/89
PROJECT NUMBER:	1800	DATE RECEIVED:	7/ 6/89
SAMPLE NUMBER:	5040	DATE COMPLETED:	7/17/89
SAMPLE DESCRIPTION:	EBASCO - 7132-1 NORTH TANK PIT		

BTEX		*SEE REMARK
TOTAL PETROLEUM HYDROCARBONS	48.5	MG/KG

REMARKS:

*BENZENE: 14000 UG/KG
*TOLUENE: 8700 UG/KG
*ETHYL BENZENE: 3600 UG/KG
*XYLENE: 19000 UG/KG
RESULTS WERE CALLED TO STEVE WILLIAMS 7-13-89 AT 2:00 PM
MG/KG RESULTS ARE REPORTED ON A WET WEIGHT BASIS

PLEASE NOTE:
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LABORATORY ANALYSIS REPORT

WATER LAB APPROVAL #4032
BACTERIA LAB APPROVAL #839

EBASCO SERVICES, INC.
255 BRADENTON AVENUE
SUITE 150
DUBLIN, OH 43017-2546

JULY 17, 1989

PROJECT NAME:	BLANKET NUMBER LAB	DATE COLLECTED:	7/ 5/89
PROJECT NUMBER:	1800	DATE RECEIVED:	7/ 6/89
SAMPLE NUMBER:	5041	DATE COMPLETED:	7/17/89
SAMPLE DESCRIPTION:	EBASCO - 7132-1 NORTH TANK FILL END		

BTEX		*SEE REMARK
TOTAL PETROLEUM HYDROCARBONS	341.7	MG/KG

REMARKS:

*BENZENE: 320 UG/KG
*TOLUENE: 39 UG/KG
*ETHYL BENZENE: 200 UG/KG
*XYLENE: 1100 UG/KG
MG/KG RESULTS ARE REPORTED ON A WET WEIGHT BASIS
RESULTS WERE CALLED TO STEVE WILLIAMS 7-13-89 AT 2:00 PM

PLEASE NOTE:
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We would welcome any inquiry into expanded services.

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LABORATORY ANALYSIS REPORT

WATER LAB APPROVAL #4032
BACTERIA LAB APPROVAL #839

EBASCO SERVICES, INC.
255 BRADENTON AVENUE
SUITE 150
DUBLIN, OH 43017-2546

JULY 17, 1989

PROJECT NAME:	BLANKET NUMBER LAB	DATE COLLECTED:	7/ 5/89
PROJECT NUMBER:	1800	DATE RECEIVED:	7/ 6/89
SAMPLE NUMBER:	5042	DATE COMPLETED:	7/17/89
SAMPLE DESCRIPTION:	EBASCO - 7132-1 N. TANK 7' FROM END		

BTEX		*SEE REMARK
TOTAL PETROLEUM HYDROCARBONS	35	MG/L

REMARKS:

*BENZENE: 55 UG/L
*TOLUENE: 18 UG/L
*ETHYL BENZENE: 20 UG/L
*XYLENE: 79 UG/L
RESULTS WERE CALLED TO STEVE WILLIAMS 7-13-89 AT 2:00 PM

PLEASE NOTE:
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We would welcome any inquiry into expanded services.

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LABORATORY ANALYSIS REPORT

WATER LAB APPROVAL #4032
BACTERIA LAB APPROVAL #829

EBASCO
255 BRADENTON AVENUE
DUBLIN, OH 43017

JULY 28, 1989

PROJECT NAME:	BLANKET NUMBER LAB	DATE COLLECTED:	7/12/89
PROJECT NUMBER:	1800	DATE RECEIVED:	7/13/89
SAMPLE NUMBER:	5267	DATE COMPLETED:	7/28/89
SAMPLE DESCRIPTION:	EBASCO,PL.BR.1 PIT 7132-1		

BTEX		*SEE REMARK
TOTAL PETROLEUM HYDROCARBONS	<1.0	MG/L

REMARKS:

*BENZENE: <2 UG/L
*TOLUENE: <2 UG/L
*ETHYL BENZENE: <2 UG/L
*XYLENE: <2 UG/L

PLEASE NOTE:
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We would welcome any inquiry into expanded services.

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LABORATORY ANALYSIS REPORT

WATER LAB APPROVAL #4032
BACTERIA LAB APPROVAL #839

EBASCO SERVICES, INC.
255 BRADENTON AVENUE
SUITE 150
DUBLIN, OH 43017-2546

JULY 31, 1989

PROJECT NAME: BLANKET NUMBER LAB
PROJECT NUMBER: 1800
SAMPLE NUMBER: 5268
SAMPLE DESCRIPTION: EBASCO.PL.BR.2
PIT 7132-3

DATE COLLECTED: 7/12/89
DATE RECEIVED: 7/13/89
DATE COMPLETED: 7/31/89

BTEX		*SEE REMARK
TOTAL PETROLEUM HYDROCARBONS	56.2	MG/L

REMARKS:

*BENZENE: <2 UG/L
*TOLUENE: <2 UG/L
*ETHYL BENZENE: <2 UG/L
*XYLENE: <2 UG/L

PLEASE NOTE:
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LABORATORY ANALYSIS REPORT

WATER LAB APPROVAL #4030
BACTERIA LAB APPROVAL #639

JULY 31, 1989

ESASCO SERVICES, INC.
255 BRADENTON AVENUE
SUITE 150
DUBLIN, OH 43017-2546

PROJECT NAME:	BLANKET NUMBER LAB	DATE COLLECTED:	7/12/89
PROJECT NUMBER:	1800	DATE RECEIVED:	7/13/89
SAMPLE NUMBER:	5270	DATE COMPLETED:	7/31/89
SAMPLE DESCRIPTION:	ESASCO.PL.BR.4 PUMP ISLAND		

BTEX		SEE REMARK
TOTAL PETROLEUM HYDROCARBONS	2317	MG/KG

REMARKS:

*BENZENE: 2300 UG/KG
*TOLUENE: 54000 UG/KG
*ETHYL BENZENE: 47000 UG/KG
*XYLENE: 400000 UG/KG
MG/KG RESULTS ARE REPORTED ON A WET WEIGHT BASIS
UG/KG RESULTS ARE REPORTED ON A WET WEIGHT BASIS

PLEASE NOTE:
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We would welcome any inquiry into expanded services.

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LABORATORY ANALYSIS REPORT

WATER LAB APPROVAL #4032
BACTERIA LAB APPROVAL #839

EBASCO SERVICES, INC.
255 BRADENTON AVENUE
SUITE 150
DUBLIN, OH 43017-2546

JULY 31, 1989

PROJECT NAME:	BLANKET NUMBER LAB	DATE COLLECTED:	7/12/89
PROJECT NUMBER:	1800	DATE RECEIVED:	7/13/89
SAMPLE NUMBER:	5269	DATE COMPLETED:	7/31/89
SAMPLE DESCRIPTION:	EBASCO,PL.BR.3 PIT 7132-3		

BTEX		*SEE REMARK
TOTAL PETROLEUM HYDROCARBONS	<1.6	MG/KG

REMARKS:

*BENZENE: <2 UG/L
*TOLUENE: <2 UG/L
*ETHYL BENZENE: <2 UG/L
*XYLENE: <2 UG/L
MG/KG RESULTS ARE REPORTED ON A WET WEIGHT BASIS
SAMPLE CONSISTED OF A WATER SOIL SLURRY.

PLEASE NOTE:
We provide many analyses other than those noted on this report.
We would welcome any inquiry into expanded services.

APPENDIX B

LABORATORY RESULTS OF THE GROUNDWATER INVESTIGATION

HITTMAN EBASCO ASSOCIATES, INC.
ANALYTICAL REPORT
SAMPLE RESULTS

CLIENT: NASA CLEVELAND

REPORT PREPARED BY KH

CONTRACT #: ESI-7019-001

DATA RELEASED BY PC

REPORTING DATE: 24-Aug-89

CLIENT ID	HEAI ID	TPH	UNITS	%SOLIDS
PBS-GW-01-011	3950	<1.0	mg/l	NR
PBS-GW-02-009	3951	<1.0	mg/l	NR
PBS-GW-03-010	3952	<1.0	mg/l	NR
PBS-GW-04-013	3953	<1.0	mg/l	NR
PBS-GW-04-012	3954	<1.0	mg/l	NR

NOTE: DETECTION LIMITS FOR SOILS ARE ELEVATED DUE TO DRY WEIGHT CALCULATION.

HITTMAN EBASCO ASSOCIATES, INC.
ANALYTICAL REPORT
SAMPLE RESULTS

CLIENT: NASA CLEVELAND

REPORT PREPARED BY

CONTRACT #: ESI-7019-001

DATA RELEASED BY

REPORTING DATE: 17-Aug-89

UNITS: MG/KG

CLIENT ID	HEAI ID	TPH	%SOLIDS
PBS-SS-01-001	3801	<38	80.5
PBS-SS-01-002	3802	<39	77.5
PBS-SS-02-003	3803	<47	65.3
PBS-SS-02-004	3804	51	78.0
PBS-SS-03-005	3805	<46	67.3
PBS-SS-03-006	3806	<39	78.1
PBS-SS-04-007	3807	<38	80.9
PBS-SS-04-008	3808	38	81.9

NOTE: DETECTION LIMITS ARE ELEVATED DUE TO DRY WEIGHT CALCULATION.

SAMPLE NUMBER
PBS-GW-01-11

Organics Analysis Data Sheet

Name: HITTMAN EBASCO ASSOC., INC.
Sample ID #: 3941
ple Matrix: WATER
a Release Authorized by: _____

Case #: _____
QC Report #: N/A
Contract #: ESI 7019-001
Date Sample Received: 8/17/89

Volatiles Compounds

Concentration: Low Medium (Circle One)

Date Extracted/Prepared: 8/21/89

Date Analyzed: 8/21/89

Conc/Dil Factor: 1

Percent Moisture (Not Decanted): N/A

ug/l or ug/Kg (Circle One)

enzene	58. X
benzene	.40
oluene	1.6
otal Xylenes	6.1

X= TAKEN FROM 1:10 DILUTION

SAMPLE NUMBER
PBS-GW-02-009

Organics Analysis Data Sheet

› Name: HITTMAN EBASCO ASSOC., INC.
› Sample ID #: 3942
ıple Matrix: WATER
:a Release Authorized by:

Case #:
QC Report #: N/A
Contract #: ESI 7019-001
Date Sample Received: 8/17/89

Volatiles Compounds

Concentration: Low Medium (Circle One)

Date Extracted/Prepared: 8/21/89

Date Analyzed: 8/21/89

Conc/Dil Factor: 1

Percent Moisture (Not Decanted): N/A

	ug/l or ug/Kg (Circle One)	
er ne	.2	U
thyl benzene	.2	U
oluene	.18	J
otal Xylenes	.2	U

SAMPLE NUMBER
PBS-GW-03-010

Organics Analysis Data Sheet

b Name: HITTMAN EBASCO ASSOC., INC.
b Sample ID #: 3943
mple Matrix: WATER
ta Release Authorized by:

Case #:
QC Report #: N/A
Contract #: ESI 7019-001
Date Sample Received: 8/17/89

Volatiles Compounds

Concentration: Low Medium (Circle One)

Date Extracted/Prepared: 8/21/89

Date Analyzed: 8/21/89

Conc/Dil Factor: 1

Percent Moisture (Not Decanted): N/A

ug/l or ug/Kg (Circle One)

ene	.2	U
thyl benzene	.2	U
oluene	.2	U
otal Xylenes	.2	U

SAMPLE NUMBER
PBS-GW-04-013

Organics Analysis Data Sheet

b Name: HITTMAN EBASCO ASSOC., INC.
b Sample ID #: 3944
mple Matrix: WATER
ta Release Authorized by: _____

Case #: _____
QC Report #: N/A
Contract #: ESI 7019-001
Date Sample Received: 8/17/89

Volatiles Compounds

Concentration: Low Medium (Circle One)

Date Extracted/Prepared: 8/21/89

Date Analyzed: 8/21/89

Conc/Dil Factor: 1

Percent Moisture (Not Decanted): N/A

	ug/l or ug/Kg (Circle One)	
3e ne	.2	U
thyl benzene	.2	U
oluene	.2	U
otal Xylenes	.2	U

SAMPLE NUMBER
PBS-GW-04-012

Organics Analysis Data Sheet

ɔ Name: HITTMAN EBASCO ASSOC., INC.
ɔ Sample ID #: 3945
mple Matrix: WATER
ta Release Authorized by: -

Case #:
QC Report #: N/A
Contract #: ES17019-001
Date Sample Received: 8/17/89

Volatiles Compounds

Concentration: Low Medium (Circle One)

Date Extracted/Prepared: 8/21/89

Date Analyzed: 8/21/89

Conc/Dil Factor: 1

Percent Moisture (Not Decanted): N/A

ug/l or ug/Kg (Circle One)

e-ene	.2	U
t benzene	.2	U
oluene	.2	U
otal Xylenes	.2	U

SAMPLE NUMBER
BLANK

Organics Analysis Data Sheet

) Name: HITTMAN EBASCO ASSOC., INC.
) Sample ID #: BLANK
ıple Matrix: WATER
:a Release Authorized by: _____

Case #: _____
QC Report #: N/A
Contract #: ESI 7019-001
Date Sample Received: N/A

Volatiles Compounds

Concentration: Low Medium (Circle One)

Date Extracted/Prepared: 8/21/89

Date Analyzed: 8/21/89

Conc/Dil Factor: 1

Percent Moisture (Not Decanted): N/A

ug/l or ug/Kg (Circle One)

ɜnzene	.2	U
:l.ı benzene	.2	U
ɔluene	.2	U
ɔtal Xylenes	.2	U

SAMPLE NUMBER
PBS-SS-01-001

Organics Analysis Data Sheet

ab Name: HITTMAN EBASCO ASSOC., INC.
ab Sample ID #: 3801
mple Matrix: Soil
ata Release Authorized by:

Case #:
QC Report #: N/A
Contract #: ESI 7019-001
Date Sample Received: 8/10/89

Volatiles Compounds

Concentration: Low Medium (Circle One)

Date Extracted/Prepared: 8/14/89

Date Analyzed: 8/14/89

Conc/Dil Factor: 1

Percent Moisture (Not Decanted): 19.46%

ug/l or ug/Kg (Circle One)

Benzene	15.03
Ethyl benzene	1.06
Toluene	1.50
Total Xylenes	4.74

SAMPLE NUMBER
PBS-SS-01-002

Organics Analysis Data Sheet

ab Name: HITTMAN EBASCO ASSOC., INC.
ab Sample ID #: 3802
ample Matrix: Soil
ata Release Authorized by: _____

Case #: _____
QC Report #: N/A
Contract #: ESI 7019-001
Date Sample Received: 8/10/89

Volatiles Compounds

Concentration: Low Medium (Circle One)

Date Extracted/Prepared: 8/14/89

Date Analyzed: 8/14/89

Conc/Dil Factor: 1

Percent Moisture (Not Decanted): 22.54%

ug/l or ug/Kg (Circle One)

F zene	14.42
Ethyl benzene	.69
Toluene	1.41
Total Xylenes	3.23

SAMPLE NUMBER
PBS-SS-02-003

Organics Analysis Data Sheet

ab Name: HITTMAN EBASCO ASSOC., INC.
ab Sample ID #: 3803
ample Matrix: Soil
ata Release Authorized by: _____

Case #: _____
QC Report #: N/A
Contract #: ESI 7019-001
Date Sample Received: 8/10/89

Volatiles Compounds

Concentration: Low Medium (Circle One)

Date Extracted/Prepared: 8/14/89

Date Analyzed: 8/14/89

Conc/Dil Factor: 1

Percent Moisture (Not Decanted): 34.74%

ug/l or ug/Kg (Circle One)

Benzene	.31	U
Ethyl benzene	.31	U
Toluene	.56	
Total Xylenes	.65	

SAMPLE NUMBER
PBS-SS-02-004

Organics Analysis Data Sheet

b Name: HITTMAN EBASCO ASSOC., INC.
b Sample ID #: 3804
mple Matrix: SOIL
ta Release Authorized by: _____

Case #: _____
QC Report #: N/A
Contract #: ESI 7019-001
Date Sample Received: 8/10/89

Volatiles Compounds

Concentration: Low Medium (Circle One)

Date Extracted/Prepared: 8/14/89

Date Analyzed: 8/14/89

Conc/Dil Factor: 1

Percent Moisture (Not Decanted): 22.01%

	ug/l or ug/Kg (Circle One)	
e ene	.26	U
thyl benzene	.39	
oluene	.31	
otal Xylenes	.39	

SAMPLE NUMBER
PBS-SS-03-005

Organics Analysis Data Sheet

.b Name: HITTMAN EBASCO ASSOC., INC.
.b Sample ID #: 3805
.mple Matrix: SOIL
.ta Release Authorized by: _____

Case #: _____
QC Report #: N/A
Contract #: ES17019-001
Date Sample Received: 8/10/89

Volatiles Compounds

Concentration: Low Medium (Circle One)

Date Extracted/Prepared: 8/14/89

Date Analyzed: 8/14/89

Conc/Dil Factor: 1

Percent Moisture (Not Decanted): 32.68%

ug/l or ug/Kg (Circle One)

Benzene	.44
yl benzene	.69
Toluene	2.37
Total Xylenes	1.57

SAMPLE NUMBER
PBS-SS-03-006

Organics Analysis Data Sheet

.b Name: HITTMAN EBASCO ASSOC., INC.
.b Sample ID #: 3806
.mple Matrix: Soil
.ta Release Authorized by:

Case #:
QC Report #: N/A
Contract #: ESI 7019-001
Date Sample Received: 8/10/89

Volatiles Compounds

Concentration: Low Medium (Circle One)

Date Extracted/Prepared: 8/14/89

Date Analyzed: 8/14/89

Conc/Dil Factor: 1

Percent Moisture (Not Decanted): 21.92%

	ug/l or ug/Kg (Circle One)	
zene	.26	U
Etnyl benzene	.26	U
Toluene	.42	
Total Xylenes	.30	

SAMPLE NUMBER
PBS-SS-04-007

Organics Analysis Data Sheet

ab Name: HITTMAN EBASCO ASSOC., INC.
ab Sample ID #: 3807
ample Matrix: Soil
ata Release Authorized by: _____

Case #: _____
QC Report #: N/A
Contract #: ESI 7019-001
Date Sample Received: 8/10/89

Volatiles Compounds

Concentration: (Low) Medium (Circle One)

Date Extracted/Prepared: 8/14/89

Date Analyzed: 8/14/89

Conc/Dil Factor: 1

Percent Moisture (Not Decanted): 19.07%

ug/l or (ug/Kg) (Circle One)

] ene	.25	U
Ethyl benzene	.25	U
Toluene	.31	
Total Xylenes	.235	J

SAMPLE NUMBER
PBS-SS-04-008

Organics Analysis Data Sheet

b Name: HITTMAN EBASCO ASSOC., INC.
b Sample ID #: 3808
mple Matrix: SOIL
ta Release Authorized by: --

Case #:
QC Report #: N/A
Contract #: ESI 7019-001
Date Sample Received: 8/10/89

Volatiles Compounds

Concentration: Low Medium (Circle One)

Date Extracted/Prepared: 8/14/89

Date Analyzed: 8/14/89

Conc/Dil Factor: 1

Percent Moisture (Not Decanted): 18.06%

	ug/l or ug/Kg (Circle One)
zene	.24 U
Ethyl benzene	.26
Toluene	.35
Total Xylenes	.25

SAMPLE NUMBER
BLANK

Organics Analysis Data Sheet

ab Name: HITTMAN EBASCO ASSOC., INC.
ab Sample ID #: BLANK
ample Matrix: WATER
ata Release Authorized by: _____

Case #: _____
QC Report #: N/A
Contract #: ESI 7019-001
Date Sample Received: N/A

Volatiles Compounds

Concentration: Low Medium (Circle One)

Date Extracted/Prepared: 8/15/89

Date Analyzed: 8/15/89

Conc/Dil Factor: 1

Percent Moisture (Not Decanted): N/A

ug/l or ug/Kg (Circle One)

zene	.2	U
Ethyl benzene	.2	U
Toluene	.2	U
Total Xylenes	.2	U

APPENDIX C

LABORATORY RESULTS OF THE EXCAVATED SOILS INVESTIGATION

HITTMAN EBASCO ASSOCIATES, INC.
ANALYTICAL REPORT
SAMPLE RESULTS

CLIENT: NASA CLEVELAND

REPORT PREPARED BY KH

CONTRACT #: ESI-7019-001

DATA RELEASED BY PC

REPORTING DATE: 24-Aug-89

CLIENT ID	HEAI ID	TPH	UNITS	%SOLIDS
PBS-SS-P3-016	3955	83	mg/kg	70.4
PBS-SS-P2-015	3956	67	mg/kg	88.5
PBS-SS-P4-017	3957	621	mg/kg	86.7
PBS-SS-P1-014	3958	76	mg/kg	89.3

NOTE: DETECTION LIMITS FOR SOILS ARE ELEVATED DUE TO DRY WEIGHT CALCULATION.

SAMPLE NUMBER
PBS-SS-P1-01A

Organics Analysis Data Sheet

) Name: HITTMAN EBASCO ASSOC., INC.
) Sample ID #: 3949
ıple Matrix: SOIL
:a Release Authorized by: -

Case #:
QC Report #: N/A
Contract #: ESI 7019-001
Date Sample Received: 8/17/89

Volatiles Compounds

Concentration: Low Medium (Circle One)

Date Extracted/Prepared: 8/22/89

Date Analyzed: 8/22/89

Conc/Dil Factor: 1

Percent Moisture (Not Decanted): 10.68%

	ug/l or ug/Kg (Circle One)	
ene	.22	U
thyl benzene	.22	U
oluene	.22	U
otal Xylenes	.22	U

SAMPLE NUMBER
PBS-SS-P2-015

Organics Analysis Data Sheet

ɔ Name: HITTMAN EBASCO ASSOC., INC.
ɔ Sample ID #: 3947
mple Matrix: SOIL
ta Release Authorized by:

Case #:
QC Report #: N/A
Contract #: ESI 7019-001
Date Sample Received: 8/17/89

Volatiles Compounds

Concentration: Low Medium (Circle One)

Date Extracted/Prepared: 8/22/89

Date Analyzed: 8/22/89

Conc/Dil Factor: 1

Percent Moisture (Not Decanted): 11.52%

ug/l or ug/Kg (Circle One)

enzene	.23	U
. benzene	.41	
oluene	.23	U
otal Xylenes	1.3	

SAMPLE NUMBER
PBS-SS-P3-016

Organics Analysis Data Sheet

Name: HITTMAN EBASCO ASSOC., INC.
Sample ID #: 3946
ple Matrix: SOIL
a Release Authorized by: _____

Case #: _____
QC Report #: N/A
Contract #: ESI 7019-001
Date Sample Received: 8/17/89

Volatiles Compounds

Concentration: Low Medium (Circle One)

Date Extracted/Prepared: 8/23/89

Date Analyzed: 8/23/89

Conc/Dil Factor: 1

Percent Moisture (Not Decanted): 29.48%

	ug/l or ug/Kg (Circle One)	
nzene	1.3	
hyl benzene	.28	U
luene	.47	
tal Xylenes	.28	U

SAMPLE NUMBER
PBS-SS-P4-017

Organics Analysis Data Sheet

Name: HITTMAN EBASCO ASSOC., INC.
Sample ID #: 3948
ple Matrix: SOIL
a Release Authorized by: _____

Case #: _____
QC Report #: N/A
Contract #: ESI 7019-001
Date Sample Received: 8/17/89

Volatiles Compounds

Concentration: Low Medium (Circle One)

Date Extracted/Prepared: 8/22/89

Date Analyzed: 8/22/89

Conc/Dil Factor: 1

Percent Moisture (Not Decanted): 13.28%

	ug/l or ug/Kg (Circle One)	
enzene	.23	U
benzene	10.	
oluene	.23	U
otal Xylenes	5.1	

HITTMAN EBASCO ASSOCIATES, INC.
ANALYTICAL REPORT
SAMPLE RESULTS

CLIENT: NASA CLEVELAND

REPORT PREPARED BY KH

CONTRACT #: ESI-7019-001

DATA RELEASED BY QC

REPORTING DATE: 24-Aug-89

****

CLIENT ID:	PBS-SS-P3-016	PBS-SS-P2-015	PBS-SS-P4-017	PBS-SS-P1-014
HEAI ID:	3955	3956	3957	3958
PARAMETER:				
LEAD (ug/l in Leachate)	<500	<500	<500	<500
FLASHPOINT (DEGREES F)	NO FLASH AT <200°	NO FLASH AT <200°	NO FLASH AT <200°	NO FLASH AT <200°

HITTMAN EBASCO ASSOCIATES, INC.
ANALYTICAL REPORT
SAMPLE RESULTS

CLIENT: NASA CLEVELAND

REPORT PREPARED BY KH

CONTRACT #: ESI-7019-001

DATA RELEASED BY PK

REPORTING DATE: 24-Aug-89

DUPLICATE ANALYSIS

UNITS: ug/l IN LEACHATE

****

LEAD

CLIENT ID	HEAI ID	SAMPLE RESULT	DUPLICATE RESULT	PERCENT RPD
PBS-SS-P3-016	3955	<500	<500	NC

HITTMAN EBASCO ASSOCIATES, INC.
ANALYTICAL REPORT
SPIKE RESULTS

CLIENT: NASA CLEVELAND

REPORT PREPARED BY KH

CONTRACT #: ESI-7019-001

DATA RELEASED BY PC

REPORTING DATE: 24-Aug-89

UNITS: ug/l IN LEACHATE

****

LEAD

CLIENT ID	HEAI ID	SPIKED SAMPLE RESULT	SAMPLE RESULT	SPIKE ADDED	PERCENT RECOVERY
PBS-SS-P3-016	3955	1140	<500	1000	94

HITTMAN EBASCO ASSOCIATES, INC.
ANALYTICAL REPORT
SAMPLE RESULTS

CLIENT: NASA CLEVELAND

REPORT PREPARED BY KH

CONTRACT #: ESI-7019-001

DATA RELEASED BY PC

REPORTING DATE: 24-Aug-89

BLANK

UNITS: ug/l IN LEACHATE

****

LEAD

DATE ANALYZED	DETECTION LIMIT	BLANK RESULT
08/22/89	500	<500

HITTMAN EBASCO ASSOCIATES, INC.
ANALYTICAL REPORT
QUALITY CONTROL

CLIENT: NASA CLEVELAND

REPORT PREPARED BY KH

CONTRACT #: ESI-7019-001

DATA RELEASED BY PC

REPORTING DATE: 24-Aug-89

UNITS: ug/l

****

LEAD

QC TRUE VALUE	FOUND RESULT	% RECOVERY
5000	4820	96

HITTMAN EBASCO ASSOCIATES, INC.
ANALYTICAL REPORT
SAMPLE RESULTS

CLIENT: NASA CLEVELAND

REPORT PREPARED BY KH

CONTRACT #: ESI-7019-001

DATA RELEASED BY QL

REPORTING DATE: 24-Aug-89

QUALITY CONTROL

UNITS: mg/l

****

TPH

TRUE VALUE	FOUND VALUE	95% CONFIDENCE LIMITS
24.5	32.1	26.6 - 33.4

HITTMAN EBASCO ASSOCIATES, INC.
ANALYTICAL REPORT
SAMPLE RESULTS

CLIENT: NASA CLEVELAND

REPORT PREPARED BY KH

CONTRACT #: ESI-7019-001

DATA RELEASED BY PC

REPORTING DATE: 24-Aug-89

DUPLICATE ANALYSIS

UNITS: mg/Kg

****

TPH

CLIENT ID	HEAI ID	SAMPLE RESULT	DUPLICATE RESULT	PERCENT RPD
PBS-SS-P2-016	3956	67	43	44

HITTMAN EBASCO ASSOCIATES, INC.
ANALYTICAL REPORT
SAMPLE RESULTS

CLIENT: NASA CLEVELAND

REPORT PREPARED BY KH

CONTRACT #: ESI-7019-001

DATA RELEASED BY PC

REPORTING DATE: 24-Aug-89

BLANK

UNITS: mg/Kg

****

TPH

DATE ANALYZED	DETECTION LIMIT	BLANK RESULT
08/22/89	32	<32

PBS003-40

BLDG. 1131

CLOSURE ASSESSMENT FOR TANKS 21, 22, AND 23
AT PLUM BROOK STATION
SANDUSKY, OHIO

FOR

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LEWIS RESEARCH CENTER
CLEVELAND, OHIO

PREPARED BY:

EBASCO ENVIRONMENTAL
5000 BRADENTON AVENUE, SUITE 200
DUBLIN, OHIO 43017

MAY 1990

1.0 Introduction

On December 28, 1989 the permanent closure by removal of three (3) underground storage tanks (USTs) was performed at the NASA Plum Brook Station near Sandusky, Ohio. The tanks removed were Tank 21, Tank 22, and Tank 23. These tanks were located adjacent to the southern side of Building 1131, which is in the Reactor Facility area. Figure 1 shows the location of the Reactor Area within the boundaries of the Plum Brook Station. The tanks were adjacent to one another, lying in a north-south direction. Figure 2 shows the locations of the removed tanks relative to Building 1131. Tank 21 and Tank 22 were 7900 gallon fuel oil tanks which were not in use prior to their removal. Tank 23 was a 500 gallon waste oil tank which had been in use until the time of removal. These tanks were installed in 1961 and were constructed of steel.

Mr. Edwin Maglott of the State Fire Marshall's Office and Ms. Pamela Doerner of the Ohio Environmental Protection Agency were on site to oversee the removal of the USTs. Representatives of NASA Plum Brook Station, Warner Osborn Pardee and Turner Construction were also on site to monitor the removal of the USTs.

2.0 Tank Removal

The tops of the tanks were approximately six feet below grade. The soil from the surface to a depth of approximately eight feet was removed and placed in containment areas. These areas consisted of two roll off boxes and an area located approximately 100 yards east of the tank pit which was covered with plastic sheeting and bounded by hay bails. All soil excavation and tank removals were performed by Independence Excavating of Cleveland, Ohio, who was retained as a subcontractor to Turner Construction Company of Cleveland, Ohio.

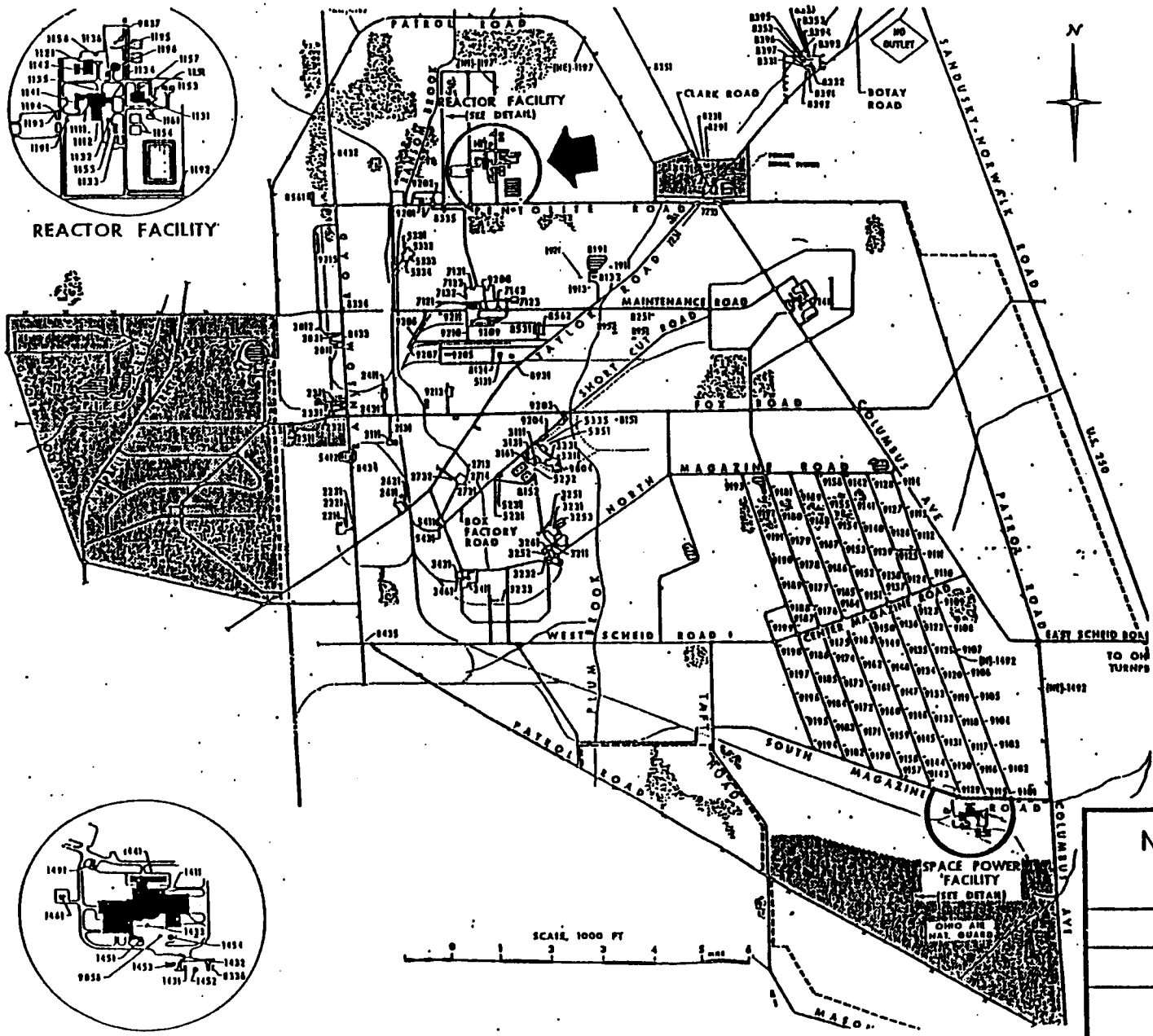
The three (3) USTs were cleaned prior to their removal. Before Tank No. 23 was cleaned, approximately 250 gallons of waste oil was removed and placed in 55 gallon drums. The cleaning of the USTs was performed by Clean Harbors of Cleveland, Ohio.

The three USTs were removed after the tank cleaning was completed. The pit appeared to contain a water-oil mixture after the tanks were removed. Two concrete slabs ran in an east-west direction beneath the tanks. These two concrete slabs were removed after the USTs were removed.

3.0 Sampling and Analysis

A total of eleven (11) soil samples were taken for this assessment. Eight (8) samples of the soils underlying the tanks were taken to detect the presence of any past or ongoing leaks. Three (3) samples of the tank cover soil were taken to determine if there had been appreciable surface spillage, overfilling or piping failures. An alphanumeric sample identification number encoded each sample's site location (Plum Brook Station), the building location (Building 1131), the sample medium (soil sample), and the sample number. Each sample was numbered sequentially, with the six samples taken from the pit bottom being samples PBS-1131-SS-1 through SS-6. Samples SS-7, SS-8 and SS-9 were taken from soil excavated prior to the removal of the USTs. Samples SS-10 and SS-11 were taken from the pit bottom after an additional 3-4 feet of soil was removed. Figure 2 shows the locations of the soil samples taken from the excavated area. The locations are shown relative to the locations of the three removed tanks.

The first set of samples (SS-1 through SS-6) was taken after the three (3) USTs and the concrete slabs were removed. Because the pit bottom soil was very unconsolidated after the removal of the tanks and concrete slabs direct sampling of the pit bottom was not possible. The soil samples

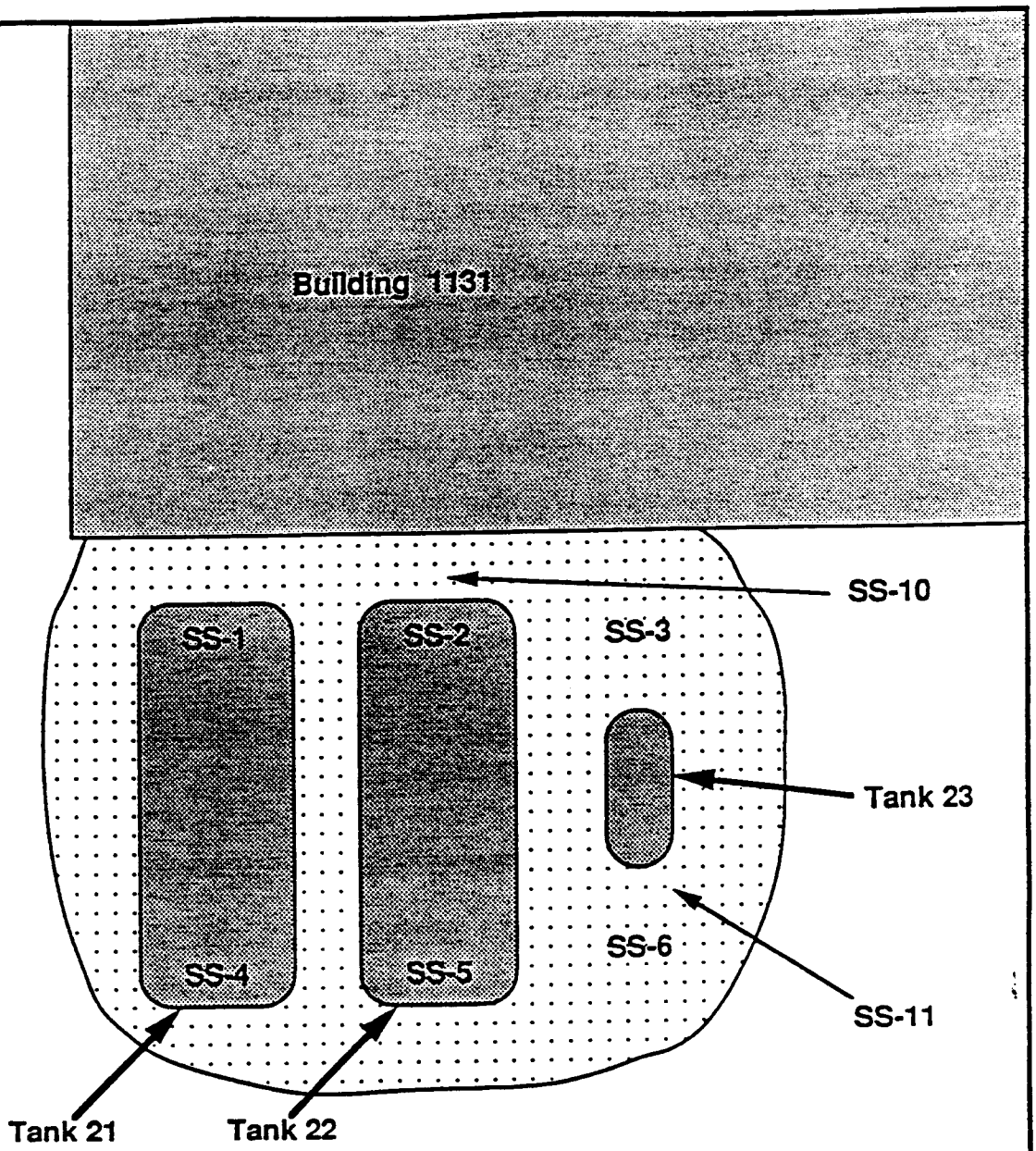


NASA Plum Brook Station
Building 1131

EBASCO ENVIRONMENTAL

FIGURE 1

Map of Plum Brook Station
Showing the Reactor Area



Buildings

Excavated Tank Pit

Locations of Excavated Tanks

SS-4 Soil Sample Locations

North

Not to Scale

NASA Plum Brook Station
Building 1131

EBASCO ENVIRONMENTAL

FIGURE 2

Locations of Removed Underground Storage Tanks and Soil Sampling Points

were taken using the backhoe bucket to remove soil from the appropriate area of the pit bottom. Samples SS-1 through SS-6 were taken in this manner. Samples SS-1 through SS-6 were analyzed for Total Petroleum Hydrocarbons (TPH) (EPA Method # 418.1), volatile organics (EPA Method # 524.2), EP Toxicity for lead (EPA Method # 200.7), and flashpoint (American Society for Testing Materials Method # D-93).

As the samples were taken from the pit bottom, they were screened with an HNu photoionization detector to determine if there were non-methane volatile organics emanating from the soil samples. Table 1 shows the HNu readings for the samples taken from the pit bottom.

Table 1

HNu Readings for Samples SS-1 through SS-6

Sample I.D. Number	HNu Reading (ppm)
PBS-1131-SS-1	Not Taken
PBS-1131-SS-2	2.0
PBS-1131-SS-3	0.6
PBS-1131-SS-4	0.6
PBS-1131-SS-5	3.0
PBS-1131-SS-6	1.8
Background Range	0.0-0.1

Although there is not a direct correlation between HNu readings and the laboratory analytical results with regard to the degree of contamination, the HNu is useful in that it gives an indication as to whether volatile contamination is present in the soil sample.

Samples SS-7, SS-8 and SS-9 were taken from the soil excavated prior to the removal of the USTs. These samples were taken from the containment area east of Building 1131. Samples SS-7 through SS-9 were analyzed for TPH, volatile organics, EP Toxicity for lead, and flashpoint. HNu readings for samples SS-7, SS-8 and SS-9 were measured at background levels. This soil had been excavated on the previous day and therefore some volatilization of this soil may have already occurred.

Due to the apparent contamination, indicated by both the HNu readings and visual inspection of the tank, it was determined that additional soil would be removed before the excavation was backfilled. However, no additional soil was removed on December 28th, due to a lack of sufficient containment capacity. On December 29th additional containment areas were set up. Approximately 3-4 feet of additional soil was removed from the pit bottom. The depth of the excavation was approximately 13 feet after the additional excavation was completed. The soil at this depth was a consistent, well consolidated gray clay.

Two samples (SS-10 and SS-11) were taken from the pit bottom after the additional soil was removed Figure 2 shows the sample locations. Sample SS-10 was taken along the northern side of the pit were it appeared that the excavated soils had been discolored, possibly due to contamination from the excavated USTs. Sample SS-11 was taken along the eastern side of the pit beneath the previous location of the waste oil tank. Both samples had background readings when screened with the HNu. Both samples were analyzed for TPH and volatile organics.

4.0 Laboratory Results

All eleven of the soil samples were analyzed for TPH and volatile organics. Samples PBS-1131-SS-1 through SS-9 were analyzed for flashpoint and EP Toxicity for lead. Appendix A contains the complete set of laboratory data. The extracted lead in each of the samples was below the detection limit of 500 micrograms per liter. The flashpoint of all of the samples exceeded 200° F. The TPH concentrations for the eleven soil samples are listed in Table 2.

Table 2

Total Petroleum Hydrocarbons Concentrations for Samples SS-1 through SS-11

Sample I.D. Number	TPH Concentration (mg/kg)
PBS-1131-SS-1	1980
PBS-1131-SS-2	293
PBS-1131-SS-3	190
PBS-1131-SS-4	U
PBS-1131-SS-5	3050
PBS-1131-SS-6	762
PBS-1131-SS-7	801
PBS-1131-SS-8	3570
PBS-1131-SS-9	1590
PBS-1131-SS-10	114
PBS-1131-SS-11	U

U: below detection limits

The concentrations of TPH in the excavated cover soil (SS-7, SS-8 and SS-9) and the pit bottom soil indicate that contamination of the surrounding soils has occurred. High concentrations of total petroleum hydrocarbons (801, 3570, 1590 ppm) were found in the soil which covered the tanks (SS-7, SS-8, SS-9). This would seem to indicate that at least a portion of the soil contamination was due to piping failures, overfilling and/or surface spills, and not leakage from the tanks themselves. Samples taken from the pit bottom (SS-1 through SS-6) also showed elevated levels of total petroleum hydrocarbons, although no petroleum hydrocarbons were detected in sample SS-4. Samples SS-10 and SS-11, which were taken after additional soil was removed from the tank pit, did not show elevated levels of TPH.

Volatile organics also were detected in the soil samples. These volatiles included both possible petroleum degradation products and other compounds such as chlorinated organics which could have been found in the waste oil tank. Table 3 lists the concentrations for the organic compounds which were detected in the soil samples. Thirty-six organics were detected in various samples and the concentrations ranged as high as 13,388 ug/kg for naphthalene in SS-8. Concentrations were also in the thousands of parts per billion for 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, 1,1-dichloroethane, and total xylenes. The majority of the remaining chemicals were detected at concentrations in the hundreds of parts per billion. Most of these contaminants were detected in lower concentrations or not at all in the two soil samples which were taken after the additional soil was removed (SS-10, SS-11), although 1,1-dichloroethane, 1,2-dichloroethane, and chloroethane were detected in much higher concetrations in samples SS-10 and SS-11. Therefore, vertical contaminant migration may be limited to a few chlorinated organics.

TABLE 3
Page 1 of 2

Soil Sample Concentrations for Samples Taken at the NASA Plum Brook Station
Building 1131 (Reactor Facility) Underground Storage Tank Removals

Samples SS-1 through SS-6 were taken from the pit bottom, SS-7, SS-8, and SS-9 were taken from the excavated soils, and samples SS-10 and SS-11 were taken from the pit bottom after approximately 4 feet of additional soil was removed

Concentrations of TPH are in mg/kg and volatile concentrations are in micrograms/kg

	1131-SS-1	1131-SS-2	1131-SS-3	1131-SS-4	1131-SS-5	1131-SS-6	1131-SS-7	1131-SS-8	1131-SS-9	1131-SS-10	1131-SS-11
Total Petroleum Hydrocarbons (TPH) (mg/kg)	1980	293	190	u	3050	762	801	3570	1590	114	u
Volatile Organics (ug/kg)	1131-SS-1	1131-SS-2	1131-SS-3	1131-SS-4	1131-SS-5	1131-SS-6	1131-SS-7	1131-SS-8	1131-SS-9	1131-SS-10	1131-SS-11
Dichlorodiflouromethane	u	J 36	u	u	u	u	J 24	J 36	u	u	61
Chloromethane	u	u	u	u	u	u	u	u	u	u	u
Vinyl Chloride	u	u	u	u	u	u	u	u	u	u	u
Bromomethane	u	u	u	u	u	u	u	u	u	u	u
Chloroethane	u	u	u	u	u	u	u	u	u	990	105
Trichlorofluoromethane	u	J 120	u	u	u	u	J 112	u	u	u	20
1,1 Dichloroethene	u	u	u	u	u	u	u	u	u	u	u
Methylene Chloride	u	446	u	u	503	u	426	205	u	25	109
trans-1,2-Dichloroethene	u	u	u	u	u	u	u	u	u	u	17
1,1 Dichloroethane	482	4483	u	u	u	u	u	u	u	6120	673
cis-1,2 Dichloroethene	u	u	u	u	u	u	u	u	u	u	165
2,2 Dichloropropane	u	u	u	u	u	u	u	u	u	u	u
Chloroform	u	u	u	u	u	u	u	u	u	J 1	u
Bromochloromethane	u	u	u	u	u	u	u	u	u	u	u
1,1,1-Trichloroethane	197	423	891	u	u	u	u	u	J 123	u	u
1,1 Dichloropropene	u	u	u	u	u	u	u	u	u	u	u
Carbon Tetrachloride	u	u	J 91	u	u	u	u	u	u	u	u
1,2 Dichloroethane	u	u	u	u	u	u	u	u	u	178	u
Benzene	u	J 28	u	J 32	J 16	u	J 25	J 25	u	J 2	u
Trichloroethene	589	577	u	u	836	u	846	u	1019	u	997
1,2 Dichloropropane	u	u	u	u	u	u	u	u	u	u	u
Bromodichloromethane	u	u	u	J 23	u	u	u	u	u	u	u

u Undetected
J Below quantitation limits; Estimated Value

TABLE 3 Continued	Soil Sample Concentrations for Samples Taken at the NASA Plum Brook Station										
Page 2 of 2	Building 1131 (Reactor Facility) Underground Storage Tank Removals										
Volatile Organics (ug/kg)	1131-SS-1	1131-SS-2	1131-SS-3	1131-SS-4	1131-SS-5	1131-SS-6	1131-SS-7	1131-SS-8	1131-SS-9	1131-SS-10	1131-SS-11
Dibromomethane	u	u	u	u	u	u	u	u	u	u	u
Toluene	u	J 26	u	J 17	J 23	u	J 27	J 41	u	J 2	6
1,1,2-Trichloroethane	u	u	u	143	u	u	u	u	u	u	u
1,3 Dichloropropane	u	u	u	u	u	u	u	u	u	u	u
Tetrachloroethene	u	677	1043	u	u	u	u	u	u	u	u
Dibromochloromethane	u	u	u	u	u	u	u	u	u	u	u
1,2-Dibromomethane-EDB	u	u	u	u	u	u	u	u	u	u	u
Chlorobenzene	u	u	u	u	u	u	u	u	u	u	u
Ethylbenzene	311	431	u	1093	329	u	548	543	140	11	11
1,1,1,2-Tetrachloroethane	u	u	u	u	u	u	J 41	375	u	J 2	u
m & p -Xylenes	430	240	u	739	566	u	647	1115	J 38	19	4
o-Xylene	204	J 80	u	413	170	u	424	703	u	14	J 1
Styrene	u	u	u	u	u	u	u	u	u	u	u
1,1,2,2-Tetrachloroethane	u	u	u	194	u	463	231	283	u	5	12
Isopropylbenzene	J 84	u	u	u	128	u	176	380	u	10	u
Bromoform	u	u	u	u	u	u	u	u	u	u	u
1,2,3- Trichloropropane	u	u	u	u	u	u	u	u	u	9	u
n-Propylbenzene	235	J 71	u	u	289	u	369	612	u	12	u
Bromobenzene	u	u	u	u	u	u	u	u	u	u	u
1,3,5 Trimethylbenzene	1775	692	269	528	1685	166	2953	4365	178	106	u
4-Chlorotoluene	u	u	u	u	u	u	u	u	u	u	u
2-Chlorotoluene	u	u	u	u	u	u	u	u	u	u	u
tert-Butylbenzene	288	183	240	129	422	u	645	618	u	23	15
1,2,4 Trimethylbenzene	2470	1000	598	1122	2348	270	3909	4413	204	115	u
sec-Butylbenzene	290	125	J 67	u	430	u	682	858	u	11	u
p-Isopropyltoluene	639	337	u	u	806	u	1503	1854	u	27	u
1,3 Dichlorobenzene	u	u	u	u	u	u	u	u	u	J 2	u
1,4 Dichlorobenzene	u	u	u	u	u	u	u	u	u	J 2	u
n-Butylbenzene	u	u	u	u	u	u	u	u	u	u	u
1,2 Dichlorobenzene	u	u	u	u	u	u	u	J 31	u	u	u
Dibromo-3-Chloropropane	u	u	u	u	u	u	u	u	u	u	u
1,2,4 Trichlorobenzene	575	185	218	u	u	u	u	u	193	3	u
Hexachlorobutadiene	404	J 82	u	u	u	u	u	u	u	u	u
Naphthalene	4550	3070	3523	4935	6332	1743	7801	13388	1255	548	223
1,2,3 Trichlorobenzene	1025	143	490	385	J 45	178	J 115	198	u	5	6
u	Undetected										
J	Below quantitation limits; Estimated Value										

5.0 Discussion and Recommendations

The results of the laboratory analyses indicated that contamination of the surrounding soils has occurred. High concentrations of total petroleum hydrocarbons (TPH) were found in the majority of the soil samples, and elevated concentrations of volatile organic compounds were found in all of the soil samples. The tanks were visually inspected by the EBASCO engineer after their removal and were found to be in good condition structurally. There were no apparent holes or cracks in the tanks and there was very little visible corrosion. This would indicate that the cause of the leakage was from piping failures or overfilling. The concentrations of organics and TPH found in the soil samples were among the highest encountered at any of the tank areas sampled at Plum Brook Station.

At present, no state or federal standards are available for TPH and organic compounds in soils. Guidelines from the Ohio EPA concerning soil remediation levels have not been promulgated because of a delay in the release of similar federal standards. Although there are no soil standards at this time, representatives of both the State Fire Marshall's Bureau of Underground Storage Tank Regulation (BUSTR) and the Ohio EPA have indicated that acceptable levels of TPH in soil range from 50 - 100 mg/kg. Concentrations of TPH exceeded 700 mg/kg in 6 of the 11 samples. The analyses also indicated that numerous chlorinated organic compounds were present in the surrounding soil.

Because of the degree of contamination encountered in the soil samples taken, and also the apparent visible contamination of the tank pit bottom, additional investigation of the area surrounding this tank area is warranted. This area has been included under the scope of work for the UST Corrective Actions Remedial Investigation / Feasibility Study of the previously assessed tank areas at Plum Brook Station, being performed under Task Order 028 of NASA/Ebasco Contract Number NASW-4301.

PBSCC3-4

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CLOSURE ASSESSMENT FOR TANKS 21, 22, AND 23
AT PLUM BROOK STATION
SANDUSKY, OHIO

FOR

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LEWIS RESEARCH CENTER
CLEVELAND, OHIO

PREPARED BY:

EBASCO ENVIRONMENTAL
5000 BRADENTON AVENUE, SUITE 200
DUBLIN, OHIO 43017

MAY 1990

Appendix A Laboratory Results of the Soil Sampling

HITTMAN EBASCO ASSOCIATES, INC.
ANALYTICAL REPORT
SAMPLE RESULTS

ENT: NASA PLUMBROOK

REPORT PREPARED BY LP

CONTRACT NO: ESI-7019-006

DATA RELEASED BY EAP

REPORTING DATE: 24-Jan-90

CLIENT ID	HEAI ID	LEAD(ug/l in leachate)	FLASHPOINT(°F)
PBS.1131.SS.1	8692	<500	NO FLASH @ <200°
PBS.1131.SS.2	8693	<500	NO FLASH @ <200°
PBS.1131.SS.3	8694	<500	NO FLASH @ <200°
PBS.1131.SS.4	8695	<500	NO FLASH @ <200°
PBS.1131.SS.5	8696	<500	NO FLASH @ <200°
PBS.1131.SS.6	8697	<500	NO FLASH @ <200°

HITTMAN EBASCO ASSOCIATES, INC.
ANALYTICAL REPORT
SAMPLE RESULTS

CLIENT: NASA PLUMBROOK

REPORT PREPARED BY KH

CONTRACT NO: ESI-7019-006

DATA RELEASED BY EAP

REPORTING DATE: 05-Jan-90

UNITS: ug/l in Leachate

CLIENT ID	HEAI ID	EPTOX LEAD	FLASHPOINT (°F)
PBS.1131.SS.7	8689	<500	NO FLASH AT <200°
PBS.1131.SS.8	8690	<500	NO FLASH AT <200°
PBS.1131.SS.9	8691	<500	NO FLASH AT <200°

HITTMAN EBASCO ASSOCIATES, INC.
ANALYTICAL REPORT
SAMPLE RESULTS

CLIENT: NASA PLUMBROOK

REPORT PREPARED BY KH

CONTRACT NO: ESI-7019-006

DATA RELEASED BY EAD

REPORTING DATE: 05-Jan-90

UNITS: mg/Kg

CLIENT ID	HEAI ID	TPH	% SOLIDS
PBS.1131.SS.1	8692	1980	82.4
PBS.1131.SS.2	8693	293	80.2
PBS.1131.SS.3	8694	190	80.1
PBS.1131.SS.4	8695	<39	83.3
PBS.1131.SS.5	8696	3050	82.8
PBS.1131.SS.6	8697	762	81.5
PBS.1131.SS.7	8698	801	84.0
PBS.1131.SS.8	8699	3570	81.0
PBS.1131.SS.9	8700	1590	78.2

HITTMAN EBASCO ASSOCIATES, INC.
ANALYTICAL REPORT
SAMPLE RESULTS

CLIENT: NASA PLUMBROOK

REPORT PREPARED BY KH

CONTRACT NO: ESI-7019-006

DATA RELEASED BY EAP

REPORTING DATE: 10-Jan-90

UNITS: mg/Kg

CLIENT ID	HEAI ID	TPH	% SOLIDS
PBS.1131.SS.10	27	114	79.2
PBS.1131.SS.11	28	<40	80.6

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AA063	Method Number:	524.2M
Lab Sample Name:	HEAI#8680 PBS1131SS1	Date Analyzed:	900110
Matrix:	Soil	Date Collected:	891228
Dilution Factor:	125.0	Date Received:	891229

Sample Info.: GC/MS A,TN,ESI7019,Sul 524.2,4gm/100 UL/5ML

U = not detected
J = estimated value, below detection limit
MS = MS/MSD compound

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		125.	U
Chloromethane		125.	U
Vinyl Chloride		125.	U
Bromomethane		125.	U
Chloroethane		125.	U
Trichlorofluoromethane		125.	U
1,1-Dichloroethene		125.	U
Methylene Chloride		125.	U
trans-1,2-Dichloroethene		125.	U
1,1-Dichloroethane	482.		
cis-1,2-Dichloroethene		125.	U
2,2-Dichloropropane		125.	U
Chloroform		125.	U
Bromochloromethane		125.	U
1,1,1-Trichloroethane	197.		
1,1-Dichloropropene		125.	U
Carbon Tetrachloride		125.	U
1,2-Dichloroethane		125.	U
Benzene		125.	U
Trichloroethene	589.		
1,2-Dichloropropane		125.	U
Bromodichloromethane		125.	U
Dibromomethane		125.	U
Toluene		125.	U
1,1,2-Trichloroethane		125.	U
1,3-Dichloropropane		125.	U
Tetrachloroethene		125.	U
Dibromochloromethane		125.	U
1,2-Dibromoethane - EDB		125.	U
Chlorobenzene		125.	U
Ethylbenzene	311.		
1,1,1,2-Tetrachloroethane		125.	U
m + p-Xylenes	430.		

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AA063	Method Number:	524.2M
Lab Sample Name:	HEAI#8680 PBS1131SS1	Date Analyzed:	900110
Matrix:	Soil	Date Collected:	891228
Dilution Factor:	125.0	Date Received:	891229

Sample Info.: GC/MS A,TN,ESI7019,Sul 524.2,4gm/100 UL/5ML

U = not detected
J = estimated value, below detection limit
MS = MS/MSD compound

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene	204.		
Styrene		125.	U
1,1,2,2-Tetrachloroethane		125.	U
Isopropylbenzene	84.		J
Bromoform		125.	U
1,2,3-Trichloropropane		125.	U
n-Propylbenzene	235.		
Bromobenzene		125.	U
1,3,5-Trimethylbenzene	1775.		
4-Chlorotoluene		125.	U
2-Chlorotoluene		125.	U
tert-Butylbenzene	288.		
1,2,4-Trimethylbenzene	2470.		
sec-Butylbenzene	290.		
p-Isopropyltoluene	639.		
1,3-Dichlorobenzene		125.	U
1,4-Dichlorobenzene		125.	U
n-Butylbenzene		125.	U
1,2-Dichlorobenzene		125.	U
1,2-Dibromo-3-Chloropropane		125.	U
1,2,4-Trichlorobenzene	575.		
Hexachlorobutadiene	404.		
Naphthalene	4550.		
1,2,3-Trichlorobenzene	1025.		

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AA050	Method Number:	524.2M
Lab Sample Name:	HEAI#8681 PBS1131SS2	Date Analyzed:	900109
Matrix:	Soil	Date Collected:	891228
Dilution Factor:	125.0	Date Received:	891229

Sample Info.: GC/MS A,TN,ESI7019,Sul 524.2,4gm/100UL/5ML

U = not detected
J = estimated value, below detection limit
MS = MS/MSD compound

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane	36.		J
Chloromethane		125.	U
Vinyl Chloride		125.	U
Bromomethane		125.	U
Chloroethane		125.	U
Trichlorofluoromethane	120.		J
1,1-Dichloroethene		125.	U
Methylene Chloride	446.		
trans-1,2-Dichloroethene		125.	U
1,1-Dichloroethane	4483.		
cis-1,2-Dichloroethene		125.	U
2,2-Dichloropropane		125.	U
Chloroform		125.	U
Bromochloromethane		125.	U
1,1,1-Trichloroethane	423.		
1,1-Dichloropropene		125.	U
Carbon Tetrachloride		125.	U
1,2-Dichloroethane		125.	U
Benzene	28.		J
Trichloroethene	577.		
1,2-Dichloropropane		125.	U
Bromodichloromethane		125.	U
Dibromomethane		125.	U
Toluene	26.		J
1,1,2-Trichloroethane		125.	U
1,3-Dichloropropane		125.	U
Tetrachloroethene	677.		
Dibromochloromethane		125.	U
1,2-Dibromoethane -- EDB		125.	U
Chlorobenzene		125.	U
Ethylbenzene	431.		
1,1,1,2-Tetrachloroethane		125.	U
m + p-Xylenes	240.		

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AA050	Method Number:	524.2M
Lab Sample Name:	HEAI#8681 PBS1131SS2	Date Analyzed:	900109
Matrix:	Soil	Date Collected:	891229
Dilution Factor:	125.0	Date Received:	891229

Sample Info.: GC/MS A,TN,ESI7019,5ul 524.2,4gm/100UL/5ML

U = not detected
J = estimated value, below detection limit
MS = MS/MSD compound

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene	80.		J
Styrene		125.	U
1,1,2,2-Tetrachloroethane		125.	U
Isopropylbenzene		125.	U
Bromoform		125.	U
1,2,3-Trichloropropane		125.	U
n-Propylbenzene	71.		J
Bromobenzene		125.	U
1,3,5-Trimethylbenzene	692.		
4-Chlorotoluene		125.	U
2-Chlorotoluene		125.	U
tert-Butylbenzene	183.		
1,2,4-Trimethylbenzene	1000.		
sec-Butylbenzene	125.		
p-Isopropyltoluene	337.		
1,3-Dichlorobenzene		125.	U
1,4-Dichlorobenzene		125.	U
n-Butylbenzene		125.	U
1,2-Dichlorobenzene		125.	U
1,2-Dibromo-3-Chloropropane		125.	U
1,2,4-Trichlorobenzene	185.		
Hexachlorobutadiene	82.		J
Naphthalene	3070.		
1,2,3-Trichlorobenzene	143.		

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AA064	Method Number:	524.2M
Lab Sample Name:	HEAI#8682 PBS1131SS3	Date Analyzed:	900110
Matrix:	Soil	Date Collected:	891228
Dilution Factor:	125.0	Date Received:	891229

Sample Info.: GC/MS A,TN,ESI7019,Sul 524.2,4gm,100UL/5ML

U = not detected
J = estimated value, below detection limit
MS = MS/MSD compound

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		125.	U
Chloromethane		125.	U
Vinyl Chloride		125.	U
Bromomethane		125.	U
Chloroethane		125.	U
Trichlorofluoromethane		125.	U
1,1-Dichloroethene		125.	U
Methylene Chloride		125.	U
trans-1,2-Dichloroethene		125.	U
1,1-Dichloroethane		125.	U
cis-1,2-Dichloroethene		125.	U
2,2-Dichloropropane		125.	U
Chloroform		125.	U
Bromochloromethane		125.	U
1,1,1-Trichloroethane	891.		
1,1-Dichloropropene		125.	U
Carbon Tetrachloride	91.		J
1,2-Dichloroethane		125.	U
Benzene		125.	U
Trichloroethene		125.	U
1,2-Dichloropropane		125.	U
Bromodichloromethane		125.	U
Dibromomethane		125.	U
Toluene		125.	U
1,1,2-Trichloroethane		125.	U
1,3-Dichloropropane		125.	U
Tetrachloroethene	1043.		
Dibromochloromethane		125.	U
1,2-Dibromoethane - EDB		125.	U
Chlorobenzene		125.	U
Ethylbenzene		125.	U
1,1,1,2-Tetrachloroethane		125.	U
m + p-Xylenes		125.	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AA064	Method Number:	524.2M
Lab Sample Name:	HEAI#8682 PBS1131SS3	Date Analyzed:	900110
Matrix:	Soil	Date Collected:	891228
Dilution Factor:	125.0	Date Received:	891229

Sample Info.: GC/MS A,TN,ESI7019,5ul 524.2,4gm,100UL/5ML

U = not detected
J = estimated value, below detection limit
MS = MS/MSD compound

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		125.	U
Styrene		125.	U
1,1,2,2-Tetrachloroethane		125.	U
Isopropylbenzene		125.	U
Bromoform		125.	U
1,2,3-Trichloropropane		125.	U
n-Propylbenzene		125.	U
Bromobenzene		125.	U
1,3,5-Trimethylbenzene	269.		
4-Chlorotoluene		125.	U
2-Chlorotoluene		125.	U
tert-Butylbenzene	240.		
1,2,4-Trimethylbenzene	598.		
sec-Butylbenzene	67.		J
p-Isopropyltoluene		125.	U
1,3-Dichlorobenzene		125.	U
1,4-Dichlorobenzene		125.	U
n-Butylbenzene		125.	U
1,2-Dichlorobenzene		125.	U
1,2-Dibromo-3-Chloropropane		125.	U
1,2,4-Trichlorobenzene	218.		
Hexachlorobutadiene		125.	U
Naphthalene	3523.		
1,2,3-Trichlorobenzene	490.		

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AA065	Method Number:	524.2M
Lab Sample Name:	HEAI#8683 PBS1131SS4	Date Analyzed:	900110
Matrix:	Soil	Date Collected:	891228
Dilution Factor:	125.0	Date Received:	891229

Sample Info.: GC/MS A,TN,ESI7019,5ul 524.2,4gm,100UL/5ML

U = not detected
J = estimated value, below detection limit
MS = MS/MSD compound

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		125.	U
Chloromethane		125.	U
Vinyl Chloride		125.	U
Bromomethane		125.	U
Chloroethane		125.	U
Trichlorofluoromethane		125.	U
1,1-Dichloroethene		125.	U
Methylene Chloride		125.	U
trans-1,2-Dichloroethene		125.	U
1,1-Dichloroethane		125.	U
cis-1,2-Dichloroethene		125.	U
2,2-Dichloropropane		125.	U
Chloroform		125.	U
Bromochloromethane		125.	U
1,1,1-Trichloroethane		125.	U
1,1-Dichloropropene		125.	U
Carbon Tetrachloride		125.	U
1,2-Dichloroethane		125.	U
Benzene	32.		J
Trichloroethene		125.	U
1,2-Dichloropropane		125.	U
Bromodichloromethane	23.		J
Dibromomethane		125.	U
Toluene	17.		J
1,1,2-Trichloroethane	143.		
1,3-Dichloropropane		125.	U
Tetrachloroethene		125.	U
Dibromochloromethane		125.	U
1,2-Dibromoethane - EDB		125.	U
Chlorobenzene		125.	U
Ethylbenzene	1093.		
1,1,1,2-Tetrachloroethane		125.	U
m + p-Xylenes	739.		

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AA065	Method Number:	524.2M
Lab Sample Name:	HEAI#8683 PBS1131SS4	Date Analyzed:	900110
Matrix:	Soil	Date Collected:	891228
Dilution Factor:	125.0	Date Received:	891229

Sample Info.: GC/MS A,TN,ESI7019,5ul 524.2,4gm,100UL/5ML

U = not detected
J = estimated value, below detection limit
MS = MS/MSD compound

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene	413.		
Styrene		125.	U
1,1,2,2-Tetrachloroethane	194.		
Isopropylbenzene		125.	U
Bromoform		125.	U
1,2,3-Trichloropropane		125.	U
n-Propylbenzene		125.	U
Bromobenzene		125.	U
1,3,5-Trimethylbenzene	528.		
4-Chlorotoluene		125.	U
2-Chlorotoluene		125.	U
tert-Butylbenzene	129.		
1,2,4-Trimethylbenzene	1122.		
sec-Butylbenzene		125.	U
p-Isopropyltoluene		125.	U
1,3-Dichlorobenzene		125.	U
1,4-Dichlorobenzene		125.	U
n-Butylbenzene		125.	U
1,2-Dichlorobenzene		125.	U
1,2-Dibromo-3-Chloropropane		125.	U
1,2,4-Trichlorobenzene		125.	U
Hexachlorobutadiene		125.	U
Naphthalene	4935.		
1,2,3-Trichlorobenzene	385.		

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AA053	Method Number:	524.2M
Lab Sample Name:	HEAI#8684 PBS1131SS5	Date Analyzed:	900109
Matrix:	Soil	Date Collected:	891228
Dilution Factor:	125.0	Date Received:	891229

Sample Info.: GC/MS A,TN,ESI7019,Sul 524.2,4gm,100UL/5ML

U = not detected
J = estimated value, below detection limit
MS = MS/MSD compound

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		125.	U
Chloromethane		125.	U
Vinyl Chloride		125.	U
Bromomethane		125.	U
Chloroethane		125.	U
Trichlorofluoromethane		125.	U
1,1-Dichloroethene		125.	U
Methylene Chloride	503.		
trans-1,2-Dichloroethene		125.	U
1,1-Dichloroethane		125.	U
cis-1,2-Dichloroethene		125.	U
2,2-Dichloropropane		125.	U
Chloroform		125.	U
Bromochloromethane		125.	U
1,1,1-Trichloroethane		125.	U
1,1-Dichloropropene		125.	U
Carbon Tetrachloride		125.	U
1,2-Dichloroethane		125.	U
Benzene	16.		J
Trichloroethene	836.		
1,2-Dichloropropane		125.	U
Bromodichloromethane		125.	U
Dibromomethane		125.	U
Toluene	23.		J
1,1,2-Trichloroethane		125.	U
1,3-Dichloropropane		125.	U
Tetrachloroethene		125.	U
Dibromochloromethane		125.	U
1,2-Dibromoethane - EDB		125.	U
Chlorobenzene		125.	U
Ethylbenzene	329.		
1,1,1,2-Tetrachloroethane		125.	U
m + p-Xylenes	566.		

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AA053	Method Number:	524.2M
Lab Sample Name:	HEAI#8684 PBS1131SSS	Date Analyzed:	900109
Matrix:	Soil	Date Collected:	891228
Dilution Factor:	125.0	Date Received:	891229

Sample Info.: GC/MS A,TN,ESI7019,Sul 524.2,4gm,100UL/5ML

U = not detected
J = estimated value, below detection limit
MS = MS/MSD compound

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene	170.		
Styrene		125.	U
1,1,2,2-Tetrachloroethane		125.	U
Isopropylbenzene	128.		
Bromoform		125.	U
1,2,3-Trichloropropane		125.	U
n-Propylbenzene	289.		
Bromobenzene		125.	U
1,3,5-Trimethylbenzene	1685.		
4-Chlorotoluene		125.	U
2-Chlorotoluene		125.	U
tert-Butylbenzene	422.		
1,2,4-Trimethylbenzene	2348.		
sec-Butylbenzene	430.		
p-Isopropyltoluene	806.		
1,3-Dichlorobenzene		125.	U
1,4-Dichlorobenzene		125.	U
n-Butylbenzene		125.	U
1,2-Dichlorobenzene		125.	U
1,2-Dibromo-3-Chloropropane		125.	U
1,2,4-Trichlorobenzene		125.	U
Hexachlorobutadiene		125.	U
Naphthalene	6332.		
1,2,3-Trichlorobenzene	45.		J

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AA066	Method Number:	524.2M
Lab Sample Name:	HEAI#8685 PBS1131SS6	Date Analyzed:	900110
Matrix:	Soil	Date Collected:	891228
Dilution Factor:	125.0	Date Received:	891229

Sample Info.: GC/MS A,TN,ESI7019,5ul 524.2,4gm,100UL/5ML

U = not detected
J = estimated value, below detection limit
MS = MS/MSD compound

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		125.	U
Chloromethane		125.	U
Vinyl Chloride		125.	U
Bromomethane		125.	U
Chloroethane		125.	U
Trichlorofluoromethane		125.	U
1,1-Dichloroethene		125.	U
Methylene Chloride		125.	U
trans-1,2-Dichloroethene		125.	U
1,1-Dichloroethane		125.	U
cis-1,2-Dichloroethene		125.	U
2,2-Dichloropropane		125.	U
Chloroform		125.	U
Bromochloromethane		125.	U
1,1,1-Trichloroethane		125.	U
1,1-Dichloropropene		125.	U
Carbon Tetrachloride		125.	U
1,2-Dichloroethane		125.	U
Benzene		125.	U
Trichloroethene		125.	U
1,2-Dichloropropane		125.	U
Bromodichloromethane		125.	U
Dibromomethane		125.	U
Toluene		125.	U
1,1,2-Trichloroethane		125.	U
1,3-Dichloropropane		125.	U
Tetrachloroethene		125.	U
Dibromochloromethane		125.	U
1,2-Dibromoethane - EDB		125.	U
Chlorobenzene		125.	U
Ethylbenzene		125.	U
1,1,1,2-Tetrachloroethane		125.	U
m + p-Xylenes		125.	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AA066	Method Number:	524.2M
Lab Sample Name:	HEAI#8685 PBS1131SS6	Date Analyzed:	900110
Matrix:	Soil	Date Collected:	891228
Dilution Factor:	125.0	Date Received:	891229

Sample Info.: GC/MS A,TN,ESI7019,5ul 524.2,4gm,100UL/5ML

U = not detected
J = estimated value, below detection limit
MS = MS/MSD compound

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		125.	U
Styrene		125.	U
1,1,2,2-Tetrachloroethane	463.		
Isopropylbenzene		125.	U
Bromoform		125.	U
1,2,3-Trichloropropane		125.	U
n-Propylbenzene		125.	U
Bromobenzene		125.	U
1,3,5-Trimethylbenzene	166.		
4-Chlorotoluene		125.	U
2-Chlorotoluene		125.	U
tert-Butylbenzene		125.	U
1,2,4-Trimethylbenzene	270.		
sec-Butylbenzene		125.	U
p-Isopropyltoluene		125.	U
1,3-Dichlorobenzene		125.	U
1,4-Dichlorobenzene		125.	U
n-Butylbenzene		125.	U
1,2-Dichlorobenzene		125.	U
1,2-Dibromo-3-Chloropropane		125.	U
1,2,4-Trichlorobenzene		125.	U
Hexachlorobutadiene		125.	U
Naphthalene	1743.		
1,2,3-Trichlorobenzene	178.		

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AA055	Method Number:	524.2M
Lab Sample Name:	HEAI#8686 PBS1131SS7	Date Analyzed:	900109
Matrix:	Soil	Date Collected:	891228
Dilution Factor:	125.0	Date Received:	891229

Sample Info.: GC/MS A,TN,ESI7019,Sul 524.2,4gm,100UL/5ML

U = not detected
J = estimated value, below detection limit
MS = MS/MSD compound

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane	24.		J
Chloromethane		125.	U
Vinyl Chloride		125.	U
Bromomethane		125.	U
Chloroethane		125.	U
Trichlorofluoromethane	112.		J
1,1-Dichloroethene		125.	U
Methylene Chloride	426.		
trans-1,2-Dichloroethene		125.	U
1,1-Dichloroethane		125.	U
cis-1,2-Dichloroethene		125.	U
2,2-Dichloropropane		125.	U
Chloroform		125.	U
Bromochloromethane		125.	U
1,1,1-Trichloroethane		125.	U
1,1-Dichloropropene		125.	U
Carbon Tetrachloride		125.	U
1,2-Dichloroethane		125.	U
Benzene	25.		J
Trichloroethene	846.		
1,2-Dichloropropane		125.	U
Bromodichloromethane		125.	U
Dibromomethane		125.	U
Toluene	27.		J
1,1,2-Trichloroethane		125.	U
1,3-Dichloropropane		125.	U
Tetrachloroethene		125.	U
Dibromochloromethane		125.	U
1,2-Dibromoethane - EDB		125.	U
Chlorobenzene		125.	U
Ethylbenzene	548.		
1,1,1,2-Tetrachloroethane	41.		J
m + p-Xylenes	647.		

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AA055	Method Number:	524.2M
Lab Sample Name:	HEAI#8686 PBS1131SS7	Date Analyzed:	900109
Matrix:	Soil	Date Collected:	891229
Dilution Factor:	125.0	Date Received:	891229

Sample Info.: GC/MS A,TN,ESI7019,Sul 524.2,4gm,100UL/5ML

U = not detected
J = estimated value, below detection limit
MS = MS/MSD compound

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene	424.		
Styrene		125.	U
1,1,2,2-Tetrachloroethane	231.		
Isopropylbenzene	176.		
Bromoform		125.	U
1,2,3-Trichloropropane		125.	U
n-Propylbenzene	369.		
Bromobenzene		125.	U
1,3,5-Trimethylbenzene	2953.		
4-Chlorotoluene		125.	U
2-Chlorotoluene		125.	U
tert-Butylbenzene	645.		
1,2,4-Trimethylbenzene	3909.		
sec-Butylbenzene	682.		
p-Isopropyltoluene	1503.		
1,3-Dichlorobenzene		125.	U
1,4-Dichlorobenzene		125.	U
n-Butylbenzene		125.	U
1,2-Dichlorobenzene		125.	U
1,2-Dibromo-3-Chloropropane		125.	U
1,2,4-Trichlorobenzene		125.	U
Hexachlorobutadiene		125.	U
Naphthalene	7901.		
1,2,3-Trichlorobenzene	115.		J

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AA056	Method Number:	524.2M
Lab Sample Name:	HEAI#8687 PBS1131SS8	Date Analyzed:	900109
Matrix:	Soil	Date Collected:	891228
Dilution Factor:	125.0	Date Received:	891229

Sample Info.: GC/MS A,TN,ESI7019,5ul 524.2,4gm,100UL/5ML

U = not detected
J = estimated value, below detection limit
MS = MS/MSD compound

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane	36.		J
Chloromethane		125.	U
Vinyl Chloride		125.	U
Bromomethane		125.	U
Chloroethane		125.	U
Trichlorofluoromethane		125.	U
1,1-Dichloroethene		125.	U
Methylene Chloride	205.		
trans-1,2-Dichloroethene		125.	U
1,1-Dichloroethane		125.	U
cis-1,2-Dichloroethene		125.	U
2,2-Dichloropropane		125.	U
Chloroform		125.	U
Bromochloromethane		125.	U
1,1,1-Trichloroethane		125.	U
1,1-Dichloropropene		125.	U
Carbon Tetrachloride		125.	U
1,2-Dichloroethane		125.	U
Benzene	25.		J
Trichloroethene		125.	U
1,2-Dichloropropane		125.	U
Bromodichloromethane		125.	U
Dibromomethane		125.	U
Toluene	41.		J
1,1,2-Trichloroethane		125.	U
1,3-Dichloropropane		125.	U
Tetrachloroethene		125.	U
Dibromochloromethane		125.	U
1,2-Dibromoethane - EDB		125.	U
Chlorobenzene		125.	U
Ethylbenzene	543.		
1,1,1,2-Tetrachloroethane	375.		
m + p-Xylenes	1115.		

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AA056	Method Number:	524.2M
Lab Sample Name:	HEAI#8687 PBS1131SS8	Date Analyzed:	900109
Matrix:	Soil	Date Collected:	891228
Dilution Factor:	125.0	Date Received:	891229

Sample Info.: GC/MS A,TN,ESI7019,Sul 524.2,4gm,100UL/5ML

U = not detected
J = estimated value, below detection limit
MS = MS/MSD compound

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene	703.		
Styrene		125.	U
1,1,2,2-Tetrachloroethane	283.		
Isopropylbenzene	380.		
Bromoform		125.	U
1,2,3-Trichloropropane		125.	U
n-Propylbenzene	612.		
Bromobenzene		125.	U
1,3,5-Trimethylbenzene	4365.		
4-Chlorotoluene		125.	U
2-Chlorotoluene		125.	U
tert-Butylbenzene	618.		
1,2,4-Trimethylbenzene	4413.		
sec-Butylbenzene	858.		
p-Isopropyltoluene	1854.		
1,3-Dichlorobenzene		125.	U
1,4-Dichlorobenzene		125.	U
n-Butylbenzene		125.	U
1,2-Dichlorobenzene	31.		J
1,2-Dibromo-3-Chloropropane		125.	U
1,2,4-Trichlorobenzene		125.	U
Hexachlorobutadiene		125.	U
Naphthalene	13388.		
1,2,3-Trichlorobenzene	198.		

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AA067	Method Number:	524.2M
Lab Sample Name:	HEAI#8688 PBS1131SS9	Date Analyzed:	900110
Matrix:	Soil	Date Collected:	891228
Dilution Factor:	125.0	Date Received:	891229

Sample Info.: GC/MS A,TN,ESI7019,Sul 524.2,4gm,100UL/5ML

U = not detected
J = estimated value, below detection limit
MS = MS/MSD compound

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		125.	U
Chloromethane		125.	U
Vinyl Chloride		125.	U
Bromomethane		125.	U
Chloroethane		125.	U
Trichlorofluoromethane		125.	U
1,1-Dichloroethene		125.	U
Methylene Chloride		125.	U
trans-1,2-Dichloroethene		125.	U
1,1-Dichloroethane		125.	U
cis-1,2-Dichloroethene		125.	U
2,2-Dichloropropane		125.	U
Chloroform		125.	U
Bromochloromethane		125.	U
1,1,1-Trichloroethane	123.		J
1,1-Dichloropropene		125.	U
Carbon Tetrachloride		125.	U
1,2-Dichloroethane		125.	U
Benzene		125.	U
Trichloroethene	1019.		
1,2-Dichloropropane		125.	U
Bromodichloromethane		125.	U
Dibromomethane		125.	U
Toluene		125.	U
1,1,2-Trichloroethane		125.	U
1,3-Dichloropropane		125.	U
Tetrachloroethene		125.	U
Dibromochloromethane		125.	U
1,2-Dibromoethane - EDB		125.	U
Chlorobenzene		125.	U
Ethylbenzene	140.		
1,1,1,2-Tetrachloroethane		125.	U
m + p-Xylenes	38.		J

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AA067	Method Number:	524.2M
Lab Sample Name:	HEAI#8688 PBS1131SS9	Date Analyzed:	900110
Matrix:	Soil	Date Collected:	891228
Dilution Factor:	125.0	Date Received:	891229

Sample Info.: GC/MS A,TN,ESI7019,Sul 524.2,4gm,100UL/5ML

U = not detected
J = estimated value, below detection limit
MS = MS/MSD compound

Compound	Concentration ug/Kg	Detection Limit
o-Xylene		125. U
Styrene		125. U
1,1,2,2-Tetrachloroethane		125. U
Isopropylbenzene		125. U
Bromoform		125. U
1,2,3-Trichloropropane		125. U
n-Propylbenzene		125. U
Bromobenzene		125. U
1,3,5-Trimethylbenzene	178.	
4-Chlorotoluene		125. U
2-Chlorotoluene		125. U
tert-Butylbenzene		125. U
1,2,4-Trimethylbenzene	204.	
sec-Butylbenzene		125. U
p-Isopropyltoluene		125. U
1,3-Dichlorobenzene		125. U
1,4-Dichlorobenzene		125. U
n-Butylbenzene		125. U
1,2-Dichlorobenzene		125. U
1,2-Dibromo-3-Chloropropane		125. U
1,2,4-Trichlorobenzene	193.	
Hexachlorobutadiene		125. U
Naphthalene	1255.	
1,2,3-Trichlorobenzene		125. U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AA043	Method Number:	524.2M
Lab Sample Name:	HEAI# 2S PBS11315S10	Date Analyzed:	900105
Matrix:	Soil	Date Collected:	122989
Dilution Factor:	2.5	Date Received:	010390

Sample Info.: GC/MS A,TN,ESI701S,5ul 524.2,2gm,LL/5ML

U = not detected
J = estimated value, below detection limit
MS = MS/MSD compound

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		3.	U
Chloromethane		3.	U
Vinyl Chloride		3.	U
Bromomethane		3.	U
Chloroethane	990.		
Trichlorofluoromethane		3.	U
1,1-Dichloroethene		3.	U
Methylene Chloride	25.		
trans-1,2-Dichloroethene		3.	U
1,1-Dichloroethane	6120.		
cis-1,2-Dichloroethene		3.	U
2,2-Dichloropropane		3.	U
Chloroform	1.		J
Bromochloromethane		3.	U
1,1,1-Trichloroethane		3.	U
1,1-Dichloropropene		3.	U
Carbon Tetrachloride		3.	U
1,2-Dichloroethane	176.		
Benzene	2.		J
Trichloroethene		3.	U
1,2-Dichloropropane		3.	U
Bromodichloromethane		3.	U
Dibromomethane		3.	U
Toluene	2.		J
1,1,2-Trichloroethane		3.	U
1,3-Dichloropropane		3.	U
Tetrachloroethene		3.	U
Dibromochloromethane		3.	U
1,2-Dibromoethane - EDB		3.	U
Chlorobenzene		3.	U
Ethylbenzene	11.		
1,1,1,2-Tetrachloroethane	2.		J
m + p-Xylenes	19.		

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AA043	Method Number:	524.2M
Lab Sample Name:	HEAI# 2S PBS1131SS10	Date Analyzed:	900105
Matrix:	Soil	Date Collected:	122989
Dilution Factor:	2.5	Date Received:	010390

Sample Info.: GC/MS A,TN,ESI7019,5ul 524.2,2gm,LL/5ML

U = not detected
J = estimated value, below detection limit
MS = MS/MSD compound

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene	14.		
Styrene		3.	U
1,1,2,2-Tetrachloroethane	5.		
Isopropylbenzene	10.		
Bromoform		3.	U
1,2,3-Trichloropropane	9.		
n-Propylbenzene	12.		
Bromobenzene		3.	U
1,3,5-Trimethylbenzene	106.		
4-Chlorotoluene		3.	U
2-Chlorotoluene		3.	U
tert-Butylbenzene	23.		
1,2,4-Trimethylbenzene	115.		
sec-Butylbenzene	11.		
p-Isopropyltoluene	27.		
1,3-Dichlorobenzene	2.		J
1,4-Dichlorobenzene	2.		J
n-Butylbenzene		3.	U
1,2-Dichlorobenzene		3.	U
1,2-Dibromo-3-Chloropropane		3.	U
1,2,4-Trichlorobenzene	3.		
Hexachlorobutadiene		3.	U
Naphthalene	546.		
1,2,3-Trichlorobenzene	5.		

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AA044	Method Number:	524.2M
Lab Sample Name:	HEAI# 30 FBS11315S11	Date Analyzed:	900105
Matrix:	Soil	Date Collected:	122989
Dilution Factor:	2.5	Date Received:	010390

Sample Info.: GC/MS A,TN,ESI7015,SUI 524.2,25gm,LL/SML

U = not detected
J = estimated value, below detection limit
MS = MS/MSD compound

Compound	Concentration ug/Kg	Detection Limit
Dichlorodifluoromethane	61.	
Chloromethane		3. U
Vinyl Chloride		3. U
Bromomethane		3. U
Chloroethane	105.	
Trichlorofluoromethane	25.	
1,1-Dichloroethene		3. U
Methylene Chloride	105.	
trans-1,2-Dichloroethene	17.	
1,1-Dichloroethane	673.	
cis-1,2-Dichloroethene	165.	
2,2-Dichloropropane		3. U
Chloroform		3. U
Bromochloromethane		3. U
1,1,1-Trichloroethane		3. U
1,1-Dichloropropene		3. U
Carbon Tetrachloride		3. U
1,2-Dichloroethane		3. U
Benzene		3. U
Trichloroethene	997.	
1,2-Dichloropropane		3. U
Bromodichloromethane		3. U
Dibromomethane		3. U
Toluene	6.	
1,1,2-Trichloroethane		3. U
1,3-Dichloropropane		3. U
Tetrachloroethene		3. U
Dibromochloromethane		3. U
1,2-Dibromoethane - EDB		3. U
Chlorobenzene		3. U
Ethylbenzene	11.	
1,1,1,2-Tetrachloroethane		3. U
m + p-Xylenes	4.	

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AA044	Method Number:	524.2M
Lab Sample Name:	HEAI# 30 FBS1131SS11	Date Analyzed:	900105
Matrix:	Soil	Date Collected:	122989
Dilution Factor:	2.5	Date Received:	010390

Sample Info.: GC/MS A,TN,ESI7019,5ul 524.2,25gm,LL/5ML

U = not detected
J = estimated value, below detection limit
MS = MS/MSD compound

Compound	Concentration ug/Kg	Detection Limit
o-Xylene	1.	J
Styrene		3. U
1,1,2,2-Tetrachloroethane	12.	
Isopropylbenzene		3. U
Bromoform		3. U
1,2,3-Trichloropropane		3. U
n-Propylbenzene		3. U
Bromobenzene		3. U
1,3,5-Trimethylbenzene		3. U
4-Chlorotoluene		3. U
2-Chlorotoluene		3. U
tert-Butylbenzene	15.	
1,2,4-Trimethylbenzene		3. U
sec-Butylbenzene		3. U
p-Isopropyltoluene		3. U
1,3-Dichlorobenzene		3. U
1,4-Dichlorobenzene		3. U
n-Butylbenzene		3. U
1,2-Dichlorobenzene		3. U
1,2-Dibromo-3-Chloropropane		3. U
1,2,4-Trichlorobenzene		3. U
Hexachlorobutadiene		3. U
Naphthalene	223.	
1,2,3-Trichlorobenzene	6.	

PBS 003-~~344~~ 39

CLOSURE REPORT
FOR NASA PLUM BROOK STATION
DIESEL TANK - BUILDING 7132
TANK NO. 36

PREPARED BY:
WARNER/OSBORN/PARDEE

FOR:
NASA LEWIS RESEARCH CENTER
PLUM BROOK STATION
6100 COLUMBUS AVENUE
SANDUSKY, OH 44870

7/90

Introduction

One 9000-gallon diesel fuel tank, the underground piping and a service pump were removed from the NASA Lewis Research Center's Plum Brook Station on 16 July, 1990. The location is shown in Figure 1. The tank was inerted and cleaned by Samsel Services and removed by Independence Excavating under contract to Turner Construction, which is a subcontractor to Warner/Osborn/Pardee. The removal, and sampling program was directed by James E. Park of Warner/Osborn/Pardee. The removal was observed by Mr Paul Clapp of the Bureau of Underground Storage Tank Regulation, the State of Ohio.

The sampling was performed by Mr Brad Boyer of OHM Remedial Services. The samples were immediately taken to OHM's ETC lab in Findlay, OH for analysis. A water sample was taken by Mr. Mike Slivka of Warner/Osborn/Pardee on 24 July, 1990 after the excavation had filled with groundwater and rainwater. This sample was delivered to OHM's ETC lab on 24 July, 1990. Strict Chain-of-Custody procedures were followed in each case.

Field Observations

A plan layout of the tank area is shown in Figure 2. The removal began with the excavation of the cover material above the tank. After the tank was exposed, it was discovered that the tank was not fiberglass as expected, but steel. The fill and supply piping was removed and LEL and O_2 readings were taken. The readings indicated that there was sufficient oxygen and only low levels of volatile organics in the tank. A hole was cut to allow entry for cleaning. The tank was pumped of residual diesel fuel and decontaminated with a cleaning solution.

Upon removal of the tank, the hole appeared dry. A very slight discoloration was evident below the tank. The tank had been backfilled with a medium-course sand, which appeared clean along the sides of the excavation. Photoionization Detector (PID) readings taken of the excavated material indicated that volatile organics were not present. Following the removal of the tank groundwater began seeping into the excavation. The majority was removed along with the additional soil taken from below the tank bottom. Approximately three (3) feet of soil was removed from the hole below the original tank bottom. The wet soil was placed in a plastic-lined containment area.

Due to the groundwater seepage and the instability of the sand around the excavation, the soil samples taken from the bottom of the hole were collected from soil removed by the backhoe. Three buckets were removed, one from each end of the excavation and one from the center. The samples were taken at a depth of approximately fourteen (14) feet or three feet below the original tank bottom. A representative sample was taken from each bucket using a wooden tongue depressor. All samples were

immediately placed in 8 oz. I-Chem sample containers and sealed with teflon coated lids.

An H-nu PID instrument was calibrated prior to use according to the manufacturer's specifications by Mr Boyer. The instrument probe was placed directly above the soil prior to all readings. All PID readings of the excavated soil were at background levels (< 4 ppm).

One soil sample was taken along the underground supply line and one sample was taken directly adjacent to the service pump pad. The supply line sample was taken after the line had been exposed and removed, at a depth of approximately three feet. The sample at the service pump was taken prior to its removal. These samples were taken using a hand-driven split-spoon sampler. The locations of these samples are shown in Figure 2.

A composite sample of the excavated material was taken to determine its suitability for disposal in a sanitary landfill.

Sample Results

The results of the analyses of the five soil samples and of the groundwater/rainwater sample are included in Table 1. The original data sheets are attached to this report. The sample locations/identifications are as follows:

Sample#	Location
001	East end of tank pit, 13' depth
002	Middle of tank pit, 13' depth
003	West end of tank pit, 13' depth
004	Composite of excavated material
005	Adjacent to service pump, 1.5' depth
006	20' along underground supply pipe line, 3' depth.

Descriptions of the analytical methods used to determine the concentrations of TPH, BETX, flash point, pH and metals are found in the attached analytical report. The associated quality assurance data and the chain of custody form are also included in this attachment.

TABLE 1. Sampling Results Summary

	Sample Number						
Analysis	001	002	003	004	006	007	water
pH	8.02	7.77	7.64	8.2	8.71	8.70	----
TPH	nd	8.28	nd	nd	1020	18.9	nd
Benz.	nd	nd	nd	nd	nd	nd	nd
Eth. Benzene	nd	nd	nd	nd	nd	nd	nd
Toluene	nd	nd	nd	nd	nd	nd	nd
Xylenes	nd	nd	nd	nd	nd	nd	nd
Flash Pt. °C	>93	>93	>93	>93	>93	>93	---
Tot. Pb	4.35	3.58	3.77	----	18.8	11.5	---

CLOSURE ASSESSMENT

Both the analytical data and the field observations indicate that the excavation is clean. Sample 002 did contain 8.28 mg/Kg TPH, but the Plum Brook site is known to have high background levels of petroleum hydrocarbon due to the presence of oil-containing shale in the near-surface formations. The groundwater which filled the pit did not contain pertrolem hydrocarbons or BETX above background levels.

The high TPH value recorded at the service pump was probably due to surface spillage. The sample (005) was collected prior to removal of the pump, the majority of the contamination should have been removed with the removal of the concrete pad and adjacent soil.

NASA intends to pump the groudwater/rainwater from the excavation and backfill with sand. The excavated soil will be hauled to the BFI-Ottawa Co. landfill upon acceptance.

<u>Names and Addresses</u>

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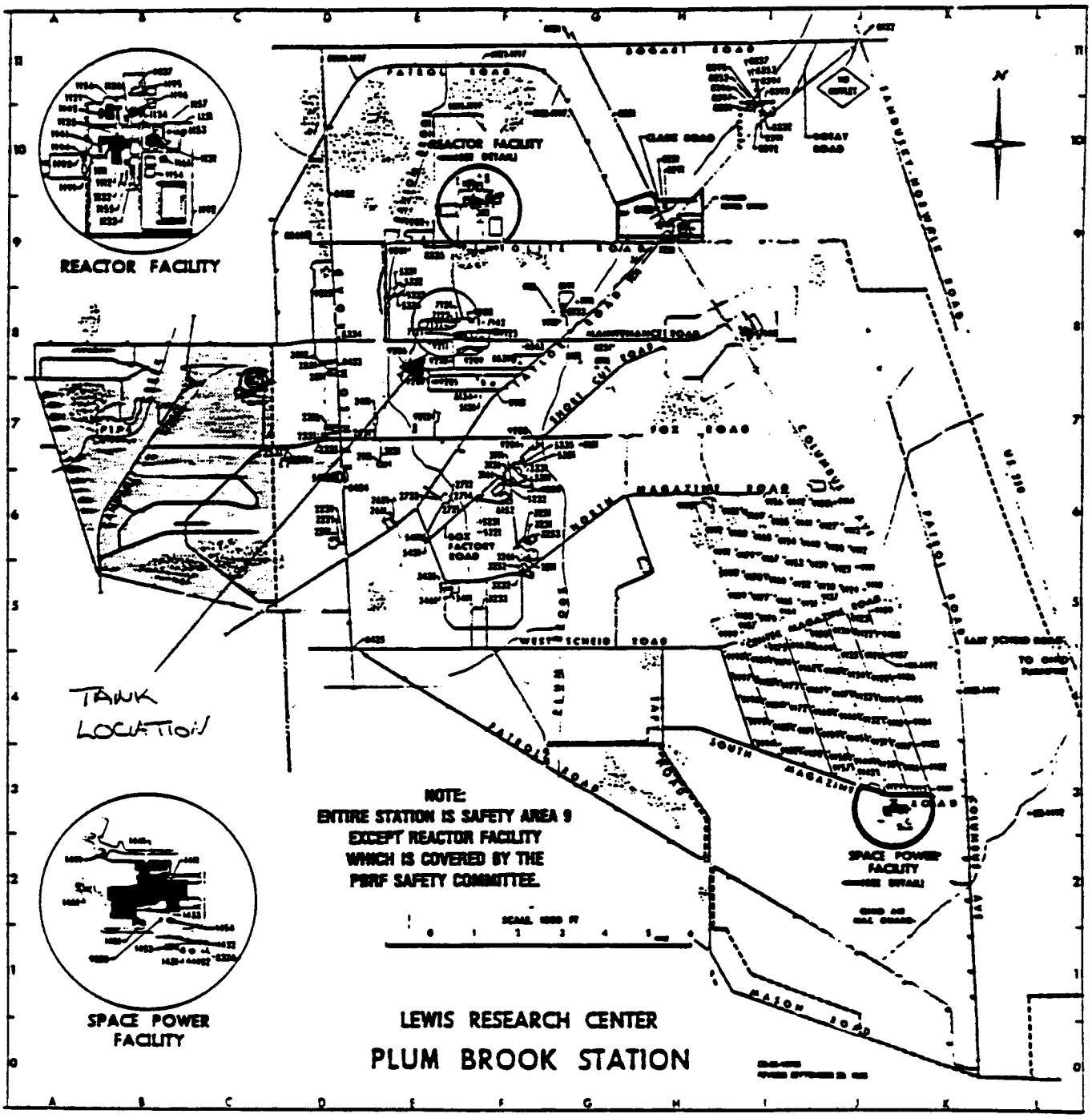

FIGURE 1. NASA DIESEL TANK LOCATION

immediately placed in 8 oz. I-Chem sample containers and sealed with teflon coated lids.

An H-nu PID instrument was calibrated prior to use according to the manufacturer's specifications by Mr Boyer. The instrument probe was placed directly above the soil prior to all readings. All PID readings of the excavated soil were at background levels (< 4 ppm).

One soil sample was taken along the underground supply line and one sample was taken directly adjacent to the service pump pad. The supply line sample was taken after the line had been exposed and removed, at a depth of approximately three feet. The sample at the service pump was taken prior to its removal. These samples were taken using a hand-driven split-spoon sampler. The locations of these samples are shown in Figure 2.

A composite sample of the excavated material was taken to determine its suitability for disposal in a sanitary landfill.

Sample Results

The results of the analyses of the five soil samples and of the groundwater/rainwater sample are included in Table 1. The original data sheets are attached to this report. The sample locations/identifications are as follows:

Sample#	Location
001	East end of tank pit, 13' depth
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003	West end of tank pit, 13' depth
004	Composite of excavated material
005	Adjacent to service pump, 1.5' depth
006	20' along underground supply pipe line, 3' depth.

Descriptions of the analytical methods used to determine the concentrations of TPH, BETX, flash point, pH and metals are found in the attached analytical report. The associated quality assurance data and the chain of custody form are also included in this attachment.

CLOSURE ASSESSMENT

Both the analytical data and the field observations indicate that the excavation is clean. Sample 002 did contain 8.28 mg/Kg TPH, but the Plum Brook site is known to have high background levels of petroleum hydrocarbon due to the presence of oil-containing shale in the near-surface formations. The groundwater which filled the pit did not contain pertrolem hydrocarbons or BETX above background levels.

The high TPH value recorded at the service pump was probably due to surface spillage. The sample (005) was collected prior to removal of the pump, the majority of the contamination should have been removed with the removal of the concrete pad and adjacent soil.

NASA intends to pump the groudwater/rainwater from the excavation and backfill with sand. The excavated soil will be hauled to the BFI-Ottawa Co. landfill upon acceptance.

Names and Addresses

NASA Project Manager
Ron Zurawski
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(216) 433-5458

Warner/Osborn/Pardee
James E. Park
Environmental Engineer
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(216) 835-9400

ETC Labs (OHM Remedial Services)
Robert Schock
Lab Manager
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Findlay, OH 45839
(419) 423-3526

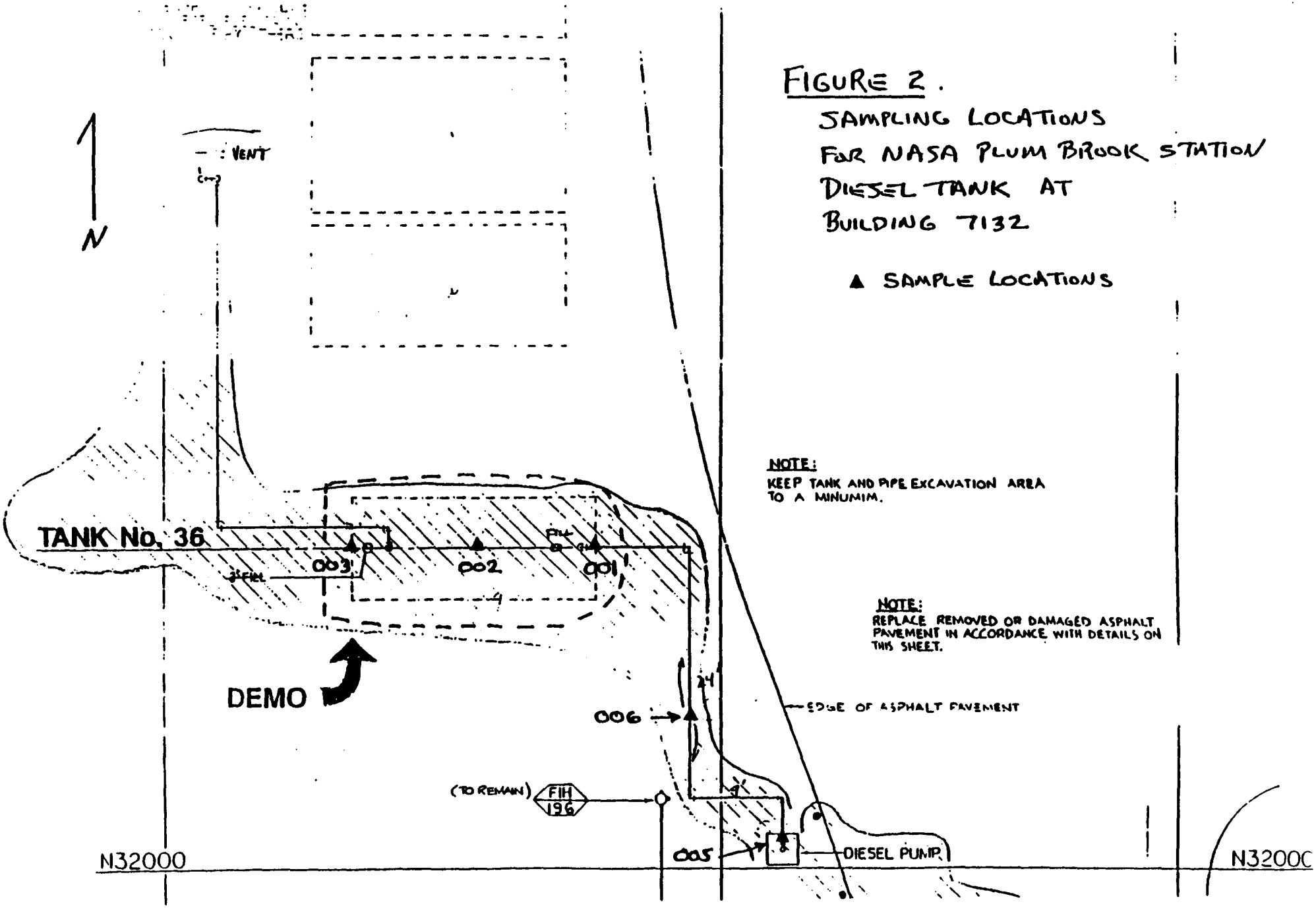

FIGURE 2.
SAMPLING LOCATIONS
FOR NASA PLUM BROOK STATION
DIESEL TANK AT
BUILDING 7132

▲ SAMPLE LOCATIONS

NOTE:
KEEP TANK AND PIPE EXCAVATION AREA TO A MINUMIM.

NOTE:
REPLACE REMOVED OR DAMAGED ASPHALT PAVEMENT IN ACCORDANCE WITH DETAILS ON THIS SHEET.

W/O/P 14 AUG. 90

PBSCC 3-3

CLOSURE REPORT
FOR NASA PLUM BROOK STATION
DIESEL TANK - BUILDING 7132
TANK NO. 36

PREPARED BY:
WARNER/OSBORN/PARDEE

FOR:
NASA LEWIS RESEARCH CENTER
PLUM BROOK STATION
6100 COLUMBUS AVENUE
SANDUSKY, OH 44870

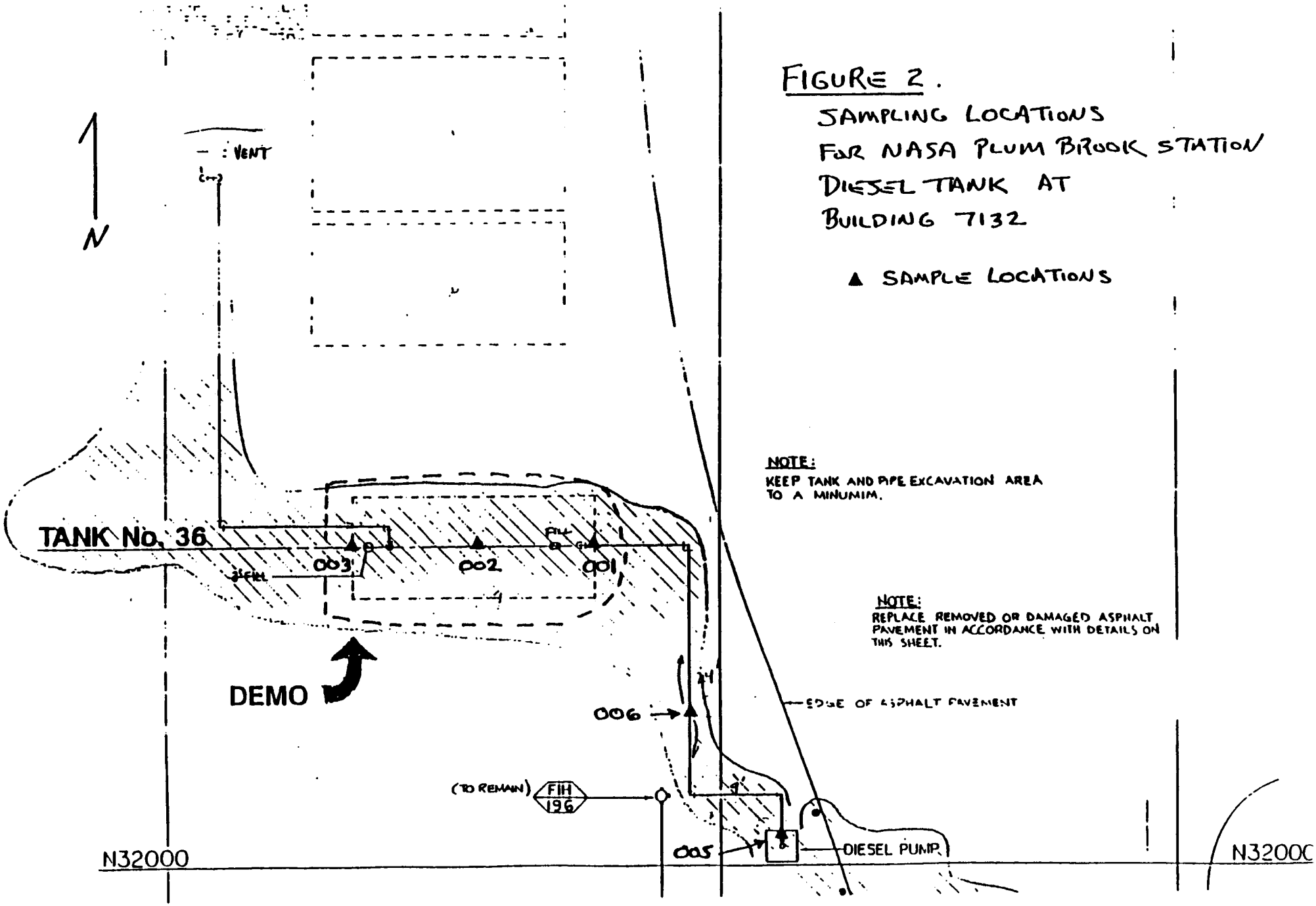

FIGURE 2.

SAMPLING LOCATIONS
FOR NASA PLUM BROOK STATION
DIESEL TANK AT
BUILDING 7132

▲ SAMPLE LOCATIONS

NOTE:
KEEP TANK AND PIPE EXCAVATION AREA TO A MINUMIM.

NOTE:
REPLACE REMOVED OR DAMAGED ASPHALT PAVEMENT IN ACCORDANCE WITH DETAILS ON THIS SHEET.

W/O/P 14 AUG. 90

OHM Corporation

Environmental Testing
and Certification Corp.

ANALYTICAL REPORT

CLIENT: NASA
Cleveland, OH

ATTN: D. Lockert

PROJECT NUMBER: 7628 **SAMPLE TYPE:** Solids

ANALYSIS PERFORMED:

Conventionals, Aromatic Volatiles, and Metals

(Samples: 001 through 004, 006, and 007)

DATE COMPLETED: 7-26-90 **DATE RECEIVED:** 7-17-90

This report is "PROPRIETARY AND CONFIDENTIAL" and delivered to, and intended for the exclusive use of the above named client only. Environmental Testing and Certification Corp. assumes no responsibility or liability for the reliance hereon or use hereof by anyone other than the above named client.

The analyses and data interpretation that form the basis of this report was prepared under the direct supervision and control of the undersigned who is solely responsible for the contents and conclusions therein.

Reviewed and Approved by: _____ Date: 7/27/90
Robert J. Schock, Mgr., ETC-Findlay Laboratory

16406 U.S. Route 224 East ■ P.O. Box 1404 ■ Findlay, Ohio 45839-1404 ■ 419-423-3526

PROJECT 7628

SUMMARY REPORT OF ANALYTICAL SERVICES

1. INTRODUCTION

ETC-Findlay Laboratory received 6 samples from OHM Corporation (OHMC). These samples were acquired by their technical personnel and transferred to the laboratory complete with Chain-of-Custody Record(s), a copy of which is attached for reference. These samples were analyzed for the following:

pH

Samples are tested for pH according to USEPA's Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods, SW-846, 3rd edition, September 1986. Method 9040, "pH Electrometric Method."

Flash Point

Flash points were performed from 23°C through 93°C according to the procedure specified in USEPA's Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods, SW-846, 3rd edition, September 1986. Method 1020, "Seta-flash Closed-cup Method."

Total Petroleum Hydrocarbons by IR

Samples were prepared according to USEPA's Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods, SW-846, 3rd edition, September 1986. Method 9071, "Oil & Grease Extraction Method for Sludge Samples," cleaned up using silica gel and analyzed according to Method 418.1, "Petroleum Hydrocarbons, Total, Recoverable, Spectrophotometric, Infrared."

Aromatic Volatile Organics

Soil samples were prepared and analyzed according to USEPA's Methods for Evaluating Solid Wastes, Physical/Chemical Methods, SW-846, 3rd edition, September 1986. Method 5030, "Purge and Trap" and Method 8020, "Aromatic Volatile Organics."

PROJECT 7628

SUMMARY REPORT OF ANALYTICAL SERVICES

RCRA Metals

Samples were prepared and analyzed according to USEPA's Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods, SW-846, 2nd edition, July 1982. Samples were prepared by Method 3010, 3030, 3050, or 1310 as appropriate for the following metals: arsenic, barium, cadmium, chromium, lead, selenium, and silver. Sample analyses for these metals were performed according to Method 6010, Inductively Coupled Plasma Method (SW-846 Proposed Sampling and Analytical Methodologies, 1984). Mercury was prepared and analyzed by Method 7470 or 7471; Manual Cold Vapor Techniques.

2. ANALYTICAL RESULTS

The following tables detail the analytical results for samples #7628-001 through #7628-004, #7628-006, and #7628-007.

NOTE:

ETC-Findlay will retain samples for a maximum of Sixty (60) days after completion of the analysis unless specifically requested by the client to hold them for a longer period of time. Where possible, ETC-Findlay will endeavor to return samples to the client; in the event that this is not practical, ETC-Findlay will dispose of the remaining samples at a nominal fee of $5.00 per sample.

APPENDIX B

PROJECT 7628
QUANTITATIVE RESULTS

TABLE 1: QUANTITATIVE RESULTS

CONVENTIONAL DATA (QR10)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Joblink
JE6422	OHM CORP., MIDWEST REGIONAL OF	007628	001	900716	603085

Compound		Results: Sample Concen.	Report DL	Blank Concen.	Batch #
Flash Point, Seta Flash	Deg. C	> 93	-	N/A	QRE01781
Petroleum Hydrocarbons (IR)	mg/kg	ND	5.00	ND	QRE01862
pH (Electrode)	std	8.02	-	N/A	QRE01772

JUL , 1990

TABLE 1: QUANTITATIVE RESULTS

CONVENTIONAL DATA (QR10)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Joblink
JE6423	OHM CORP., MIDWEST REGIONAL OF	007628	002	900716	603085

Compound		Results: Sample Concen.	Report DL	Blank Concen.	Batch #
Flash Point, Seta Flash	Deg. C	> 93	-	N/A	QRE01781
Petroleum Hydrocarbons (IR)	mg/kg	8.28	5.00	ND	QRE01802
pH (Electrode)	std	7.77	-	N/A	QRE01772

TABLE 1: QUANTITA..VE RESULTS

CONVENTIONAL DATA (QR10)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Joblink
JE6424	OHM CORP., MIDWEST REGIONAL OF	007628	003	900716	603085

Compound		Results: Sample Concen.	Report DL	Blank Concen.	Batch #
Flash Point, Seta Flash	Deg. C	>. 93	-	N/A	QRE01781
Petroleum Hydrocarbons (IR)	mg/kg	ND	5.00	ND	QRE01802
pH (Electrode)	std	7.64	-	N/A	QRE01772

TABLE 1: QUANTITATIVE RESULTS

CONVENTIONAL DATA (QR10)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Joblink
JE6427	OHM CORP., MIDWEST REGIONAL OF	007628	004	900716	603085

Compound		Results: Sample Concen.	Report DL	Blank Concen.	Batch #
Flash Point, Seta Flash	Deg. C	> 93	-	N/A	QRE01781
Petroleum Hydrocarbons (IR)	mg/kg	ND	5.00	ND	QRE01802
pH (Electrode)	std	8.20	-	N/A	QRE01772

TABLE 1: QUANTITATIVE RESULTS

CONVENTIONAL DATA (QR10)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Joblink
JE6425	OHM CORP., MIDWEST REGIONAL OF	007628	006	900716	603085

Compound		Results: Sample Concen.	Report DL	Blank Concen.	Batch #
Flash Point, Seta Flash	Deg. C	> 93	-	N/A	QRE01781
Petroleum Hydrocarbons (IR)	mg/kg	1020	5.00	ND	QRE01802
pH (Electrode)	std	8.71	-	N/A	QRE01772

TABLE 1: QUANTITATIVE RESULTS

CONVENTIONAL DATA (QR10)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Joblink
JE6426	OHM CORP., MIDWEST REGIONAL OF	007628	007	900716	603085

Compound		Results: Sample Concen.	Report DL	Blank Concen.	Batch #
Flash Point, Seta Flash	Deg. C	> 93	-	N/A	QRE01781
Petroleum Hydrocarbons (IR)	mg/kg	18.9	5.00	ND	QRE01802
pH (Electrode)	std	8.70	-	N/A	QRE01772

TABLE 1: QUANTITATIVE RESULTS

AROMATIC (BTXE) VOLATILES (JR78)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Joblink
JE6422	OHM CORP., MIDWEST REGIONAL OF	007628	001	900716	603085

Compound	Results: Sample Concen. mg/kg	Report DL mg/kg	Blank Concen. mg/kg	Batch #
Benzene	ND	.500	ND	QW0338
Toluene	ND	.500	ND	QW0338
Ethylbenzene	ND	.500	ND	QW0338
p-Xylene	ND	.500	ND	QW0338
m-Xylene	ND	.500	ND	QW0338
o-Xylene	ND	.500	ND	QW0338

.6, 1990

TABLE 1: QUANTIT..IVE RESULTS

AROMATIC (BTXE) VOLATILES (JR78)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Joblink
JE6423	OHM CORP., MIDWEST REGIONAL OF	007628	002	900716	603085

Compound	Results				
	Sample Concen. mg/kg	Report DL mg/kg	Blank Concen. mg/kg	Batch #	
Benzene	ND	.488	ND	QW0338	
Toluene	ND	.488	ND	QW0338	
Ethylbenzene	ND	.488	ND	QW0338	
p-Xylene	ND	.488	ND	QW0338	
m-Xylene	ND	.488	ND	QW0338	
o-Xylene	ND	.488	ND	QW0338	

TABLE 1: QUANTITATIVE RESULTS

AROMATIC (BTXE) VOLATILES (JR78)

.6, 1990

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Joblink
JE6424	OHM CORP., MIDWEST REGIONAL OF	007628	003	900716	603085

Compound	Results			
	Sample Concen. mg/kg	Report DL mg/kg	Blank Concen. mg/kg	Batch #
Benzene	ND	.499	ND	QW0338
Toluene	ND	.499	ND	QW0338
Ethylbenzene	ND	.499	ND	QW0338
p-Xylene	ND	.499	ND	QW0338
m-Xylene	ND	.499	ND	QW0338
o-Xylene	ND	.499	ND	QW0338

TABLE 1: QUANTITATIVE RESULTS

AROMATIC (BTXE) VOLATILES (JR78)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Joblink
JE6427	OHM CORP., MIDWEST REGIONAL OF	007628	004	900716	603085

Compound	Results			
	Sample Concen. mg/kg	Report DL mg/kg	Blank Concen. mg/kg	Batch #
Benzene	ND	.494	ND	QW0338
Toluene	ND	.494	ND	QW0338
Ethylbenzene	ND	.494	ND	QW0338
p-Xylene	ND	.494	ND	QW0338
m-Xylene	ND	.494	ND	QW0338
o-Xylene	ND	.494	ND	QW0338

TABLE 1: QUANTITATIVE RESULTS

AROMATIC (BTXE) VOLATILES (JR78)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Joblink
JE6425	OHM CORP., MIDWEST REGIONAL OF	007628	006	900716	603085

Compound	Results				
	Sample Concen. mg/kg	Report DL mg/kg	Blank Concen. mg/kg	Batch #	
Benzene	ND	.483	ND	QW0338	
Toluene	ND	.483	ND	QW0338	
Ethylbenzene	ND	.483	ND	QW0338	
p-Xylene	ND	.483	ND	QW0338	
m-Xylene	ND	.483	ND	QW0338	
o-Xylene	ND	.483	ND	QW0338	

JUL ..., 1990

TABLE 1: QUANTITATIVE RESULTS

AROMATIC (BTXE) VOLATILES (JR78)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Joblink
JE6426	OHM CORP., MIDWEST REGIONAL OF	007628	007	900716	603085

Compound	Results			
	Sample Concen. mg/kg	Report DL mg/kg	Blank Concen. mg/kg	Batch #
Benzene	ND	.483	ND	QW0338
Toluene	ND	.483	ND	QW0338
Ethylbenzene	ND	.483	ND	QW0338
p-Xylene	ND	.483	ND	QW0338
m-Xylene	ND	.483	ND	QW0338
o-Xylene	ND	.483	ND	QW0338

JU. , 1990

TABLE 1: QUANTITATIVE RESULTS

METALS ANALYSIS (JR07)

Chain of Custody Data Required for ETC Data Management Summary Reports					
JE6422	OHM CORP., MIDWEST REGIONAL OF	007628	001	900716	603085
ETC Sample No.	Company	Facility	Sample Point	Date	Joblink

Compound	Results				
	Sample Concen. mg/kg	Report DL mg/kg	Blank Concen. mg/kg	Batch #	
lead	4.35	2.00	ND	Q1562	

JUL ., 1990

TABLE 1: QUANTITATIVE RESULTS

METALS ANALYSIS (JR07)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Joblink
JE6423	OHM CORP., MIDWEST REGIONAL OF	007628	002	900716	603085

Compound	Results				
	Sample Concen. mg/kg	Report DL mg/kg	Blank Concen. mg/kg	Batch #	
Lead	3.58	2.00	ND	Q1562	

TABLE 1: QUANTITATIVE RESULTS

METALS ANALYSIS (JR07)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Joblink
JE6424	OHM CORP., MIDWEST REGIONAL OF	007628	003	900716	603085

Compound	Results				
	Sample Concen. mg/kg	Report DL mg/kg	Blank Concen. mg/kg	Batch #	
Lead	3.77	2.00	ND	Q1562	

JUL , 1990

TABLE 1: QUANTITATIVE RESULTS

METALS ANALYSIS (JR07)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Joblink
JE6425	OHM CORP., MIDWEST REGIONAL OF	007628	006	900716	603085

Compound	Results				
	Sample Concen. mg/kg	Report DL mg/kg	Blank Concen. mg/kg	Batch #	
Lead	18.8	2.00	ND	Q1562	

TABLE 1: QUANTITATIVE RESULTS

METALS ANALYSIS (JR07)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Joblink
JE6426	OHM CORP., MIDWEST REGIONAL	OF 007628	007	900716	603085

Compound	Results				
	Sample Concen. mg/kg	Report DL mg/kg	Blank Concen. mg/kg	Batch #	
Lead	11.5	2.00	ND	Q1562	

JUL 4, 1990

TABLE 1: QUANTITATIVE RESULTS

RCRA METALS ANALYSIS (JR08)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Joblink
JE6427	OHM CORP., MIDWEST REGIONAL	OF 007628	004	900716	603085

Compound	Results				
	Sample Concen. mg/L	Report DL mg/L	Blank Concen. mg/L	Batch #	
Arsenic (Leachate)	ND	.100	ND	Q1576	
Barium (Leachate)	.416	.100	ND	Q1576	
Cadmium (Leachate)	ND	.005	ND	Q1576	
Chromium (Leachate)	ND	.020	ND	Q1576	
Lead (Leachate)	ND	.100	ND	Q1576	
Mercury (Leachate)	ND	.001	ND	Q1578	
Selenium (Leachate)	ND	.100	ND	Q1576	
Silver (Leachate)	ND	.020	ND	Q1576	

APPENDIX B

PROJECT 7628
QUALITY ASSURANCE DATA

JU. 1990

TABLE 1: QUALITY ASSURANCE DATA

CONVENTIONAL DATA (QR10)

Chain of Custody Data Required for ETC Data Management Summary Reports

See Below

ETC Batch No.

Compound	QC Blank and Spiked Data			QC Matrix Spike			QC Duplicate			
	Blank Concen.	Concen. Added	% Recov	Unspiked Sample	Concen. Added	% Recov	First	Second	RPD	Batch #
Petroleum Hydrocarbons (IR) mg/kg	ND	41.3	110	ND	41.3	105	43.2	46.8	8	QRE01802

TABLE 1: QUALITY ASSURANCE DATA

CONVENTIONAL DATA (QR10)

Chain of Custody Data Required for ETC Data Management Summary Reports

See Below

ETC Batch No.

Compound	QC Blank and Spiked Data			QC Matrix Spike			QC Duplicate			
	Blank Concen.	Concen. Added	% Recov	Unspiked Sample	Concen. Added	% Recov	First	Second	RPD	Batch #
Petroleum Hydrocarbons (IR) mg/kg	ND	41.3	103	38.0	39.4	68	64.7	64.5	.3	QRE01862

JU , 1990

TABLE 1: QUALITY ASSURANCE DATA

AROMATIC (BTXE) VOLATILES (JR78)

Chain of Custody Data Required for ETC Data Management Summary Reports

See Below

ETC Batch No.

Compound	QC Blank and Spiked Data			QC Matrix Spike			QC Duplicate			
	Blank Concen. mg/kg	Concen. Added mg/kg	% Recov	Unspiked Sample mg/kg	Concen. Added mg/kg	% Recov	First mg/kg	Second mg/kg	RPD	Batch #
Benzene	ND	5.02	94	ND	4.96	100	4.94	4.81	3	QW0338
Toluene	ND	5.00	96	ND	4.94	97	4.78	4.67	2	QW0338
Ethylbenzene	ND	5.00	98	ND	4.94	97	4.78	4.70	2	QW0338
p-Xylene	ND	4.98	96	ND	4.92	96	4.73	4.67	1	QW0338
m-Xylene	ND	4.98	97	ND	4.92	93	4.60	4.53	2	QW0338
o-Xylene	ND	5.00	93	ND	4.94	92	4.54	4.46	2	QW0338

TABLE 1: QUALITY ASSURANCE DATA

METALS ANALYSIS (JR07)

Jul. 13, 1990

Chain of Custody Data Required for ETC Data Management Summary Reports

See Below

ETC Batch No.

Compound	QC Blank and Spiked Data			QC Matrix Spike			QC Duplicate			
	Blank Concen. mg/kg	Concen. Added mg/kg	% Recov	Unspiked Sample mg/kg	Concen. Added mg/kg	% Recov	First mg/kg	Second mg/kg	RPD	Batch #
Lead	ND	12.5	106	18.8	12.5	65	27.0	26.0	4	Q1562

JU , 1990

TABLE 1: QUALITY ASSURANCE DATA

RCRA METALS ANALYSIS (JR08)

Chain of Custody Data Required for ETC Data Management Summary Reports

See Below

ETC Batch No.

Compound	QC Blank and Spiked Data			QC Matrix Spike			QC Duplicate			
	Blank Concen. mg/L	Concen. Added mg/L	% Recov	Unspiked Sample mg/L	Concen. Added mg/L	% Recov	First mg/L	Second mg/L	RPD	Batch #
Arsenic (Leachate)	ND	2.00	96	ND	2.00	97	1.93	1.92	.5	Q1576
Barium (Leachate)	ND	2.00	97	ND	2.00	95	2.00	2.00	0	Q1576
Cadmium (Leachate)	ND	.050	87	ND	.050	91	.045	.043	5	Q1576
Chromium (Leachate)	ND	.200	94	ND	.200	95	.189	.187	1	Q1576
Lead (Leachate)	ND	.500	98	ND	.500	98	.491	.481	2	Q1576
Mercury (Leachate)	ND	.002	115	ND	.002	105	.002	.002	0	Q1578
Selenium (Leachate)	ND	2.00	94	ND	2.00	92	1.84	1.86	1	Q1576
Silver (Leachate)	ND	.050	93	ND	.050	96	.048	.048	.4	Q1576

1 Corporation

CHAIN-OF-CUSTODY RECORD

orm 0019
Field Technical Services
Rev. 08/89

No. 84191

H. MATERIALS CORP. • P.O. BOX 551 • FINDLAY, OH 45839-0551 • 419-423-3526

ECT NAME: NASA PLUM BROOK
PROJECT LOCATION: PLUM BROOK SAM
NO: 628
PROJECT CONTACT: JIM PARK
PROJECT TELEPHONE NO.: 216 835-9460
NT'S REPRESENTATIVE: JIM PARK
PROJECT MANAGER/SUPERVISOR: DAVE LOCKHART

SAMPLE NUMBER	DATE	TIME	COMP	GRAB	SAMPLE DESCRIPTION (INCLUDE MATRIX AND POINT OF SAMPLE)	NUMBER OF CONTAINERS	BTXE	TPHC	FLASH PT.	PH	LEAD (TOTAL)	EP TOX METALS			REMARKS
001	7-16	1430		X	Soil, sand mix Front of Tank hole 7132 D 13 Ft Deep	1 QT	X	X	X	X	X				
002	7-16	1430		X	Soil sand ~~mix~~ clay mix Middle of Tank hole # 7132 D 13 Ft Deep	1 QT	X	X	X	X	X				
003	7-16	1430		X	Soil, sand clay mix Back of Tank hole # 7132 D 13 Ft Deep	1-QT	X	X	X	X	X				3/4 FULL
004	7-16	1430	X		Soil sample, clay mix composite Back fill mat.	1-QT	X	X	X	X	X	X			No Lead (TOTAL)
005	7-16	1600		X	Soil Beside old gas pump 1.5 Ft Deep	1-QT	X	X	X	X	X				
007	7-16	1600		X	Soil Near to pipe 3 Ft Deep Spring Spoon	1-QT	X	X	X	X	X				1/2 FULL

TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	TRANSFERS ACCEPTED BY	DATE	TIME
1	1-6	Brad Boger	Cooler	7-16	1800
2	1-6	Cooler	Donita Jensen	7/17/90	6:30 AM
3					
4					

REMARKS: 10 DAY T.A.T.

SAMPLER'S SIGNATURE: Brad Boger 2179

OHM Corporation

Environmental Testing
and Certification Corp.

ANALYTICAL REPORT

CLIENT: NASA
Cleveland, OH

ATTN: D. Lockert

PROJECT NUMBER: 7628 **SAMPLE TYPE:** Liquid

ANALYSIS PERFORMED:

TPHC by IR and Aromatic Volatiles

(Sample: 725/WAT)

DATE COMPLETED: 7-30-90 **DATE RECEIVED:** 7-27-90

This report is "PROPRIETARY AND CONFIDENTIAL" and delivered to, and intended for the exclusive use of the above named client only. Environmental Testing and Certification Corp. assumes no responsibility or liability for the reliance hereon or use hereof by anyone other than the above named client.

The analyses and data interpretation that form the basis of this report was prepared under the direct supervision and control of the undersigned who is solely responsible for the contents and conclusions therein.

Reviewed and Approved by: Robert J. Schock, Mgr., ETC-Findlay Laboratory Date: 7/31/90

16406 U.S. Route 224 East ■ P.O. Box 1404 ■ Findlay, Ohio 45839-1404 ■ 419-423-3526

PROJECT 7628

SUMMARY REPORT OF ANALYTICAL SERVICES

1. INTRODUCTION

ETC-Findlay Laboratory received 1 sample from OHM Corporation, (OHMC). This sample was acquired by their technical personnel and transferred to the laboratory complete with Chain-of-Custody Record(s), a copy of which is attached for reference. This sample was analyzed for the following:

NOTE: ALL sample results are reported on an as received "wet weight" basis unless otherwise noted on the report.

Total Petroleum Hydrocarbons by IR

Samples were prepared according to USEPA's Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods, SW-846, 3rd edition, September 1986. Method 9071, "Oil & Grease Extraction Method for Sludge Samples," cleaned up using silica gel and analyzed according to Method 418.1, "Petroleum Hydrocarbons, Total, Recoverable, Spectrophotometric, Infrared."

Aromatic Volatile Organics - Water

Water samples were prepared and analyzed according to USEPA's Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, July 1982; Method 602, "Purgeable Aromatics."

2. ANALYTICAL RESULTS

The following tables detail the analytical results for sample #7628-725/WAT.

NOTE:

ETC-Findlay will retain samples for a maximum of Sixty (60) days after completion of the analysis unless specifically requested by the client to hold them for a longer period of time. Where possible, ETC-Findlay will endeavor to return samples to the client; in the event that this is not practical, ETC-Findlay will dispose of the remaining samples at a nominal fee of $5.00 per sample.

JUL 30, 1990

TABLE 1:- QUANTITATIVE RESULTS

CONVENTIONAL DATA (QR10)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility	Sample Point	Date	Joblink
JE7419	OHM CORP., MIDWEST REGIONAL OF	007628	725/WAT	900725	603227

Compound	Results				
	Sample Concen. mg/l	Report DL mg/l	Blank Concen. mg/l	Batch #	
Petroleum Hydrocarbons (IR)	ND	1.00	ND	QRB01923	

JUL 29, 1990

TABLE 1: QUANTITATIVE RESULTS

AROMATIC (BTXE) VOLATILES (JR78)

Chain of Custody Data Required for BTC Data Management Summary Reports

BTC Sample No.	Company	Facility	Sample Point	Date	Joblink
JR7419	OHM CORP.	MIDWEST REGIONAL OF 007628	725/WAT	900725	603227

Compound	Results			
	Sample Concen. mg/L	Report DL mg/L	Blank Concen. mg/L	Batch #
ene	ND	.001	ND	QW0339
ene	ND	.001	ND	QW0339
lbenzene	ND	.001	ND	QW0339
lene	ND	.001	ND	QW0339
lene	ND	.001	ND	QW0339
lene	ND	.001	ND	QW0339

APPENDIX B

PROJECT 7628
DATA SUMMARY REPORT

DATA SUMMARY REPORT

DATE: 07/30/90
PAGE: 1

Company: OHM CORP., MIDWEST REGIONAL OFFICE

Sample Point ID: 725/WAT
ETC Sample Number: JE7419
Sample Date: 900725
Facility Code: 007628

Parameters	Units	
romatic (BTXE) Volatiles (JR78)		
Benzene	mg/L	<.001
Toluene	mg/L	<.001
Ethylbenzene	mg/L	<.001
p-Xylene	mg/L	<.001
m-Xylene	mg/L	<.001
o-Xylene	mg/L	<.001
onventional Data (QR10)		
Petroleum Hydrocarbons (IR)	mg/L	<1.00

APPENDIX C

PROJECT 7628
QUALITY ASSURANCE DATA

TABLE 1: QUALITY ASSURANCE DATA

CONVENTIONAL DATA (QR10)

Chain of Custody Data Required for ETC Data Management Summary Reports

See Below

ETC Batch No.

Compound	QC Blank and Spiked Data			QC Matrix Spike			QC Duplicate			
	Blank Concen. mg/L	Concen Added mg/L	% Recov	Unspiked Sample mg/L	Concen Added mg/L	% Recov	First mg/L	Second mg/L	RPD	Batch #
Petroleum Hydrocarbons (IR)	ND	8.26	97	14.7	20.7	9	16.6	16.3	2	QRE01923

JUL 29, 1990

TABLE 1: QUALITY ASSURANCE DATA

AROMATIC (BTXE) VOLATILES (JR78)

Chain of Custody Data Required for ETC Data Management Summary Reports

See Below

ETC Batch No.

Compound	QC Blank and Spiked Data			QC Matrix Spike			QC Duplicate			
	Blank Concen. mg/L	Concen Added mg/L	% Recov.	Unspiked Sample mg/L	Concen. Added mg/L	% Recov	First mg/L	Second mg/L	RPD	Batch #
Benzene	ND	.050	93	.221	.252	86	.437	.394	10	QW0339
Toluene	ND	.050	94	.058	.250	89	.281	.250	11	QW0339
Ethylbenzene	ND	.050	94	.016	.250	90	.241	.225	7	QW0339
p-Xylene	ND	.050	96	.011	.249	92	.240	.203	16	QW0339
m-Xylene	ND	.050	97	ND	.249	92	.232	.200	15	QW0339
o-Xylene	ND	.050	96	.008	.250	90	.232	.200	15	QW0339

CHAIN-OF-CUSTODY RECORD

m 0019
Field Technical Services
Rev. 08/09

No. 73946

ERIALS CORP. • P.O. BOX 551 • FINDLAY, OH 45839-0551 • 419-423-3526

Plum Brook

PROJECT LOCATION: Plum Brook

PROJECT CONTACT: Jim Park

PROJECT TELEPHONE NO.: (216) 835-9400

REPRESENTATIVE

PROJECT MANAGER/SUPERVISOR: Dave Lockart 6047

SAMPLE NUMBER	DATE	TIME	COMP	GRAB	SAMPLE DESCRIPTION (INCLUDE MATRIX AND POINT OF SAMPLE)	NUMBER OF CONTAINERS	ANALYSIS DESIRED (INDICATE SEPARATE CONTAINERS) TPHC/IR BTXE	REMARKS
WAT					Water from excavation	4 QA.		3 Day TAT per Jim Park 7/27/90

ITEM NUMBER	TRANSFERS RELINQUISHED BY	TRANSFERS ACCEPTED BY	DATE	TIME
1	[signature]	[signature]	7-25-90	1300

REMARKS: Called/left message 7/25/90 1:30 pm
Results Tuesday, 7/31/90 AM - Per Wayne Word on 7/27/90

SAMPLERS SIGNATURE

LAB COPY

AUG 03 '90 09:53 OHM MIDWEST REGION

P.12

PBS003-~~34~~ 37

SITE ASSESSMENT FOR TANKS 24, 25, 28, 29, 30, 31, 32, AND 39

AT PLUM BROOK STATION

FOR

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PLUM BROOK STATION
SANDUSKY, OHIO

PREPARED BY:

EBASCO SERVICES, INC.
5000 BRADENTON AVENUE, SUITE 200
DUBLIN, OHIO 43017

9/89

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1.0 Introduction

On September 18th through 19th, 1989, the permanent closure-by-removal of eight (8) steel underground storage tanks (USTs) was performed at the NASA Plum Brook Station near Sandusky, Ohio. The tanks removed were No.s 24, 25, 28, 29, 30, 31, 32, and 39. Tank No.s 24 and 25 were located near Building No. 1411. Tank No.s 24 and 25 were 1,000 gallon steel tanks, Tank No. 24 was in use prior to its removal, while Tank No. 25 was not in use at the time of removal. Tank No. 24 had contained waste oil and solvents, while Tank No. 25 had contained fuel oil. Tank No. 28 was a 3,000 gallon tank and Tank No.s 29, 30, and 31 were 770 gallon tanks. These tanks were located east of Building No. 7121. Tank No. 28 had contained waste oil and solvents and was in use until the time of removal. Tank No.s 29, 30, and 31 had stored toluene and these tanks were not in use prior to removal. Tank No. 32 was a 1,500 gallon waste oil and solvents tank located north of Building No. 7131. Tank No. 32 was in use prior to its removal. Tank No. 39, located west of building 8133, was a 250 gallon tank which was not currently in use, but which had previously contained gasoline.

Mr. Jack Graves of the State Fire Marshal's Office was on site to oversee the removal of the tanks. EMPACO Incorporated and Independence Excavating were retained as subcontractors to Turner Construction to remove the tanks.

2.0 Tank Removal

Samples of the soils underlying the tank, the sidewalls of the excavation pit and excavated soils were collected from each of the tank locations at the time of removal in order to determine if a release of tank contents had occurred during the active life of the tank. The performance of the closure assessments indicated that varying degrees of contamination are present. The following sections detail the significant findings of the closure assessments. A complete set of laboratory results is located in Appendix A.

2.1 Tank No.s 29, 30, 31

Tank No.s 29, 30, and 31 were removed on September 18th. Two (2) soil samples were taken from the pit bottom and two (2) samples were taken from the excavated soil. The following table lists the sample numbers and describes the sampling location and the types of analyses performed on each sample.

TABLE 1
Tank No.s 29, 30, 31: Sample IDs, Locations, and Analyses

Sample ID	Location	Analyses
PBS-7121-SS-1	North wall of the tank pit	Volatile Organic Compounds (VOCs), Total Petroleum Hydrocarbons (TPH), EP Toxicity for Lead, Ignitability
PBS-7121-SS-2	South wall of the tank pit	(VOCs), (TPH), EP Toxicity for Lead, Ignitability
PBS-7121-SS-3	Excavated soil	(VOCs), (TPH)
PBS-7121-SS-4	Excavated soil	(VOCs), (TPH), EP Toxicity for Lead, Ignitability

Total petroleum hydrocarbons (TPH) concentrations in the samples ranged from undetected to 287

mg/kg. The VOC analyses showed low levels of volatile organics. Trichloroethene (TCE) had a maximum concentration 200 ug/kg and 1,1,1-trichloroethane (TCA) had a maximum concentration of 610 ug/kg. Figure 1 shows the sampling locations and the concentrations of TPH, TCE, TCA, and carbon tetrachloride for Tank No.s 29, 30 and 31. Lead concentrations were below detection limits for the samples and flashpoints >200°F were determined using the ignitability analysis.

2.2 Tank No. 28

Tank No. 28 was removed on September 18th. Three (3) samples were taken of the pit bottom and two (2) samples were collected from the excavated material. The table below describes the sampling location and the types of analyses done on each sample:

TABLE 2
Tank No. 28 Sample IDs, Locations, and Analyses

Sample ID	Location	Analyses
PBS-7121-SS-5	North wall of tank pit	Volatile Organic Compounds (VOCs), Total Petroleum Hydrocarbons (TPH)
PBS-7121-SS-6	East wall of tank pit	VOCs, TPH
PBS-7121-SS-7	South wall of tank pit	VOCs, TPH
PBS-7121-SS-8	Excavated soil	VOCs, TPH, EP Toxicity for Lead, Ignitability
PBS-7121-SS-9	Excavated soil	VOCs, TPH, EP Toxicity for Lead, Ignitability

Lead concentrations were below detection limits for the samples and flashpoints >200°F were determined using the ignitability analysis. The sample concentrations for total petroleum hydrocarbons ranged from undetected concentrations to 284 mg/kg for the five samples. The samples from tank area No. 28 had very high concentrations of volatile organics. Table 3 shows the compounds which were present in the highest concentrations.

TABLE 3
Maximum Concentrations of Volatile Organics at Tank No. 28 Pit Area

Compounds	Concentration ug/kg
trichloroethene	21142
tetrachloroethene	10048
1,1,1 trichloroethane	7770
1,1 dichloroethane	1214
toluene	628
total Xylenes	532
1,2,4 trimethylbenzene	479
1,3,5 trimethylbenzene	442
carbon tetrachloride	431
methylene chloride	231

Table 3 is not a complete list, but only designates the compounds with the highest concentrations.

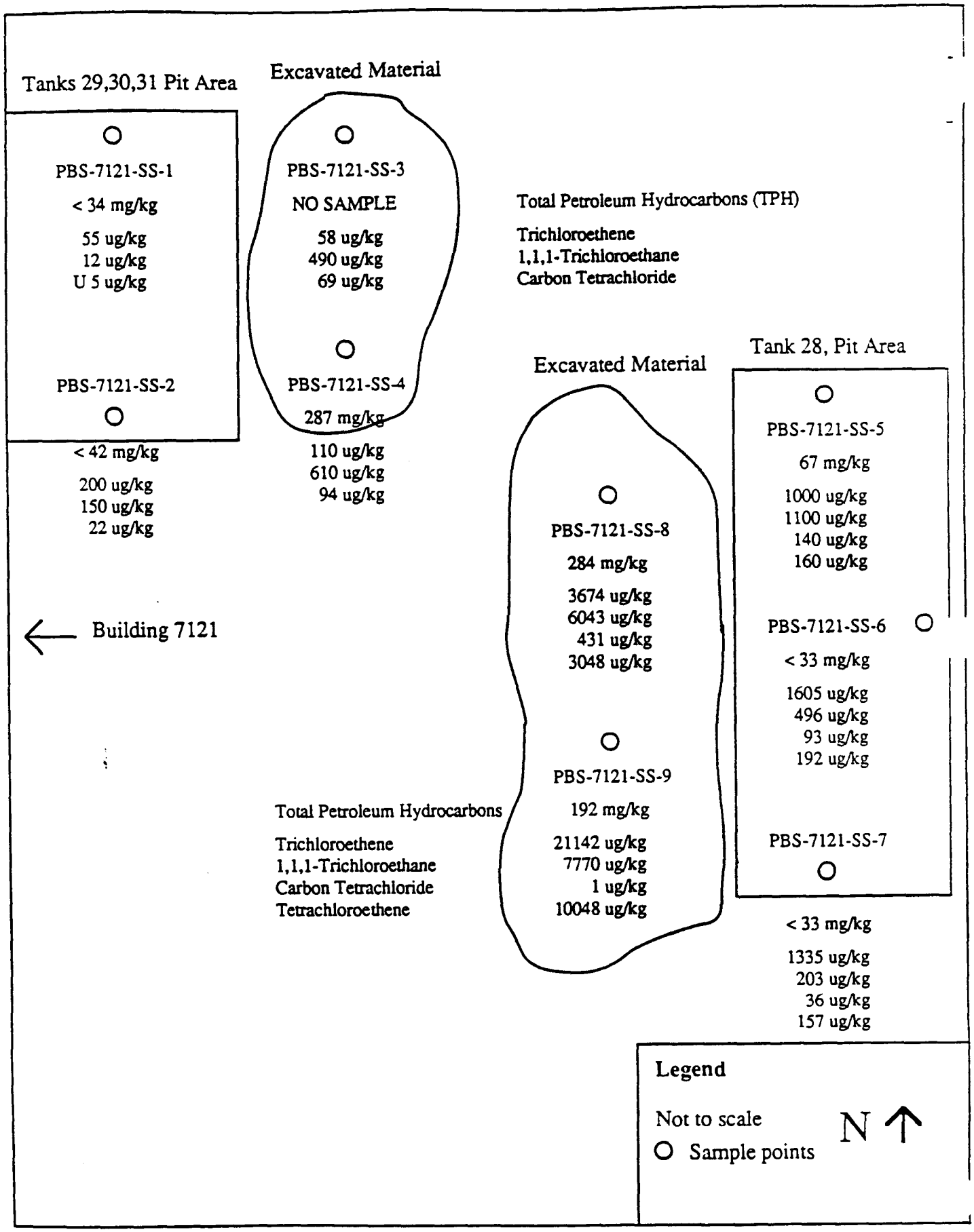

Figure 1; Tanks 28, 29, 30 and 31, east of building 7121
location of soil sampling points and sample concentrations

Figure 1 shows the sample point locations and the associated concentrations for TPH, trichloroethene, 1,1,1-trichloroethane, carbon tetrachloride and tetrachloroethene.

2.3 Tank No. 32

Tank No. 32, located north of Building No. 7131, was excavated on September 18th. Prior to the tank's removal, it was used to store waste oil and solvents. Five (5) samples were taken from this pit area and their location and analyses are listed below.

TABLE 4
Tank No. 32 Sample IDs, Locations, and Analyses

Sample ID	Location	Analyses
PBS-7131-SS-1	West end of pit	Volatile Organic Compounds (VOC), Total Petroleum Hydrocarbons (TPH)
PBS-7131-SS-2	Center of pit	VOC, TPH
PBS-7131-SS-3	East end of pit	VOC, TPH
PBS-7131-SS-4	Excavated soil	VOC, TPH, EP Toxicity for lead, ignitability
PBS-7131-SS-5	Excavated soil	VOC, TPH, EP Toxicity for lead, ignitability

There were no visible signs of contamination during excavation. Analysis of the samples indicated low levels of contamination. The concentrations for TPH and four (4) organic compounds found in the highest concentrations are shown below for each sample.

TABLE 5
Concentrations of TPH and Selected Volatile Organics at Tank No. 32

Sample ID	TPH mg/kg	TCE• ug/kg	1,3,5 trimethylbenzene ug/kg	1,2,4 trimethylbenzene ug/kg	naphthalene ug/kg
PBS-7131-SS-1	120	372	U 1	U 1	4
PBS-7131-SS-2	244	359	U 1	U 1	3
PBS-7131-SS-3	191	606	U 1	U 1	1
PBS-7131-SS-4	<38	464	U 1	1	1
PBS-7131-SS-5	193	728	366	349	159

• TCE - trichloroethene
U - Undetected at the given concentration

Elevated concentrations of trichloroethene were found in each of the five samples. Elevated levels of total petroleum hydrocarbons were found in each sample except PBS-7131-SS-4. Figure 2 shows the sampling locations with their respective concentrations of TPH, TCE, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene and naphthalene.

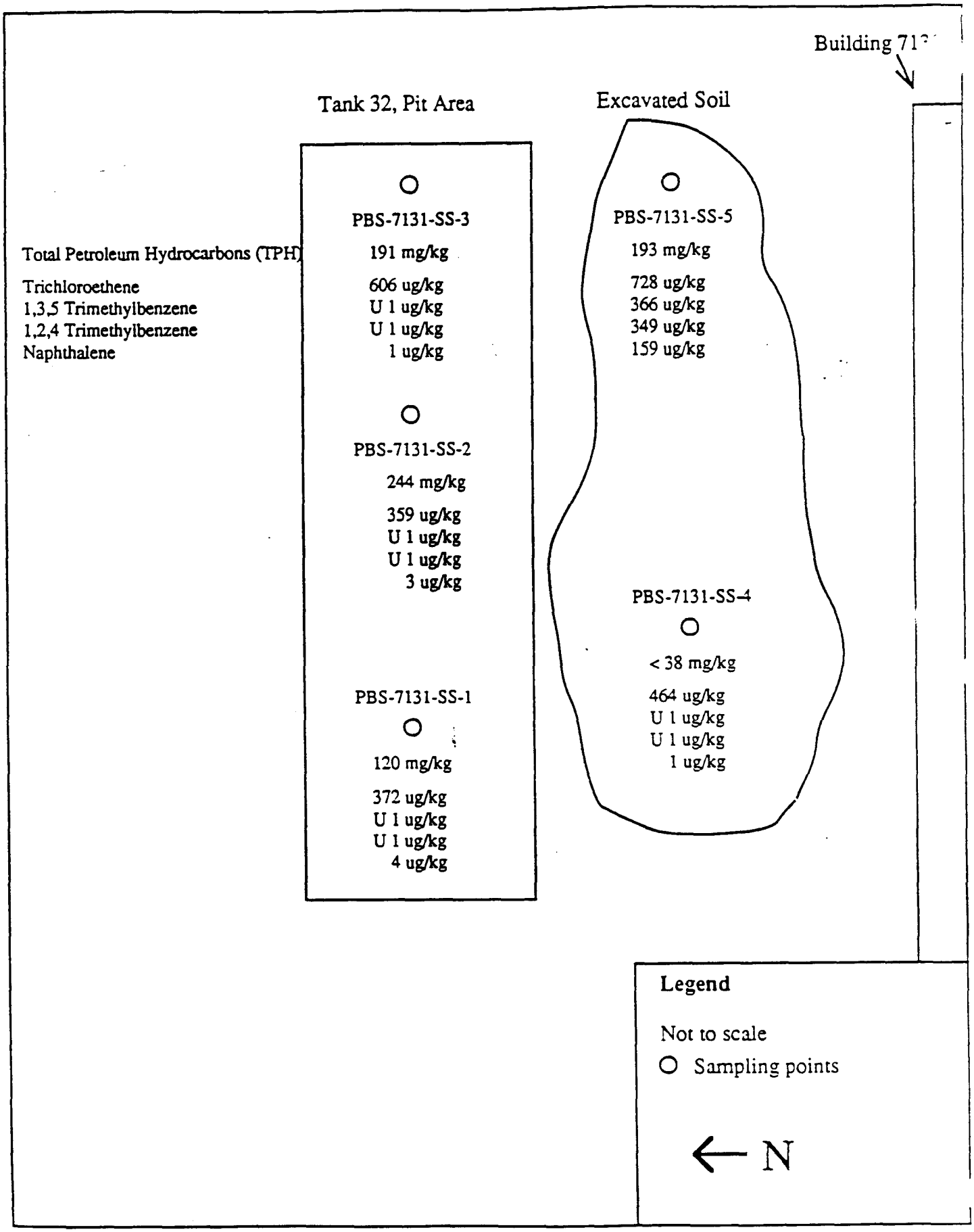

Figure 2; Tank 32, north of building 7131
location of soil sampling points and sample concentrations

2.4 Tank No 39

Tank No. 39 was removed September 18th. This 250 gallon tank was not in use before its removal. In the past, this tank had been used for gasoline storage. When this tank was removed, holes were found in it. The soil in the tank pit was visibly contaminated. After the tank was removed, water slowly began to seep into the pit. Water which was draining from beneath Building No. 8133 continued to fill the pit until the water level was approximately 2 feet below the ground surface. A tank truck was used to pump the water out of the excavated area in order to sample the soil. Additional contaminated soil was then removed and a water main was discovered approximately 7 feet below the ground surface. Three (3) soil samples were collected at this tank site. Table 6 indicates where each sample was collected and the lab analyses performed.

TABLE 6
Tank No. 32 Sample IDs, Locations, and Analyses

Sample ID	Location	Lab Analyses
PBS-8133-SS-1	Excavated soil	TPH, Ignitability, EP Toxicity for lead; Benzene, Toluene, Ethylbenzene, Total Xylenes (BTEX)
PBS-8133-SS-2	Excavated soil	TPH, Ignitability, EP Toxicity for lead, BTEX
PBS-8133-SS-3	Center of tank	TPH, Ignitability, EP Toxicity for lead, BTEX

The following table shows the concentrations for total petroleum hydrocarbons (TPH) and benzene, toluene, ethylbenzene and total xylenes (BTEX).

TABLE 7
Concentrations of TPH and BTEX at Tank No. 39

Sample ID	TPH mg/kg	Benzene ug/kg	Toluene ug/kg	Ethylbenzene ug/kg	Total Xylenes ug/kg
PBS-8133-SS-1	655	1400.	7200.	4400.	16000.
PBS-8133-SS-2	< 44	62.	103.	15.	65.
PBS-8133-SS-3	< 42	0.19	0.77	U 0.27	0.94

Measured concentrations for sample SS-1 indicated high levels of TPH and BTEX. Sample SS-2 had much lower concentrations than SS-1, but still had elevated levels of BTEX. Sample SS-3 had very low levels of BTEX, while total petroleum hydrocarbons were undetected in the sample. Samples SS-1 and SS-2 were taken from the excavated soils, while sample SS-3 was taken from the pit bottom. Since the contaminant concentrations in SS-3 are negligible, this may indicate that there is limited contamination. Specifically, this may indicate that contamination is limited to soils in the immediate vicinity of the tank.

2.5 Tank No.s 24 and 25

Tank No. 24 was removed September 18th, and Tank No. 25 was removed September 19th. Sampling was performed at both locations on September 19th. Tank No.s 24 and 25 were located south of Building No. 1411. Tank No. 24 contained waste oil and solvents, while Tank No. 25 contained fuel oil. Nine (9) soil samples were collected at this area. The location and analyses for

each sample is listed in Table 8.

TABLE 8
Tank No.s 24, 25 Sample IDs, Locations, and Analyses

Sample ID	Location	Analyses
PBS-1411-SS-1	South wall, Tank Area 24	VOCs, TPH, EP Toxicity for Lead Ignitability
PBS-1411-SS-2	East wall, Tank Area 24	VOCs, TPH
PBS-1411-SS-3	North wall, Tank Area 24	VOCs, TPH
PBS-1411-SS-4	Excavated Soil	VOCs, TPH, EP Toxicity for Lead, Ignitability
PBS-1411-SS-5	Excavated Soil	VOCs, TPH, EP Toxicity for Lead, Ignitability
PBS-1411-SS-6	East end, Tank Area 25	VOCs, TPH
PBS-1411-SS-7	West wall, Tank Area 25	VOCs, TPH
PBS-1411-SS-8	Excavated Soil	VOCs, TPH, EP Toxicity for lead, Ignitability
PBS-1411-SS-9	Excavated Soil	VOCs, TPH, EP Toxicity for lead, Ignitability

Samples SS-6 and SS-7 were taken using the backhoe bucket because the walls of the excavation pit were unstable. During excavation, shale bedrock was encountered approximately 12 feet below the ground surface. Lead concentrations were below the detection limits in all of the samples and a flashpoint >200°F was measured in each of the samples indicating the soils are not considered hazardous by virtue of their toxicity or ignitability. The TPH concentrations for each sample are listed below.

TABLE 9
TPH Concentrations for Samples Collected at Tank No.s 24 and 25

Tank No. 24		Tank No. 25	
Sample ID	TPH mg/kg	Sample ID	TPH mg/kg
PBS-1411-SS-1	244	PBS-1411-SS-6	317
PBS-1411-SS-2	411	PBS-1411-SS-7	1120
PBS-1411-SS-3	2030	PBS-1411-SS-8	93
PBS-1411-SS-4	686	PBS-1411-SS-9	1050
PBS-1411-SS-5	243		

There are elevated concentrations of total petroleum hydrocarbons in the area of both Tank No.s 24 and 25. Samples SS-3, SS-7, and SS-9 have the highest concentrations of TPH of the eight (8) tanks removed September 18th and 19th.

The following table shows the highest concentrations for selected volatile organic aromatics. Figure 3 shows the area of Tank Pit 24 and 25. Sampling locations are shown with their respective soil concentrations for TPH and four (4) volatile organic compounds.

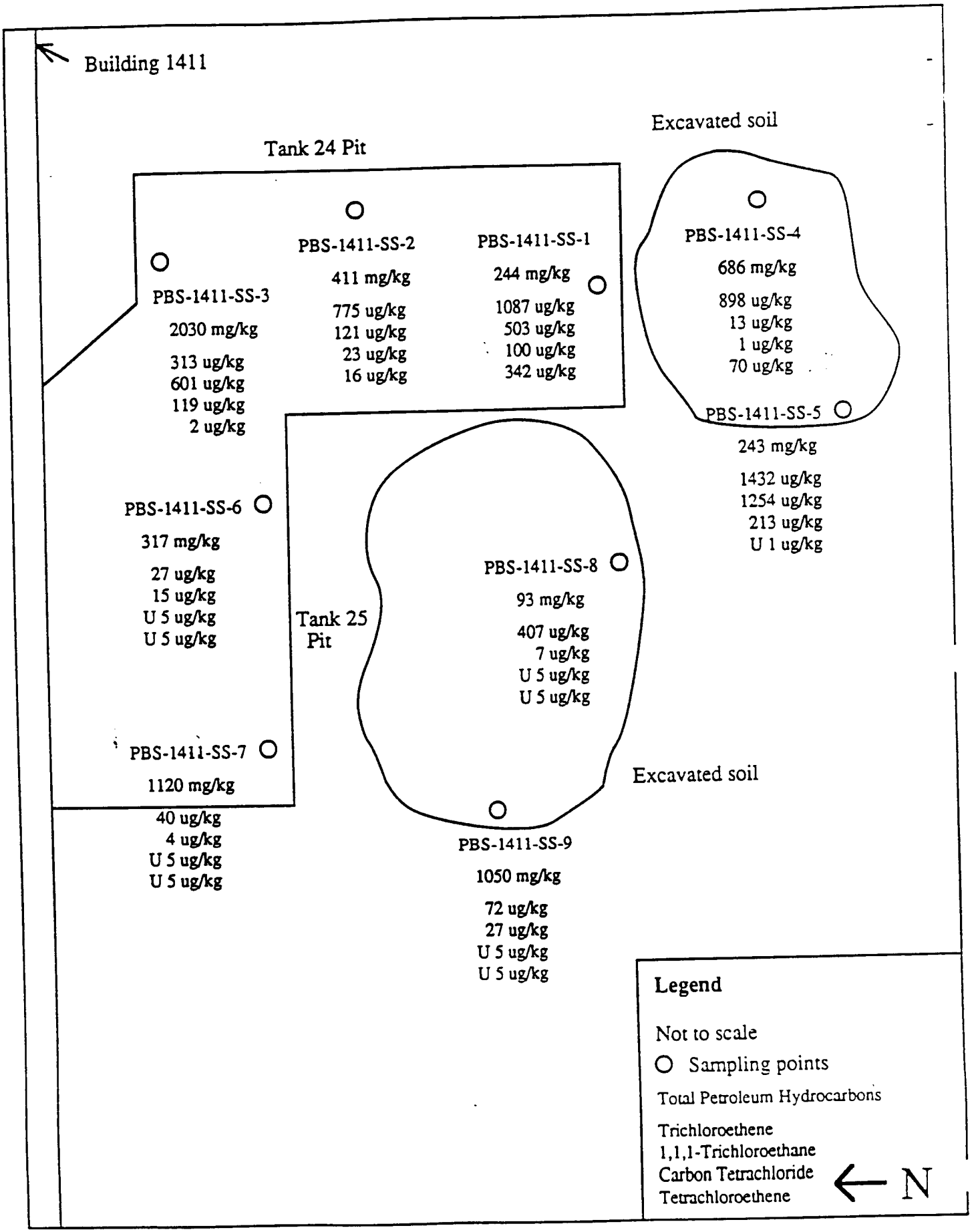

Figure 3; Tanks 24 and 25, south of building 1411
location of soil sampling points and sample concentrations

TABLE 10

Maximum Concentrations of Volatile Organics at Tank No.s 24 and 25 Pit Area

Compound	Concentration
trichlorofluoromethane	93
methylene chloride	164
1,1-dichloroethane	17
cis-1,2-dichloroethene	362
1,1,1-trichloroethane	1254
carbon tetrachloride	213
trichloroethene	1432
toluene	16
tetrachlorethene	342
ethylbenzene	45
m + p-xylenes	43
o-xylene	23
n-propylbenzene	76
1,3,5-trimethylbenzene	496
tert-butylbenzene	70
1,2,4-trimethylbenzene	541
p-isopropyltoluene	74
naphthalene	1094

3.0 Discussion and Recommendations

It is apparent from the visual inspection and also the laboratory analyses results that contamination has occurred at each of the sites of the eight (8) excavated underground storage tanks. The extent of contamination varies at each tank pit area, from visible contamination at Tank Pit 28, Tank Pit 24 and 25, and Tank Pit 39 to very limited contamination at Tank Pit 32. Levels of contamination at the sites can be compared to the clean up goals of the Ohio State Fire Marshal's Office; Bureau of Underground Storage Tank Regulation (BUSTR). According to Tom Forbes of BUSTR acceptable levels of total petroleum hydrocarbons are approximately 100 mg/kg in soil and 5 ug/kg for volatile organics in soil.

At the pit area of Tanks 29, 30 and 31 contamination is basically limited to elevated levels of trichloroethene (TCE), 1,1,1-trichloroethane and to a lesser extent, carbon tetrachloride. Levels of these three chlorinated organics ranged from undetectable levels to 610 ug/kg in the four soil samples taken from this area. Levels of total petroleum hydrocarbons in the four samples ranged from undetectable levels in two of the samples to 287 mg/kg.

At the Tank 28 pit area there was visible contamination when the tank was removed and the lab analyses showed relatively high levels of contamination of chlorinated organics. Levels of TCE were as high as 21142 ug/kg (21 ppm), while levels of 1,1,1-trichloroethane, carbon tetrachloride, and tetrachlorethene were as high as 10 ppm, levels of total petroleum hydrocarbons ranged from undetectable levels to 284 mg/kg.

At the Tank 32 pit area there was no visible contamination at the time of excavation. The volatile organics analyses showed levels of TCE that ranged from undetectable levels to 606 ug/kg. Concentrations of Total Petroleum Hydrocarbons were as high as 244 mg/kg.

Visible contamination was found at the Tank 39 pit area. Three samples were taken from the pit and excavated soils. The one sample taken from the pit bottom (8133-SS-3) could be considered clean according to the standards set by the Bureau of Underground Storage Tank Regulation. Sample 8133-SS-1 was very contaminated, and was taken from the excavated soil surrounding the tank. The tank was found to have holes in it when it was excavated. This would seem to indicate that contamination is limited to the immediate area where the tank had been buried.

At the pit area of Tanks 24 and 25 elevated levels of total petroleum hydrocarbons and volatile organics were reported in the laboratory analysis results. Total petroleum hydrocarbon levels were as high as 2030 mg/kg. Levels of chlorinated organics (TCE, 1,1,1-trichloroethane, carbon tetrachloride, tetrachloroethene) ranged from undetectable concentrations to 1432 ug/kg.

From the initial soil sampling, it appears that the areas around tank 28 and tanks 24, 25 are the most contaminated. The area of tank 39 has unacceptable levels of TPH and volatile organics, but does not appear to be as contaminated as the areas of tank 28 and tanks 24, 25. The area of tank 32 seems to have very limited contamination. The lab analyses indicated that soil contamination was present around tanks 29, 30 and 31, further investigation will consider the area of tanks 29, 30, and 31 and the area of tank 28 as a single contaminant area due to their proximity.

Because there is soil contamination and possibly groundwater contamination at each of the tank pit areas, it was determined that further investigation and possible remediation will be necessary to accomplish clean closure of each area. A soil gas survey of each of the areas was performed in an effort to determine the lateral extent of the contamination. Preliminary results indicate the need for a complete site characterization to support the screening of the currently available remedial alternatives. Because the majority of the tank areas involve contamination due to solvents and waste oils, OEPA and the Bureau of Underground Storage Tank Regulation (BUSTR) have determined that OEPA will be responsible for future regulatory activity. The Ohio EPA's clean up standards are background or undetectable levels or health based remediation levels supported by risk assessment. According to Hallie Serazin, of the Division of Emergency and Remedial Response, OEPA is developing a statewide background standard for total petroleum hydrocarbons (TPH) and also health based standards for volatile organics. These standards are being developed presently therefore BUSTR's approximate values for undetectable levels of TPH and volatiles in soils are used for reference purposes, when discussing soil contaminant levels at the tank pit areas.

A comprehensive remedial investigation, to include an extensive field sampling program, will be conducted at each of the areas to further quantify the lateral and vertical extent, and the degree of contamination in the soil and groundwater. The Ohio Environmental Protection Agency (OEPA), is the regulatory agency responsible for approving the upcoming site investigation and possible remedial activity.

HITTMAN EBASCO ASSOCIATES, INC.
ANALYTICAL REPORT
SAMPLE RESULTS

CLIENT: NASA

REPORT PREPARED BY

CONTRACT #: ESI-7019-002

DATA RELEASED BY

REPORTING DATE: 27-Sep-89

UNITS: mg/Kg

CLIENT ID	HEAI ID	TPH	% SOLIDS
PBS-7121-SS-1	5475	<34	93.7
PBS-7121-SS-2	5476	<42	76.8
PBS-7121-SS-4	5477	287	96.9
PBS-7121-SS-8	5478	284	77.5
PBS-7121-SS-9	5479	192	76.7
PBS-7131-SS-4	5480	<38	83.5
PBS-7131-SS-5	5481	193	86.6
PBS-1411-SS-1	5482	244	76.3
PBS-1411-SS-4	5483	686	91.5
PBS-1411-SS-5	5484	243	82.5
PBS-7121-SS-5	5485	67	96.7
PBS-7121-SS-6	5486	<33	77.5
PBS-7121-SS-7	5487	<33	78.6
PBS-7131-SS-1	5488	120	83.3
PBS-7131-SS-2	5489	244	82.3
PBS-7131-SS-3	5490	191	84.3
PBS-1411-SS-2	5491	411	77.9
PBS-1411-SS-3	5492	2030	78.5

HITTMAN EBASCO ASSOCIATES, INC.
ANALYTICAL REPORT
SAMPLE RESULTS

CLIENT: NASA CLEVELAND

REPORT PREPARED BY

CONTRACT #: ESI-7019-002

DATA RELEASED BY _____

REPORTING DATE: 22-Sep-89

UNITS: mg/Kg

CLIENT ID	HEAI ID		TPH	%SOLIDS
PBS-8133-SS-1	5447		655	77.5
PBS-8133-SS-2	5448		<44	71.9
PBS-8133-SS-3	5449		<42	75.4
PBS-8133-SS-3	5449	DUP	<42	75.4
PBS-1411-SS-8	5450		93	80.1
PBS-1411-SS-9	5451		1050	84.5
PBS-1411-SS-6	5452		317	83.3
PBS-1411-SS-7	5453		1120	77.5

HITTMAN EBASCO ASSOCIATES, INC.
ANALYTICAL REPORT
SAMPLE RESULTS

CLIENT: NASA

REPORT PREPARED BY

CONTRACT #: ESI-7019-002

REPORTING DATE: 27-Sep-89

DATA RELEASED BY

CLIENT ID	HEAI ID	FLASHPOINT (degrees F)
PBS-8133-SS-1	5447	NO FLASH <200
PBS-8133-SS-2	5448	NO FLASH <200
PBS-8133-SS-3	5449	NO FLASH <200
PBS-1411-SS-8	5450	NO FLASH <200
PBS-1411-SS-9	5451	NO FLASH <200
PBS-7121-SS-1	5475	NO FLASH <200
PBS-7121-SS-2	5476	NO FLASH <200
PBS-7121-SS-4	5477	NO FLASH <200
PBS-7121-SS-8	5478	NO FLASH <200
PBS-7121-SS-9	5479	NO FLASH <200
PBS-7131-SS-4	5480	NO FLASH <200
PBS-7131-SS-5	5481	NO FLASH <200
PBS-1411-SS-1	5482	NO FLASH <200
PBS-1411-SS-4	5483	NO FLASH <200
PBS-1411-SS-5	5484	NO FLASH <200

HITTMAN EBASCO ASSOCIATES, INC.
ANALYTICAL REPORT
SAMPLE RESULTS

CLIENT: NASA

REPORT PREPARED BY

CONTRACT #: ESI-7019-002

DATA RELEASED BY

REPORTING DATE: 27-Sep-89

UNITS: ug/l in leachates

CLIENT ID	HEAI ID	LEAD
PBS-8133-SS-1	5447	<500
PBS-8133-SS-2	5448	<500
PBS-8133-SS-3	5449	<500
PBS-1411-SS-8	5450	<500
PBS-1411-SS-9	5451	<500
PBS-7121-SS-1	5475	<500
PBS-7121-SS-2	5476	<500
PBS-7121-SS-4	5477	<500
PBS-7121-SS-8	5478	<500
PBS-7121-SS-9	5479	<500
PBS-7131-SS-4	5480	<500
PBS-7131-SS-5	5481	<500
PBS-1411-SS-1	5482	<500
PBS-1411-SS-4	5483	<500
PBS-1411-SS-5	5484	<500

Building 7121, Tank No.s 28, 29, 30, 31; Volatile Organics Analysis

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI092	Method Number:	8240
Lab Sample Name:	PBS7121SS1,H#5454	Date Analyzed:	890922
Matrix:	Water	Date Collected:	890918
Dilution Factor:	1.1	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/5gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/l	Detection Limit	
Chloromethane		11	U
Bromomethane		11	U
Vinyl Chloride	3		J
Chloroethane	34		
Methylene Chloride	4		J
Acetone	380		
Acrylonitrile		5	U
Acrolein		5	U
Trichlorofluoromethane	4		J
Carbon Disulfide	1		J
1,1-Dichloroethene	2		J
1,1-Dichloroethane	70		
1,2-Dichloroethene (Total)	3		J
Chloroform		5	U
1,2-Dichloroethane	3		J
2-Butanone	86		
1,1,1-Trichloroethane	12		
Carbon Tetrachloride		5	U
Vinyl Acetate		11	U
Bromodichloromethane		5	U
1,2-Dichloropropane		5	U
trans-1,3-Dichloropropene		5	U
Trichloroethene	36		
Dibromochloromethane		5	U
1,1,2-Trichloroethane		5	U
Benzene		5	U
cis-1,3-Dichloropropene		5	U
2-Chloroethylvinylether		5	U
Bromoform		5	U
4-Methyl-2-Pentanone		11	U
2-Hexanone		11	U
Tetrachloroethene	2		J
1,1,2,2-Tetrachloroethane		5	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI092	Method Number:	8240
Lab Sample Name:	PBS7121SS1,H#5454	Date Analyzed:	890922
Matrix:	Water	Date Collected:	890918
Dilution Factor:	1.1	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/5gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/l	Detection Limit
Toluene	2	J
Chlorobenzene	1	J
Ethylbenzene	1	J
Styrene		5 U
Xylenes (Total)	3	J
m-Xylene	2	J
o + p-Xylene	1	J
1,3 Dichlorobenzene	2	J
1,2 Dichlorobenzene	1	J
1,4 Dichlorobenzene	2	J

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VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PBS7121551

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: HE#5454

Sample wt/vol: 5 G Lab File ID: >C1092

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/22/89

Column: PACK Dilution Factor: 1.0676

Number TICs found: ..... CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI102	Method Number:	8240
Lab Sample Name:	PBS7121SS1 1:5,5454	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	NA.
Dilution Factor:	1.0	Date Received:	NA.

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/1gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Chloromethane		10	U
Bromomethane		10	U
Vinyl Chloride		10	U
Chloroethane	5		J
Methylene Chloride	1		J
Acetone	75		
Acrylonitrile		5	U
Acrolein		5	U
Trichlorofluoromethane		5	U
Carbon Disulfide		5	U
1,1-Dichloroethene		5	U
1,1-Dichloroethane	11		
1,2-Dichloroethene (Total)		5	U
Chloroform		5	U
1,2-Dichloroethane		5	U
2-Butanone		5	U
1,1,1-Trichloroethane	3		J
Carbon Tetrachloride		5	U
Vinyl Acetate		10	U
Bromodichloromethane		5	U
1,2-Dichloropropane		5	U
trans-1,3-Dichloropropene		5	U
Trichloroethene	55		
Dibromochloromethane		5	U
1,1,2-Trichloroethane		5	U
Benzene		5	U
cis-1,3-Dichloropropene		5	U
2-Chloroethylvinylether		5	U
Bromoform		5	U
4-Methyl-2-Pentanone		10	U
2-Hexanone		10	U
Tetrachloroethene		5	U
1,1,2,2-Tetrachloroethane		5	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI102	Method Number:	8240
Lab Sample Name:	PBS7121SS1 1:5,5454	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	NA.
Dilution Factor:	1.0	Date Received:	NA.

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/1gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Toluene		5	U
Chlorobenzene		5	U
Ethylbenzene		5	U
Styrene		5	U
Xylenes (Total)		5	U
m-Xylene		5	U
o + p-Xylene		5	U
1,3 Dichlorobenzene		5	U
1,2 Dichlorobenzene		5	U
1,4 Dichlorobenzene		5	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PBS/12/1551

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: #5454 1:5

Sample wt/vol: 1 G Lab File ID: >C1102

Level: LOW Date Received: 09/20/89

% Moisture: not dec._____ Date Analyzed: 9/23/89

Column: PACK Dilution Factor: 5.3380

Number TICs Found: CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PBS7121SS5

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: #5458 1:5

Sample wt/vol: 1 G Lab File ID: >C1110

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/25/89

Column: PACK Dilution Factor: 5.4385

Number TICs found: CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI095	Method Number:	8240
Lab Sample Name:	PBS7121SS2,#HE5455	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.3	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/5gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Toluene	2		J
Chlorobenzene		7	U
Ethylbenzene		7	U
Styrene		7	U
Xylenes (Total)		7	U
m-Xylene		7	U
o + p-Xylene		7	U
1,3 Dichlorobenzene		7	U
1,2 Dichlorobenzene		7	U
1,4 Dichlorobenzene		7	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI095	Method Number:	8240
Lab Sample Name:	PBS7121SS3,HE#5456	Date Analyzed:	890522
Matrix:	Soil	Date Collected:	890518
Dilution Factor:	1.0	Date Received:	890520

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/5gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Chloromethane		10	U
Bromomethane		10	U
Vinyl Chloride		10	U
Chloroethane		10	U
Methylene Chloride		5	U
Acetone		10	U
Acrylonitrile		5	U
Acrolein		5	U
Trichlorofluoromethane		5	U
Carbon Disulfide		5	U
1,1-Dichloroethene	1		J
1,1-Dichloroethane	2		J
1,2-Dichloroethene (Total)		5	U
Chloroform		5	U
1,2-Dichloroethane		5	U
2-Butanone		5	U
1,1,1-Trichloroethane	97		
Carbon Tetrachloride	14		
Vinyl Acetate		10	U
Bromodichloromethane		5	U
1,2-Dichloropropane		5	U
trans-1,3-Dichloropropene		5	U
Trichloroethene	11		
Dibromochloromethane		5	U
1,1,2-Trichloroethane		5	U
Benzene		5	U
cis-1,3-Dichloropropene		5	U
2-Chloroethylvinylether		5	U
Bromoform		5	U
4-Methyl-2-Pentanone		10	U
2-Hexanone		10	U
Tetrachloroethene	1		J
1,1,2,2-Tetrachloroethane		5	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PB57121552

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: HE#5455

Sample wt/vol: 5 G Lab File ID: >C1095

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/22/89

Column: PACK Dilution Factor: 1.3016

Number TICs found: ..... CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

P8S7121SS3

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: HE#5456

Sample wt/vol: 5 G Lab File ID: >C1096

Level: LOW Date Received: 09/20/89

% Moisture: not dec._____ Date Analyzed: 9/22/89

Column: PACK Dilution Factor: 1.0000

Number TICs found: CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO. -

PBS/121585

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: #5456 1:5

Sample wt/vol: 1 G Lab File ID: >C1110

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/25/89

Column: PACK Dilution Factor: 5.4385

Number TICs found: CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI095	Method Number:	8240
Lab Sample Name:	PBS7121SS2,#HE5455	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.3	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/5gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Chloromethane		13	U
Bromomethane		13	U
Vinyl Chloride		13	U
Chloroethane		13	U
Methylene Chloride	4		J
Acetone		13	U
Acrylonitrile		7	U
Acrolein		7	U
Trichlorofluoromethane	3		J
Carbon Disulfide		7	U
1,1-Dichloroethene		7	U
1,1-Dichloroethane	3		J
1,2-Dichloroethene (Total)		7	U
Chloroform		7	U
1,2-Dichloroethane		7	U
2-Butanone		7	U
1,1,1-Trichloroethane	150		
Carbon Tetrachloride	22		
Vinyl Acetate		13	U
Bromodichloromethane		7	U
1,2-Dichloropropane		7	U
trans-1,3-Dichloropropene		7	U
Trichloroethene	200		
Dibromochloromethane		7	U
1,1,2-Trichloroethane		7	U
Benzene		7	U
cis-1,3-Dichloropropene		7	U
2-Chloroethylvinylether		7	U
Bromoform		7	U
4-Methyl-2-Pentanone		13	U
2-Hexanone		13	U
Tetrachloroethene	6		J
1,1,2,2-Tetrachloroethane		7	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI103	Method Number:	8240
Lab Sample Name:	PBS7121SS3 1:5,5456	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.0	Date Received:	890920

Sample Info.: GC/MS C,L5,ESI-7019,10ul IS-21,SS-20/1gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Toluene		5	U
Chlorobenzene		5	U
Ethylbenzene		5	U
Styrene		5	U
Xylenes (Total)		5	U
m-Xylene		5	U
o + p-Xylene		5	U
1,3 Dichlorobenzene		5	U
1,2 Dichlorobenzene		5	U
1,4 Dichlorobenzene		5	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI103	Method Number:	8240
Lab Sample Name:	PBS7121SS3 1:5,5456	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	5.2	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/1gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Chloromethane		52	U
Bromomethane		52	U
Vinyl Chloride		52	U
Chloroethane		52	U
Methylene Chloride		26	U
Acetone		52	U
Acrylonitrile		26	U
Acrolein		26	U
Trichlorofluoromethane		26	U
Carbon Disulfide		26	U
1,1-Dichloroethene	6		J
1,1-Dichloroethane	8		J
1,2-Dichloroethene (Total)		26	U
Chloroform		26	U
1,2-Dichloroethane		26	U
2-Butanone		26	U
1,1,1-Trichloroethane	490		
Carbon Tetrachloride	69		
Vinyl Acetate		52	U
Bromodichloromethane		26	U
1,2-Dichloropropane		26	U
trans-1,3-Dichloropropene		26	U
Trichloroethene	58		
Dibromochloromethane		26	U
1,1,2-Trichloroethane		26	U
Benzene		26	U
cis-1,3-Dichloropropene		26	U
2-Chloroethylvinylether		26	U
Bromoform		26	U
4-Methyl-2-Pentanone		52	U
2-Hexanone		52	U
Tetrachloroethene	5		J
1,1,2,2-Tetrachloroethane		26	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI103	Method Number:	8240
Lab Sample Name:	PBS7121SS3 1:5,5456	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	5.2	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/1gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Toluene		26	U
Chlorobenzene		26	U
Ethylbenzene		26	U
Styrene		26	U
Xylenes (Total)		26	U
m-Xylene		26	U
o + p-Xylene		26	U
1,3 Dichlorobenzene		26	U
1,2 Dichlorobenzene		26	U
1,4 Dichlorobenzene		26	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PRS/121553

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: #5456 1:5

Sample wt/vol: 1 G Lab File ID: >C1103

Level: LOW Date Received: 05/20/89

% Moisture: not dec._____ Date Analyzed: 5/23/89

Column: PACK Dilution Factor: 5.2148

Number TICs found: CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI097	Method Number:	8240
Lab Sample Name:	PBS7121SS4,#HE5457	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.0	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/5gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Chloromethane		10	U
Bromomethane		10	U
Vinyl Chloride		10	U
Chloroethane		10	U
Methylene Chloride	2		J
Acetone		10	U
Acrylonitrile		5	U
Acrolein		5	U
Trichlorofluoromethane	3		J
Carbon Disulfide	2		J
1,1-Dichloroethene	13		
1,1-Dichloroethane	9		
1,2-Dichloroethene (Total)		5	U
Chloroform		5	U
1,2-Dichloroethane		5	U
2-Butanone		5	U
1,1,1-Trichloroethane	610		
Carbon Tetrachloride	94		
Vinyl Acetate		10	U
Bromodichloromethane		5	U
1,2-Dichloropropane		5	U
trans-1,3-Dichloropropene		5	U
Trichloroethene	77		
Dibromochloromethane		5	U
1,1,2-Trichloroethane	1		J
Benzene		5	U
cis-1,3-Dichloropropene		5	U
2-Chloroethylvinylether		5	U
Bromoform		5	U
4-Methyl-2-Pentanone		10	U
2-Hexanone	7		J
Tetrachloroethene	7		
1,1,2,2-Tetrachloroethane		5	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI097	Method Number:	8240
Lab Sample Name:	PBS7121SS4,#HE5457	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890919
Dilution Factor:	1.0	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/5gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Toluene	1		J
Chlorobenzene	1		J
Ethylbenzene		5	U
Styrene		5	U
Xylenes (Total)		5	U
m-Xylene		5	U
o + p-Xylene		5	U
1,3 Dichlorobenzene		5	U
1,2 Dichlorobenzene		5	U
1,4 Dichlorobenzene		5	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO

FBS7121554

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: HE#5457

Sample wt/vol: 5 G Lab File ID: >C1097

Level: LOW Date Received: 09/20/89

% Moisture: not dec._____ Date Analyzed: 9/22/89

Column: PACK Dilution Factor: 1.0321

Number TICs found: CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI104	Method Number:	8240
Lab Sample Name:	PBS7121SS4 1:5,5457	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	890919
Dilution Factor:	5.2	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/1gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Chloromethane		52	U
Bromomethane		52	U
Vinyl Chloride		52	U
Chloroethane		52	U
Methylene Chloride		26	U
Acetone		52	U
Acrylonitrile		26	U
Acrolein		26	U
Trichlorofluoromethane		26	U
Carbon Disulfide		26	U
1,1-Dichloroethene	6		J
1,1-Dichloroethane	6		J
1,2-Dichloroethene (Total)		26	U
Chloroform		26	U
1,2-Dichloroethane		26	U
2-Butanone		26	U
1,1,1-Trichloroethane	410		
Carbon Tetrachloride	56		
Vinyl Acetate		52	U
Bromodichloromethane		26	U
1,2-Dichloropropane		26	U
trans-1,3-Dichloropropene		26	U
Trichloroethene	110		
Dibromochloromethane		26	U
1,1,2-Trichloroethane		26	U
Benzene		26	U
cis-1,3-Dichloropropene		26	U
2-Chloroethylvinylether		26	U
Bromoform		26	U
4-Methyl-2-Pentanone		52	U
2-Hexanone		52	U
Tetrachloroethene	8		J
1,1,2,2-Tetrachloroethane		26	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI104	Method Number:	8240
Lab Sample Name:	PBS7121SS4 1:5,5457	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	5.2	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/1gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Toluene		26	U
Chlorobenzene		26	U
Ethylbenzene		26	U
Styrene		26	U
Xylenes (Total)		26	U
m-Xylene		26	U
o + p-Xylene		26	U
1,3 Dichlorobenzene		26	U
1,2 Dichlorobenzene		26	U
1,4 Dichlorobenzene		26	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PBS7121SS4

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: #5457 1:5

Sample wt/vol: 1 G Lab File ID: >C1104

Level: LOW Date Received: 05/20/89

% Moisture: not dec._____ Date Analyzed: 9/23/89

Column: PACK Dilution Factor: 5.1705

Number TICs found: CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI098	Method Number:	8240
Lab Sample Name:	PBS7121SS5,#HES458	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.3	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/5gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Chloromethane		13	U
Bromomethane		13	U
Vinyl Chloride		13	U
Chloroethane		13	U
Methylene Chloride	6		J
Acetone	6		J
Acrylonitrile		6	U
Acrolein		6	U
Trichlorofluoromethane	7		
Carbon Disulfide		6	U
1,1-Dichloroethene	6		J
1,1-Dichloroethane	35		
1,2-Dichloroethene (Total)	19		
Chloroform		6	U
1,2-Dichloroethane		6	U
2-Butanone		6	U
1,1,1-Trichloroethane	760		
Carbon Tetrachloride	100		
Vinyl Acetate		13	U
Bromodichloromethane		6	U
1,2-Dichloropropane		6	U
trans-1,3-Dichloropropene		6	U
Trichloroethene	850		
Dibromochloromethane		6	U
1,1,2-Trichloroethane	3		J
Benzene		6	U
cis-1,3-Dichloropropene		6	U
2-Chloroethylvinylether		6	U
Bromoform		6	U
4-Methyl-2-Pentanone		13	U
2-Hexanone		13	U
Tetrachloroethene	110		
1,1,2,2-Tetrachloroethane	1		J

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI098	Method Number:	8240
Lab Sample Name:	PBS7121SS5,#HE5458	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.3	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/5gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Toluene	19		
Chlorobenzene		6	U
Ethylbenzene		6	U
Styrene		6	U
Xylenes (Total)	5		J
m-Xylene	3		J
o + p-Xylene	2		J
1,3 Dichlorobenzene		6	U
1,2 Dichlorobenzene		6	U
1,4 Dichlorobenzene		6	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PBS7121555

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: HE#5458

Sample wt/vol: 5 G Lab File ID: >C1098

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/22/89

Column: PACK Dilution Factor: 1.2877

Number TICs found: CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI105	Method Number:	8240
Lab Sample Name:	PBS7121SS5 1:5,5458	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	5.4	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/1gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Chloromethane		54	U
Bromomethane		54	U
Vinyl Chloride		54	U
Chloroethane		54	U
Methylene Chloride		27	U
Acetone		54	U
Acrylonitrile		27	U
Acrolein		27	U
Trichlorofluoromethane		27	U
Carbon Disulfide		27	U
1,1-Dichloroethene	8		J
1,1-Dichloroethane	47		
1,2-Dichloroethene (Total)	19		J
Chloroform		27	U
1,2-Dichloroethane		27	U
2-Butanone		27	U
1,1,1-Trichloroethane	1100		
Carbon Tetrachloride	140		
Vinyl Acetate		54	U
Bromodichloromethane		27	U
1,2-Dichloropropane		27	U
trans-1,3-Dichloropropene		27	U
Trichloroethene	1000		
Dibromochloromethane		27	U
1,1,2-Trichloroethane	6		J
Benzene		27	U
cis-1,3-Dichloropropene		27	U
2-Chloroethylvinylether		27	U
Bromoform		27	U
4-Methyl-2-Pentanone		54	U
2-Hexanone		54	U
Tetrachloroethene	160		
1,1,2,2-Tetrachloroethane		27	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI105	Method Number:	8240
Lab Sample Name:	PBS7121SS5 1:5,5458	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	5.4	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/1gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Toluene	25		J
Chlorobenzene		27	U
Ethylbenzene		27	U
Styrene		27	U
Xylenes (Total)		27	U
m-Xylene		27	U
o + p-Xylene		27	U
1,3 Dichlorobenzene		27	U
1,2 Dichlorobenzene		27	U
1,4 Dichlorobenzene		27	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PR5/121555

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: #5458 1:5

Sample wt/vol: 1 G Lab File ID: >C1105

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/23/89

Column: PACK Dilution Factor: 5.4385

Number TICs found: CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI110	Method Number:	8240
Lab Sample Name:	PBS7121SSS 1:5,5458	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	5.4	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/1gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Chloromethane		54	U
Bromomethane		54	U
Vinyl Chloride		54	U
Chloroethane		54	U
Methylene Chloride	45		
Acetone	28		J
Acrylonitrile		27	U
Acrolein		27	U
Trichlorofluoromethane		27	U
Carbon Disulfide		27	U
1,1-Dichloroethene		27	U
1,1-Dichloroethane	27		J
1,2-Dichloroethene (Total)	11		J
Chloroform		27	U
1,2-Dichloroethane		27	U
2-Butanone		27	U
1,1,1-Trichloroethane	530		
Carbon Tetrachloride	73		
Vinyl Acetate		54	U
Bromodichloromethane		27	U
1,2-Dichloropropane		27	U
trans-1,3-Dichloropropene		27	U
Trichloroethene	880		
Dibromochloromethane		27	U
1,1,2-Trichloroethane		27	U
Benzene		27	U
cis-1,3-Dichloropropene		27	U
2-Chloroethylvinylether		27	U
Bromoform		27	U
4-Methyl-2-Pentanone		54	U
2-Hexanone		54	U
Tetrachloroethene	94		
1,1,2,2-Tetrachloroethane		27	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI110	Method Number:	8240
Lab Sample Name:	PBS7121SS5 1:5,5458	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	5.4	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/1gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Toluene	15		J
Chlorobenzene		27	U
Ethylbenzene		27	U
Styrene		27	U
Xylenes (Total)		27	U
m-Xylene		27	U
o + p-Xylene		27	U
1,3 Dichlorobenzene		27	U
1,2 Dichlorobenzene		27	U
1,4 Dichlorobenzene		27	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI077	Method Number:	8240
Lab Sample Name:	PBS7121SS6 #5459	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.3	Date Received:	890920

Sample Info.: GC/MS A,LB,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		1.	U
Chloromethane		1.	U
Vinyl Chloride		1.	U
Bromomethane		1.	U
Chloroethane		1.	U
Trichlorofluoromethane	3.		
1,1-Dichloroethene		1.	U
Methylene Chloride	5.		
trans-1,2-Dichloroethene		1.	U
1,1-Dichloroethane	12.		
cis-1,2-Dichloroethene	60.		
2,2-Dichloropropane		1.	U
Chloroform		1.	U
Bromochloromethane		1.	U
1,1,1-Trichloroethane	442.		
1,1-Dichloropropene		1.	U
Carbon Tetrachloride	93.		
1,2-Dichloroethane	3.		
Benzene	0.		J
Trichloroethene	890.		
1,2-Dichloropropane		1.	U
Bromodichloromethane		1.	U
Dibromomethane		1.	U
Toluene	22.		
1,1,2-Trichloroethane	4.		
1,3-Dichloropropane		1.	U
Tetrachloroethene	119.		
Dibromochloromethane		1.	U
1,2-Dibromoethane - EDB		1.	U
Chlorobenzene		1.	U
Ethylbenzene	3.		
1,1,1,2-Tetrachloroethane		1.	U
m + p-Xylenes	4.		

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI077	Method Number:	8240
Lab Sample Name:	FBS7121SS6 #5459	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.3	Date Received:	890920

Sample Info.: GC/MS A,LB,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
o-Xylene	2.	
Styrene		1. U
1,1,2,2-Tetrachloroethane		1. U
Isopropylbenzene		1. U
Bromoform		1. U
1,2,3-Trichloropropane		1. U
n-Propylbenzene		1. U
Bromobenzene		1. U
1,3,5-Trimethylbenzene	5.	
4-Chlorotoluene		1. U
2-Chlorotoluene		1. U
tert-Butylbenzene		1. U
1,2,4-Trimethylbenzene	6.	
sec-Butylbenzene		1. U
p-Isopropyltoluene		1. U
1,3-Dichlorobenzene		1. U
1,4-Dichlorobenzene		1. U
n-Butylbenzene		1. U
1,2-Dichlorobenzene		1. U
1,2-Dibromo-3-Chloropropane		1. U
1,2,4-Trichlorobenzene		1. U
Hexachlorobutadiene		1. U
Naphthalene	4.	
1,2,3-Trichlorobenzene		1. U

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PB57121556

Lab Name: Hittman Ebasco Contract: ES1 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: HA#5458

Sample wt/vol: 5 G Lab File ID: >A1077

Level: LOW Date Received: 09/20/88

% Moisture: not dec.____ Date Analyzed: 9/23/88

Column: W.B. Dilution Factor: 1.2902

Number TICs found: 6

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	28.03	15.	
2.	91576	Naphthalene, 2-methyl- (8C19	29.02	12.	
3.		Unknown	29.42	13.	
4.	544763	Hexadecane (8C19C1)	30.52	15.	
5.	581420	Naphthalene, 2,6-dimethyl- (	32.02	12.	
6.		Unknown	32.75	11.	
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI109	Method Number:	8240
Lab Sample Name:	PBS7121SS6 #5459 1/10	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	12.9	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,.5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
Dichlorodifluoromethane		13. U
Chloromethane		13. U
Vinyl Chloride		13. U
Bromomethane		13. U
Chloroethane		13. U
Trichlorofluoromethane		13. U
1,1-Dichloroethene		13. U
Methylene Chloride	231.	
trans-1,2-Dichloroethene		13. U
1,1-Dichloroethane		13. U
cis-1,2-Dichloroethene	37.	
2,2-Dichloropropane		13. U
Chloroform		13. U
Bromochloromethane		13. U
1,1,1-Trichloroethane	496.	
1,1-Dichloropropene		13. U
Carbon Tetrachloride		13. U
1,2-Dichloroethane		13. U
Benzene		13. U
Trichloroethene	1605.	
1,2-Dichloropropane		13. U
Bromodichloromethane		13. U
Dibromomethane		13. U
Toluene	23.	
1,1,2-Trichloroethane		13. U
1,3-Dichloropropane		13. U
Tetrachloroethene	192.	
Dibromochloromethane		13. U
1,2-Dibromoethane - EDB		13. U
Chlorobenzene		13. U
Ethylbenzene		13. U
1,1,1,2-Tetrachloroethane		13. U
m + p-Xylenes		13. U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI109	Method Number:	8240
Lab Sample Name:	PBS7121SS6 #5459 1;10	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	12.9	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,.5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
o-Xylene		13. U
Styrene		13. U
1,1,2,2-Tetrachloroethane		13. U
Isopropylbenzene		13. U
Bromoform		13. U
1,2,3-Trichloropropane		13. U
n-Propylbenzene		13. U
Bromobenzene		13. U
1,3,5-Trimethylbenzene		13. U
4-Chlorotoluene		13. U
2-Chlorotoluene		13. U
tert-Butylbenzene		13. U
1,2,4-Trimethylbenzene		13. U
sec-Butylbenzene		13. U
p-Isopropyltoluene		13. U
1,3-Dichlorobenzene		13. U
1,4-Dichlorobenzene		13. U
n-Butylbenzene		13. U
1,2-Dichlorobenzene		13. U
1,2-Dibromo-3-Chloropropane		13. U
1,2,4-Trichlorobenzene		13. U
Hexachlorobutadiene		13. U
Naphthalene	20.	
1,2,3-Trichlorobenzene		13. U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

FRS7121SS6 //C1

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: 5459 //C

Sample wt/vol: .5 G Lab File ID: >A1108

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/25/89

Column: W.B. Dilution Factor: 166.45

Number TICs found: 0

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI078	Method Number:	8240
Lab Sample Name:	PBS7121SS7 #5460	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.3	Date Received:	890920

Sample Info.: GC/MS A,LB,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		1.	U
Chloromethane		1.	U
Vinyl Chloride		1.	U
Bromomethane		1.	U
Chloroethane		1.	U
Trichlorofluoromethane	13.		
1,1-Dichloroethene		1.	U
Methylene Chloride	19.		
trans-1,2-Dichloroethene		1.	U
1,1-Dichloroethane	20.		
cis-1,2-Dichloroethene	28.		
2,2-Dichloropropane		1.	U
Chloroform		1.	U
Bromochloromethane		1.	U
1,1,1-Trichloroethane	177.		
1,1-Dichloropropene		1.	U
Carbon Tetrachloride	36.		
1,2-Dichloroethane		1.	U
Benzene	0.		J
Trichloroethene	851.		
1,2-Dichloropropane		1.	U
Bromodichloromethane		1.	U
Dibromomethane		1.	U
Toluene	2.		
1,1,2-Trichloroethane	4.		
1,3-Dichloropropane		1.	U
Tetrachloroethene	88.		
Dibromochloromethane		1.	U
1,2-Dibromoethane - EDB		1.	U
Chlorobenzene		1.	U
Ethylbenzene	1.		J
1,1,1,2-Tetrachloroethane		1.	U
m + p-Xylenes	0.		J

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI078	Method Number:	8240
Lab Sample Name:	PBS7121SS7 #5460	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.3	Date Received:	890920

Sample Info.: GC/MS A,LB,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		1.	U
Styrene		1.	U
1,1,2,2-Tetrachloroethane		1.	U
Isopropylbenzene		1.	U
Bromoform		1.	U
1,2,3-Trichloropropane		1.	U
n-Propylbenzene		1.	U
Bromobenzene		1.	U
1,3,5-Trimethylbenzene		1.	U
4-Chlorotoluene		1.	U
2-Chlorotoluene		1.	U
tert-Butylbenzene		1.	U
1,2,4-Trimethylbenzene	0.		J
sec-Butylbenzene		1.	U
p-Isopropyltoluene		1.	U
1,3-Dichlorobenzene		1.	U
1,4-Dichlorobenzene		1.	U
n-Butylbenzene		1.	U
1,2-Dichlorobenzene		1.	U
1,2-Dibromo-3-Chloropropane		1.	U
1,2,4-Trichlorobenzene		1.	U
Hexachlorobutadiene		1.	U
Naphthalene	1.		
1,2,3-Trichlorobenzene		1.	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
PBS7121SS7

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: HE#5460

Sample wt/vol: 5 G Lab File ID: >8110/8

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/23/89

Column: W.B. Dilution Factor: 1.2/24

Number TICs found: 3

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	8.85	6.	
2.		Unknown	13.89	13.	
3.	581408	Naphthalene, 2,3-dimethyl- (	32.83	12.	
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI110	Method Number:	8240
Lab Sample Name:	PBS7121SS7 #5460 1110	Date Analyzed:	890525
Matrix:	Soil	Date Collected:	890518
Dilution Factor:	12.7	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,.5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
Dichlorodifluoromethane		13. U
Chloromethane		13. U
Vinyl Chloride		13. U
Bromomethane		13. U
Chloroethane		13. U
Trichlorofluoromethane		13. U
1,1-Dichloroethene		13. U
Methylene Chloride	249.	
trans-1,2-Dichloroethene		13. U
1,1-Dichloroethane		13. U
cis-1,2-Dichloroethene		13. U
2,2-Dichloropropane		13. U
Chloroform		13. U
Bromochloromethane		13. U
1,1,1-Trichloroethane	203.	
1,1-Dichloropropene		13. U
Carbon Tetrachloride		13. U
1,2-Dichloroethane		13. U
Benzene		13. U
Trichloroethene	1335.	
1,2-Dichloropropane		13. U
Bromodichloromethane		13. U
Dibromomethane		13. U
Toluene		13. U
1,1,2-Trichloroethane		13. U
1,3-Dichloropropane		13. U
Tetrachloroethene	157.	
Dibromochloromethane		13. U
1,2-Dibromoethane - EDB		13. U
Chlorobenzene		13. U
Ethylbenzene		13. U
1,1,1,2-Tetrachloroethane		13. U
m + p-Xylenes		13. U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI110	Method Number:	8240
Lab Sample Name:	PBS7121SS7 #5460 1110	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	12.7	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,.5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		13.	U
Styrene		13.	U
1,1,2,2-Tetrachloroethane		13.	U
Isopropylbenzene		13.	U
Bromoform		13.	U
1,2,3-Trichloropropane		13.	U
n-Propylbenzene		13.	U
Bromobenzene		13.	U
1,3,5-Trimethylbenzene		13.	U
4-Chlorotoluene		13.	U
2-Chlorotoluene		13.	U
tert-Butylbenzene		13.	U
1,2,4-Trimethylbenzene		13.	U
sec-Butylbenzene		13.	U
p-Isopropyltoluene		13.	U
1,3-Dichlorobenzene		13.	U
1,4-Dichlorobenzene		13.	U
n-Butylbenzene		13.	U
1,2-Dichlorobenzene		13.	U
1,2-Dibromo-3-Chloropropane		13.	U
1,2,4-Trichlorobenzene		13.	U
Hexachlorobutadiene		13.	U
Naphthalene		13.	U
1,2,3-Trichlorobenzene		13.	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PRS7121SS7 110

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: 5488 110

Sample wt/vol: .5 G Lab File ID: >A1110

Level: LOW Date Received: 09/20/89

% Moistore: not dec.____ Date Analyzed: 9/25/89

Column: W.B. Dilution Factor: 161.91

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
3.					
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI079	Method Number:	8240
Lab Sample Name:	PBS7121SS8 #5461	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.3	Date Received:	890920

Sample Info.: GC/MS A,LB,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
Dichlorodifluoromethane		1. U
Chloromethane		1. U
Vinyl Chloride		1. U
Bromomethane		1. U
Chloroethane	10.	
Trichlorofluoromethane	28.	
1,1-Dichloroethene	19.	
Methylene Chloride	28.	
trans-1,2-Dichloroethene	2.	
1,1-Dichloroethane	197.	
cis-1,2-Dichloroethene	32.	
2,2-Dichloropropane		1. U
Chloroform	1.	J
Bromochloromethane		1. U
1,1,1-Trichloroethane	2246.	
1,1-Dichloropropene		1. U
Carbon Tetrachloride	431.	
1,2-Dichloroethane	4.	
Benzene	1.	J
Trichloroethene	1658.	
1,2-Dichloropropane		1. U
Bromodichloromethane		1. U
Dibromomethane		1. U
Toluene	82.	
1,1,2-Trichloroethane	15.	
1,3-Dichloropropane		1. U
Tetrachloroethene	517.	
Dibromochloromethane		1. U
1,2-Dibromoethane - EDB		1. U
Chlorobenzene		1. U
Ethylbenzene	6.	
1,1,1,2-Tetrachloroethane		1. U
m + p-Xylenes	10.	

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI079	Method Number:	8240
Lab Sample Name:	PBS7121SS8 #5461	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	890919
Dilution Factor:	1.3	Date Received:	890920

Sample Info.: GC/MS A,LB,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
o-Xylene	6.	
Styrene		1. U
1,1,2,2-Tetrachloroethane		1. U
Isopropylbenzene	2.	
Bromoform		1. U
1,2,3-Trichloropropane		1. U
n-Propylbenzene	3.	
Bromobenzene		1. U
1,3,5-Trimethylbenzene	22.	
4-Chlorotoluene		1. U
2-Chlorotoluene		1. U
tert-Butylbenzene	2.	
1,2,4-Trimethylbenzene	15.	
sec-Butylbenzene		1. U
p-Isopropyltoluene		1. U
1,3-Dichlorobenzene		1. U
1,4-Dichlorobenzene		1. U
n-Butylbenzene		1. U
1,2-Dichlorobenzene		1. U
1,2-Dibromo-3-Chloropropane		1. U
1,2,4-Trichlorobenzene		1. U
Hexachlorobutadiene		1. U
Naphthalene	5.	
1,2,3-Trichlorobenzene		1. U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PBS7121SS8

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: HE#5461

Sample wt/vol: 5 G Lab File ID: >F10/9

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/23/89

Column: W.B. Dilution Factor: 1.2905

Number TICs found: 19 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	13.81	10.	
2.		Unknown	17.28	11.	
3.		Unknown	21.38	15.	
4.	1758889	Benzene, 2-ethyl-1,4-dimethyl	23.13	10.	
5.	95932	Benzene, 1,2,4,5-tetramethyl	23.87	8.	
6.	874419	Benzene, 1-ethyl-2,4-dimethyl	24.05	30.	
7.	527537	Benzene, 1,2,3,5-tetramethyl	24.93	10.	
8.		Unknown	25.99	11.	
9.		Unknown	26.86	13.	
10.		Unknown	27.45	12.	
11.		Unknown	27.71	11.	
12.		Unknown	28.03	20.	
13.	90120	Naphthalene, 1-methyl- (8C19	28.99	16.	
14.		Unknown	29.39	28.	
15.		Unknown	29.72	10.	
16.		Unknown	30.52	14.	
17.		Unknown	31.18	23.	
18.	581420	Naphthalene, 2,6-dimethyl- (	31.98	30.	
19.	571619	Naphthalene, 1,5-dimethyl- (	32.75	20.	
20.					
21.					
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30.					

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI104	Method Number:	8240
Lab Sample Name:	PBS7121SS8 #5461 1:25	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	32.3	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,ML,500ul,5uL IS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
Dichlorodifluoromethane		32. U
Chloromethane		32. U
Vinyl Chloride		32. U
Bromomethane		32. U
Chloroethane		32. U
Trichlorofluoromethane		32. U
1,1-Dichloroethene		32. U
Methylene Chloride	38.	
trans-1,2-Dichloroethene		32. U
1,1-Dichloroethane	97.	
cis-1,2-Dichloroethene		32. U
2,2-Dichloropropane		32. U
Chloroform		32. U
Bromochloromethane		32. U
1,1,1-Trichloroethane	2536.	
1,1-Dichloropropene		32. U
Carbon Tetrachloride		32. U
1,2-Dichloroethane		32. U
Benzene		32. U
Trichloroethene	3674.	
1,2-Dichloropropane		32. U
Bromodichloromethane		32. U
Dibromomethane		32. U
Toluene	79.	
1,1,2-Trichloroethane		32. U
1,3-Dichloropropane		32. U
Tetrachloroethene	961.	
Dibromochloromethane		32. U
1,2-Dibromoethane - EDB		32. U
Chlorobenzene		32. U
Ethylbenzene		32. U
1,1,1,2-Tetrachloroethane		32. U
m + p-Xylenes		32. U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI104	Method Number:	8240
Lab Sample Name:	PBS7121SS8 #5461 1:25	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	32.3	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,ML,500ul,5uL IS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		32.	U
Styrene		32.	U
1,1,2,2-Tetrachloroethane		32.	U
Isopropylbenzene		32.	U
Bromoform		32.	U
1,2,3-Trichloropropane		32.	U
n-Propylbenzene		32.	U
Bromobenzene		32.	U
1,3,5-Trimethylbenzene		32.	U
4-Chlorotoluene		32.	U
2-Chlorotoluene		32.	U
tert-Butylbenzene		32.	U
1,2,4-Trimethylbenzene		32.	U
sec-Butylbenzene		32.	U
p-Isopropyltoluene		32.	U
1,3-Dichlorobenzene		32.	U
1,4-Dichlorobenzene		32.	U
n-Butylbenzene		32.	U
1,2-Dichlorobenzene		32.	U
1,2-Dibromo-3-Chloropropane		32.	U
1,2,4-Trichlorobenzene		32.	U
Hexachlorobutadiene		32.	U
Naphthalene	88.		
1,2,3-Trichlorobenzene	55.		

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PRS/121588

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: #5461 1:25

Sample wt/vol: .2 G Lab File ID: >A1104

Level: MED Date Received: 08/20/88

% Moisture: not dec.____ Date Analyzed: 9/25/88

Column: W.B. Dilution Factor: 1.0000

Number TICs found: 20

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
3.					
4.					
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI105	Method Number:	8240
Lab Sample Name:	PBS7121SS8 #5461MS 1125	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	32.3	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI701S,ML,500ul,5uL IS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
Dichlorodifluoromethane		32. U
Chloromethane		32. U
Vinyl Chloride		32. U
Bromomethane		32. U
Chloroethane		32. U
Trichlorofluoromethane		32. U
1,1-Dichloroethene		
Methylene Chloride	141.	
trans-1,2-Dichloroethene		32. U
1,1-Dichloroethane	254.	
cis-1,2-Dichloroethene		32. U
2,2-Dichloropropane		32. U
Chloroform		32. U
Bromochloromethane		32. U
1,1,1-Trichloroethane	6043.	
1,1-Dichloropropene		32. U
Carbon Tetrachloride		32. U
1,2-Dichloroethane		32. U
Benzene		
Trichloroethene		
1,2-Dichloropropane		32. U
Bromodichloromethane		32. U
Dibromomethane		32. U
Toluene		
1,1,2-Trichloroethane		32. U
1,3-Dichloropropane		32. U
Tetrachloroethene	3048.	
Dibromochloromethane		32. U
1,2-Dibromoethane - EDB		32. U
Chlorobenzene		
Ethylbenzene	86.	
1,1,1,2-Tetrachloroethane		32. U
m + p-Xylenes	55.	

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI105	Method Number:	8240
Lab Sample Name:	PBS7121SS8 #5461MS 1:25	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	32.3	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI701S,ML,500ul,5uL IS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		32.	U
Styrene		32.	U
1,1,2,2-Tetrachloroethane		32.	U
Isopropylbenzene		32.	U
Bromoform		32.	U
1,2,3-Trichloropropane		32.	U
n-Propylbenzene		32.	U
Bromobenzene		32.	U
1,3,5-Trimethylbenzene		32.	U
4-Chlorotoluene		32.	U
2-Chlorotoluene		32.	U
tert-Butylbenzene		32.	U
1,2,4-Trimethylbenzene		32.	U
sec-Butylbenzene		32.	U
p-Isopropyltoluene		32.	U
1,3-Dichlorobenzene		32.	U
1,4-Dichlorobenzene		32.	U
n-Butylbenzene		32.	U
1,2-Dichlorobenzene		32.	U
1,2-Dibromo-3-Chloropropane		32.	U
1,2,4-Trichlorobenzene		32.	U
Hexachlorobutadiene		32.	U
Naphthalene		32.	U
1,2,3-Trichlorobenzene		32.	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI106	Method Number:	8240
Lab Sample Name:	PBS7121SS8 #5461MSD 1125	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	32.3	Date Received:	890520

Sample Info.: GC/MS A,TN,ESI7019,ML,500ul,5uL IS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
Dichlorodifluoromethane		32. U
Chloromethane		32. U
Vinyl Chloride		32. U
Bromomethane		32. U
Chloroethane		32. U
Trichlorofluoromethane		32. U
1,1-Dichloroethene		
Methylene Chloride	116.	
trans-1,2-Dichloroethene		32. U
1,1-Dichloroethane	135.	
cis-1,2-Dichloroethene		32. U
2,2-Dichloropropane		32. U
Chloroform		32. U
Bromochloromethane		32. U
1,1,1-Trichloroethane	3192.	
1,1-Dichloropropene		32. U
Carbon Tetrachloride		32. U
1,2-Dichloroethane		32. U
Benzene		
Trichloroethene		
1,2-Dichloropropane		32. U
Bromodichloromethane		32. U
Dibromomethane		32. U
Toluene		
1,1,2-Trichloroethane		32. U
1,3-Dichloropropane		32. U
Tetrachloroethene	1504.	
Dibromochloromethane		32. U
1,2-Dibromoethane - EDB		32. U
Chlorobenzene		
Ethylbenzene		32. U
1,1,1,2-Tetrachloroethane		32. U
m + p-Xylenes		32. U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI10C	Method Number:	8240
Lab Sample Name:	PBS7121SS8 #5461MSD 1.25	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	32.3	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,ML,500ul,5uL IS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		32.	U
Styrene		32.	U
1,1,2,2-Tetrachloroethane		32.	U
Isopropylbenzene		32.	U
Bromoform		32.	U
1,2,3-Trichloropropane		32.	U
n-Propylbenzene		32.	U
Bromobenzene		32.	U
1,3,5-Trimethylbenzene		32.	U
4-Chlorotoluene		32.	U
2-Chlorotoluene		32.	U
tert-Butylbenzene		32.	U
1,2,4-Trimethylbenzene		32.	U
sec-Butylbenzene		32.	U
p-Isopropyltoluene		32.	U
1,3-Dichlorobenzene		32.	U
1,4-Dichlorobenzene		32.	U
n-Butylbenzene		32.	U
1,2-Dichlorobenzene		32.	U
1,2-Dibromo-3-Chloropropane		32.	U
1,2,4-Trichlorobenzene		32.	U
Hexachlorobutadiene		32.	U
Naphthalene		32.	U
1,2,3-Trichlorobenzene		32.	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI080	Method Number:	8240
Lab Sample Name:	PBS7121SS9 #5462	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.3	Date Received:	890920

Sample Info.: GC/MS A,LB,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		1.	U
Chloromethane		1.	U
Vinyl Chloride		1.	U
Bromomethane		1.	U
Chloroethane		1.	U
Trichlorofluoromethane	13.		
1,1-Dichloroethene	44.		
Methylene Chloride	3.		
trans-1,2-Dichloroethene	1.		J
1,1-Dichloroethane	754.		
cis-1,2-Dichloroethene	188.		
2,2-Dichloropropane		1.	U
Chloroform	1.		J
Bromochloromethane		1.	U
1,1,1-Trichloroethane	3442.		
1,1-Dichloropropene		1.	U
Carbon Tetrachloride	1.		J
1,2-Dichloroethane	96.		
Benzene	2.		
Trichloroethene	723.		
1,2-Dichloropropane		1.	U
Bromodichloromethane	1.		J
Dibromomethane		1.	U
Toluene	628.		
1,1,2-Trichloroethane	212.		
1,3-Dichloropropane		1.	U
Tetrachloroethene	1107.		
Dibromochloromethane		1.	U
1,2-Dibromoethane - EDB		1.	U
Chlorobenzene		1.	U
Ethylbenzene	216.		
1,1,1,2-Tetrachloroethane		1.	U
m + p-Xylenes	258.		

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI080	Method Number:	8240
Lab Sample Name:	PBS7121SS9 #5462	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.3	Date Received:	890920

Sample Info.: GC/MS A,LB,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene	101.		
Styrene		1.	U
1,1,2,2-Tetrachloroethane	4.		
Isopropylbenzene	10.		
Bromoform		1.	U
1,2,3-Trichloropropane		1.	U
n-Propylbenzene	31.		
Bromobenzene		1.	U
1,3,5-Trimethylbenzene	297.		
4-Chlorotoluene		1.	U
2-Chlorotoluene		1.	U
tert-Butylbenzene	40.		
1,2,4-Trimethylbenzene	319.		
sec-Butylbenzene	8.		
p-Isopropyltoluene	22.		
1,3-Dichlorobenzene		1.	U
1,4-Dichlorobenzene	1.		J
n-Butylbenzene		1.	U
1,2-Dichlorobenzene	0.		J
1,2-Dibromo-3-Chloropropane		1.	U
1,2,4-Trichlorobenzene	1.		
Hexachlorobutadiene		1.	U
Naphthalene	201.		
1,2,3-Trichlorobenzene	2.		

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO

PRS7121SS8

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: HE#5462

Sample wt/vol: 5 G Lab File ID: >A1080

Level: LOW Date Received: 08/20/88

% Moisture: not dec._____ Date Analyzed: 9/23/88

Column: W.B. Dilution Factor: 1.2994

Number TICs Found: 20

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	5.30	110.	
2.		Unknown	7.27	85.	
3.		Unknown	10.09	340.	
4.		Unknown	13.01	1300.	
5.		Unknown	14.07	150.	
6.	565617	2-Pentanone, 3-methyl- (8C19	14.55	210.	
7.	535773	Benzene, 1-methyl-3-(1-methyl	23.15	23.	
8.		Unknown	23.44	46.	
9.	527537	Benzene, 1,2,3,5-tetramethyl	23.88	29.	
10.	874419	Benzene, 1-ethyl-2,4-dimethyl	24.07	100.	
11.		Unknown	24.29	38.	
12.	95932	Benzene, 1,2,4,5-tetramethyl	24.91	31.	
13.		Unknown	25.13	20.	
14.		Unknown	25.61	27.	
15.		Unknown	28.03	48.	
16.	90120	Naphthalene, 1-methyl- (8C19	28.98	68.	
17.	91576	Naphthalene, 2-methyl- (8C19	29.67	37.	
18.		Unknown	30.52	46.	
19.	571619	Naphthalene, 1,5-dimethyl- (	32.02	31.	
20.	569415	Naphthalene, 1,8-dimethyl- (	32.75	24.	
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI107	Method Number:	8240
Lab Sample Name:	PBS7121SS9 #5462 1762	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	81.2	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,ML,200ul,5uL IS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
Dichlorodifluoromethane		81. U
Chloromethane		81. U
Vinyl Chloride		81. U
Bromomethane		81. U
Chloroethane		81. U
Trichlorofluoromethane		81. U
1,1-Dichloroethene		81. U
Methylene Chloride	141.	
trans-1,2-Dichloroethene		81. U
1,1-Dichloroethane	1214.	
cis-1,2-Dichloroethene	152.	
2,2-Dichloropropane		81. U
Chloroform		81. U
Bromochloromethane		81. U
1,1,1-Trichloroethane	7770.	
1,1-Dichloropropene		81. U
Carbon Tetrachloride		81. U
1,2-Dichloroethane		81. U
Benzene		81. U
Trichloroethene	21142.	
1,2-Dichloropropane		81. U
Bromodichloromethane		81. U
Dibromomethane		81. U
Toluene	1101.	
1,1,2-Trichloroethane		81. U
1,3-Dichloropropane		81. U
Tetrachloroethene	10048.	
Dibromochloromethane		81. U
1,2-Dibromoethane - EDB		81. U
Chlorobenzene		81. U
Ethylbenzene	411.	
1,1,1,2-Tetrachloroethane		81. U
m + p-Xylenes	395.	

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI107	Method Number:	8240
Lab Sample Name:	PBS7121SS9 #5462 1.62	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	81.2	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,ML,200ul,5uL IS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
o-Xylene	137.	
Styrene		81. U
1,1,2,2-Tetrachloroethane		81. U
Isopropylbenzene		81. U
Bromoform		81. U
1,2,3-Trichloropropane		81. U
n-Propylbenzene		81. U
Bromobenzene		81. U
1,3,5-Trimethylbenzene	442.	
4-Chlorotoluene		81. U
2-Chlorotoluene		81. U
tert-Butylbenzene		81. U
1,2,4-Trimethylbenzene	479.	
sec-Butylbenzene		81. U
p-Isopropyltoluene		81. U
1,3-Dichlorobenzene		81. U
1,4-Dichlorobenzene		81. U
n-Butylbenzene		81. U
1,2-Dichlorobenzene		81. U
1,2-Dibromo-3-Chloropropane		81. U
1,2,4-Trichlorobenzene		81. U
Hexachlorobutadiene		81. U
Naphthalene	268.	
1,2,3-Trichlorobenzene		81. U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
PBS7121SS3

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: #5462 1:62

Sample wt/vol: .08 G Lab File ID: >A1107

Level: MED Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/25/89

Column: W.B. Dilution Factor: 81.2124

Number TICs found: 7 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	23.14	22000.	
2.		Unknown	23.47	31000.	
3.	112403	Dodecane (8C19C1)	24.05	110000.	
4.		Unknown	24.27	37000.	
5.		Unknown	25.99	50000.	
6.	90120	Naphthalene, 1-methyl- (8C19	28.99	28000.	
7.		Unknown	30.52	33000.	
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI117	Method Number:	8240
Lab Sample Name:	PBS7121SSS #5462	Date Analyzed:	890926
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	162.4	Date Received:	890920

Sample Info.: GC/MS A,DC, ,ML,100ul,SuL IS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		162.	U
Chloromethane		162.	U
Vinyl Chloride		162.	U
Bromomethane		162.	U
Chloroethane		162.	U
Trichlorofluoromethane		162.	U
1,1-Dichloroethene		162.	U
Methylene Chloride	49.		J
trans-1,2-Dichloroethene		162.	U
1,1-Dichloroethane	1164.		
cis-1,2-Dichloroethene	181.		
2,2-Dichloropropane		162.	U
Chloroform		162.	U
Bromochloromethane		162.	U
1,1,1-Trichloroethane	5325.		
1,1-Dichloropropene		162.	U
Carbon Tetrachloride		162.	U
1,2-Dichloroethane		162.	U
Benzene	14.		J
Trichloroethene	16401.		
1,2-Dichloropropane		162.	U
Bromodichloromethane		162.	U
Dibromomethane		162.	U
Toluene	605.		
1,1,2-Trichloroethane		162.	U
1,3-Dichloropropane		162.	U
Tetrachloroethene	5376.		
Dibromochloromethane		162.	U
1,2-Dibromoethane - EDB		162.	U
Chlorobenzene		162.	U
Ethylbenzene		162.	U
1,1,1,2-Tetrachloroethane		162.	U
m + p-Xylenes	53.		J

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI117	Method Number:	8240
Lab Sample Name:	PBS7121SS3 #5462	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	162.4	Date Received:	890920

Sample Info.: GC/MS A,DC, ,ML,100ul,5uL IS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		162.	U
Styrene		162.	U
1,1,2,2-Tetrachloroethane		162.	U
Isopropylbenzene		162.	U
Bromoform		162.	U
1,2,3-Trichloropropane		162.	U
n-Propylbenzene		162.	U
Bromobenzene		162.	U
1,3,5-Trimethylbenzene	167.		
4-Chlorotoluene		162.	U
2-Chlorotoluene		162.	U
tert-Butylbenzene		162.	U
1,2,4-Trimethylbenzene	186.		
sec-Butylbenzene		162.	U
p-Isopropyltoluene		162.	U
1,3-Dichlorobenzene		162.	U
1,4-Dichlorobenzene		162.	U
n-Butylbenzene		162.	U
1,2-Dichlorobenzene		162.	U
1,2-Dibromo-3-Chloropropane		162.	U
1,2,4-Trichlorobenzene		162.	U
Hexachlorobutadiene		162.	U
Naphthalene	149.		J
1,2,3-Trichlorobenzene		162.	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PRS7121SS9

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: 5462

Sample wt/vol: .01 G Lab File ID: >A1117

Level: MED Date Received: 08/20/89

% Moisture: not dec._____ Date Analyzed: 9/26/89

Column: W.B. Dilution Factor: 105468

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
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21.					
22.					
23.					
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26.					
27.					
28.					
29.					
30.					

Building 7131, Tank No. 32; Volatile Organics Analysis

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI065	Method Number:	8240
Lab Sample Name:	PBS7131SS1 #5463	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.2	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		1.	U
Chloromethane		1.	U
Vinyl Chloride		1.	U
Bromomethane		1.	U
Chloroethane		1.	U
Trichlorofluoromethane		1.	U
1,1-Dichloroethene		1.	U
Methylene Chloride	7.		
trans-1,2-Dichloroethene		1.	U
1,1-Dichloroethane		1.	U
cis-1,2-Dichloroethene		1.	U
2,2-Dichloropropane		1.	U
Chloroform		1.	U
Bromochloromethane		1.	U
1,1,1-Trichloroethane	3.		
1,1-Dichloropropene		1.	U
Carbon Tetrachloride		1.	U
1,2-Dichloroethane		1.	U
Benzene		1.	U
Trichloroethene	372.		
1,2-Dichloropropane		1.	U
Bromodichloromethane		1.	U
Dibromomethane		1.	U
Toluene	0.		J
1,1,2-Trichloroethane		1.	U
1,3-Dichloropropane		1.	U
Tetrachloroethene		1.	U
Dibromochloromethane		1.	U
1,2-Dibromoethane - EDB		1.	U
Chlorobenzene		1.	U
Ethylbenzene		1.	U
1,1,1,2-Tetrachloroethane		1.	U
m + p-Xylenes		1.	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI065	Method Number:	8240
Lab Sample Name:	PBS7131SS1 #5463	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.2	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		1.	U
Styrene		1.	U
1,1,2,2-Tetrachloroethane		1.	U
Isopropylbenzene		1.	U
Bromoform		1.	U
1,2,3-Trichloropropane		1.	U
n-Propylbenzene		1.	U
Bromobenzene		1.	U
1,3,5-Trimethylbenzene		1.	U
4-Chlorotoluene		1.	U
2-Chlorotoluene		1.	U
tert-Butylbenzene		1.	U
1,2,4-Trimethylbenzene		1.	U
sec-Butylbenzene		1.	U
p-Isopropyltoluene		1.	U
1,3-Dichlorobenzene		1.	U
1,4-Dichlorobenzene		1.	U
n-Butylbenzene		1.	U
1,2-Dichlorobenzene		1.	U
1,2-Dibromo-3-Chloropropane		1.	U
1,2,4-Trichlorobenzene		1.	U
Hexachlorobutadiene		1.	U
Naphthalene	1.		J
1,2,3-Trichlorobenzene		1.	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PB5713155I

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: HE#5463

Sample wt/vol: 5 G Lab File ID: >R1065

Level: LOW Date Received: 09/20/89

% Moisture: not dec._____ Date Analyzed: 9/22/89

Column: W.B. Dilution Factor: 1.2012

Number TICs found: 3

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	13.70	8.	
2.		Unknown	28.03	8.	
3.		Unknown	29.38	9.	
4.					
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI093	Method Number:	8240
Lab Sample Name:	PBS7131SS1 #5463 115	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	6.0	Date Received:	890920

Sample Info.: GC/MS A,RC,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		6.	U
Chloromethane		6.	U
Vinyl Chloride		6.	U
Bromomethane		6.	U
Chloroethane		6.	U
Trichlorofluoromethane		6.	U
1,1-Dichloroethene		6.	U
Methylene Chloride		6.	U
trans-1,2-Dichloroethene		6.	U
1,1-Dichloroethane		6.	U
cis-1,2-Dichloroethene		6.	U
2,2-Dichloropropane		6.	U
Chloroform		6.	U
Bromochloromethane		6.	U
1,1,1-Trichloroethane		6.	U
1,1-Dichloropropene		6.	U
Carbon Tetrachloride		6.	U
1,2-Dichloroethane		6.	U
Benzene		6.	U
Trichloroethene	301.		
1,2-Dichloropropane		6.	U
Bromodichloromethane		6.	U
Dibromomethane		6.	U
Toluene		6.	U
1,1,2-Trichloroethane		6.	U
1,3-Dichloropropane		6.	U
Tetrachloroethene		6.	U
Dibromochloromethane		6.	U
1,2-Dibromoethane - EDB		6.	U
Chlorobenzene		6.	U
Ethylbenzene		6.	U
1,1,1,2-Tetrachloroethane		6.	U
m + p-Xylenes		6.	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI093	Method Number:	8240
Lab Sample Name:	PBS7131SS1 #5463 1.5	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	6.0	Date Received:	890920

Sample Info.: GC/MS A,RC,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		6.	U
Styrene		6.	U
1,1,2,2-Tetrachloroethane		6.	U
Isopropylbenzene		6.	U
Bromoform		6.	U
1,2,3-Trichloropropane		6.	U
n-Propylbenzene		6.	U
Bromobenzene		6.	U
1,3,5-Trimethylbenzene		6.	U
4-Chlorotoluene		6.	U
2-Chlorotoluene		6.	U
tert-Butylbenzene		6.	U
1,2,4-Trimethylbenzene		6.	U
sec-Butylbenzene		6.	U
p-Isopropyltoluene		6.	U
1,3-Dichlorobenzene		6.	U
1,4-Dichlorobenzene		6.	U
n-Butylbenzene		6.	U
1,2-Dichlorobenzene		6.	U
1,2-Dibromo-3-Chloropropane		6.	U
1,2,4-Trichlorobenzene		6.	U
Hexachlorobutadiene	14.		
Naphthalene	4.		J
1,2,3-Trichlorobenzene	18.		

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PBS7131551 /15

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: 5463 /15

Sample wt/vol: 1 G Lab File ID: >A1093

Level: LOW Date Received: 09/20/89

% Moisture: not dec._____ Date Analyzed: 9/24/89

Column: PACK Dilution Factor: 7.2100

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
3.					
4.					
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI066	Method Number:	8240
Lab Sample Name:	PBS7131SS2 #5464	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.2	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
Dichlorodifluoromethane		1. U
Chloromethane		1. U
Vinyl Chloride		1. U
Bromomethane		1. U
Chloroethane		1. U
Trichlorofluoromethane		1. U
1,1-Dichloroethene		1. U
Methylene Chloride		1. U
trans-1,2-Dichloroethene		1. U
1,1-Dichloroethane		1. U
cis-1,2-Dichloroethene		1. U
2,2-Dichloropropane		1. U
Chloroform		1. U
Bromochloromethane		1. U
1,1,1-Trichloroethane	3.	
1,1-Dichloropropene		1. U
Carbon Tetrachloride		1. U
1,2-Dichloroethane		1. U
Benzene		1. U
Trichloroethene	359.	
1,2-Dichloropropane		1. U
Bromodichloromethane		1. U
Dibromomethane		1. U
Toluene		1. U
1,1,2-Trichloroethane		1. U
1,3-Dichloropropane		1. U
Tetrachloroethene		1. U
Dibromochloromethane		1. U
1,2-Dibromoethane - EDB		1. U
Chlorobenzene		1. U
Ethylbenzene		1. U
1,1,1,2-Tetrachloroethane		1. U
m + p-Xylenes		1. U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI066	Method Number:	8240
Lab Sample Name:	PBS7131SS2 #5464	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.2	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		1.	U
Styrene		1.	U
1,1,2,2-Tetrachloroethane		1.	U
Isopropylbenzene		1.	U
Bromoform		1.	U
1,2,3-Trichloropropane		1.	U
n-Propylbenzene		1.	U
Bromobenzene		1.	U
1,3,5-Trimethylbenzene		1.	U
4-Chlorotoluene		1.	U
2-Chlorotoluene		1.	U
tert-Butylbenzene		1.	U
1,2,4-Trimethylbenzene		1.	U
sec-Butylbenzene		1.	U
p-Isopropyltoluene		1.	U
1,3-Dichlorobenzene		1.	U
1,4-Dichlorobenzene		1.	U
n-Butylbenzene		1.	U
1,2-Dichlorobenzene		1.	U
1,2-Dibromo-3-Chloropropane		1.	U
1,2,4-Trichlorobenzene		1.	U
Hexachlorobutadiene		1.	U
Naphthalene	1.		J
1,2,3-Trichlorobenzene		1.	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PBS7131552

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: HE#5464

Sample wt/vol: 5 G Lab File ID: >A1066

Level: LOW Date Received: 09/20/89

% Moisture: not dec._____ Date Analyzed: 9/22/89

Column: W.B. Dilution Factor: 1.2158

Number TICs found: 2

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	8.88	6.	
2.		Unknown	29.13	9.	
3.					
4.					
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI094	Method Number:	8240
Lab Sample Name:	PBS7131SS2 #5464 1/5	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	6.1	Date Received:	890920

Sample Info.: GC/MS A,RC,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		6.	U
Chloromethane		6.	U
Vinyl Chloride		6.	U
Bromomethane		6.	U
Chloroethane		6.	U
Trichlorofluoromethane		6.	U
1,1-Dichloroethene		6.	U
Methylene Chloride		6.	U
trans-1,2-Dichloroethene		6.	U
1,1-Dichloroethane		6.	U
cis-1,2-Dichloroethene		6.	U
2,2-Dichloropropane		6.	U
Chloroform		6.	U
Bromochloromethane		6.	U
1,1,1-Trichloroethane		6.	U
1,1-Dichloropropene		6.	U
Carbon Tetrachloride		6.	U
1,2-Dichloroethane		6.	U
Benzene		6.	U
Trichloroethene	301.		
1,2-Dichloropropane		6.	U
Bromodichloromethane		6.	U
Dibromomethane		6.	U
Toluene	0.		J
1,1,2-Trichloroethane		6.	U
1,3-Dichloropropane		6.	U
Tetrachloroethene		6.	U
Dibromochloromethane		6.	U
1,2-Dibromoethane - EDB		6.	U
Chlorobenzene		6.	U
Ethylbenzene		6.	U
1,1,1,2-Tetrachloroethane		6.	U
m + p-Xylenes		6.	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI094	Method Number:	8240
Lab Sample Name:	PBS7131SS2 #5464 115	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	6.1	Date Received:	890920

Sample Info.: GC/MS A,RC,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		6.	U
Styrene		6.	U
1,1,2,2-Tetrachloroethane		6.	U
Isopropylbenzene		6.	U
Bromoform		6.	U
1,2,3-Trichloropropane		6.	U
n-Propylbenzene		6.	U
Bromobenzene		6.	U
1,3,5-Trimethylbenzene		6.	U
4-Chlorotoluene		6.	U
2-Chlorotoluene		6.	U
tert-Butylbenzene		6.	U
1,2,4-Trimethylbenzene		6.	U
sec-Butylbenzene		6.	U
p-Isopropyltoluene		6.	U
1,3-Dichlorobenzene		6.	U
1,4-Dichlorobenzene		6.	U
n-Butylbenzene		6.	U
1,2-Dichlorobenzene		6.	U
1,2-Dibromo-3-Chloropropane		6.	U
1,2,4-Trichlorobenzene		6.	U
Hexachlorobutadiene		6.	U
Naphthalene	3.		J
1,2,3-Trichlorobenzene		6.	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
PRS7131552715

Lab Name: Hittman Ebasco Contract: ES1 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: 5464 715

Sample wt/vol: 1 G Lab File ID: >A1094

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/24/89

Column: PACK Dilution Factor: 7.3900

Number TICs found: 0 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI067	Method Number:	8240
Lab Sample Name:	PBS7131SS3 #5455	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.2	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		1.	U
Chloromethane		1.	U
Vinyl Chloride		1.	U
Bromomethane		1.	U
Chloroethane		1.	U
Trichlorofluoromethane		1.	U
1,1-Dichloroethene		1.	U
Methylene Chloride	7.		
trans-1,2-Dichloroethene		1.	U
1,1-Dichloroethane		1.	U
cis-1,2-Dichloroethene		1.	U
2,2-Dichloropropane		1.	U
Chloroform		1.	U
Bromochloromethane		1.	U
1,1,1-Trichloroethane	6.		
1,1-Dichloropropene		1.	U
Carbon Tetrachloride		1.	U
1,2-Dichloroethane		1.	U
Benzene		1.	U
Trichloroethene	417.		
1,2-Dichloropropane		1.	U
Bromodichloromethane		1.	U
Dibromomethane		1.	U
Toluene	1.		J
1,1,2-Trichloroethane		1.	U
1,3-Dichloropropane		1.	U
Tetrachloroethene		1.	U
Dibromochloromethane		1.	U
1,2-Dibromoethane - EDB		1.	U
Chlorobenzene		1.	U
Ethylbenzene		1.	U
1,1,1,2-Tetrachloroethane		1.	U
m + p-Xylenes		1.	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI067	Method Number:	8240
Lab Sample Name:	PBS7131SS3 #5465	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.2	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		1.	U
Styrene		1.	U
1,1,2,2-Tetrachloroethane		1.	U
Isopropylbenzene		1.	U
Bromoform		1.	U
1,2,3-Trichloropropane		1.	U
n-Propylbenzene		1.	U
Bromobenzene		1.	U
1,3,5-Trimethylbenzene		1.	U
4-Chlorotoluene		1.	U
2-Chlorotoluene		1.	U
tert-Butylbenzene		1.	U
1,2,4-Trimethylbenzene		1.	U
sec-Butylbenzene		1.	U
p-Isopropyltoluene		1.	U
1,3-Dichlorobenzene		1.	U
1,4-Dichlorobenzene		1.	U
n-Butylbenzene		1.	U
1,2-Dichlorobenzene		1.	U
1,2-Dibromo-3-Chloropropane		1.	U
1,2,4-Trichlorobenzene		1.	U
Hexachlorobutadiene		1.	U
Naphthalene	1.		J
1,2,3-Trichlorobenzene		1.	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PBS7131553

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: HE#5465

Sample wt/vol: 5 G Lab File ID: >A1067

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/22/89

Column: W.B. Dilution Factor: 1.1858

Number TICs found: 6

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	Unknown	13.70	11.	
2.	Unknown	28.03	9.	
3.	Unknown	28.98	7.	
4.	Unknown	29.42	7.	
5.	Unknown	30.51	10.	
6.	Unknown	32.78	8.	
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI095	Method Number:	8240
Lab Sample Name:	PBS7131SS3 #5463 115	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	5.9	Date Received:	890920

Sample Info.: GC/MS A,RC,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
Dichlorodifluoromethane		6. U
Chloromethane		6. U
Vinyl Chloride		6. U
Bromomethane		6. U
Chloroethane		6. U
Trichlorofluoromethane		6. U
1,1-Dichloroethene		6. U
Methylene Chloride		6. U
trans-1,2-Dichloroethene		6. U
1,1-Dichloroethane		6. U
cis-1,2-Dichloroethene		6. U
2,2-Dichloropropane		6. U
Chloroform		6. U
Bromochloromethane		6. U
1,1,1-Trichloroethane		6. U
1,1-Dichloropropene		6. U
Carbon Tetrachloride		6. U
1,2-Dichloroethane		6. U
Benzene		6. U
Trichloroethene	606.	
1,2-Dichloropropane		6. U
Bromodichloromethane		6. U
Dibromomethane		6. U
Toluene		6. U
1,1,2-Trichloroethane		6. U
1,3-Dichloropropane		6. U
Tetrachloroethene		6. U
Dibromochloromethane		6. U
1,2-Dibromoethane - EDB		6. U
Chlorobenzene		6. U
Ethylbenzene		6. U
1,1,1,2-Tetrachloroethane		6. U
m + p-Xylenes		6. U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI095	Method Number:	8240
Lab Sample Name:	PBS7131SS3 #5465 1:5	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	5.9	Date Received:	890920

Sample Info.: GC/MS A,RC,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
o-Xylene		6. U
Styrene		6. U
1,1,2,2-Tetrachloroethane		6. U
Isopropylbenzene		6. U
Bromoform		6. U
1,2,3-Trichloropropane		6. U
n-Propylbenzene		6. U
Bromobenzene		6. U
1,3,5-Trimethylbenzene		6. U
4-Chlorotoluene		6. U
2-Chlorotoluene		6. U
tert-Butylbenzene		6. U
1,2,4-Trimethylbenzene		6. U
sec-Butylbenzene		6. U
p-Isopropyltoluene		6. U
1,3-Dichlorobenzene		6. U
1,4-Dichlorobenzene		6. U
n-Butylbenzene		6. U
1,2-Dichlorobenzene		6. U
1,2-Dibromo-3-Chloropropane		6. U
1,2,4-Trichlorobenzene		6. U
Hexachlorobutadiene		6. U
Naphthalene		6. U
1,2,3-Trichlorobenzene		6. U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
FBS7131553 MS

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: 5465 MS

Sample wt/vol: 1 G Lab File ID: >A1095

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/24/89

Column: PACK Dilution Factor: 7.0300

Number TICs found: 0 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
3.					
4.					
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI068	Method Number:	8240
Lab Sample Name:	PBS7131SS4 #5466	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.2	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
Dichlorodifluoromethane		1. U
Chloromethane		1. U
Vinyl Chloride		1. U
Bromomethane		1. U
Chloroethane		1. U
Trichlorofluoromethane		1. U
1,1-Dichloroethene		1. U
Methylene Chloride	6.	
trans-1,2-Dichloroethene		1. U
1,1-Dichloroethane		1. U
cis-1,2-Dichloroethene		1. U
2,2-Dichloropropane		1. U
Chloroform		1. U
Bromochloromethane		1. U
1,1,1-Trichloroethane	6.	
1,1-Dichloropropene		1. U
Carbon Tetrachloride		1. U
1,2-Dichloroethane		1. U
Benzene		1. U
Trichloroethene	464.	
1,2-Dichloropropane		1. U
Bromodichloromethane		1. U
Dibromomethane		1. U
Toluene	1.	
1,1,2-Trichloroethane		1. U
1,3-Dichloropropane		1. U
Tetrachloroethene	9.	
Dibromochloromethane		1. U
1,2-Dibromoethane - EDB		1. U
Chlorobenzene		1. U
Ethylbenzene		1. U
1,1,1,2-Tetrachloroethane		1. U
m + p-Xylenes		1. U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI068	Method Number:	8240
Lab Sample Name:	PBS7131SS4 #5466	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.2	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		1.	U
Styrene		1.	U
1,1,2,2-Tetrachloroethane		1.	U
Isopropylbenzene		1.	U
Bromoform		1.	U
1,2,3-Trichloropropane		1.	U
n-Propylbenzene		1.	U
Bromobenzene		1.	U
1,3,5-Trimethylbenzene		1.	U
4-Chlorotoluene		1.	U
2-Chlorotoluene		1.	U
tert-Butylbenzene		1.	U
1,2,4-Trimethylbenzene	1.		J
sec-Butylbenzene		1.	U
p-Isopropyltoluene		1.	U
1,3-Dichlorobenzene		1.	U
1,4-Dichlorobenzene		1.	U
n-Butylbenzene		1.	U
1,2-Dichlorobenzene		1.	U
1,2-Dibromo-3-Chloropropane		1.	U
1,2,4-Trichlorobenzene		1.	U
Hexachlorobutadiene		1.	U
Naphthalene	1.		J
1,2,3-Trichlorobenzene		1.	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
PBS7131SS4

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: HE#5466

Sample wt/vol: 5 G Lab File ID: >A1068

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/22/89

Column: W.B. Dilution Factor: 1.1972

Number TICs found: 5

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	13.73	7.	
2.		Unknown	24.04	8.	
3.		Unknown	25.98	11.	
4.		Unknown	28.02	13.	
5.		Unknown	29.38	9.	
6.					
7.					
8.					
9.					
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI096	Method Number:	8240
Lab Sample Name:	PBS7131SS4 #5466 115	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	6.0	Date Received:	890920

Sample Info.: GC/MS A,RC,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		6.	U
Chloromethane		6.	U
Vinyl Chloride		6.	U
Bromomethane		6.	U
Chloroethane		6.	U
Trichlorofluoromethane		6.	U
1,1-Dichloroethene		6.	U
Methylene Chloride		6.	U
trans-1,2-Dichloroethene		6.	U
1,1-Dichloroethane		6.	U
cis-1,2-Dichloroethene		6.	U
2,2-Dichloropropane		6.	U
Chloroform		6.	U
Bromochloromethane		6.	U
1,1,1-Trichloroethane	23.		
1,1-Dichloropropene		6.	U
Carbon Tetrachloride	2.		J
1,2-Dichloroethane		6.	U
Benzene		6.	U
Trichloroethene	419.		
1,2-Dichloropropane		6.	U
Bromodichloromethane		6.	U
Dibromomethane		6.	U
Toluene		6.	U
1,1,2-Trichloroethane		6.	U
1,3-Dichloropropane		6.	U
Tetrachloroethene	17.		
Dibromochloromethane		6.	U
1,2-Dibromoethane - EDB		6.	U
Chlorobenzene		6.	U
Ethylbenzene		6.	U
1,1,1,2-Tetrachloroethane		6.	U
m + p-Xylenes		6.	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI096	Method Number:	8240
Lab Sample Name:	PBS7131SS4 #5466 1:5	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	6.0	Date Received:	890920

Sample Info.: GC/MS A,RC,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
o-Xylene		6. U
Styrene		6. U
1,1,2,2-Tetrachloroethane		6. U
Isopropylbenzene		6. U
Bromoform		6. U
1,2,3-Trichloropropane		6. U
n-Propylbenzene		6. U
Bromobenzene		6. U
1,3,5-Trimethylbenzene		6. U
4-Chlorotoluene		6. U
2-Chlorotoluene		6. U
tert-Butylbenzene		6. U
1,2,4-Trimethylbenzene		6. U
sec-Butylbenzene		6. U
p-Isopropyltoluene		6. U
1,3-Dichlorobenzene		6. U
1,4-Dichlorobenzene		6. U
n-Butylbenzene		6. U
1,2-Dichlorobenzene		6. U
1,2-Dibromo-3-Chloropropane		6. U
1,2,4-Trichlorobenzene		6. U
Hexachlorobutadiene		6. U
Naphthalene		6. U
1,2,3-Trichlorobenzene		6. U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PBS7131554 /ST

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: 5466 1:5

Sample wt/vol: 1 G Lab File ID: >A1096

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/24/89

Column: W.B Dilution Factor: 7.1400

Number TICs found: 0 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
3.					
4.					
5.					
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI076	Method Number:	8240
Lab Sample Name:	PBS7131SS5 #5467	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.2	Date Received:	890920

Sample Info.: GC/MS A,LB,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		1.	U
Chloromethane		1.	U
Vinyl Chloride		1.	U
Bromomethane		1.	U
Chloroethane		1.	U
Trichlorofluoromethane	17.		
1,1-Dichloroethene		1.	U
Methylene Chloride	16.		
trans-1,2-Dichloroethene		1.	U
1,1-Dichloroethane	40.		
cis-1,2-Dichloroethene		1.	U
2,2-Dichloropropane		1.	U
Chloroform		1.	U
Bromochloromethane		1.	U
1,1,1-Trichloroethane		1.	U
1,1-Dichloropropene		1.	U
Carbon Tetrachloride		1.	U
1,2-Dichloroethane	370.		
Benzene	0.		J
Trichloroethene		1.	U
1,2-Dichloropropane		1.	U
Bromodichloromethane		1.	U
Dibromomethane		1.	U
Toluene		1.	U
1,1,2-Trichloroethane		1.	U
1,3-Dichloropropane		1.	U
Tetrachloroethene		1.	U
Dibromochloromethane		1.	U
1,2-Dibromoethane - EDB		1.	U
Chlorobenzene		1.	U
Ethylbenzene	2.		
1,1,1,2-Tetrachloroethane		1.	U
m + p-Xylenes	2.		

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI076	Method Number:	8240
Lab Sample Name:	PBS7131SS5 #5467	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.2	Date Received:	890920

Sample Info.: GC/MS A,LB,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		1.	U
Styrene		1.	U
1,1,2,2-Tetrachloroethane		1.	U
Isopropylbenzene		1.	U
Bromoform		1.	U
1,2,3-Trichloropropane		1.	U
n-Propylbenzene		1.	U
Bromobenzene		1.	U
1,3,5-Trimethylbenzene	366.		
4-Chlorotoluene		1.	U
2-Chlorotoluene		1.	U
tert-Butylbenzene		1.	U
1,2,4-Trimethylbenzene	349.		
sec-Butylbenzene		1.	U
p-Isopropyltoluene		1.	U
1,3-Dichlorobenzene		1.	U
1,4-Dichlorobenzene		1.	U
n-Butylbenzene		1.	U
1,2-Dichlorobenzene		1.	U
1,2-Dibromo-3-Chloropropane		1.	U
1,2,4-Trichlorobenzene		1.	U
Hexachlorobutadiene		1.	U
Naphthalene	159.		
1,2,3-Trichlorobenzene		1.	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PRS7131555

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: HE#5467

Sample wt/vol: 5 G Lab File ID: >A1U76

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/23/89

Column: W.B. Dilution Factor: 1.1550

Number TICs found: 20

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI069	Method Number:	8240
Lab Sample Name:	PBS7131SS5 #5467	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.2	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		1.	U
Chloromethane		1.	U
Vinyl Chloride		1.	U
Bromomethane		1.	U
Chloroethane		1.	U
Trichlorofluoromethane		1.	U
1,1-Dichloroethene		1.	U
Methylene Chloride	2.		
trans-1,2-Dichloroethene		1.	U
1,1-Dichloroethane		1.	U
cis-1,2-Dichloroethene		1.	U
2,2-Dichloropropane		1.	U
Chloroform		1.	U
Bromochloromethane		1.	U
1,1,1-Trichloroethane	10.		
1,1-Dichloropropene		1.	U
Carbon Tetrachloride	1.		J
1,2-Dichloroethane		1.	U
Benzene	0.		J
Trichloroethene	172.		
1,2-Dichloropropane		1.	U
Bromodichloromethane		1.	U
Dibromomethane		1.	U
Toluene		1.	U
1,1,2-Trichloroethane		1.	U
1,3-Dichloropropane		1.	U
Tetrachloroethene		1.	U
Dibromochloromethane		1.	U
1,2-Dibromoethane - EDB		1.	U
Chlorobenzene		1.	U
Ethylbenzene		1.	U
1,1,1,2-Tetrachloroethane		1.	U
m + p-Xylenes		1.	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI069	Method Number:	8240
Lab Sample Name:	PBS7131SS5 #5467	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.2	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		1.	U
Styrene		1.	U
1,1,2,2-Tetrachloroethane		1.	U
Isopropylbenzene		1.	U
Bromoform		1.	U
1,2,3-Trichloropropane		1.	U
n-Propylbenzene		1.	U
Bromobenzene		1.	U
1,3,5-Trimethylbenzene		1.	U
4-Chlorotoluene		1.	U
2-Chlorotoluene		1.	U
tert-Butylbenzene		1.	U
1,2,4-Trimethylbenzene		1.	U
sec-Butylbenzene		1.	U
p-Isopropyltoluene		1.	U
1,3-Dichlorobenzene		1.	U
1,4-Dichlorobenzene		1.	U
n-Butylbenzene		1.	U
1,2-Dichlorobenzene		1.	U
1,2-Dibromo-3-Chloropropane		1.	U
1,2,4-Trichlorobenzene		1.	U
Hexachlorobutadiene		1.	U
Naphthalene	0.		J
1,2,3-Trichlorobenzene		1.	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PRS7131555

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: HE#5467

Sample wt/vol: 5 . G Lab File ID: >A1069

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/22/89

Column: W.B. Dilution Factor: 1.1550

Number TICs found: 8

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	Unknown	8.87	7.	
2.	Unknown	13.51	8.	
3.	Unknown	27.47	9.	
4.	Unknown	29.12	22.	
5.	Unknown	29.37	48.	
6.	Unknown	31.97	45.	
7.	Unknown	32.41	12.	
8.	Unknown	33.50	9.	
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI111	Method Number:	8240
Lab Sample Name:	PBS7131SS5 #5467 1:5	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	5.8	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,1g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
Dichlorodifluoromethane		6. U
Chloromethane		6. U
Vinyl Chloride		6. U
Bromomethane		6. U
Chloroethane		6. U
Trichlorofluoromethane		6. U
1,1-Dichloroethene		6. U
Methylene Chloride	70.	
trans-1,2-Dichloroethene		6. U
1,1-Dichloroethane		6. U
cis-1,2-Dichloroethene		6. U
2,2-Dichloropropane		6. U
Chloroform		6. U
Bromochloromethane		6. U
1,1,1-Trichloroethane		6. U
1,1-Dichloropropene		6. U
Carbon Tetrachloride		6. U
1,2-Dichloroethane		6. U
Benzene		6. U
Trichloroethene	728.	
1,2-Dichloropropane		6. U
Bromodichloromethane		6. U
Dibromomethane		6. U
Toluene		6. U
1,1,2-Trichloroethane		6. U
1,3-Dichloropropane		6. U
Tetrachloroethene		6. U
Dibromochloromethane		6. U
1,2-Dibromoethane - EDB		6. U
Chlorobenzene		6. U
Ethylbenzene		6. U
1,1,1,2-Tetrachloroethane		6. U
m + p-Xylenes		6. U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI111	Method Number:	8240
Lab Sample Name:	PBS7131SS5 #5467 115	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	5.8	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,1g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		6.	U
Styrene		6.	U
1,1,2,2-Tetrachloroethane		6.	U
Isopropylbenzene		6.	U
Bromoform		6.	U
1,2,3-Trichloropropane		6.	U
n-Propylbenzene		6.	U
Bromobenzene		6.	U
1,3,5-Trimethylbenzene		6.	U
4-Chlorotoluene		6.	U
2-Chlorotoluene		6.	U
tert-Butylbenzene		6.	U
1,2,4-Trimethylbenzene		6.	U
sec-Butylbenzene		6.	U
p-Isopropyltoluene		6.	U
1,3-Dichlorobenzene		6.	U
1,4-Dichlorobenzene		6.	U
n-Butylbenzene		6.	U
1,2-Dichlorobenzene		6.	U
1,2-Dibromo-3-Chloropropane		6.	U
1,2,4-Trichlorobenzene		6.	U
Hexachlorobutadiene		6.	U
Naphthalene		6.	U
1,2,3-Trichlorobenzene		6.	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PBS7131555 /1ST

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: 5467 /1S

Sample wt/vol: 1 G Lab File ID: >A1111

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/25/89

Column: W.B. Dilution Factor: 33.35

Number TICs found: 0

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
3.					
4.					
5.					
6.					
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30.					

Building 8133, Tank No. 39: BTEX Analysis

SAMPLE NUMBER
PBS-8133-SS-1

Organics Analysis Data Sheet

Lab Name: HITTMAN EBASCO ASSOC., INC.
Lab Sample ID #: 5440
Sample Matrix: SOIL
Data Release Authorized by: _____

Case #: _____
QC Report #: N/A
Contract #: ESI 7019-001
Date Sample Received: 9/20/89

Volatiles Compounds

Concentration: Low (Medium) (Circle One)

Date Extracted/Prepared: 9/21/89

Date Analyzed: 9/21/89

Conc/Dil Factor: 667

Percent Moisture (Not Decanted): 22.48%

	ug/l or (ug/Kg) (Circle One)
enzene	1400
Ethyl benzene	4400
Toluene	7200
Total Xylenes	16000

SAMPLE NUMBER
PBS-8133-SS-2

Organics Analysis Data Sheet

Lab Name: HITTMAN EBASCO ASSOC., INC.
Lab Sample ID #: 5441
Sample Matrix: SOIL
Data Release Authorized by: _____

Case #: _____
QC Report #: N/A
Contract #: ESI 7019-001
Date Sample Received: 9/20/89

Volatiles Compounds

Concentration: Low (Medium) (Circle One)

Date Extracted/Prepared: 9/21/89

Date Analyzed: 9/21/89

Conc/Dil Factor: 10

Percent Moisture (Not Decanted): 28.48%

	ug/l or (ug/Kg) (Circle One)
Benzene	62 x
Ethyl benzene	15
Toluene	103
Total Xylenes	65

x= Dilution Factor of 200

SAMPLE NUMBER
PBS-8133-SS-3

Organics Analysis Data Sheet

Lab Name: HITTMAN EBASCO ASSOC., INC.
Lab Sample ID #: 5442
Sample Matrix: Soil
Data Release Authorized by: _____

Case #: _____
QC Report #: N/A
Contract #: ESI 7019-001
Date Sample Received: 9/20/89

Volatiles Compounds

Concentration Low Medium (Circle One)

Date Extracted/Prepared: 9/21/89

Date Analyzed: 9/21/89

Conc/Dil Factor: 1

Percent Moisture (Not Decanted): 24.6%

	ug/l or ug/Kg (Circle One)	
enzene	.19	J
Ethyl benzene	.27	U
Toluene	.77	
Total Xylenes	.94	

Building 1411, Tank No.s 24, 25; Volatile Organics Analysis

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI070	Method Number:	8240
Lab Sample Name:	PBS1411SS1 #S468	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.3	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,Sg,SuL IS,SS/Sm1s P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
Dichlorodifluoromethane		1. U
Chloromethane		1. U
Vinyl Chloride		1. U
Bromomethane		1. U
Chloroethane		1. U
Trichlorofluoromethane	19.	
1,1-Dichloroethene	22.	
Methylene Chloride	12.	
trans-1,2-Dichloroethene		1. U
1,1-Dichloroethane	228.	
cis-1,2-Dichloroethene	8.	
2,2-Dichloropropane		1. U
Chloroform		1. U
Bromochloromethane		1. U
1,1,1-Trichloroethane	503.	
1,1-Dichloropropene		1. U
Carbon Tetrachloride	100.	
1,2-Dichloroethane		1. U
Benzene	2.	
Trichloroethene	509.	
1,2-Dichloropropane		1. U
Bromodichloromethane		1. U
Dibromomethane		1. U
Toluene	1.	J
1,1,2-Trichloroethane		1. U
1,3-Dichloropropane		1. U
Tetrachloroethene		1. U
Dibromochloromethane		1. U
1,2-Dibromoethane - EDB		1. U
Chlorobenzene		1. U
Ethylbenzene	27.	
1,1,1,2-Tetrachloroethane		1. U
m + p-Xylenes	34.	

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI070	Method Number:	8240
Lab Sample Name:	P9S141ISS1 #5468	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890910
Dilution Factor:	1.3	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
o-Xylene	15.	
Styrene		1. U
1,1,2,2-Tetrachloroethane		1. U
Isopropylbenzene	31.	
Bromoform		1. U
1,2,3-Trichloropropane		1. U
n-Propylbenzene	76.	
Bromobenzene		1. U
1,3,5-Trimethylbenzene	496.	
4-Chlorotoluene		1. U
2-Chlorotoluene		1. U
tert-Butylbenzene	70.	
1,2,4-Trimethylbenzene	541.	
sec-Butylbenzene	37.	
p-Isopropyltoluene	74.	
1,3-Dichlorobenzene		1. U
1,4-Dichlorobenzene		1. U
n-Butylbenzene		1. U
1,2-Dichlorobenzene		1. U
1,2-Dibromo-3-Chloropropane		1. U
1,2,4-Trichlorobenzene		1. U
Hexachlorobutadiene		1. U
Naphthalene	563.	
1,2,3-Trichlorobenzene		1. U

QUANT REPORT

Operator ID: TMDY Quant Rev: 6 Quant Time: 890922 21:46
Output File: DATA2:::001 Injected at: 890922 20:50
Data File: DATA2:::A1 Dilution Factor: 1.000000
Name: PRS14115001 #5461
Misc: HP/MS A,IN,ESI/0012,50,500 15,55/5min PRI

ID File: IDVAR2::ID
Title: ESI VOLATILES
Last Calibration: 890922 16:21

	Compound	R.T.	Scan#	Area	Conc	Units	
1)	*Fluorobenzene	12.28	203	94284	50.00	ng/ml	
2)	Trichlorofluoromethane	6.54	46	6638	19.10	ng/mL	
8)	1,1-Dichloroethene	7.53	73	8354	27.45	ng/ml	
9)	Methylene Chloride	8.26	93	5745	12.13	ng/mL	
11)	1,1-Dichloroethane	9.39	124	184474	229.70	ng/mL	
12)	cis-1,2-Dichloroethene	10.38	151	3876	8.12	ng/ml	
16)	1,1,1-Trichloroethane	11.29	176	233372	507.35	ng/mL	
18)	Carbon tetrachloride	11.29	176	35875	111.23	ng/mL	
20)	Benzene	11.98	195	2848	2.00	ng/ml	1
21)	Trichloroethene	12.93	221	234883	513.53	ng/mL	
25)	Toluene	15.06	279	1063	1.25	ng/mL	
26)	BROMOFLUOROBENZENE (SURR1)	19.74	407	24451	39.57	ng/mL	
33)	Ethylbenzene	17.83	355	39130	27.30	ng/ml	
35)	m + p-Xylenes	17.83	355	19152	33.84	ng/mL	
36)	o-Xylene	18.64	377	8514	14.94	ng/ml	
39)	*1,4-Dichlorobenzene-d4	21.97	468	105134	50.000	ng/mL	
40)	Isopropylbenzene	19.26	394	14262	30.91	ng/ml	
43)	n-Propylbenzene	19.99	414	46316	76.62	ng/mL	
45)	1,3,5-Trimethylbenzene	20.17	419	167337	500.55	ng/ml	
48)	tert-Butylbenzene	21.02	442	24467	71.13	ng/mL	
49)	1,2,4-Trimethylbenzene	21.07	447	189360	545.17	ng/mL	
50)	sec-Butylbenzene	21.34	451	20971	57.35	ng/mL	
51)	p-Isopropyltoluene	21.49	455	28636	75.02	ng/ml	
59)	Naphthalene	26.47	571	192548	567.69	ng/mL	1
61)	BROMOFLUOROBENZENE (SURR2)	19.74	407	24451	129.24	ng/ml	

* Compound is ISTD

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
PBS1411551

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: HE#5468

Sample wt/vol: 5 G Lab File ID: >H1070

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/22/89

Column: W.B. Dilution Factor: 1.3110

Number TICs found: 20

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	3726474	Cyclopentane, 1-ethyl-3-meth	16.33	100.	
2.	611143	Benzene, 1-ethyl-2-methyl- (	20.80	120.	
3.	95636	Benzene, 1,2,4-trimethyl- (8	21.97	950.	
4.	1074551	Benzene, 1-methyl-4-propyl-	22.22	310.	
5.	1758889	Benzene, 2-ethyl-1,4-dimethyl	22.37	180.	
6.		Unknown	22.59	330.	
7.	874419	Benzene, 1-ethyl-2,4-dimethyl	22.95	220.	
8.	535773	Benzene, 1-methyl-3-(1-methyl	23.14	310.	
9.	1587048	Benzene, 1-methyl-2-(2-prope	23.39	200.	
10.		Unknown	23.58	310.	
11.	95932	Benzene, 1,2,4,5-tetramethyl	23.87	350.	
12.	527537	Benzene, 1,2,3,5-tetramethyl	24.02	600.	
13.		Unknown	24.79	300.	
14.	488233	Benzene, 1,2,3,4-tetramethyl	24.90	350.	
15.		Unknown	25.11	600.	
16.		Unknown	25.59	320.	
17.		Unknown	25.96	350.	
18.	112403	Dodecane (8C19C1)	28.04	120.	
19.	91576	Naphthalene, 2-methyl- (8C19	29.00	700.	
20.	90120	Naphthalene, 1-methyl- (8C19	29.69	400.	
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI097	Method Number:	8240
Lab Sample Name:	PBS1411SS1 #5468 1.5	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	6.6	Date Received:	890920

Sample Info.: GC/MS A,RC,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		7.	U
Chloromethane		7.	U
Vinyl Chloride		7.	U
Bromomethane		7.	U
Chloroethane		7.	U
Trichlorofluoromethane		7.	U
1,1-Dichloroethene		7.	U
Methylene Chloride	4.		J
trans-1,2-Dichloroethene		7.	U
1,1-Dichloroethane	181.		
cis-1,2-Dichloroethene		7.	U
2,2-Dichloropropane		7.	U
Chloroform		7.	U
Bromochloromethane		7.	U
1,1,1-Trichloroethane	479.		
1,1-Dichloropropene		7.	U
Carbon Tetrachloride	93.		
1,2-Dichloroethane		7.	U
Benzene	1.		J
Trichloroethene	1087.		
1,2-Dichloropropane		7.	U
Bromodichloromethane		7.	U
Dibromomethane		7.	U
Toluene	16.		
1,1,2-Trichloroethane		7.	U
1,3-Dichloropropane		7.	U
Tetrachloroethene	342.		
Dibromochloromethane		7.	U
1,2-Dibromoethane - EDB		7.	U
Chlorobenzene		7.	U
Ethylbenzene	45.		
1,1,1,2-Tetrachloroethane		7.	U
m + p-Xylenes	43.		

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI097	Method Number:	8240
Lab Sample Name:	P3S1411SS1 #5468 1:5	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	6.6	Date Received:	890920

Sample Info.: GC/MS A,RC,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
o-Xylene	23.	
Styrene		7. U
1,1,2,2-Tetrachloroethane		7. U
Isopropylbenzene	21.	
Bromoform		7. U
1,2,3-Trichloropropane		7. U
n-Propylbenzene	61.	
Bromobenzene		7. U
1,3,5-Trimethylbenzene	400.	
4-Chlorotoluene		7. U
2-Chlorotoluene		7. U
tert-Butylbenzene	60.	
1,2,4-Trimethylbenzene	497.	
sec-Butylbenzene	33.	
p-Isopropyltoluene	64.	
1,3-Dichlorobenzene		7. U
1,4-Dichlorobenzene		7. U
n-Butylbenzene		7. U
1,2-Dichlorobenzene		7. U
1,2-Dibromo-3-Chloropropane		7. U
1,2,4-Trichlorobenzene		7. U
Hexachlorobutadiene		7. U
Naphthalene	1094.	
1,2,3-Trichlorobenzene		7. U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
PRS141158T/5

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: #5468 1:5

Sample (wt/vol): 5 G Lab File ID: >A1057

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____

Column: W.B. Date Analyzed: 9/25/89

Dilution Factor: 6.5555

Number TICs found: 20

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	611143	Benzene, 1-ethyl-2-methyl- (	20.79	77.	
2.		Unknown	22.40	62.	
3.		Unknown	22.58	170.	
4.	1758889	Benzene, 2-ethyl-1,4-dimethyl	22.99	140.	
5.	874419	Benzene, 1-ethyl-2,4-dimethyl	23.13	140.	
6.		Unknown	23.43	86.	
7.		Unknown	23.61	120.	
8.	527537	Benzene, 1,2,3,5-tetramethyl	23.87	140.	
9.	95932	Benzene, 1,2,4,5-tetramethyl	24.05	220.	
10.		Unknown	24.78	130.	
11.	488233	Benzene, 1,2,3,4-tetramethyl	24.93	160.	
12.		Unknown	25.15	200.	
13.		Unknown	25.62	230.	
14.		Unknown	25.95	90.	
15.		Unknown	27.12	54.	
16.	17057828	1H-Indene, 2,3-dihydro-1,2-d	27.52	66.	
17.		Unknown	27.71	61.	
18.		Unknown	28.11	64.	
19.	90120	Naphthalene, 1-methyl- (8C19	28.99	370.	
20.	91576	Naphthalene, 2-methyl- (8C19	29.68	230.	
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI071	Method Number:	8240
Lab Sample Name:	P8S1411SS2 #5469	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890913
Dilution Factor:	1.3	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		1.	U
Chloromethane		1.	U
Vinyl Chloride		1.	U
Bromomethane		1.	U
Chloroethane		1.	U
Trichlorofluoromethane	93.		
1,1-Dichloroethene	18.		
Methylene Chloride	4.		
trans-1,2-Dichloroethene	17.		
1,1-Dichloroethane	179.		
cis-1,2-Dichloroethene	362.		
2,2-Dichloropropane		1.	U
Chloroform		1.	U
Bromochloromethane		1.	U
1,1,1-Trichloroethane	121.		
1,1-Dichloropropene		1.	U
Carbon Tetrachloride	23.		
1,2-Dichloroethane	3.		
Benzene	1.		J
Trichloroethene	545.		
1,2-Dichloropropane		1.	U
Bromodichloromethane		1.	U
Dibromomethane		1.	U
Toluene	9.		
1,1,2-Trichloroethane		1.	U
1,3-Dichloropropane		1.	U
Tetrachloroethene	16.		
Dibromochloromethane		1.	U
1,2-Dibromoethane - EDB		1.	U
Chlorobenzene		1.	U
Ethylbenzene	23.		
1,1,1,2-Tetrachloroethane		1.	U
m + p-Xylenes	25.		

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI071	Method Number:	8240
Lab Sample Name:	PBS1411SS2 #5469	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.3	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene	29.		
Styrene		1.	U
1,1,2,2-Tetrachloroethane		1.	U
Isopropylbenzene	8.		
Bromoform		1.	U
1,2,3-Trichloropropane		1.	U
n-Propylbenzene	23.		
Bromobenzene		1.	U
1,3,5-Trimethylbenzene	328.		
4-Chlorotoluene		1.	U
2-Chlorotoluene		1.	U
tert-Butylbenzene	29.		
1,2,4-Trimethylbenzene	225.		
sec-Butylbenzene	17.		
p-Isopropyltoluene	55.		
1,3-Dichlorobenzene		1.	U
1,4-Dichlorobenzene		1.	U
n-Butylbenzene		1.	U
1,2-Dichlorobenzene	8.		
1,2-Dibromo-3-Chloropropane		1.	U
1,2,4-Trichlorobenzene	1.		J
Hexachlorobutadiene		1.	U
Naphthalene	467.		
1,2,3-Trichlorobenzene	3.		

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PRS1411552

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: HE#5469

Sample wt/vol: 5 G Lab File ID: >A1071

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/22/89

Column: W.B. Dilution Factor: 1.2844

Number TICs found: 20

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	76131	Ethane, 1,1,2-trichloro-1,2,	7.23	210.	
2.	111842	Nonane (8C19C1)	17.29	29.	
3.		Unknown	18.82	25.	
4.	1074437	Benzene, 1-methyl-3-propyl-	22.23	36.	
5.	1758889	Benzene, 2-ethyl-1,4-dimethyl	22.33	19.	
6.	535773	Benzene, 1-methyl-3-(1-methyl	23.14	23.	
7.		Unknown	23.47	21.	
8.	95932	Benzene, 1,2,4,5-tetramethyl	23.87	26.	
9.	527537	Benzene, 1,2,3,5-tetramethyl	24.02	62.	
10.		Unknown	24.28	19.	
11.		Unknown	24.79	20.	
12.	1758889	Benzene, 2-ethyl-1,4-dimethyl	24.90	29.	
13.		Unknown	25.12	31.	
14.		Unknown	25.59	46.	
15.		Unknown	25.96	34.	
16.	62238124	Decane, 2,3,6-trimethyl- (9C	28.05	37.	
17.	90120	Naphthalene, 1-methyl- (8C19	29.00	99.	
18.	91576	Naphthalene, 2-methyl- (8C19	29.70	64.	
19.	575439	Naphthalene, 1,6-dimethyl- (	32.00	34.	
20.	571619	Naphthalene, 1,5-dimethyl- (	32.74	33.	
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI098	Method Number:	8240
Lab Sample Name:	PBS1411SS2 #5459 1.5	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	6.4	Date Received:	890920

Sample Info.: GC/MS A,RC,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
Dichlorodifluoromethane		6. U
Chloromethane		6. U
Vinyl Chloride		6. U
Bromomethane		6. U
Chloroethane		6. U
Trichlorofluoromethane		6. U
1,1-Dichloroethene		6. U
Methylene Chloride		6. U
trans-1,2-Dichloroethene		6. U
1,1-Dichloroethane	68.	
cis-1,2-Dichloroethene	162.	
2,2-Dichloropropane		6. U
Chloroform		6. U
Bromochloromethane		6. U
1,1,1-Trichloroethane	52.	
1,1-Dichloropropene		6. U
Carbon Tetrachloride	7.	
1,2-Dichloroethane		6. U
Benzene		6. U
Trichloroethene	775.	
1,2-Dichloropropane		6. U
Bromodichloromethane		6. U
Dibromomethane		6. U
Toluene	7.	
1,1,2-Trichloroethane		6. U
1,3-Dichloropropane		6. U
Tetrachloroethene	15.	
Dibromochloromethane		6. U
1,2-Dibromoethane - EDB		6. U
Chlorobenzene		6. U
Ethylbenzene	25.	
1,1,1,2-Tetrachloroethane		6. U
m + p-Xylenes	18.	

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI098	Method Number:	8240
Lab Sample Name:	PBS1411SS2 #5469 1.5	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	6.4	Date Received:	890920

Sample Info.: GC/MS A,RC,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
o-Xylene	33.	
Styrene		6. U
1,1,2,2-Tetrachloroethane		6. U
Isopropylbenzene		6. U
Bromoform		6. U
1,2,3-Trichloropropane		6. U
n-Propylbenzene	15.	
Bromobenzene		6. U
1,3,5-Trimethylbenzene	236.	
4-Chlorotoluene		6. U
2-Chlorotoluene		6. U
tert-Butylbenzene	23.	
1,2,4-Trimethylbenzene	178.	
sec-Butylbenzene	15.	
p-Isopropyltoluene	48.	
1,3-Dichlorobenzene		6. U
1,4-Dichlorobenzene		6. U
n-Butylbenzene		6. U
1,2-Dichlorobenzene	8.	
1,2-Dibromo-3-Chloropropane		6. U
1,2,4-Trichlorobenzene		6. U
Hexachlorobutadiene		6. U
Naphthalene	992.	
1,2,3-Trichlorobenzene		6. U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PRS141SS2/15

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: #5469 1:5

Sample wt/vol: 5 G Lab File ID: >A1098

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/25/89

Column: W.B. Dilution Factor: 6.4220

Number TICs found: 20 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	22.25	67.	
2.		Unknown	22.36	110.	
3.	874419	Benzene, 1-ethyl-2,4-dimethyl	23.13	89.	
4.		Unknown	23.60	76.	
5.	527537	Benzene, 1,2,3,5-tetramethyl	23.86	110.	
6.	95932	Benzene, 1,2,4,5-tetramethyl	24.04	270.	
7.		Unknown	24.78	110.	
8.	488233	Benzene, 1,2,3,4-tetramethyl	24.92	150.	
9.	824226	1H-Indene, 2,3-dihydro-4-met	25.14	160.	
10.	4175535	1H-Indene, 2,3-dihydro-1,3-d	25.62	250.	
11.		Unknown	25.98	140.	
12.	6682719	1H-Indene, 2,3-dihydro-4,7-d	27.12	96.	
13.		Unknown	27.52	140.	
14.		Unknown	27.70	93.	
15.		Unknown	28.03	180.	
16.	90120	Naphthalene, 1-methyl- (8C19	28.98	670.	
17.		Unknown	29.39	140.	
18.	91576	Naphthalene, 2-methyl- (8C19	29.68	460.	
19.	575439	Naphthalene, 1,6-dimethyl- (	32.02	180.	
20.	569415	Naphthalene, 1,8-dimethyl- (	32.79	160.	
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI072	Method Number:	8240
Lab Sample Name:	PBS1411SS3 #S470	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.3	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
Dichlorodifluoromethane		1. U
Chloromethane		1. U
Vinyl Chloride		1. U
Bromomethane		1. U
Chloroethane		1. U
Trichlorofluoromethane		1. U
1,1-Dichloroethene		1. U
Methylene Chloride	3.	
trans-1,2-Dichloroethene		1. U
1,1-Dichloroethane	36.	
cis-1,2-Dichloroethene		1. U
2,2-Dichloropropane		1. U
Chloroform		1. U
Bromochloromethane		1. U
1,1,1-Trichloroethane	601.	
1,1-Dichloropropene		1. U
Carbon Tetrachloride	119.	
1,2-Dichloroethane		1. U
Benzene		1. U
Trichloroethene	116.	
1,2-Dichloropropane		1. U
Bromodichloromethane		1. U
Dibromomethane		1. U
Toluene		1. U
1,1,2-Trichloroethane	11.	
1,3-Dichloropropane		1. U
Tetrachloroethene	2.	
Dibromochloromethane		1. U
1,2-Dibromoethane - EDB		1. U
Chlorobenzene		1. U
Ethylbenzene		1. U
1,1,1,2-Tetrachloroethane		1. U
m + p-Xylenes		1. U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI072	Method Number:	8240
Lab Sample Name:	PBS1411SS3 #5470	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.3	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
o-Xylene		1. U
Styrene		1. U
1,1,2,2-Tetrachloroethane		1. U
Isopropylbenzene		1. U
Bromoform		1. U
1,2,3-Trichloropropane		1. U
n-Propylbenzene		1. U
Bromobenzene		1. U
1,3,5-Trimethylbenzene	2.	
4-Chlorotoluene		1. U
2-Chlorotoluene		1. U
tert-Butylbenzene		1. U
1,2,4-Trimethylbenzene	2.	
sec-Butylbenzene		1. U
p-Isopropyltoluene		1. U
1,3-Dichlorobenzene		1. U
1,4-Dichlorobenzene		1. U
n-Butylbenzene		1. U
1,2-Dichlorobenzene		1. U
1,2-Dibromo-3-Chloropropane		1. U
1,2,4-Trichlorobenzene		1. U
Hexachlorobutadiene		1. U
Naphthalene	14.	
1,2,3-Trichlorobenzene		1. U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

FBS141153S

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: HE#5470

Sample wt/vol: 5 G Lab File ID: >A1072

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/22/89

Column: W.B. Dilution Factor: 1.2740

Number TICs found: 20

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	17.65	6.	
2.		Unknown	18.12	6.	
3.	1467629U	Heptane, 3-ethyl-2-methyl- (	18.45	9.	
4.		Unknown	18.82	19.	
5.	15869940	Octane, 3,6-dimethyl- (8C19C	19.04	6.	
6.		Unknown	19.44	6.	
7.		Unknown	19.95	17.	
8.		Unknown	20.65	7.	
9.		Unknown	21.23	13.	
10.		Unknown	21.34	6.	
11.		Unknown	21.78	18.	
12.		Unknown	22.26	80.	
13.		Unknown	22.55	76.	
14.		Unknown	23.25	20.	
15.		Unknown	23.50	24.	
16.		Unknown	23.61	20.	
17.		Unknown	23.87	7.	
18.	2958761	Naphthalene, decahydro-2-met	24.09	23.	
19.		Unknown	24.24	17.	
20.	4453901	1,4-Methanonaphthalene, 1,4-	28.99	9.	
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

HITTMAN BASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI099	Method Number:	8240
Lab Sample Name:	PBS1411SS3 #5470 115	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	6.4	Date Received:	890920

Sample Info.: GC/MS A,RC,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
Dichlorodifluoromethane		6. U
Chloromethane		6. U
Vinyl Chloride		6. U
Bromomethane		6. U
Chloroethane		6. U
Trichlorofluoromethane		6. U
1,1-Dichloroethene		6. U
Methylene Chloride		6. U
trans-1,2-Dichloroethene		6. U
1,1-Dichloroethane	7.	
cis-1,2-Dichloroethene		6. U
2,2-Dichloropropane		6. U
Chloroform		6. U
Bromochloromethane		6. U
1,1,1-Trichloroethane	210.	
1,1-Dichloropropene		6. U
Carbon Tetrachloride		6. U
1,2-Dichloroethane		6. U
Benzene		6. U
Trichloroethene	313.	
1,2-Dichloropropane		6. U
Bromodichloromethane		6. U
Dibromomethane		6. U
Toluene		6. U
1,1,2-Trichloroethane		6. U
1,3-Dichloropropane		6. U
Tetrachloroethene		6. U
Dibromochloromethane		6. U
1,2-Dibromoethane - EDB		6. U
Chlorobenzene		6. U
Ethylbenzene		6. U
1,1,1,2-Tetrachloroethane		6. U
m + p-Xylenes		6. U

HITTMAN EDASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI099	Method Number:	8240
Lab Sample Name:	PBS1411SS3 #5470 115	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890919
Dilution Factor:	6.4	Date Received:	890920

Sample Info.: GC/MS A,RC,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
o-Xylene		6. U
Styrene		6. U
1,1,2,2-Tetrachloroethane		6. U
Isopropylbenzene		6. U
Bromoform		6. U
1,2,3-Trichloropropane		6. U
n-Propylbenzene		6. U
Bromobenzene		6. U
1,3,5-Trimethylbenzene		6. U
4-Chlorotoluene		6. U
2-Chlorotoluene		6. U
tert-Butylbenzene		6. U
1,2,4-Trimethylbenzene		6. U
sec-Butylbenzene		6. U
p-Isopropyltoluene		6. U
1,3-Dichlorobenzene		6. U
1,4-Dichlorobenzene		6. U
n-Butylbenzene		6. U
1,2-Dichlorobenzene		6. U
1,2-Dibromo-3-Chloropropane		6. U
1,2,4-Trichlorobenzene		6. U
Hexachlorobutadiene		6. U
Naphthalene	100.	
1,2,3-Trichlorobenzene		6. U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PB5141158 7/5

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: #5470 1:5

Sample wt/vol: 5 G Lab File ID: >A1099

Level: LOW Date Received: 08/20/89

% Moisture: not dec._____ Date Analyzed: 9/25/89

Column: W.B. Dilution Factor: 6.3700

Number TICs Found: 20

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	1467629D	Heptane, 3-ethyl-2-methyl- (	18.45	26.	
2.		Unknown	18.81	49.	
3.		Unknown	20.05	37.	
4.	17302282	Nonane, 2,6-dimethyl- (8C19C	20.20	93.	
5.		Unknown	20.38	28.	
6.		Unknown	21.15	130.	
7.		Unknown	21.37	88.	
8.		Unknown	21.77	51.	
9.		Unknown	22.25	310.	
10.		Unknown	22.54	240.	
11.		Unknown	23.09	30.	
12.		Unknown	23.24	86.	
13.		Unknown	23.50	97.	
14.		Unknown	23.61	42.	
15.	2958761	Naphthalene, decahydro-2-met	24.08	100.	
16.		Unknown	24.23	64.	
17.	90120	Naphthalene, 1-methyl- (8C19	28.98	47.	
18.	91576	Naphthalene, 2-methyl- (8C19	29.68	31.	
19.	575371	Naphthalene, 1,7-dimethyl- (	32.02	23.	
20.	581408	Naphthalene, 2,3-dimethyl- (	32.71	23.	
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

HITTMAN EGASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI091	Method Number:	8240
Lab Sample Name:	PBS1411SS4 #5471	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.1	Date Received:	890920

Sample Info.: GC/MS A,LB,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		1.	U
Chloromethane		1.	U
Vinyl Chloride		1.	U
Bromomethane		1.	U
Chloroethane		1.	U
Trichlorofluoromethane	13.		
1,1-Dichloroethene		1.	U
Methylene Chloride	1.		J
trans-1,2-Dichloroethene		1.	U
1,1-Dichloroethane	2.		
cis-1,2-Dichloroethene		1.	U
2,2-Dichloropropane		1.	U
Chloroform		1.	U
Bromochloromethane		1.	U
1,1,1-Trichloroethane	13.		
1,1-Dichloropropene		1.	U
Carbon Tetrachloride	1.		J
1,2-Dichloroethane	2.		
Benzene	0.		J
Trichloroethene	688.		
1,2-Dichloropropane		1.	U
Bromodichloromethane		1.	U
Dibromomethane		1.	U
Toluene	2.		
1,1,2-Trichloroethane		1.	U
1,3-Dichloropropane		1.	U
Tetrachloroethene	23.		
Dibromochloromethane		1.	U
1,2-Dibromoethane - EDB		1.	U
Chlorobenzene		1.	U
Ethylbenzene	1.		
1,1,1,2-Tetrachloroethane		1.	U
m + p-Xylenes	1.		J

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI081	Method Number:	8240
Lab Sample Name:	PBS1411SS4 #5471	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.1	Date Received:	890920

Sample Info.: GC/MS A,LB,ESI7018,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene	0.		J
Styrene		1.	U
1,1,2,2-Tetrachloroethane		1.	U
Isopropylbenzene		1.	U
Bromoform		1.	U
1,2,3-Trichloropropane		1.	U
n-Propylbenzene		1.	U
Bromobenzene		1.	U
1,3,5-Trimethylbenzene	8.		
4-Chlorotoluene	0.		J
2-Chlorotoluene	0.		J
tert-Butylbenzene		1.	U
1,2,4-Trimethylbenzene	7.		
sec-Butylbenzene		1.	U
p-Isopropyltoluene		1.	U
1,3-Dichlorobenzene		1.	U
1,4-Dichlorobenzene		1.	U
n-Butylbenzene		1.	U
1,2-Dichlorobenzene		1.	U
1,2-Dibromo-3-Chloropropane		1.	U
1,2,4-Trichlorobenzene	10.		
Hexachlorobutadiene		1.	U
Naphthalene	26.		
1,2,3-Trichlorobenzene		1.	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PBS141154

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: 5471

Sample wt/vol: 5 G Lab File ID: >C1081

Level: LOW Date Received: N.A.

% Moisture: not dec.____ Date Analyzed: 9/23/86

Column: PACK Dilution Factor: 1.0924

Number TICs found: 20

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	21.78	13.	
2.		Unknown	22.15	15.	
3.		Unknown	22.59	22.	
4.		Unknown	22.92	18.	
5.		Unknown	23.14	12.	
6.		Unknown	23.47	29.	
7.		Unknown	23.61	28.	
8.	62238135	Decane, 2,3,7-trimethyl- (9C	23.87	71.	
9.		Unknown	24.05	36.	
10.		Unknown	24.27	64.	
11.		Unknown	24.64	18.	
12.		Unknown	24.82	25.	
13.	1618220	Naphthalene, decahydro-2,6-d	25.04	88.	
14.		Unknown	25.23	34.	
15.	62016335	Octane, 2,3,6-trimethyl- (9C	25.37	92.	
16.	61179/1	Dodecane, 4-methyl- (8C19CI)	26.00	60.	
17.		Unknown	26.33	53.	
18.	74645980	Dodecane, 2,7,10-trimethyl-	27.46	120.	
19.	62238113	Decane, 2,3,5-trimethyl- (9C	28.05	73.	
20.		Unknown	31.20	82.	
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI112	Method Number:	8240
Lab Sample Name:	PSS1411SS4 #5471 1:5	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	5.5	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,1g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
Dichlorodifluoromethane		5. U
Chloromethane		5. U
Vinyl Chloride		5. U
Bromomethane		5. U
Chloroethane		5. U
Trichlorofluoromethane		5. U
1,1-Dichloroethene		5. U
Methylene Chloride	113.	
trans-1,2-Dichloroethene		5. U
1,1-Dichloroethane		5. U
cis-1,2-Dichloroethene		5. U
2,2-Dichloropropane		5. U
Chloroform		5. U
Bromochloromethane		5. U
1,1,1-Trichloroethane		5. U
1,1-Dichloropropene		5. U
Carbon Tetrachloride		5. U
1,2-Dichloroethane		5. U
Benzene		5. U
Trichloroethene	898.	
1,2-Dichloropropane		5. U
Bromodichloromethane		5. U
Dibromomethane		5. U
Toluene		5. U
1,1,2-Trichloroethane		5. U
1,3-Dichloropropane		5. U
Tetrachloroethene	70.	
Dibromochloromethane		5. U
1,2-Dibromoethane - EDB		5. U
Chlorobenzene		5. U
Ethylbenzene		5. U
1,1,1,2-Tetrachloroethane		5. U
m + p-Xylenes		5. U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI112	Method Number:	8240
Lab Sample Name:	PBS1411SS4 #5471 1.5	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	5.5	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,1g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		5.	U
Styrene		5.	U
1,1,2,2-Tetrachloroethane		5.	U
Isopropylbenzene		5.	U
Bromoform		5.	U
1,2,3-Trichloropropane		5.	U
n-Propylbenzene		5.	U
Bromobenzene		5.	U
1,3,5-Trimethylbenzene		5.	U
4-Chlorotoluene		5.	U
2-Chlorotoluene		5.	U
tert-Butylbenzene		5.	U
1,2,4-Trimethylbenzene	11.		
sec-Butylbenzene		5.	U
p-Isopropyltoluene		5.	U
1,3-Dichlorobenzene		5.	U
1,4-Dichlorobenzene		5.	U
n-Butylbenzene		5.	U
1,2-Dichlorobenzene		5.	U
1,2-Dibromo-3-Chloropropane		5.	U
1,2,4-Trichlorobenzene		5.	U
Hexachlorobutadiene		5.	U
Naphthalene	17.		
1,2,3-Trichlorobenzene		5.	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PES141155A /ST

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: #5471 1:5

Sample wt/vol: 1 G Lab File ID: >81112

Level: LOW Date Received: 05/20/89

% Moisture: not dec.____ Date Analyzed: 5/25/89

Column: W.B. Dilution Factor: 5.4620

Number TICs found: 19 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	22.62	570.	
2.		Unknown	22.95	180.	
3.		Unknown	23.50	200.	
4.		Unknown	23.65	290.	
5.		Unknown	23.94	670.	
6.		Unknown	24.09	460.	
7.		Unknown	24.27	550.	
8.		Unknown	24.64	160.	
9.		Unknown	24.82	170.	
10.		Unknown	25.07	770.	
11.		Unknown	25.26	300.	
12.	62016346	Octane, 2,3,7-trimethyl- (9C	25.37	1200.	
13.	27126223	Heptane, 4-azido- (8C19C1)	25.99	570.	
14.		Unknown	26.32	660.	
15.		Unknown	26.76	370.	
16.		Unknown	27.46	1300.	
17.	62238124	Decane, 2,3,6-trimethyl- (9C	28.04	850.	
18.	62016335	Octane, 2,3,6-trimethyl- (9C	29.36	880.	
19.		Unknown	31.19	370.	
20.					
21.					
22.					
23.					
24.					
25.					
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27.					
28.					
29.					
30.					

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI082	Method Number:	8240
Lab Sample Name:	PBS1411SS5 #5472	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.2	Date Received:	890920

Sample Info.: GC/MS A,LB,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
Dichlorodifluoromethane		1. U
Chloromethane		1. U
Vinyl Chloride		1. U
Bromomethane		1. U
Chloroethane		1. U
Trichlorofluoromethane		1. U
1,1-Dichloroethene		1. U
Methylene Chloride		1. U
trans-1,2-Dichloroethene		1. U
1,1-Dichloroethane	93.	
cis-1,2-Dichloroethene		1. U
2,2-Dichloropropane		1. U
Chloroform		1. U
Bromochloromethane		1. U
1,1,1-Trichloroethane	1254.	
1,1-Dichloropropene		1. U
Carbon Tetrachloride	213.	
1,2-Dichloroethane		1. U
Benzene		1. U
Trichloroethene	1432.	
1,2-Dichloropropane		1. U
Bromodichloromethane		1. U
Dibromomethane		1. U
Toluene		1. U
1,1,2-Trichloroethane		1. U
1,3-Dichloropropane		1. U
Tetrachloroethene		1. U
Dibromochloromethane		1. U
1,2-Dibromoethane - EDB		1. U
Chlorobenzene		1. U
Ethylbenzene		1. U
1,1,1,2-Tetrachloroethane		1. U
m + p-Xylenes		1. U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI082	Method Number:	8240
Lab Sample Name:	PBS1411SS5 #5472	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.2	Date Received:	890920

Sample Info.: GC/MS A,LB,ESI7019,5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
o-Xylene		1. U
Styrene		1. U
1,1,2,2-Tetrachloroethane		1. U
Isopropylbenzene		1. U
Bromoform		1. U
1,2,3-Trichloropropane		1. U
n-Propylbenzene		1. U
Bromobenzene		1. U
1,3,5-Trimethylbenzene		1. U
4-Chlorotoluene		1. U
2-Chlorotoluene		1. U
tert-Butylbenzene		1. U
1,2,4-Trimethylbenzene		1. U
sec-Butylbenzene		1. U
p-Isopropyltoluene		1. U
1,3-Dichlorobenzene		1. U
1,4-Dichlorobenzene		1. U
n-Butylbenzene		1. U
1,2-Dichlorobenzene		1. U
1,2-Dibromo-3-Chloropropane		1. U
1,2,4-Trichlorobenzene		1. U
Hexachlorobutadiene		1. U
Naphthalene	22.	
1,2,3-Trichlorobenzene		1. U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PBS141155S

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: S472

Sample wt/vol: 5 G Lab File ID: >C1082

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/23/89

Column: PACK Dilution Factor: 1.2127

Number TICs found: 20

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	8.15	21.	
2.		Unknown	8.77	29.	
3.		Unknown	16.84	21.	
4.		Unknown	17.32	17.	
5.		Unknown	17.50	34.	
6.		Unknown	18.49	27.	
7.		Unknown	19.29	19.	
8.		Unknown	20.17	25.	
9.		Unknown	23.14	20.	
10.		Unknown	24.05	54.	
11.		Unknown	24.27	86.	
12.	62016346	Octane, 2,3,7-trimethyl- (9C	25.37	170.	
13.		Unknown	25.99	170.	
14.		Unknown	26.28	80.	
15.		Unknown	27.01	170.	
16.	17302328	Nonane, 3,7-dimethyl- (8C19C	27.45	550.	
17.	62238113	Decane, 2,3,5-trimethyl- (9C	28.04	520.	
18.	17301303	Undecane, 3,8-dimethyl- (8C1	29.36	700.	
19.	629629	Pentadecane (8C19C1)	30.49	380.	
20.		Unknown	33.64	88.	
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI113	Method Number:	8240
Lab Sample Name:	PSS1411SSS #5472 1/10	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	12.1	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,.5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
Dichlorodifluoromethane		12. U
Chloromethane		12. U
Vinyl Chloride		12. U
Bromomethane		12. U
Chloroethane		12. U
Trichlorofluoromethane		12. U
1,1-Dichloroethene		12. U
Methylene Chloride	164.	
trans-1,2-Dichloroethene		12. U
1,1-Dichloroethane	48.	
cis-1,2-Dichloroethene		12. U
2,2-Dichloropropane		12. U
Chloroform		12. U
Bromochloromethane		12. U
1,1,1-Trichloroethane	620.	
1,1-Dichloropropene		12. U
Carbon Tetrachloride		12. U
1,2-Dichloroethane		12. U
Benzene		12. U
Trichloroethene	1416.	
1,2-Dichloropropane		12. U
Bromodichloromethane		12. U
Dibromomethane		12. U
Toluene		12. U
1,1,2-Trichloroethane		12. U
1,3-Dichloropropane		12. U
Tetrachloroethene		12. U
Dibromochloromethane		12. U
1,2-Dibromoethane - EDB		12. U
Chlorobenzene		12. U
Ethylbenzene		12. U
1,1,1,2-Tetrachloroethane		12. U
m + p-Xylenes		12. U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI113	Method Number:	8240
Lab Sample Name:	PBS1411SS5 #5472 /J/O	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	12.1	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,.5g,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		12.	U
Styrene		12.	U
1,1,2,2-Tetrachloroethane		12.	U
Isopropylbenzene		12.	U
Bromoform		12.	U
1,2,3-Trichloropropane		12.	U
n-Propylbenzene		12.	U
Bromobenzene		12.	U
1,3,5-Trimethylbenzene		12.	U
4-Chlorotoluene		12.	U
2-Chlorotoluene		12.	U
tert-Butylbenzene		12.	U
1,2,4-Trimethylbenzene		12.	U
sec-Butylbenzene		12.	U
p-Isopropyltoluene		12.	U
1,3-Dichlorobenzene		12.	U
1,4-Dichlorobenzene		12.	U
n-Butylbenzene		12.	U
1,2-Dichlorobenzene		12.	U
1,2-Dibromo-3-Chloropropane		12.	U
1,2,4-Trichlorobenzene		12.	U
Hexachlorobutadiene		12.	U
Naphthalene		12.	U
1,2,3-Trichlorobenzene		12.	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PRS141155570

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: #5472 1:10

Sample wt/vol: .5 G Lab File ID: >81113

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/25/89

Column: W.B. Dilution Factor: 12.1270

Number TICs found: 6 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	25.99	960.	
2.	31081182	Nonane, 3-methyl-5-propyl- (	27.45	2100.	
3.		Unknown	28.04	2000.	
4.	17301303	Undecane, 3,8-dimethyl- (8CI	29.39	2700.	
5.		Unknown	30.52	1000.	
6.		Unknown	31.15	1000.	
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
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27.					
28.					
29.					
30.					

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI082	Method Number:	8240
Lab Sample Name:	PSS1411SS6,H#5443	Date Analyzed:	890920
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.2	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/5gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Chloromethane		12	U
Bromomethane		12	U
Vinyl Chloride		12	U
Chloroethane		12	U
Methylene Chloride	3		J
Acetone	22		
Acrylonitrile		6	U
Acrolein		6	U
Trichlorofluoromethane	3		J
Carbon Disulfide		6	U
1,1-Dichloroethene		6	U
1,1-Dichloroethane	26		
1,2-Dichloroethene (Total)	3		J
Chloroform		6	U
1,2-Dichloroethane		6	U
2-Butanone		6	U
1,1,1-Trichloroethane	15		
Carbon Tetrachloride		6	U
Vinyl Acetate		12	U
Bromodichloromethane		6	U
1,2-Dichloropropane		6	U
trans-1,3-Dichloropropene		6	U
Trichloroethene	27		
Dibromochloromethane		6	U
1,1,2-Trichloroethane		6	U
Benzene	1		J
cis-1,3-Dichloropropene		6	U
2-Chloroethylvinylether		6	U
Bromoform		6	U
4-Methyl-2-Pentanone		12	U
2-Hexanone	9		J
Tetrachloroethene		6	U
1,1,2,2-Tetrachloroethane		6	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI082	Method Number:	8240
Lab Sample Name:	PBS1411SS6,H#5443	Date Analyzed:	890920
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.2	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/5gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit
Toluene		6 U
Chlorobenzene		6 U
Ethylbenzene		6 U
Styrene		6 U
Xylenes (Total)		6 U
m-Xylene		6 U
o + p-Xylene		6 U
1,3 Dichlorobenzene		6 U
1,2 Dichlorobenzene		6 U
1,4 Dichlorobenzene		6 U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PBS1411S56

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: HE#5443

Sample wt/vol: 5 G Lab File ID: >CI082

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/20/89

Column: PACK Dilution Factor: 1.2000

Number TICs found: 10

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	1.19	76.	
2.		Unknown	1.33	78.	
3.	3073663	Cyclohexane, 1,1,3-trimethyl	27.34	31.	
4.		Unknown	27.61	19.	
5.		Unknown	28.11	14.	
6.	6236880	Cyclohexane, 1-ethyl-4-methy	28.89	29.	
7.		Unknown	29.80	34.	
8.		Unknown	31.90	61.	
9.	63830693	4-Nonene, 3-methyl-, (Z)- (9	34.14	68.	
10.		Unknown	36.15	39.	
11.					
12.					
13.					
14.					
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI083	Method Number:	8240
Lab Sample Name:	PBS1411SS7,H#5444	Date Analyzed:	890920
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.0	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Chloromethane		10	U
Bromomethane		10	U
Vinyl Chloride		10	U
Chloroethane		10	U
Methylene Chloride	3		J
Acetone	13		
Acrylonitrile		5	U
Acrolein		5	U
Trichlorofluoromethane	5		J
Carbon Disulfide		5	U
1,1-Dichloroethene		5	U
1,1-Dichloroethane	1		J
1,2-Dichloroethene (Total)		5	U
Chloroform		5	U
1,2-Dichloroethane		5	U
2-Butanone		5	U
1,1,1-Trichloroethane	4		J
Carbon Tetrachloride		5	U
Vinyl Acetate		10	U
Bromodichloromethane		5	U
1,2-Dichloropropane		5	U
trans-1,3-Dichloropropene		5	U
Trichloroethene	40		
Dibromochloromethane		5	U
1,1,2-Trichloroethane		5	U
Benzene		5	U
cis-1,3-Dichloropropene		5	U
2-Chloroethylvinylether		5	U
Bromoform		5	U
4-Methyl-2-Pentanone	4		J
2-Hexanone	19		
Tetrachloroethene		5	U
1,1,2,2-Tetrachloroethane		5	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI083	Method Number:	8240
Lab Sample Name:	PSS1411SS7,H#5444	Date Analyzed:	890920
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.0	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Toluene		5	U
Chlorobenzene		5	U
Ethylbenzene		5	U
Styrene		5	U
Xylenes (Total)	9		
m-Xylene	5		J
o + p-Xylene	5		J
1,3 Dichlorobenzene		5	U
1,2 Dichlorobenzene		5	U
1,4 Dichlorobenzene		5	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PBS1411SS7

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: HE#5444

Sample wt/vol: 5 G Lab File ID: >CI083

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/20/89

Column: PACK Dilution Factor: 1.0296

Number TICs found: 9 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	1.05	8.	
2.		Unknown	1.19	150.	
3.	109660	Pentane (ACN)(DOT)(8CI9CI)	14.65	5.	
4.	96377	Cyclopentane, methyl- (8CI9C	16.16	9.	
5.	96140	Pentane, 3-methyl- (8CI9CI)	19.99	7.	
6.		Unknown	22.96	10.	
7.		Unknown	25.11	10.	
8.	281232	Tricyclo[3.3.1.13,7]decane (	26.39	19.	
9.	63830693	4-Nonene, 3-methyl-, (Z)- (9	34.12	38.	
10.					
11.					
12.					
13.					
14.					
15.					
16.					
17.					
18.					
19.					
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21.					
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24.					
25.					
26.					
27.					
28.					
29.					
30.					

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI093	Method Number:	8240
Lab Sample Name:	PBS1411SS7MS,#5444MS	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.0	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20,MS-16/5gms P3T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Chloromethane		10	U
Bromomethane		10	U
Vinyl Chloride		10	U
Chloroethane		10	U
Methylene Chloride	3		J
Acetone	35		
Acrylonitrile		5	U
Acrolein		5	U
Trichlorofluoromethane	1		J
Carbon Disulfide		5	U
1,1-Dichloroethene			
1,1-Dichloroethane	3		J
1,2-Dichloroethene (Total)		5	U
Chloroform		5	U
1,2-Dichloroethane		5	U
2-Butanone		5	U
1,1,1-Trichloroethane	6		
Carbon Tetrachloride		5	U
Vinyl Acetate		10	U
Bromodichloromethane		5	U
1,2-Dichloropropane		5	U
trans-1,3-Dichloropropene		5	U
Trichloroethene			
Dibromochloromethane		5	U
1,1,2-Trichloroethane		5	U
Benzene			
cis-1,3-Dichloropropene		5	U
2-Chloroethylvinylether		5	U
Bromoform		5	U
4-Methyl-2-Pentanone		10	U
2-Hexanone	5		J
Tetrachloroethene		5	U
1,1,2,2-Tetrachloroethane		5	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI093	Method Number:	8240
Lab Sample Name:	PBS1411SS7MS,#5444MS	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.0	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20,MS-16/5gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Toluene			
Chlorobenzene			
Ethylbenzene		5	U
Styrene		5	U
Xylenes (Total)	2		J
m-Xylene	1		J
o + p-Xylene	1		J
1,3 Dichlorobenzene		5	U
1,2 Dichlorobenzene		5	U
1,4 Dichlorobenzene		5	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI094	Method Number:	8240
Lab Sample Name:	PBS1411SS7MSD,5444MSD	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.0	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20,MS-16/5gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Chloromethane		10	U
Bromomethane		10	U
Vinyl Chloride		10	U
Chloroethane		10	U
Methylene Chloride	2		J
Acetone	13		
Acrylonitrile		5	U
Acrolein		5	U
Trichlorofluoromethane	1		J
Carbon Disulfide		5	U
1,1-Dichloroethene			
1,1-Dichloroethane		5	U
1,2-Dichloroethene (Total)		5	U
Chloroform		5	U
1,2-Dichloroethane		5	U
2-Butanone		5	U
1,1,1-Trichloroethane	6		
Carbon Tetrachloride		5	U
Vinyl Acetate		10	U
Bromodichloromethane		5	U
1,2-Dichloropropane		5	U
trans-1,3-Dichloropropene		5	U
Trichloroethene			
Dibromochloromethane		5	U
1,1,2-Trichloroethane		5	U
Benzene			
cis-1,3-Dichloropropene		5	U
2-Chloroethylvinylether		5	U
Bromoform		5	U
4-Methyl-2-Pentanone		10	U
2-Hexanone	7		J
Tetrachloroethene		5	U
1,1,2,2-Tetrachloroethane		5	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI094	Method Number:	8240
Lab Sample Name:	PBS1411SS7MSD,5444MSD	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.0	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20,MS-16/5gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Toluene			
Chlorobenzene			
Ethylbenzene		5	U
Styrene		5	U
Xylenes (Total)	3		J
m-Xylene	1		J
o + p-Xylene	1		J
1,3 Dichlorobenzene		5	U
1,2 Dichlorobenzene		5	U
1,4 Dichlorobenzene		5	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI056	Method Number:	8240
Lab Sample Name:	PSS1411SS8 #5445 bottle 1	Date Analyzed:	890921
Matrix:	Soil 4/12/89	Date Collected:	890918
Dilution Factor:	1.3	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		1.	U
Chloromethane		1.	U
Vinyl Chloride		1.	U
Bromomethane		1.	U
Chloroethane		1.	U
Trichlorofluoromethane		1.	U
1,1-Dichloroethene		1.	U
Methylene Chloride	8.		
trans-1,2-Dichloroethene	7.		
1,1-Dichloroethane	151.		
cis-1,2-Dichloroethene	126.		
2,2-Dichloropropane		1.	U
Chloroform		1.	U
Bromochloromethane		1.	U
1,1,1-Trichloroethane	3.		
1,1-Dichloropropene		1.	U
Carbon Tetrachloride		1.	U
1,2-Dichloroethane		1.	U
Benzene	8.		
Trichloroethene	407.		
1,2-Dichloropropane		1.	U
Bromodichloromethane		1.	U
Dibromomethane		1.	U
Toluene	0.		J
1,1,2-Trichloroethane		1.	U
1,3-Dichloropropane		1.	U
Tetrachloroethene		1.	U
Dibromochloromethane		1.	U
1,2-Dibromoethane - EDB		1.	U
Chlorobenzene		1.	U
Ethylbenzene		1.	U
1,1,1,2-Tetrachloroethane		1.	U
m + p-Xylenes		1.	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI056	Method Number:	8240
Lab Sample Name:	PBS1411SS8 #5445	Date Analyzed:	890921
Matrix:	Soil	Date Collected:	890913
Dilution Factor:	1.3	Date Received:	890920

but Rev 1 9/22/89

Sample Info.: GC/MS A,TN,ESI7019,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		1.	U
Styrene		1.	U
1,1,2,2-Tetrachloroethane		1.	U
Isopropylbenzene		1.	U
Bromoform		1.	U
1,2,3-Trichloropropane		1.	U
n-Propylbenzene		1.	U
Bromobenzene		1.	U
1,3,5-Trimethylbenzene		1.	U
4-Chlorotoluene		1.	U
2-Chlorotoluene		1.	U
tert-Butylbenzene		1.	U
1,2,4-Trimethylbenzene		1.	U
sec-Butylbenzene		1.	U
p-Isopropyltoluene		1.	U
1,3-Dichlorobenzene		1.	U
1,4-Dichlorobenzene		1.	U
n-Butylbenzene		1.	U
1,2-Dichlorobenzene		1.	U
1,2-Dibromo-3-Chloropropane		1.	U
1,2,4-Trichlorobenzene		1.	U
Hexachlorobutadiene		1.	U
Naphthalene	1.		J
1,2,3-Trichlorobenzene		1.	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PBS1411SS8
bottle 1
4/22/89

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: HE#5445

Sample wt/vol: 5 G Lab File ID: >AI056

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/21/89

Column: W.B. Dilution Factor: 1.25

Number TICs found: 14

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Air	4.04	590.	
2.		Unknown	6.27	4.	
3.		Unknown	23.60	8.	
4.	62108229	Decane, 2,5,9-trimethyl- (9C	23.78	25.	
5.	17312457	Decane, 3,4-dimethyl- (8CI9C	24.59	8.	
6.	17312764	Undecane, 6,6-dimethyl- (8CI	24.88	62.	
7.		Unknown	25.50	9.	
8.		Unknown	25.79	7.	
9.		Unknown	26.45	14.	
10.		Unknown	26.63	16.	
11.	31295564	Dodecane, 2,6,11-trimethyl-	26.93	41.	
12.	62108218	Decane, 6-ethyl-2-methyl- (9	27.48	10.	
13.		Unknown	28.46	20.	
14.	62108252	Decane, 2,6,7-trimethyl- (9C	28.72	50.	
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI051	Method Number:	8240
Lab Sample Name:	PSS1411SS8 #5445 ~~bottle 2~~	Date Analyzed:	890921
Matrix:	Soil Tw 9/22/89	Date Collected:	890918
Dilution Factor:	3.1	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,2grams,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		3.	U
Chloromethane		3.	U
Vinyl Chloride		3.	U
Bromomethane		3.	U
Chloroethane		3.	U
Trichlorofluoromethane		3.	U
1,1-Dichloroethene		3.	U
Methylene Chloride		3.	U
trans-1,2-Dichloroethene	11.		
1,1-Dichloroethane	220.		
cis-1,2-Dichloroethene	195.		
2,2-Dichloropropane		3.	U
Chloroform		3.	U
Bromochloromethane		3.	U
1,1,1-Trichloroethane	7.		
1,1-Dichloropropene		3.	U
Carbon Tetrachloride		3.	U
1,2-Dichloroethane	5.		
Benzene	11.		
Trichloroethene	315.		
1,2-Dichloropropane		3.	U
Bromodichloromethane		3.	U
Dibromomethane		3.	U
Toluene	1.		J
1,1,2-Trichloroethane		3.	U
1,3-Dichloropropane		3.	U
Tetrachloroethene		3.	U
Dibromochloromethane		3.	U
1,2-Dibromoethane - EDB		3.	U
Chlorobenzene		3.	U
Ethylbenzene	16.		
1,1,1,2-Tetrachloroethane		3.	U
m + p-Xylenes		3.	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI061	Method Number:	8240
Lab Sample Name:	PSS1411SS8 #5445 bottle 2 9/22/89	Date Analyzed:	890921
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	3.1	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,2grams,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene	2.		J
Styrene		3.	U
1,1,2,2-Tetrachloroethane		3.	U
Isopropylbenzene	11.		
Bromoform		3.	U
1,2,3-Trichloropropane		3.	U
n-Propylbenzene	21.		
Bromobenzene		3.	U
1,3,5-Trimethylbenzene	43.		
4-Chlorotoluene	3.		
2-Chlorotoluene	3.		
tert-Butylbenzene	7.		
1,2,4-Trimethylbenzene	48.		
sec-Butylbenzene	17.		
p-Isopropyltoluene	34.		
1,3-Dichlorobenzene		3.	U
1,4-Dichlorobenzene		3.	U
n-Butylbenzene		3.	U
1,2-Dichlorobenzene		3.	U
1,2-Dibromo-3-Chloropropane		3.	U
1,2,4-Trichlorobenzene		3.	U
Hexachlorobutadiene		3.	U
Naphthalene	111.		
1,2,3-Trichlorobenzene	40.		

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

PSS1411SS8
bottle 2
9/22/89

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: ESI SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: 5445

Sample wt/vol: 2 G Lab File ID: >AI061

Level: LOW Date Received: 9/20/89

% Moisture: not dec.____ Date Analyzed: 9/21/89

Column: WIDEBOR Dilution Factor: 3.12

TLN 9/22/89

Number TICs found: 20 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Air	4.17	450.	
2.	3726474	Cyclopentane, 1-ethyl-3-meth	16.38	85.	
3.	111842	Nonane (8CI9CI)	17.36	12.	
4.	15869939	Octane, 3,5-dimethyl- (8CI9C	18.86	21.	
5.	4926903	Cyclohexane, 1-ethyl-1-methy	22.30	68.	
6.	1632708	Undecane, 5-methyl- (8CI9CI)	22.63	52.	
7.	62108229	Decane, 2,5,9-trimethyl- (9C	22.96	11.	
8.	17302339	Undecane, 6-methyl- (8CI9CI)	23.18	32.	
9.	7045718	Undecane, 2-methyl- (8CI9CI)	23.33	36.	
10.	4292926	Cyclohexane, pentyl- (8CI9CI	23.55	53.	
11.	62238124	Decane, 2,3,6-trimethyl- (9C	23.92	29.	
12.	112403	Dodecane (8CI9CI)	24.14	59.	
13.	6044719	Dodecane, 6-methyl- (8CI9CI)	24.32	130.	
14.		Unknown (C13H28)	24.87	22.	
15.	17301289	Undecane, 3,6-dimethyl- (8CI	25.13	47.	
16.	6117971	Dodecane, 4-methyl- (8CI9CI)	25.31	24.	
17.	26730143	Tridecane, 7-methyl- (8CI9CI	25.46	63.	
18.	6117971	Dodecane, 4-methyl- (8CI9CI)	26.08	24.	
19.	61141728	Dodecane, 4,6-dimethyl- (9CI	26.37	25.	
20.		Unknown (C14H30)	29.05	32.	
21.					
22.					
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI035	Method Number:	8240
Lab Sample Name:	PBS1411SS9,H#5446	Date Analyzed:	890920
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.2	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Chloromethane		12	U
Bromomethane		12	U
Vinyl Chloride		12	U
Chloroethane		12	U
Methylene Chloride	4		J
Acetone	54		
Acrylonitrile		6	U
Acrolein		6	U
Trichlorofluoromethane	3		J
Carbon Disulfide	1		J
1,1-Dichloroethene		6	U
1,1-Dichloroethane	21		
1,2-Dichloroethene (Total)	3		J
Chloroform		6	U
1,2-Dichloroethane		6	U
2-Butanone		6	U
1,1,1-Trichloroethane	27		
Carbon Tetrachloride		6	U
Vinyl Acetate		12	U
Bromodichloromethane		6	U
1,2-Dichloropropane		6	U
trans-1,3-Dichloropropene		6	U
Trichloroethene	72		
Dibromochloromethane		6	U
1,1,2-Trichloroethane		6	U
Benzene	2		J
cis-1,3-Dichloropropene		6	U
2-Chloroethylvinylether		6	U
Bromoform		6	U
4-Methyl-2-Pentanone	10		J
2-Hexanone	39		
Tetrachloroethene		6	U
1,1,2,2-Tetrachloroethane		6	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI085	Method Number:	8240
Lab Sample Name:	PSS1411SS9,H#5446	Date Analyzed:	890920
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.2	Date Received:	890920

Sample Info.: GC/MS C,LB,ESI-7019,10ul IS-21,SS-20/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit
Toluene	8	
Chlorobenzene		6 U
Ethylbenzene	23	
Styrene		6 U
Xylenes (Total)	47	
m-Xylene	16	
o + p-Xylene	26	
1,3 Dichlorobenzene		6 U
1,2 Dichlorobenzene		6 U
1,4 Dichlorobenzene		6 U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
PBS1411SS9

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: HE#5446

Sample wt/vol: 5 G Lab File ID: >CI085

Level: LOW Date Received: 09/20/89

% Moisture: not dec.____ Date Analyzed: 9/20/89

Column: PACK Dilution Factor: 1.1829

Number TICs found: 12 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	1.05	91.	
2.		Unknown	1.14	260.	
3.	78784	Butane, 2-methyl- (8CI9CI)	13.09	9.	
4.	109660	Pentane (ACN)(DOT)(8CI9CI)	14.65	21.	
5.	96377	Cyclopentane, methyl- (8CI9C	16.15	20.	
6.	96140	Pentane, 3-methyl- (8CI9CI)	19.99	14.	
7.	1759586	Cyclopentane, 1,3-dimethyl-,	20.63	6.	
8.		Unknown	22.96	20.	
9.		Unknown	25.29	11.	
10.	3073663	Cyclohexane, 1,1,3-trimethyl	27.35	38.	
11.	4926903	Cyclohexane, 1-ethyl-1-methy	28.90	33.	
12.		Unknown	34.12	140.	
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Quality Assurance / Quality Control

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI055	Method Number:	8240
Lab Sample Name:	TRIP BLANK #5473	Date Analyzed:	890921
Matrix:	Water	Date Collected:	890918
Dilution Factor:	1.0	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/l	Detection Limit
Dichlorodiflucromethane		1. U
Chloromethane		1. U
Vinyl Chloride		1. U
Bromomethane		1. U
Chloroethane		1. U
Trichlorofluoromethane		1. U
1,1-Dichloroethene		1. U
Methylene Chloride		1. U
trans-1,2-Dichloroethene		1. U
1,1-Dichloroethane		1. U
cis-1,2-Dichloroethene		1. U
2,2-Dichloropropane		1. U
Chloroform		1. U
Bromochloromethane		1. U
1,1,1-Trichloroethane		1. U
1,1-Dichloropropene		1. U
Carbon Tetrachloride		1. U
1,2-Dichloroethane		1. U
Benzene		1. U
Trichloroethene		1. U
1,2-Dichloropropane		1. U
Bromodichloromethane		1. U
Dibromomethane		1. U
Toluene		1. U
1,1,2-Trichloroethane		1. U
1,3-Dichloropropane		1. U
Tetrachloroethene		1. U
Dibromochloromethane		1. U
1,2-Dibromoethane - EDB		1. U
Chlorobenzene		1. U
Ethylbenzene		1. U
1,1,1,2-Tetrachloroethane		1. U
m + p-Xylenes		1. U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI055	Method Number:	8240
Lab Sample Name:	TRIP BLANK #5473	Date Analyzed:	890921
Matrix:	Water	Date Collected:	890918
Dilution Factor:	1.0	Date Received:	890920

Sample Info.: GC/MS A,TN,ESI7019,5uL IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/l	Detection Limit
o-Xylene		1. U
Styrene		1. U
1,1,2,2-Tetrachloroethane		1. U
Isopropylbenzene		1. U
Bromoform		1. U
1,2,3-Trichloropropane		1. U
n-Propylbenzene		1. U
Bromobenzene		1. U
1,3,5-Trimethylbenzene		1. U
4-Chlorotoluene		1. U
2-Chlorotoluene		1. U
tert-Butylbenzene		1. U
1,2,4-Trimethylbenzene		1. U
sec-Butylbenzene		1. U
p-Isopropyltoluene		1. U
1,3-Dichlorobenzene		1. U
1,4-Dichlorobenzene		1. U
n-Butylbenzene		1. U
1,2-Dichlorobenzene		1. U
1,2-Dibromo-3-Chloropropane		1. U
1,2,4-Trichlorobenzene		1. U
Hexachlorobutadiene		1. U
Naphthalene		1. U
1,2,3-Trichlorobenzene		1. U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

TRIP BLANK

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: WATER Lab Sample ID: #5473

Sample wt/vol: 5 mL Lab File ID: >A1055

Level: LOW Date Received: N.A.

% Moisture: not dec.____ Date Analyzed: 9/21/89

Column: WB Dilution Factor: 1.0000

Number TICs found: ..... CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI081	Method Number:	8240
Lab Sample Name:	0920VBLKC	Date Analyzed:	890920
Matrix:	Soil	Date Collected:	NA.
Dilution Factor:	1.0	Date Received:	NA.

Sample Info.: GC/MS,C,LB,10ul IS-21,SS-20/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Chloromethane		10	U
Bromomethane		10	U
Vinyl Chloride		10	U
Chloroethane		10	U
Methylene Chloride		5	U
Acetone	7		J
Acrylonitrile		5	U
Acrolein		5	U
Trichlorofluoromethane		5	U
Carbon Disulfide		5	U
1,1-Dichloroethene		5	U
1,1-Dichloroethane		5	U
1,2-Dichloroethene (Total)		5	U
Chloroform		5	U
1,2-Dichloroethane		5	U
2-Butanone		5	U
1,1,1-Trichloroethane		5	U
Carbon Tetrachloride		5	U
Vinyl Acetate		10	U
Bromodichloromethane		5	U
1,2-Dichloropropane		5	U
trans-1,3-Dichloropropene		5	U
Trichloroethene		5	U
Dibromochloromethane		5	U
1,1,2-Trichloroethane		5	U
Benzene		5	U
cis-1,3-Dichloropropene		5	U
2-Chloroethylvinylether		5	U
Bromoform		5	U
4-Methyl-2-Pentanone		10	U
2-Hexanone		10	U
Tetrachloroethene		5	U
1,1,2,2-Tetrachloroethane		5	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI081	Method Number:	8240
Lab Sample Name:	0920VBLKC	Date Analyzed:	890920
Matrix:	Soil	Date Collected:	NA.
Dilution Factor:	1.0	Date Received:	NA.

Sample Info.: GC/MS,C,LB,10ul IS-21,SS-20/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit
Toluene		5 U
Chlorobenzene		5 U
Ethylbenzene		5 U
Styrene		5 U
Xylenes (Total)		5 U
m-Xylene		5 U
o + p-Xylene		5 U
1,3 Dichlorobenzene		5 U
1,2 Dichlorobenzene		5 U
1,4 Dichlorobenzene		5 U

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

0920VBLKC

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: 0920VBLKC

Sample wt/vol: 5 G Lab File ID: >CI081

Level: LOW Date Received: N.A.

% Moisture: not dec.____ Date Analyzed: 9/20/89

Column: PACK Dilution Factor: 1.0000

Number TICs found: 4

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	1.19	9.	
2.		Unknown	1.32	19.	
3.		Unknown	37.28	7.	
4.	439	1,4-Dichlorobenzene d-4	37.82	22.	
5.					
6.					
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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

0920VBLKC

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: 0920VBLKC

Sample wt/vol: 5 G Lab File ID: >CI081

Level: LOW Date Received: N.A.

% Moisture: not dec.____ Date Analyzed: 9/20/89

Column: PACK Dilution Factor: 1.0000

Number TICs found: 4

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	Unknown	1.19	9.	
2.	Unknown	1.32	19.	
3.	Unknown	37.28	7.	
4. 439	1,4-Dichlorobenzene d-4	37.82	22.	
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI091	Method Number:	8240
Lab Sample Name:	0822VBLKC	Date Analyzed:	890822
Matrix:	Water	Date Collected:	N.A.
Dilution Factor:	1.0	Date Received:	N.A.

Sample Info.: GC/MS,C,LB,10ul IS-21,SS-20/5gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/l	Detection Limit	
Chloromethane		10	U
Bromomethane		10	U
Vinyl Chloride		10	U
Chloroethane		10	U
Methylene Chloride		5	U
Acetone	12		
Acrylonitrile		5	U
Acrolein		5	U
Trichlorofluoromethane		5	U
Carbon Disulfide		5	U
1,1-Dichloroethene		5	U
1,1-Dichloroethane		5	U
1,2-Dichloroethene (Total)		5	U
Chloroform		5	U
1,2-Dichloroethane		5	U
2-Butanone		5	U
1,1,1-Trichloroethane		5	U
Carbon Tetrachloride		5	U
Vinyl Acetate		10	U
Bromodichloromethane		5	U
1,2-Dichloropropane		5	U
trans-1,3-Dichloropropene		5	U
Trichloroethene		5	U
Dibromochloromethane		5	U
1,1,2-Trichloroethane		5	U
Benzene		5	U
cis-1,3-Dichloropropene		5	U
2-Chloroethylvinylether		5	U
Bromoform		5	U
4-Methyl-2-Pentanone		10	U
2-Hexanone		10	U
Tetrachloroethene		5	U
1,1,2,2-Tetrachloroethane		5	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI091	Method Number:	8240
Lab Sample Name:	0922VBLKC	Date Analyzed:	890922
Matrix:	Water	Date Collected:	N.A.
Dilution Factor:	1.0	Date Received:	N.A.

Sample Info.: GC/MS,C,LB,10ul IS-21,SS-20/5gms P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/l	Detection Limit	
Toluene		5	U
Chlorobenzene		5	U
Ethylbenzene		5	U
Styrene		5	U
Xylenes (Total)		5	U
m-Xylene		5	U
o + p-Xylene		5	U
1,3 Dichlorobenzene		5	U
1,2 Dichlorobenzene		5	U
1,4 Dichlorobenzene		5	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

0922VBLKC

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: 0922VBLKC

Sample wt/vol: 5 G Lab File ID: >C1091

Level: LOW Date Received: N.A.

% Moisture: not dec.____ Date Analyzed: 9/22/89

Column: PACK Dilution Factor: 1.0000

Number TICs found: ..... CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI064	Method Number:	8240
Lab Sample Name:	0S22VABLK	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	NA.
Dilution Factor:	1.0	Date Received:	NA.

Sample Info.: GC/MSA,TN,5uL 50ng/ul IS,SS 524/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
Dichlorodifluoromethane		1. U
Chloromethane		1. U
Vinyl Chloride		1. U
Bromomethane		1. U
Chloroethane		1. U
Trichlorofluoromethane		1. U
1,1-Dichloroethene		1. U
Methylene Chloride		1. U
trans-1,2-Dichloroethene		1. U
1,1-Dichloroethane		1. U
cis-1,2-Dichloroethene		1. U
2,2-Dichloropropane		1. U
Chloroform		1. U
Bromochloromethane		1. U
1,1,1-Trichloroethane		1. U
1,1-Dichloropropene		1. U
Carbon Tetrachloride		1. U
1,2-Dichloroethane		1. U
Benzene		1. U
Trichloroethene		1. U
1,2-Dichloropropane		1. U
Bromodichloromethane		1. U
Dibromomethane		1. U
Toluene		1. U
1,1,2-Trichloroethane		1. U
1,3-Dichloropropane		1. U
Tetrachloroethene		1. U
Dibromochloromethane		1. U
1,2-Dibromoethane - EDB		1. U
Chlorobenzene		1. U
Ethylbenzene		1. U
1,1,1,2-Tetrachloroethane		1. U
m + p-Xylenes		1. U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI054	Method Number:	8240
Lab Sample Name:	0921VABLK	Date Analyzed:	890921
Matrix:	Water	Date Collected:	N.A.
Dilution Factor:	1.0	Date Received:	N.A.

Sample Info.: GC/MS A,TN,5ul 50ng/ul 524 IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/l	Detection Limit	
o-Xylene		1.	U
Styrene		1.	U
1,1,2,2-Tetrachloroethane		1.	U
Isopropylbenzene		1.	U
Bromoform		1.	U
1,2,3-Trichloropropane		1.	U
n-Propylbenzene		1.	U
Bromobenzene		1.	U
1,3,5-Trimethylbenzene		1.	U
4-Chlorotoluene		1.	U
2-Chlorotoluene		1.	U
tert-Butylbenzene		1.	U
1,2,4-Trimethylbenzene		1.	U
sec-Butylbenzene		1.	U
p-Isopropyltoluene		1.	U
1,3-Dichlorobenzene		1.	U
1,4-Dichlorobenzene		1.	U
n-Butylbenzene		1.	U
1,2-Dichlorobenzene		1.	U
1,2-Dibromo-3-Chloropropane		1.	U
1,2,4-Trichlorobenzene		1.	U
Hexachlorobutadiene		1.	U
Naphthalene		1.	U
1,2,3-Trichlorobenzene		1.	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

092IVABLK

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: 092IVABLK

Sample wt/vol: 5 G Lab File ID: >A1054

Level: LOW Date Received: 09/21/89

% Moisture: not dec.____ Date Analyzed: 9/21/89

Column: W.B. Dilution Factor: 1.00000

Number TICs Found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI054	Method Number:	8240
Lab Sample Name:	0921VABLK	Date Analyzed:	890921
Matrix:	Water	Date Collected:	N.A.
Dilution Factor:	1.0	Date Received:	N.A.

Sample Info.: GC/MS A,TN,5ul 50ng/ul 524 IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/l	Detection Limit	
Dichlorodifluoromethane		1.	U
Chloromethane		1.	U
Vinyl Chloride		1.	U
Bromomethane		1.	U
Chloroethane		1.	U
Trichlorofluoromethane		1.	U
1,1-Dichloroethene		1.	U
Methylene Chloride		1.	U
trans-1,2-Dichloroethene		1.	U
1,1-Dichloroethane		1.	U
cis-1,2-Dichloroethene		1.	U
2,2-Dichloropropane		1.	U
Chloroform		1.	U
Bromochloromethane		1.	U
1,1,1-Trichloroethane		1.	U
1,1-Dichloropropene		1.	U
Carbon Tetrachloride		1.	U
1,2-Dichloroethane		1.	U
Benzene		1.	U
Trichloroethene		1.	U
1,2-Dichloropropane		1.	U
Bromodichloromethane		1.	U
Dibromomethane		1.	U
Toluene		1.	U
1,1,2-Trichloroethane		1.	U
1,3-Dichloropropane		1.	U
Tetrachloroethene		1.	U
Dibromochloromethane		1.	U
1,2-Dibromoethane - EDB		1.	U
Chlorobenzene		1.	U
Ethylbenzene		1.	U
1,1,1,2-Tetrachloroethane		1.	U
m + p-Xylenes		1.	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

0920VBLKC

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: 0920VBLKC

Sample wt/vol: 5 G Lab File ID: >CI081

Level: LOW Date Received: N.A.

% Moisture: not dec.____ Date Analyzed: 9/20/89

Column: PACK Dilution Factor: 1.0000

Number TICs found: 4

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	Unknown	1.19	9.	
2.	Unknown	1.32	19.	
3.	Unknown	37.28	7.	
4. 439	1,4-Dichlorobenzene d-4	37.82	22.	
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI064	Method Number:	8240
Lab Sample Name:	0922VABLK	Date Analyzed:	890922
Matrix:	Soil	Date Collected:	NA.
Dilution Factor:	1.0	Date Received:	NA.

Sample Info.: GC/MSA,TN,SuL 50ng/ul IS,SS 524/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		1.	U
Styrene		1.	U
1,1,2,2-Tetrachloroethane		1.	U
Isopropylbenzene		1.	U
Bromoform		1.	U
1,2,3-Trichloropropane		1.	U
n-Propylbenzene		1.	U
Bromobenzene		1.	U
1,3,5-Trimethylbenzene		1.	U
4-Chlorotoluene		1.	U
2-Chlorotoluene		1.	U
tert-Butylbenzene		1.	U
1,2,4-Trimethylbenzene		1.	U
sec-Butylbenzene		1.	U
p-Isopropyltoluene		1.	U
1,3-Dichlorobenzene		1.	U
1,4-Dichlorobenzene		1.	U
n-Butylbenzene		1.	U
1,2-Dichlorobenzene		1.	U
1,2-Dibromo-3-Chloropropane		1.	U
1,2,4-Trichlorobenzene		1.	U
Hexachlorobutadiene		1.	U
Naphthalene	1.		J
1,2,3-Trichlorobenzene		1.	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

U922VABLK

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: U922VABLK

Sample wt/vol: 5 G Lab File ID: >A1064

Level: LOW Date Received: N.A.

% Moisture: not dec.____ Date Analyzed: 9/22/89

Column: WB Dilution Factor: 1.0000

Number TICs found: CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI101	Method Number:	8240
Lab Sample Name:	0923VBLKC	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	NA.
Dilution Factor:	1.0	Date Received:	NA.

Sample Info.: GC/MS,C,LB,10ul IS-21,SS-20/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Chloromethane		10	U
Bromomethane		10	U
Vinyl Chloride		10	U
Chloroethane		10	U
Methylene Chloride		5	U
Acetone		10	U
Acrylonitrile		5	U
Acrolein		5	U
Trichlorofluoromethane		5	U
Carbon Disulfide		5	U
1,1-Dichloroethene		5	U
1,1-Dichloroethane		5	U
1,2-Dichloroethene (Total)		5	U
Chloroform		5	U
1,2-Dichloroethane		5	U
2-Butanone		5	U
1,1,1-Trichloroethane		5	U
Carbon Tetrachloride		5	U
Vinyl Acetate		10	U
Bromodichloromethane		5	U
1,2-Dichloropropane		5	U
trans-1,3-Dichloropropene		5	U
Trichloroethene		5	U
Dibromochloromethane		5	U
1,1,2-Trichloroethane		5	U
Benzene		5	U
cis-1,3-Dichloropropene		5	U
2-Chloroethylvinylether		5	U
Bromoform		5	U
4-Methyl-2-Pentanone		10	U
2-Hexanone		10	U
Tetrachloroethene		5	U
1,1,2,2-Tetrachloroethane		5	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI101	Method Number:	8240
Lab Sample Name:	0923VBLKC	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	NA.
Dilution Factor:	1.0	Date Received:	NA.

Sample Info.: GC/MS,C,LB,10ul IS-21,SS-20/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit
Toluene		5 U
Chlorobenzene		5 U
Ethylbenzene		5 U
Styrene		5 U
Xylenes (Total)		5 U
m-Xylene		5 U
o + p-Xylene		5 U
1,3 Dichlorobenzene		5 U
1,2 Dichlorobenzene		5 U
1,4 Dichlorobenzene		5 U

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VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

U923VBLKC

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: U923VBLKC

Sample wt/vol: 5 G Lab File ID: >C1101

Level: LOW Date Received: N.A.

% Moisture: not dec.____ Date Analyzed: 9/23/89

Column: PACK Dilution Factor: 1.0000

Number TICs found: CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI075	Method Number:	8240
Lab Sample Name:	0523VABLK	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	NA.
Dilution Factor:	1.0	Date Received:	NA.

Sample Info.: GC/MS A,TN,5ul 50ng/ul 524 IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		1.	U
Chloromethane		1.	U
Vinyl Chloride		1.	U
Bromomethane		1.	U
Chloroethane		1.	U
Trichlorofluoromethane		1.	U
1,1-Dichloroethene		1.	U
Methylene Chloride		1.	U
trans-1,2-Dichloroethene		1.	U
1,1-Dichloroethane		1.	U
cis-1,2-Dichloroethene		1.	U
2,2-Dichloropropane		1.	U
Chloroform		1.	U
Bromochloromethane		1.	U
1,1,1-Trichloroethane		1.	U
1,1-Dichloropropene		1.	U
Carbon Tetrachloride		1.	U
1,2-Dichloroethane		1.	U
Benzene		1.	U
Trichloroethene		1.	U
1,2-Dichloropropane		1.	U
Bromodichloromethane		1.	U
Dibromomethane		1.	U
Toluene		1.	U
1,1,2-Trichloroethane		1.	U
1,3-Dichloropropane		1.	U
Tetrachloroethene		1.	U
Dibromochloromethane		1.	U
1,2-Dibromoethane - EDB		1.	U
Chlorobenzene		1.	U
Ethylbenzene		1.	U
1,1,1,2-Tetrachloroethane		1.	U
m + p-Xylenes		1.	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI075	Method Number:	8240
Lab Sample Name:	0923VABLK	Date Analyzed:	890923
Matrix:	Soil	Date Collected:	NA.
Dilution Factor:	1.0	Date Received:	NA.

Sample Info.: GC/MS A,TN,5ul 50ng/ul 524 IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		1.	U
Styrene		1.	U
1,1,2,2-Tetrachloroethane		1.	U
Isopropylbenzene		1.	U
Bromoform		1.	U
1,2,3-Trichloropropane		1.	U
n-Propylbenzene		1.	U
Bromobenzene		1.	U
1,3,5-Trimethylbenzene		1.	U
4-Chlorotoluene		1.	U
2-Chlorotoluene		1.	U
tert-Butylbenzene		1.	U
1,2,4-Trimethylbenzene		1.	U
sec-Butylbenzene		1.	U
p-Isopropyltoluene		1.	U
1,3-Dichlorobenzene		1.	U
1,4-Dichlorobenzene		1.	U
n-Butylbenzene		1.	U
1,2-Dichlorobenzene		1.	U
1,2-Dibromo-3-Chloropropane		1.	U
1,2,4-Trichlorobenzene		1.	U
Hexachlorobutadiene		1.	U
Naphthalene		1.	U
1,2,3-Trichlorobenzene		1.	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

09230ABLK

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: 09230ABLK

Sample wt/vol: 5 G Lab File ID: >A1075

Level: LOW Date Received: 09/23/89

% Moisture: not dec.____ Date Analyzed: 9/23/89

Column: W.B. Dilution Factor: 1.0000

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI092	Method Number:	8240
Lab Sample Name:	0924VABLK	Date Analyzed:	890924
Matrix:	Soil	Date Collected:	NA.
Dilution Factor:	1.0	Date Received:	NA.

Sample Info.: GC/MS A,TN,5ul 50ng/ul 524 IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
Dichlorodifluoromethane		1. U
Chloromethane		1. U
Vinyl Chloride		1. U
Bromomethane		1. U
Chloroethane		1. U
Trichlorofluoromethane		1. U
1,1-Dichloroethene		1. U
Methylene Chloride		1. U
trans-1,2-Dichloroethene		1. U
1,1-Dichloroethane		1. U
cis-1,2-Dichloroethene		1. U
2,2-Dichloropropane		1. U
Chloroform		1. U
Bromochloromethane		1. U
1,1,1-Trichloroethane		1. U
1,1-Dichloropropene		1. U
Carbon Tetrachloride		1. U
1,2-Dichloroethane	1.	
Benzene		1. U
Trichloroethene		1. U
1,2-Dichloropropane		1. U
Bromodichloromethane		1. U
Dibromomethane		1. U
Toluene		1. U
1,1,2-Trichloroethane		1. U
1,3-Dichloropropane		1. U
Tetrachloroethene		1. U
Dibromochloromethane		1. U
1,2-Dibromoethane - EDB		1. U
Chlorobenzene		1. U
Ethylbenzene		1. U
1,1,1,2-Tetrachloroethane		1. U
m + p-Xylenes		1. U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI092	Method Number:	8240
Lab Sample Name:	0524VABLK	Date Analyzed:	890924
Matrix:	Soil	Date Collected:	NA.
Dilution Factor:	1.0	Date Received:	NA.

Sample Info.: GC/MS A,TN,Sul 50ng/ul 524 IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		1.	U
Styrene		1.	U
1,1,2,2-Tetrachloroethane		1.	U
Isopropylbenzene		1.	U
Bromoform		1.	U
1,2,3-Trichloropropane		1.	U
n-Propylbenzene		1.	U
Bromobenzene		1.	U
1,3,5-Trimethylbenzene	2.		
4-Chlorotoluene		1.	U
2-Chlorotoluene		1.	U
tert-Butylbenzene		1.	U
1,2,4-Trimethylbenzene		1.	U
sec-Butylbenzene		1.	U
p-Isopropyltoluene		1.	U
1,3-Dichlorobenzene	0.		J
1,4-Dichlorobenzene	2.		
n-Butylbenzene		1.	U
1,2-Dichlorobenzene		1.	U
1,2-Dibromo-3-Chloropropane		1.	U
1,2,4-Trichlorobenzene	12.		
Hexachlorobutadiene	14.		
Naphthalene	14.		
1,2,3-Trichlorobenzene	16.		

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

092400BLK

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: 092400BLK

Sample wt/vol: 5 G Lab File ID: >A1092

Level: LOW Date Received: 09/24/89

% Moisture: not dec.____ Date Analyzed: 9/24/89

Column: PACK Dilution Factor: 1.0000

Number TICs found: 0 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI109	Method Number:	8240
Lab Sample Name:	0925VBLKC	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	NA.
Dilution Factor:	1.0	Date Received:	NA.

Sample Info.: GC/MS,C,LB,10ul IS-21,SS-20/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Chloromethane		10	U
Bromomethane		10	U
Vinyl Chloride		10	U
Chloroethane		10	U
Methylene Chloride	2		J
Acetone		10	U
Acrylonitrile		5	U
Acrolein		5	U
Trichlorofluoromethane		5	U
Carbon Disulfide		5	U
1,1-Dichloroethene		5	U
1,1-Dichloroethane		5	U
1,2-Dichloroethene (Total)		5	U
Chloroform		5	U
1,2-Dichloroethane		5	U
2-Butanone		5	U
1,1,1-Trichloroethane		5	U
Carbon Tetrachloride		5	U
Vinyl Acetate		10	U
Bromodichloromethane		5	U
1,2-Dichloropropane		5	U
trans-1,3-Dichloropropene		5	U
Trichloroethene		5	U
Dibromochloromethane		5	U
1,1,2-Trichloroethane		5	U
Benzene		5	U
cis-1,3-Dichloropropene		5	U
2-Chloroethylvinylether		5	U
Bromoform		5	U
4-Methyl-2-Pentanone		10	U
2-Hexanone		10	U
Tetrachloroethene		5	U
1,1,2,2-Tetrachloroethane		5	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>CI109	Method Number:	8240
Lab Sample Name:	0925VBLKC	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	NA.
Dilution Factor:	1.0	Date Received:	NA.

Sample Info.: GC/MS,C,LB,10ul IS-21,SS-20/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/kg	Detection Limit	
Toluene		5	U
Chlorobenzene		5	U
Ethylbenzene		5	U
Styrene		5	U
Xylenes (Total)		5	U
m-Xylene		5	U
o + p-Xylene		5	U
1,3 Dichlorobenzene		5	U
1,2 Dichlorobenzene		5	U
1,4 Dichlorobenzene		5	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

U925VBLKC

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: U925VBLKC

Sample wt/vol: 5 G Lab File ID: >C1109

Level: LOW Date Received: N.A.

% Moisture: not dec.____ Date Analyzed: 9/25/89

Column: PACK Dilution Factor: 1.0000

Number TICs found:

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI103	Method Number:	8240
Lab Sample Name:	0925VABLK	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	NA.
Dilution Factor:	1.0	Date Received:	NA.

Sample Info.: GC/MS A,TN,5ul 50ng/ul 524 IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
Dichlorodifluoromethane		1. U
Chloromethane		1. U
Vinyl Chloride		1. U
Bromomethane		1. U
Chloroethane		1. U
Trichlorofluoromethane		1. U
1,1-Dichloroethene		1. U
Methylene Chloride		1. U
trans-1,2-Dichloroethene		1. U
1,1-Dichloroethane		1. U
cis-1,2-Dichloroethene		1. U
2,2-Dichloropropane		1. U
Chloroform		1. U
Bromochloromethane		1. U
1,1,1-Trichloroethane		1. U
1,1-Dichloropropene		1. U
Carbon Tetrachloride		1. U
1,2-Dichloroethane		1. U
Benzene		1. U
Trichloroethene		1. U
1,2-Dichloropropane		1. U
Bromodichloromethane		1. U
Dibromomethane		1. U
Toluene		1. U
1,1,2-Trichloroethane		1. U
1,3-Dichloropropane		1. U
Tetrachloroethene		1. U
Dibromochloromethane		1. U
1,2-Dibromoethane - EDB		1. U
Chlorobenzene		1. U
Ethylbenzene		1. U
1,1,1,2-Tetrachloroethane		1. U
m + p-Xylenes		1. U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI103	Method Number:	8240
Lab Sample Name:	0925VABLK	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	NA.
Dilution Factor:	1.0	Date Received:	NA.

Sample Info.: GC/MS A,TN,5ul 50ng/ul 524 IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
o-Xylene		1.	U
Styrene		1.	U
1,1,2,2-Tetrachloroethane		1.	U
Isopropylbenzene		1.	U
Bromoform		1.	U
1,2,3-Trichloropropane		1.	U
n-Propylbenzene		1.	U
Bromobenzene		1.	U
1,3,5-Trimethylbenzene		1.	U
4-Chlorotoluene		1.	U
2-Chlorotoluene		1.	U
tert-Butylbenzene		1.	U
1,2,4-Trimethylbenzene		1.	U
sec-Butylbenzene		1.	U
p-Isopropyltoluene		1.	U
1,3-Dichlorobenzene		1.	U
1,4-Dichlorobenzene		1.	U
n-Butylbenzene		1.	U
1,2-Dichlorobenzene		1.	U
1,2-Dibromo-3-Chloropropane		1.	U
1,2,4-Trichlorobenzene	2.		
Hexachlorobutadiene	3.		
Naphthalene	4.		
1,2,3-Trichlorobenzene	4.		

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

09250ABLK

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: 09250ABLK

Sample wt/vol: 5 G Lab File ID: >A1103

Level: LOW Date Received: 09/25/89

% Moisture: not dec._____ Date Analyzed: 9/25/89

Column: PACK Dilution Factor: 1.0000

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI116	Method Number:	8240
Lab Sample Name:	0926VABLK	Date Analyzed:	890926
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.0	Date Received:	890920

Sample Info.: GC/MS A,TN,5ul 50ng/ul 524 IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit	
Dichlorodifluoromethane		1.	U
Chloromethane		1.	U
Vinyl Chloride		1.	U
Bromomethane		1.	U
Chloroethane		1.	U
Trichlorofluoromethane		1.	U
1,1-Dichloroethene		1.	U
Methylene Chloride		1.	U
trans-1,2-Dichloroethene		1.	U
1,1-Dichloroethane		1.	U
cis-1,2-Dichloroethene		1.	U
2,2-Dichloropropane		1.	U
Chloroform		1.	U
Bromochloromethane		1.	U
1,1,1-Trichloroethane		1.	U
1,1-Dichloropropene		1.	U
Carbon Tetrachloride		1.	U
1,2-Dichloroethane		1.	U
Benzene		1.	U
Trichloroethene		1.	U
1,2-Dichloropropane		1.	U
Bromodichloromethane		1.	U
Dibromomethane		1.	U
Toluene		1.	U
1,1,2-Trichloroethane		1.	U
1,3-Dichloropropane		1.	U
Tetrachloroethene		1.	U
Dibromochloromethane		1.	U
1,2-Dibromoethane - EDB		1.	U
Chlorobenzene		1.	U
Ethylbenzene		1.	U
1,1,1,2-Tetrachloroethane		1.	U
m + p-Xylenes		1.	U

HITTMAN EBASCO ASSOCIATES, Inc.
VOLATILE ORGANIC ANALYSIS - TABULATED REPORT

Lab Data File:	>AI116	Method Number:	8240
Lab Sample Name:	0925VABLK	Date Analyzed:	890925
Matrix:	Soil	Date Collected:	890918
Dilution Factor:	1.0	Date Received:	890920

Sample Info.: GC/MS A,TN,5ul 50ng/ul 524 IS,SS/5mls P&T

U = not detected
J = estimated value, below detection limit

Compound	Concentration ug/Kg	Detection Limit
o-Xylene		1. U
Styrene		1. U
1,1,2,2-Tetrachloroethane		1. U
Isopropylbenzene		1. U
Bromoform		1. U
1,2,3-Trichloropropane		1. U
n-Propylbenzene		1. U
Bromobenzene		1. U
1,3,5-Trimethylbenzene		1. U
4-Chlorotoluene		1. U
2-Chlorotoluene		1. U
tert-Butylbenzene		1. U
1,2,4-Trimethylbenzene		1. U
sec-Butylbenzene		1. U
p-Isopropyltoluene		1. U
1,3-Dichlorobenzene		1. U
1,4-Dichlorobenzene		1. U
n-Butylbenzene		1. U
1,2-Dichlorobenzene		1. U
1,2-Dibromo-3-Chloropropane		1. U
1,2,4-Trichlorobenzene	9.	
Hexachlorobutadiene	9.	
Naphthalene	11.	
1,2,3-Trichlorobenzene	12.	

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VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

U926VABLK

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix: SOIL Lab Sample ID: U926VABLK

Sample wt/vol: 5 G Lab File ID: >A1116

Level: MED Date Received: 09/26/89

% Moisture: not dec.____ Date Analyzed: 9/26/89

Column: W.B. Dilution Factor: 1.0000

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/Kg

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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QC SUMMARY

Surrogate Recovery
MS/MSD Recovery
Daily Blank Summary
GC/MS Tuning and Calibration

SOIL VOLATILE SURROGATE RECOVERY

Lab Name: Hillman Ebasco Contract: ESI 7018

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Level: LOW

	EPA SAMPLE NO.	S1 (TOL)#	S2 (BFB)#	S3 (DCE)#	OTHER	TOT OUT
01	0920VBLKC	101	91	94		0
02	PBS1411SS6	105	100	89		0
03	PBS1411SS7	106	104	92		0
04	PBS1411SS8	114	108	89		0
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	QC LIMITS
S1 (TOL) - Toluene-d8	(81-117)
S2 (BFB) - Bromofluorobenzene	(74-121)
S3 (DCE) - 1,2-Dichloroethane-d4	(70-121)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogates diluted out

2A
SOIL VOLATILE SURROGATE RECOVERY

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

	EPA SAMPLE NO.	S1 (BFB)#	S2 (BFB)#	OTHER	
01	0921VABLK	92	96		0
02	TRIP BLANK	89	95		0
03	PBS1411SS8	54 *	108		1
04	PBS1411SS8	78 *	133 *		2
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	QC LIMITS
S1 (BFB) = Bromofluorobenzene/ Fluorobenzene	(80-120)
S2 (BFB) = Bromofluorobenzene/ 1,4-DCB-d4	(80-120)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogates diluted out

2B
SOIL VOLATILE SURROGATE RECOVERY

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Level: LOW

	EPA SAMPLE NO.	S1 (TOL)#	S2 (BFB)#	S3 (DCE)#	OTHER	TOT OUT
01	0922VBLKC	103	93	93		0
02	PBS7121SS1	110	86	96		0
03	PBS1411SS7	108	97	95		0
04	PBS1411SS7	108	89	93		0
05	PBS7121SS2	109	83	95		0
06	PBS7121SS3	102	93	96		0
07	PBS7121SS4	100	79	93		0
08	PBS7121SS5	114	80	94		0
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	QC LIMITS
S1 (TOL) = Toluene-d8	(81-117)
S2 (BFB) = Bromofluorobenzene	(74-121)
S3 (DCE) = 1,2-Dichloroethane-d4	(70-121)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogates diluted out

2A
SOIL VOLATILE SURROGATE RECOVERY

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

	EPA SAMPLE NO.	S1 (BFB)#	S2 (BFB)#	OTHER	
01	0922VABLK	101	98		0
02	PBS7131SS1	89	128 *		1
03	PBS7131SS2	79 *	116		1
04	PBS7131SS3	82	112		0
05	PBS7131SS4	82	119		0
06	PBS7131SS5	66 *	126 *		2
07	PBS1411SS1	60 *	*** *		2
08	PBS1411SS2	56 *	157 *		2
09	PBS1411SS3	83	150 *		1
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	QC LIMITS
S1 (BFB) = Bromofluorobenzene/ Fluorobenzene	(80-120)
S2 (BFB) = Bromofluorobenzene/ 1,4-DCB-d4	(80-120)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogates diluted out

FORM II VOA - 524

2B
SOIL VOLATILE SURROGATE RECOVERY

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Level: LOW

	EPA SAMPLE NO.	S1 (TOL)#	S2 (BFB)#	S3 (DCE)#	OTHER	TOT OUT
01	0923VBLKC	100	94	95		0
02	PBS7121SS1	102	87	94		0
03	PBS7121SS3	102	93	96		0
04	PBS7121SS4	101	90	97		0
05	PBS7121SS5	101	84	96		0
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	QC LIMITS
S1 (TOL) = Toluene-d8	(81-117)
S2 (BFB) = Bromofluorobenzene	(74-121)
S3 (DCE) = 1,2-Dichloroethane-d4	(70-121)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogates diluted out

2A
SOIL VOLATILE SURROGATE RECOVERY

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

	EPA SAMPLE NO.	S1 (BFB)#	S2 (BFB)#	OTHER	
01	0923VABLK	105	96		0
02	PBS7121SS6	70 *	129 *		2
03	PBS7121SS7	68 *	128 *		2
04	PBS7121SS8	60 *	142 *		2
05	PBS7121SS9	66 *	113		1
06	PBS1411SS4	68 *	142 *		2
07	PBS1411SS5	72 *	87		1
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	QC LIMITS
S1 (BFB) = Bromofluorobenzene/ Fluorobenzene	(80-120)
S2 (BFB) = Bromofluorobenzene/ 1,4-DCB-d4	(80-120)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogates diluted out

2A
SOIL VOLATILE SURROGATE RECOVERY

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

	EPA SAMPLE NO.	S1 (BFB)#	S2 (BFB)#	OTHER	
01	0924VABLK	88	96		0
02	PBS7131SS1	88	103		0
03	PBS7131SS2	94	96		0
04	PBS7131SS3	86	94		0
05	PBS7131SS4	88	96		0
06	PBS1411SS1	75 *	108		1
07	PBS1411SS2	83	109		0
08	PBS1411SS3	100	107		0
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	QC LIMITS
S1 (BFB) = Bromofluorobenzene/ Fluorobenzene	(80-120)
S2 (BFB) = Bromofluorobenzene/ 1,4-DCB-d4	(80-120)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogates diluted out

2B
SOIL VOLATILE SURROGATE RECOVERY

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Level: LOW

	EPA SAMPLE NO.	S1 (TOL)#	S2 (BFB)#	S3 (DCE)#	OTHER	TOT OUT
01	0925VBLKC	100	93	90		0
02	PBS7121SS5	100	93	94		0
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	QC LIMITS
S1 (TOL) = Toluene-d8	(81-117)
S2 (BFB) = Bromofluorobenzene	(74-121)
S3 (DCE) = 1,2-Dichloroethane-d4	(70-121)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogates diluted out

2A
SOIL VOLATILE SURROGATE RECOVERY

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

	EPA SAMPLE NO.	S1 (BFB)#	S2 (BFB)#	OTHER	
01	0S2SVADLK	101	102		0
02	PBS7121SS8	54 *	87		1
03	PBS7121SS8MS	134 *	57 *		2
04	PBS7121SS8MS	65 *	70 *		2
05	PBS7121SS9	77 *	67 *		2
06	PBS7121SS6	86	100		0
07	PDS7121SS7	92	114		0
08	PBS7131SS5	95	114		0
09	PBS1411SS4	84	109		0
10	PBS1411SS5	79 *	116		1
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	QC LIMITS
S1 (BFB) = Bromofluorobenzene/ Fluorobenzene	(80-120)
S2 (BFB) = Bromofluorobenzene/ 1,4-DCB-d4	(80-120)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogates diluted out

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2A
SOIL VOLATILE SURROGATE RECOVERY

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

	EPA SAMPLE NO.	S1 (BFB)#	S2 (BFB)#	OTHER	
01	0926VABLK	91	109		0
02	PBS7131SS1	78 *	90		1
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	QC LIMITS
S1 (BFB) = Bromofluorobenzene/ Fluorobenzene	(80-120)
S2 (BFB) = Bromofluorobenzene/ 1,4-DCB-d4	(80-120)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogates diluted out

SOIL VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix Spike - EPA Sample No: PBS1411SS7 Level: LOW

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC LIMITS REC.
1,1-Dichloroethene	51.00	0.00	47.00	92	59-172
Trichloroethene	51.00	40.00	81.00	82	62-137
Benzene	51.00	0.00	46.00	90	66-142
Toluene	51.00	0.00	51.00	100	59-139
Chlorobenzene	51.00	0.00	54.00	106	60-133

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
1,1-Dichloroethene	51.00	42.00	82	12	22	59-172
Trichloroethene	51.00	72.00	63	26 *	24	62-137
Benzene	51.00	45.00	88	2	21	66-142
Toluene	51.00	50.00	98	2	21	59-139
Chlorobenzene	51.00	53.00	104	2	21	60-133

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of qc limits

RPD: 1 out of 5 outside limits
Spike Recovery: 0 out of 10 outside limits

COMMENTS: _____

SOIL VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Matrix Spike - EPA Sample No: PBS7121SS8 Level: LOW

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC	#	QC LIMITS REC.
1,1-Dichloroethene	8070.00	0.00	8840.00	109		59-172
Trichloroethene	8070.00	3670.00	19800.00	200	*	62-137
Benzene	8070.00	0.00	7140.00	88		66-142
Toluene	8070.00	79.00	11600.00	142	*	59-139
Chlorobenzene	8070.00	0.00	12200.00	151	*	60-133

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC	#	% RPD	#	QC LIMITS RPD	REC.
1,1-Dichloroethene	8070.00	5840.00	72		40	*	22	59-172
Trichloroethene	8070.00	10100.00	79		85	*	24	62-137
Benzene	8070.00	6300.00	78		12		21	66-142
Toluene	8070.00	5520.00	67		71	*	21	59-139
Chlorobenzene	8070.00	6980.00	86		54	*	21	60-133

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of qc limits

RPD: 4 out of 5 outside limits
Spike Recovery: 3 out of 10 outside limits

COMMENTS: _____

4A

VOLATILE METHOD BLANK SUMMARY

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Lab File ID: >CI081 Lab Sample ID: 0920VBLKC

Date Analyzed: 9/20/89 Time Analyzed: 13:57

Matrix: SOIL Level: LOW

Instrument ID: HP5970-C

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	LAB SAMPLE ID.	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED
01	HE#5443	PBS1411SS6	>CI082	9/20/89
02	HE#5444	PBS1411SS7	>CI083	9/20/89
03	HE#5446	PBS1411SS9	>CI085	9/20/89
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COMMENTS: _____

4A

VOLATILE METHOD BLANK SUMMARY

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: ESI SAS No: N.A. SDG No: N.A.

Lab File ID: >AI054 Lab Sample ID: 0921VABLK

Date Analyzed: 9/21/89 Time Analyzed: 10:14

Matrix: SOIL Level: LOW

Instrument ID: HP5895-A

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	LAB SAMPLE ID.	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED
01	#5473	TRIP BLANK	>AI055	9/21/89
02	HE#5445	PBS1411SS8	>AI056	9/21/89
03	#5340MS	PSS002MS	>CI061	9/14/89
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COMMENTS: _____

FORM IV VOA 1/87 Rev.

4A

VOLATILE METHOD BLANK SUMMARY

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Lab File ID: >CI091 Lab Sample ID: 0922VBLKC

Date Analyzed: 9/22/89 Time Analyzed: 11:16

Matrix: SOIL Level: LOW

Instrument ID: HP5970-C

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	LAB SAMPLE ID.	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED
01	HE#5454	PBS7121SS1	>CI092	9/22/89
02	HE#5444MS	PBS1411SS7MS	>CI093	9/22/89
03	HE#5444MSD	PBS1411SS7MSD	>CI094	9/22/89
04	HE#5455	PBS7121SS2	>CI095	9/22/89
05	HE#5456	PBS7121SS3	>CI096	9/22/89
06	HE#5457	PBS7121SS4	>CI097	9/22/89
07	HE#5458	PBS7121SS5	>CI098	9/22/89
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COMMENTS: _____

FORM IV VOA 1/87 Rev.

4A

VOLATILE METHOD BLANK SUMMARY

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Lab File ID: >AI064 Lab Sample ID: 0922VABLK

Date Analyzed: 9/22/89 Time Analyzed: 16:09

Matrix: SOIL Level: LOW

Instrument ID: HP5895-A

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	LAB SAMPLE ID.	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED
01	HE#5463	PBS7131SS1	>AI065	9/22/89
02	HE#5464	PBS7131SS2	>AI066	9/22/89
03	HE#5465	PBS7131SS3	>AI067	9/22/89
04	HE#5466	PBS7131SS4	>AI068	9/22/89
05	HE#5467	PBS7131SS5	>AI069	9/22/89
06	HE#5468	PBS1411SS1	>AI070	9/22/89
07	HE#5469	PBS1411SS2	>AI071	9/22/89
08	HE#5470	PBS1411SS3	>AI072	9/22/89
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COMMENTS: _____

4A

VOLATILE METHOD BLANK SUMMARY

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Lab File ID: >CI101 Lab Sample ID: 0923VBLKC

Date Analyzed: 9/23/89 Time Analyzed: 13:06

Matrix: SOIL Level: LOW

Instrument ID: HP5970-C

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	LAB SAMPLE ID.	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED
01	#5454 1:5	PBS7121SS1 1:5	>CI102	9/23/89
02	#5456 1:5	PBS7121SS3 1:5	>CI103	9/23/89
03	#5457 1:5	PBS7121SS4 1:5	>CI104	9/23/89
04	#5458 1:5	PBS7121SS5 1:5	>CI105	9/23/89
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COMMENTS: _____

FORM IV VOA 1/87 Rev.

4A

VOLATILE METHOD BLANK SUMMARY

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Lab File ID: >AI075 Lab Sample ID: 0923VABLK

Date Analyzed: 9/23/89 Time Analyzed: 13:12

Matrix: SOIL Level: LOW

Instrument ID: HP5895-A

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	LAB SAMPLE ID.	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED
01	HE#5467	PBS7131SS5	>AI076	9/23/89
02	HE#5459	PBS7121SS6	>AI077	9/23/89
03	HE#5460	PBS7121SS7	>AI078	9/23/89
04	HE#5461	PBS7121SS8	>AI079	9/23/89
05	HE#5462	PBS7121SS9	>AI080	9/23/89
06	HE#5471	PBS1411SS4	>CI081	9/23/89
07	HE#5472	PBS1411SS5	>CI082	9/23/89
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COMMENTS: _____

FORM IV VOA 1/87 Rev.

4A

VOLATILE METHOD BLANK SUMMARY

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Lab File ID: >AI092 Lab Sample ID: 0924VABLK

Date Analyzed: 9/24/89 Time Analyzed: 22:47

Matrix: SOIL Level: LOW

Instrument ID: HP5895-A

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	LAB SAMPLE ID.	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED
01	#5463 1:5	PBS7131SS1 1:5	>AI093	9/25/89
02	#5464 1:5	PBS7131SS2 1:5	>AI094	9/25/89
03	#5465 1:5	PBS7131SS3 1:5	>AI095	9/25/89
04	#5466 1:5	PBS7131SS4 1:5	>AI096	9/25/89
05	#5468 1:5	PBS1411SS1 1:5	>AI097	9/25/89
06	#5469 1:5	PBS1411SS2 1:5	>AI098	9/25/89
07	#5470 1:5	PBS1411SS3 1:5	>AI099	9/25/89
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COMMENTS: _____

FORM IV VOA 1/87 Rev.

4A

VOLATILE METHOD BLANK SUMMARY

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Lab File ID: >CI109 Lab Sample ID: 092SVBLKC

Date Analyzed: 9/25/89 Time Analyzed: 12:45

Matrix: SOIL Level: LOW

Instrument ID: HP5970-C

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	LAB SAMPLE ID.	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED
01	#5458 1:5	PBS7121SS5 1:5	>CI110	9/25/89
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COMMENTS: _____

FORM IV VOA 1/87 Rev.

4A

VOLATILE METHOD BLANK SUMMARY

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Lab File ID: >AI103 Lab Sample ID: 0925VABLK

Date Analyzed: 9/25/89 Time Analyzed: 15:08

Matrix: SOIL Level: LOW

Instrument ID: HP5895-A

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	LAB SAMPLE ID.	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED
01	#5461 1:25	PBS7121SS8 1:2	>AI104	9/25/89
02	HE#5461MS	PBS7121SS8MS	>AI105	9/25/89
03	HE#5461MSD	PBS7121SS8MSD	>AI106	9/25/89
04	#5462 1:62	PBS7121SS9 1:6	>AI107	9/25/89
05	#5459 1:10	PBS7121SS6 1:1	>AI109	9/25/89
06	#5460 1:10	PBS7121SS7 1:1	>AI110	9/25/89
07	#5467 1:5	PBS7131SS5 1:5	>AI111	9/25/89
08	#5471 1:5	PBS1411SS4 1:5	>AI112	9/25/89
09	#5472 1:10	PBS1411SS5 1:1	>AI113	9/25/89
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COMMENTS: _____

FORM IV VOA 1/87 Rev.

4A
VOLATILE METHOD BLANK SUMMARY

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Lab File ID: >AI116 Lab Sample ID: 0926VABLK

Date Analyzed: 9/26/89 Time Analyzed: 12:32

Matrix: SOIL Level: LOW

Instrument ID: HP5895-A

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	LAB SAMPLE ID.	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED
01	#5462	PBS7121SS9	>AI117	9/25/89
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COMMENTS: _____.
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FORM IV VOA 1/87 Rev.

4A
VOLATILE METHOD BLANK SUMMARY

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Lab File ID: >CI091 Lab Sample ID: 0922VBLKC

Date Analyzed: 9/22/89 Time Analyzed: 11:16

Matrix: SOIL Level: LOW

Instrument ID: HP5970-C

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	LAB SAMPLE ID.	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED
01	HE#5454	PBS7121SS1	>CI092	9/22/89
02	HE#5444MS	PBS1411SS7MS	>CI093	9/22/89
03	HE#5444MSD	PBS1411SS7MSD	>CI094	9/22/89
04	HE#5455	PBS7121SS2	>CI095	9/22/89
05	HE#5456	PBS7121SS3	>CI096	9/22/89
06	HE#5457	PBS7121SS4	>CI097	9/22/89
07	HE#5458	PBS7121SS5	>CI098	9/22/89
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COMMENTS: _____

FORM IV VOA 1/87 Rev.

4A

VOLATILE METHOD BLANK SUMMARY

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: ESI SAS No: N.A. SDG No: N.A.

Lab File ID: >AI054 Lab Sample ID: 0921VABLK

Date Analyzed: 9/21/89 Time Analyzed: 10:14

Matrix: SOIL Level: LOW

Instrument ID: HP5895-A

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	LAB SAMPLE ID.	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED
01	#5473	TRIP BLANK	>AI055	9/21/89
02	HE#5445	PBS1411SS8	>AI056	9/21/89
03	#5340MS	PSS002MS	>CI061	9/14/89
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COMMENTS: _____

FORM IV VOA 1/87 Rev.

5A

VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: Hittman Ebasco Contract: | the contra

Lab Code: HITMAN Case No: | the Ca SAS No: N.A. SDG No: N.A.

Lab File ID: >CI019 BFB Injection Date: 9/08/89

Instrument ID:. HP5970-C BFB Injection Time: 10:04

Matrix: WATER Level: LOW Column: PACK

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% OF MASS 95	18.2
75	30.0 - 60.0% OF MASS 95	46.4
95	Base peak, 100% relative abundance	100.
96	5.0 - 9.0% of mass 95	7.8
173	Less than 2.0% of mass 174	0.0(0.0)1
174	Greater than 50.0% of mass 95	68.8
175	5.0 - 9.0% of mass 174	4.8(7.0)1
176	Greater than 95.0%, but less than 101.0% of mass 174	67.8(98.6)1
177	5.0 - 9.0% of mass 176	4.5(6.7)2

1-Value is % mass 174 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	LAB SAMPLE ID	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	0908VSTD50	0908VSTD50	>CI020	9/08/89	10:53
02	0908VSTD100	0908VSTD100	>CI021	9/08/89	14:10
03	0908VSTD150	0908VSTD150	>CI022	9/08/89	14:59
04	0908VSTD200	0908VSTD200	>CI023	9/08/89	15:48
05	0908VSTD20	0908VSTD20	>CI024	9/08/89	16:38
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VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: Hittman Ebasco Contract: ESI 2001

Lab Code: HITMAN Case No: BRCS SAS No: N.A. SDG No: N.A.

Lab File ID: >AI035 BFB Injection Date: 9/14/89

Instrument ID: HP5895-A BFB Injection Time: 10:00

Matrix: SOIL Level: LOW Column: WIDE BO

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% OF MASS 95	16.6
75	30.0 - 60.0% OF MASS 95	39.4
95	Base peak, 100% relative abundance	100.
96	5.0 - 9.0% of mass 95	7.4
173	Less than 2.0% of mass 174	1.1(1.4)1
174	Greater than 50.0% of mass 95	82.0
175	5.0 - 9.0% of mass 174	6.2(7.5)1
176	Greater than 95.0%, but less than 101.0% of mass 174	80.0(97.6)1
177	5.0 - 9.0% of mass 176	5.3(6.6)2

1-Value is % mass 174 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	LAB SAMPLE ID	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	0914VAS010	0914VAS010	>AI040	9/14/89	15:52
02	0914VAS020	0914VAS020	>AI041	9/14/89	16:29
03	0914VAS050	0914VAS050	>AI042	9/14/89	17:07
04	0914VAS075	0914VAS075	>AI043	9/14/89	17:44
05	0914VAS100	0914VAS100	>AI044	9/14/89	18:22
06	0914VAS150	0914VAS150	>AI045	9/14/89	18:59
07	0914VAS200	0914VAS200	>AI046	9/14/89	19:37
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5A

VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Lab File ID: >CI078 BFB Injection Date: 9/20/89

Instrument ID: HP5970-C BFB Injection Time: 9:54

Matrix: N.A. Level: LOW Column: PACK

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% OF MASS 95	20.4
75	30.0 - 60.0% OF MASS 95	46.1
95	Base peak, 100% relative abundance	100.
96	5.0 - 9.0% of mass 95	7.8
173	Less than 2.0% of mass 174	0.0(0.0)1
174	Greater than 50.0% of mass 95	60.6
175	5.0 - 9.0% of mass 174	4.5(7.3)1
176	Greater than 95.0%, but less than 101.0% of mass 174	58.8(96.9)1
177	5.0 - 9.0% of mass 176	4.1(6.9)2

1-Value is % mass 174 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	LAB SAMPLE ID	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	0920VSTD50	0920VSTD50	>CI080	9/20/89	11:50
02	0920VBLKC	0920VBLKC	>CI081	9/20/89	13:57
03	HE#5443	PBS1411SS6	>CI082	9/20/89	15:04
04	HE#5444	PBS1411SS7	>CI083	9/20/89	17:00
05	HE#5446	PBS1411SS9	>CI085	9/20/89	20:53
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VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: ESI SAS No: N.A. SDG No: N.A.

Lab File ID: >AI052 BFB Injection Date: 9/21/89

Instrument ID: HP5895-A BFB Injection Time: 8:19

Matrix: SOIL Level: LOW Column: WB

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% OF MASS 95	19.4
75	30.0 - 60.0% OF MASS 95	40.5
95	Base peak, 100% relative abundance	100.
96	5.0 - 9.0% of mass 95	7.3
173	Less than 2.0% of mass 174	0.0(0.0)1
174	Greater than 50.0% of mass 95	58.1
175	5.0 - 9.0% of mass 174	4.2(7.2)1
176	Greater than 95.0%, but less than 101.0% of mass 174	57.4(98.6)1
177	5.0 - 9.0% of mass 176	3.3(5.8)2

1-Value is % mass 174 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	LAB SAMPLE ID	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	0921VAS050	0921VAS050	>AI053	9/21/89	9:10
02	0921VABLK	0921VABLK	>AI054	9/21/89	10:14
03	#5473	TRIP BLANK	>AI055	9/21/89	11:17
04	HE#5445	PBS1411SS8	>AI056	9/21/89	12:06
05	#5445-2g	PBS1411SS8-2g	>AI061	9/21/89	17:19
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VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Lab File ID: >CI088 BFB Injection Date: 9/22/89

Instrument ID: HP5970-C BFB Injection Time: 8:18

Matrix: N.A. Level: LOW Column: PACK

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% OF MASS 95	18.6
75	30.0 - 60.0% OF MASS 95	44.9
95	Base peak, 100% relative abundance	100.
96	5.0 - 9.0% of mass 95	8.6
173	Less than 2.0% of mass 174	0.0(0.0)1
174	Greater than 50.0% of mass 95	63.6
175	5.0 - 9.0% of mass 174	4.9(7.7)1
176	Greater than 95.0%, but less than 101.0% of mass 174	63.9(100.4)1
177	5.0 - 9.0% of mass 176	4.1(6.3)2

1-Value is % mass 174 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	LAB SAMPLE ID	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	0922VSTD50	0922VSTD50	>CI090	9/22/89	10:09
02	0922VBLKC	0922VBLKC	>CI091	9/22/89	11:16
03	HE#5454	PBS7121SS1	>CI092	9/22/89	12:20
04	HE#5444MS	PBS1411SS7MS	>CI093	9/22/89	14:11
05	HE#5444MSD	PBS1411SS7MSD	>CI094	9/22/89	15:18
06	HE#5455	PBS7121SS2	>CI095	9/22/89	16:24
07	HE#5456	PBS7121SS3	>CI096	9/22/89	17:14
08	HE#5457	PBS7121SS4	>CI097	9/22/89	18:03
09	HE#5458	PBS7121SS5	>CI098	9/22/89	18:53
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VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Lab File ID: >AI062 BFB Injection Date: 9/22/89

Instrument ID: HP5995-A BFB Injection Time: 14:26

Matrix: SOIL Level: LOW Column: WB

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% OF MASS 95	22.0
75	30.0 - 60.0% OF MASS 95	41.7
95	Base peak, 100% relative abundance	100.
96	5.0 - 9.0% of mass 95	6.3
173	Less than 2.0% of mass 174	0.0(0.0)1
174	Greater than 50.0% of mass 95	67.4
175	5.0 - 9.0% of mass 174	4.7(6.9)1
176	Greater than 95.0%, but less than 101.0% of mass 174	65.4(97.1)1
177	5.0 - 9.0% of mass 176	3.9(5.9)2

1-Value is % mass 174 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	LAB SAMPLE ID	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	0922VASTS0	0922VASTS0	>AI063	9/22/89	14:56
02	0922VABLK	0922VABLK	>AI064	9/22/89	16:09
03	HE#5463	PBS7131SS1	>AI065	9/22/89	16:57
04	HE#5464	PBS7131SS2	>AI066	9/22/89	17:40
05	HE#5465	PBS7131SS3	>AI067	9/22/89	18:22
06	HE#5466	PBS7131SS4	>AI068	9/22/89	19:05
07	HE#5467	PBS7131SS5	>AI069	9/22/89	19:47
08	HE#5468	PBS1411SS1	>AI070	9/22/89	20:30
09	HE#5469	PBS1411SS2	>AI071	9/22/89	21:12
10	HE#5470	PBS1411SS3	>AI072	9/22/89	21:55
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VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Lab File ID: >CI099 BFB Injection Date: 9/23/89

Instrument ID: HP5970-C BFB Injection Time: 11:01

Matrix: N.A. Level: LOW Column: PACK

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% OF MASS 95	19.2
75	30.0 - 60.0% OF MASS 95	43.3
95	Base peak, 100% relative abundance	100.
96	5.0 - 9.0% of mass 95	5.1
173	Less than 2.0% of mass 174	0.0(0.0)1
174	Greater than 50.0% of mass 95	75.8
175	5.0 - 9.0% of mass 174	5.8(7.6)1
176	Greater than 95.0%, but less than 101.0% of mass 174	73.2(96.6)1
177	5.0 - 9.0% of mass 176	4.3(5.8)2

1-Value is % mass 174 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	LAB SAMPLE ID	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	0923VSTD50	0923VSTD50	>CI100	9/23/89	11:54
02	0923VBLKC	0923VBLKC	>CI101	9/23/89	13:06
03	0923VBLKC	0923VBLKC	>CI101	9/23/89	13:06
04	#5456 1:5	PBS7121SS3 1:5	>CI103	9/23/89	15:32
05	#5457 1:5	PBS7121SS4 1:5	>CI104	9/23/89	16:21
06	#5458 1:5	PBS7121SS5 1:5	>CI105	9/23/89	17:11
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VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Lab File ID: >AI073 BFB Injection Date: 9/23/89

Instrument ID: HP5895-A BFB Injection Time: 10:59

Matrix: SOIL Level: LOW Column: W8

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% OF MASS 95	16.4
75	30.0 - 60.0% OF MASS 95	37.7
95	Base peak, 100% relative abundance	100.
96	5.0 - 9.0% of mass 95	6.7
173	Less than 2.0% of mass 174	0.0(0.0)1
174	Greater than 50.0% of mass 95	74.6
175	5.0 - 9.0% of mass 174	5.4(7.2)1
176	Greater than 95.0%, but less than 101.0% of mass 174	72.2(96.7)1
177	5.0 - 9.0% of mass 176	4.2(5.8)2

1-Value is % mass 174 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	LAB SAMPLE ID	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	0923VAST50	0923VAST50	>AI074	9/23/89	11:59
02	0923VABLK	0923VABLK	>AI075	9/23/89	13:12
03	HE#5467	PBS7131SS5	>AI076	9/23/89	14:45
04	HE#5459	PBS7121SS6	>AI077	9/23/89	15:28
05	HE#5460	PBS7121SS7	>AI078	9/23/89	16:10
06	HE#5461	PBS7121SS8	>AI079	9/23/89	16:53
07	HE#5462	PBS7121SS9	>AI080	9/23/89	17:35
08	0920VBLKC	0920VBLKC	>CI081	9/23/89	18:18
09	HE#5443	PBS1411SS6	>CI082	9/23/89	19:00
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VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Lab File ID: >AI090 BFB Injection Date: 9/24/89

Instrument ID: HP5895-A BFB Injection Time: 20:34

Matrix: SOIL Level: LOW Column: WB

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% OF MASS 95	17.0
75	30.0 - 60.0% OF MASS 95	39.1
95	Base peak, 100% relative abundance	100.
96	5.0 - 9.0% of mass 95	6.4
173	Less than 2.0% of mass 174	0.0(0.0)1
174	Greater than 50.0% of mass 95	73.4
175	5.0 - 9.0% of mass 174	5.2(7.1)1
176	Greater than 95.0%, but less than 101.0% of mass 174	71.9(97.9)1
177	5.0 - 9.0% of mass 176	4.2(5.8)2

1-Value is % mass 174 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	LAB SAMPLE ID	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	0924VAST50	0924VAST50	>AI091	9/24/89	21:19
02	0924VABLK	0924VABLK	>AI092	9/24/89	22:47
03	#5463 1:5	PBS7131SS1 1:5	>AI093	9/25/89	0:32
04	#5464 1:5	PBS7131SS2 1:5	>AI094	9/25/89	1:14
05	#5465 1:5	PBS7131SS3 1:5	>AI095	9/25/89	1:57
06	#5466 1:5	PBS7131SS4 1:5	>AI096	9/25/89	2:39
07	#5468 1:5	PBS1411SS1 1:5	>AI097	9/25/89	3:22
08	#5469 1:5	PBS1411SS2 1:5	>AI098	9/25/89	4:04
09	#5470 1:5	PBS1411SS3 1:5	>AI099	9/25/89	4:47
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VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Lab File ID: >CI106 BFB Injection Date: 9/25/89

Instrument ID: HP5970-C BFB Injection Time: 9:14

Matrix: N.A. Level: LOW Column: PACK

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% OF MASS 95	18.2
75	30.0 - 60.0% OF MASS 95	43.2
95	Base peak, 100% relative abundance	100.
96	5.0 - 9.0% of mass 95	6.1
173	Less than 2.0% of mass 174	0.0(0.0)1
174	Greater than 50.0% of mass 95	67.7
175	5.0 - 9.0% of mass 174	5.0(7.3)1
176	Greater than 95.0%, but less than 101.0% of mass 174	67.4(99.5)1
177	5.0 - 9.0% of mass 176	4.9(7.3)2

1-Value is % mass 174 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	LAB SAMPLE ID	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	0925VSTD50	0925VSTD50	>CI108	9/25/89	11:29
02	0925VBLKC	0925VBLKC	>CI109	9/25/89	12:45
03	#5458 1:5	PBS7121SS5 1:5	>CI110	9/25/89	14:25
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VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Lab File ID: >AI100 BFB Injection Date: 9/25/89

Instrument ID: HP5895-A BFB Injection Time: 11:05

Matrix: SOIL Level: LOW Column: WB

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% OF MASS 95	17.7
75	30.0 - 60.0% OF MASS 95	42.6
95	Base peak, 100% relative abundance	100.
96	5.0 - 9.0% of mass 95	6.1
173	Less than 2.0% of mass 174	.8(1.0)1
174	Greater than 50.0% of mass 95	82.9
175	5.0 - 9.0% of mass 174	6.0(7.2)1
176	Greater than 95.0%, but less than 101.0% of mass 174	79.2(95.6)1
177	5.0 - 9.0% of mass 176	4.8(6.0)2

1-Value is % mass 174 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	LAB SAMPLE ID	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	0925VAST50	0925VAST50	>AI102	9/25/89	12:51
02	0925VABLK	0925VABLK	>AI103	9/25/89	15:08
03	#5461 1:25	PBS7121SS8 1:25	>AI104	9/25/89	16:34
04	HE#5461MS	PBS7121SS8MS	>AI105	9/25/89	17:16
05	HE#5461MSD	PBS7121SS8MSD	>AI106	9/25/89	17:59
06	#5462 1:62	PBS7121SS9 1:62	>AI107	9/25/89	18:42
07	#5459 1:10	PBS7121SS6 1:10	>AI109	9/25/89	19:24
08	#5460 1:10	PBS7121SS7 1:10	>AI110	9/25/89	20:07
09	#5467 1:5	PBS7131SS5 1:5	>AI111	9/25/89	20:49
10	#5471 1:5	PBS1411SS4 1:5	>AI112	9/25/89	21:32
11	#5472 1:10	PBS1411SS5 1:10	>AI113	9/25/89	22:14
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VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: Hittman Ebasco Contract: ESI 7019

Lab Code: HITMAN Case No: NASA SAS No: N.A. SDG No: N.A.

Lab File ID: >AI114 BFB Injection Date: 9/26/89

Instrument ID: HP5895-A BFB Injection Time: 9:28

Matrix: SOIL Level: MED Column: WB

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% OF MASS 95	18.9
75	30.0 - 60.0% OF MASS 95	38.6
95	Base peak, 100% relative abundance	100.
96	5.0 - 9.0% of mass 95	8.6
173	Less than 2.0% of mass 174	0.0(0.0)1
174	Greater than 50.0% of mass 95	56.3
175	5.0 - 9.0% of mass 174	4.3(7.6)1
176	Greater than 95.0%, but less than 101.0% of mass 174	55.0(97.7)1
177	5.0 - 9.0% of mass 176	3.8(6.9)2

1-Value is % mass 174 2-Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	LAB SAMPLE ID	EPA SAMPLE NO.	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	0926VAST50	0926VAST50	>AI115	9/26/89	11:14
02	0926VABLK	0926VABLK	>AI116	9/26/89	12:32
03	#5462	PBS7121SS9	>AI117	9/26/89	15:00
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EBASCO ENVIRONMENTAL
A Division of EBASCO SERVICES INCORPORATED

EBASCO

5000 Bradenton Avenue, Suite 200, Dublin, OH 43017, (614) 761-2004, Fax (614) 761-2116

January 31, 1991

Mr. Ronald Zurawski, P.E.
Project Manager
NASA Lewis Research Center
Mail Stop 501-8, Building 501
21000 Brookpark Road
Cleveland, Ohio 44135

SUBJECT: Transmittal of Copies of the Final Report on the Site Assessment Performed for Former Underground Storage Tank Numbers 7132-1, 7132-2 and 7132-3 at the Plum Brook Station

Dear Ron:

Attached are six copies of the Final Report on the site assessment performed for the three former underground storage tanks at the Garage and Maintenance Area at the Plum Brook Station that you requested in our recent telephone conversation.

As always, give me a call if you have any questions about this report or if I can be of any further assistance.

Sincerely,

Ron Marnicio

Ronald J. Marnicio, Ph.D., P.E.
Principal Engineer, Columbus Operations

RJM:ls

Attachments