0714
Site: West Lake LDF
ID #: MAD079900932
Break: 11.6 001
Other: Shrine of St. Jude 7-31-91

RECEIVED
AUG 01 1991
SAFE SECTION

# RESPONSE OF THE SHRINE OF ST. JUDE

# TO

# CERCLA 104(e) REQUEST FOR INFORMATION

## VOLUME II OF III

JULY 31, 1991

40054962
SUPERFUND RECORDS

JUD0004

# HYDROGEOLOGIC INVESTIGATION
# WESTLAKE LANDFILL
# PRIMARY PHASE REPORT

October, 1986
Project No. 84-075-4-004

Burns & McDonnell
Engineers-Architects-Consultants
Kansas City, Missouri

EXHIBIT 13-B

TABLE OF CONTENTS


| | Page No. |
|---|---|
| INTRODUCTION | |
| PART I - GEOLOGICAL SETTING | I-1 |
| PART II - SUBSURFACE INVESTIGATION | II-1 |
| A. Preliminary and Primary Investigations and Previous Studies | II-1 |
| B. Monitoring Well Program | |
| C. Drilling and Soil Testing | |
| D. Groundwater Sampling and Chemical Analysis | |
| E. Data Interpretation | |
| PART III - SUBSURFACE CONDITIONS | III-1 |
| A. Unconsolidated Overburden | III-1 |
| B. Bedrock | |
| C. Groundwater Occurrence | |
| PART IV - IMPACT OF LANDFILL ON GROUNDWATER QUALITY | IV-1 |
| A. Downgradient Water Use | IV-1 |
| B. Downgradient Water Quality | |
| C. Risk Assessment | |
| PART V - CONCLUSIONS | V-1 |
| A. Summary of Hydrogeological Conditions | V-1 |
| B. Groundwater Chemical Quality | |
| C. Recommendations | |
| REFERENCES | |
| FIGURES | |
| APPENDIX A - Criteria for Logging of Soil and Rock - Boring Logs | |
| APPENDIX B - Piezometer Construction | |
| APPENDIX C - Observed Water Level Readings | |
| APPENDIX D - Laboratory Test Data on Soil Engineering Properties | |
| APPENDIX E - Groundwater Chemical Analyses | |

## LIST OF FIGURES


| Figure No. | Title | Page No. |
|---|---|---|
| IN-1 | Site Location and Regional Groundwater Map..... | |
| I-1 | Regional Groundwater Profile..... | |
| I-2 | Site Map..... | |
| I-3 | Geologic Profile, All Wells, 8/29/84 and 8/30/84..... | |
| III-1 | Water Level Contours, All Wells, 8/29/84 and 8/30/84.... | |
| III-2 | Piezometer and River, Hydrographs, November, 1983 - December 1984..... | |
| III-3 | Piezometer and River Hydrographs, January, 1985 - June, 1986..... | |
| III-4 | Water Level Contours, Shallow and Intermediate Wells, 8/8/85..... | |
| III-5 | Water Level Contours, Deep Wells, 8/8/85..... | |
| III-6 | Water Level Contours, Deep Wells, 12/11/85..... | |
| III-7 | Water Level Contours, Deep Wells, 5/20/85..... | |
| III-8 | Distribution of Methylene Chloride, Round 1..... | |
| III-9 | Distribution of Methylene Chloride, Round 2..... | |
| III-10 | Distribution of BIS (2 Ethyl Hexyl) Phthalate, Round 1..... | |
| III-11 | Distribution of Phenol, Round 1..... | |
| III-12 | Distribution of Chlordane, Round 1..... | |
| III-13 | Distribution of 4, 4'DDE, Round 1..... | |
| III-14 | Distribution of Sodium, Round 1..... | |
| III-15 | Distribution of Iron, Round 1..... | |
| III-16 | Distribution of Zinc, Round 1..... | |
| III-17 | Distribution of Zinc, Round 2..... | |
| III-18 | Distribution of Arsenic, Round 2..... | |

## LIST OF TABLES


| Table No. | Title | Page No. |
|---|---|---|
| III-1 | Summary of Boring Depths..... | III-2 |
| III-2 | Summary of Depths to Bedrock..... | |
| IV-1 | Water Quality Criteria..... | |


* * * * *

# INTRODUCTION

## SITE LOCATION

The site of the West Lake Landfill is located at 13500 St. Charles Rock Road in Bridgeton, Missouri (see Figure IN-1). The site of the old landfill, approximately _____ acres, was placed on the alluvium of the Missouri River, and part was placed in previously existing rock quarry pits at the edge of the Missouri River Valley. Current landfilling is being carried out in a deep quarry placed in bedrock formations which are hydrologically isolated from the old landfill, and is therefore not part of this study.

## PURPOSE

The hydrogeologic investigation was intended to obtain the data necessary to define the groundwater flow patterns and flow rates in the vicinity of the site, and determine the nature and distribution of any contaminants which may occur in the groundwater. It was also intended to provide a basis for planning a program of long-term groundwater quality monitoring at the site and background data for development of a remedial action program if conditions warrant.

Because the geologic setting and stratification of the subsurface materials beneath the site influence the groundwater occurrence and flow pattern, a major part of the investigation was directed towards defining the site geology and engineering properties of the subsurface materials. In addition, a certain amount of data was available from previous investigations, and an analysis was made of the usefulness of that information.

## SCOPE

To analyze the hydrogeologic conditions at the site, field work was performed in two phases, after evaluating existing subsurface information, as well as available geological publications. Soil samples were obtained from 15 borings drilled for this investigation. Selected samples were tested for soil engineering properties, including moisture content, density, grain size, and for fine grained soils, Atterberg limits. Piezometer standpipes were installed in the borings, both to future water level measurements and in some cases to obtain groundwater samples for chemical analysis. Twenty of the previously existing piezometers on the site were found to be usable for water level determinations. Therefore, water levels were measured periodically in a total of 35 piezometers. The piezometer tubes are screened at various depths in the alluvial aquifer, to determine the hydraulic head and groundwater flow direction at different levels in different and areas of the site.

Groundwater samples were collected from 18 selected monitoring wells. The wells were selected to provide data at widespread locations on the site and at different depths within the alluvium. Two rounds of sampling were performed, one in winter and one in summer. The water samples were chemically analyzed in the laboratory for full priority pollutants.

To assist in interpretation of the data from this investigation, maps and subsurface profiles have been prepared showing the hydraulic head in the aquifer, and the distribution of chemical constituents in the groundwater. The maps and profiles are included in this report.

The analysis of the data includes an assessment of the impacts of the landfill on the groundwater of the area. The analysis was applied towards recommending a plan for future, long-term groundwater monitoring.

* * * * *

# PART I

## GEOLOGICAL SETTING

In the St. Louis vicinity, the bedrock stratigraphic sequence consists primarily of limestone and dolomite which were deposited, for the most part, in shallow epicontinental seas. Geologic deposits range in age from Precambrian to Holocene. The Precambrian rocks are the only units that do not crop out in the St. Louis area; they are, however, present in the subsurface. Many periods of emergence, nondeposition or erosion are implied by the disconformities and local unconformities observed in surface exposures and well data.

Bedrock in the West Lake area consists of limestones of the Pennsylvanian and Mississippian systems (Ref. 1). A thin deposit of the Cherokee Group (Pennsylvanian) occurs nearest the surface at the site. The Cherokee consists primarily of limestone in this area, but may also contain interbeds of other clastic sedimentary rocks, primarily shales (Ref. 2). Below the Cherokee are Mississippian limestones of the Meramecian series. The Ste. Genevieve limestone (approximately 30 feet thick), if present here, is apparently quite thin. Occurring stratigraphically below the Ste. Genevieve is the St. Louis Formation (approximately 100 feet thick). The Saint Louis is the primary limestone which is presently mined at the West Lake Quarry. Below the St. Louis Formation is the Salem Formation (approximately 100 to 160 feet thick), a limestone which is also being quarried at West Lake. The Warsaw Formation occurs below the Salem. The Warsaw is a shaley limestone with some shale interbeds (approximately 80 feet thick) and quarrying probably terminates near the top of this stratum.

The present structural attitude of the rock units is the result of compressional, tensional and uplifting forces which moved and altered the units from their original depositional positions. These forces have folded, fractured, faulted and tilted the rocks in the St. Louis area to a moderate degree, and the resulting structures are superimposed on a regional dip or large-scale tilting of the rock units of from 60 to 80 feet per mile to the northeast. Locally, in the West Lake area, the bedrock strata are nearly horizontal with minimal fractures.

Alluvium, including thick deposits of glacial outwash and some river terrace deposits fills the deeply eroded bedrock channel formed by the Missouri River during the Pleistocene Epoch. The thickness of the alluvium is variable because of irregularities in the bedrock surface upon which it was deposited, but the maximum known thickness is approximately 150 feet. The alluvium is composed of clay, silt, sand and gravel. In general, the alluvium becomes coarser-grained with depth. Occuring on the Missouri River valley bluffs above the river valley are thick loess deposits. These loess deposits directly overlie the bedrock of the uplands.

The West Lake Landfill site is located on the Missouri River valley's east wall (Figure I-1). Bedrock in the landfill vicinity occurs near the surface at the point of transition between the loessial bluffs to the east and the alluvial valley to the west. The generalized line of transition is shown on Figure I-2. The bedrock surface drops off sharply below the valley to the west and the loess bluffs rise abruptly above the bedrock to the east. The quarry operations occur generally where the bedrock is nearest the surface at the edge of the valley

wall, and past landfill operations have generally extended from the quarry area westward on the alluvium. The surface of the alluvial deposits is quite level, although small drainageways and channels create slight depressions and terraces.

Figure I-1 is a generalized, vertically exaggerated geologic profile across the Missouri River valley in the vicinity of the site. This profile illustrates the relationships between the impervious bedrock, the alluvial aquifer, and the general range of water table elevations in the aquifer.

Figure I-2 is a site plan showing the topography of the site and the locations of the borings drilled and/or used in this investigation. Also shown on Figure I-2 are the approximate boundaries of the landfilled area.

Figure I-3 is a detailed geologic profile along the southwest perimeter of the existing landfill. The location of the line of the detailed geologic profile is shown on Figure I-2. Figure I-3 shows the relationships between the bedrock and the overlying alluvium, comprised of the coarse-grained aquifer and the uppermost, generally fine-grained aquitard. Also shown are water levels in piezometers at times of relatively high river stage (and consequent high water table in May 1984) and relatively low river stage (and consequent low water table in February 1984). Also, note that the water table intersects the ground surface in the drainage ditch adjacent to the road at the northern end of the profile line.

* * * * *

PART II

SUBSURFACE INVESTIGATION

## A. PRELIMINARY AND PRIMARY INVESTIGATIONS AND PREVIOUS STUDIES

A preliminary subsurface field investigation of the site was conducted in August, 1984. The field and laboratory work performed for this investigation were intended to supplement information from previous investigations of this site, and to obtain additional information on groundwater conditions. The preliminary investigation included drilling and sampling nine borings, four of which extended to bedrock. The locations of the borings (which are numbered in the 80's) are shown on Figure I-2. The information was presented in the report entitled "Hydrogeologic Investigation - West Lake Landfill - Preliminary Phase Report", January, 1985 by Burns & McDonnell. After the preliminary phase of the project was completed and the data evaluated the primary phase was begun. Six test borings were drilled and piezometers installed in April and August, 1985. All six test borings were drilled to bedrock. The locations of these borings (numbered in the 90's) are shown on Figure I-2.

Existing piezometeres (numbered in the 50's, 60's, and 70's) were evaluated for soundness of construction by field inspection and response to water level changes and found to be acceptable for indication of water levels (hydraulic head). Therefore, data collected from these piezometers was utilized to evaluate groundwater gradients and flow directions.

Piezometers were installed in all borings for both phases for purposes of water level determination were used for obtaining water samples for chemical analysis. Some of the piezometers were clustered with existing monitoring wells or with each other resulting in eight clusters of water level monitoring points that can be used to detect possible differences in water pressure (hydraulic head) with depth. Boring depths ranged from 22.0 feet to 143.3 feet. Soil samples were obtained on 5- or 10-foot centers in all borings according to ASTM standards. Using thin-walled Shelby tubes, 12 undisturbed soil samples were obtained at various depths in the borings. Using standard penetration test procedure, 156 split-spoon samples were also obtained.

The geologic logs of all of the borings drilled for this investigation are included in Appendix A.

## B. MONITORING WELL PROGRAM

Piezometers were installed in each boring according to the typical construction diagram in Appendix B. Specific construction details for piezometers are noted on the respective boring logs. When piezometers were not responding to changing water levels in the aquifer they were developed by evacuating with compressed air until clear water flowed freely into the piezometer. Piezometer D-87 did not respond even after evacuation by compressed air, so it was bailed and surged to ensure that it was functioning properly. Piezometers were installed at shallow depths (designated "S" and screened near the water table elevation), deep depths (designated "D" and screened near the bedrock surface), or intermediate

depths (designated "I"). Depths were determined considering depths of nearby existing piezometers so that the entire saturated thickness of the aquifer could be monitored. Because the depths of many of the shallow and intermediate piezometers were close to each other, data from the shallow and intermediate piezometers were all used together for contouring the water table.

Presence and depth of free water was noted on boring logs during drilling, when possible, and water levels in borings and piezometers were noted immediately after installation and at various times thereafter. These water levels, along with water levels from existing monitoring wells, are tabulated in Appendix C of this report. A surface water monitoring point (SMP-4) was placed in the drainage ditch along St. Charles Rock Road at the northern tip of the site. Throughout most of the year, the water table in the aquifer is above the bottom of the ditch, so monitoring surface water elevations there provides data on hydraulic head in the aquifer. SMP-4 was destroyed before its location and elevation were surveyed but changes in water levels were recorded for three months.

During the preliminary phase, in-situ hydraulic conductivity was determined in four piezometers using a single-pulse bailer test, performed according to methods described by Hvorslev (1951). An air compressor was used to evacuate the piezometers, and water levels were measured as the well recovered. Data from these tests along with calculations of permeability using Hazen's formula are presented in Table D-1 in Appendix D of this report.

## C. DRILLING AND SOIL TESTING

The soil borings were drilled using a truck-mounted Acker MP-5 drill rig. Generally, 4-inch-diameter continuous-flight augers were used to drill above the water table and 4-1/2-inch-diameter Tri-cone rotary wash methods were used below the water table. The drilling was performed by Wabash Drilling Company (Subsurface Construction Company), St. Louis, Missouri, under the continuous observation of a Burns & McDonnell geologist who logged the encountered soil and rock materials. Surveying to determine boring elevations was done by Bollinger Surveying Company.

Laboratory testing of the soils material was performed by Kansas City Testing Laboratory, Shawnee Mission, Kansas. Tests included (three) moisture contents, (three) dry unit weights, (two) Atterberg limits, (eight) sieve analyses, and (two) hydrometer analyses. All tests were performed in accordance with ASTM standards.

The results of all soils laboratory tests for engineering properties are included in Appendix D.

## D. GROUNDWATER SAMPLING AND CHEMICAL ANALYSIS

### 1. SAMPLE LOCATIONS

For the evaluation of groundwater chemical quality, 18 existing monitoring wells were selected for sampling. The wells were located in various locations around the site of the previously landfilled areas and

screened in the shallow, intermediate and deep parts of the alluvium. There were two sampling rounds, from December 11 to December 15, 1985, and from May 19 to May 21, 1986. The purpose was to evaluate the difference in groundwater quality in relation to seasonal variation. The sampled monitoring wells were as follows:

| | |
|---|---|
| S-51 | D-87 |
| I-59 | D-88 |
| I-66 | D-89 |
| S-80 | D-90 |
| D-81 | D-91 |
| D-82 | D-92 |
| D-83 | D-93 |
| S-84 | D-94 |
| D-85 | D-95 |

It should be noted that Piezometer I-66 was not sampled during the first sampling round because it was inundated by surface water in the road-side ditch.

## 2. FIELD METHODS

All samples were collected by a Burns & McDonnell Environmental Engineer with assistance from West Lake employees.

Before sample collection, the water level was measured to determine the amount of water in the piezometer casing. Approximately three casing volumes were then removed from each piezometer with a bailer and the piezometer was allowed to recharge before sampling. A Teflon bailer with polypropylene rope was used to flush and sample.

Before moving to the next well, the bailer was thoroughly cleaned with distilled water and the polypropylene rope was replaced.

The samples were collected in bottles prepared and supplied by the laboratory. The volatile samples were collected first, leaving no air space in the sample vials. All preservatives were added to the samples in the field except for the metals samples. Preservative was added to the metals samples after they were filtered through a 45-micron Geotech backflush filter. This took place at the end of each sampling day.

All samples were kept cool until delivery to the laboratory. All sample bottles were accompanied by Chain-of-Custody forms listing information such as the sample number name of sampler, date, bottles, and type of analysis.

3. CHEMICAL ANALYSIS

All samples were analyzed for priority pollutants listed under 40 CFR, Part 122. The priority pollutants consist of the following:

Volatile Organics
Acid/Base Neutral Extractables
Pesticides/PCB's
Total Phenols
Total Cyanide
Metals

In addition, during Round 1, samples for Monitoring Wells D-83, S-84, D-85 and D-92 were analyzed for gross alpha and beta radiation. On May 7 and 8, 1986, water samples were collected from 32 wells by Department of Energy personnel and analyzed for gross alpha and beta radiation.

4. LABORATORIES

The priority pollutant samples collected during Round 1 were analyzed by Environmental Trace Substances Research Center, located in Columbia, Missouri. The samples analyzed for gross alpha and beta were sent to Controls for Environmental Pollution, Inc., in Santa Fe, New Mexico. Volatile organics were analyzed according to EPA Method 624. Base-Neutral Extractables were analyzed according to EPA Method 625. Acid extractables were analyzed according to EPA Method 604. Pesticides and PCB's were analyzed according to ERA Method 608. Metals were analyzed by inductively coupled plasma, and cold vapor atomic absorption was used to detect mercury.

The second round of priority pollutant samples was analyzed by Envirodyne Engineers of St. Louis, Missouri. The Department of Energy gross alpha and beta samples were analyzed by Oak Ridge Associated Universities, in Oak Ridge, Tennessee. Volatile organics were analyzed by EPA Method 624. Base-Neutral/Acid Extractables, and Pesticides/PCB's were analyzed by EPA Method 625. Arsenic, selenium, silver, antimony and thallium were analyzed by furnace atomic absorption. Mercury was analyzed by cold vapor atomic absorption. The remainder of the metals were analyzed by inductively copyled plasma.

## E. DATA INTERPRETATION

### 1. GEOLOGICAL INFORMATION

The geological and subsurface information obtained from the test borings on the site is illustrated on several subsurface profiles to facilitate interpretation and understanding of the geology of the site. The profiles have been used to show the lateral changes in subsurface materials, determined from the geologist's logs and soils laboratory data.

### 2. WATER LEVEL DATA

Selected rounds of water level measurements have been contoured in plan view to illustrate the configuration of the water table in different parts of the site at times of different river stage. From the water level contour maps, directions of groundwater flow are indicated. Maps were prepared separately for the deep piezometers so that comparison between groundwater flow in the deep and shallow/intermediate zones in the aquifer could be made. Note that the depths of the bottoms of the piezometers designated shallow and intermediate are vary nearly the same, so for purposes of this report, they are contoured together. Selected water levels are also shown on geologic profiles (Figures I-1 and I-3) to illustrate the relationship between deep and shallow water levels. In addition, two graphs are provided showing change in Missouri River stage relative to changes in water levels in selected piezometer.

* * * * * *

## PART III

## SUBSURFACE CONDITIONS

### A. UNCONSOLIDATED OVERBURDEN

There are basically two types of unconsolidated overburden in the West Lake vicinity; windblown silt (loess) and Missouri River alluvium. The loess overlies bedrock on the bluffs bordering the Missouri River Valley. The old landfill operations on the West Lake property are generally to the west of the loess bluffs. No loess was encountered in test holes drilled for this investigation. Due to the long-term construction activities at the site, soil and crushed rock fill material occurs to depths of over 30 feet in some places on the site. An example can be seen on the log of Boring D-92, where fill soil and rock occurs to a depth of 31.0 feet.

Within the Missouri River Valley are thick deposits of alluvium. The alluvium consists generally of sand and gravel, with minor seams and lenses of clay and silt. Silt and clay occurs in the alluvium in significant amounts at shallow depths, with the maximum depth of occurrence of approximately 25 feet in some locations, and as little as approximately 5 feet in other areas. The alluvium extends to depths of over 100 feet. The alluvium thins abruptly toward the valley edge as the bedrock rises beneath it to form the valley wall. Permeability of the alluvium ranges from $2.4 \times 10^{-4}$ cm/sec to $2.5 \times 10^{-1}$ cm/sec (see Table D-1 in Appendix D).

Ten borings drilled for this investigation penetrated the full thickness of alluvium. Table III-1 presents a summary of alluvium thicknesses and the

depth to bedrock in each of these borings. All ten of these borings terminated in limestone bedrock.

Table III-1

SUMMARY OF BORING DEPTHS

| Boring No. | Thickness of Alluvium (ft( | Depth to Bedrock (ft) |
|---|---|---|
| D-83 | 115.3 | 115.3 |
| D-85 | 61.5 | 83.5 |
| D-87 | 92.0 | 111.0 |
| D-89 | 33.9 | 47.8 |
| D-90 | 46.0 | 46.0 |
| D-91 | 44.0 | 44.0 |
| D-92 | 112.6 | 143.6 |
| D-93 | 104.0 | 118.0 |
| D-94 | 108.8 | 108.8 |
| D-95 | 92.6 | 100.6 |

Natural deposition in the Missouri River floodplain has occured as the river channel meandered between the valley walls creating point bars and natural levees, filling abandoned channels, and temporarily forming swamps, lakes, and small channel environments. This resulted in the deposition of various materials throughout the floodplain, and, consequently, lithologic units terminate in the subsurface very abruptly both horizontally and vertically. A relatively consistent pattern in the alluvial profile is that coarse sands and gravels tend to occur lower in the profile and silts and clays occur nearer the ground surface. Soils that are predominantly silt and clay tend to occur in the upper 5 to 10 feet of the natural alluvium, but fines occur to depths of approximately 25 feet in places. This is generally above an elevation of 430 feet. A few seams of fine-grained soil occur below the 430-foot elevation as in Boring D-81. South of the site, a substantial

thickness of silty clay was encountered during the investigation. Boring D-91 encountered a deposit of silty clay to a maximum depth of 31.0 feet.

Between elevations of roughly 450 feet and 400 feet, the alluvium is characterized by interbedded seams of sand, silty and clayey sand, and a few silty clay seams. These seams range in thickness from a few inches to over 10 feet. They are quite discontinuous laterally as evidenced by the poor correlation between adjacent borings. This material is generally of a lower permeability than the underlying sands and may be considered an aquitard in the areas where the fines occur. Flow occurs through the soil, but transmission is impeded by the presence of a significant amount of fines. This zone is of a highly variable thickness due to its depositional history (see Figure I-3). In places, the bottom of the old landfill apparently extends below this fine grained stratum into the aquifer sands below.

Below an elevation of roughly 400 feet, thick deposits of sand which are quite uniform in character, are predominant. Several borings encountered gravel seams. For example, Borings D-81, D-92, D-93, and D-95 encountered gravel seams at depths ranging from 47 to 123 feet. While being more uniform in character than the overlying alluvium, these deeper sands exhibit changes in lithology and grain-size characteristics when correlated between borings.

## B. BEDROCK

Bedrock was encountered in Borings D-83, D-85, D-87, D-89, D-90, D-91, D-92, D-93, D-94 and D-95. The rock was penetrated from 0.0-feet to 1.2 feet in these borings. The bedrock is described as a cream to light-brown limestone, medium strong to strong, and correlates with the St. Louis and Salem limestones observed in the West Lake quarry. The bedrock below the alluvium is apparently only slightly weathered as evidenced by the difficulty with which it was penetrated. A few fracture zones are visible in the quarry but the limestone is predominantly unfractured. Very few seeps discharge into the quarry which has been excavated to more than 180 feet below the alluvial water table.

Table III-2, below, lists the borings in which bedrock was encountered and the depths and elevations of the bedrock surface, which was found to be limestone in all cases.

Table III-2

| Boring No. | Depth to Bedrock | Elevation of Bedrock |
|---|---|---|
| D-83 | 115.3 | 329.1 |
| D-85 | 83.5 | 369.4 |
| D-87 | 111.0 | 349.0 |
| D-89 | 47.8 | 406.3 |
| D-90 | 46.0 | 400.0 |
| D-91 | 44.0 | 404.0 |
| D-92 | 143.6 | 331.77 |
| D-93 | 118.0 | 332.70 |
| D-94 | 109.8 | 333.88 |
| D-95 | 100.6 | 352.49 |

The base of the nearby quarry is in shaley limestone, probably of the Warsaw Formation, which is at an elevation of about 240 feet. The St. Louis and

Salem limestones in the quarry area extend from near the ground surface down to the Warsaw Formation.

## C. GROUNDWATER OCCURRENCE

### 1. GENERAL DESCRIPTION

Groundwater in the alluvium generally occurs as a single aquifer under water table conditions. There are a few localized exceptions to this condition which cause minor and usually temporary confining conditions. Another minor exception that has been found is that the water level in piezometer S-80, at the south end of the site represents a perched water table above a localized silt and clay deposit. The water table surface is quite level, not varying more than a foot or two in elevation over most of the site at any given time; thus the gradient is very low.

The water table elevation fluctuates vertically as much as 7 feet, in any particular well, throughout the year in response to variations in precipitation. Precipitation affects the Missouri River stages, infiltration on the site, and some localized recharge due to runoff from the river valley bluffs; all of which have direct affect on the water table elevations.

Generally, the major portion of the aquifer is responding to a gradient induced by the configuration of the Missouri River bedrock channel and also influenced by the Missouri River stage (Ref. 3). but superimposed upon this general gradient are some minor groundwater mounds and

depressions which influence the gradient near the water table surface. These are apparent from groundwater contour maps, several of which were constructed from water level data obtained from this study. The August 29-30, 1984 data are representative of the perennial contour pattern and are shown on Figure III-2. The most prominent of the water table features is the persistent mound occurring in the southern portion of the landfill.

The water table gradient is variable with time in different parts of the aquifer, although these variations are of a relatively minor scale. Since the water table is nearly level, a relatively minor change in the water level in an area can cause a change in flow direction at the water table surface. Because of the many minor effects on the water table over the area, such as local recharge and discharge areas and variable soils materials, the water table is an uneven surface at any given time and may change its configuration over a period of time. However, overall movement of groundwater over a substantial period of time is most often to the northwest, either toward the river or subparallel to the river.

The elevation of the water table at the site generally fluctuates between 430 and 440 feet during the year. The water table is high during and after the spring rains and snowmelt of March and April and rises slightly after the fall rains in October (see Figures III-2 and III-3). The water table fluctuations generally mimic the Missouri River stage fluctuations in a subdued manner.

At any given time, the water table is nearly level with the notable exception of the persistent groundwater mound in the vicinity of Piezometers S-75, S-76, I-73 and D-89 which is discussed later in this section. In the northern half of the landfill site, the relief on the water table surface is commonly less than 0.5-feet at any given time, indicating a very low gradient. The groundwater mound in the southern portion of the landfill is seen to exhibit relief of from 1 to about 4 feet at the different times of observation for this study.

At times, there is an apparent predominantly downward component of flow in the aquifer near the valley wall. This is indicated by the difference in hydrostatic head between piezometers screened in the upper and lower portions of the aquifer. The deeper piezometers generally indicate lower water levels than nearby shallower piezometers. Since groundwater flows from areas of higher pressure to lower pressure, the flow would be generally downward in this area. An example of this is seen when comparing October 1984 water levels in the deeper D-81 and D-89 piezometers to water levels in the shallower S-75 and S-76 piezometers. The calculated vertical gradient near the valley wall varies somewhat throughout the year but generally ranges between 0.117 and 0.0007. This vertical component of flow dominates the horizontal component near the valley wall, which generally ranges between 0.003 and 0.008 throughout the year. Further west, away from the sloping bedrock valley wall, flow is predominantly lateral. Comparison of deep hydrostatic head in D-83 with shallow hydrostatic head in I-62 indicates little elevation difference and, therefore, almost no vertical component

units?

of flow exists. The flow is basically horizontal; generally toward the Missouri River. The horizontal gradient generally ranges between 0.0003 and 0.0007 throughout this year as calculated from regional groundwater contours (obtained from Earth City piezometers as shown on Figure IN-1).

units?

Generally, the water table elevation is influenced most significantly by the stages of the Missouri River. As the river rises or declines, the water table responds similarly but in a delayed and subdued manner. Hydrographs were constructed from piezometers which exhibit the typical pattern of change in water levels throughout the year. As can be seen by comparing these hydrographs with the Missouri River stages (Figures III-2 and III-3), the water levels in the piezometers are seen to rise steadily in the spring, when the river is rising, and decline during the drier summer months. The rise in the water table at the West Lake site lags behind the overall rise in the river stage during the spring by several weeks. The alluvium creates a buffer zone between the river and the alluvial groundwater beneath the site causing the time lag. Another effect of the alluvium is to decrease the effect of rapid changes in the river stage so that the water levels in the piezometers do not fluctuate dramatically on a daily basis. This lack of daily fluctuation of the water table was documented by the continuous water level recorder, which reveals gradual, slow changes in water table elevation.

The water table generally slopes downstream and toward the river during the dry summer months and generally downstream during the wet spring

?? what are they trying to say here??

months, although changes in gradient direction apparently occur at other times during the year in response to changes in stage of the Missouri River. Determination of this overall gradient direction is based upon Earth City piezometer readings and from water table contour maps of the floodplain across the Missouri River Valley from the site (Ref. 4) (see Figure IN-1). The gradient may be away from the river for short periods of time during high river states, but this is apparently only a localized affect near the river.

explain ??

The unconfined condition of the aquifer is evidenced by the absence of a continuous aquiclude being correlated between borings. Another indication of unconfined conditions is the water level data from clustered piezometers. As can be seen by comparing Figures III-1 and III-4, five clusters (pairs) of piezometers, S-84 and D-85, I-66 and D-94; I-62 and D-83; S-82 and D-93; S-51 and D-90; and I-50 and D-91 show essentially no elevation difference in water levels between the piezometers screened in the deeper portion of the aquifer and the adjacent piezometers set to shallower depths. This indicates that the deep and shallow wells were screened in the same hydraulic unit and no confining conditions exist there. It also indicates horizontal flow in these areas with little or no vertical component of flow at the time these measurements were made.

Why or how did it show horizontal flow??

Another cluster, S-80 and I-50, exhibits significant, though not large, water level differences between adjacent deep and shallow wells. The difference between water levels in S-80 and the deeper I-50 is due to a

shallow perched water zone which is intercepted by the screened segment of Piezometer S-80. Piezometer S-80 indicates the head in the perched zone and I-50 indicates the head in a deeper sand seam. The sand seam is confined below silty clay. Because the water elevation in I-50 is very nearly the same elevation as in nearby wells and since the clay seams in the vicinity tend not to be laterally extensive, it is concluded that the groundwater in I-50 is semi-confined, rather than completely confined. That is, it has some degree of hydraulic connection with the surrounding groundwater, but is partially confined because of the presence of the overlying low-permeability material. Since the water table in Piezometer S-80 is perched, the water levels from this well are excluded from the groundwater contour maps.

Water levels were continuously monitored in Piezometer I-62 from May 24 to October 23, 1984 using a Stevens water level recorder. The water level remained fairly steady, with only minor fluctuations, until approximately July 6, 1984 when a fairly steady decline from 436.1 to 435.6 occurred until about the end of July. Another more rapid decline in the water level occurred from about August 6 to August 28 when the water elevation dropped from 435.4 to 432.9. The water level remained fairly steady through September until October 3 when the recorder was removed. The indication from the continuous monitoring data is that monthly water level measurements are adequate for detecting any significant changes in water table elevations.

## FLOW DIRECTION AND GRADIENTS

Figure III-1 includes water table contours and arrows indicating general groundwater flow direction. It is important to note that the map was made using water level data from August 29 and 30, 1984, and that the pattern of contours is consistent with the pattern from the other water well measurements made for this study, thus, the pattern of water table contours is relatively constant throughout the year, even while the elevation of the water table in the entire aquifer is illustrated by the water levels shown on the detailed geologic profile across the site (Figure I-3).

To determine the difference between groundwater flow in the upper portion of the aquifer as compared to that in the lower part of the aquifer, a comparison was made between water levels measured in the shallow and intermediate piezometers and those measured in the deep peizometers.

The deep and shallow flow patterns are generally similar, but there are times when the hydraulic gradients in the lower part of the aquifer are extremely low (less than 1 foot per mile), and the groundwater flow rates in the deep aquifer are negligible. This can be seen by comparing Figure III-4 (where the flow patterns and gradients in the upper aquifer are similar to the general pattern shown on Figure III-3), with Figure III-5, where the gradient is negligible, but very slightly elevated in the northern parts of the landfill. Figures III-5 and III-6 have been provided to illustrate that there are times when a gradient builds up on

the hydraulic head in the deep aquifer, in response to recharge from the surface water recharge zones in the southeast part of the site. The changing pattern of hydraulic head distribution in the deep portion of the aquifer is also probably related to changing pressures in the aquifer canal by rise and fall of the river stage. As can be seen in Figures III-6 and III-7, the pattern of groundwater flow in the deep aquifer is similar to that in the shallow aquifer.

The flow direction of groundwater beneath the West lake site is dependent upon which part of the aquifer is considered. At the surface of the water table, a perennial mound in the southern portion of the site controls the flow direction (see Figure III-1). Groundwater in the upper portion of the aquifer will flow away from the mound to the north, west, and south. Because this mound is small (less than 3 feet of relief in comparison to the thickness and volume of the aquifer, it has only a slight affect on groundwater flow direction at greater depths. The groundwater mound is the result of a local recharge area created by: (1) the pumping of water from the quarry to surface drainage ditches which is discharged to this area, (2) surface infiltration along Old St. Charges Rock Road, and (3) possible leakage from unlined surface water holding ponds in the quarry vicinity. Groundwater in the lower portion of the aquifer flows generally in a westerly or northwesterly direction in response to the gradient induced by the Missouri River stage and the gradient of the river valley. Flow is predominantly downward near the valley wall. Another influence on the flow direction is the nonuniform permeability characteristics of the aquifer. Because

of the various alluvial materials, such as clay lenses and small sand-filled channels, groundwater will flow more rapidly through the higher permeability materials. These effects will tend to be localized and will not change the overall flow direction drastically.

In the northern part of the site where the water table gradients are seen to the very low (see Figure III-1), groundwater flow is generally northward near the northern end of the site and westward from the western portion of the landfill. Thus, flow is generally radiating from the central portion of the landfill toward the perimeter, probably due to slight mounding of the water table within the landfill itself. Because of the extremely low hydraulic gradients and low relief on the water table, this pattern may not be consistent with time; local variations may alter the pattern somewhat, but these variations are minor. Thus the pattern shown on Figure III-1 predominates throughout the year.

## 2. GROUNDWATER QUALITY

### a. Distribution of Chemical Constituents

Rewrite

The lateral and vertical distribution of detected chemical constituents was investigated to determine if the landfill was affecting local and downgradient groundwater quality.

(1) Lateral Distribution: Chemical results were obtained from wells upgradient, downgradient, and around the perimeter of the

landfilled area. When chemicals were detected at several locations, the results were plotted on a site map. The most informative chemical distribution maps are shown in this report. The complete results of chemical analysis are contained in Appendix E.

reference

The only priority pollutant volatile organic compound detected in both rounds was methylene chloride. The chemical distributions for Round 1 and Round 2 are shown on Figures ___ and ____. In Round 1, methylene chloride was detected in wells throughout the landfill area. Piezometer D-90 showed 83 ug/l of methylene chloride, the highest detected level. The concentration pattern was irregular and therefore not contoured. In general, the downgradient wells showed lower levels of methylene chloride (from 6 to 12 ug/l), except for Piezometer D-83, which had 55 ug/l. * Acetone, not a priority pollutant, was also detected in most samples. Methylene chloride was also detected in Round 2, but at only three locations and at lower concentrations. Piezometer D-90, only contained 6 ug/l. Piezometer D-89 showed 10 ug/l and Piezometer I-59, a shallow downgradient well, showed 7 ug/l. The rest of the well concentrations were less than the detection limit of 5 ug/l.

The only priority pollutant base-neutral compounds detected in Round 1 were bis(2-ethylhexyl)phthalate and trace amounts of two

other phthalates. Only bis(2-ethylhexyl)phthalate was detected during Round 2 at one location. The chemical distribution map for Round 1 is shown on Figure III-10. Round 1 results showed bis(2-ethylhexyl)phthalate at five locations throughout the landfill area. The pattern was irregular and therefore not contoured. Piezometer D-90 showed 115 ug/l, while the background wells had concentrations less than the 1 ug/l detection limit. Piezometer D-92 had the highest level of 477 ug/l. The downgradient well mostly had concentrations either close to or below the detection limit.

Round 2 results showed bis(2-ethylhexyl)phthalate at only one location. As in Round 1, Piezometer D-92 had the highest level of 25 ug/l. All other wells showed concentrations less than the 10 ug/l detection limit.

The Round 1 results, in addition to providing priority pollutants concentrations, also provided information on possible additional organic compounds. Trace amounts of aliphatic hydrocarbons (also identified as diesel oil) were detected in Piezometer I-59 and S-80. An organic odor was evident in Piezometer S-80 during both sampling rounds. Most of the samples contained a variety of tentatively identified compounds such as phthalate esters, trimethyl cyclohexane-1-one, and other compounds found in plastics. The source of these compounds is unknown.

Phenol was detected at five locations in Round 1. Figure III-11 shows the distribution of phenol. The pattern is irregular and therefore not contoured. Piezometer D-92 had the highest concentration of 19 ug/l. The downgradient wells to the west of the landfill had concentrations of up to 7 ug/l. The detection limit was 1.7 ug/l.

Phenol was not detected in Round 2 above the detection limit of 10 ug/l. No other acid-extractable compound was detected. A general analysis of total phenolic compounds, a different analysis with detection limit of 2 ug/l, was negative.

Trace amounts of several pesticides were detected during Round 1. Compounds detected included gamma BHC (Lindane), delta BHC, chlordane, dieldrin, endrin, 4,4' DDD, 4,4' DDE, 4,4' DDT, and hexachlorobenzene. The compounds DDD and DDE are decomposition products of DDT. All wells tested positive for at least one pesticide. Piezometers S-82 and D-83, to the west of the landfill, showed the greatest numbers and highest concentrations of pesticides. All pesticide concentrations were less than 0.70 ug/l. The distribution of two frequently found pesticides, chlordane and 4,4' DDE, were plotted and shown on Figures III-12 and III-13. Chlordane was not detected in the upgradient wells, and shows an irregular pattern in the downgradient wells. Piezometer S-82 had a maximum concentration of 0.258 ug/l. The DDT decomposition product, 4,4' DDE, was

found at 11 wells, both upgradient and downgradient of the landfill. The upgradient and background wells had higher concentrations. Piezometer D-89 had the maximum concentration at 0.117 ug/l. In general, the distribution of pesticides is irregular and the source is unknown. No pesticides were detected in Round 2. The detection limits in Round 2 were similar to those in Round 1.

elaborate not a problem

The distribution of inorganic constituents followed an undefined pattern as did the organic constituents. Total cyanide was detected at 1 or 2 ug/l levels at six locations during Round 1. The highest level was 6 ug/l at Piezometer D-90 to the south of the landfill area. In Round 2, total cyanide was detected in only one well above the 5 ug/l detection limit. Piezometer D-89 had the highest level at 7 ug/l. — Back ground well

→ not caused by landfill

The Round 1 metals ICP (Inductively Coupled Plasma) scan produced results for 32 dissolved metals. Conventional parameters such as iron and sodium were plotted to determine a pattern with respect to the landfill, since these compounds are often associated with landfill contamination. The distributions of sodium and iron are shown on Figures III-14 and III-15. The sodium concentration ranged from 5 mg/l to a high of 175 mg/l at Piezometer D-83. The ranges were generally between 30 and 70 mg/l both upgradient and downgradient of the landfill, with no distinct pattern. Levels were generally higher in the wells

west of the landfill (over 100 mg/l). Dissolved iron distribution was also irregular. The highest concentration of 31.5 mg/l was found in Piezometer S-84. Levels were generally higher within the landfill boundary. Downgradient concentrations were slightly higher than upgradient concentrations.

In Round 1, very few priority pollutant metals were detected, except for copper and zinc. The distribution of zinc, which was found in almost all wells, is shown for Rounds 1 and 2 on Figures III-16 and III-17. The concentrations ranged from less than 2 ug/l in Piezometer D-90 to 1240 ug/l in the adjacent Piezometer S-51. Most other concentrations ranged from 30 to 140 ug/l throughout the landfill.

In Round 2, the detection limits for most metals were approximately one tenth the detection limits in Round 1. Even at detection limits of 1 to 4 ug/l, very few heavy metals were detected. The highest lead concentration was found at Piezometer D-91,to the south of the landfill. Compounds such as antimony, nickel, thallium, and zinc were commonly found. Silver was detected but at levels close to or below the detection limit of 2 ug/l. The distribution of zinc is shown on Figure III-19. As in Round 1, the lowest level of less than 2 ug/l was found in Piezometer D-90, while the highest level of 2000 ug/l was found in the adjacent Piezometer S-51. The

remaining wells ranged between less than 2 and 70 ug/l throughout the landfill.

The distribution of the heavy metal arsenic was plotted, since several positive values were obtained. This is shown on Figure III-18. Piezometer D-91, a background well, contained 4 ug/l of dissolved arsenic. The maximum level of 9 ug/l was found in Piezometer S-84 and S-88.

Generally, the distribution of dissolved metals showed no distinct pattern and downgradient levels did not significantly differ from upgradient levels.

The significance of the chemical constituent concentrations will be discussed in Part IV.

In addition to priority pollutant analysis, four wells were also sampled for gross alpha and beta radiation during Round 1. The results are included in Appendix E. The values for gross alpha ranged from less than 2 pCi/l (pico curies per liter) in Piezometer D-83 to 270 pCi/l in Piezometer S-84. Piezometer S-84 had the only gross alpha or beta level exceeding 31 pCi/l. The laboratory explained that these high levels could have been due to the presence of suspended clay material in the sample, and that future samples should be filtered.

In May, 1986, 32 well samples were collected and analyzed for gross alpha and beta by the Department of Energy. The results are included in Appendix E. Further isotopic analyses are being performed on many of the samples.

Comments will be made in Appendix E.

(2) Vertical Distribution: The vertical distribution of chemical constituents was evaluated to determine:

(a) The presence of chemicals in the shallow and deep aquifers.

(b) Differences between the shallow and deep aquifers with respect to chemical constituents.

Organic chemicals were detected both in the shallow and deep part of the aquifer. In general, highest levels of methylene chloride were found in the deep piezometers, although only three piezometers had detectable levels in Round 2. Bis(2-ethylhexyl)phthalate was only found in deep piezometers in both Round 1 and Round 2. In Round 1, phenol was found in both shallow and deep piezometers. Pesticides were also found in both shallow and deep piezometers at similar concentrations.

Dissolved metals concentrations showed no definite pattern with respect to shallow and deep aquifer levels. In some well clusters, sodium was highest in the deep wells and in other well clusters sodium was highest in the shallow wells. The same was

true for iron, zinc and many of the other detected metals. The well cluster of D-90 and S-51 consistently showed a low zinc level in the deep well and a high zinc level in the shallow well. The reason for this is uncertain, since this occurrence was inconsistent with other metals data but nonetheless is not at a level of concern.

b. Seasonal Variation

The sampling rounds occurred during two distinct seasons. Round 1 took place in December while Round 2 took place in May. In general, more chemicals were detected in Round 1, and at higher concentrations. Among those chemicals found to a greater extent in Round 1 were methylene chloride, bis(2-ethylhexyl)phthalate, phenol and pesticides. Priority pollutant metals were found more often in Round 2 because of the lower detection limits. Comparable metals such as zinc did not show substantial changes from Round 1 to Round 2.

c. Validity of Data

The validity of the chemical data is dependent on:

- The field collection of the water samples and proper preservation of the samples.
- The chemical laboratory quality assurance/quality control (QA/QC).

The organic data can be evaluated using the laboratory spike and blank and replicate sample data. During Round 1, the spike and duplicate sample results were within method accuracy limits. Bis(2-ethylhexyl)phthalate was detected in the blank at 3.5 ug/l.

The Round 2 laboratory volatile organic blanks contained 17 and 15 ug/l of methylene chloride. Trace concentrations of bis(2-ethylhexyl)phthalate were detected in the blanks.

The QA/QC information provided by the laboratories for Round 1 and Round 2 indicates that the sample data is reliable with respect to laboratory analysis. Possible interferences are methylene chloride and bis(2-ethylhexyl)phthalate. The Round 2 blank concentrations of methylene chloride may be high enough to cancel out the concentrations found in the three wells.

Field procedures could also have introduced an error factor to the chemical results. Common sampling errors are:

- Introduction of surface contamination to the sample.
- Improper cooling, storage and preservation.
- Aeration of sample during collection.
- Insufficient purging of stagnant well water.
- Use of unclean sample bottles and sampling equipment.

Since precautions were taken to minimize these errors, the collected samples are probably representative of the aquifer water quality.

It should be noted that the Department of Energy samples, taken on May 7 and 8, 1986, were sampled by different personnel. The quality control of the filed procedures are unknown.

* * * * *

PART IV

IMPACT OF LANDFILL ON GROUNDWATER QUALITY

A. DOWNGRADIENT WATER USE

As described above in the discussion of regional groundwater hydrology, the discharge point for the groundwater downgradient beneath the old landfill site is the Missouri River. There are no water supply wells at the Earth City industrial park, and no known water supply wells elsewhere downgradient. The drainage ditches along St. Charles Rock Road intersect the water table. Therefore, the groundwater underflow beneath the site passes through the ditches as a surface water occurrence.

B. DOWNGRADIENT GROUNDWATER QUALITY

To assess the impact of the landfill on groundwater quality, the chemical constituent levels in the background wells were compared with levels within and downgradient of the landfill.

Methylene chloride was found in a background piezometer (D-91), an upgradient piezometer (D-89) and is also a possible laboratory interferent. It is unclear whether the landfill is a source of methylene chloride. ? not sure they were leaved in

Bis (2-ethylhexyl)pthalate was found in an upgradient (D-89) and is a possible laboratory interferent. Levels in Round 1 were generally highest within the landfill (D-92), and may therefore be affected by the landfill.

Phenol was found at its highest levels within the landfill area (D-92) and in downgradient piezometers and could therefore be affected by the landfill.

The various pesticides found in Round 1 showed no particular distribution pattern. Some were found more in the background wells (4, 4'DDE) and others in the downgradient wells (heptachlor, chlorodane). Levels tended to be highest in Piezometers S-82, D-83 and S-84, all downgradient. The effect of the landfill on pesticide levels is unclear, since none were detected in Round 2.

As mentioned earlier, the distribution of dissolved metals showed no particular pattern. Sodium levels tended to be higher in the interior and downgradient wells, as did iron levels. Other metals of concern did not appear to be affected by the landfill.

The chemical results suggest that certain wells showed relatively high levels of several constituents. During Round 1, Piezometer D-90 had the maximum concentrations for methylene chloride, total cyanide and also contained bis (2-ethylhexyl) pthalate. Piezometer D-92 had the maximum concentration of phenol and bis (2-ethylhexyl) pthalate and also contained methylene chloride.

During Round 2, Well D-89 had the maximum concentration of methylene chloride and bis (2-ethylhexyl) phthalate. [One possible source is the vehicle maintenance shop located near piezometer D-89.]

Move to IV-1

## C. RISK ASSESSMENT

### 1. POTENTIAL PATHWAYS

The potential pathways of chemical transport from the landfill are the following:

- o Direct contact.
- o Air transport.
- o Surface water runoff.
- o Groundwater transport.

Direct contact and air transport would primarily affect persons working in and around in the landfill operation and were not considered major pathways. The risk is most likely similar to operations at most municipal landfills.

Surface water runoff from the landfill primarily flows to a drainage ditch along the north side of the landfill and the south side of St. Charles Rock Road. This ditch is also occasionally recharged with groundwater. This surface water either recharges the groundwater or discharges to the Missouri River. A pond along this ditch is located on the northwest side of the landfill, and is known to contain fish. Groundwater could potentially be affecting fish in this pond, but more data is needed to evaluate this possibility. Surface water runoff to the south and southwest flows out across relatively flat agricultural

level, and some of this runoff may join the small intermittent creeks which traverse the area.

The groundwater pathway would affect persons using groundwater downgradient of the landfill before it discharges in the Missouri River. As discussed in Part IV, Section A, no private wells have been identified. The remote possibility of future wells being located down gradient of the site should be considered when evaluating the groundwater quality.

dilution factor - reduces risk factor downgradient

2. STATE AND FEDERAL WATER QUALITY CRITERIA

The concentration levels of various groundwater chemical constituents found during this investigation were compared with Federal and State drinking water quality standard and recommendations. The comparison is shown on Table IV-1. The compounds listed were the major detected compounds which have water quality standards and recommendations. The maximum, or worst case, concentrations were used to evaluate the groundwater quality.

According to the available data, most of the chemicals detected in the groundwater were at levels below drinking water quality limits and guidelines. Exceptions are phenol, chlordane, 4,4' DDT and cyanide.

Phenol was considerably below federal guidelines for health and aesthetics (taste and odor) but was greater than the drinking water limit of 1 ug/l. Chlordane was detected and therefore exceeded the

proposed RMCC of 0 for potential carcinogens. The EPA Health Risk Criteria for 4,4'DDT is 0.00024 ug/l and was detected at 0.051 ug/l. Some decomposition products, 4,4'DDE and 4,4'DDD, were also detected. Total cyanide, at 7 ug/l exceeded the drinking water standard of 5 ug/l; however, the standard is based on cyanide amenable to chlorination. Arsenic, at 9 ug/l, exceeded the EPA Health Risk criteria for one in 100,000 cancer risk but was below the 50 ug/l drinking water standard.

TABLE IV-1

WATER QUALITY CRITERIA

| Compound | Max. Conc. (ug/l) | Well No. Round | HRC | Water Quality Criteria (ug/l AWQL | MDNR | Other |
|---|---|---|---|---|---|---|
| Methylene Chloride | 83 | D-90(1) | | | | 600 (RSD)<br>150 (SNARL) |
| Bis (2-ethylhexyl) phthalate | 477 | D-92(1) | | 15,000 | | |
| Phenol | 19 | D-92(1) | | | 1 | 4000 (RFD)<br>300 (T&O) |
| Gamma BHC-(Lindane) | 0.100 | S-82(1) | 0.186 | | | 4 (DWS) |
| Chlordane | 0.258 | S-82(1) | 0.23 | | | 8 (SNARL)<br>0 (RMCL) |
| Endrin | 0.140 | S-84(1) | | 1 | | 0.2 (DWS) |
| 4,4' DDT | 0.051 | D-83(1) | 0.00024 | | | |
| Cyanide | 7 | D-89(2) | | 200 | 5 (Amen to Cl) | |
| Arsenic | 9 | S-84,S-88(2) | 0.0022 | | 50 | 50 (DWS)<br>50 (RMCL) |
| Cadmium | 3 | D-85(1) | | 10 | 10 | 10 (DWS)<br>5 (RMCL) |
| Lead | 13 | D-91(2) | | 50 | 50 | 50 (DWS)<br>20 (RMCL) |
| Silver | 7 | I-59,D-92(2) | | 50 | 50 | 50 (DWS) |
| Copper | 57 | I-59(1) | | | 1000 | 1000 (T&O) |
| Nickel | 62 | S-82(2) | | 13,400 | | |
| Zinc | 2000 | S-51(2) | | | 5000 | 5000 (T&O) |

Note:

HRC - Health Risk Criteria: Cancer Risk per 100,000 population (Fed. Reg. 11/28/80)
AWQL - Ambient Water Quality Criteria (Fed. Reg. 11/28/80)
MDNR - Missouri Department of Natural Resources - Drinking Water Limits
RSD - Risk Specific Dose: Cancer Risk per 100,000 pop. (Fed. Reg. 613186)
RFD - Risk Factor Dose: (Fed. Reg. 613186)
T&O - Taste and Odor Recommendations
SNARL - Suggested No Adverse Response Levels, Long Term
DWS - U.S.E.P.A. Drinking Water Standard
RMCL - Recommended Maximum Contaminant Level (proposed - Fed. Reg. 11/13/85)

PART V

CONCLUSIONS

## A. SUMMARY OF HYDROGEOLOGICAL CONCLUSIONS

Based upon information from the Burns & McDonnell investigation of the West Lake Landfill site it can be concluded that:

The alluvium of the Missouri River forms the major aquifer in the vicinity of the site. The underlying bedrock is relatively impermeable, both on the valley side slopes and the bedrock valley floor buried beneath the alluvium.

Alluvial deposits of the Missouri River are in hydraulic communication with the river, thus the river has a major influence on water levels in the alluvium. A rise in river stage during seasons of high rainfall and snow melt causes the water table in the aquifer to rise. Conversely a seasonal drop in the river stage causes the water table in the aquifer to drop. Although the rise and fall of the aquifer is less than that of the correlative change in river stage, the change in water table elevation is relatively uniform throughout the entire extent of the aquifer in the site vicinity.

The predominant direction of groundwater flow in the aquifer in the region near the site is northwestward toward the Missouri River. This predominant, regional pattern of flow is illustrated on Figure IN-1, which was made using water levels in piezometers in the Earth City area in 1976. There are broad fluctuations in this flow direction throughout the year and the predominant

flow direction ranges from slightly south of due west to northwest (subparallel to the northerly flow direction of the Missouri River). During short periods of the year (primarily in the spring and for short periods in winter), when the river stage is rising rapidly, the predominant groundwater flow direction in the aquifer may be temporarily reversed in the localized vicinity of the river. This occurs while the river is at a higher elevation than the water table. This generally eastward flow is of short duration and is overshadowed by the predominant westward flow at some distance from the river.

Throughout most of its extent, the aquifer is generally unconfined (under water table conditions). Relatively low-permeability, discontinuous clayey and silty zones in the upper part of the alluvium may cause semiconfined and perched water conditions in very localized areas.

Other localized effects, of only minor significance, may affect groundwater flow directions in the aquifer. As can be seen on Figure III-1 the only local feature of note is a perennial groundwater mound, superimposed on the generally westward sloping water table which predominates on the rest of the site. The groundwater mound is located on the southern part of the West Lake site, and occurs due to a localized recharge zone. This mounding is created by: (1) water pumped from the quarry being discharged at the ground surface above the mound, (2) surface infiltration from the drainage ditches along Old St. Charles Rock Road after rainfall (illustrated by cross-hatching on Figure III-1, (3) and possible leakage from the surface water holding ponds immediately west of the existing quarry (also illustrated by

cross-hatching on Figure III-1. This mound generally affects flow direction only in the upper portion of the aquifer, but may result in a significant vertical component of flow beneath the mound. The mounding effect is superimposed on the effect caused by changes in river stages and the effect of the bedrock valley. In the bulk of the aquifer, other than beneath the mound, the vertical component of flow is insignificant.

In the area of the groundwater mound, flow direction in the upper portion of the aquifer is to the south, west and north away from the mound. Flow direction lower in the aquifer includes a major component that is vertically downward near the valley wall, but is horizontal either toward or subparallel to the Missouri River at some distance from the valley wall.

Gradients in hydraulic head in the lower aquifer are, at times, extremely low. See, for example, Figure III-5. Thus, minor fluctuations in head (in the range of 1/10-foot) may be sufficient to cause ~~major~~ changes in flow direction. But because the gradients are very low at such times, groundwater flow rates are negligible.

At other times (see for example, Figure III-7), there may be two to three feet of differential in hydraulic head across the site. The pattern in hydraulic head distribution in the deep aquifer at such times is seen to reflect approximately the same pattern as the head distribution in the shallow aquifer (see Figure III-4). Thus, the surface water features which recharge the shallow part of the aquifer and cause groundwater ? in the southeastern part of the site also recharge the deeper part of the

aquifer by vertical infiltration from above. During such times, groundwater flow in the deep portion of the aquifer is laterally, away from the recharge area, predominantly to the west and northwest. During all times of measurement, the hydraulic gradients in the deeper part of the aquifer were substantially less than that in the shallow part of the aquifer.

Piezometers D-89 and I-73 are in the upgradient portion of the site, in the vicinity of the predominant recharge area of the site. Piezometers I-50 and D-91 are in an area south of the landfill where they are outside the area of influence of the groundwater flow pattern of the site. Thus, the groundwater in the aquifer there is not downgradient of the site, but is recharged from elsewhere, and samples from these wells may be considered background water quality samples for the aquifer. The surface water drainage ditches along the northern edge of the site are interconnected with the water table, and are in the downgradient area of the groundwater flow pattern. Thus, they contain not only surface water runoff, but also underflow of groundwater from the aquifer.

Based on an interpreted value of hydraulic gradient of 0.003 across the site, (considering the fan-shaped flow pattern diverging from the groundwater around beneath the landfill), a value of $6.35 \times 10^{-4}$ cm/sec for hydraulic conductivity of aquifer materials, a saturated thickness of 95 feet, and a site perimeter length of 6900 feet, the flow rate is calculated to be 27,000 gallons per day beneath the entire site. For an assumed value of 0.20 for effective porosity, the groundwater flow velocity is calculated to be 75 feet per year.

## B. SUMMARY OF GROUNDWATER QUALITY

1. Methylene chloride was the only detected priority pollutant volatile organic chemical. In Round 2, the detection of methylene chloride was accounted for by its concentration in blank samples.

2. During Round 1, methylene chloride had a maximum concentration in Piezometer D-90.

3. The compounds bis(2-ethyl hexyl) phthalate and phenol were found at the maximum concentration at Piezometer D-92 during Round 1.

4. The general distribution of organic constituents was scattered and irregular. In general, phenol and methylene chloride were found to be slightly higher in downgradient wells during Round 1. The landfill is a possible, but not certain, contributor.

5. The distribution of dissolved metals was irregular and significant differences were not detected between the background, upgradient and downgradient wells.

6. Many chemical constituents were detected in the deep wells but no significant increase was detected between the deep wells and the shallow wells.

7. More chemicals were detected during Round 1 (December 1985) at greater concentrations than during Round 2 (May 1986).

8. A variety of pesticides were detected during Round 1 at various locations, especially Piezometers S-82, D-83 and S-84. The source of these pesticides is unknown. No detection in Round 2

9. Compared to state and federal drinking water standards, the levels of chemicals found in the groundwater do not appear excessive. Some of the pesticides, such as chlordane and 4,4' DDT, exceeded recommended levels for cancer risk. No detection in Round 2

10. Surface water and groundwater are connected in the drainage ditch running along the north side of the landfill. A pond connected to this ditch, located on the northwest side of the landfill, contains fish which could be affected by the groundwater.

11. No water supplies using groundwater downgradient of the landfill have been found.

## C. PROPOSED GROUNDWATER MONITORING PROGRAM

The purpose of the proposed groundwater monitoring plan is to evaluate the effect of the landfill on groundwater quality through long-term monitoring. Certain constituents detected during this investigation will also be resampled to clarify differing results between Round 1 and Round 2.

The components of the proposed plan are as follows:

1. SHORT-TERM MONITORING

The following piezometers will be resampled and analyzed for the listed constituents:

I-59: Volatile Organics

D-81: Volatile Organics

S-82: Pesticides

D-83: Volatile Organics

S-84: Pesticides

D-87: bis(2 ethylhexyl) pthalate

D-89: bis(2 ethylhexyl) pthalate, volatile organics

D-90: bis(2 ethylhexyl) pthalate, volatile organics

D-92: bis(2 ethylhexyl) pthalate, volatile organics

Based on this data, the long-term monitoring plan will be revised appropriately.

Also, because of the presence of fish in the surface pond to the west of the landfill, ,the fish should be sampled and analyzed for the following constituents:

Priority pollutant pesticides

Priority pollutant metals

gross alpha and beta radiation

From this data, a decision can be made on whether or not fishing should be allowed in this pond.

2. LONG-TERM MONITORING

MDNR

The following piezometers shall be sampled on a quarterly basis:

S-84, D-85: north of landfill

S-82, D-93: west of landfill

D-89: upgradient

D-91: background

D-92: within landfill boundary

The samples will be analyzed according to MDNR parameters for landfill monitoring. In addition, the water level will be measured in each well before sampling.

An analysis of the results will determine if future remedial action is needed at the site.

Change wording

## REFERENCES


3. Anderson, Kenneth, et al, Geologic Map of Missouri: Missouri Geological Survey and Water Resources. Scale 1:500,000. 1979.

4. Koenig, John W., The Stratigraphic Succession in Missouri, Missouri Geological Survey Bulletin 15, 2nd Series. 1961.

5. Miller, Don E., et al, Water Resources - St. Louis Area, Missouri, Water Resources Report No. 30, Missouri Geological Survey and Water Resources and the U.S. Geological Survey, 1974.

6. Gann, E. E., et al, Water Resources of Northeastern Missouri, Hydrologic Investigations Atlas HA-372, U.S. Geological Survey and the Missouri Geological Survey and Water Resources, 1971.


* * * * *

# APPENDIX A

## CRITERIA FOR LOGGING OF SOIL AND ROCK BORING LOGS

## LEGEND AND NOMENCLATURE OF DRILLING LOGS

Information preceeding the logs relates to pertinent project and boring descriptions, which are self-explanatory. Remaining items on drilling logs are described as follows:

1) DEPTH: Depth below a given reference elevation. Normally, units are in feet and are from the aforementioned ground surface, unless otherwise noted.

2) DESCRIPTION: Description of soil or rock material according to Unified Soil Classification. Word descriptions give principal soil constituent, other minor soil constituents, color, moisture, consistency or density, plasticity, and other appropriate material characteristics. Geologic names, where appropriate, are shown in REMARKS. A solid line denotes a stratigraphic change; a dashed line indicates the approximate location of a stratigraphic change. Rock samples are described according to lithology, color, moisture content, weathering, strength, and any discernible structure. Criteria for evaluating weathering and strength (established by the U.S. Bureau of Mines,) are as follows:

Weathering:

FR: (Fresh) No visible signs of weathering.

SW: (Slightly Weathered) Weathering (alteration) limited to the surface of major discontinuities, no weathering of rock material.

MW: (Moderately Weathered) Weathering (alteration) extends throughout the rock mass, but the rock material is not friable.

HW: (Highly Weathered) Rock is decomposed and friable, but the rock texture and structure are preserved.

XW: (Extremely Weathered) Soil material with the original texture, structure, and mineralogy of the rock completely destroyed.

Strength: VS: (Very Strong) Rock surfaces cannot be scratched by a steel nail.

S: (Strong) Faint scratch made with a steel nail.

MS: (Moderately Strong) Distinct scratch trace made with a steel nail.

W: (Weak) Slight scratch left by fingernail, material can be gouged out with steel nail.

VW: (Very weak) Material can be gouged out with fingernail.

3) <u>LOG OR CLASSIFICATION</u>: Unified Soil Classification symbols are shown in reference to appropriate description of soil. Rock material is noted by visual symbols (referenced from NAVFAC DM-7 Manual, March 1971, with slight revision) representing rock classification, as shown below:

SANDSTONE

CONGLOMERATE

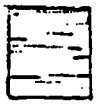
COAL

LIMESTONE

COMPACTION SHALE

GNEISS

GRANITE


SILTSTONE

MUDSTONE

DOLOMITE

CHALK

CEMENTED SHALE

SCHIST

BASALT

4) BLOW COUNT: (ie: 4/7/8)

Numbers indicate the necessary blows to drive 3 six-inch increments, or part thereof, of a split barrel sampler when driven by a 140-pound hammer falling freely for 30 inches; as per ASTM D 1586. The Standard Penetration Resistance (N value) is the sum of the second and third six-inch penetrations. If the sampler is driven less than 18 inches, the N value is represented by the total resistance over the last 12 inches. If the sampler is driven less than 12 inches, logs indicate the number of blows and fraction of increment in inches actually penetrated. Note that a blow count can be listed for a California or Dames & Moore sampler, but that this is not the Standard Penetration Resistance.

5) RECOVERY & LOSS: In soil this represents the total length of soil recovered over the amount of sample penetrated. In rock this notes the percent core recovery and Rock Quality Designation (RQD).

6) SAMPLE DEPTH: A column that provides a reference to the depth below the previously mentioned reference elevation at which samples were taken.

7) BOX SAMPLE NO: In the case of rock coring, the box number and core run number are noted. For soils, the designated type and consecutively numbered sample are noted by the following letter;

SS - Split-Spoon sample, obtained by driving a 2-inch diameter split spoon according to D 1586 to retreve penetration resistance and sample recovery.

ST - Undisturbed thin-walled tube sample (Shelby Tube) D 1587, obtained by penetration of a 3-inch diameter thin-walled tube using an open or, where indicated, fixed piston sampling head.

C - Continuous sampler: obtained by drilling a 5-foot long, 2½-inch I.D., CME split barrel sampler into the soil material.

DM - Liner tube sampler (Dames & Moore), obtained by penetration of a thick-walled, split-barrel sampler containing 2½-inch diameter ring liners.

B - Bag Sample, obtained by combining disturbed auger cuttings for a large bag sample.

D - Disturbed Sample, obtained from auger cuttings or wash water for a small container sample.

-J - Jar Sample, obtained from any other sample method, but later placed into a jar container due to sample size or disturbance.

8) REMARKS: Pertinent observations made and noted by the inspector during drilling. These may include, but are not restricted to, type of drilling, water seepage, fluid loss, time during drilling, material formation, hole termination, pocket penetrometer readings (TSF), piezometer installation, water levels first encountered during drilling and at some time after completion of drilling, and any other pertinent information.

9) SOIL STRENGTH: $Q_p$ is the designation of soil strength as measured with a pocket penetrometer. Units are in tons per square foot.

# Drilling Log

| | | | |
|---|---|---|---|
| Project Name | WESTLAKE | Boring No. | S-80 |
| Project No. | 84-075-4-002 | Page 1 of 2 | |
| Ground Elevation | 448.4 | Location | N. 2592.7962, E. 2619.0159 |
| Total Footage | 22.0 | | |

| Drilling Type | Hole Size | Overburden Footage | Bedrock Footage | No. of Samples | No. Core Boxes | Depth To Water | Date Measured |
|---|---|---|---|---|---|---|---|
| SOLID AUGERS | 5" | 22.0' | 0 | 4 | 0 | SEE REMARKS | – |

| | | | |
|---|---|---|---|
| Drilling Co. | WABASH DRILLING CO. | Driller (s) | DORL THORNTON |
| Drilling Rig. | ACKER MP-5, TRUCK | Type of Penetration Test | STANDARD |
| Date | 8-28-84 To 8-29-84 | Field Observer (s) | GLEN ERNSTMANN |

| Depth | Description | Class. | Blow Count | Recov. | | Sample or Box No. | Remarks |
|---|---|---|---|---|---|---|---|
| | DARK BROWN SANDY, SILT AND ORGANIC MATTER, DAMP | | | | | | 5" SOLID AUGERS 0' TO 20'. |
| 1 | | | | | | | |
| 2 | LIGHT BROWN FINE SANDY SILT, LOW PLASTICITY, VERY LOOSE, DAMP | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | 5.0 | | |
| | | | 2/2/1 | 8"/18" | | SS-1 | |
| 6 | | | | | 6.5 | | |
| 7 | GRAY-BROWN SILTY CLAY, MEDIUM PLASTICITY, MEDIUM STIFF TO SOFT, MOIST | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | 10.0 | | |
| | | | 1/3/2 | 18"/18" | | SS-2 | |
| 11 | | | | | 11.5 | | |
| 12 | | | | | | | |
| 13 | GRAY-BROWN FINE SANDY SILT, SOME CLAY, VERY SOFT, SATURATED | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

Boring No. S-80

Project Name: WESTLAKE

Page 2 of 2

Project No. 84-075-4-002

Date 8-28-84

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 15 | GRAY BROWN FINE SANDY SILT, SOME CLAY, VERY SOFT, SATURATED | | | | 15.0 | | SATURATED MATERIAL @ APPROX. 14'. |
| 16 | | | | 16"/24" | | ST-3 | $Q_p$ = 0.0 TO 0.5 TSF |
| 17 | | | | | 17.0 | | STOPPED 8-28-84 RESUMED 8-29-84 |
| 18 | GRAY SILTY CLAY, MEDIUM TO HIGH PLASTICITY, MEDIUM STIFF, SATURATED | | | | | | WATER ENTERED HOLE TO A DEPTH OF 13.5' AFTER SAMPLE ST-3 WAS OBTAINED. |
| 19 | | | | | | | WATER LEVEL BEFORE DRILLING 7:00am 8-29-84 ; 12.4' BELOW G.S. |
| 20 | | | | | 20.0 | | |
| 21 | | | | 24"/24" | | ST-4 | $Q_p$ = 0.6 TSF |
| 22 | | | | | 22.0 | | |
| 23 | TOTAL DEPTH 22.0' | | | | | | |
| 24 | | | | | | | A 2" dia. PVC piezometer was installed to 20'. |
| 25 | | | | | | | 1' of clay cuttings and 1' of bentonite pellets were implaced in bottom of hole. |
| 26 | | | | | | | PVC is flush-jointed threaded couplings. |
| 27 | | | | | | | Bottom 10' is .010" machine slotted screen. |
| 28 | | | | | | | Bottom 11' is gravel packed with a 2' thick bentonite pellet seal above. |
| 29 | | | | | | | Annulus is grouted from seal to surface. |
| 30 | | | | | | | T.O.P. is 5' above G.S. WATER LEVEL IS 18.17' BELOW T.O.P. IMMEDIATELY AFTER PIEZOMETER INSTALLATION 9:00am 8-29-84 |

WATER LEVEL @ 17.4' BELOW T.O.P. AFTER PUMPING WATER INTO PIEZO. @ 9:20 AM 8-29-84

# Drilling Log

| | | | |
|---|---|---|---|
| Project Name: WESTLAKE | | | Boring No.: D-81 |
| Project No.: 84-075-4-002 | | | Page 1 of 4 |
| Ground Elevation: 447.8 | Location: N. 1196.2728, E. 922.0145 | | Total Footage: 61.5' |

| Drilling Type | Hole Size | Overburden Footage | Bedrock Footage | No. of Samples | No. Core Boxes | Depth To Water | Date Measured |
|---|---|---|---|---|---|---|---|
| SEE REMARKS | SEE REMARKS | 61.5 | 0 | 11 | 0 | SEE REMARKS | — |

| | | | |
|---|---|---|---|
| Drilling Co. | WABASH DRILLING CO. | Driller (s) | DORL THORNTON |
| Drilling Rig. | ACKER MP-5, TRUCK | Type of Penetration Test | STANDARD |
| Date | 8-13-84 To 8-15-84 | Field Observer (s) | GLEN ERNSTMANN |

| Depth | Description | Class. | Blow Count | Recov. | | Sample or Box No. | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | BROWN FINE SANDY SILT, LOW PLASTICITY, DAMP (FILL) | | | | | | 5" SOLID AUGERS 0' TO 15' |
| 2 | | | | | | | |
| 3 | GRAY-BROWN COARSE GRAVEL (MAX, 2" DIA.), SOME FINE | | | | | | |
| 4 | GRAVEL AND SAND, DAMP (FILL) | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | BROWN CLAYEY SILT, LOW PLASTICITY, DAMP TO MOIST (FILL) | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | BROWN FINE TO MEDIUM SAND, MEDIUM DENSE TO LOOSE, DAMP (FILL) | | 5/5/4 | 16"/18" | 10.0 | SS-1 | |
| 11 | BROWN CLAYEY SILT, LOW PLASTICITY, MOIST (FILL) | | | | 11.5 | | STOPPED 8-13-84 RESUMED 8-14-84 |
| 12 | BROWN SILTY FINE TO MEDIUM SAND, MEDIUM DENSITY, SATURATED BELOW APPROX. 13'. (FILL?) | | | | | | |
| 13 | | | | | | | SATURATED MATERIAL FIRST ENCOUNTERED @ APPROX. 13' |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| | Boring No. D-81 |
| Project Name WESTLAKE | Page 2 of 4 |
| Project No. 84-075-4-002 | Date 8-13-84 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 15 | BROWN SILTY FINE TO MEDIUM SAND, MEDIUM DENSE SATURATED BELOW APPROX. 13' (FILL(?) | | 3/5/7 | 14"/18" | 15.0 | SS-2 | BEGAN 4½" DIA. TRI-CONE, WASH BORING @ 15'. CONTINUED TO 61.5'. |
| 16 | | | | | 16.5 | | |
| 17 | | | | | | | |
| 18 | BROWN FINE TO MEDIUM SAND, WELL SORTED, SUBROUNDED GRAINS, MEDIUM DENSITY, SATURATED | | | | | | |
| 19 | | | | | | | |
| 20 | | | 6/10/16 | 10"/18" | 20.0 | SS-3 | |
| 21 | | | | | 21.5 | | |
| 22 | | | | | | | |
| 23 | | | | | | | |
| 24 | | | | | | | |
| 25 | | | 9/14/15 | 10"/18" | 25.0 | SS-4 | |
| 26 | | | | | 26.5 | | |
| 27 | | | | | | | |
| 28 | GRAY FINE SAND, TRACE SILT, SAND IS HIGHLY QUARTZOSE, MEDIUM DENSE, SATURATED | | | | | | |
| 29 | | | | | | | |
| 30 | | | 10/12/5 | 11"/18" | 30.0 | SS-5a | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

Boring No. D-81
Page 3 of 4
Project Name WESTLAKE
Date 8-13-84
Project No. 84-075-4-002

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 32 | GRAY SILTY CLAY MEDIUM TO HIGH PLASTICITY, STIFF TO MEDIUM STIFF, MOIST TO SATURATED | | | | 31.5 | SS-5 | |
| 33 | | | | | | | |
| 34 | GRAY SILT AND SAND INTERBEDS, SILT IS LOW PLASTICITY, VERY LOOSE, SATURATED | | | | | | |
| 35 | | | *0/1/4 | *0"/18" | 35.0 | SS-6 | *NOTE: RODS SUNK 6" WHEN SAMPLE SS-6 WAS FIRST ATTEMPTED. NO RECOVERY ON FIRST ATTEMPT SO RODS WERE DROPPED BACK DOWN THE HOLE AND A SAMPLE OBTAINED. |
| 36 | | | | | 36.5 | | |
| 37 | | | | | | | |
| 38 | | | | | | | |
| 39 | | | | | | | |
| 40 | | | | 18"/18" | 40.0 | ST-7 | $Q_p$ = N.A. |
| 41 | | | | | 41.5 | | |
| 42 | GRAY FINE TO COARSE SD, SUBANGULAR TO SUBROUND GRAINS, HIGHLY QUARTZ, SATURATED | | | | | | |
| 43 | | | | | | | |
| 44 | GRAY SAND AND GRAVEL MAX.) SATURATED | | | | | | |
| 45 | GRAY COARSE SAND, SOME MEDIUM AND FINE, SUBRND TO SUBANGULAR, DENSE | | 15/20/18 | 7"/18" | 45.0 | SS-8 | |
| 46 | | | | | 46.5 | | |
| 47 | (SEE DESCRIPTION BELO | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| | Boring No. D-81 |
| Project Name WESTLAKE | Page 4 of 4 |
| Project No. 84-075-4-002 | Date 8-13-84 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 49 | GRAY SAND AND FINE GRAVEL INTERBEDS, SAND IS FINE TO COARSE, SUBROUNDED, QUARTZOSE | | | | | | |
| 50 | GRAVEL IS SUBANGULAR TO SUBROUNDED, QUARTZ, FELDSPAR AND SOME MAFIC MINERALS, | | 15/18/22 | 10"/18" | 50.0 | SS-9a | ← GRAVEL |
| 51 | DENSE TO VERY DENSE, SATURATED | | | | | SS-9b | ← SAND |
| | | | | | 51.5 | | |
| 52 | | | | | | | |
| 53 | | | | | | | |
| 54 | | | | | | | |
| 55 | | | | | 55.0 | | |
| 56 | | | 13/21/37 | 9"/18" | | SS-10 | A 2" dia. PVC piezometer was installed to 60'. |
| | | | | | 56.5 | | PVC is flush-joint, threaded couplings. |
| 57 | | | | | | | |
| 58 | | | | | | | Bottom 15' is .010" machine slotted screen. |
| 59 | GRAY-BROWN FINE TO MEDIUM SAND, VERY DENSE, SATURATED | | | | | | Bottom 17.5' is gravel packed with a 3' thick bentonite pellet seal above. |
| 60 | | | | | 60.0 | | |
| 61 | | | 14/20/44 | 8"/18" | | SS-11 | Annulus is grouted from seal to ground surface. |
| | | | | | 61.5 | | T.O.P. is 3' above ground surface. |
| 62 | TOTAL DEPTH: 61.5' | | | | | | |
| 63 | | | | | | | WATER LEVEL IS @ 16.63' BELOW T.O.P. 3:05pm 8-15-83 (4 hrs. after installation) |
| 64 | | | | | | | |

# Drilling Log

| | | | |
|---|---|---|---|
| Project Name: WESTLAKE | | | Boring No. S-82 |
| Project No. 84-075-4-002 | | | Page 1 of 2 |
| Ground Elevation 447.7 | Location N. 599.1580, E. 19.3231 | | Total Footage 26.5' |

| Drilling Type | Hole Size | Overburden Footage | Bedrock Footage | No. of Samples | No. Core Boxes | Depth To Water | Date Measured |
|---|---|---|---|---|---|---|---|
| SEE REMARKS | SEE REMARKS | 26.5' | 0 | 5 | 0 | SEE REMARKS | – |

| | | | |
|---|---|---|---|
| Drilling Co. | WABASH DRILLING CO. | Driller (s) | DORL THORNTON |
| Drilling Rig. | ACKER MP-5, TRUCK | Type of Penetration Test | STANDARD |
| Date | 8-24-84 To 8-27-84 | Field Observer (s) | GLEN ERNSTMANN |

| Depth | Description | Class. | Blow Count | Recov. | | Sample or Box No. | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | BROWN SANDY CLAY, SOME GRAVEL, MEDIUM PLASTICITY, STIFF TO VERY STIFF, DAMP TO MOIST (FILL) | | | | | | 5" SOLID AUGERS 0' TO 20'. |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | 5.0 | | |
| | | | 5/4/8 | 14"/18" | | SS-1 | |
| 6 | | | | | 6.5 | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | BROWN FINE SANDY SILT, LOW TO NON-PLASTIC, STIFF, MOIST TO SATURATED | | | | | | SATURATED MATERIAL ENCOUNTERED @ 11' TO 13'. |
| 10 | | | | | 10.0 | | |
| | | | 2/3/3 | 17"/18" | | SS-2 | UNSATURATED 13' TO 17', |
| 11 | | | | | 11.5 | | |
| 12 | | | | | | | |
| 13 | LIGHT BROWN FINE TO MEDIUM SAND, DAMP | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

Boring No. S-82

Project Name WESTLAKE

Page 2 of 2

Project No. 84-075-4002

Date 8-27-84

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| | LIGHT BROWN FINE TO MEDIUM SAND, DAMP | | | | | | |
| 15 | | | | | 15.0 | | |
| | BROWN SILTY CLAY, MEDIUM PLASTICITY, VERY STIFF, MOIST | | 3/7/13 | 16"/18" | | SS-3 | |
| 16 | | | | | 16.5 | | |
| 17 | | | | | | | SATURATED MATERIAL BELOW APPROX. 17' TO 18'. |
| | BROWN-GRAY SILTY FINE TO MEDIUM SAND, MEDIUM DENSITY, SATURATED | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | CASING WAS DRIVEN TO 20' & HOLE WAS WASH-BORED FROM 20' TO 25'. |
| 20 | | | | | 20.0 | | |
| | | | 4/7/12 | 15"/18" | | SS-4 | |
| 21 | | | | | | | STOPPED 8-24-84 |
| | | | | | 21.5 | | RESUMED 8-27-84 |
| 22 | | | | | | | NOTE: HOLE HAS COLLAPSED TO 13.3' BELOW G.S. OVER THE WEEKEND. |
| 23 | | | | | | | |
| | GRAY-BROWN COARSE SAND, SOME FINE TO MEDIUM SAND, MEDIUM DENSITY, SATURATED | | | | | | |
| 24 | PRIMARILY QUARTZ, SOME CHERT FRAGMENTS AND MAFIC MINERALS | | | | | | A 2" dia. PVC piezometer was installed to 25.5' PVC is flush-jointed, threaded Couplings. |
| 25 | | | | | 25.0 | | |
| | | | 7/14/29 | 17"/18" | | SS-5a | |
| 26 | GRAY, SILTY FINE TO MED. SAND, SATURATED | | | | 26.5 | SS-5b | BOTTOM 10' IS .010" machine slotted screen. |
| 27 | TOTAL DEPTH 26.5' | | | | | | Bottom 12.5' is gravel packed with a 2' thick bentonite pellet seal above. |
| 28 | | | | | | | Anulus is grouted from seal to surface. |
| 29 | | | | | | | T.O.P. is 3.0' above ground surface. |
| 30 | | | | | | | WATER LEVEL IS 18.2' BELOW T.O.P. IMMEDIATELY AFTER PIEZOMETER INSTALLATION 1:45 pm 8-27-84. |

# Drilling Log

| | | | |
|---|---|---|---|
| Project Name: WESTLAKE | | | Boring No. D-83 |
| Project No. 89-075-4-002 | | | Page 1 of 7 |
| Ground Elevation 444.4 | Location N. 1742.7093, E. 1219.6580 | | Total Footage 115.3 |

| Drilling Type | Hole Size | Overburden Footage | Bedrock Footage | No. of Samples | No. Core Boxes | Depth To Water | Date Measured |
|---|---|---|---|---|---|---|---|
| SEE REMARKS | SEE REMARKS | 115.3 | 0 | 16 | 0 | SEE REMARKS | — |

| | | | |
|---|---|---|---|
| Drilling Co. | WABASH DRILLING CO. | Driller (s) | DORL THORNTON |
| Drilling Rig. | ACKER MP-5, TRUCK | Type of Penetration Test | STANDARD |
| Date 8-16-84 | To 8-20-84 | Field Observer (s) | GLEN ERNSTMANN |

| Depth | Description | Class. | Blow Count | Recov. | | Sample or Box No. | Remarks |
|---|---|---|---|---|---|---|---|
| | BROWN FINE SANDY SILT AND ORGANIC MATERIAL, DAMP | | | | | | 5" DIA. SOLID AUGERS 0' TO 15'. |
| 1 | | | | | | | |
| | BROWN SILTY FINE SAND, DAMP | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| | LIGHT BROWN FINE TO MEDIUM SAND, TRACE SILT, LOOSE TO MEDIUM DENSITY, DAMP SATURATED BELOW APPROX. 10.5' | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | 5.0 | | |
| | | | 3/3/3 | 17"/18" | | SS-1 | |
| 6 | | | | | | | |
| | | | | | 6.5 | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| | | | | | | | SATURATED MATERIAL ENCOUNTERED @ APPROX. 10.5' |
| 10 | | | | | 10.0 | | |
| | | | 3/4/8 | 16"/18" | | SS-2 | |
| 11 | | | | | | | |
| | | | | | 11.5 | | |
| 12 | | | | | | | |
| 13 | LIGHT BROWN FINE SAND INTERBEDDED WITH THIN (3" TO 6") CLAY SEAMS, SATURATED | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

Boring No. D-83
Project Name WESTLAKE
Page 2 of 7
Project No. 84-075-4-002
Date 8-16-84

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| | LIGHT BROWN FINE SAND INTERBEDDED WITH THIN (3" TO 6") CLAY SEAMS, SATURATED | | | | | | BEGAN 4½" DIA. TRI-CONE WASH BORING @ 15' TO 115.3'. |
| 15 | | | | | 15.0 | | |
| | BROWN SILTY CLAY, MEDIUM PLASTICITY, MOIST | | 4/10/15 | 15"/18" | | SS-3a | |
| 16 | LIGHT BROWN FINE TO MEDIUM SAND, TRACE SILT, MEDIUM DENSITY, SATURATED | | | | | SS-3b | STOPPED 8-16-84 |
| | | | | | 16.5 | | RESUMED 8-17-84 |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | FINE TO COARSE SAND AND FINE GRAVEL, SATURATED | | | | | | |
| 20 | | | | | 20.0 | | |
| | BROWN TO GRAY FINE TO MEDIUM SAND, TRACE SILT, DENSE, SATURATED | | 14/19/24 | 15"/18" | | SS-4 | |
| 21 | | | | | 21.5 | | |
| 22 | | | | | | | |
| 23 | | | | | | | |
| | GRAY-BROWN MEDIUM TO COARSE SAND, SOME FINE SAND, FEW THIN (3" TO 8" THICK) FINE GRAVEL SEAMS (3/4" MAX. DIA.), MEDIUM DENSE | | | | | | |
| 24 | | | | | | | |
| 25 | | | | | 25.0 | | |
| | SAND IS PRIMARILY QUARTZ, SOME FELDSPAR AND MAFIC MINERALS, SUBROUNDED TO SUBANGULAR GRAINS | | 9/10/10 | 13"/18" | | SS-5 | |
| 26 | | | | | 26.5 | | |
| 27 | | | | | | | |
| 28 | | | | | | | |
| 29 | | | | | | | |
| 30 | | | | | 30.0 | | |
| | GRAY FINE TO MEDIUM SAND, TRACE SILT AND COARSE SAND, PRIMARILY QUARTZ, DENSE, SATURATED | | 10/15/17 | 8"/18" | | SS-6 | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| Boring No. | D-83 |
| Project Name | WESTLAKE |
| Page | 3 of 7 |
| Project No. | 84-075-4-002 |
| Date | 8-16-84 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| | | | | | 31.5 | SS-6 | |
| 32 | GRAY FINE TO MEDIUM SAND, TRACE SILT AND COARSE SAND, PRIMARILY QUARTZ SAND, DENSE, SATURATED | | | | | | |
| 33 | | | | | | | |
| 34 | | | | | | | |
| 35 | | | | | 35.0 | | |
| | | | 9/15/21 | 9"/18" | | SS-7 | |
| 36 | | | | | 36.5 | | |
| 37 | | | | | | | |
| 38 | | | | | | | |
| 39 | GRAY-BROWN MEDIUM TO COARSE SAND, FEW FINE GRAVEL SEAMS, PRIMARILY QUARTZ, WITH SOME FELDSPAR, SUBROUNDED TO SUBANGULAR GRAINS, DENSE, SATURATED | | | | | | |
| 40 | | | | | 40.0 | | |
| | | | 10/13/17 | 8"/18" | | SS-8 | |
| 41 | | | | | 41.5 | | |
| 42 | | | | | | | |
| 43 | | | | | | | |
| 44 | GRAY-BROWN FINE TO COARSE SAND AND FINE TO COARSE GRAVEL (3" MAX. DIA.), QUARTZ, FELDSPAR, AND MAFIC MINERALS, SUBANGULAR GRAINS, MEDIUM DENSE, SATURATED | | | | | | |
| 45 | | | | | 45.0 | | |
| | | | 12/10/11 | 9"/18" | | SS-9 | |
| 46 | | | | | 46.5 | | |
| 47 | | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| | Boring No. D-83 |
| Project Name WESTLAKE | Page 4 of 7 |
| Project No. 84-075-4-002 | Date 8-16-84 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| | GRAY-BROWN FINE TO COARSE SAND AND FINE TO COARSE GRAVEL AS DESCRIBED ABOVE | | | | | | |
| 49 | | | | | | | |
| | GRAY FINE TO COARSE SAND, MEDIUM DENSITY, SATURATED | | | | 50.0 | | |
| 50 | | | 4/7/11 | 8"/18" | | SS-10 | |
| 51 | | | | | 51.5 | | |
| 52 | | | | | | | |
| 53 | | | | | | | |
| 54 | | | | | | | |
| 55 | | | | | | | |
| 56 | | | | | | | |
| 57 | | | | | | | |
| 58 | | | | | | | |
| | SAND AND GRAVEL, SATURATED | | | | | | |
| 59 | | | | | | | |
| 60 | | | | | 60.0 | | |
| | GRAY SILTY FINE TO MEDIUM SAND, PRIMARILY QUARTZ, VERY DENSE, SATURATED | | 35/50/5" | 7"/11" | | SS-11 | |
| 61 | | | | | 60.9 | | |
| 62 | SEVERAL THIN (3" TO 6" THICK) FINE TO COARSE GRAVEL SEAMS | | | | | | |
| 63 | | | | | | | |
| 64 | | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| | Boring No. D-83 |
| Project Name WESTLAKE | Page 5 of 7 |
| Project No. 84-075-4-002 | Date 8-16-84 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 66 | GRAY SILTY FINE TO MEDIUM SAND, PRIMARILY QUARTZ, VERY DENSE | | | | | | |
| 67 | | | | | | | |
| 68 | SEVERAL THIN (3" TO 6" THICK) FINE TO COARSE GRAVEL SEAMS AND COARSE SAND SEAMS | | | | | | |
| 69 | | | | | | | |
| 70 | | | 14/19/22 | 7"/18" | 70.0 | SS-12 | |
| 71 | | | | | 71.5 | | |
| 72 | | | | | | | |
| 73 | | | | | | | |
| 74 | | | | | | | |
| 75 | | | | | | | |
| 76 | | | | | | | |
| 77 | GRAY-BROWN COARSE SAND, SOME FINE TO MEDIUM SAND AND FINE GRAVEL, QUARTZ, FELDSPAR AND SOME MAFIC MINERALS, SUBROUNDED, MEDIUM DENSITY TO DENSE, SATURATED | | | | | | NOTE: SLIGHT ORGANIC OR LEACHATE-LIKE ODOR IN SAMPLES. SS-12 & SS-13 |
| 78 | | | | | | | |
| 79 | | | | | | | |
| 80 | | | 13/14/14 | 8"/18" | 80.0 | SS-13 | |
| 81 | | | | | 81.5 | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| | Boring No. D-83 |
| Project Name WESTLAKE | Page 6 of 7 |
| Project No. 84-075-4-002 | Date 8-16-84 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 83 | | | | | | | |
| 84 | GRAY-BROWN COARSE SAND, SOME FINE TO MEDIUM SAND AND FINE GRAVEL, QUARTZ FELDSPAR, AND SOME MAFIC MINERALS, SUBROUNDED, MEDIUM DENSITY TO DENSE, SATURATED | | | | | | |
| 85 | | | | | | | |
| 86 | | | | | | | |
| 87 | | | | | | | |
| 88 | | | | | | | |
| 89 | | | | | | | |
| 90 | | | | | 90.0 | | NOTE: MODERATE TO STRONG LEACHATE-LIKE ODOR IN SAMPLE SS-14 |
| 91 | | | 14/16/17 | 8"/18" | | SS-14 | |
| 92 | OCCASIONAL GRAVEL SEAM (3" TO 4" THICK), 92' TO 104'. | | | | 91.5 | | |
| 93 | | | | | | | |
| 94 | | | | | | | |
| 95 | | | | | | | |
| 96 | | | | | | | |
| 97 | | | | | | | |
| 98 | | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| | Boring No. D-83 |
| Project Name WESTLAKE | Page 7 of 7 |
| Project No. 84-075-4-002 | Date 8-16-84 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 100 | GRAY-BROWN COARSE SAND, SOME FINE TO MEDIUM SAND AND FINE GRAVEL, QUARTZ, FELDSPAR AND SOME MAFIC MINERALS, SUBROUNDED, MEDIUM DENSE TO DENSE, SATURATED | | 18/26/26 | 9" 18" | 100.0 | SS-15 | SLOWER DRILLING RATE 90' TO 100'. |
| 101 | | | | | 101.5 | | STOPPED 8-17-84 RESUMED 8-20-84 |
| 102 | OCCASIONAL GRAVEL SEAM (3" TO 4" THICK), 92' TO 104'. | | | | | | |
| 103 | | | | | | | |
| 104 | | | | | | | MUCH SLOWER DRILLING RATE 100' TO 115.3'. |
| 105 | | | | | | | A 2" dia. PVC piezometer was installed to 97'. PVC is flush-jointed, threaded couplings. Bottom 20' is .010" machine slotted screen. |
| 106 | | | | | | | |
| 107 | | | | | | | Gravel 115.3' to 100'. Bentonite pellets 100' to 99'. Gravel pack 99' to 75.5' with a 2' thick bentonite pellet seal above. Annulus is grouted from seal to ground surface. |
| 108 | | | | | | | |
| 109 | | | | | | | |
| 110 | | | 24/22/27 | 3" 18" | 110.0 | SS-16 | T.O.P. is 3.2' above ground surface. |
| 111 | GRAVEL AND SAND, SOME SILT, DENSE, SATURATED | | | | 111.5 | | |
| 112 | | | | | | | |
| 113 | | | | | | | |
| 114 | | | | | | | WATER LEVEL IMMEDIATELY AFTER PIEZOMETER INSTALLED (2:05 pm 8-21-84) is 14.50' BELOW T.O.P. |
| 115 | CREAM LIMESTONE | | | | | | |
| | TOTAL DEPTH 115.3' | | | | | | |

# Drilling Log

| | | | |
|---|---|---|---|
| Project Name: WESTLAKE | | | Boring No. 5-84 |
| Project No.: 84-075-4-002 | | | Page 1 of 3 |
| Ground Elevation: 452.9 | Location: N. 340.0038, E. 1998.2729 | | Total Footage: 31.5' |

| Drilling Type | Hole Size | Overburden Footage | Bedrock Footage | No. of Samples | No. Core Boxes | Depth To Water | Date Measured |
|---|---|---|---|---|---|---|---|
| SEE REMARKS | 5" | 31.5 | 0 | 4 | 0 | SEE REMARKS | — |

| | | | |
|---|---|---|---|
| Drilling Co. | WABASH DRILLING CO. | Driller (s) | DORL THORNTON |
| Drilling Rig. | ACKER MP-5, TRUCK | Type of Penetration Test | STANDARD |
| Date | 8-24-84 To 8-24-84 | Field Observer (s) | GLEN ERNSTMANN |

| Depth | Description | Class. | Blow Count | Recov. | | Sample or Box No. | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | LIGHT BROWN SAND, SILT AND GRAVEL, DAMP TO DRY (FILL) | | | | | | 5" DIA. SOLID AUGERS 0' TO 30'. |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | GREENISH GRAY TO DARK GRAY SILTY FINE SAND, VERY LOOSE, DAMP (FILL) | | | | | | |
| 5 | | | | | 5.0 | | |
| 6 | | | 2/2/2 | 18"/18" | | SS-1 | |
| | | | | | 6.5 | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | FEW THIN SATURATED SANDY ZONES BELOW 13'. |
| 12 | GREENISH GRAY SILTY FINE SAND, ZONES OF DARK GRAY CLAYEY SILT, MOIST TO SATURATED (FILL) | | | | | | |
| 13 | | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| | Boring No. S-84 |
| Project Name WESTLAKE | Page 2 of 3 |
| Project No. 84-075-4-002 | Date 8-24-84 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 15 | | | | | 15.0 | | |
| 16 | GREENISH GRAY SILTY FINE SAND, ZONES OF DARK GRAY CLAYEY SILT, MOIST TO SATURATED (FILL) | | | 24"/24" | | ST-2 | $Q_p$ = N.A. |
| 17 | | | | | 17.0 | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | | | | | ALL MATERIAL SATURATED BELOW APPROX. 20'. |
| 21 | | | | | | | |
| 22 | | | | | | | |
| 23 | GRAY-BROWN FINE TO MEDIUM SAND, TRACE SILT, MEDIUM DENSE | | | | | | |
| 24 | | | | | | | |
| 25 | | | | | 25.0 | | |
| 26 | | | 9/9/12 | 18"/18" | | SS-3 | |
| | | | | | 26.5 | | |
| 27 | | | | | | | |
| 28 | | | | | | | APPROX. 6 FT. OF SLOUGH IN HOLE WHEN SAMPLE SS-4 WAS FIRST ATTEMPTED. |
| 29 | GRAY MEDIUM TO COARSE SAND, MEDIUM DENSITY, SATURATED | | | | | | CASING WAS DRIVEN TO 30' THEN SLOUGH WASH-BORED OUT W/ TRICONE BIT. |
| 30 | | | | | 30.0 | | NO BENTONITE WAS USED. |
| | | | 5/6/9 | 12"/18" | | SS-4 | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| | Boring No. S-84 |
| Project Name WESTLAKE | Page 3 of 3 |
| Project No. 84-075-4-002 | Date 8-24-84 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| | (SEE ABOVE) | | | | 31.5 | SS-4 | |
| 32 | TOTAL DEPTH 31.5' | | | | | | |
| 33 | | | | | | | A 2" dia. PVC piezometer was installed to 30.9'. |
| 34 | | | | | | | PVC is flush-jointed, threaded couplings. Bottom 10' is .010" machine slotted screen. |
| 35 | | | | | | | |
| 36 | | | | | | | Gravel pack 31.5' to 20.0' with a 1.8' thick bentonite pellet seal above. |
| 37 | | | | | | | |
| 38 | | | | | | | Anulas is grouted from seal to ground surface. |
| 39 | | | | | | | T.O.P. is 4.0 above ground surface. |
| 40 | | | | | | | |
| | | | | | | | WATER LEVEL IMMEDIATELY AFTER PIEZOMETER INSTALLATION IS 23.7' BELOW T.O.P. 12:20pm 8-24-84. |
| | | | | | | | WATER LEVEL IS 23.91' BELOW T.O.P. 7:15am 8-27-84 |

# Drilling Log

| | | | |
|---|---|---|---|
| Project Name | WESTLAKE | Boring No. | D - 85 |
| Project No. | 84-075-4-002 | Page | 1 of 6 |
| Ground Elevation | 453.1 | Location | N. 340.5414, E. 1986.8430 |
| Total Footage | 84.1' | | |

| Drilling Type | Hole Size | Overburden Footage | Bedrock Footage | No. of Samples | No. Core Boxes | Depth To Water | Date Measured |
|---|---|---|---|---|---|---|---|
| SEE REMARKS | SEE REMARKS | 83.5 | 0.6 | 12 | 0 | SEE REMARKS | — |

| | | | |
|---|---|---|---|
| Drilling Co. | WABASH DRILLING CO. | Driller (s) | DORL THORNTON |
| Drilling Rig. | ACKER MP-5, TRUCK | Type of Penetration Test | STANDARD |
| Date | 8-21-84 To 8-22-84 | Field Observer (s) | GLEN ERNSTMANN |

| Depth | Description | Class. | Blow Count | Recov. | | Sample or Box No. | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | LIGHT BROWN SAND, SILT AND GRAVEL, DAMP TO DRY (FILL) | | | | | | 5" SOLID AUGERS 0' TO 10' |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | GREENISH-GRAY TO DARK GRAY SILTY FINE SAND, VERY LOOSE, DAMP (FILL) | | | | | | |
| 5 | | | | | 5.0 | | |
| | | | 3/2/3 | 7"/18" | | SS-1 | |
| 6 | | | | | 6.5 | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | 10.0 | | 4½" TRI-CONE WASH BORE 10.0' TO 84.1'. |
| | | | 1/1/1 | 18"/18" | | SS-2 | |
| 11 | | | | | 11.5 | | STOPPED 8-21-84 RESUMED 8-22-84 |
| 12 | | | | | | | |
| 13 | GRAY CLAYEY SILT, AND FINE SAND, LOW PLASTICITY, STIFF, MOIST (FILL) | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

Boring No. D-85

Project Name WESTLAKE

Page 2 of 6

Project No. 84-075-4-002

Date 8-21-84

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 15 | GRAY CLAYEY SILT, AND FINE SAND, LOW PLASTICITY, STIFF, MOIST (FILL) | | 3/4/5 | 12"/18" | 15.0 | SS-3 | |
| 16 | | | | | 16.5 | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | 2/4/4 | 10"/18" | 20.0 | SS-4 | |
| 21 | | | | | 21.5 | | SATURATED MATERIAL ENCOUNTERED BETWEEN 18' AND 25'. |
| 22 | GRAY-BROWN SILTY FINE SAND, MOIST TO SATURATED | | | | | | |
| 23 | | | | | | | |
| 24 | | | | | | | |
| 25 | | | | | 25.0 | | |
| 26 | | | | 17"/18" | | ST-5 | $Q_p$ = NOT OBTAINABLE |
| | | | | | 26.5 | | |
| 27 | GRAY FINE TO COARSE SAND, TRACE SILT, MEDIUM DENSE TO VERY DENSE, SATURATED | | | | | | |
| 28 | PRIMARILY SUBROUNDED QUARTZ GRAINS | | | | | | |
| 29 | | | | | | | |
| 30 | | | 50/10/10 | 10"/18" | 30.0 | SS-6 | |

# Drilling Log, continued

| | |
|---|---|
| Boring No. | D-85 |
| Project Name | WESTLAKE |
| Page | 3 of 6 |
| Project No. | 84-075-4-002 |
| Date | 8-21-84 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| | GRAY FINE TO COARSE SAND, TRACE SILT, MEDIUM DENSE TO VERY DENSE, SATURATED | | | | 31.5 | SS-6 | |
| 32 | | | | | | | |
| | PRIMARILY SUBROUNDED QUARTZ GRAINS | | | | | | |
| 33 | | | | | | | |
| 34 | | | | | | | |
| 35 | | | | | 35.0 | | |
| | | | 21/27/26 | 13"/18" | | SS-7 | |
| 36 | | | | | 36.5 | | |
| 37 | | | | | | | |
| 38 | | | | | | | |
| 39 | | | | | | | |
| 40 | GRAY TO GRAY-BROWN COARSE SAND, SOME FINE TO MEDIUM SAND, FEW FINE GRAVELLY GRAMS, DENSE, SATURATED | | | | 40.0 | | |
| | | | 16/23/21 | 8"/18" | | SS-8 | |
| 41 | | | | | 41.5 | | |
| 42 | | | | | | | |
| 43 | | | | | | | |
| 44 | | | | | | | |
| 45 | | | | | | | |
| 46 | | | | | | | |
| 47 | | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

Boring No. D-85

Project Name: WESTLAKE

Page 4 of 6

Project No. 84-075-4-002

Date 8-21-84

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 49 | GRAY TO GRAY-BROWN COARSE SAND, SOME FINE TO MEDIUM SAND, FEW FINE GRAVELLY SEAMS, DENSE, SATURATED | | | | | | |
| 50 | GREENISH GRAY TO GRAY FINE TO MEDIUM SAND, TRACE SILT AND COARSE SAND, VERY DENSE, TO DENSE, SATURATED | | 26/34/24 | 13"/18" | 50.0 | SS-9 | |
| 51 | 90% QUARTZ, SUBROUNDED TO SUBANGULAR | | | | 51.5 | | |
| 52 | | | | | | | |
| 53 | | | | | | | |
| 54 | | | | | | | |
| 55 | | | | | | | |
| 56 | | | | | | | |
| 57 | | | | | | | |
| 58 | | | | | | | |
| 59 | | | | | | | |
| 60 | | | 14/16/22 | 8"/18" | 60.0 | SS-10 | |
| 61 | | | | | 61.5 | | |
| 62 | | | | | | | |
| 63 | | | | | | | |
| 64 | | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| | Boring No. D-85 |
| Project Name WESTLAKE | Page 5 of 6 |
| Project No. 84-075-4-002 | Date 8-21-84 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 66 | GREENISH GRAY TO GRAY FINE TO MEDIUM SAND, TRACE SILT AND COARSE SAND, VERY DENSE TO DENSE, SATURATED | | | | | | |
| 67 | 90% QUARTZ, SUBROUNDED TO SUBANGULAR | | | | | | |
| 68 | | | | | | | |
| 69 | | | | | | | |
| 70 | | | | | 70.0 | | |
| | | | 17/20/27 | 16"/18" | | SS-11 | |
| 71 | | | | | 71.5 | | |
| 72 | | | | | | | |
| 73 | | | | | | | |
| 74 | | | | | | | |
| 75 | | | | | | | |
| 76 | | | | | | | |
| 77 | | | | | | | |
| 78 | | | | | | | |
| 79 | | | | | | | |
| 80 | | | | | 80.0 | | |
| | | | 17/21/34 | 15"/18" | | SS-12 | VERY SLIGHT LEACHATE LIKE OR ORGANIC ODOR |
| 81 | | | | | 81.5 | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| | Boring No. D-85 |
| Project Name WESTLAKE | Page 6 of 6 |
| Project No. 84-075-4-002 | Date 8-21-84 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| | GRAVEL, COBBLES AND SAND, SATURATED | | | | | | |
| 83 | | | | | | | |
| | CREAM TO LIGHT BROWN LIMESTONE | | | | | | A 2" dia. PVC piezometer was installed to 82'. |
| 84 | | | | | | | |
| | TOTAL DEPTH 84.1' | | | | | | PVC is flush-jointed, threaded couplings. |
| 85 | | | | | | | |
| | | | | | | | Bottom 20' is .010" machine slotted screen. |
| 86 | | | | | | | |
| | | | | | | | Gravel pack from 84.1' to 59.7' with a 2.2' thick bentonite pellet seal above. |
| 87 | | | | | | | |
| 88 | | | | | | | |
| | | | | | | | Anulus is grouted from seal to ground surface. |
| 89 | | | | | | | |
| 90 | | | | | | | T.O.P. is 3.0' above ground surface. |
| | | | | | | | WATER LEVEL IMMEDIATELY AFTER PIEZOMETER INSTALLATION 20.05' BELOW T.O.P. 10:00am 8-24-84 |
| | | | | | | | WATER LEVEL IS 24.09' BELOW T.O.P. 7:15am 8-27-84. |

# Drilling Log

| Project Name | Boring No. |
|---|---|
| WESTLAKE | D - 87 |
| Project No. 84-075-4-002 | Page 1 of 7 |
| Ground Elevation 460.0 | Location N 114.45, E. 903.6487 |
| Total Footage 111.7 | |

| Drilling Type | Hole Size | Overburden Footage | Bedrock Footage | No. of Samples | No. Core Boxes | Depth To Water | Date Measured |
|---|---|---|---|---|---|---|---|
| SEE REMARKS | 5" @ THE SURFACE | 111.0 | 0.7 | 22 | 0 | SEE REMARKS | — |

| | | | |
|---|---|---|---|
| Drilling Co. | WABASH DRILLING CO. | Driller (s) | DORL THORNTON |
| Drilling Rig. | ACKER MP-5, TRUCK | Type of Penetration Test | STANDARD |
| Date 8-9-84 | To 8-10-84 | Field Observer (s) | GLEN ERNSTMANN |

| Depth | Description | Class. | Blow Count | Recov. | | Sample or Box No. | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | LIGHT BROWN FINE TO COARSE SAND, SOME SILT AND GRAVEL, DAMP (FILL) | | | | | | 5" SOLID AUGERS 0' TO 30.0' |
| 2 | LIGHT GRAY GRAVEL (2" MAX. DIA.), SOME SAND, VERY DENSE, DAMP (FILL) | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | 50/3" | 2"/3" | 5.0 / 5.3 | SS-1 | |
| 6 | MOTTLED LIGHT GRAY TO DARK GRAY TO BROWN SANDY SILTY CLAY, MEDIUM PLASTICITY, STIFF, MOIST (FILL | | | | | | |
| 7 | TRACE GRAVEL (2" MAX. DIA.) | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | 2/3/4 | 12"/18" | 10.0 | SS-2 | |
| 11 | | | | | 11.5 | | |
| 12 | | | | | | | |
| 13 | | | | | | | |

# Drilling Log, continued

| | |
|---|---|
| | Boring No. D-87 |
| Project Name WESTLAKE | Page 2 of 7 |
| Project No. 84-075-4-002 | Date 8-9-84 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 15 | MOTTLED LIGHT GRAY TO DARK GRAY TO BROWN SANDY, SILTY CLAY, MEDIUM PLASTICITY, STIFF MOIST (FILL | | | | 15.0 | | |
| 16 | TRACE GRAVEL (2" MAX. DIA.) | | | 23"/24" | | ST-3 | $Q_p$ = 1.5 TSF |
| 17 | | | | | 17.0 | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | DARK GRAY SILTY CLAY, MEDIUM TO HIGH PLASTICITY, VERY STIFF, MOIST | | | | 20.0 | | |
| 21 | | | | 21"/24" | | ST-4 | $Q_p$ = 2.75 TSF |
| 22 | | | | | 22.0 | | |
| 23 | | | | | | | |
| 24 | DARK GRAY SANDY SILT AND SILTY SAND INTERBEDS, SAND IS FINE TO MEDIUM, LOW TO NON-PLASTIC, WET TO SATURATED | | | | | | |
| 25 | | | | | 25.0 | | |
| 26 | | | | 4"/24" | | ST-5 | $Q_p$ = N.A. |
| 27 | | | | | 27.0 | | SATURATED MATERIAL FIRST ENCOUNTERED @ APPROXIMATELY 27.0' BELOW G.S. |
| 28 | | | | | | | |
| 29 | | | | | | | |
| 30 | BROWN TO GRAY-BROWN SILTY FINE SAND, MEDIUM DENSE SATURATED, SLIGHTLY MICACEOUS | | 3/7/8 | 10"/18" | 30.0 | SS-6 | |

# Drilling Log, continued

| | |
|---|---|
| Project Name | WEST LAKE |
| Project No. | 84-075-4-002 |
| Boring No. | D-87 |
| Page | 3 of 7 |
| Date | 8-9-84 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| | BROWN TO GRAY-BROWN SILTY FINE SAND, MEDIUM DENSE SATURATED SLIGHTLY MICACEOUS | | | | 31.5 | SS-6 | NOTE: HOLE COLLAPSED TO 26.7' AFTER SAMPLE SS-6 WAS OBTAINED. NO FREE WATER OCCURS ABOVE THIS DEPTH. BEGAN ROTARY WASH BORING W/ 4½" DIA. TRI-CONE BIT @ 30.0' |
| 32 | | | | | | | |
| 33 | | | | | | | |
| 34 | | | | | | | |
| | BROWN FINE TO MEDIUM SAND, TRACE SILT, HIGHLY QUARTZOSE, DENSE, SATURATED | | | | 35.0 | | |
| 35 | | | 12/14/20 | 4"/18" | | SS-7 | |
| 36 | | | | | 36.5 | | |
| 37 | | | | | | | |
| 38 | LIGHT BROWN FINE TO COARSE SAND INTERBEDDED WITH THIN (3" TO 10" THICK) GRAVEL SEAMS, TRACE SILT, DENSE TO VERY DENSE, SATURATED | | | | | | |
| 39 | | | | | | | |
| 40 | | | | | 40.0 | | |
| 41 | | | 15/25/25 | 8"/18" | | SS-8 | |
| | | | | | 41.5 | | |
| 42 | | | | | | | |
| 43 | | | | | | | |
| 44 | | | | | | | |
| 45 | | | | | 45.0 | | |
| 46 | | | 17/23/14 | 8"/18" | | SS-9 | |
| | | | | | 46.5 | | |
| 47 | | | | | | | |

# Drilling Log, continued

| | |
|---|---|
| | Boring No. D-87 |
| Project Name WESTLAKE | Page 4 of 7 |
| Project No. 84-075-4-002 | Date 8-9-84 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 49 | LIGHT BROWN FINE TO COARSE SAND INTERBEDDED WITH THIN (3" TO 10" THICK) GRAVEL SEAMS, TRACE SILT, DENSE TO VERY DENSE, SATURATED | | | | | | |
| 50 | | | 14/24/50 | 10"/18" | 50.0 | SS-10 | |
| 51 | | | | | 51.5 | | |
| 52 | DARK GREENISH GRAY FINE TO MEDIUM SAND, TRACE SILT, DENSE TO VERY DENSE, SATURATED | | | | | | |
| 53 | | | | | | | |
| 54 | | | | | | | |
| 55 | | | 12/17/23 | 9"/18" | 55.0 | SS-11 | |
| 56 | | | | | 56.5 | | |
| 57 | | | | | | | |
| 58 | | | | | | | |
| 59 | | | | | | | |
| 60 | | | 33/35/50/4" | 12"/18" | 60.0 | SS-12 | |
| 61 | | | | | 61.5 | | |
| 62 | | | | | | | |
| 63 | | | | | | | |
| 64 | | | | | | | |

# Drilling Log, continued

| | |
|---|---|
| | Boring No. D-87 |
| Project Name WESTLAKE | Page 5 of 7 |
| Project No. 84-075-4-002 | Date 8-9-84 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| | GREENISH DARK GRAY FINE TO MEDIUM SAND, TRACE SILT, DENSE TO VERY DENSE, SATURATED | | 24/25/36 | 13"/18" | 65.0 | SS-13 | |
| 66 | | | | | 66.5 | | STOPPED 8-9-84 RESUMED 8-10-84 |
| 67 | | | | | | | |
| 68 | | | | | | | |
| 69 | | | | | | | |
| 70 | | | 30/23/24 | 14"/18" | 70.0 | SS-14 | |
| 71 | | | | | 71.5 | | |
| 72 | | | | | | | |
| 73 | | | | | | | |
| 74 | | | | | | | |
| 75 | GRAY TO DARK GREENISH GRAY FINE TO COARSE SAND, HIGHLY QUARTZOSE, SUBROUNDED GRAINS, VERY DENSE TO MEDIUM DENSE, SATURATED FEW THIN (3" TO 6") GRAVEL SEAMS | | 22/29/34 | 14"/18" | 75.0 | SS-15 | |
| 76 | | | | | 76.5 | | |
| 77 | | | | | | | |
| 78 | | | | | | | |
| 79 | | | | | | | |
| 80 | | | | | 80.0 | | |
| 81 | | | 27/37/26 | 11"/18" | 81.5 | SS-16 | |

# Drilling Log, continued

| | |
|---|---|
| Boring No. | D-87 |
| Project Name | WESTLAKE |
| Page | 6 of 7 |
| Project No. | 84-075-4-002 |
| Date | 8-9-84 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 83 | GRAY TO DARK GREENISH GRAY FINE TO COARSE SAND, HIGHLY QUARTZOSE, SUBROUNDED GRAINS, VERY DENSE TO MEDIUM DENSE, SATURATED | | | | | | |
| 84 | | | | | | | |
| 85 | FEW THIN (3" TO 6" THICK) GRAVEL SEAMS AT INTERVALS OF 1' TO 5'. | | 15/16/14 | 9"/18" | 85.0 | SS-17 | |
| 86 | | | | | 86.5 | | |
| 87 | | | | | | | |
| 88 | NOTE: SAND IS PREDOMINANTLY COARSE WITH TRACE FINE GRAVEL THROUGHOUT BELOW APPROXIMATELY 88'. | | | | | | |
| 89 | | | | | | | |
| 90 | | | 15/17/22 | 8"/18" | 90.0 | SS-18 | |
| 91 | | | | | 91.5 | | |
| 92 | | | | | | | |
| 93 | | | | | | | |
| 94 | | | | | | | |
| 95 | | | 14/15/18 | 7"/18" | 95.0 | SS-19 | |
| 96 | | | | | 96.5 | | |
| 97 | | | | | | | |
| 98 | | | | | | | |

# Drilling Log, continued

| | |
|---|---|
| | Boring No. D-87 |
| Project Name WESTLAKE | Page 7 of 7 |
| Project No. 84-075-4-002 | Date 8-9-84 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 100 | GRAY TO DARK GREENISH GRAY FINE TO COARSE SAND, HIGHLY QUARTZOSE SUBROUNDED GRAINS, VERY DENSE TO MEDIUM DENSE, SATURATED | | 24/50/6" | 6"/12" | 100.0 | SS-20 | |
| 101 | | | | | 101.0 | | |
| 102 | FEW THIN (3" TO 6" THICK) GRAVEL SEAMS AT INTERVALS OF ROUGHLY 1' TO 5'. | | | | | | |
| 103 | NOTE = SAND IS PREDOMINANTLY COARSE WITH TRACE FINE GRAVEL THROUGHOUT BELOW APPROXIMATELY 88'. | | | | | | |
| 104 | | | | | | | A 2" dia. PVC piezometer was installed to 111'. |
| 105 | | | 24/31/48 | 9"/18" | 105.0 | SS-21 | PVC is flush-joint, threaded couplings. |
| 106 | | | | | 106.5 | | Bottom 20' is .010" machine slotted screen. |
| 107 | | | | | | | |
| 108 | | | | | | | Bottom 24' is gravel packed with a 3' thick bentonite pellet seal above. |
| 109 | | | | | | | Annulus is grouted from seal to ground surface. |
| 110 | | | 17/30/50/4" | 10"/16" | 110.0 | SS-22a | T.O.P. is 3' above ground surface. |
| 111 | GRAY TO CREAM LIMESTONE, MEDIUM STRONG TO STRONG, SLIGHTLY TO MODERATELY WEATHERED | | | | 111.3 | SS-22b | |
| 112 | | | | | | | 111.7' |
| 113 | TOTAL DEPTH 111.7' | | | | | | WATER LEVEL IMMEDIATELY AFTER PIEZOMETER INSTALLATION 8-10-84 IS 4.46 BELOW T.O.P. |
| 114 | | | | | | | WATER LEVEL @ 26.05' BELOW T.O.P. 8:15am 8-14-84 |
| 115 | | | | | | | |

# Drilling Log

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project Name: WESTLAKE | | | | | | Boring No. S-88 | |
| Project No. 84-075-4-002 | | | | | | Page 1 of 3 | |
| Ground Elevation 460.0 | | Location N. 695.0461, E. 309.2279 | | | | Total Footage 41.5 | |
| Drilling Type | Hole Size | Overburden Footage | Bedrock Footage | No. of Samples | No. Core Boxes | Depth To Water | Date Measured |
| SEE REMARKS | SEE REMARKS | 41.5' | 0 | 7 | 0 | SEE REMARKS | — |

| | | | |
|---|---|---|---|
| Drilling Co. | WABASH DRILLING CO. | Driller (s) | DORL THORNTON |
| Drilling Rig. | ACKER MP-5, TRUCK | Type of Penetration Test | STANDARD |
| Date | 8-15-84 To 8-16-84 | Field Observer (s) | GLEN ERNSTMANN |

| Depth | Description | Class. | Blow Count | Recov. | | Sample or Box No. | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | GRAY TO BROWN SAND AND FINE GRAVEL, DRY TO DAMP (FILL) | | | | | | 5" DIA. SOLID AUGERS 0' TO 30'. |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | GRAVEL, SOME SAND, DAMP (FILL) | | | | | | |
| 6 | | | | | | | |
| 7 | BROWN SILT, LOW TO NON-PLASTIC, MOIST TO DAMP (FILL) | | | | | | |
| 8 | GRAVEL (1" MAX. DIA.), SOME SAND, CLAY AND LANDFILL DEBRIS, DAMP (FILL) | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | 10.0 | | |
| 11 | | | 6/14/16 | 15"/18" | | SS-1 | |
| | | | | | 11.5 | | |
| 12 | | | | | | | |
| 13 | | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| | Boring No. S-88 |
| Project Name WESTLAKE | Page 2 of 3 |
| Project No. 84-075-4-002 | Date 8-15-84 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 15 | GRAY FINE SANDY SILT, LOW PLASTICITY, MEDIUM DENSE, DAMP | | 3/4/8 | 17"/18" | 15.0 | SS-2 | |
| 16 | | | | | 16.5 | | |
| 17 | | | | | | | SATURATED SEAMS FIRST ENCOUNTERED @ APPROX. 18'. |
| 18 | FEW THIN, SATURATED SILTY FINE TO COARSE SAND SEAMS 18' TO 24'. | | | | | | |
| 19 | | | | | | | |
| 20 | | | 5/6/10 | 18"/18" | 20.0 | SS-3 | |
| 21 | | | | | 21.5 | | |
| 22 | | | | | | | MATERIAL IS SATURATED BELOW APPROX. 24' |
| 23 | | | | | | | |
| 24 | GRAY SILTY FINE TO MEDIUM SAND, FEW SANDY SILT SEAMS, SATURATED | | | | | | |
| 25 | | | *4/3/4 | 0"/24" | 25.0 | ST-4 | $Q_p$ = N.A. |
| 26 | | | | | | | NO RECOVERY ON THE SHELBY TUBE |
| 27 | | | | | 27.0 | | *A SPLIT SPOON SAMPLE WAS OBTAINED 25.0' TO 26.5' |
| 28 | | | | | | | |
| 29 | GRAY FINE TO MEDIUM SAND, TRACE SILT, LOOSE TO VERY DENSE, SATURATED | | | | | | |
| 30 | | | 3/3/5 | 18"/18" | 30.0 | SS-5 | 4½" DIA. TRI-CONE WASH BORE 30' TO 41.5' |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

Boring No. S-88

Project Name: WESTLAKE

Page 3 of 3

Project No. 84-075-4-002

Date 8-15-84

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 32 | GRAY FINE TO MEDIUM SAND QUARTZOSE, TRACE SILT, LOOSE TO VERY DENSE, SATURATED | | | | 31.5 | SS-5 | STOPPED 8-15-84 RESUMED 8-16-84 |
| 33 | | | | | | | |
| 34 | NOTE: COLOR OF SAND IS BROWN 34' TO 37'. | | | | | | |
| 35 | | | | | 35.0 | | |
| 36 | FEW THIN COARSE SAND SEAMS 37' TO 41.5'. | | 11/20/50/5½ | 12"/17½" | 36.5 | SS-6 | |
| 37 | | | | | | | |
| 38 | | | | | | | |
| 39 | | | | | | | A 2" dia. PVC piezometer was installed to 40'. PVC is flush-joint, threaded couplings. |
| 40 | | | | | 40.0 | | |
| 41 | | | 13/20/33 | 10"/18" | 41.5 | SS-7 | Bottom 10' is .010" machine slotted screen. Bottom 11' is gravel packed with a 2' thick bentonite pellet seal above. Anulus is pressure grouted from seal to ground surface. T.O.P. IS 2.7' ABOVE GROUND SURFACE |
| 42 | TOTAL DEPTH 41.5' | | | | | | |
| 43 | | | | | | | |
| 44 | | | | | | | |
| 45 | | | | | | | WATER LEVEL IS @ 29.3' BELOW T.O.P. IMMEDIATELY AFTER PIEZOMETER INSTALLATION, 11:00 8-16-84. |
| 46 | | | | | | | |
| 47 | | | | | | | |

# Drilling Log

| | | | |
|---|---|---|---|
| Project Name | WESTLAKE | Boring No. | D-89 |
| Project No. | 84-075-4-002 | Page | 1 of 4 |
| Ground Elevation | 454.1 | Location | N. 1790.5514, E. 602.6094 |
| Total Footage | 49.0' | | |

| Drilling Type | Hole Size | Overburden Footage | Bedrock Footage | No. of Samples | No. Core Boxes | Depth To Water | Date Measured |
|---|---|---|---|---|---|---|---|
| SEE REMARKS | SEE REMARKS | 47.8 | 1.2' | 8 | 0 | SEE REMARKS | — |

| | | | |
|---|---|---|---|
| Drilling Co. | WABASH DRILLING CO. | Driller (s) | DOKL THORNTON |
| Drilling Rig. | ACKER MP-5, TRUCK | Type of Penetration Test | STANDARD |
| Date | 8-27-84 To 8-28-84 | Field Observer (s) | GLEN ERNSTMANN |

| Depth | Description | Class. | Blow Count | Recov. | | Sample or Box No. | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | LIGHT GRAY TO GRAY TO BROWN SAND AND GRAVEL, SOME SILT, DAMP (FILL) | | | | | | 5" SOLID AUGERS 0' TO 25'. |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | GREENISH BROWN TO DARK GRAY SILTY CLAY AND CLAYEY SILT, LOW TO MEDIUM PLASTICITY, STIFF, DAMP TO MOIST (FILL) | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | 10.0 | | |
| 11 | NOTE: COLOR IS GREENISH BROWN WITH SOME BROWN (IRON) STAINS BELOW APPROX. 14' | | 3/2/3 | 15"/18" | | SS-1 | |
| | | | | | 11.5 | | |
| 12 | | | | | | | |
| 13 | | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

Boring No. D-89

Project Name: WESTLAKE

Page 2 of 4

Project No. 84-075-4-002

Date 8-27-84

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| | GREENISH BROWN TO DARK GRAY SILTY CLAY AND CLAYEY SILT, LOW TO MEDIUM PLASTICITY, DAMP TO MOIST, STIFF | | | | | | |
| 15 | | | | | 15.0 | | |
| | | | | 18"/24" | | ST-2 | $Q_p$ = 1.75 TSF |
| 16 | | | | | | | |
| | NOTE: COLOR IS GREENISH BROWN WITH SOME BROWN (IRON) STAINS BELOW APPROX. 14'. | | | | | | |
| 17 | | | | | 17.0 | | |
| | | | | | | | FEW THIN SATURATED ZONES 15' TO 20'. |
| 18 | | | | | | | |
| | | | | | | | MATERIAL IS SATURATED BELOW APPROX. 21'. |
| 19 | | | | | | | |
| 20 | | | | | 20.0 | | |
| | | | | 24"/24" | | | |
| 21 | | | | | | ST-3 | $Q_p$ = 1.0 TSF |
| | | | | | 22.0 | | STOPPED 8-27-84 |
| 22 | | | | | | | RESUMED 8-28-84 |
| | | | | | | | NOTE: WATER LEVEL IS 19.3' BELOW G.S. 7:00 am 8-28-84 |
| 23 | GRAY SILTY FINE TO MEDIUM SAND, SATURATED | | | | | | |
| 24 | GRAYISH SILTY CLAY, MEDIUM PLASTICITY, SATURATED | | | | | | |
| 25 | | | | | 25.0 | | |
| | | | | * 12"/24" | | ST-4 | $Q_p$ = N.A. |
| 26 | GRAY SILTY FINE TO MEDIUM SAND, MEDIUM DENSE, SATURATED | | | | | | |
| | | | | | | | * Approx. 12" of material was retained in the tube but it slipped out of the tube and was lost when brought to the surface. A Jar sample was collected. |
| 27 | | | | | 27.0 | | |
| 28 | | | | | | | |
| 29 | | | | | | | 4½" TRI-CONE WASH-BORE, 25' TO |
| 30 | | | | | 30.0 | | |
| | | | 10/12/18 | 18"/18" | | SS-5 | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| | Boring No. D-89 |
| Project Name WESTLAKE | Page 3 of 4 |
| Project No. 84-075-4-002 | Date 8-27-84 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| | | | | | 31.5 | SS-5 | |
| 32 | GRAY SILTY FINE TO MEDIUM SAND, MEDIUM DENSE, SATURATED | | | | | | |
| 33 | | | | | | | |
| 34 | GRAY FINE TO MEDIUM SAND, DENSE, SATURATED | | | | | | |
| 35 | | | | | 35.0 | | |
| | | | 7/14/28 | 16"/18" | | SS-6 | |
| 36 | 90% TO 95% SUBANGULAR QUARTZ GRAINS | | | | 36.5 | | |
| 37 | | | | | | | |
| 38 | | | | | | | |
| 39 | GRAY TO BROWN FINE TO MEDIUM SAND, WELL SORTED, DENSE TO VERY DENSE, SATURATED | | | | | | |
| 40 | | | | | 40.0 | | |
| | 80% QUARTZ, 10% CHERT FRAGMENTS, | | 7/11/23 | 11"/18" | | SS-7 | |
| 41 | QUARTZ GRAINS ARE SUBROUNDED TO ROUNDED | | | | 41.5 | | |
| 42 | | | | | | | |
| 43 | | | | | | | |
| 44 | | | | | | | |
| 45 | | | | | 45.0 | | |
| | | | 13/18/39 | 10"/18" | | SS-8 | |
| 46 | | | | | 46.5 | | |
| 47 | | | | | | | |
| | BUFF LIMESTONE | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| | Boring No. D-89 |
| Project Name WESTLAKE | Page 4 of 4 |
| Project No. 84-075-4-002 | Date 8-27-84 |

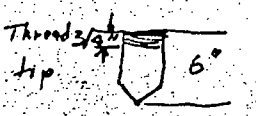
| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| | BUFF LIMESTONE | | | | | | |
| 49 | | | | | | | |
| | TOTAL DEPTH 49.0' | | | | | | |
| 50 | | | | | | | |
| 51 | | | | | | | A 2" dia. PVC piezometer was installed to 49'. PVC is flush-jointed, threaded couplings. |
| 52 | | | | | | | |
| 53 | | | | | | | Bottom 15' is .010" machine slotted screen. |
| 54 | | | | | | | Bottom 16.5' is gravel packed with a 2' thick bentonite pellet seal above. |
| 55 | | | | | | | Annulus is pressure grouted from seal to surface. |
| | | | | | | | T.O.P. is 3' above ground surface. |
| | | | | | | | WATER LEVEL IS 22.3' BELOW T.O.P. IMMEDIATELY AFTER PIEZOMETER INSTALLATION, 1:30 pm 8-28-84 |

# Drilling Log

| | | | |
|---|---|---|---|
| Project Name: WESTLAKE | | | Boring No.: D-90 |
| Project No.: 84-075-4-004 | | | Page 1 of 1 |
| Ground Elevation: See Exhibit I-1 | Location: See Exhibit I-1 | | Total Footage: 47 |

| Drilling Type | Hole Size | Overburden Footage | Bedrock Footage | No. of Samples | No. Core Boxes | Depth To Water | Date Measured |
|---|---|---|---|---|---|---|---|
| HSA and 4" Auger & Rotary Wash | 4" & 3 7/8" | 46 | 1 | | | 9' | 8/7/85 |

| | |
|---|---|
| Drilling Co. WABASH (Subsurface Construction Company) | Driller (s) Gary Miles, Gary Feldmann |
| Drilling Rig. CME-750 | Type of Penetration Test SPT |
| Date Aug 6, 1985 To Aug 7, 1985 | Field Observer (s) Stathis Payiatakis |

| Depth | Description | Class. | Blow Count | Recov. | | Sample or Box No. | Remarks |
|---|---|---|---|---|---|---|---|
| | sl. sandy silt - tan, brown, damp | | | | | | 10:10 Start drilling w/ 4" solid auger |
| 5 | Br. Gray mottled sl. silty clay, damp, med. med. plastic | | 3/5/5 | 18/18 | | SPT-1 | → switch to rotary wash w/ 3 7/8 tricone rotary bit. |
| 10 | Br. silty fine sand, loose | | 2/3/4 | 12/18 | | SPT-2 | |
| 15 | Br sl. silty fine sand, mdm dense | | 5/7/7 | 12/18 | | SPT-3 | |
| 20 | Same as above | | 3/6/7 | 10/18 | | SPT-4 | |
| 25 | Br. sl. silty fine to medium sand, dense. | | 9/16/18 | 19/18 | | SPT-5 | |
| 30 | Tan brown mdm to coarse sand md. dense | | 15/15/12 | 4/18 | | SPT-6 | |
| 35 | Dk. Gray silty v. fine sand, loose | | 5/3/3 | 12/18 | | SPT-7 | |
| 40 | Dk. Gray silty clay, moist, ~~soft~~ stiff, plastic | | 0/0/1 | 18/18 | | SPT-8 | Settled 12" under weight of 40' rods. Stop for the day - Heavy rainstorm |
| 45 | Dk Gray sl. silty fine sand, dense<br>Limestone, lt brown, very hard, sl. weathered<br>1.5' seam - Loose water pressure<br>BOB @ 46.9' | | 19/50-5.5" | 11.5/11.5 | | SPT-9 | 8/7/85 Start again @ 40'. Rock @ 46. Rate @ 500psi w/ tricone 5min for 2" 30 min for 10" 8:45 Start piezometer installation. 9:30 Grout w/ pipe @ 2 1:50 Remove top casing |
| 50 | Total pipe length 50'-5 1/4"<br>Piezometer @ ~ 46'-3 1/4" depth below G.S. | | | | | | |
| 55 | | | | | | | |
| 60 | Piezometer tip  | | | | | | |
| 65 | | | | | | | |
| 70 | | | | | | | |

# Drilling Log

| | |
|---|---|
| Project Name: WESTLAKE | Boring No.: D-91 |
| Project No.: 84-075-4-004 | Page 1 of 1 |
| Ground Elevation: ≈448 See Exhibit I-1 | Location: See Exhibit I-1 |
| Total Footage: 45 | |

| Drilling Type | Hole Size | Overburden Footage | Bedrock Footage | No. of Samples | No. Core Boxes | Depth To Water | Date Measured |
|---|---|---|---|---|---|---|---|
| SEE REMARKS | SEE REMARKS | 44' | 1' | 4 | 0 | 9.25' from G.S. | 7:45 8/6/85 |

| | |
|---|---|
| Drilling Co.: WABASH | Driller (s): Gary Miles, Gary Feldmann |
| Drilling Rig.: CME-750 | Type of Penetration Test: SPT |
| Date: Aug 5, 1985 To: Aug 6, 1985 | Field Observer (s): Stathis Poyiatakis |

| Depth | Description | Class. | Blow Count | Recov. | | Sample or Box No. | Remarks |
|---|---|---|---|---|---|---|---|
| | Topsoil, organic<br>lt br. f. sandy silt, sl. plastic, v. loose, damp | | | | | | Start drilling @ 11:00 w/ 4" solid augers. Push 4 5/8" OD 4" ID casing & set water tank. Tricone bit 3 7/8" ø |
| 5 | Gr. brn silty clay, mod. plastic | | | | | | |
| 10 | | | | | | | |
| 15 | Gr. brn f. sandy silt, some clay | | | | | | |
| 20 | Gr. silty clay, mod. plastic, tr. sand | | | | | | |
| 25 | Gr. sl. silty clay, mod. plastic, soft, moist becomes more silty near 30' | | 0*/1/1 | 18/18 | | SPT-1 | *Sank 6" under weight of 25' rod. |
| 30 | Dk. grey v.f. sand, loose, saturated, tr. silt | | 1/2/2 | 18/18 | | SPT-2 | |
| 35 | | | 3/2/3 | 10/18 | | SPT-3 | |
| 40 | Tan-grey f. to mdm sand, md. dense w/ thin (2"-4") clay lenses | | 3/9/11 | 9/18 | | SPT-4 | |
| 45 | Limestone, white/creamy mod. strong, mod. hard sl. weathered<br>BOB | | | | | | 14:00 Finish drilling<br>14:10 Start piezometer installation. 10' screen SL-500 + 40' 2" "Triloc" PVC pipe, flush threaded schedule 50 & scl. 20 screen (200 slots/inch)<br>15:15 Finish for day 8/6/85. Grout to surface Finish @ 9:00 |
| 50 | | | | | | | |
| 55 | | | | | | | |
| 60 | | | | | | | |
| 65 | | | | | | | |
| 70 | | | | | | | |

Bentonite Dossier

sand

screen

# Drilling Log

| | | | |
|---|---|---|---|
| Project Name: WESTLAKE | | | Boring No.: D-90 |
| Project No.: 84-075-4-004 | | | Page 1 of 1 |
| Ground Elevation: ≈446 See Exhibit I-1 | Location: See Exhibit I-1 | | Total Footage: 47 |

| Drilling Type | Hole Size | Overburden Footage | Bedrock Footage | No. of Samples | No. Core Boxes | Depth To Water | Date Measured |
|---|---|---|---|---|---|---|---|
| Solid 4" Auger & Rotary Wash | 4" & 3 7/8" | 46 | 1 | 9 | 0 | 7' | 8/7/85 |

| | |
|---|---|
| Drilling Co.: WABASH (Subsurface Construction Company) | Driller (s): Gary Miles, Gary Feldmann |
| Drilling Rig: CME-750 | Type of Penetration Test: SPT |
| Date: Aug 6, 1985 To: Aug 7, 1985 | Field Observer (s): Stathis Payiatakis |

| Depth | Description | Class. | Blow Count | Recov. | | Sample or Box No. | Remarks |
|---|---|---|---|---|---|---|---|
| | sl. sandy silt - tan & brown, damp | | | | | | 10:10 Start drilling w/ 4" solid auger |
| 5 | Br. Gray mottled sl. silty clay, damp, med. med. plastic | | 3/5/5 | 18/18 | | SPT-1 | → switch to rotary wash w/ 3 7/8" tricone rotary bit. |
| 10 | Br. silty fine sand, loose | | 2/3/4 | 12/18 | | SPT-2 | |
| 15 | Br sl. silty fine sand, mdm. dense | | 5/7/7 | 12/18 | | SPT-3 | |
| 20 | Same as above | | 3/6/7 | 10/18 | | SPT-4 | |
| 25 | Br. sl. silty fine to medium sand, dense. | | 9/16/18 | 18/18 | | SPT-5 | |
| 30 | Tan brown mdm to coarse sand md. dense | | 15/15/12 | 4/18 | | SPT-6 | |
| 35 | Dk Gray silty v. fine sand, loose | | 5/3/3 | 12/18 | | SPT-7 | |
| 40 | Dk. Gray silty clay, moist, v. weak, plastic | | 0/0/1 | 18/18 | | SPT-8 | Settled 12" under weight of 40' rods. Stop for the day - Heavy rain storm |
| 45 | Dk Gray sl. silty fine sand, dense<br>Limestone, lt brown, very hard, sl. weathered<br>1.5" seam - Loose water pressure | | 19/50-5.5" | 11.3/11.5 | | SPT-9 | 8/7/85 Start again @ 40'<br>Rock @ 46'<br>Rate @ 500psi w/ tric<br>5min for 2"<br>60min for 10"<br>3:25 Start piezometer installation<br>4:30 Grout w/ pipe @<br>4:50 Remove top rods |
| | BOB @ 46.9' | | | | | | |
| 50 | Total pipe length 50'-5 1/4"<br>Piezometer @ ~ 46'-3 1/4" depth below G.S. | | | | | | |
| 55 | | | | | | | |
| 60 | Piezometer tip — Threaded 2 1/4" — 6" | | | | | | |
| 65 | | | | | | | |
| 70 | | | | | | | |

# Drilling Log

| | | | |
|---|---|---|---|
| Project Name: WESTLAKE | | | Boring No.: D - 92 |
| Project No.: 84-075-4-004 | | | Page 1 of 9 |
| Ground Elevation: 475.37 | Location: See Exhibit I-1 | | Total Footage: 143.6 |

| Drilling Type | Hole Size | Overburden Footage | Bedrock Footage | No. of Samples | No. Core Boxes | Depth To Water | Date Measured |
|---|---|---|---|---|---|---|---|
| SEE REMARKS | 4 7/8" | 143.6 | 0.0 | 19 | 0 | SEE REMARKS | — |

| | | | |
|---|---|---|---|
| Drilling Co. | SUBSURFACE CONSTRUCTORS (WABASH) | Driller (s) | DORL THORNTON, DEAN |
| Drilling Rig. | ACKER MP-5, TRUCK | Type of Penetration Test | STANDARD |
| Date | 4-9-85 To 4-11-85 | Field Observer (s) | G. ERNSTMANN |

| Depth | Description | Class. | Blow Count | Recov. | | Sample or Box No. | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | LIGHT GRAY-BROWN SAND AND GRAVEL (3" MAX. DIA.), | | | | | | 4" SOLID AUGERS 0' TO 40.0' |
| 2 | | | | | | | |
| 3 | GRAY AND BROWN GRAVELLY SAND, SOME SILT, LOOSE TO MEDIUM DENSE, MOIST (FILL) | | | | | | |
| 4 | SLIGHT LEACHATE-LIKE ODOR | | | | | | |
| 5 | | | | | 5.0 | | |
| | | | 5/6/6 | 9"/18" | | SS-1 | |
| 6 | | | | | 6.5 | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | 10.0 | | |
| | | | 2/3/3 | 7"/18" | | SS-2 | |
| 11 | | | | | 11.5 | | |
| 12 | | | | | | | |
| 13 | BROWN SANDY SILT, LOW PLASTICITY, TRACE GRAVEL, LOOSE (FILL) | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| Project Name | WESTLAKE |
| Project No. | 84-075-4-004 |
| Boring No. | D-92 |
| Page | 2 of 9 |
| Date | 4-9-85 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 15 | BROWN SANDY SILT, LOW PLASTICITY, TRACE GRAVEL, LOOSE TO MEDIUM DENSE, MOIST (FILL) | | 3/5/5 | 6"/18" | 15.0 | SS-3 | |
| 16 | | | | | 16.5 | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | 3/5/6 | 8"/18" | 20.0 | SS-4 | |
| 21 | | | | | 21.5 | | |
| 22 | | | | | | | |
| 23 | | | | | | | |
| 24 | | | | | | | |
| 25 | | | 6/5/5 | 11"/18" | 25.0 | SS-5 | |
| 26 | | | | | 26.5 | | |
| 27 | | | | | | | |
| 28 | | | | | | | |
| 29 | | | | | | | |
| 30 | | | 5/6/7 | 15"/18" | 30.0 | SS-6 | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| Boring No. | D-92 |
| Project Name | WESTLAKE |
| Page | 3 of 9 |
| Project No. | 84-075-4-004 |
| Date | 4-9-85 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| | BROWN SANDY SILT, LOW PLASTICITY, TRACE GRAVEL, LOOSE TO MEDIUM DENSE, MOIST | | | | 31.5 | SS-6 | |
| 32 | | | | | | | |
| 33 | DARK GRAY SILTY CLAY, MEDIUM PLASTISITY, VERY STIFF, MOIST | | | | | | |
| 34 | SLIGHT LEACHATE-LIKE ODOR | | | | | | |
| 35 | | | | | 35.0 | | |
| | | | 5/7/13 | 16"/18" | | SS-7 | |
| 36 | | | | | 36.5 | | |
| 37 | | | | | | | |
| 38 | GRAY FINE TO MEDIUM SAND, MOIST | | | | | | |
| 39 | | | | | | | SATURATED MATERIAL ENCOUNTERED @ APPROX. 39.5' |
| 40 | GRAY SILTY FINE TO MEDIUM SAND, MEDIUM DENSE, SATURATED | | | | 40.0 | | |
| | | | 8/11/7 | 11"/18" | | SS-8 | |
| 41 | | | | | 41.5 | | STOPPED 4-9-85 |
| 42 | | | | | | | RESUMED 4-10-85 |
| 43 | | | | | | | BEGAN WASH BORING W/ 3 7/8" TRI-CONE BIT AND BENTONITE MUD @ 40.0'. |
| 44 | GRAY FINE TO MEDIUM SAND, TRACE SILT, DENSE, SATURATED | | | | | | |
| 45 | | | | | 45.0 | | |
| | | | 10/17/17 | 15"/18" | | SS-9 | |
| 46 | | | | | 46.5 | | |
| 47 | | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| | Boring No. D-92 |
| Project Name WESTLAKE | Page 4 of 9 |
| Project No. 84-075-4-004 | Date 4-9-85 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| | GRAY FINE TO MEDIUM SAND, TRACE SILT, DENSE, SATURATED | | | | | | |
| 49 | — — — — — — — | | | | | | |
| | BROWN FINE TO COARSE SAND, VERY DENSE, SATURATED | | | | | | |
| 50 | | | | | 50.0 | | |
| | | | 20/28/26 | 11"/18" | | SS-10 | |
| 51 | | | | | 51.5 | | |
| 52 | | | | | | | |
| 53 | | | | | | | |
| 54 | | | | | | | |
| 55 | | | | | | | |
| 56 | | | | | | | |
| 57 | | | | | | | |
| 58 | | | | | | | |
| 59 | | | | | | | |
| 60 | | | | | 60.0 | | |
| | | | 16/26/34 | 10"/18" | | SS-11 | |
| 61 | | | | | 61.5 | | |
| 62 | | | | | | | |
| 63 | | | | | | | |
| 64 | | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| | Boring No. D-92 |
| Project Name WESTLAKE | Page 5 of 9 |
| Project No. 84-075-4.004 | Date 4-9-85 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| | BROWN FINE TO COARSE SAND, VERY DENSE, SATURATED | | | | | | |
| 66 | | | | | | | |
| 67 | | | | | | | |
| 68 | GRAY MEDIUM TO COARSE SAND, VERY DENSE, SATURATED | | | | | | |
| 69 | | | | | | | |
| 70 | | | | | 70.0 | | |
| | | | 21/34/36 | 15"/18" | | SS-12 | |
| 71 | | | | | 71.5 | | |
| 72 | | | | | | | |
| 73 | | | | | | | |
| 74 | | | | | | | |
| 75 | | | | | | | |
| 76 | GRAY-BROWN COARSE SAND, SOME MEDIUM TO FINE SAND, MEDIUM DENSE TO VERY DENSE, SATURATED | | | | | | |
| 77 | | | | | | | |
| 78 | | | | | | | |
| 79 | | | | | | | |
| 80 | | | | | 80.0 | | |
| | | | 15/11/13 | 7"/18" | | SS-13 | |
| 81 | | | | | 81.5 | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

Boring No. D-92

Project Name WESTLAKE

Page 6 of 9

Project No. 84-075-4-004

Date 4-9-85

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 83 | GRAY-BROWN COARSE SAND, SOME MEDIUM TO FINE SAND, MEDIUM DENSE TO VERY DENSE, SATURATED | | | | | | |
| 84 | | | | | | | |
| 85 | | | | | | | |
| 86 | | | | | | | |
| 87 | | | | | | | |
| 88 | GRAY FINE TO MEDIUM SAND, TRACE SILT, VERY DENSE, SATURATED | | | | | | |
| 89 | | | | | | | |
| 90 | | | 25/28/39 | 9"/18" | 90.0 | SS-14 | |
| 91 | GRAY SILTY FINE SAND, VERY DENSE, SATURATED | | | | 91.5 | | |
| 92 | | | | | | | |
| 93 | | | | | | | |
| 94 | GRAY-BROWN COARSE SAND, SOME MEDIUM TO FINE SAND, DENSE | | | | | | |
| 95 | | | | | | | |
| 96 | | | | | | | |
| 97 | | | | | | | |
| 98 | | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| Boring No. | D-92 |
| Project Name | WESTLAKE |
| Page | 7 of 9 |
| Project No. | 84-075-4-004 |
| Date | 4-9-85 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 100 | GRAY-BROWN COARSE SAND, SOME MEDIUM TO FINE SAND, DENSE | | 17/22/26 | 8"/18" | 100.0 | SS-15 | |
| 101 | | | | | 101.5 | | |
| 102 | | | | | | | |
| 103 | | | | | | | |
| 104 | | | | | | | |
| 105 | | | | | | | |
| 106 | | | | | | | |
| 107 | | | | | | | |
| 108 | BROWN-GRAY COARSE SAND, TRACE MEDIUM SAND AND FINE GRAVEL, VERY DENSE, SATURATED | | | | | | |
| 109 | | | | | | | |
| 110 | | | 31/50/6" | 8"/12" | [illegible] | SS-16 | |
| 111 | | | | | 111.0 | | STOPPED 4-10-85 RESUMED 4-11-85 |
| 112 | | | | | | | |
| 113 | GRAY-BROWN MEDIUM TO COARSE SAND WITH THIN (1" TO 3" THICK) GRAVEL INTERBEDS, SATURATED | | | | | | |
| 114 | | | | | | | |
| 115 | | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| Project Name | WESTLAKE |
| Project No. | 84-075-4-004 |
| Boring No. | D-92 |
| Page | 8 of 9 |
| Date | 4-9-85 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 117 | GRAY-BROWN MEDIUM TO COARSE SAND WITH THIN (1" TO 3" THICK) GRAVEL INTERBEDS, SATURATED | | | | | | |
| 118 | | | | | | | |
| 119 | GRAY MEDIUM TO COARSE SAND, TRACE SILT, VERY DENSE, SATURATED | | | | | | |
| 120 | | | | | 120.0 | | |
| 121 | | | 17/24/28 | 8"/18" | | SS-17 | |
| | | | | | 121.5 | | |
| 122 | | | | | | | |
| 123 | GRAVEL SEAM 123.0' to 123.3' | | | | | | |
| 124 | | | | | | | |
| 125 | | | | | | | |
| 126 | | | | | | | |
| 127 | | | | | | | |
| 128 | | | | | | | |
| 129 | | | | | | | |
| 130 | | | | | 130.0 | | |
| 131 | | | 20/19/31 | 6"/18" | | SS-18 | |
| | | | | | 131.5 | | |
| 132 | | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

Boring No. D-92
Project Name WESTLAKE
Page 9 of 9
Project No. 84-075-4-004
Date 4-9-85

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 134 | GRAY MEDIUM TO COARSE SAND, TRACE SILT, VERY DENSE, SATURATED | | | | | | HOLE WAS REAMED W/ A 4 7/8" TRI-CONE BIT. |
| 135 | | | | | | | |
| 136 | | | | | | | 4 1/2" O.D. steel casing was temporarily installed to 143.6'. |
| 137 | | | | | | | |
| 138 | | | | | | | The bentonite mud was flushed from the casing w/ potable water. |
| 139 | | | | | | | |
| 140 | | | | | 140.0 | | A 2" dia. PVC piezometer was installed to 143'. Flush-joint, threaded couplings. |
| | | | 21/36/50/4" | 9"/16" | | SS-19 | |
| 141 | | | | | 141.3 | | Bottom 20' is .010 machine-slotted screen. |
| 142 | | | | | | | Gravel pack w/ quartz sand to 120.0'. |
| 143 | | | | | | | Bentonite pellets 120.0' to 117.5'. |
| 144 | LIMESTONE | | | | | | 143.6 |
| | TOTAL DEPTH 143.6 | | | | | | HOLE COLLAPSED ABOVE THE BENTONITE SEAL TO 40' BELOW G.S. |
| 145 | | | | | | | GROUT 0' TO 40'. |
| 146 | | | | | | | |
| 147 | | | | | | | WATER LEVEL IN PIEZOMETER IMMEDIATELY AFTER INSTALLATION 59.6' BELOW G.S. 10:00am 4-15-85. |
| 148 | | | | | | | |
| 149 | | | | | | | T.O.P. IS 0.2' BELOW G.S. 4-17-85 11:15am 38.9' BELOW T.O.P. |

# Drilling Log

| | | | |
|---|---|---|---|
| Project Name | WESTLAKE | Boring No. | D-93 |
| Project No. | 84-075-4-004 | Page 1 of 8 | |
| Ground Elevation | 450.70 | Location | Total Footage 169.2 |

| Drilling Type | Hole Size | Overburden Footage | Bedrock Footage | No. of Samples | No. Core Boxes | Depth To Water | Date Measured |
|---|---|---|---|---|---|---|---|
| WASH BORE | 4 7/8" | 118.0 | 1.2 | 16 | 0 | SEE REMARKS | — |

| | | | |
|---|---|---|---|
| Drilling Co. | SUBSURFACE CONSTRUCTION (WABASH) | Driller (s) | GARY MILES |
| Drilling Rig. | CME 750, ATV | Type of Penetration Test | STANDARD |
| Date | 4-15-85 To 4-18-85 | Field Observer (s) | GLEN ERNSTMANN |

| Depth | Description | Class. | Blow Count | Recov. | | Sample or Box No. | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | GRAY TO BROWN SILTY CLAY, AND SAND, SOME GRAVEL AND FEW BOULDERS, MOIST (FILL) | | | | | | 6" H.S. AUGER 0.0' TO 3.0'. 6" CASING SET TO 8'. 4 7/8" TRI-CONE WASH BORE 8.0' TO BENTONITE DRILLING MUD. |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | 5.0 | | |
| 6 | | | 2/3/5 | 7" / 18" | | SS-1 | |
| | | | | | 6.5 | | |
| 7 | | | | | | | |
| 8 | | | | | | | STOPPED 4-15-85. RESUMED 4-16-85 |
| 9 | | | | | | | |
| 10 | | | | | 10.0 | | |
| 11 | | | 5/3/4 | 0" / 18" | | SS-2 | NO RECOVERY (PROBABLY A PIECE OF GRAVEL IN THE SPOON TIP) |
| | | | | | 11.5 | | |
| 12 | | | | | | | |
| 13 | | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| | Boring No. D-93 |
| Project Name WESTLAKE | Page 2 of 8 |
| Project No. 84-075-4-004 | Date 4-15-85 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| | GREENISH BROWN FINE SAND, SOME MEDIUM SAND, MEDIUM DENSE, MOIST, TRACE SILT | | | | | | |
| 15 | | | 5/8/9 | 8"/18" | 15.0 | SS-3 | |
| 16 | | | | | 16.5 | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| | BROWN MEDIUM SAND, SOME FINE SAND, MEDIUM DENSE, SATURATED | | | | | | |
| 20 | | | 9/10/11 | 8"/18" | | SS-4 | |
| 21 | | | | | | | |
| 22 | | | | | | | |
| 23 | BROWN COARSE SAND SEAM 22.0-22.4 | | | | | | |
| 24 | BROWN MEDIUM TO COARSE SAND, MEDIUM DENSE, SATURATED | | | | | | |
| 25 | | | 6/9/12 | 9"/18" | 25.0 | SS-5 | |
| 26 | | | | | 26.5 | | |
| 27 | SEVERAL COARSE SAND AND FINE GRAVEL SEAMS, 26.0 TO 30.0 | | | | | | |
| 28 | | | | | | | |
| 29 | | | | | | | |
| 30 | | | 10/14/14 | 9/18" | 30.0 | SS-6 | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| | Boring No. D-93 |
| Project Name WESTLAKE | Page 3 of 8 |
| Project No. 84-675-4-004 | Date 4-15-85 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| | BROWN MEDIUM TO COARSE SAND, MEDIUM DENSE, SATURATED | | | | 31.5 | SS-6 | |
| 32 | | | | | | | |
| 33 | | | | | | | |
| 34 | | | | | | | |
| 35 | GRAY-BROWN FINE TO MEDIUM SAND, TRACE SILT, FEW THIN GRAY CLAY SEAMS, DENSE, SATURATED | | 9/17/18 | 10"/18" | 35.0 | SS-7 | |
| 36 | | | | | 36.5 | | |
| 37 | | | | | | | |
| 38 | | | | | | | |
| 39 | GRAY COARSE SAND, SOME MEDIUM SAND, TRACE GRAVEL, MEDIUM DENSE, SATURATED | | | | | | |
| 40 | | | | | 40.0 | | |
| 41 | | | 8/13/14 | 8"/18" | 41.5 | SS-8 | 5.0 |
| 42 | | | | | | | |
| 43 | | | | | | | |
| 44 | | | | | | | |
| 45 | | | | | 45.0 | | |
| 46 | | | 9/14/14 | 9"/18" | 46.5 | SS-9 | 5.0 |
| 47 | | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

Boring No. D-93
Project Name WESTLAKE
Page 4 of 8
Project No. 84-075-4-004
Date 4-15-85

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| | GRAY COARSE SAND, SOME MEDIUM SAND, TRACE GRAVEL, MEDIUM DENSE, SATURATED | | | | | | |
| 49 | | | | | | | |
| | GRAY SILTY FINE SAND, SOME MEDIUM SAND, VERY DENSE, SATURATED | | | | 50.0 | | |
| 50 | | | 18/25/26 | 15"/18" | | SS-10 | |
| 51 | | | | | 51.5 | | |
| 52 | | | | | | | |
| 53 | | | | | | | |
| 54 | | | | | | | |
| 55 | | | | | | | |
| 56 | | | | | | | |
| 57 | | | | | | | |
| 58 | FINE GRAVEL, SOME SAND AND COARSE GRAVEL, SATURATED | | | | | | |
| 59 | | | | | | | |
| | GRAY SILTY FINE SAND, SOME SILTY MEDIUM SAND SEAMS, DENSE TO VERY DENSE, SATURATED | | | | 60.0 | | |
| 60 | | | 14/25/20 | 13"/18" | | SS-11 | S.O. |
| 61 | | | | | 61.5 | | |
| 62 | | | | | | | |
| 63 | | | | | | | |
| 64 | | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| | Boring No. D-93 |
| Project Name WESTLAKE | Page 5 of 8 |
| Project No. 84-075-4-004 | Date 4-15-85 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 66 | GRAY SILTY FINE SAND, SOME SILTY MEDIUM SAND SEAMS DENSE TO VERY DENSE, SATURATED | | | | | | |
| 67 | | | | | | | |
| 68 | | | | | | | |
| 69 | | | | | | | |
| 70 | | | | | 60.0 | | |
| | | | 17/34/28 | 8"/18" | | SS-12 | |
| 71 | | | | | 61.5 | | |
| 72 | | | | | | | |
| 73 | | | | | | | |
| 74 | | | | | | | |
| 75 | | | | | | | |
| 76 | FINE GRAVEL AND SAND, SOME COARSE GRAVEL | | | | | | |
| 77 | GRAY MEDIUM TO COARSE SAND, TRACE FINE TO COARSE GRAVEL, DENSE, SATURATED | | | | | | |
| 78 | | | | | | | |
| 79 | | | | | | | |
| 80 | | | | | 80.0 | | |
| | | | 14/25/24 | 14"/18" | | SS-13 | |
| 81 | | | | | 81.5 | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| Boring No. | D-93 |
| Project Name | WESTLAKE |
| Page | 6 of 8 |
| Project No. | 84-075-4-004 |
| Date | 4-15-85 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 83 | FINE TO COARSE GRAVEL | | | | | | |
| 84 | GRAY-BROWN COARSE SAND, SOME FINE GRAVEL, DENSE, SATURATED | | | | | | SLOWER DRILLING RATE AND MUCH GREATER CIRCULATION LOSS 80' TO |
| 85 | COARSE GRAVEL SEAM 85.5' TO 86.0' | | | | | | |
| 86 | | | | | | | |
| 87 | | | | | | | |
| 88 | | | | | | | |
| 89 | | | | | | | |
| 90 | | | | | 90.0 | | |
| 91 | | | 13/16/19 | 9"/18" | | SS-14 | |
| | | | | | 91.5 | | STOPPED 4-16-85 RESUMED 4-17-85 |
| 92 | | | | | | | |
| 93 | GRAY-BROWN COARSE SAND AND FINE GRAVEL, SOME COARSE GRAVEL, FEW THIN (1" TO 12" THICK) SAND SEAMS, VERY DENSE, SATURATED | | | | | | |
| 94 | | | | | | | |
| 95 | | | | | | | |
| 96 | | | | | | | |
| 97 | | | | | | | |
| 98 | | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

Boring No. D-93
Project Name WESTLAKE
Page 7 of 8
Project No. 84-075-4-004
Date 4-15-85

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 100 | GRAY-BROWN COARSE SAND AND FINE GRAVEL, SOME COARSE GRAVEL FEW SAND SEAMS (1" TO 12" THICK) VERY DENSE, SATURATED | | 18/24/48 | 8"/18" | 100.0 | SS-15 | |
| 101 | | | | | 101.5 | | |
| 102 | | | | | | | |
| 103 | | | | | | | |
| 104 | | | | | | | |
| 105 | | | | | | | |
| 106 | COBBLE 106.0' TO 106.5' | | | | | | |
| 107 | COARSE SAND, TRACE FINE GRAVEL | | | | | | |
| 108 | | | | | | | |
| 109 | FINE TO COARSE GRAVEL, SOME SAND | | | | | | |
| 110 | COBBLE 110.0' TO 110.4'. | | | | | | |
| 111 | | | | | | | |
| 112 | GRAY COARSE SAND AND FINE GRAVEL, SOME COARSE GRAVEL, DENSE, SATURATED | | | | | | |
| 113 | | | | | | | |
| 114 | | | | | | | |
| 115 | | | 15/22/27 | 5"/10" | | SS-16 | STOPPED 4-17-85 RESUMED 4-18-85. |

# Drilling Log, continued

| | |
|---|---|
| Boring No. | D-93 |
| Project Name | WESTLAKE |
| Page | 8 of 8 |
| Project No. | 84-075-4-004 |
| Date | 4-15-85 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| | GRAY COARSE SAND AND FINE GRAVEL, SOME COARSE GRAVEL, DENSE, SATURATED | | | | 1165 | SS-16 | |
| 117 | | | | | | | |
| 118 | FRACTURED LIMESTONE | | | | | | 4½" dia. steel casing was temporarily installed to 112'. Hole collapsed to 112'. |
| 119 | LIMESTONE | | | | | | |
| | TOTAL DEPTH 119.2' | | | | | | |
| 120 | | | | | | | A 2" dia. PVC, flush-joint, threaded coupling piezometer was installed to 112'. |
| 121 | | | | | | | |
| 122 | | | | | | | The casing was pulled back to 90' and the hole collapsed to 91'. |
| 123 | | | | | | | |
| 124 | | | | | | | Bentonite pellets 91' to 89.6'. Grout 89.6' to surface. |
| 125 | | | | | | | 20' of .010 machine-slotted screen. |
| 126 | | | | | | | T.O.P. is 3.3' above ground surface |
| 127 | | | | | | | |
| 128 | | | | | | | Water level in Piezometer immediately after installation 4-18-85 1:30pm is 15.4' below T.O.P. |
| 129 | | | | | | | |
| 130 | | | | | | | |
| 131 | | | | | | | |
| 132 | | | | | | | |

# Drilling Log

| | | | |
|---|---|---|---|
| Project Name | WESTLAKE | Boring No. | D-94 |
| Project No. | 84-075-4-004 | Page | 1 of 7 |
| Ground Elevation | 442.68 | Location | |
| Total Footage | 109.0 | | |

| Drilling Type | Hole Size | Overburden Footage | Bedrock Footage | No. of Samples | No. Core Boxes | Depth To Water | Date Measured |
|---|---|---|---|---|---|---|---|
| WASH BORE | 3 7/8" | 108.8 | 0.2 | 15 | 0 | SEE REMARKS | — |

| | | | |
|---|---|---|---|
| Drilling Co. | SUBSURFACE CONSTRUCTORS (WABASH) | Driller (s) | GARY MILES |
| Drilling Rig. | CME 750, ATV | Type of Penetration Test | STANDARD |
| Date | 4-18-85 To 4-24-85 | Field Observer (s) | GLEN ERNSTMANN |

| Depth | Description | Class. | Blow Count | Recov. | | Sample or Box No. | Remarks |
|---|---|---|---|---|---|---|---|
| | BROWN SANDY SILT AND ORGANIC MATERIAL, moist | | | | | | 4" solid auger 0' to 5'. |
| 1 | BROWN FINE TO MEDIUM SAND, TRACE SILT, VERY LOOSE TO VERY DENSE, SATURATED BELOW 2'. | | | | | | 5' of 4" casing set. Wash bore w/ 3 7/8" tri-cone roller bit 5' to |
| 2 | | | | | | | |
| 3 | | | | | | | SATURATED MATERIAL @ APPROX. 3'. |
| 4 | | | | | | | |
| 5 | | | | | 5.0 | | |
| | | | 1/2/3 | 17"/18" | | SS-1 | |
| 6 | | | | | 6.5 | | STOPPED 4-18-85 RESUMED 4-19-85 |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | 10.0 | | |
| | | | 3/5/7 | 4"/18" | | SS-2 | |
| 11 | | | | | 11.5 | | |
| 12 | | | | | | | |
| 13 | | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| Boring No. | D-94 |
| Project Name | WESTLAKE |
| Page | 2 of 7 |
| Project No. | 84-075-4-004 |
| Date | 4-18-85 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 15 | BROWN FINE TO MEDIUM SAND, TRACE SILT, VERY LOOSE TO VERY DENSE, SATURATED | | 11/22/28 | 7"/18" | 15.0 | SS-3 | |
| 16 | | | | | 16.5 | | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | | | 18/24/31 | 15"/18" | 20.0 | SS-4 | |
| 21 | | | | | 21.5 | | |
| 22 | | | | | | | |
| 23 | | | | | | | |
| 24 | | | | | | | |
| 25 | | | 8/11/15 | 15"/18" | 25.0 | SS-5 | |
| 26 | | | | | 26.5 | | |
| 27 | | | | | | | |
| 28 | GRAY-BROWN FINE TO COARSE SAND, FEW COARSE SAND SEAMS (1" TO 2" THICK), MEDIUM DENSE, SATURATED | | | | | | |
| 29 | | | | | | | |
| 30 | | | 12/8/7 | 9"/18" | 30.0 | SS-6 | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| Boring No. | D-94 |
| Project Name | WESTLAKE |
| Page | 3 of 7 |
| Project No. | 84-075-4004 |
| Date | 4-18-85 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| | GRAY-BROWN FINE TO COARSE SAND, FEW COARSE SAND SEAMS (1" TO 2" THICK), MEDIUM DENSE, SATURATED | | | | 31.5 | SS-6 | |
| 32 | | | | | | | |
| 33 | BROWN COARSE SAND, SOME MEDIUM TO FINE SAND, MEDIUM DENSE, SATURATED | | | | | | |
| 34 | | | | | | | |
| 35 | | | | | 35.0 | | |
| | | | 9/13/12 | 8"/18" | | SS-7 | |
| 36 | | | | | 36.5 | | |
| 37 | | | | | | | |
| 38 | | | | | | | |
| 39 | | | | | | | |
| 40 | | | | | 40.0 | | |
| | | | 6/8/9 | 6"/18" | | SS-8 | |
| 41 | | | | | 41.5 | | |
| 42 | | | | | | | |
| 43 | | | | | | | |
| 44 | GRAY MEDIUM TO COARSE SAND, MEDIUM DENSE, SATURATED | | | | | | |
| 45 | | | | | 45.0 | | |
| | | | 16/12/14 | 9"/18" | | SS-9 | |
| 46 | | | | | 46.5 | | |
| 47 | | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| | Boring No. D-94 |
| Project Name WESTLAKE | Page 4 of 7 |
| Project No. 84-075-4-004 | Date 4-18-85 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| | GRAY MEDIUM TO COARSE SAND, MEDIUM DENSE, SATURATED | | | | | | |
| 49 | | | | | | | |
| | GRAY COARSE SAND, SOME MEDIUM SAND, MEDIUM DENSE TO DENSE, SATURATED | | | | 50.0 | | |
| 50 | | | 7/10/10 | 10"/18" | | SS-10 | |
| 51 | | | | | 51.5 | | |
| 52 | | | | | | | |
| 53 | GRAVEL SEAM 53.0' TO 53.2' | | | | | | |
| 54 | | | | | | | |
| 55 | | | | | | | |
| 56 | | | | | | | |
| 57 | GRAVEL SEAM 57.0' TO 57.8' | | | | | | |
| 58 | | | | | | | |
| 59 | | | | | | | |
| 60 | | | | | 60.0 | | |
| 61 | | | 15/16/16 | 4"/18" | | SS-11 | |
| | | | | | 61.5 | | |
| 62 | | | | | | | |
| 63 | | | | | | | |
| 64 | | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

Boring No. D-94

Project Name WESTLAKE

Page 5 of 7

Project No. 84-075-4-004

Date 4-18-85

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 66 | GRAY COARSE SAND, SOME MEDIUM SAND, MEDIUM DENSE TO DENSE, SATURATED | | | | | | |
| 67 | GRAVEL SEAM 67.0 TO 67.4. | | | | | | |
| 68 | | | | | | | |
| 69 | | | | | | | |
| 70 | | | | | 70.0 | | |
| | | | 13/20/19 | 7"/18" | | SS-12 | |
| 71 | | | | | 71.5 | | STOPPED 4-19-85 RESUMED 4-22-85 |
| 72 | GRAVEL SEAM 72' TO 72.3' | | | | | | |
| 73 | | | | | | | |
| 74 | | | | | | | |
| 75 | | | | | | | |
| 76 | | | | | | | |
| 77 | | | | | | | |
| 78 | | | | | | | |
| 79 | | | | | | | |
| 80 | | | | | 80.0 | | |
| | | | 9/20/22 | 6"/18" | | SS-13 | |
| 81 | | | | | 81.5 | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

Boring No. D-94

Project Name WESTLAKE

Page 6 of 7

Project No. 84-075-4-004

Date 4-12-85

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 83 | GRAY COARSE SAND, SOME MEDIUM SAND, MEDIUM DENSE TO DENSE, SATURATED | | | | | | |
| 84 | | | | | | | |
| 85 | | | | | | | |
| 86 | GRAVEL SEAM 86.0' TO 86.4' | | | | | | |
| 87 | GRAY FINE TO COARSE SAND, VERY DENSE, SATURATED | | | | | | |
| 88 | | | | | | | |
| 89 | | | | | | | |
| 90 | SILTY SAND SEAM 90.6 TO 90.8 | | 22/32/36 | 7"/18" | | SS-14 | |
| 91 | | | | | | | |
| 92 | | | | | | | |
| 93 | | | | | | | |
| 94 | | | | | | | |
| 95 | | | | | | | |
| 96 | | | | | | | |
| 97 | | | | | | | |
| 98 | | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | |
|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-4-004 | Hole No.: D-90 |
| Location | Elev. Ground Surface (G.S.) | |
| N E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 450.60 | |
| Date Started Drilling Hole: 8-6-85 Time | Total Depth of Hole: 47.0' | Drilling Type: Solid Auger & Rotary Wash |
| Date Completed Drilling Hole: 8-7-85 Time | Total Depth of Piezometer: 47.0' | Footage Slotted: 10' |
| Date Piezometer Installed: 8-7-85 Time: 9:50 AM | | |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 12-13-85 | - | M. Erio | 13.87 from T.O.P. | 436.73 | Electric Tape |
| 5-19-86 | - | " | 15.38 from " | 435.22 | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | |
|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-4-002 | Hole No.: SMP-63 |
| Location: Ponded surface water north of site, southwest of St. Charles Rock Road | Elev. Ground Surface (G.S.) | |
| N — E — | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.) | |
| Date Started Drilling Hole: N.A. Time: — | Total Depth of Hole: N.A. | Drilling Type: N.A. |
| Date Completed Drilling Hole: N.A. Time: — | Total Depth of Piezometer: N.A. | Footage Slotted: N.A. |
| Date Piezometer Installed: N.A. Time: — | | |

Remarks:

Reference point is a rod located in the ponded water north of the site in the ditch southwest of St. Charles Rock Road. The rod is marked in increments of 0.1 foot and starts with 0.0 at the bottom and ends at approximately 12-feet at the top. The top of the rod is under water during most of the spring and early summer.

| Date | Time | By Whom | ~~Depth to~~ Height of Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 10-15-84 | 12:15pm | Bill Canney | 10.21 from R.P. | | |
| 10-26-84 | 9:15am | G. Ernstmann | 11.05 from R.P. | | |
| 12-19-84 | 10:53 am | G. Ernstmann | 11.4 from R.P. | | |
| 3-30-84 | — | G. Ernstmann | * from — | | * Reference rod is submerged in ponded water. |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet ____ of ____

| | | |
|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-4-002 | Hole No.: Earth City #12 |
| Location: Earth City, west of the landfill | Elev. Ground Surface (G.S.) | |
| N / E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 440.59 | |
| Date Started Drilling Hole: — Time: — | Total Depth of Hole: — | Drilling Type: — |
| Date Completed Drilling Hole: — Time: — | Total Depth of Piezometer: — | Footage Slotted: — |
| Date Piezometer Installed: — Time: — | | |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 8-30-84 | 1:00pm | G. Ernstmann | 7.7 from T.O.P. | 432.89 | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet ____ of ____

| | | |
|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-4-002 | Hole No.: Earth City #9 |
| Location: Earth City, West of the landfill | Elev. Ground Surface (G.S.): approx. 436 | |
| N: | E: | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 441.85 |
| Date Started Drilling Hole: — | Time: — | Total Depth of Hole: — |
| Date Completed Drilling Hole: — | Time: — | Drilling Type: — |
| Date Piezometer Installed: — | Time: — | Total Depth of Piezometer: — |
| | | Footage Slotted: — |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 10-26-84 | 1:20pm | G. Ernstmann | 7.4 from T.O.P. | 434.45 | |
| 12-19-84 | 11:22am | G. Ernstmann | 7.7 from T.O.P. | 434.2 | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | |
|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-4-002 | Hole No.: Earth City #8 |
| Location: Earth City, west of the landfill | Elev. Ground Surface (G.S.) | |
| N / E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 441.87 | |
| Date Started Drilling Hole: — Time: — | Total Depth of Hole: — | Drilling Type: — |
| Date Completed Drilling Hole: — Time: — | Total Depth of Piezometer: — | Footage Slotted: — |
| Date Piezometer Installed: — Time: — | | |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 8-30-84 | 12:30pm | G. Ernstmann | 8.7 from T.O.P. | 433.17 | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | | |
|---|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-4-002 | Hole No.: D-89 | |
| Location | | Elev. Ground Surface (G.S.): 454.1 | |
| N: 1790.5514 | E: 602.6094 | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 457.10 | |
| Date Started Drilling Hole: 8-27-84 | Time: — | Total Depth of Hole: 49.0' | Drilling Type: WASH BORING |
| Date Completed Drilling Hole: 8-28-84 | Time: — | Total Depth of Piezometer: 49.0' | Footage Slotted: 15.0' |
| Date Piezometer Installed: 8-28-84 | Time: 1:30 pm | | |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 8-27-84 | — | G. Ernstmann | 15' to 20' from G.S. | | few thin saturated zones encountered during drilling. |
| 8-27-84 | — | G. Ernstmann | 21' from G.S. | | saturated material encountered during drilling below 21'. |
| 8-28-84 | 1:30 pm | G. Ernstmann | 22.3' from T.O.P | 434.8 | immediately after piezometer installation. |
| 8-29-84 | 10:30 am | G. Ernstmann | 24.50 from T.O.P. | 432.60 | Just prior to evacuating piezometer with compressed air |
| 8-29-84 | 11:45 am | G. Ernstmann | 24.65 from T.O.P. | 432.45 | 10 minutes after evacuating the piezometer. |
| 10-3-84 | 9:33 am | R. Robinson | 24.73 from T.O.P. | 432.37 | Electric Tape |
| 10-26-84 | 12:19 pm | G. Ernstmann | 23.65 from T.O.P. | 433.45 | " " |
| 12-19-84 | 12:30 pm | G. Ernstmann | 23.6 from T.O.P. | 433.5 | " " |
| 3-30-85 | 2:00 pm | G. Ernstmann | 21.25 from T.O.P. | 435.85 | steel tape |
| 4-25-85 | 11:35 AM | " | 22.13 from " | 434.97 | |
| 6-4-85 | 1:15 PM | S. Payiatakis | 22.95 from " | 434.15 | |
| 6-7-85 | 10:05 AM | " | 22.01 from " | 435.09 | |
| 8-8-85 | — | " | 24.10 from " | 433.00 | Cloth Tape |
| 12-13-85 | — | M. Erio | 21.07 from " | 436.03 | Electric Tape |
| 5-19-86 | — | " | 24.79 from " | 432.81 | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet 1 of 2

| | | | |
|---|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-4-002 | | Hole No.: S-88 |
| Location | | Elev. Ground Surface (G.S.): 460.0 | |
| N: 695.0461 | E: 309.2279 | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 462.73 | |
| Date Started Drilling Hole: 8-15-84 | Time: — | Total Depth of Hole: 41.5' | Drilling Type: WASH BORING |
| Date Completed Drilling Hole: 8-16-84 | Time: — | | |
| Date Piezometer Installed: 8-16-84 | Time: 11:00 am | Total Depth of Piezometer: 40.0' | Footage Slotted: 10.0' |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 8-15-84 | — | G. Ernstmann | 18' to 24' from G.S. | | saturated seams encountered during drilling. |
| 8-15-84 | | G. Ernstmann | 24' from G.S. | 439' | saturated material encountered during drilling below 24'. |
| 8-16-84 | 11:00 am | G. Ernstmann | 29.3' from T.O.P. | 433.43 | immediately after piezometer installation. |
| 8-20-84 | 1:00 pm | G. Ernstmann | 29.50' from T.O.P. | 433.23 | Electric Tape |
| 8-21-84 | 8:38 am | G. Ernstmann | 29.46' from T.O.P. | 433.27 | just before evacuating piezometer with compressed air |
| 8-21-84 | 9:01 am | G. Ernstmann | 29.8' from T.O.P. | 432.93 | 1½ mins. after evacuating piezometer |
| 8-24-84 | 1:30 pm | G. Ernstmann | 29.90' from T.O.P. | 432.83 | |
| 8-29-84 | 11:10 am | G. Ernstmann | 30.20 from T.O.P. | 432.53 | |
| 10-3-84 | 10:45 am | R. Robinson | 30.34 from T.O.P. | 432.39 | Electric Tape |
| 10-26-84 | 10:40 am | G. Ernstmann | 29.50 from T.O.P. | 433.23 | " " |
| 12-19-84 | 12:11 pm | G. Ernstmann | 29.4 from T.O.P. | 433.3 | " " |
| 3-30-85 | 11:45 am | G. Ernstmann | 27.00 from T.O.P. | 435.37 | " " |
| 4-25-85 | 8:25 AM | " | 27.50 from " | 435.23 | |
| 6-4-85 | 2:10 PM | S. Payiatacis | 28.81 from " | 433.92 | |
| 6-7-85 | 9:17 AM | " | 27.71 from " | 435.02 | |
| 8-8-85 | — | " | 29.65 from " | 433.08 | Cloth Tape |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet 2 of 2

| | | |
|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-4-002 | Hole No.: S-88 |
| Location | Elev. Ground Surface (G.S.): See Sheet 1 | |
| N See Sheet 1 E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): " | |
| Date Started Drilling Hole: " Time: " | Total Depth of Hole: " | Drilling Type: " |
| Date Completed Drilling Hole: " Time: " | Total Depth of Piezometer: " | Footage Slotted: " |
| Date Piezometer Installed: " Time: " | | |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 12-11-85 | – | M. Erio | 26.48 from T.O.P. | 436.25 | Electric Tape |
| 5-20-86 | – | " | 29.79 from " | 432.94 | " " |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings



| | | | |
|---|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-4-002 | | Hole No.: D-87 |
| Location | | Elev. Ground Surface (G.S.): 460.0 | |
| N 114.45 | E 903.6487 | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 463.04 | |
| Date Started Drilling Hole: 8-9-84 | Time: — | Total Depth of Hole: 111.7' | Drilling Type: WASH BORING |
| Date Completed Drilling Hole: 8-10-84 | Time: — | | |
| Date Piezometer Installed: 8-10-84 | Time: — | Total Depth of Piezometer: 111.0' | Footage Slotted: 20.0' |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 8-9-84 | — | G. Ernstmann | 27' from G.S. | | saturated material encountered during drilling. |
| 8-10-84 | — | G. Ernstmann | 4.46 from T.O.P. | 458.58 | immediately after piezometer installation. |
| 8-14-84 | 8:15 am | G. Ernstmann | 26.05' from T.O.P. | 436.99 | |
| 8-20-84 | 12:50 pm | G. Ernstmann | 29.75' from T.O.P. | 433.29 | |
| 8-23-84 | 1:30 pm | G. Ernstmann | 30.0' from T.O.P. | 433.04 | before surging well. |
| 8-23-84 | 3:30 pm | G. Ernstmann | 30.3' from T.O.P. | 432.74 | few minutes after surging and bailing the well. |
| 8-27-84 | 10:15 am | G. Ernstmann | 29.29' from T.O.P. | 433.75 | just prior to evacuating piezometer with compressed air. |
| 8-27-84 | 10:32 am | G. Ernstmann | 30.5' from T.O.P. | 432.54 | 4 minutes after evacuating the piezometer. |
| 8-29-84 | 11:15 am | G. Ernstmann | 30.46 from T.O.P. | 432.58 | |
| 10-3-84 | 9:50 am | R. Robinson | 30.61 from T.O.P. | 432.43 | Electric Tape |
| 10-26-84 | 10:45 am | G. Ernstmann | 29.75 from T.O.P. | 433.29 | " " |
| 12-19-84 | 10:43 am | G. Ernstmann | 29.6 from T.O.P. | 433.4 | " " |
| 3-30-85 | 11:39 am | G. Ernstmann | 27.09 from T.O.P. | 435.95 | " " |
| 4-25-85 | 8:30 AM | " | 27.50 from " | 435.54 | |
| 6-4-85 | 1:20 PM | S. Poyiatzis | 28.74 from " | 434.30 | |
| 6-7-85 | 8:35 PM | " | 27.88 from " | 435.16 | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet 2 of 2

| | | |
|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-41-002 | Hole No.: D-87 |
| Location | Elev. Ground Surface (G.S.): See Sheet 1 | |
| N See Sheet 1 E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): " | |
| Date Started Drilling Hole: " Time: " | Total Depth of Hole: " | Drilling Type: " |
| Date Completed Drilling Hole: " Time: " | Total Depth of Piezometer: " | Footage Slotted: " |
| Date Piezometer Installed: " Time: " | | |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 8-8-85 | – | " | 29.38 from " | 433.26 | Cloth Tape |
| 12-11-85 | – | M. Erio | 26.75 from " | 436.54 | Electric Tape |
| 5-20-86 | – | " | 27.75 from " | 435.29 | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | | |
|---|---|---|---|
| Project Name | WESTLAKE | Project No. | 84-075-4-002 |
| Hole No. | D-85 | | |
| Location | | Elev. Ground Surface (G.S.) | 453.1 |
| N 340.5414 | E 1986.8430 | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.) | 457.15 |
| Date Started Drilling Hole | 8-21-84 | Time | — |
| Total Depth of Hole | 84.1' | Drilling Type | WASH BORING |
| Date Completed Drilling Hole | 8-22-84 | Time | — |
| Total Depth of Piezometer | 82.0' | Footage Slotted | 20.0' |
| Date Piezometer Installed | 8-24-84 | Time | 10:00 am |

Remarks:

| | | | Depth to Water* | | | W.L. Elev. | Remarks |
|---|---|---|---|---|---|---|---|
| 8-22-84 | 7:30 am | G. Ernstmann | approx. 18' to 25' | from | G.S. | | saturated material encountered during drilling. |
| 8-24-84 | 10:00 am | G. Ernstmann | 20.05 | from | T.O.P. | 437.10 | immediately after piezometer installation. |
| 8-27-84 | 7:15 am | G. Ernstmann | 24.09 | from | T.O.P. | 433.06 | |
| 8-27-84 | 9:40 am | G. Ernstmann | 24.12 | from | T.O.P. | 433.03 | Just prior to evacuating piezometer with compressed air. |
| 8-27-84 | 2:20 pm | G. Ernstmann | 24.21 | from | T.O.P. | 432.94 | about 4 1/2 hrs. after evacuating the piezometer. |
| 8-30-84 | 9:15 am | G. Ernstmann | 24.50 | from | T.O.P. | 432.65 | |
| 10-3-84 | 10:07 am | R. Robinson | 24.54 | from | T.O.P. | 432.61 | Electric Tape |
| 10-26-84 | 11:55 am | G. Ernstmann | 23.35 | from | T.O.P. | 433.80 | " " |
| 12-19-84 | 10:37 am | G. Ernstmann | 23.5 | from | T.O.P. | 433.6 | " " |
| 3-30-85 | 11:20 am | G. Ernstmann | 20.62 | from | T.O.P. | 436.53 | " " |
| 4-25-85 | — | " | 21.08 | from | " | 436.07 | |
| 6-4-85 | 12:53 PM | S. Payiatakis | 22.48 | from | " | 434.67 | |
| 6-7-85 | 8:00 AM | " | 21.23 | from | " | 435.92 | |
| 8-8-85 | — | " | 23.22 | from | " | 433.93 | Cloth Tape |
| 12-11-85 | — | M. Erio | 20.20 | from | " | 436.95 | Electric Tape |
| 5-20-86 | — | " | 24.40 | from | " | 432.75 | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet 1 of 2

| | | |
|---|---|---|
| Project Name: WEST LAKE | Project No. 84-075-11-002 | Hole No. S-84 |
| Location | Elev. Ground Surface (G.S.) 452.9 | |
| N 340.0038 E 1998.2729 | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.) 456.92 | |
| Date Started Drilling Hole 8-24-84 Time — | Total Depth of Hole 31.5' | Drilling Type SOLID AUGERS |
| Date Completed Drilling Hole 8-24-84 Time — | | |
| Date Piezometer Installed 8-24-84 Time 12:20 pm | Total Depth of Piezometer 30.9' | Footage Slotted 10.0' |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 8-24-84 | — | G. Ernstmann | 13' to 20' from G.S. | | few thin saturated zones encountered during drilling. |
| 8-24-84 | — | G. Ernstmann | 20' from G.S. | 437' | saturated material below 20' during drilling. |
| 8-24-84 | 12:20 pm | G. Ernstmann | 23.7' from T.O.P. | 433.22 | immediately after piezometer installation. |
| 8-27-84 | 7:15 am | G. Ernstmann | 23.91' from T.O.P. | 433.01 | |
| 8-27-84 | 9:20 am | G. Ernstmann | 23.92' from T.O.P. | 433.00 | just prior to evacuating piezometer with compressed air |
| 8-27-84 | 2:15 pm | G. Ernstmann | 23.98 from T.O.P. | 432.94 | about 4½ hrs. after evacuating the piezometer |
| 8-30-84 | 9:16 am | G. Ernstmann | 24.28 from T.O.P. | 432.64 | |
| 10-3-84 | 10:05 am | R. Robinson | 24.32 from T.O.P. | 432.60 | Electric Tape |
| 10-26-84 | 11:56 am | G. Ernstmann | 23.20 from T.O.P. | 433.72 | " " |
| 12-19-84 | 10:35 am | G. Ernstmann | 23.3 from T.O.P. | 433.6 | " " |
| 3-30-85 | 11:22 am | G. Ernstmann | 20.33 from T.O.P. | 436.59 | " " |
| 4-25-85 | 11:15 AM | " | 20.83 from " | 436.09 | |
| 6-4-85 | 12:30 PM | S. Payiatakis | 22.25 from " | 434.67 | |
| 6-7-85 | 8:00 AM | " | 21.16 from " | 435.76 | |
| 8-8-85 | — | " | 22.96 from " | 433.96 | Cloth Tape |
| 12-13-85 | — | M. Erio | 19.85 from " | 437.07 | Electric Tape |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings



| | | |
|---|---|---|
| Project Name: WESTLAKE | Project No.: 34-075-41-002 | Hole No.: S-84 |
| Location | Elev. Ground Surface (G.S.): See Sheet 1 | |
| N: See Sheet 1 E: | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): " " " | |
| Date Started Drilling Hole: " " " Time: " | Total Depth of Hole: " " " | Drilling Type: " " " |
| Date Completed Drilling Hole: " " " Time: " | | |
| Date Piezometer Installed: " " " Time: " | Total Depth of Piezometer: " " " | Footage Slotted: " " " |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 5-20-86 | — | M. Erjo | 24.19 from T.O.P. | 432.73 | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet ____ of ____

| | | | |
|---|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-4-002 | | Hole No.: D-83 |
| Location | | Elev. Ground Surface (G.S.): 444.4 | |
| N 1742.7093 | E 1219.6580 | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 447.62 | |
| Date Started Drilling Hole: 8-16-84 | Time: — | Total Depth of Hole: 115.3' | Drilling Type: WASH BORING |
| Date Completed Drilling Hole: 8-20-84 | Time: — | | |
| Date Piezometer Installed: 8-21-84 | Time: 2:05 pm | Total Depth of Piezometer: 97.0' | Footage Slotted: 20.0' |

Remarks:

| Date | Time | By Whom | Depth to Water* | | | W.L. Elev. | Remarks |
|---|---|---|---|---|---|---|---|
| 8-16-84 | — | G. Ernstmann | 10.5' | from | G.S. | 437.1 | saturated material encountered during drilling. |
| 8-21-84 | 2:05 pm | G. Ernstmann | 14.50' | from | T.O.P. | 433.12 | immediately after piezometer installation. |
| 8-27-84 | 10:40 am | G. Ernstmann | 14.84' | from | T.O.P. | 432.78 | just prior to evacuating piezometer with compressed air. |
| 8-27-84 | 11:17 am | G. Ernstmann | 15.0' | from | T.O.P. | 432.62 | 4 minutes after evacuating the piezometer. |
| 8-29-84 | 1:05 pm | G. Ernstmann | 15.04' | from | T.O.P. | 432.58 | |
| 10-3-84 | 1:10 pm | R. Robinson | 15.39 | from | T.O.P. | 432.23 | Electric Tape |
| 10-26-84 | 9:10 am | G. Ernstmann | 14.55 | from | T.O.P. | 433.07 | " " |
| 12-19-84 | 10:47 am | G. Ernstmann | 14.4 | from | T.O.P. | 433.2 | " " |
| 3-30-85 | 12:00 noon | G. Ernstmann | 11.46 | from | T.O.P. | 436.16 | " " |
| 4-25-85 | 10:58 AM | " | 11.83 | from | " | 435.79 | |
| 6-7-85 | 9:05 AM | S. Papiafakis | 12.14 | from | " | 435.48 | |
| 8-8-85 | — | " | 14.18 | from | " | 433.44 | Cloth Tape |
| 12-12-85 | — | M. Erio | 10.56 | from | | 437.06 | Electric Tape |
| 5-19-86 | — | " | 15.08 | from | | 432.54 | |
| | | | | from | | | |
| | | | | from | | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | | |
|---|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-4-002 | | Hole No.: S-82 |
| Location | | Elev. Ground Surface (G.S.): 447.7 | |
| N 599.1580 | E 19.3231 | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 450.69 | |
| Date Started Drilling Hole: 8-24-84 | Time: — | Total Depth of Hole: 26.5' | Drilling Type: WASH-BORING |
| Date Completed Drilling Hole: 8-27-84 | Time: — | | |
| Date Piezometer Installed: 8-27-84 | Time: 1:45 pm | Total Depth of Piezometer: 25.5' | Footage Slotted: 10.0' |

Remarks:

| Date | Time | By Whom | Depth to Water* | | | W.L. Elev. | Remarks |
|---|---|---|---|---|---|---|---|
| 8-24-84 | — | G. Ernstmann | 11' to 13' and below 17' | from | G.S. | below 434. | saturated material encountered during drilling. |
| 8-27-84 | 1:45pm | G. Ernstmann | 18.2 | from | T.O.P. | 432.49 | immediately after piezometer installation. |
| 8-29-84 | 12:20pm | G. Ernstmann | 18.25' | from | T.O.P. | 432.44 | |
| 10-3-84 | 11:30am | R. Robinson | 18.34 | from | T.O.P. | 432.35 | Electric Tape |
| 10-26-84 | 9:45 am | G. Ernstmann | 17.51 | from | T.O.P. | 433.18 | " " |
| 12-19-84 | 11:17 am | G. Ernstmann | 17.5 | from | T.O.P. | 433.2 | " " |
| 3-30-85 | 12:45 pm | G. Ernstmann | 15.00 | from | T.O.P. | 435.69 | steel tape |
| 4-17-85 | — | " | 15.00 | from | " | 435.69 | |
| 4-25-85 | 10:37 AM | " | 15.46 | from | " | 435.23 | |
| 6-7-85 | 12:45 PM | S. Payiatakis | 15.56 | from | " | 435.13 | |
| 8-8-85 | — | " | 17.53 | from | " | 433.16 | Cloth Tape |
| 5-20-86 | — | M. Erio | 18.00 | from | " | 432.69 | |
| 12-12-85 | — | " | 14.40 | from | " | 436.29 | |
| | | | | from | | | |
| | | | | from | | | |
| | | | | from | | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | | |
|---|---|---|---|
| Project Name | WESTLAKE | Project No. | 84-075-4-002 |
| Hole No. | D-81 | | |
| Location | | Elev. Ground Surface (G.S.) | 447.8 |
| N 1146.2728 | E 922.0145 | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.) | 450.82 |
| Date Started Drilling Hole | 8-13-84 | Time | — |
| Date Completed Drilling Hole | 8-15-84 | Time | — |
| Date Piezometer Installed | 8-15-84 | Time | 11:00 am |
| Total Depth of Hole | 61.5' | Drilling Type | WASH BORING |
| Total Depth of Piezometer | 60.0' | Footage Slotted | 15.0' |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 8-13-84 | 3:30 pm | G. Ernstmann | ≈ 13' from G.S. | ≈438 | saturated material encountered during drilling. |
| 8-15-84 | 3:05 pm | G. Ernstmann | 16.63' from T.O.P. | 434.19 | 4 hours after piezometer installation. |
| 8-20-84 | 4:50 pm | G. Ernstmann | 17.6' from T.O.P. | 433.22 | Electric tape |
| 8-21-84 | 9:15 am | G. Ernstmann | 17.6' from T.O.P. | 433.22 | just before evacuating piezometer with compressed air |
| 8-21-84 | 9:37 am | G. Ernstmann | 17.75' from T.O.P. | 433.07 | 2 mins. after evacuating piezometer |
| 8-24-84 | 1:25 pm | G. Ernstmann | 16.94' from T.O.P. | 433.88 | |
| 8-29-84 | 12:35 pm | G. Ernstmann | 18.28 from T.O.P. | 432.54 | |
| 10-26-84 | 10:25 am | G. Ernstmann | 17.35 from T.O.P. | 433.47 | Electric tape |
| 12-19-84 | 12:02 pm | G. Ernstmann | 17.3 from T.O.P. | 433.5 | " " |
| 3-30-85 | 2:35 pm | G. Ernstmann | 14.92 from T.O.P. | 435.90 | steel tape |
| 4-25-85 | 9:10 AM | " | 15.88 from " | 434.94 | |
| 6-7-85 | 12:35 PM | S. Payiatakis | 15.73 from " | 435.09 | |
| 8-8-85 | — | " | 17.68 from " | 433.14 | Cloth Tape |
| 12-13-85 | — | M. Erio | 14.71 from " | 436.11 | Electric Tape. |
| 5-19-86 | — | " | 18.12 from " | 432.70 | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | | |
|---|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-4-002 | | Hole No.: S-80 |
| Location | | Elev. Ground Surface (G.S.): 448.4 | |
| N 2592.7962 | E 2619.0159 | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 453.38 | |
| Date Started Drilling Hole: 8-28-84 | Time: — | Total Depth of Hole: 22.0' | Drilling Type: SOLID AUGERS |
| Date Completed Drilling Hole: 8-29-84 | Time: — | | |
| Date Piezometer Installed: 8-29-84 | Time: 9:00 am | Total Depth of Piezometer: 20.0' | Footage Slotted: 10.0' |

Remarks:

| Date | Time | By Whom | Depth to Water* | | | W.L. Elev. | Remarks |
|---|---|---|---|---|---|---|---|
| 8-28-84 | — | G. Ernstmann | ≈ 14' | from | G.S. | ≈ 439 | saturated material encountered during drilling. |
| 8-29-84 | 7:00am | G. Ernstmann | 12.9' | from | G.S. | 440.48 | water level standing in hole during drilling. |
| 8-29-84 | 9:00am | G. Ernstmann | 18.17 | from | T.O.P. | 435.21 | immediately after piezometer installation. |
| 8-29-84 | 9:30am | G. Ernstmann | 17.4 | from | T.O.P. | 435.98 | |
| 10-3-84 | 8:57AM | A. ROBINSON | 18.6 | from | T.O.P. | 434.78 | Electric Tape |
| 10-26-84 | 12:50pm | G. Ernstmann | 17.10 | from | T.O.P. | 436.28 | " " |
| 12-19-84 | 12:55pm | G. Ernstmann | 14.4 | from | T.O.P. | 439.0 | " " |
| 3-30-85 | 2:30pm | G. Ernstmann | 11.50 | from | T.O.P. | 441.88 | steel tape |
| 4-17-85 | — | " | 9.90 | from | " | 443.48 | |
| 4-25-85 | 12:29 PM | " | 16.29 | from | " | 442.09 | |
| 6-7-85 | 10:55 AM | S. Papiatakis | 14.18 | from | " | 439.20 | Cloth Tape |
| 8-8-85 | — | " | 15.62 | from | " | 437.76 | |
| 12-13-85 | — | M. Erio | 10.90 | from | " | 442.45 | Electric Tape |
| 5-19-86 | — | " | 16.65 | from | " | 436.73 | |
| | | | | from | | | |
| | | | | from | | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | |
|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-4-002 | Hole No.: S-76 (old 37A) |
| Location | Elev. Ground Surface (G.S.): 474.4 | |
| N E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 477.5 | |
| Date Started Drilling Hole ____ Time ____ | Total Depth of Hole: 50.0 | Drilling Type: ____ |
| Date Completed Drilling Hole ____ Time ____ | | |
| Date Piezometer Installed ____ Time ____ | Total Depth of Piezometer: 50.0 | Footage Slotted: 3.0 |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 4-27-84 | 9:30am | Bill Canney | 40.7 from T.O.P. | 436.8 | |
| 5-23-84 | 4:00pm | G. Ernstmann | 40.5 from T.O.P. | 437.0 | |
| 6-27-84 | 11:05am | R. Robinson | 40.54 from T.O.P. | 436.96 | |
| 8-8-84 | 4:10pm | G. Ernstmann | 42.21 from T.O.P. | 435.29 | |
| 8-20-84 | 4:35pm | G. Ernstmann | 42.95 from T.O.P. | 434.55 | Electric tape |
| 8-24-84 | 1:10pm | G. Ernstmann | 43.36 from T.O.P. | 434.14 | |
| 8-29-84 | 10:15am | G. Ernstmann | 43.69 from T.O.P. | 433.81 | |
| 10-26-84 | 10:15am | G. Ernstmann | 42.80 from T.O.P. | 434.70 | Electric Tape |
| 12-19-84 | 11:52am | G. Ernstmann | 42.6 from T.O.P. | 434.9 | " " |
| 3-30-85 | 1:45pm | G. Ernstmann | 40.92 from T.O.P. | 436.58 | steel Tape |
| 4-25-85 | 9:05 AM | " | 40.04 from " | 437.46 | |
| 6-7-85 | 2:00 PM | S. Papiatakis | 41.79 from " | 435.71 | |
| 8.8.85 | — | " | 43.24 from " | 434.26 | Cloth Tape |
| | | | from | | |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | |
|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-4-002 | Hole No.: S-75 (old 37) |
| Location | Elev. Ground Surface (G.S.): 458.8 | |
| N E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 459.9 | |
| Date Started Drilling Hole: ____ Time: ____ | Total Depth of Hole: 26.0 | Drilling Type: ____ |
| Date Completed Drilling Hole: ____ Time: ____ | | |
| Date Piezometer Installed: ____ Time: ____ | Total Depth of Piezometer: 26.0 | Footage Slotted: 3.0 |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 4-26-84 | 2:03 pm | P. Hustad | 21.4 from T.O.P. | 438.5 | |
| 5-24-84 | 12:30pm | G. Ernstmann | 22.4 from T.O.P. | 437.5 | |
| 6-27-84 | 11:00am | R. Robinson | 22.53 from T.O.P. | 437.37 | |
| 8-8-84 | 4:05pm | G. Ernstmann | 24.33 from T.O.P. | 435.57 | |
| 8-20-84 | 4:45pm | G. Ernstmann | 25.0 from T.O.P. | 434.9 | Electric tape |
| 8-24-84 | 1:05pm | G. Ernstmann | 25.37 from T.O.P. | 434.53 | |
| 8-29-84 | 10:05am | G. Ernstmann | 25.70 from T.O.P. | 434.2 | |
| 10-3-84 | 10:58am | R. Robinson | 25.53 from T.O.P. | 434.37 | Electric Tape |
| 10-26-84 | 10:22am | G. Ernstmann | 24.15 from T.O.P. | 435.75 | " " |
| 12-19-84 | 11:55am | G. Ernstmann | 24.3 from T.O.P. | 435.6 | " " |
| 3-30-85 | 1:55pm | G. Ernstmann | 17.50 from T.O.P. | 442.4 | steel tape |
| 4-17-85 | — | " | 24.1 from " | 435.80 | |
| 4-25-85 | 9:07 AM | " | 22.88 from " | 437.02 | |
| 6-7-85 | 12:30 PM | S. Payiatakis | 17.70 from " | 442.20 | |
| 8-8-85 | — | " | 21.18 from " | 438.72 | Cloth Tape |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | |
|---|---|---|
| Project Name WESTLAKE | Project No. 84-075-4-002 | Hole No. 74 Q |
| Location | Elev. Ground Surface (G.S.) | |
| N E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.) approx. 465' ±5' | |
| Date Started Drilling Hole Time | Total Depth of Hole | Drilling Type |
| Date Completed Drilling Hole Time | Total Depth of Piezometer | Footage Slotted |
| Date Piezometer Installed Time | | |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 4-26-84 | 2:36pm | P. Hustad | 17.3 from T.O.P. | ≈ 448 | |
| 5-23-84 | 1:15pm | G. Ernstmann | 15.5' from *T.O.P. | ≈ 450 | * highest point on top of Tilted concrete casing |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | |
|---|---|---|
| Project Name: WESTLAKE | Project No. 84-075-4-002 | Hole No. I-73 (old 58) |
| Location | Elev. Ground Surface (G.S.) 462.7 | |
| N E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.) 465.4 | |
| Date Started Drilling Hole ____ Time ____ | Total Depth of Hole 50.0 | Drilling Type ____ |
| Date Completed Drilling Hole ____ Time ____ | Total Depth of Piezometer 50.0 | Footage Slotted 3.0 |
| Date Piezometer Installed ____ Time ____ | | |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 4-26-84 | 2:31 pm | P. Hustad | 26.15 from T.O.P. | 436.55 | |
| 5-23-84 | 1:15 pm | G. Ernstmann | 26.5 from T.O.P. | 436.2 | |
| 6-27-84 | 1:40 pm | R. Robinson | 26.67 from T.O.P. | 436.03 | |
| 8-8-84 | 3:17 pm | G. Ernstmann | 28.62 from T.O.P. | 436.78 | |
| 8-20-84 | 1:15 pm | G. Ernstmann | 29.61 from T.O.P. | 435.79 | Electric Tape |
| 8-29-84 | 10:27 am | G. Ernstmann | 30.13 from T.O.P. | 435.27 | |
| 10-3-84 | 9:43 am | R. Robinson | 29.97 from T.O.P. | 435.43 | Electric Tape |
| 10-26-84 | 10:38 am | G. Ernstmann | 29.20 from T.O.P. | 436.20 | " " |
| 12-19-84 | 12:20 pm | G. Ernstmann | 29.1 from T.O.P. | 436.3 | " " |
| 3-30-85 | 11:53 am | G. Ernstmann | 27.17 from T.O.P. | 438.23 | " " |
| 4-25-85 | 8:17 am | G. Ernstmann | 27.58 from T.O.P. | 437.87 | " " |
| 6-4-85 | 2:50 pm | S. Payiatakis | 28.48 from T.O.P. | 436.92 | " " |
| 6-7-85 | 9:50 am | S. Payiatakis | 27.68 from T.O.P. | 437.72 | " " |
| 8-8-85 | — | S. Payiatakis | 29.48 from T.O.P. | 435.92 | cloth Tape |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | |
|---|---|---|
| Project Name WESTLAKES | Project No. 84-075-4-002 | Hole No. I-72 (old 39) |
| Location | Elev. Ground Surface (G.S.) 462.7 | |
| N E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.) 465.4 | |
| Date Started Drilling Hole ____ Time ____ | Total Depth of Hole 50.0 | Drilling Type ____ |
| Date Completed Drilling Hole ____ Time ____ | | |
| Date Piezometer Installed ____ Time ____ | Total Depth of Piezometer 50.0 | Footage Slotted 3.0 |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 4-26-84 | 2:28pm | P. Hustad | 28.15 from T.O.P. | 437.25 | |
| 5-23-84 | 1:00pm | G. Ernstmann | 28.4 from T.O.P. | 437.00 | |
| 6-27-84 | 1:35pm | R. Robinson | 28.66 from T.O.P. | 436.74 | |
| 8-8-84 | 3:15pm | G. Ernstmann | 30.22 from T.O.P. | 435.18 | |
| 8-20-84 | 1:10pm | G. Ernstmann | 31.05 from T.O.P. | 434.35 | Electric tape |
| 8-29-84 | 10:25am | G. Ernstmann | 31.81 from T.O.P. | 433.59 | |
| 10-3-84 | 9:40am | R. Robinson | 31.92 from T.O.P. | 433.48 | Electric Tape |
| 10-26-84 | 10:35am | G. Ernstmann | 31.05 from T.O.P. | 434.35 | " " |
| 12-19-84 | 12:18pm | G. Ernstmann | 30.8 from T.O.P. | 434.2 | " " |
| 3-30-85 | 11:50am | G. Ernstmann | 28.58 from T.O.P. | 436.82 | " " |
| 4-25-85 | 8:14am | G. Ernstmann | 29.21 from T.O.P. | 436.19 | " " |
| 6-4-85 | 2:30pm | S. Payiatakis | 30.10 from T.O.P. | 435.30 | " " |
| 6-7-85 | 9:40am | S. Payiatakis | 29.33 from T.O.P. | 436.07 | " " |
| 8-8-85 | — | S. Payiatakis | 31.28 from T.O.P. | 434.12 | cloth tape |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet ____ of ____

| | | |
|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-4-002 | Hole No.: I-68 (old N-7) |
| Location | Elev. Ground Surface (G.S.): 440.9 | |
| N / E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 448.32 | |
| Date Started Drilling Hole ____ Time ____ | Total Depth of Hole: 31.2 | Drilling Type: ____ |
| Date Completed Drilling Hole ____ Time ____ | | |
| Date Piezometer Installed ____ Time ____ | Total Depth of Piezometer: 31.2 | Footage Slotted: 10.0 |

Remarks:

| Date | Time | By Whom | Depth to Water* | | | W.L. Elev. | Remarks |
|---|---|---|---|---|---|---|---|
| 4-26-84 | 12:37pm | P. Hustad | 10.9 | from | T.O.P. | 437.42 | |
| 5-24-84 | 11:45am | G. Ernstmann | 11.5 | from | T.O.P. | 436.82 | |
| 6-27-84 | 1:30pm | R. Robinson | 12.25 | from | T.O.P. | 436.07 | |
| 8-8-84 | 1:47pm | G. Ernstmann | 14.02 | from | T.O.P. | 434.30 | |
| 8-21-84 | 6:55am | G. Ernstmann | 14.9 | from | T.O.P. | 433.42 | Electric tape |
| 8-30-84 | 9:20am | G. Ernstmann | 15.70 | from | T.O.P. | 432.62 | |
| 10-3-84 | 10:01am | R. Robinson | 15.84 | from | T.O.P. | 432.48 | Electric Tape |
| 10-26-84 | 12:00 noon | G. Ernstmann | 14.55 | from | T.O.P. | 433.77 | " " |
| 12-19-84 | 10:40am | G. Ernstmann | 14.6 | from | T.O.P. | 433.7 | " " |
| 3-30-85 | 11:35am | G. Ernstmann | 11.17 | from | T.O.P. | 437.15 | " " |
| 4-25-85 | 11:24am | G. Ernstmann | 12.29 | from | T.O.P. | 436.03 | " " |
| 6-4-85 | 1:10pm | S. Payatakis | 13.51 | from | T.O.P. | 434.81 | " " |
| 6-7-85 | 8:05am | S. Payatakis | 11.30 | from | T.O.P. | 437.02 | " " |
| 8-8-85 | — | S. Payatakis | 14.17 | from | T.O.P. | 434.15 | cloth tape |
| | | | | from | | | |
| | | | | from | | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | |
|---|---|---|
| Project Name: WESTLAKES | Project No.: 84-075-4-002 | Hole No.: I-GT (old N-6) |
| Location | Elev. Ground Surface (G.S.): 436.5 | |
| N / E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 439.08 | |
| Date Started Drilling Hole: ____ Time: ____ | Total Depth of Hole: 35.4 | Drilling Type: ____ |
| Date Completed Drilling Hole: ____ Time: ____ | | |
| Date Piezometer Installed: ____ Time: ____ | Total Depth of Piezometer: 35.4 | Footage Slotted: 10.0 |

Remarks:

| Date | Time | By Whom | Depth to Water* | | | W.L. Elev. | Remarks |
|---|---|---|---|---|---|---|---|
| 4-26-84 | afternoon | P. Hustad | * | from | — | — | * water in ditch is above the T.O.P. |
| 5-24-84 | 11:30am | G. Ernstmann | * | from | — | — | * water in ditch is above the T.O.P. |
| 6-27-84 | 1:24pm | R. Robinson | 2.61 | from | T.O.P. | 436.47 | |
| 8-8-84 | 1:35pm | G. Ernstmann | 4.65 | from | T.O.P. | 434.43 | |
| 8-21-84 | 12:50pm | G. Ernstmann | 5.55 | from | T.O.P. | 433.53 | |
| 8-30-84 | 9:10am | G. Ernstmann | 6.22 | from | T.O.P. | 432.86 | |
| 10-3-84 | noon | R. Robinson | 6.42 | from | T.O.P. | 432.66 | Electric Tape |
| 12-19-84 | 10:19am | G. Ernstmann | 5.3 | from | T.O.P. | 433.8 | " " |
| 3-30-85 | — | G. Ernstmann | See Remarks | from | — | — | Piez. is inaccessible because of water in ditch. |
| 4-25-85 | — | G. Ernstmann | " | from | — | — | Piezometer is under water. |
| 6-4-85 | — | S. Paylatakis | " | from | — | — | " " " |
| 8-8-85 | — | S. Paylatakis | 4.75 | from | T.O.P. | 434.32 | cloth Tape |
| | | | | from | | | |
| | | | | from | | | |
| | | | | from | | | |
| | | | | from | | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet ____ of ____

| | | |
|---|---|---|
| Project Name: WESTLAKES | Project No. 84-075-4-002 | Hole No. I-66 (old N-5) |
| Location | Elev. Ground Surface (G.S.) 437.7 | |
| N E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.) 441.80 | |
| Date Started Drilling Hole ____ Time ____ | Total Depth of Hole 36.9 | Drilling Type ____ |
| Date Completed Drilling Hole ____ Time ____ | | |
| Date Piezometer Installed ____ Time ____ | Total Depth of Piezometer 36.9 | Footage Slotted 10.0 |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 4-26-84 | afternoon | P. Hustad | * from | | * water in ditch has surrounded the piezometer |
| 5-24-84 | 11:15 am | G. Ernstmann | 4.9' from T.O.P. | 436.9 | Water in ditch, at base of piezometer, is 3.4' below T.O.P. (438.4) |
| 6-27-84 | 1:18 pm | R. Robinson | 5.40 from T.O.P. | 436.4 | |
| 8-8-84 | 1:43 pm | G. Ernstmann | 7.42 from T.O.P. | 434.38 | |
| 8-21-84 | 12:25 pm | G. Ernstmann | 8.38 from T.O.P. | 433.42 | |
| 8-30-84 | 9:05 am | G. Ernstmann | 9.05 from T.O.P. | 432.75 | |
| 10-3-84 | 11:55 am | R. Robinson | 9.36 from T.O.P. | 432.44 | Electric Tape |
| 10-26-84 | 12:15 pm | G. Ernstmann | 8.25 from T.O.P. | 433.55 | " " |
| 12-19-84 | 10:15 am | G. Ernstmann | 8.2 from T.O.P. | 433.6 | " " |
| 3-30-85 | — | G. Ernstmann | See Remarks from — | — | Piez. is inaccessible because of water in ditch. |
| 4-25-85 | — | G. Ernstmann | " from " | — | " " " " " |
| 6-7-85 | — | S. Payiatakis | " from — | — | 2' of water @ surface |
| 8-8-85 | — | S. Payiatakis | 7.63 from T.O.P. | 434.17 | electric tape |
| 5-20-86 | — | M. Fino | 9.12 from T.O.P. | 432.68 | |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | |
|---|---|---|
| Project Name: WESTLAKES | Project No. 84-075-4-002 | Hole No. I-65 (old N-4) |
| Location | Elev. Ground Surface (G.S.) 438.5 | |
| N E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.) 441.80 | |
| Date Started Drilling Hole ____ Time ____ | Total Depth of Hole 36.0 | Drilling Type ____ |
| Date Completed Drilling Hole ____ Time ____ | | |
| Date Piezometer Installed ____ Time ____ | Total Depth of Piezometer 36.0 | Footage Slotted 10.0 |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 4-26-84 | 12:52 pm | P. Husted | 4.5' from T.O.P. | 437.3 | |
| 5-24-84 | 11:00 am | G. Ernstmann | 5.0' from T.O.P. | 436.8 | |
| 6-27-84 | 1:12 pm | R. Robinson | 5.46 from T.O.P. | 436.34 | |
| 8-8-84 | 1:40 pm | G. Ernstmann | 7.43 from T.O.P. | 434.37 | |
| 8-21-84 | 12:20 pm | G. Ernstmann | 8.42 from T.O.P. | 433.38 | |
| 8-30-84 | 8:55 am | G. Ernstmann | 9.18 from T.O.P. | 432.62 | |
| 10-3-84 | 11:50 am | R. Robinson | 9.45 from T.O.P. | 432.35 | Electric Tape |
| 10-26-84 | 12:08 pm | G. Ernstmann | 8.55 from T.O.P. | 433.25 | " " |
| 12-19-84 | 10:10 am | G. Ernstmann | 8.4 from T.O.P. | 433.4 | " " |
| 3-30-85 | 2:45 pm | G. Ernstmann | 5.33 from T.O.P. | 436.47 | steel tape |
| 4-25-85 | 11:10 am | G. Ernstmann | 5.83 from T.O.P. | 435.97 | Electric tape |
| 6-7-85 | 8:25 am | S. Payiatakis | 6.25 from T.O.P. | 435.55 | " " |
| 8-8-85 | — | S. Payiatakis | 7.76 from T.O.P. | 433.82 | cloth tape |
| | | | from | | |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

[redacted]8067[redacted] Burns & McDonnell Engineers [redacted]s-Consu[redacted] Form TS-GT-2-8

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | |
|---|---|---|
| Project Name WESTLAKES | Project No. 84-075-4-002 | Hole No. I-62 (old N-3) |
| Location | Elev. Ground Surface (G.S.) 444.1 | |
| N E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.) 446.08 | |
| Date Started Drilling Hole ____ Time ____ | Total Depth of Hole 44.0 | Drilling Type ____ |
| Date Completed Drilling Hole ____ Time ____ | | |
| Date Piezometer Installed ____ Time ____ | Total Depth of Piezometer 44.0 | Footage Slotted 10.0 |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 4-26-84 | afternoon | P. Hustad | 8.9 from T.O.P. | 437.18 | |
| 5-24-84 | 9:00 am | G. Ernstmann | 9.4 from T.O.P. | 436.68 | |
| 6-27-84 | 12:20 pm | R. Robinson | 9.86 from T.O.P. | 436.22 | |
| 8-10-84 | 7:35 am | G. Ernstmann | 11.89 from T.O.P. | 434.19 | |
| 8-16-84 | 8:00 am | G. Ernstmann | 12.40 from T.O.P. | 433.68 | |
| 8-20-84 | 7:30 am | G. Ernstmann | 12.66 from T.O.P. | 433.42 | |
| 8-21-84 | 11:30 am | G. Ernstmann | 12.78 from T.O.P. | 433.30 | |
| 8-28-84 | 10:40 am | G. Ernstmann | 13.2 from T.O.P. | 432.88 | |
| 8-29-84 | 1:15 pm | G. Ernstmann | 13.35 from T.O.P. | 432.73 | |
| 10-3-84 | 1:12 pm | R. Robinson | 13.84 from T.O.P. | 432.24 | Electric Tape |
| 10-26-84 | 9:12 am | G. Ernstmann | 12.95 from T.O.P. | 433.13 | " " |
| 12-19-84 | 10:45 am | G. Ernstmann | 12.7 from T.O.P. | 433.4 | " " |
| 3-30-85 | 12:02 pm | G. Ernstmann | 10.04 from T.O.P. | 436.04 | " " |
| 4-25-85 | 11:30 am | G. Ernstmann | 10.17 from T.O.P. | 435.91 | " " |
| 6-7-85 | 9:00 am | G. Papadakis | 10.32 from T.O.P. | 435.76 | " " |
| 8-8-85 | — | G. Papadakis | [illegible] from T.O.P. | 433.63 | cloth Tape |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | |
|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-4-002 | Hole No.: S-61 (old S-1) |
| Location | Elev. Ground Surface (G.S.): 445.6 | |
| N / E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 450.17 | |
| Date Started Drilling Hole ____ Time ____ | Total Depth of Hole: 21.5 | Drilling Type: ____ |
| Date Completed Drilling Hole ____ Time ____ | | |
| Date Piezometer Installed ____ Time ____ | Total Depth of Piezometer: 21.5 | Footage Slotted: ____ |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 4-26-84 | afternoon | P. Hustad | 13.3 from T.O.P. | 436.87 | |
| 5-24-84 | 8:30am | G. Ernstmann | 13.8 from T.O.P. | 436.37 | |
| 6-27-84 | 12:07pm | R. Robinson | 14.05 from T.O.P. | 436.12 | |
| 8-8-84 | 2:20pm | G. Ernstmann | 16.00 from T.O.P. | 434.17 | |
| 8-20-84 | 10:38am | G. Ernstmann | 16.90 from T.O.P. | 433.27 | |
| 8-29-84 | 12:00 noon | G. Ernstmann | 17.56 from T.O.P. | 432.61 | |
| 10-3-84 | 11:40 am | R. Robinson | 17.88 from T.O.P. | 432.29 | Electric Tape |
| 10-26-84 | 9:20am | G. Ernstmann | 17.00 from T.O.P. | 433.17 | " " |
| 12-19-84 | 11:08am | G. Ernstmann | 16.8 from T.O.P. | 433.4 | " " |
| 3-30-85 | 12:35pm | G. Ernstmann | 14.42 from T.O.P. | 435.75 | steel Tape |
| 4-17-85 | 2:45pm | G. Ernstmann | 14.1 from T.O.P. | 436.07 | Electric Tape |
| 4-25-85 | 10:28am | G. Ernstmann | 14.42 from T.O.P. | 435.75 | " " |
| 6-4-85 | 2:10pm | G. Papadakis | 15.79 from T.O.P. | 434.38 | " " |
| 6-7-85 | 8:47am | G. Papadakis | 14.89 from T.O.P. | 435.28 | " " |
| 8-8-85 | — | G. Papadakis | 16.72 from T.O.P. | 433.45 | cloth Tape |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | |
|---|---|---|
| Project Name: WESTLAKE | Project No. 84-075-4-002 | Hole No. S-60 (old S-2) |
| Location | Elev. Ground Surface (G.S.) 443.1 | |
| N E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.) 446.93(1) 446.30(2) | |
| Date Started Drilling Hole ___ Time ___ | Total Depth of Hole 21.0 | Drilling Type ___ |
| Date Completed Drilling Hole ___ Time ___ | | |
| Date Piezometer Installed ___ Time ___ | Total Depth of Piezometer 21.0 | Footage Slotted ___ |

Remarks:
(1) T.O.P = 446.93 prior to (4/17/85)
(2) T.O.P. = 446.30 beginning (4/17/85)

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 4-26-84 | afternoon | P. Hustad | 10.65 from T.O.P.(1) | 436.28 | |
| 5-24-84 | 8:40 am | G. Ernstmann | 10.7 from T.O.P.(1) | 436.23 | |
| 6-27-84 | 10:91 am | R. Robinson | 12.02 from T.O.P.(1) | 434.91 | |
| 8-8-84 | 2:22 pm | G. Ernstmann | 12.84 from T.O.P.(1) | 434.09 | |
| 8-20-84 | 10:42 am | G. Ernstmann | 13.74 from T.O.P.(1) | 433.19 | |
| 8-29-84 | 12:02 pm | G. Ernstmann | 14.4 from T.O.P.(1) | 432.53 | |
| 10-3-84 | 11:36 am | R. Robinson | 14.70 from T.O.P.(1) | 432.23 | Electric Tape |
| 10-26-84 | 9:40 am | G. Ernstmann | 13.95 from T.O.P.(1) | 432.98 | " " |
| 12-19-84 | 11:12 am | G. Ernstmann | * 13.7(±.1) from T.O.P.(1) | 433.2 | Electric Tape - *Note: above-ground part of piez. is badly damaged. |
| 3-30-85 | 12:37 pm | G. Ernstmann | * 1.17 from G.S. | 441.93 | steel tape *Note: piez. is still damaged and was open at the surface |
| 4-17-85 | 11:00 am | G. Ernstmann | 10.4 from T.O.P.(2) | 435.90 | |
| 4-25-85 | 10:31 am | G. Ernstmann | 10.92 from T.O.P.(2) | 435.38 | |
| 6-4-85 | 2:30 pm | S. Payiatakis | 12.06 from T.O.P.(2) | 434.24 | Cloth Tape |
| 6-7-85 | 1:30 pm | S. Payiatakis | 11.03 from T.O.P.(2) | 435.27 | Cloth Tape |
| 8-8-85 | — | S. Payiatakis | 12.98 from T.O.P.(2) | 433.32 | Cloth Tape |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | |
|---|---|---|
| Project Name: WESTLAKE | Project No. 84-075-4-002 | Hole No. I-59 (old N-2) |
| Location | Elev. Ground Surface (G.S.) 444.9 | |
| N E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.) 448.67 | |
| Date Started Drilling Hole ____ Time ____ | Total Depth of Hole 43.5 | Drilling Type ____ |
| Date Completed Drilling Hole ____ Time ____ | | |
| Date Piezometer Installed ____ Time ____ | Total Depth of Piezometer 43.5 | Footage Slotted 10.0 |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 4-26-84 | 1:22 pm | P. Hustad | 12.55 from T.O.P. | 436.12 | |
| 5-24-84 | 8:20 am | G. Ernstmann | 12.7 from T.O.P. | 435.97 | |
| 6-27-84 | 11:55 am | R. Robinson | 12.92 from T.O.P. | 435.75 | |
| 8-8-84 | 2:35 pm | G. Ernstmann | 14.68 from T.O.P. | 433.99 | |
| 8-20-84 | 10:48 am | G. Ernstmann | 15.56 from T.O.P. | 433.11 | |
| 8-24-84 | 2:15 pm | G. Ernstmann | 15.84 from T.O.P. | 432.83 | |
| 8-29-84 | 12:15 pm | G. Ernstmann | 16.16 from T.O.P. | 432.51 | |
| 10-3-84 | 11:27 am | R. Robinson | 16.36 from T.O.P. | 432.31 | Electric Tape |
| 10-26-84 | 9:47 am | G. Ernstmann | 15.45 from T.O.P. | 433.22 | " " |
| 12-19-84 | 11:18 am | G. Ernstmann | 15.4 from T.O.P. | 433.2 | " " |
| 3-30-85 | 12:47 pm | G. Ernstmann | 13.00 from T.O.P. | 435.67 | Steel Tape |
| 4-25-85 | 10:41 am | G. Ernstmann | 13.42 from T.O.P. | 435.25 | |
| 6-7-85 | 1:15 pm | S. Payiatakis | 13.50 from T.O.P. | 435.17 | |
| 8-8-85 | — | S. Payiatakis | 15.47 from T.O.P. | 433.20 | Cloth Tape |
| 12-13-85 | — | M. Erio | 14.43 from T.O.P. | 434.24 | Electric Tape |
| 5-20-86 | — | M. Erio | 15.92 from T.O.P. | 432.75 | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet ____ of ____

| | | |
|---|---|---|
| Project Name: WESTLAKE | Project No. 84-075-4-002 | Hole No. I-58 (old 40) |
| Location | Elev. Ground Surface (G.S.) 477.5 | |
| N E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.) 480.5 | |
| Date Started Drilling Hole ____ Time ____ | Total Depth of Hole 60.0 | Drilling Type ____ |
| Date Completed Drilling Hole ____ Time ____ | | |
| Date Piezometer Installed ____ Time ____ | Total Depth of Piezometer 60.0 | Footage Slotted 3.0 |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 4-26-84 | 1:30 pm | P. Hustad | 43.5 from T.O.P. | 437.0 | |
| 5-24-84 | 8:00 am | G. Ernstmann | 43.3 from T.O.P. | 437.2 | |
| 6-27-84 | 11:35 am | R. Robinson | 43.55 from T.O.P. | 436.95 | |
| 8-8-84 | 2:45 pm | G. Ernstmann | 45.29 from T.O.P. | 435.21 | |
| 8-20-84 | 4:10 pm | G. Ernstmann | 46.15 from T.O.P. | 434.35 | Electric Tape |
| 8-29-84 | 10:30 am | G. Ernstmann | 46.81 from T.O.P. | 433.69 | |
| 10-3-84 | 11:21 am | R. Robinson | 47.02 from T.O.P. | 433.48 | Electric Tape |
| 10-26-84 | 9:50 am | G. Ernstmann | 46.00 from T.O.P. | 434.50 | " " |
| 12-19-84 | 11:35 am | G. Ernstmann | 46.0 from T.O.P. | 434.5 | " " |
| 3-30-85 | 1:15 pm | G. Ernstmann | 43.58 from T.O.P. | 436.92 | steel tape |
| 4-25-85 | 8:40 am | G. Ernstmann | 44.04 from T.O.P. | 436.46 | |
| 6-7-85 | 1:40 pm | S. Payiatakis | 44.13 from T.O.P. | 436.37 | |
| 8-8-85 | — | S. Payiatakis | 46.41 from T.O.P. | 434.09 | Clean Tape |
| | | | from | | |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet ____ of ____

| | | |
|---|---|---|
| Project Name WESTLAKE | Project No. 84-075-4-002 | Hole No. I-56 (old 34) |
| Location | Elev. Ground Surface (G.S.) 475.1 | |
| N E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.) 478.4 | |
| Date Started Drilling Hole ____ Time ____ | Total Depth of Hole 61.1 | Drilling Type ____ |
| Date Completed Drilling Hole ____ Time ____ | Total Depth of Piezometer 61.1 | Footage Slotted 3.0 |
| Date Piezometer Installed ____ Time ____ | | |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 4-26-84 | 1:36 pm | P. Hustad | 41.45 from T.O.P. | 436.95 | |
| 4-25-84 | 8:10 am | G. Ernstmann | 41.5 from T.O.P. | 436.9 | |
| 4-27-84 | 11:25 am | R. Robinson | 41.67 from T.O.P. | 436.73 | |
| 8-8-84 | 2:55 pm | G. Ernstmann | 43.34 from T.O.P. | 435.06 | |
| 8-20-84 | 3:55 pm | G. Ernstmann | 44.0 from T.O.P. | 434.4 | Electric Tape |
| 8-29-84 | 10:22 am | G. Ernstmann | 44.86 from T.O.P. | 433.54 | |
| 10-3-84 | 11:15 am | R. Robinson | 44.97 from T.O.P. | 433.43 | Electric Tape |
| 10-26-84 | 9:57 am | G. Ernstmann | 43.95 from T.O.P. | 434.45 | " " |
| 12-19-84 | 11:42 am | G. Ernstmann | 44.0 from T.O.P. | 434.4 | " " |
| 3-30-85 | 1:25 pm | G. Ernstmann | 41.42 from T.O.P. | 436.98 | steel tape |
| 4-25-85 | 8:48 am | G. Ernstmann | 42.17 from T.O.P. | 436.23 | |
| 6-7-85 | 1:45 pm | S. Payiatakis | 42.18 from T.O.P. | 436.22 | |
| 8-8-85 | — | S. Payiatakis | 44.43 from T.O.P. | 433.97 | |
| | | | from | | |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | |
|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-4-002 | Hole No.: I-55 (old 35) |
| Location | Elev. Ground Surface (G.S.): 471.9 | |
| N / E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 475.1 | |
| Date Started Drilling Hole: ____ Time: ____ | Total Depth of Hole: 60.0 | Drilling Type: ____ |
| Date Completed Drilling Hole: ____ Time: ____ | | |
| Date Piezometer Installed: ____ Time: ____ | Total Depth of Piezometer: 60.0 | Footage Slotted: 3.0 |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 4-26-84 | 1:40pm | P. Hustad | 38.0 from T.O.P. | 437.1 | |
| 5-23-84 | 4:15pm | G. Ernstmann | 37.9 from T.O.P. | 437.2 | |
| 6-27-84 | 11:20am | R. Robinson | 38.02 from T.O.P. | 437.08 | |
| 8-8-84 | 3:00pm | G. Ernstmann | 39.55 from T.O.P. | 435.55 | |
| 8-20-84 | 4:25pm | G. Ernstmann | 40.4 from T.O.P. | 434.7 | Electric Tape |
| 8-29-84 | 10:20am | G. Ernstmann | 41.13 from T.O.P. | 433.97 | |
| 10-3-84 | 11:10am | R. Robinson | 41.15 from T.O.P. | 433.95 | Electric Tape |
| 10-26-84 | 10:02am | G. Ernstmann | 40.20 from T.O.P. | 434.90 | " " |
| 12-19-84 | 11:45am | G. Ernstmann | 40.2 from T.O.P. | 434.9 | " " |
| 3-30-85 | 1:30pm | G. Ernstmann | 37.83 from T.O.P. | 437.27 | steel tape |
| 4-25-85 | 8:55am | G. Ernstmann | 38.63 from T.O.P. | 436.47 | |
| 6-7-85 | 1:50pm | S. Payiatakis | 38.52 from T.O.P. | 436.58 | |
| 8-8-85 | — | S. Payiatakis | 44.73 from T.O.P. | 430.37 | Cloth Tape |
| | | | from | | |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet ____ of ____

| | | | |
|---|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-4-002 | Hole No.: S-54 (old 36) | |
| Location | | Elev. Ground Surface (G.S.): 470.0 | |
| N | E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 471.0 | |
| Date Started Drilling Hole: ____ | Time: ____ | Total Depth of Hole: 40.4 | Drilling Type: ____ |
| Date Completed Drilling Hole: ____ | Time: ____ | | |
| Date Piezometer Installed: ____ | Time: ____ | Total Depth of Piezometer: 40.4 | Footage Slotted: 3.0 |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 4-26-84 | 1:44pm | P. Hustad | 34.2 from T.O.P. | 436.8 | |
| 5-23-84 | 1:10pm | G. Ernstmann | 34.2 from T.O.P. | 436.8 | |
| 6-27-84 | 11:15am | R. Robinson | 35.45 from T.O.P. | 435.55 | |
| 8-8-84 | 4:15pm | G. Ernstmann | 35.75 from T.O.P. | 435.25 | |
| 8-20-84 | 4:28pm | G. Ernstmann | 36.4 from T.O.P. | 434.6 | Electric tape (water level indicator) |
| 8-24-84 | 1:15pm | G. Ernstmann | 36.91 from T.O.P. | 434.09 | |
| 8-29-84 | 10:15am | G. Ernstmann | 37.24 from T.O.P. | 433.76 | |
| 10-3-84 | 11:05am | R. Robinson | 37.19 from T.O.P. | 433.81 | Electric Tape |
| 10-26-84 | 10:10am | G. Ernstmann | 36.20 from T.O.P. | 434.80 | " " |
| 12-19-84 | 11:48am | G. Ernstmann | 36.3 from T.O.P. | 434.7 | " " |
| 3-30-85 | 1:35pm | G. Ernstmann | 34.08 from T.O.P. | 436.92 | steel tape |
| 4-25-85 | 9:02am | G. Ernstmann | 34.75 from T.O.P. | 436.25 | |
| 6-7-85 | 1:55pm | S. Payiatakis | 34.84 from T.O.P. | 436.16 | |
| 8-8-85 | — | S. Payiatakis | 36.83 from T.O.P. | 434.17 | Cloth Tape |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | |
|---|---|---|
| Project Name: WESTLAKES | Project No.: 84-075-41-002 | Hole No.: S-53 (old HL-1) |
| Location | Elev. Ground Surface (G.S.): 444.8 | |
| N E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 449.00 | |
| Date Started Drilling Hole: _____ Time: _____ | Total Depth of Hole: 23.7 | Drilling Type: _____ |
| Date Completed Drilling Hole: _____ Time: _____ | Total Depth of Piezometer: 23.7 | Footage Slotted: 3.0 |
| Date Piezometer Installed: _____ Time: _____ | | |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 4-26-84 | 11:32 am | P. Hustad | 11.65 from T.O.P. | 437.35 | |
| 5-23-84 | 1:05 pm | G. Ernstmann | 11.85 from T.O.P. | 437.15 | |
| 6-27-84 | 10:55 am | R. Robinson | 11.94 from T.O.P. | 437.06 | |
| 8-8-84 | 3:42 pm | G. Ernstmann | 13.62 from T.O.P. | 435.38 | |
| 8-20-84 | 5:20 pm | G. Ernstmann | 14.3 from T.O.P. | 434.7 | Electric Tape |
| 8-29-84 | 10:55 am | G. Ernstmann | 14.96 from T.O.P. | 434.04 | |
| 10-3-84 | 9:27 am | R. Robinson | 15.09 from T.O.P. | 433.91 | Electric Tape |
| 10-26-84 | 12:35 pm | G. Ernstmann | 14.10 from T.O.P. | 434.90 | " " |
| 12-12-84 | 12:37 pm | G. Ernstmann | 14.0 from T.O.P. | 435.0 | " " |
| 3-30-85 | 2:10 pm | G. Ernstmann | 11.67 from T.O.P. | 437.33 | Steel tape |
| 4-18-85 | NOON | G. Ernstmann | 12.1 from T.O.P. | 436.90 | |
| 4-25-85 | 12:21 pm | G. Ernstmann | 12.63 from T.O.P. | 436.37 | |
| 6-7-85 | 11:35 am | S. Payiatakis | 12.83 from T.O.P. | 436.17 | |
| 8-8-85 | — | S. Payiatakis | 14.48 from T.O.P. | 434.52 | Cloth Tape |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | |
|---|---|---|
| Project Name WESTLAKES | Project No. 84-075-4-002 | Hole No. S-52 (old HL-2) |
| Location | Elev. Ground Surface (G.S.) 444.7 | |
| N E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.) 447.08 | |
| Date Started Drilling Hole ____ Time ____ | Total Depth of Hole 25.2 | Drilling Type ____ |
| Date Completed Drilling Hole ____ Time ____ | Total Depth of Piezometer 25.2 | Footage Slotted 3.0 |
| Date Piezometer Installed ____ Time ____ | | |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 4-26-84 | 11:28 am | P. Hustad | 10.9 from T.O.P. | 436.18 | |
| 5-23-84 | 1:00 am | G. Ernstmann | 11.3 from T.O.P. | 435.78 | |
| 6-27-84 | 10:51 am | R. Robinson | 11.39 from T.O.P. | 433.31 | |
| 8-8-84 | 3:40 pm | G. Ernstmann | 12.98 from T.O.P. | 434.10 | |
| 8-20-84 | 5:15 pm | G. Ernstmann | 13.75 from T.O.P. | 433.33 | Electric Tape |
| 8-29-84 | 10:50 am | G. Ernstmann | 14.38 from T.O.P. | 432.70 | |
| 10-3-84 | 9:25 am | R. Robinson | 14.54 from T.O.P. | 432.54 | Electric Tape |
| 10-26-84 | 12:40 pm | G. Ernstmann | 13.50 from T.O.P. | 433.58 | " " |
| 12-19-84 | 12:41 pm | G. Ernstmann | 13.3 from T.O.P. | 434.8 | " " |
| 3-30-85 | 2:15 pm | G. Ernstmann | 10.92 from T.O.P. | 436.16 | steel tape |
| 4-18-85 | — | G. Ernstmann | 11.4 from T.O.P. | 435.68 | |
| 4-25-85 | 12:25 pm | G. Ernstmann | 12.0 from T.O.P. | 435.08 | |
| 6-7-85 | 11:25 am | S. Payiatakis | 11.90 from T.O.P. | 435.18 | |
| 8-8-85 | — | S. Payiatakis | 13.96 from T.O.P. | 433.32 | cloth Tape |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | |
|---|---|---|
| Project Name WESTLAKES | Project No. 84-075-4-002 | Hole No. S-51 (old HL-3) |
| Location | Elev. Ground Surface (G.S.) 446.3 | |
| N E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.) 447.72 | |
| Date Started Drilling Hole ____ Time ____ | Total Depth of Hole 25.8 | Drilling Type ____ |
| Date Completed Drilling Hole ____ Time ____ | Total Depth of Piezometer 25.8 | Footage Slotted 3.0 |
| Date Piezometer Installed ____ Time ____ | | |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 4-26-84 | 11:38 am | P. Hustad | 12.3 from T.O.P. | 435.42 | |
| 5-24-84 | 12:45 pm | G. Ernstmann | 13.0 from T.O.P. | 434.72 | |
| 6-27-84 | 10:47 am | R. Robinson | 13.36 from T.O.P. | 434.36 | |
| 8-8-84 | 3:35 pm | G. Ernstmann | 14.97 from T.O.P. | 432.75 | |
| 8-20-84 | 5:10 pm | G. Ernstmann | 15.75 from T.O.P. | 431.97 | Electric Tape (water level indicator) |
| 8-29-84 | 10:45 am | G. Ernstmann | 16.39 from T.O.P. | 431.33 | |
| 10-3-84 | 9:20 am | R. Robinson | 16.40 from T.O.P. | 431.32 | Electric Tape |
| 10-26-84 | 12:45 pm | G. Ernstmann | 15.35 from T.O.P. | 432.37 | Electric Tape |
| 12-19-84 | 12:45 pm | G. Ernstmann | 15.2 from T.O.P. | 432.5 | Electric Tape |
| 3-30-85 | 2:20 pm | G. Ernstmann | 12.58 from T.O.P. | 435.14 | Steel Tape |
| 4-18-85 | — | G. Ernstmann | 13.00 from T.O.P. | 434.72 | |
| 4-25-85 | 12:17 pm | G. Ernstmann | 13.83 from T.O.P. | 433.89 | |
| 6-7-85 | 11:15 am | S. Payiatakis | 13.88 from T.O.P. | 433.84 | |
| 8-8-85 | — | S. Payiatakis | 15.74 from T.O.P. | 431.98 | Cloth Tape |
| 12-13-85 | — | M. Frio | 12.23 from T.O.P. | 435.29 | Electric Tape |
| 5-14-86 | — | M. Frio | 16.12 from T.O.P. | 431.60 | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet ____ of ____

| | | |
|---|---|---|
| Project Name: WESTLAKES | Project No.: 84-075-41-002 | Hole No.: I-50 (old N-1) |
| Location | Elev. Ground Surface (G.S.): 449.0 | |
| N / E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 453.48 | |
| Date Started Drilling Hole: — Time: — | Total Depth of Hole: 40.6 | Drilling Type: — |
| Date Completed Drilling Hole: — Time: — | | |
| Date Piezometer Installed: — Time: — | Total Depth of Piezometer: 40.6 | Footage Slotted: 10.0 |

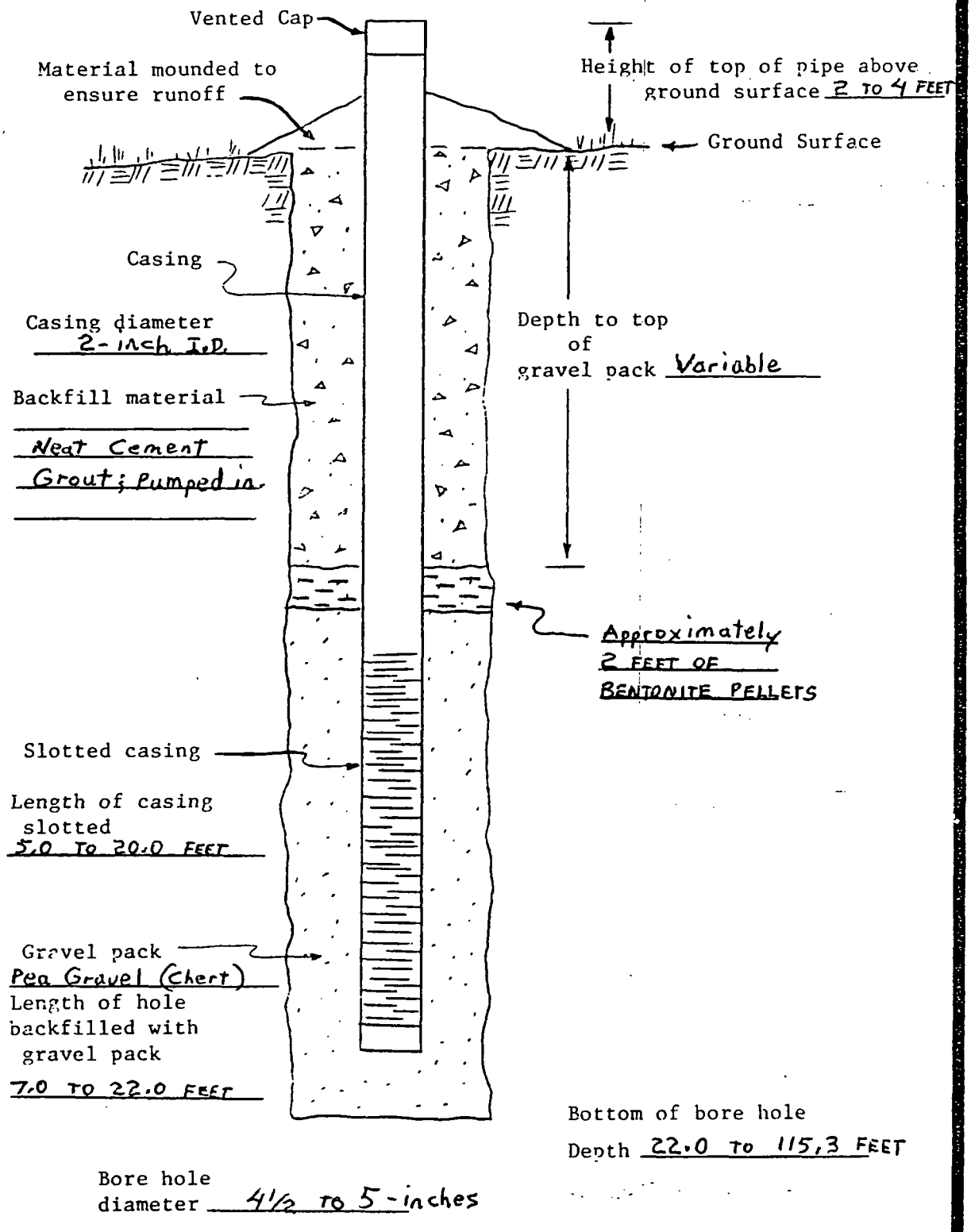
Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 4-26-84 | 11:15 am | P. Hustad | 15.8' from T.O.P. | 437.68 | |
| 6-27-84 | 10:40 am | R. Robinson | 16.47' from T.O.P. | 437.01 | |
| 8-8-84 | 3:48 pm | G. Ernstmann | 18.62' from T.O.P. | 434.86 | |
| 8-20-84 | 5:05 pm | G. Ernstmann | 19.5' from T.O.P. | 433.98 | Electric tape (water level indicator) |
| 8-29-84 | 7:15 am | G. Ernstmann | 20.33 from T.O.P. | 433.15 | |
| 10-3-84 | 9:04 am | R. Robinson | 20.4 from T.O.P. | 433.08 | Electric Tape |
| 10-26-84 | 12:55 pm | G. Ernstmann | 18.80 from T.O.P. | 434.68 | Electric Tape |
| 12-14-84 | 12:58 pm | G. Ernstmann | 18.50 from T.O.P. | 434.98 | Electric Tape |
| 3-30-85 | 2:25 pm | G. Ernstmann | 15.50 from T.O.P. | 437.98 | steel tape |
| 4-25-85 | 12:35 pm | G. Ernstmann | 17.13 from T.O.P. | 436.35 | |
| 6-7-85 | 11:[illegible] am | S. Payiatakis | 19.96 from T.O.P. | [illegible] | |
| 8-8-85 | — | S. Payiatakis | 19.14 from T.O.P. | 434.34 | [illegible] tape |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

# APPENDIX C

# OBSERVED WATER LEVEL READINGS




date

designed

Burns & McDonnell Engineers Architects Consultants
Kansas City, Missouri

PIEZOMETER CONSTRUCTION RECORD

Piezometer No. TYPICAL

project

contract

dwg. no. rev.

Form GCO-1-9 051978

# APPENDIX B

# PIEZOMETER CONSTRUCTION

# Drilling Log

| | | | |
|---|---|---|---|
| Project Name: WESTLAKE | | | Boring No.: D-95 |
| Project No.: 84-075-4-004 | | | Page 1 of |
| Ground Elevation: 453.09 | Location: | | Total Footage: |

| Drilling Type | Hole Size | Overburden Footage | Bedrock Footage | No. of Samples | No. Core Boxes | Depth To Water | Date Measured |
|---|---|---|---|---|---|---|---|
| SEE REMARKS | | | | | | | |

| | | | |
|---|---|---|---|
| Drilling Co. | SUBSURFACE CONSTRUCTORS (WABASH) | Driller (s) | GARY JOHANNING |
| Drilling Rig. | CME 55, TRUCK | Type of Penetration Test | STANDARD |
| Date | 4-22-85 To | Field Observer (s) | G. ERNSTMANN |

| Depth | Description | Class. | Blow Count | Recov. | | Sample or Box No. | Remarks |
|---|---|---|---|---|---|---|---|
| | GRAVEL | | | | | | 6" HOLLOW AUGERS 0' TO 20'. |
| 1 | DARK BROWN SAND AND GRAVEL, MOIST (FILL) | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | 5.0 | | |
| | | | 3/6/9 | 8"/18" | | SS-1 | |
| 6 | | | | | | | |
| | | | | | 6.5 | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | BROWN TO BLACK SILT, SAND AND GRAVEL, VERY LOOSE, MOIST | | | | | | |
| 10 | | | | | 10.0 | | |
| | | | 2/3/2 | 9"/18" | | SS-2 | |
| 11 | | | | | | | |
| | | | | | 11.5 | | |
| 12 | | | | | | | |
| 13 | BROWN FINE SANDY SILT, LOW PLASTICITY, VERY LOOSE, MOIST - SATURATED BELOW APPROX. 15' | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| | Boring No. D-95 |
| Project Name WESTLAKE | Page 2 of |
| Project No. 84-075-4-004 | Date 4-22-85 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 15 | BROWN FINE SANDY SILT, LOW PLASTICITY, VERY LOOSE, MOIST - SATURATED BELOW APPROX. 15' | | 2/2/3 | 6"/18" | 15.0 | SS-3 | WATER LEVEL @ 13.6' BELOW G.S. 7:15am 4-23-85 (HOLE SAT OVERNIGHT AFTER BEING DRILLED 20'). |
| 16 | | | | | 16.5 | | |
| 17 | | | | | | | |
| 18 | — — — — — — — | | | | | | |
| 19 | BROWN FINE TO MEDIUM SAND, LOOSE TO MEDIUM DENSE, SATURATED | | | | | | |
| 20 | | | | | 20.0 | | |
| 21 | | | 1/3/3 | 6"/18" | | SS-4 | |
| | | | | | 21.5 | | STOPPED 4-22-85 RESUMED 4-23-85 SET 4½" CASING AND BEGAN WASH BORING W/ 3⅞" DIA. TRI-CONE BIT, |
| 22 | | | | | | | |
| 23 | | | | | | | |
| 24 | SILTY SAND SEAM 25.0' TO 25.3' | | | | 24.0 | | |
| 25 | | | | 13"/18" | | SS-5 | |
| | | | | | 26.5 | | |
| 26 | — — — — — — — | | 11/13/15 | | | | |
| 27 | BROWN SILTY FINE TO MEDIUM SAND, DENSE, SATURATED | | | | | | |
| 28 | | | | | | | |
| 29 | | | | | 29.0 | | |
| 30 | | | 15/21/20 | 12"/18" | | SS-6 | |
| | | | | | 30.5 | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

| | |
|---|---|
| | Boring No. D-95 |
| Project Name WESTLAKE | Page 3 of |
| Project No. | Date 4-23-85 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 32 | BROWN SILTY FINE TO MEDIUM SAND, DENSE, SATURATED | | | | | | |
| 33 | | | | | | | |
| 34 | | | | | 34.0 | | |
| | | | 11/16/23 | 14"/18" | | SS-7 | |
| 35 | | | | | 35.5 | | |
| 36 | | | | | | | |
| 37 | — — — — — — | | | | | | |
| 38 | GRAY FINE TO MEDIUM SAND, MEDIUM DENSE TO VERY DENSE, SATURATED | | | | | | |
| 39 | | | | | 39.0 | | |
| | | | 4/9/14 | 8"/18" | | SS-8 | |
| 40 | | | | | 40.5 | | |
| 41 | | | | | | | |
| 42 | | | | | | | |
| 43 | | | | | | | |
| 44 | | | | | 44.0 | | |
| | | | 9/6/5 | 6"/18" | | SS-9 | |
| 45 | | | | | 45.5 | | |
| 46 | | | | | | | |
| 47 | FEW THIN COARSE SAND SEAMS 47' TO 49'. | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

Boring No. D-95

Project Name WESTLAKE

Page 4 of

Project No. 84-075-4004

Date

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 49 | GRAY FINE TO MEDIUM SAND, MEDIUM DENSE TO VERY DENSE, SATURATED | | 12/28/43 | 5"/18" | 49.0 | | |
| 50 | | | | | | SS-10 | |
| | | | | | 50.5 | | |
| 51 | | | | | | | |
| 52 | | | | | | | |
| 53 | — — — — — — — | | | | | | |
| 54 | GRAY FINE TO COARSE SAND, TRACE FINE GRAVEL, DENSE | | | | | | |
| 55 | | | | | | | |
| 56 | | | | | | | |
| 57 | | | | | | | |
| 58 | | | | | | | |
| 59 | | | 11/13/24 | 6"/18" | 59.0 | | |
| 60 | | | | | | SS-11 | |
| | | | | | 60.5 | | |
| 61 | | | | | | | |
| 62 | | | | | | | |
| 63 | | | | | | | |
| 64 | | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

Boring No. D-95

Project Name WESTLAKE

Page 5 of

Project No. 04-075-4-004

Date

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 66 | | | | | | | |
| 67 | GRAY FINE TO MEDIUM SAND, VERY DENSE, SATURATED | | | | | | |
| 68 | | | | | | | |
| 69 | | | 24/50/6" | 10"/12" | 69.0 | SS-12 | |
| 70 | | | | | 70.0 | | |
| 71 | | | | | | | |
| 72 | GRAVEL SEAM 72.0' - 72.2' | | | | | | |
| 73 | | | | | | | |
| 74 | | | | | | | |
| 75 | | | | | | | |
| 76 | | | | | | | |
| 77 | | | | | | | |
| 78 | GRAY COARSE SAND, SOME MEDIUM AND FINE SAND, VERY DENSE | | | | | | |
| 79 | | | | | 79.0 | | |
| 80 | | | 16/25/27 | 7"/18" | | SS-13 | |
| | | | | | 80.5 | | |
| 81 | | | | | | | |

# Drilling Log, continued

| | |
|---|---|
| | Boring No. D-95 |
| Project Name WESTLAKE | Page 6 of |
| Project No. 84-075-4-004 | Date |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 83 | GRAY COARSE SAND, SOME MEDIUM AND FINE SAND, VERY DENSE, SATURATED | | | | | | |
| 84 | GRAVEL SEAM 83.5 TO 83.8 | | | | | | |
| 85 | | | | | | | |
| 86 | | | | | | | |
| 87 | | | | | | | |
| 88 | | | | | | | |
| 89 | | | | | 89.0 | | |
| | | | 15/23/29 | 7"/18" | | SS-14 | |
| 90 | | | | | 90.5 | | STOPPED 4-23-85 RESUMED 4-24-85 |
| 91 | | | | | | | |
| 92 | | | | | | | |
| 93 | | | | | | | |
| 94 | | | | | | | |
| 95 | TRACE OF COARSE GRAVEL 95.5 TO | | | | | | |
| 96 | | | | | | | |
| 97 | | | | | | | |
| 98 | | | | | | | |

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Drilling Log (continued)

Boring No. D-95

Project Name WESTLAKE

Page 7 of

Project No. 84-075-4-004

Date

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| | GRAY COARSE SAND, SOME MEDIUM AND FINE SAND, VERY DENSE, SATURATED | | 17/23/43 | 7"/18" | 99.0 | SS-15 | |
| 100 | | | | | 100.5 | | |
| 101 | LIMESTONE | | | | | | |
| | TOTAL DEPTH 101.0' | | | | | | A 2" dia., flush-joint, threaded couple PVC piezometer was installed to 101.0'. Bottom 20' is .010 machine slotted screen. Hole collapsed to 62' after PVC installed. Grout 62' to surface. |
| 102 | | | | | | | |
| 103 | | | | | | | |
| 104 | | | | | | | |
| 105 | | | | | | | |
| 106 | | | | | | | T.O.P. is 3.3' above ground surface. |
| 107 | | | | | | | Water level in piezometer immediately after installation 4-27-85 3:00pm is 16.7' below T.O.P. |
| 108 | | | | | | | |
| 109 | | | | | | | |
| 110 | | | | | | | |
| 111 | | | | | | | |
| 112 | | | | | | | |
| 113 | | | | | | | |
| 114 | | | | | | | |
| 115 | | | | | | | |

# Drilling Log, continued

| | |
|---|---|
| Project Name | WESTLAKE |
| Project No. | 84-075-4-004 |
| Boring No. | D-94 |
| Page | 7 of 7 |
| Date | 4-18-85 |

| Depth | Description | Log or Class | Blow Count | Core Recov. & Loss | | Box or Sample No. | Remarks |
|---|---|---|---|---|---|---|---|
| 100 | GRAY FINE TO COARSE SAND, VERY DENSE, SATURATED | | 14/28/27 | 4"/18" | 100.0 | SS-15 | |
| 101 | | | | | | | |
| 102 | | | | | | | |
| 103 | | | | | | | |
| 104 | | | | | | | |
| 105 | | | | | | | STOPPED 4-23-85 RESUMED 4-24-85 |
| 106 | | | | | | | |
| 107 | | | | | | | |
| 108 | GRAVEL | | | | | | A 2" PVC, flush-joint, threaded Couple piezometer was installed To 106'. |
| 109 | LIMESTONE | | | | | | |
| | TOTAL DEPTH 109.0' | | | | | | |
| 110 | | | | | | | 20' of .010 machine slotted screen. |
| 111 | | | | | | | Hole collapsed to a depth of 65'. |
| 112 | | | | | | | Bentonite pellets 65' TO 64. Grout 64' to Surface. |
| 113 | | | | | | | water level immediately after installation. |
| 114 | | | | | | | 4-23-85, 3:00pm 2.6' below T.O.P. |
| 115 | | | | | | | T.O.P is 4.0' above GLS |

Environmental Trace Substances Research Center
Base Neutral Result Sheet

Sample Source: Burns & McDonnell
Submitter ID#: S-510R
ETSRC ID#: 5120513 Data File#: BN5120513
Sample Matrix: Water
Method: U.S.E.P.A. #625
Date Received: December 17, 1985
Date Analyzed: January 20, 1986 Conc. Units: mcg/L
Analyst: Carl Orazio

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | <MDL |
| 2. 1,3-Dichlorobenzene | 146 | | | | <MDL |
| 3. 1,4-Dichlorobenzene | 146 | | | | <MDL |
| 4. 1,2-Dichlorobenzene | 146 | | | | <MDL |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | <MDL |
| 6. Hexachloroethane | 117 | | | | <MDL |
| 7. Nitrobenzene | 77 | | | | <MDL |
| 8. Isophorone | 82 | | | | <MDL |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | <MDL |
| 10. Trichlorobenzene | 180 | | | | <MDL |
| 11. Naphthalene | 128 | | | | <MDL |
| 12. Hexachlorobutadiene | 225 | | | | <MDL |
| 13. Hexachlorocyclopentadiene | 237 | | | | <MDL |
| 14. 2-Chloronaphthalene | 162 | | | | <MDL |
| 15. Acenaphthylene | 152 | | | | <MDL |
| 17. Dimethylphthalate | 163 | | | | <MDL |
| 18. Acenaphthene | 154 | | | | <MDL |
| 19. 2,4-Dinitrotoluene | 165 | | | | <MDL |
| 20. Fluorene | 166 | | | | <MDL |
| 21. Diethylphthalate | 149 | | | | <MDL |
| 22. N-Nitrodiphenylamine | 169 | | | | <MDL |
| 23. 4-Bromophenylphentyl ether | 248 | | | | <MDL |

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 24. Hexachlorobenzene | 284 | | | | 1.0 |
| 25. Phenanthrene | 178 | | | | 1.0 |
| 26. Anthracene | 178 | | | | 1.0 |
| 27. Di-n-Butylphthalate | 149 | | | | 1.0 |
| 28. Fluoranthene | 202 | | | | 1.0 |
| 29. Pyrene | 202 | | | | 1.0 |
| 30. Butylbenzylphthalate | 149 | | | | 1.0 |
| 31. Benz[a]anthracene | 228 | | | | 1.0 |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | 2.0 |
| 33. Chrysene | 228 | | | | 1.0 |
| 34. Bis[2-ethylhexyl]phthalate | 149 | | | | 1.0 |
| 35. Di-n-Octylphthalate | 149 | | | | 1.0 |
| 36. Benzo[b]Fluoranthene | 252 | | | | 1.0 |
| 37. Benzo[k]Fluoranthene | 252 | | | | 1.0 |
| 38. Benzo[a]Pyrene | 252 | | | | 1.0 |
| 39. 1,2-Diphenylhydrazine | 77 | | | | 5.0 |
| 40. Benzidine | 184 | | | | 10.0 |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | 2.0 |
| 42. N-Nitroso-n-propylamine | 70 | | | | 10.0 |

Environmental Trace Substances Research Center
Base Neutral Result Sheet
Detection Limit

Sample Source:
Submitter ID#:
ETSRC ID#:
Sample Matrix:
Method: U.S.E.P.A. #625
Date Received:
Date Analyzed:
Analyst:

Data File#:

Conc. Units: mcg/L

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | 1.0 |
| 2. 1,3-Dichlorobenzene | 146 | | | | 1.0 |
| 3. 1,4-Dichlorobenzene | 146 | | | | 1.0 |
| 4. 1,2-Dichlorobenzene | 146 | | | | 1.0 |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | 5.0 |
| 6. Hexachloroethane | 117 | | | | 1.0 |
| 7. Nitrobenzene | 77 | | | | 1.0 |
| 8. Isophorone | 82 | | | | 2.0 |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | 3.0 |
| 10. Trichlorobenzene | 180 | | | | 1.0 |
| 11. Naphthalene | 128 | | | | 1.0 |
| 12. Hexachlorobutadiene | 225 | | | | 1.0 |
| 13. Hexachlorocyclopentadiene | 237 | | | | 1.0 |
| 14. 2-Chloronaphthalene | 162 | | | | 1.0 |
| 15. Acenaphthylene | 152 | | | | 1.0 |
| 17. Dimethylphthalate | 163 | | | | 1.0 |
| 18. Acenaphthene | 154 | | | | 1.0 |
| 19. 2,4-Dinitrotoluene | 165 | | | | 1.0 |
| 20. Fluorene | 166 | | | | 1.0 |
| 21. Diethylphthalate | 149 | | | | 1.0 |
| 22. N-Nitrosodiphenylamine | 169 | | | | 2.0 |
| 23. 4-Bromophenylphentyl ether | 248 | | | | 1.0 |

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 24. Hexachlorobenzene | 284 | | | | <MDL |
| 25. Phenanthrene | 178 | | | | <MDL |
| 26. Anthracene | 178 | | | | <MDL |
| 27. Di-n-Butylphthalate | 149 | | | | <MDL |
| 28. Fluoranthene | 202 | | | | <MDL |
| 29. Pyrene | 202 | | | | <MDL |
| 30. Butylbenzylphthalate | 149 | | | | <MDL |
| 31. Benz[a]anthracene | 228 | | | | <MDL |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | <MDL |
| 33. Chrysene | 228 | | | | <MDL |
| 34. Bis[2-ethylhexyl]phthalate | 149 | | | | <MDL |
| 35. Di-n-Octylphthalate | 149 | | | | <MDL |
| 36. Benzo[b]Fluoranthene | 252 | | | | <MDL |
| 37. Benzo[k]Fluoranthene | 252 | | | | <MDL |
| 38. Benzo[a]Pyrene | 252 | | | | <MDL |
| 39. 1,2-Diphenylhydrazine | 77 | | | | <MDL |
| 40. Benzidine | 184 | | | | <MDL |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | <MDL |
| 42. N-Nitroso-n-propylamine | 70 | | | | |

RESULT SUMMARY SHEETS

BASE/NEUTRAL PRIORITY POLLUTANTS

Environmental Trace Substances Research Center
ICP Scan - Sample Analysis Report
Project: BURNS AND MCDONNELL Units: MCG/ML
Batch #: B-5120530

Customer ID: D-95 METALS
ETSRC ID: 5120548

| Elm | Result |
|---|---|
| AG | <0.003 |
| AL | 0.04 |
| AS | <0.06 |
| B | 0.1 |
| BA | 0.183 |
| BE | <0.0003 |
| BI | <0.06 |
| CA | 67.9 |
| CD | <0.003 |
| CO | <0.006 |
| CR | <0.02 |
| CU | 0.01 |
| FE | 0.16 |
| K | 1.7 |
| LI | 0.013 |
| MG | 11.2 |
| MN | 0.066 |
| MO | 0.01 |
| NA | 40.9 |
| NI | <0.02 |
| P | 0.3 |
| PB | <0.04 |
| SB | <0.04 |
| SE | <0.08 |
| SI | 12.1 |
| SN | <0.02 |
| SR | 0.325 |
| TI | <0.003 |
| TL | <0.1 |
| V | <0.003 |
| ZN | 0.035 |

Environmental Trace Substances Research Center
ICP Scan - Sample Analysis Report
Project: BURNS AND MCDONNELL Units: MCG/ML
Batch #: B-5120530

Customer ID: D-94 METALS
ETSRC ID: 5120547

| Elm | Result |
|---|---|
| AG | <0.003 |
| AL | <0.02 |
| AS | <0.06 |
| B | 0.06 |
| BA | 0.666 |
| BE | <0.0003 |
| BI | <0.06 |
| CA | 110. |
| CD | <0.003 |
| CO | <0.006 |
| CR | <0.02 |
| CU | 0.01 |
| FE | 0.12 |
| K | 3.1 |
| LI | 0.021 |
| MG | 24.6 |
| MN | 0.20 |
| MO | 0.01 |
| NA | 68.6 |
| NI | <0.02 |
| P | <0.2 |
| PB | <0.04 |
| SB | <0.04 |
| SE | <0.08 |
| SI | 10.6 |
| SN | <0.02 |
| SR | 0.588 |
| TI | 0.005 |
| TL | <0.1 |
| V | <0.003 |
| ZN | 0.14 |

Environmental Trace Substances Research Center
ICP Scan - Sample Analysis Report
Project: BURNS AND MCDONNELL Units: MCG/ML
Batch #: B-5120530

Customer ID: D-93 METALS
ETSRC ID: 5120546

| Elm | Result |
|---|---|
| AG | 0.004 |
| AL | 0.03 |
| AS | <0.06 |
| B | 0.1 |
| BA | 1.06 |
| BE | <0.0003 |
| BI | <0.06 |
| CA | 246. |
| CD | <0.003 |
| CO | <0.006 |
| CR | <0.02 |
| CU | 0.024 |
| FE | 2.63 |
| K | 1. |
| LI | 0.034 |
| MG | 61.4 |
| MN | 0.336 |
| MO | <0.008 |
| NA | 64.3 |
| NI | <0.02 |
| P | 0.2 |
| PB | <0.04 |
| SB | 0.07 |
| SE | <0.08 |
| SI | 14.5 |
| SN | <0.03 |
| SR | 0.861 |
| TI | <0.003 |
| TL | <0.1 |
| V | <0.003 |
| ZN | 0.020 |

Environmental Trace Substances Research Center
ICP Scan - Sample Analysis Report
Project: BURNS AND MCDONNELL Units: MCG/ML
Batch #: B-5120530

Customer ID: D-92 METALS
ETSRC ID: 5120545

| Elm | Result |
|---|---|
| AG | <0.003 |
| AL | 0.20 |
| AS | <0.06 |
| B | 0.21 |
| BA | 0.614 |
| BE | <0.0003 |
| BI | <0.06 |
| CA | 287. |
| CD | <0.003 |
| CO | <0.006 |
| CR | <0.02 |
| CU | 0.008 |
| FE | 6.28 |
| K | 1.8 |
| LI | 0.033 |
| MG | 77.5 |
| MN | 1.63 |
| MO | <0.008 |
| NA | 153. |
| NI | 0.02 |
| P | 0.3 |
| PB | <0.04 |
| SB | 0.07 |
| SE | <0.08 |
| SI | 11.1 |
| SN | <0.03 |
| SR | 1.12 |
| TI | 0.20 |
| TL | <0.1 |
| V | <0.003 |
| ZN | 0.029 |

Environmental Trace Substances Research Center
ICP Scan - Sample Analysis Report
Project: BURNS AND MCDONNELL Units: MCG/ML
Batch #: B-5120530

Customer ID: D-91 METALS
ETSRC ID: 5120544

| Elm | Result |
|---|---|
| AG | <0.003 |
| AL | 0.03 |
| AS | <0.06 |
| B | 0.07 |
| BA | 0.446 |
| BE | <0.0003 |
| BI | <0.06 |
| CA | 162. |
| CD | <0.003 |
| CO | <0.006 |
| CR | <0.02 |
| CU | 0.008 |
| FE | 4.04 |
| K | <0.4 |
| LI | 0.026 |
| MG | 56.4 |
| MN | 1.09 |
| MO | <0.008 |
| NA | 44.5 |
| NI | <0.02 |
| P | <0.2 |
| PB | <0.04 |
| SB | <0.05 |
| SE | <0.08 |
| SI | 15.7 |
| SN | <0.02 |
| SR | 0.826 |
| TI | <0.003 |
| TL | <0.1 |
| V | <0.003 |
| ZN | 0.044 |

Environmental Trace Substances Research Center
ICP Scan - Sample Analysis Report

Project: BURNS AND MCDONNELL Units: MCG/ML

Batch #: B-5120530

Customer ID: D-90 METALS
ETSRC ID: 5120543

| Elm | Result |
|---|---|
| AG | <0.003 |
| AL | 0.05 |
| AS | <0.06 |
| B | 0.1 |
| BA | 0.174 |
| BE | <0.0003 |
| BI | <0.06 |
| CA | 70.0 |
| CD | <0.003 |
| CO | <0.006 |
| CR | <0.02 |
| CU | <0.005 |
| FE | 0.034 |
| K | 5.6 |
| LI | 0.025 |
| MG | 34.6 |
| MN | 0.14 |
| MO | 0.02 |
| NA | 45.6 |
| NI | <0.02 |
| P | <0.2 |
| PB | <0.04 |
| SB | <0.04 |
| SE | <0.08 |
| SI | 11.1 |
| SN | <0.02 |
| SR | 0.671 |
| TI | <0.002 |
| TL | <0.1 |
| V | <0.003 |
| ZN | <0.002 |

Environmental Trace Substances Research Center
ICP Scan - Sample Analysis Report

Project: BURNS AND MCDONNELL Units: MCG/ML

Batch #: B-5120530

Customer ID: D-89 METALS
ETSRC ID: 5120542

| Elm | Result |
|---|---|
| AG | <0.003 |
| AL | 0.05 |
| AS | <0.06 |
| B | 0.06 |
| BA | 0.191 |
| BE | <0.0003 |
| BI | <0.06 |
| CA | 129. |
| CD | <0.003 |
| CO | <0.006 |
| CR | <0.02 |
| CU | 0.033 |
| FE | 0.15 |
| K | <0.4 |
| LI | 0.021 |
| MG | 50.9 |
| MN | 0.351 |
| MO | <0.007 |
| NA | 10.9 |
| NI | <0.02 |
| P | <0.2 |
| PB | <0.04 |
| SB | <0.04 |
| SE | <0.08 |
| SI | 10.7 |
| SN | <0.02 |
| SR | 0.459 |
| TI | <0.002 |
| TL | <0.1 |
| V | <0.003 |
| ZN | 0.048 |

Environmental Trace Substances Research Center
ICP Scan - Sample Analysis Report
Project: BURNS AND MCDONNELL Units: MCG/ML
Batch #: B-5120530

Customer ID: S-88 METALS
ETSRC ID: 5120541

| Elm | Result |
|---|---|
| AG | <0.003 |
| AL | 0.25 |
| AS | <0.06 |
| B | 0.09 |
| BA | 0.199 |
| BE | <0.0003 |
| BI | <0.06 |
| CA | 247. |
| CD | <0.003 |
| CO | 0.01 |
| CR | <0.02 |
| CU | <0.005 |
| FE | 2.28 |
| K | <0.4 |
| LI | 0.031 |
| MG | 56.0 |
| MN | 2.36 |
| MO | <0.008 |
| NA | 10.1 |
| NI | <0.02 |
| P | 0.2 |
| PB | <0.04 |
| SB | 0.05 |
| SE | <0.08 |
| SI | 14.4 |
| SN | <0.02 |
| SR | 0.915 |
| TI | 0.004 |
| TL | <0.1 |
| V | 0.003 |
| ZN | 0.051 |

Environmental Trace Substances Research Center
ICP Scan - Sample Analysis Report
Project: BURNS AND MCDONNELL Units: MCG/ML
Batch #: B-5120530

Customer ID: D-87 METALS
ETSRC ID: 5120540

| Elm | Result |
|---|---|
| AG | <0.003 |
| AL | <0.02 |
| AS | <0.06 |
| B | 0.46 |
| BA | 0.702 |
| BE | <0.0003 |
| BI | <0.06 |
| CA | 273. |
| CD | <0.003 |
| CO | <0.006 |
| CR | <0.02 |
| CU | <0.005 |
| FE | 7.67 |
| K | <0.4 |
| LI | 0.034 |
| MG | 70.9 |
| MN | 1.19 |
| MO | <0.008 |
| NA | 104. |
| NI | <0.02 |
| P | <0.2 |
| PB | <0.04 |
| SB | <0.05 |
| SE | <0.08 |
| SI | 15.2 |
| SN | <0.03 |
| SR | 0.756 |
| TI | <0.003 |
| TL | <0.1 |
| V | <0.003 |
| ZN | 0.018 |

Environmental Trace Substances Research Center
ICP Scan - Sample Analysis Report
Project: BURNS AND MCDONNELL Units: MCG/ML
Batch #: B-5120530

Customer ID: D-85 METALS
ETSRC ID: 5120539

| Elm | Result |
|---|---|
| AG | 0.003 |
| AL | <0.02 |
| AS | <0.06 |
| B | 0.23 |
| BA | 0.874 |
| BE | <0.0003 |
| BI | <0.06 |
| CA | 243. |
| CD | 0.003 |
| CO | 0.01 |
| CR | <0.02 |
| CU | 0.006 |
| FE | 14.3 |
| K | <0.4 |
| LI | 0.030 |
| MG | 75.9 |
| MN | 1.87 |
| MO | <0.008 |
| NA | 61.7 |
| NI | <0.02 |
| P | 0.2 |
| PB | <0.04 |
| SB | 0.06 |
| SE | <0.09 |
| SI | 15.0 |
| SN | <0.02 |
| SR | 0.522 |
| TI | <0.003 |
| TL | 0.1 |
| V | 0.004 |
| ZN | 0.036 |

Environmental Trace Substances Research Center
ICP Scan - Sample Analysis Report
Project: BURNS AND MCDONNELL Units: MCG/ML
Batch #: B-5120530

Customer ID: S-84 METALS
ETSRC ID: 5120538

| Elm | Result |
|---|---|
| AG | <0.003 |
| AL | 0.52 |
| AS | <0.06 |
| B | 0.1 |
| BA | 0.448 |
| BE | <0.0003 |
| BI | <0.06 |
| CA | 191. |
| CD | <0.003 |
| CO | 0.022 |
| CR | <0.02 |
| CU | 0.007 |
| FE | 31.5 |
| K | <0.4 |
| LI | 0.022 |
| MG | 49.2 |
| MN | 3.68 |
| MO | <0.01 |
| NA | 29.1 |
| NI | <0.02 |
| P | <0.2 |
| PB | <0.04 |
| SB | 0.05 |
| SE | <0.09 |
| SI | 18.5 |
| SN | <0.02 |
| SR | 0.494 |
| TI | 0.007 |
| TL | <0.1 |
| V | 0.003 |
| ZN | 0.051 |

Environmental Trace Substances Research Center
ICP Scan - Sample Analysis Report
Project: BURNS AND MCDONNELL Units: MCG/ML
Batch #: B-5120530

Customer ID: D-83 METALS
ETSRC ID: 5120537

| Elm | Result |
|---|---|
| AG | <0.003 |
| AL | <0.02 |
| AS | <0.06 |
| B | 0.92 |
| BA | 1.15 |
| BE | <0.0003 |
| BI | <0.06 |
| CA | 158. |
| CD | <0.003 |
| CO | <0.006 |
| CR | <0.02 |
| CU | <0.005 |
| FE | 0.386 |
| K | 13. |
| LI | 0.033 |
| MG | 47.0 |
| MN | 0.419 |
| MO | <0.007 |
| NA | 175. |
| NI | 0.02 |
| P | <0.2 |
| PB | <0.04 |
| SB | <0.04 |
| SE | <0.08 |
| SI | 14.1 |
| SN | <0.03 |
| SR | 0.714 |
| TI | <0.003 |
| TL | <0.1 |
| V | <0.003 |
| ZN | 0.038 |

Environmental Trace Substances Research Center
ICP Scan - Sample Analysis Report
Project: BURNS AND MCDONNELL Units: MCG/ML
Batch #: B-5120530

Customer ID: S-82 METALS
ETSRC ID: 5120536

| Elm | Result |
|---|---|
| AG | <0.003 |
| AL | <0.02 |
| AS | <0.06 |
| B | 1.3 |
| BA | 0.159 |
| BE | <0.0003 |
| BI | <0.06 |
| CA | 239. |
| CD | <0.003 |
| CO | 0.01 |
| CR | <0.02 |
| CU | 0.040 |
| FE | 0.083 |
| K | 16. |
| LI | 0.042 |
| MG | 59.6 |
| MN | 1.75 |
| MO | <0.007 |
| NA | 137. |
| NI | 0.060 |
| P | 0.3 |
| PB | <0.04 |
| SB | <0.05 |
| SE | <0.08 |
| SI | 12.5 |
| SN | <0.02 |
| SR | 0.805 |
| TI | <0.003 |
| TL | <0.1 |
| V | 0.003 |
| ZN | 0.099 |

Environmental Trace Substances Research Center
ICP Scan - Sample Analysis Report
Project: BURNS AND MCDONNELL Units: MCG/ML
Batch #: B-5120530

Customer ID: D-81 METALS
ETSRC ID: 5120535

| Elm | Result |
|---|---|
| AG | <0.003 |
| AL | 0.086 |
| AS | <0.06 |
| B | 0.18 |
| BA | 0.340 |
| BE | <0.0003 |
| BI | <0.06 |
| CA | 180. |
| CD | <0.003 |
| CO | <0.006 |
| CR | <0.02 |
| CU | 0.023 |
| FE | 0.14 |
| K | 1.5 |
| LI | 0.028 |
| MG | 38.0 |
| MN | 0.676 |
| MO | 0.02 |
| NA | 32.9 |
| NI | <0.02 |
| P | <0.2 |
| PB | <0.04 |
| SB | <0.04 |
| SE | <0.08 |
| SI | 8.84 |
| SN | <0.02 |
| SR | 0.455 |
| TI | <0.003 |
| TL | 0.1 |
| V | <0.003 |
| ZN | 0.087 |

Environmental Trace Substances Research Center
ICP Scan - Sample Analysis Report
Project: BURNS AND MCDONNELL Units: MCG/ML
Batch #: B-5120530

Customer ID: S-80 METALS
ETSRC ID: 5120534

| Elm | Result |
|---|---|
| AG | <0.003 |
| AL | 0.05 |
| AS | <0.06 |
| B | 0.06 |
| BA | 0.238 |
| BE | <0.0003 |
| BI | <0.06 |
| CA | 132. |
| CD | <0.003 |
| CO | <0.006 |
| CR | <0.02 |
| CU | 0.019 |
| FE | 0.11 |
| K | 1. |
| LI | 0.015 |
| MG | 36.7 |
| MN | 0.030 |
| MO | <0.007 |
| NA | 82.8 |
| NI | <0.02 |
| P | 0.4 |
| PB | <0.04 |
| SB | <0.04 |
| SE | <0.08 |
| SI | 9.91 |
| SN | <0.02 |
| SR | 0.389 |
| TI | <0.002 |
| TL | 0.1 |
| V | 0.004 |
| ZN | 0.031 |

Result Summary Sheet

Submitter ID: Burns and McDonnel # D-85 OR

ETSRC ID: 5120520 R. Data File: 5120520

Sample Matrix: Water

Analytes: Priority pollutant phenols

Method: EPA604 - GC/MS

Date Recieved/Analyzed: Dec. 1986/Jan. 1, 1986

Analyst: Carl Orazio

Conc. Units: mcg/L

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Phenol | | | | | <MDL |
| 2. 2-Chlorophenol | | | | | <MDL |
| 3. 2-Nitrophenol | | | | | <MDL |
| 4. 2,4-Dimethylphenol | | | | | <MDL |
| 5. 2,4-Dichlorophenol | | | | | <MDL |
| 6. 4-Chloro, 3-Methylphenol | | | | | <MDL |
| 7. 2,4,6-Trichlorophenol | | | | | <MDL |
| 8. 2,4-Dinitrophenol | | | | | <MDL |
| 9. 4-Nitrophenol | | | | | <MDL |
| 10. 4,6-Dinitro, 2-Methylphenol | | | | | <MDL |
| 11. Pentachlorophenol | | | | | <MDL |
| Phenol D-5 (Surrogate) rec | | | | | 21.3% |

Submitter ID: Burns and McDonnel # D-87 CR

ETSRC ID: 5120521 K. Data File: 5120521

Sample Matrix: Water

Analytes: Priority pollutant phenols

Method: EPA604 - GC/MS

Date Recieved/Analyzed: Dec. 1986/Jan. 1, 1986

Analyst: Carl Orazio

Conc. Units: mcg/L

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Phenol | | | | | <MDL |
| 2. 2-Chlorophenol | | | | | <MDL |
| 3. 2-Nitrophenol | | | | | <MDL |
| 4. 2,4-Dimethylphenol | | | | | <MDL |
| 5. 2,4-Dichlorophenol | | | | | <MDL |
| 6. 4-Chloro, 3-Methylphenol | | | | | <MDL |
| 7. 2,4,6-Trichlorophenol | | | | | <MDL |
| 8. 2,4-Dinitrophenol | | | | | <MDL |
| 9. 4-Nitrophenol | | | | | <MDL |
| 10. 4,6-Dinitro, 2-Methylphenol | | | | | <MDL |
| 11. Pentachlorophenol | | | | | <MDL |
| Phenol D-5 (Surrogate) rec | | | | | 20.6% |

Environmental Trace Substances Research Center
ICP Scan - Sample Analysis Report

Project: BURNS AND MCDONNELL Units: MCG/ML

Batch #: B-5120530

Customer ID: I-59 METALS
ETSRC ID: 5120532

| Elm | Result |
|---|---|
| AG | <0.003 |
| AL | <0.02 |
| AS | <0.06 |
| B | 1.2 |
| BA | 0.352 |
| BE | <0.0003 |
| BI | <0.06 |
| CA | 259. |
| CD | <0.003 |
| CO | <0.006 |
| CR | <0.02 |
| CU | 0.057 |
| FE | 7.38 |
| K | 7.4 |
| LI | 0.041 |
| MG | 63.3 |
| MN | 0.846 |
| MO | <0.008 |
| NA | 138. |
| NI | 0.03 |
| P | 0.3 |
| PB | <0.04 |
| SB | 0.05 |
| SE | <0.08 |
| SI | 12.6 |
| SN | <0.02 |
| SR | 0.921 |
| TI | <0.003 |
| TL | <0.1 |
| V | <0.003 |
| ZN | 0.11 |

Environmental Trace Substances Research Center
ICP Scan - Sample Analysis Report
Project: BURNS AND MCDONNELL Units: MCG/ML
Batch #: B-5120530

Customer ID: S-51 METALS
ETSRC ID: 5120530

| Elm | Result |
|---|---|
| AG | <0.003 |
| AL | <0.02 |
| AS | <0.06 |
| B | <0.05 |
| BA | 0.130 |
| BE | <0.0003 |
| BI | <0.06 |
| CA | 62.9 |
| CD | <0.003 |
| CO | <0.006 |
| CR | <0.02 |
| CU | 0.01 |
| FE | 0.020 |
| K | <0.4 |
| LI | 0.011 |
| MG | 19.9 |
| MN | 0.031 |
| MO | <0.007 |
| NA | 4.79 |
| NI | <0.02 |
| P | <0.2 |
| PB | <0.04 |
| SB | <0.04 |
| SE | <0.08 |
| SI | 8.56 |
| SN | <0.02 |
| SR | 0.149 |
| TI | <0.002 |
| TL | <0.1 |
| V | <0.003 |
| ZN | 1.24 |

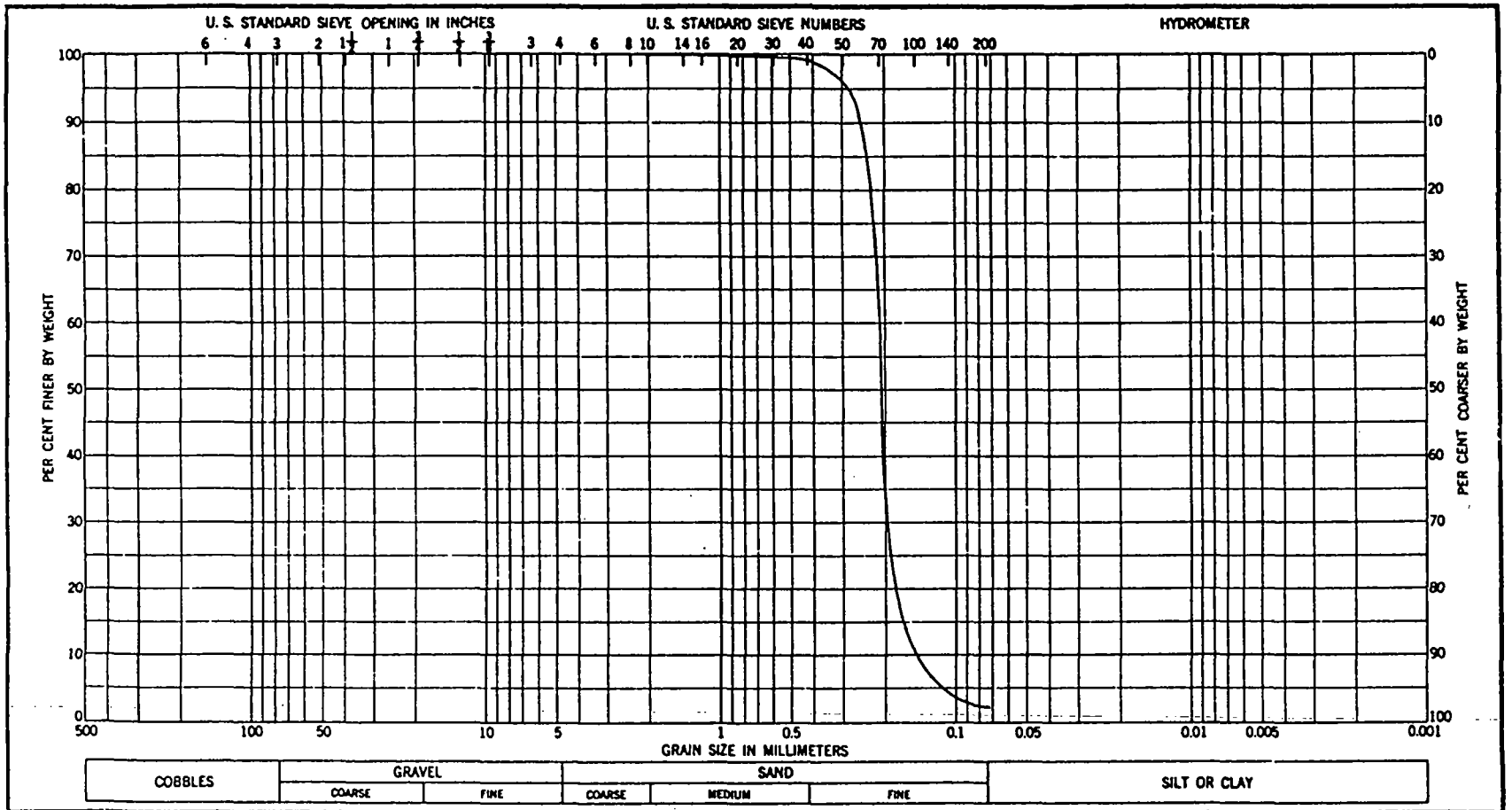
PRIORITY POLLUTANTS

DECEMBER, 1985

# APPENDIX E

# GROUNDWATER CHEMICAL ANALYSES

# KANSAS CITY TESTING LABORATORY




| Sample No. | Elev or Depth | Classification | Nat w % | LL | PL | PI |
|---|---|---|---|---|---|---|
| SS-5 | 30.0-31.5 | | | | | |

Project Westlake

Job No. 84-075-4-002

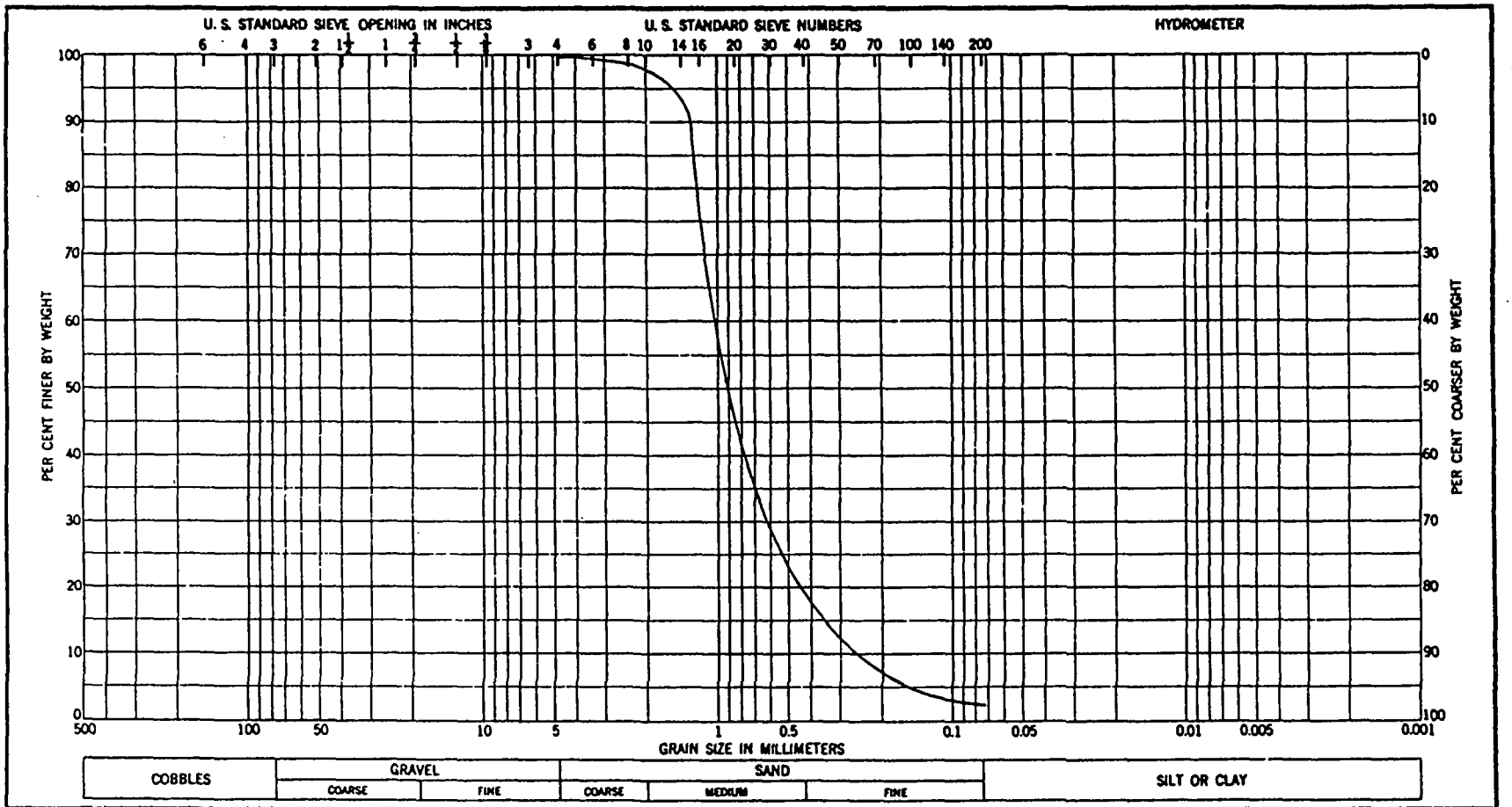
Area

Boring No. S-88

Date

GRADATION CURVES

# KANSAS CITY TESTING LABORATORY




| Sample No. | Elev or Depth | Classification | Nat w % | LL | PL | PI |
|---|---|---|---|---|---|---|
| SS-20 | 100.0-101.0 | | | | | |

Project Westlake

Job No. 84-075-4-002

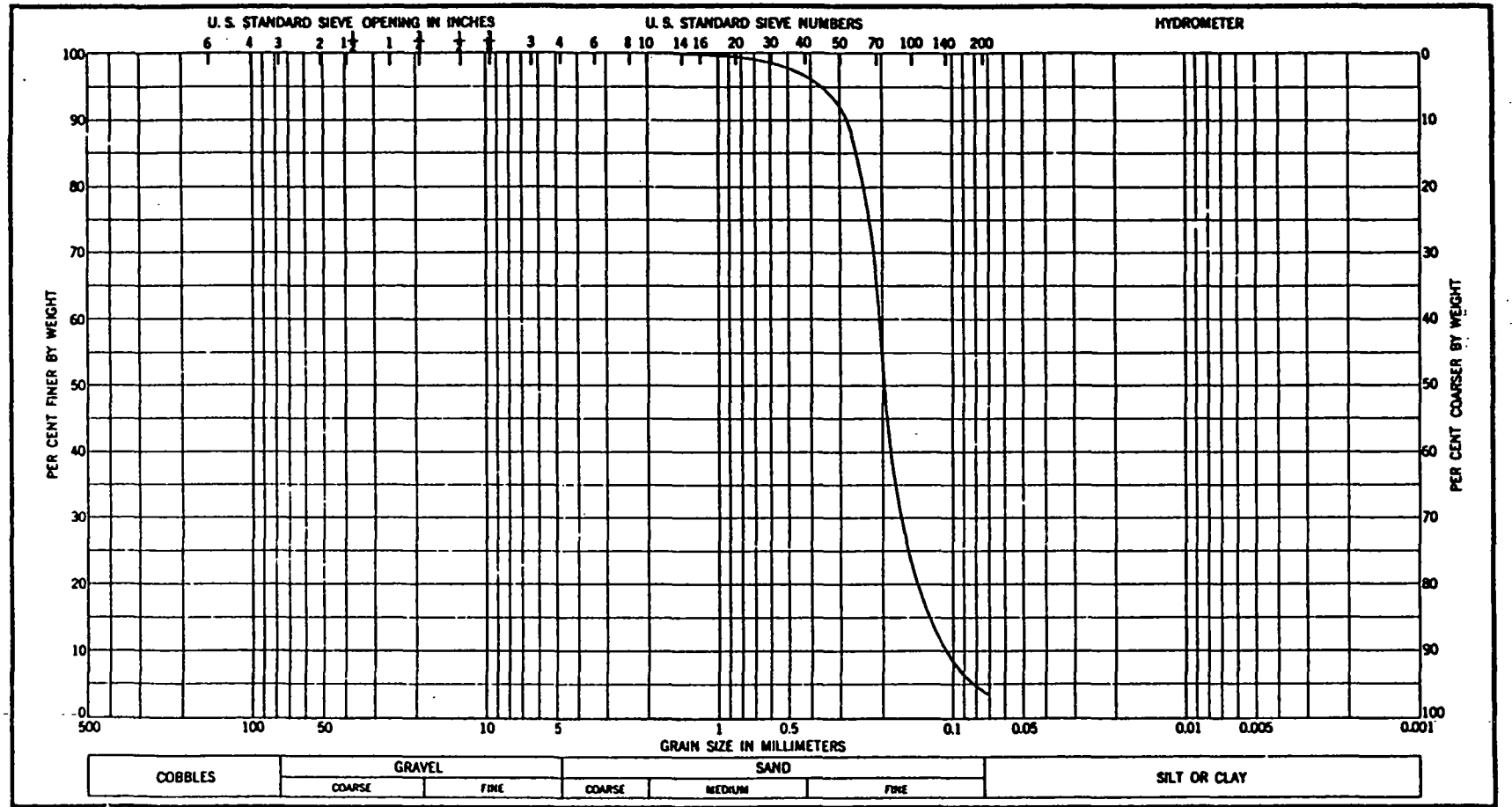
Area

Boring No. D-87

Date

GRADATION CURVES

# KANSAS CITY TESTING LABORATORY




| Sample No. | Elev or Depth | Classification | Nat w % | LL | PL | PI |
|---|---|---|---|---|---|---|
| SS-11 | 70.0-71.5 | | | | | |

Project Westlake

Job No. 84-075-4-002

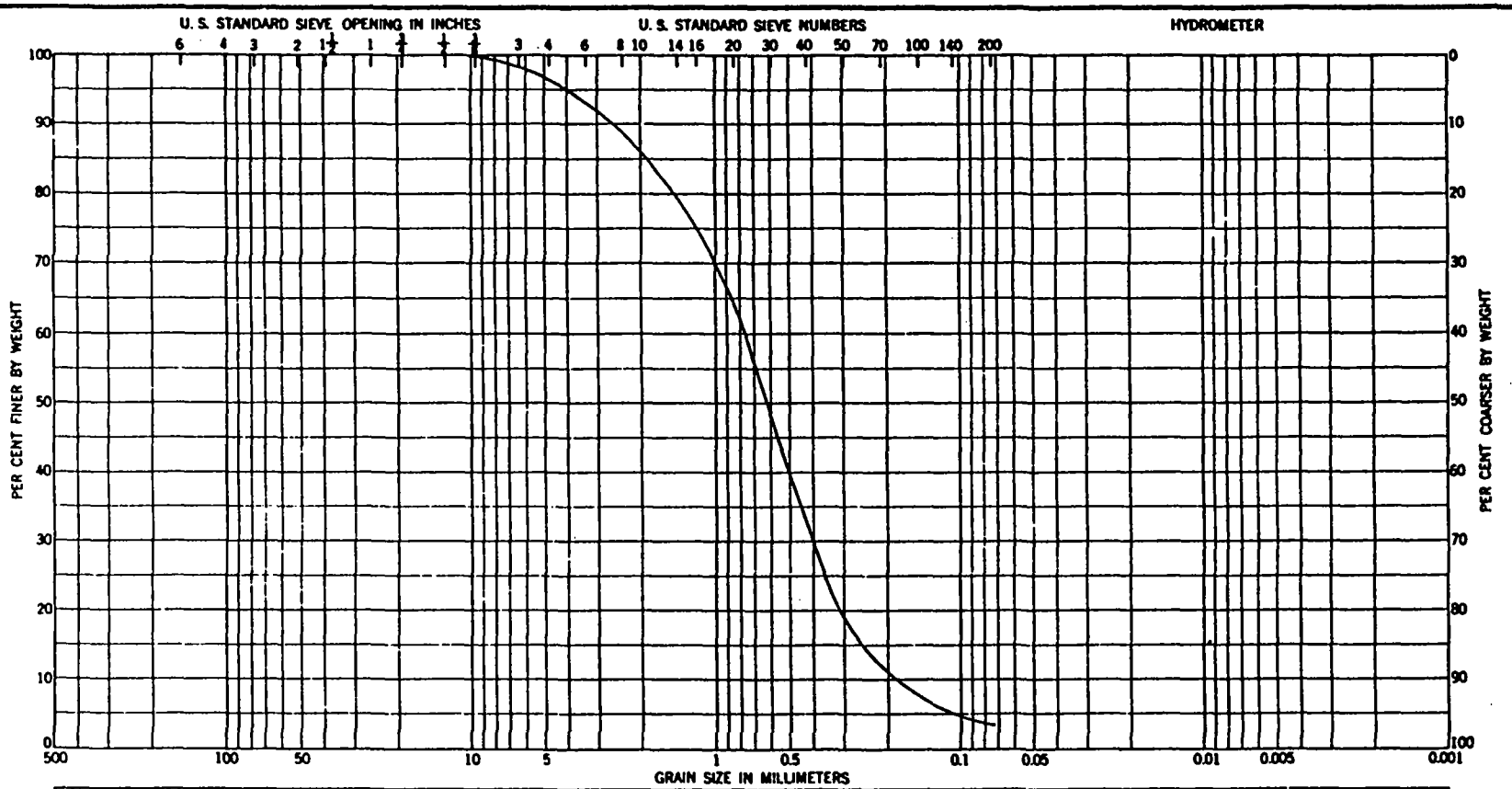
Area

Boring No. D-85

Date

GRADATION CURVES

# KANSAS CITY TESTING LABORATORY




| Sample No. | Elev or Depth | Classification | Nat w % | LL | PL | PI |
|---|---|---|---|---|---|---|
| SS-8 | 40.0-41.5 | | | | | |

Project Westlake

Job No. 84-075-4-002

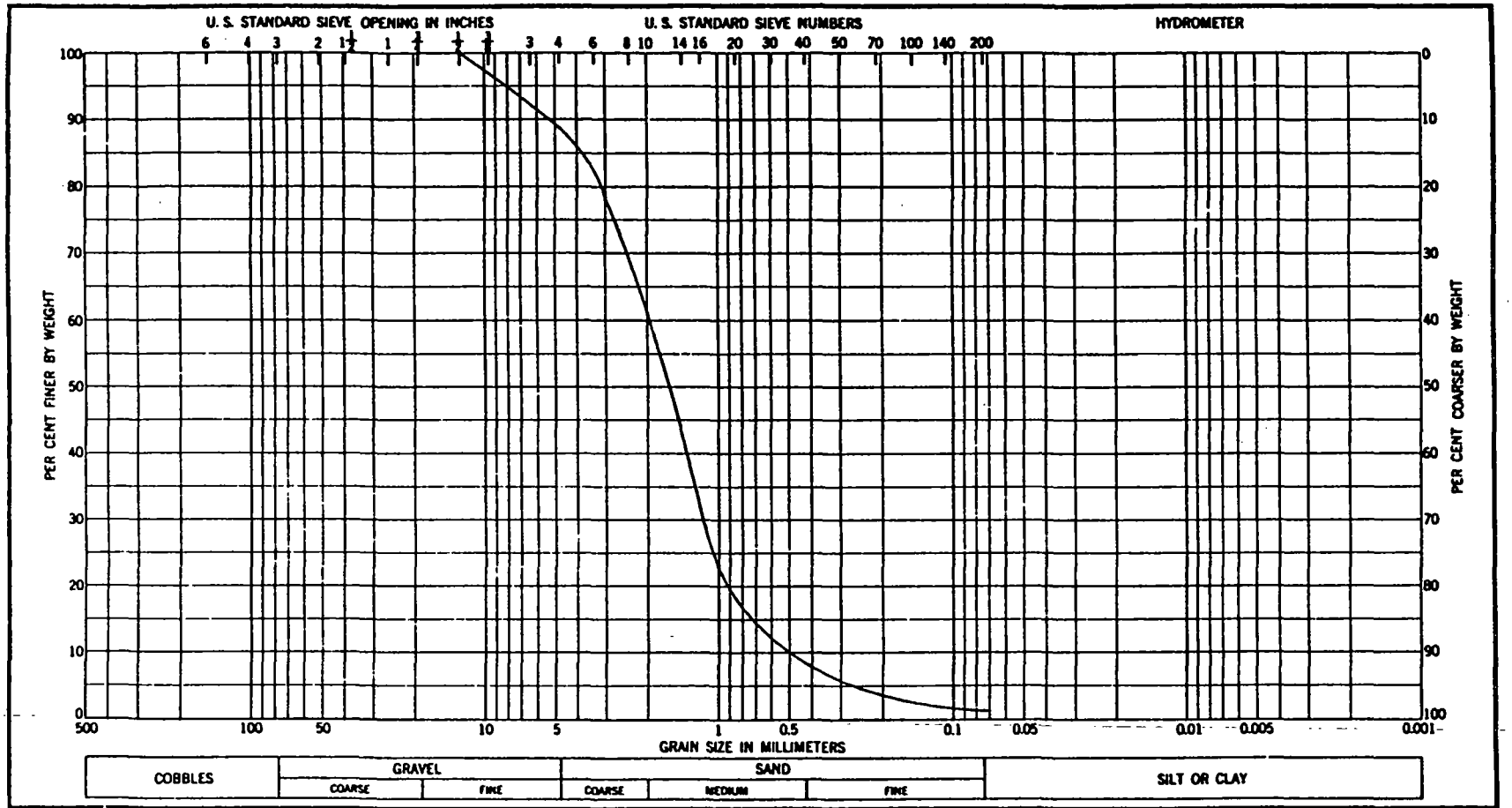
Area

Boring No. D-85

Date

GRADATION CURVES

# KANSAS CITY TESTING LABORATORY




| Sample No. | Elev or Depth | Classification | Nat w % | LL | PL | PI |
|---|---|---|---|---|---|---|
| SS-14 | 90.0-91.5 | | | | | |

Project Westlake

Job No. 84-075-4-002

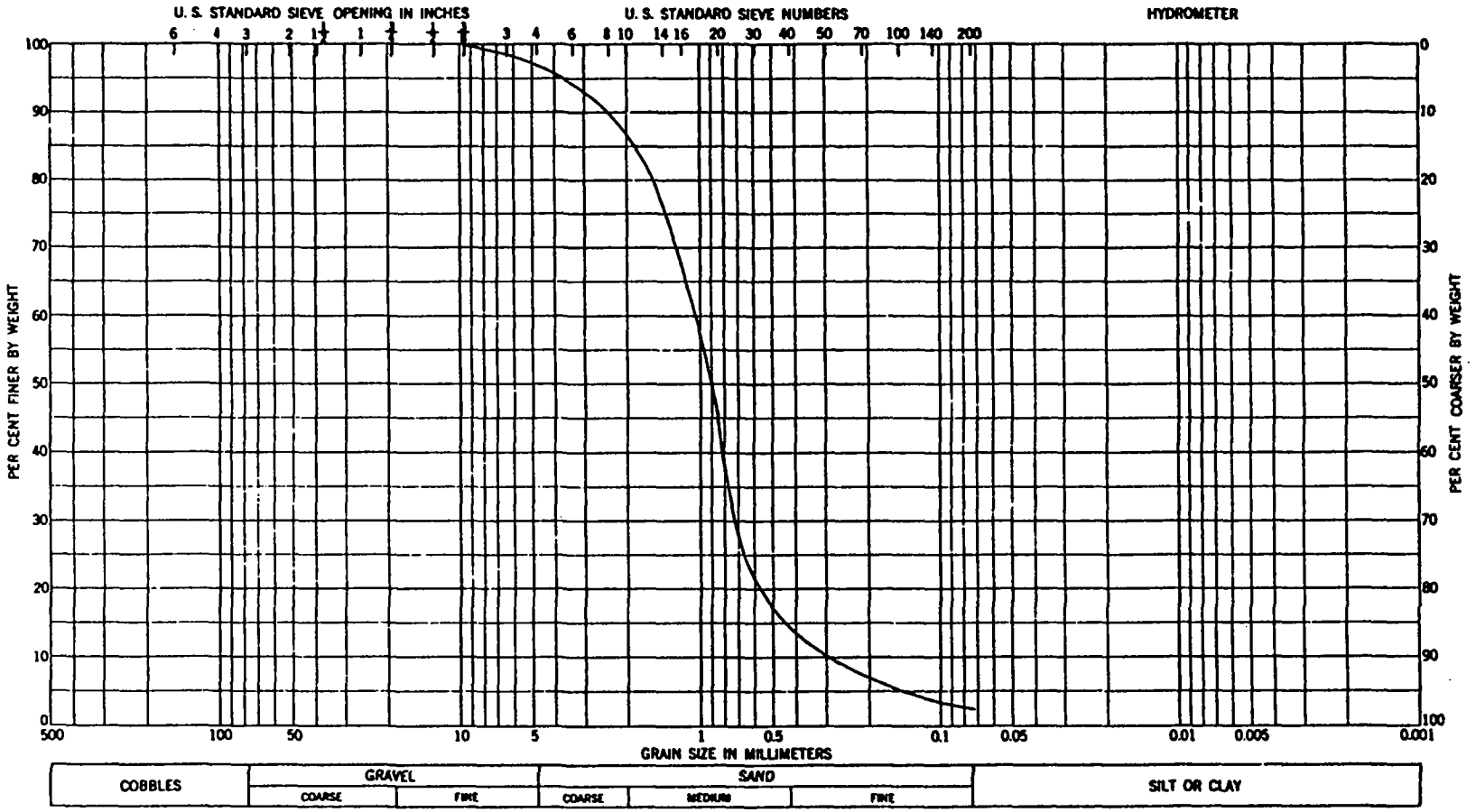
Area

Boring No. D-83

Date

GRADATION CURVES

# KANSAS CITY TESTING LABORATORY




| Sample No. | Elev or Depth | Classification | Nat w % | LL | PL | PI |
|---|---|---|---|---|---|---|
| SS-12 | 70.0-71.5 | | | | | |

Project Westlake

Job No. 84-075-4-002

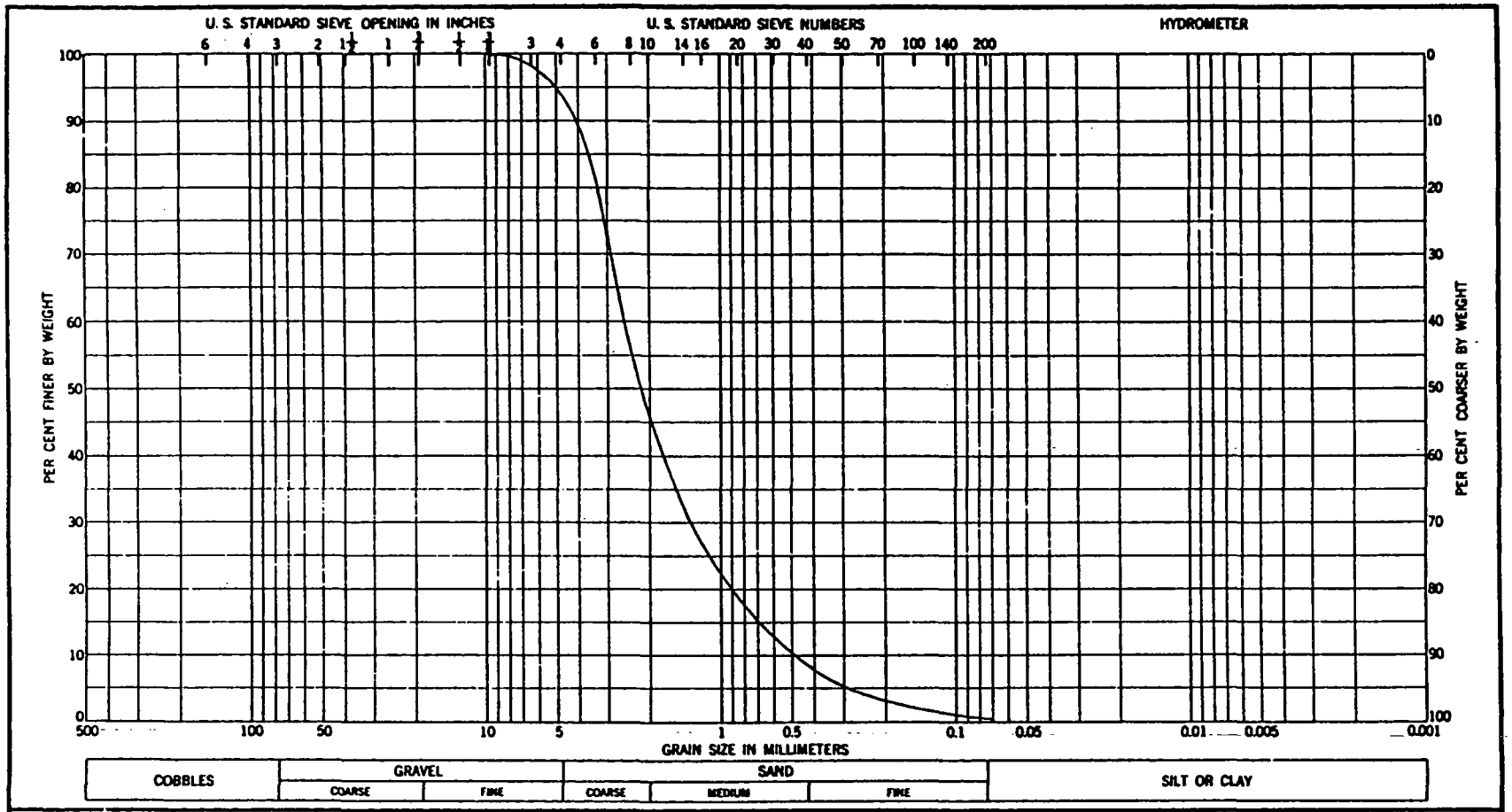
Area

Boring No. D-83

Date

GRADATION CURVES

# KANSAS CITY TESTING LABORATORY




| Sample No. | Elev or Depth | Classification | Nat w % | LL | PL | PI |
|---|---|---|---|---|---|---|
| SS-9A | 50.0-50.6 | | | | | |

Project Westlake

Job No. 84-075-4-002

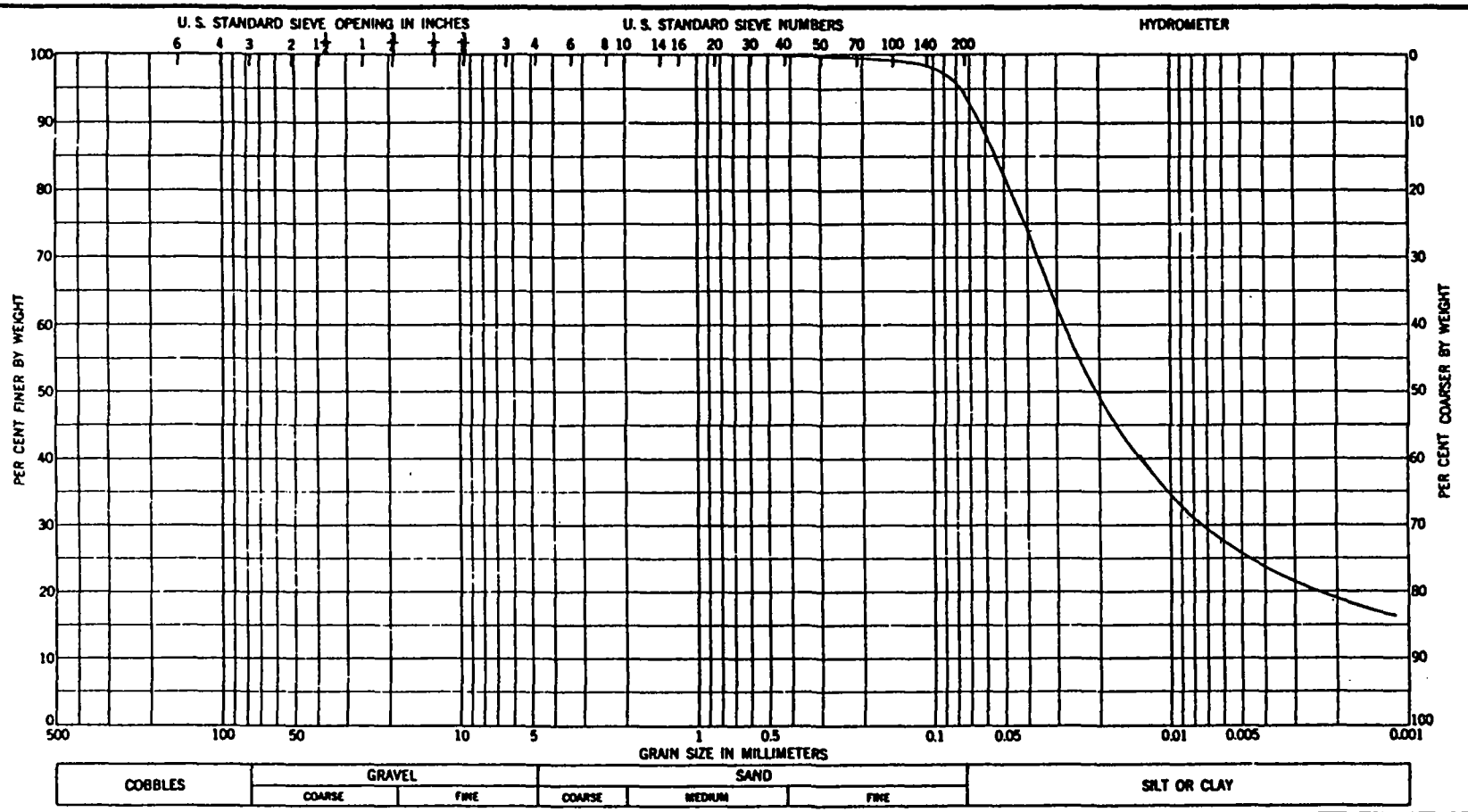
Area

Boring No. D-81

Date

GRADATION CURVES

# KANSAS CITY TESTING LABORATORY




| Sample No. | Elev or Depth | Classification | Nat w % | LL | PL | PI |
|---|---|---|---|---|---|---|
| ST-3 | 15.0-17.0 | | 34.9 | | | |

Project Westlake

Job No. 84-075-4-002

Area

Boring No S-80

Date

GRADATION CURVES

# KANSAS CITY TESTING LABORATORY

## SUMMARY OF SOIL TESTS

PROJECT Westlake

PROJECT NO 84-075-4-002

| BORING NUMBER | SAMPLE NUMBER | DEPTH ft | % MOISTURE | DRY UNIT WT.-PCF | UNCONFINED COMPRESSION | | ATTERBERG LIMITS | | | % -200 | UNIFIED CLASSIFICATION | | | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | PSF | %E | LL | PL | PI | | | | | | | |
| S-80 | ST-3 | 15.0-17.0 | 34.9 | 87.9 | | | | | | 94.6 | | | | | | |
| | ST-4 | 20.0-22.0 | 48.3 | 75.8 | | | 57 | 21 | 36 | | CH | | | | | |
| | | | | | | | | | | | | | | | | |
| D-81 | SS-9A | 50.0-50.6 | | | | | | | | 0.7 | | | | | | |
| | | | | | | | | | | | | | | | | |
| D-83 | SS-3A | 15.0-15.7 | 32.4 | 90.7 | | | 25 | 21 | 4 | | CL/ML | | | | | |
| | SS-12 | 70.0-71.5 | | | | | | | | 2.3 | | | | | | |
| | SS-14 | 90.0-91.5 | | | | | | | | 1.2 | | | | | | |
| | | | | | | | | | | | | | | | | |
| D-85 | SS-8 | 40.0-41.5 | | | | | | | | 3.4 | | | | | | |
| | SS-11 | 70.0-71.5 | | | | | | | | 3.6 | | | | | | |
| | | | | | | | | | | | | | | | | |
| D-87 | SS-20 | 100.0-101.0 | | | | | | | | 2.3 | | | | | | |
| | | | | | | | | | | | | | | | | |
| S-88 | SS-5 | 30.0-31.5 | | | | | | | | 2.2 | | | | | | |

# APPENDIX D

## LABORATORY TEST DATA ON SOIL ENGINEERING PROPERTIES

TABLE D-1

Permeability of Alluvium

| Boring | Depth | Sample | Method | Permeability (cm/sec) |
|---|---|---|---|---|
| D-81 | 50.0 to 50.6 | SS-9a | * Hazen's Formula | $2.5 \times 10^{-1}$ |
| D-83 | 73.5 to 97.0 | N.A. | ** Bailer Test | $5.11 \times 10^{-4}$ |
| D-83 | 70.0 to 71.5 | SS-12 | Hazen's Formula | $9.0 \times 10^{-2}$ |
| D-83 | 90.0 to 91.5 | SS-14 | Hazen's Formula | $2.5 \times 10^{-1}$ |
| D-85 | 40.0 to 41.5 | SS-8 | Hazen's Formula | $4.0 \times 10^{-2}$ |
| D-85 | 70.0 to 71.5 | SS-11 | Hazen's Formula | $1.2 \times 10^{-2}$ |
| D-87 | 87.0 to 111.0 | N.A. | Bailer Test | $3.35 \times 10^{-4}$ |
| D-87 | 100.0 to 101.0 | SS-20 | Hazen's Formula | $6.8 \times 10^{-2}$ |
| S-88 | 30.0 to 31.5 | SS-5 | Hazen's Formula | $2.3 \times 10^{-2}$ |
| S-88 | 29.0 to 40.0 | N.A. | Bailer Test | $1.45 \times 10^{-3}$ |
| D-89 | 32.5 to 49.0 | N.A. | Bailer Test | $2.44 \times 10^{-4}$ |

* Hazen's Formula is used to estimate permeability based upon soil grain size distribution. (see Hazen, A., 1930, Water Supply, American Civil Engineers Handbook, John Wiley and Sons, Inc., N.Y.)

** A bailer test is a field method for determining in-situ permeability. Water was evacuated from the piezometer with a compressed air pump and the rate of recovery recorded. The rate of recovery is related to the soil permeability (see Hvorslev, M. Juul, 1951, Time Lag and Soil Permeability in Groundwater Observations, Waterways Experiment Station, Corps of Engineers, U.S. Army, Vicksburg, Mississippi, Bulletin No. 36.)

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | |
|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-4-004 | Hole No.: D-91 |
| Location | Elev. Ground Surface (G.S.) | |
| N E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 453.37 | |
| Date Started Drilling Hole: 8-5-85 Time | Total Depth of Hole: 45.0 | Drilling Type: Solid Auger |
| Date Completed Drilling Hole: 8-6-85 Time | Total Depth of Piezometer: 45.0 | Footage Slotted: 10' |
| Date Piezometer Installed: 8-6-85 Time: 9:00 | | |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 12-13-85 | — | M. Erio | 15.42 from T.O.P. | 437.95 | Electric Tape |
| 5-19-86 | — | " | 17.29 from " | 434.08 | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | |
|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-4-002 | Hole No.: D-92 |
| Location | Elev. Ground Surface (G.S.): ≈ 475.5 | |
| N E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 475.37 | |
| Date Started Drilling Hole: 4-9-85 Time | Total Depth of Hole: 143.6 | Drilling Type |
| Date Completed Drilling Hole: 4-11-85 Time | Total Depth of Piezometer: 143.0 | Footage Slotted: 20' |
| Date Piezometer Installed: 4-11-85 Time | | |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 4-17-85 | 11:15 AM | G. Ernstmann | 38.9 from T.O.P. | 436.47 | |
| 4-22-85 | 10:30 AM | " | 40.2 from " | 435.17 | |
| 4-23-85 | 3:30 PM | " | 39.3 from " | 436.07 | |
| 4-24-85 | 7:00 AM | " | 40.5 from " | 434.87 | |
| 4-25-85 | 8:30 AM | " | 40.04 from " | 435.33 | Electric Tape |
| 6-4-85 | 1:40 PM | S. Payiatakis | 41.17 from " | 434.20 | |
| 6-7-85 | 8:40 AM | " | 38.06 from " | 437.31 | |
| 8-8-85 | - | " | 42.08 from " | 433.29 | Cloth Tape |
| 12-12-85 | - | M. Erio | 38.55 from " | 436.82 | Electric Tape |
| 5-19-86 | - | " | 42.40 from " | 432.97 | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | |
|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-4-002 | Hole No.: D-93 |
| Location | Elev. Ground Surface (G.S.): ≈ 448 | |
| N E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 450.7 | |
| Date Started Drilling Hole: 4-15-85 Time | Total Depth of Hole: 119.2 | Drilling Type: Wash bore |
| Date Completed Drilling Hole: 4-18-85 Time | Total Depth of Piezometer: 112' | Footage Slotted: 20' |
| Date Piezometer Installed: 4-18-85 Time: 1:30PM | | |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 4-22-85 | 10:30 AM | G. Ernstmann | 15.3 from T.O.P. | 435.4 | |
| 4-24-85 | 7:00 AM | " | 15.5 from " | 435.2 | |
| 4-25-85 | – | " | 15.46 from " | 435.24 | Electric Tape |
| 6-7-85 | 1:00 PM | S. Payiatakis | 15.51 from " | 435.19 | |
| 8-8-85 | – | " | 17.50 from " | 433.20 | cloth Tape |
| 12-12-85 | – | M. Erio | 14.24 from " | 436.46 | Electric Tape |
| 5-20-86 | – | " | 17.94 from " | 432.76 | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | |
|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-4-002 | Hole No.: D-94 |
| Location | Elev. Ground Surface (G.S.): ≈ 438.5 | |
| N E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 442.68 | |
| Date Started Drilling Hole: 4-18-85 Time | Total Depth of Hole: 109.0 | Drilling Type: Wash boring |
| Date Completed Drilling Hole: 4-24-85 Time | Total Depth of Piezometer: 106.0 | Footage Slotted: 20' |
| Date Piezometer Installed: 4-24-85 Time: 3:00 PM | | |

Remarks:

| Date | Time | By Whom | Depth to Water* | | | W.L. Elev. | Remarks |
|---|---|---|---|---|---|---|---|
| 4-25-85 | 11:08AM | G. Ernstmann | 7.29 | from | T.O.P. | 435.39 | Electric Tape |
| 6-4-85 | 1:50 PM | S. Payiatakis | 7.88 | from | " | 434.80 | |
| 6-7-85 | 8:15 AM | " | 6.98 | from | " | 435.70 | |
| 8-8-85 | – | " | 8.75 | from | " | 433.93 | Cloth Tape |
| 12-12-85 | – | M. Erlo | 5.25 | from | " | 437.43 | Electric Tape. |
| 5-20-86 | – | " | 10.90 | from | " | 431.78 | |
| | | | | from | | | |
| | | | | from | | | |
| | | | | from | | | |
| | | | | from | | | |
| | | | | from | | | |
| | | | | from | | | |
| | | | | from | | | |
| | | | | from | | | |
| | | | | from | | | |
| | | | | from | | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

TECHNICAL SERVICES
GEOTECHNICAL DEPARTMENT

# Observed Water Level Readings

Sheet _____ of _____

| | | |
|---|---|---|
| Project Name: WESTLAKE | Project No.: 84-075-4-002 | Hole No.: D-95 |
| Location | Elev. Ground Surface (G.S.): ≈450 | |
| N E | Elev. Top at Pipe (T.O.P.) or Reference Point (R.P.): 453.09 | |
| Date Started Drilling Hole: 4-22-85 Time: | Total Depth of Hole: 100.0 | Drilling Type: H.S. Auger & wash boring |
| Date Completed Drilling Hole: 4-24-85 Time: | Total Depth of Piezometer: 101.0 | Footage Slotted: 20 |
| Date Piezometer Installed: 4-24-85 Time: 3:00 PM | | |

Remarks:

| Date | Time | By Whom | Depth to Water* | W.L. Elev. | Remarks |
|---|---|---|---|---|---|
| 4-25-85 | 12:00 PM | G. Ernstmann | 16.75 from T.O.P. | 436.34 | Electric Tape |
| 6-7-85 | 10:35 AM | S. Papiatsis | 17.02 from " | 436.07 | |
| 8-8-85 | — | " | 19.01 from " | 434.08 | Cloth Tape |
| 12-12-85 | — | M. Erio | 15.35 from " | 437.74 | Electric Tape. |
| 5-21-86 | — | " | 20.46 from " | 432.63 | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |
| | | | from | | |

*Depth to water noted from Ground Surface (G.S.), Top of Pipe (T.O.P.), or Reference Point (R.P.).

Environmental Trace Substances Research Center
Base Neutral Result Sheet

Sample Source: Burns & McDonnell
Submitter ID#: D-900R
ETSRC ID#: 5120524 Data File#: BN5120524
Sample Matrix: Water
Method: U.S.E.P.A. #625
Date Received: December 17, 1985
Date Analyzed: January 22, 1985 Conc. Units: mcg/L
Analyst: Carl Orazio

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | <MDL |
| 2. 1,3-Dichlorobenzene | 146 | | | | <MDL |
| 3. 1,4-Dichlorobenzene | 146 | | | | <MDL |
| 4. 1,2-Dichlorobenzene | 146 | | | | <MDL |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | <MDL |
| 6. Hexachloroethane | 117 | | | | <MDL |
| 7. Nitrobenzene | 77 | | | | <MDL |
| 8. Isophorone | 82 | | | | <MDL |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | <MDL |
| 10. Trichlorobenzene | 180 | | | | <MDL |
| 11. Naphthalene | 128 | | | | <MDL |
| 12. Hexachlorobutadiene | 225 | | | | <MDL |
| 13. Hexachlorocyclopentadiene | 237 | | | | <MDL |
| 14. 2-Chloronaphthalene | 162 | | | | <MDL |
| 15. Acenaphthylene | 152 | | | | <MDL |
| 17. Dimethylphthalate | 163 | | | | <MDL |
| 18. Acenaphthene | 154 | | | | <MDL |
| 19. 2,4-Dinitrotoluene | 165 | | | | <MDL |
| 20. Fluorene | 166 | | | | <MDL |
| 21. Diethylphthalate | 149 | | | | <MDL |
| 22. N-Nitrodiphenylamine | 169 | | | | <MDL |
| 23. 4-Bromophenylphentyl ether | 248 | | | | <MDL |

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 24. Hexachlorobenzene | 284 | | | | <MDL |
| 25. Phenanthrene | 178 | | | | <MDL |
| 26. Anthracene | 178 | | | | <MDL |
| 27. Di-n-Butylphthalate | 149 | | | | <MDL |
| 28. Fluoranthene | 202 | | | | <MDL |
| 29. Pyrene | 202 | | | | <MDL |
| 30. Butylbenzylphthalate | 149 | | | | <MDL |
| 31. Benz[a]anthracene | 228 | | | | <MDL |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | <MDL |
| 33. Chrysene | 228 | | | | <MDL |
| 34. Bis[2-ethylhexyl]phthalate | 149 | 3456 | 94122 | 129.5 | 115.2 |
| 35. Di-n-Octylphthalate | 149 | | | | <MDL |
| 36. Benzo[b]Fluoranthene | 252 | | | | <MDL |
| 37. Benzo[k]Fluoranthene | 252 | | | | <MDL |
| 38. Benzo[a]Pyrene | 252 | | | | <MDL |
| 39. 1,2-Diphenylhydrazine | 77 | | | | <MDL |
| 40. Benzidine | 184 | | | | <MDL |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | <MDL |
| 42. N-Nitroso-n-propylamine | 70 | | | | <MDL |

## SURROGATE RESULTS

| | Compound | Quantity m/e | Scan # | Area | Det Conc | Spiked Conc |
|---|---|---|---|---|---|---|
| 1. | Anthracene D-10 | 188 | 2422 | 189204 | 101.5 | 100.0 |
| 2. | Chrysene D-12 | 240 | 3380 | 125099 | 149.1 | 100.0 |
| 3. | | | | | | |
| 4. | | | | | | |

## Tentatively Identified Compounds

| | Compound | Scan # | NBS LIB FIT | Base m/e | Area | Est Conc |
|---|---|---|---|---|---|---|
| 1. | Trimethyl Cyclohexane-1-One | 1079 | No Match | 123 | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

Environmental Trace Substances Research Center
Base Neutral Result Sheet

Sample Source: Burns & McDonnell
Submitter ID#: S-51DR
ETSRC ID#: 5120513DR
Data File#: BN0513DR
Sample Matrix: Water
Method: U.S.E.P.A. #625
Date Received: December 17, 1985
Date Analyzed: January 20, 1986
Conc. Units: mcg/L
Analyst: Carl Orazio

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | <MDL |
| 2. 1,3-Dichlorobenzene | 146 | | | | <MDL |
| 3. 1,4-Dichlorobenzene | 146 | | | | <MDL |
| 4. 1,2-Dichlorobenzene | 146 | | | | <MDL |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | <MDL |
| 6. Hexachloroethane | 117 | | | | <MDL |
| 7. Nitrobenzene | 77 | | | | <MDL |
| 8. Isophorone | 82 | | | | <MDL |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | <MDL |
| 10. Trichlorobenzene | 180 | | | | <MDL |
| 11. Naphthalene | 128 | | | | <MDL |
| 12. Hexachlorobutadiene | 225 | | | | <MDL |
| 13. Hexachlorocyclopentadiene | 237 | | | | <MDL |
| 14. 2-Chloronaphthalene | 162 | | | | <MDL |
| 15. Acenaphthylene | 152 | | | | <MDL |
| 17. Dimethylphthalate | 163 | | | | <MDL |
| 18. Acenaphthene | 154 | | | | <MDL |
| 19. 2,4-Dinitrotoluene | 165 | | | | <MDL |
| 20. Fluorene | 166 | | | | <MDL |
| 21. Diethylphthalate | 149 | | | | <MDL |
| 22. N-Nitrodiphenylamine | 169 | | | | <MDL |
| 23. 4-Bromophenylphentyl ether | 248 | | | | <MDL |

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 24. Hexachlorobenzene | 284 | | | | <MDL |
| 25. Phenanthrene | 178 | | | | <MDL |
| 26. Anthracene | 178 | | | | <MDL |
| 27. Di-n-Butylphthalate | 149 | | | | <MDL |
| 28. Fluoranthene | 202 | | | | <MDL |
| 29. Pyrene | 202 | | | | <MDL |
| 30. Butylbenzylphthalate | 149 | | | | <MDL |
| 31. Benz[a]anthracene | 228 | | | | <MDL |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | <MDL |
| 33. Chrysene | 228 | | | | <MDL |
| 34. Bis[2-ethylhexyl]phthalate | 149 | | | | <MDL |
| 35. Di-n-Octylphthalate | 149 | | | | <MDL |
| 36. Benzo[b]Fluoranthene | 252 | | | | <MDL |
| 37. Benzo[k]Fluoranthene | 252 | | | | <MDL |
| 38. Benzo[a]Pyrene | 252 | | | | <MDL |
| 39. 1,2-Diphenylhydrazine | 77 | | | | <MDL |
| 40. Benzidine | 184 | | | | <MDL |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | <MDL |
| 42. N-Nitroso-n-propylamine | 70 | | | | |

## SURROGATE RESULTS

| | Compound | Quantity m/e | Scan # | Area | Det Conc | Spiked Conc |
|---|---|---|---|---|---|---|
| 1. | Anthracene D-10 | 188 | 2424 | 141779 | 76.0 | 100.0 |
| 2. | Chrysene D-12 | 240 | 3384 | 105002 | 125.0 | 100.0 |
| 3. | | | | | | |
| 4. | | | | | | |

## Tentatively Identified Compounds

| | Compound | Scan # | NBS LIB FIT | Base m/e | Area | Est Conc |
|---|---|---|---|---|---|---|
| 1. | Trimethyl Gyclohexen-1-one | 1083 | No Match | 123 | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

Environmental Trace Substances Research Center
Base Neutral Result Sheet

Sample Source: Burns & McDonnell
Submitter ID#: I-590R
ETSRC ID#: 5120514 Data File#: BN5120514
Sample Matrix: Water
Method: U.S.E.P.A. #625
Date Received: December 17, 1985
Date Analyzed: January 20, 1986 Conc. Units: mcg/L
Analyst: Carl Orazio

Sample contained traces of aliphatic hydrocarbons. Possibly due to diesel or similar contaminant.

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | <MDL |
| 2. 1,3-Dichlorobenzene | 146 | | | | <MDL |
| 3. 1,4-Dichlorobenzene | 146 | | | | <MDL |
| 4. 1,2-Dichlorobenzene | 146 | | | | <MDL |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | <MDL |
| 6. Hexachloroethane | 117 | | | | <MDL |
| 7. Nitrobenzene | 77 | | | | <MDL |
| 8. Isophorone | 82 | | | | <MDL |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | <MDL |
| 10. Trichlorobenzene | 180 | | | | <MDL |
| 11. Naphthalene | 128 | | | | <MDL |
| 12. Hexachlorobutadiene | 225 | | | | <MDL |
| 13. Hexachlorocyclopentadiene | 237 | | | | <MDL |
| 14. 2-Chloronaphthalene | 162 | | | | <MDL |
| 15. Acenaphthylene | 152 | | | | <MDL |
| 17. Dimethylphthalate | 163 | | | | <MDL |
| 18. Acenaphthene | 154 | | | | <MDL |
| 19. 2,4-Dinitrotoluene | 165 | | | | <MDL |
| 20. Fluorene | 166 | | | | <MDL |

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 21. Diethylphthalate | 149 | | | | <MDL |
| 22. N-Nitrodiphenylamine | 169 | | | | <MDL |
| 23. 4-Bromophenylphentyl ether | 248 | | | | <MDL |
| 24. Hexachlorobenzene | 284 | | | | <MDL |
| 25. Phenanthrene | 178 | | | | <MDL |
| 26. Anthracene | 178 | | | | <MDL |
| 27. Di-n-Butylphthalate | 149 | | | | <MDL |
| 28. Fluoranthene | 202 | | | | <MDL |
| 29. Pyrene | 202 | | | | <MDL |
| 30. Butylbenzylphthalate | 149 | | | | <MDL |
| 31. Benz[a]anthracene | 228 | | | | <MDL |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | <MDL |
| 33. Chrysene | 228 | | | | <MDL |
| 34. Bis[2-ethylhexyl]phthalate | 149 | 3463 | | | * |
| 35. Di-n-Octylphthalate | 149 | | | | <MDL |
| 36. Benzo[b]Fluoranthene | 252 | | | | <MDL |
| 37. Benzo[k]Fluoranthene | 252 | | | | <MDL |
| 38. Benzo[a]Pyrene | 252 | | | | <MDL |
| 39. 1,2-Diphenylhydrazine | 77 | | | | <MDL |
| 40. Benzidine | 184 | | | | <MDL |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | <MDL |
| 42. N-Nitroso-n-propylamine | 70 | | | | <MDL |

*Present but < quantitation limit.

## SURROGATE RESULTS

| | Compound | Quantity m/e | Scan # | Area | Det Conc | Spiked Conc |
|---|---|---|---|---|---|---|
| 1. | Anthracene D-10 | 188 | 2427 | 160,353 | 86.0 | 100.0 |
| 2. | Chrysene D-12 | 240 | 3382 | 90,836 | 108.3 | 100.0 |
| 3. | | | | | | |
| 4. | | | | | | |

## Tentatively Identified Compounds

| | Compound | Scan # | NBS LIB FIT | Base m/e | Area | Est Conc |
|---|---|---|---|---|---|---|
| 1. | 1,1'-Oxy Bis (2 Ethoxy) Ethane | 1031 | 946 | 59 | | |
| 2. | Pentylenetetrazole | 2053 | 973 | 55 | | |
| | | 1630 | No Match | | | |
| 3. | Aliphatic Hydrocarbon | 3509 | No Match | 57 | | |
| 4. | Aliphatic Hydrocarbon | 3626 | No Match | 57 | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

Environmental Trace Substances Research Center
Base Neutral Result Sheet

Sample Source: Burns & McDonnell
Submitter ID#: S-800R
ETSRC ID#: 5120515 Data File#: BN5120515
Sample Matrix: Water
Method: U.S.E.P.A. #625
Date Received: December 17, 1985
Date Analyzed: January 20, 1986 Conc. Units: mcg/L
Analyst: Carl Orazio

Sample contains traces of aliphatic hydrocarbons from diesel or similar contaminants.

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | <MDL |
| 2. 1,3-Dichlorobenzene | 146 | | | | <MDL |
| 3. 1,4-Dichlorobenzene | 146 | | | | <MDL |
| 4. 1,2-Dichlorobenzene | 146 | | | | <MDL |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | <MDL |
| 6. Hexachloroethane | 117 | | | | <MDL |
| 7. Nitrobenzene | 77 | | | | <MDL |
| 8. Isophorone | 82 | | | | <MDL |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | <MDL |
| 10. Trichlorobenzene | 180 | | | | <MDL |
| 11. Naphthalene | 128 | | | | <MDL |
| 12. Hexachlorobutadiene | 225 | | | | <MDL |
| 13. Hexachlorocyclopentadiene | 237 | | | | <MDL |
| 14. 2-Chloronapnthalene | 162 | | | | <MDL |
| 15. Acenaphthylene | 152 | | | | <MDL |
| 17. Dimethylphthalate | 163 | | | | <MDL |
| 18. Acenaphthene | 154 | | | | <MDL |
| 19. 2,4-Dinitrotoluene | 165 | | | | <MDL |
| 20. Fluorene | 166 | | | | <MDL |

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 21. Diethylphthalate | 149 | | | | <MDL |
| 22. N-Nitrodiphenylamine | 169 | | | | <MDL |
| 23. 4-Bromophenylphentyl ether | 248 | | | | <MDL |
| 24. Hexachlorobenzene | 284 | | | | <MDL |
| 25. Phenanthrene | 178 | | | | <MDL |
| 26. Anthracene | 178 | | | | <MDL |
| 27. Di-n-Butylphthalate | 149 | | | | <MDL |
| 28. Fluoranthene | 202 | | | | <MDL |
| 29. Pyrene | 202 | | | | <MDL |
| 30. Butylbenzylphthalate | 149 | | | | <MDL |
| 31. Benz[a]anthracene | 228 | | | | <MDL |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | <MDL |
| 33. Chrysene | 228 | 3463 | | | <MDL |
| 34. Bis[2-ethylhexyl]phthalate | 149 | | | | <MDL |
| 35. Di-n-Octylphthalate | 149 | | | | <MDL |
| 36. Benzo[b]Fluoranthene | 252 | | | | <MDL |
| 37. Benzo[k]Fluoranthene | 252 | | | | <MDL |
| 38. Benzo[a]Pyrene | 252 | | | | <MDL |
| 39. 1,2-Diphenylhydrazine | 77 | | | | <MDL |
| 40. Benzidine | 184 | | | | <MDL |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | <MDL |
| 42. N-Nitroso-n-propylamine | 70 | | | | <MDL |

## SURROGATE RESULTS

| | Compound | Quantity m/e | Scan # | Area | Det Conc | Spiked Conc |
|---|---|---|---|---|---|---|
| 1. | Anthracene D-10 | 188 | 2426 | 142,258 | 76.3 | 100.0 |
| 2. | Chrysene D-12 | 240 | 3384 | 100,922 | 120.3 | 100.0 |
| 3. | | | | | | |
| 4. | | | | | | |

## Tentatively Identified Compounds

| | Compound | Scan # | NBS LIB FIT | Base m/e | Area | Est Conc |
|---|---|---|---|---|---|---|
| 1. | Aliphatic Hydrocarbon | 3150 | | | | |
| 2. | Aliphatic Hydrocarbon | 3626 | | | | |
| 3. | Trimethyl Cyclohexane-1-One | 1082 | No Match | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

Environmental Trace Substances Research Center
Base Neutral Result Sheet

Sample Source: Burns & McDonnell
Submitter ID#: D-85 OR
ETSRC ID#: 5120520 Data File#: BN5120520
Sample Matrix: Water
Method: U.S.E.P.A. #625
Date Received: December 17, 1985
Date Analyzed: January 21, 1986 Conc. Units: mcg/L
Analyst: Carl Orazio

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | <MDL |
| 2. 1,3-Dichlorobenzene | 146 | | | | <MDL |
| 3. 1,4-Dichlorobenzene | 146 | | | | <MDL |
| 4. 1,2-Dichlorobenzene | 146 | | | | <MDL |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | <MDL |
| 6. Hexachloroethane | 117 | | | | <MDL |
| 7. Nitrobenzene | 77 | | | | <MDL |
| 8. Isophorone | 82 | | | | <MDL |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | <MDL |
| 10. Trichlorobenzene | 180 | | | | <MDL |
| 11. Naphthalene | 128 | | | | <MDL |
| 12. Hexachlorobutadiene | 225 | | | | <MDL |
| 13. Hexachlorocyclopentadiene | 237 | | | | <MDL |
| 14. 2-Chloronaphthalene | 162 | | | | <MDL |
| 15. Acenaphthylene | 152 | | | | <MDL |
| 17. Dimethylphthalate | 163 | | | | <MDL |
| 18. Acenaphthene | 154 | | | | <MDL |
| 19. 2,4-Dinitrotoluene | 165 | | | | <MDL |
| 20. Fluorene | 166 | | | | <MDL |
| 21. Diethylphthalate | 149 | | | | <MDL |
| 22. N-Nitrodiphenylamine | 169 | | | | <MDL |
| 23. 4-Bromophenylphentyl ether | 248 | | | | <MDL |

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 24. Hexachlorobenzene | 284 | | | | <MDL |
| 25. Phenanthrene | 178 | | | | <MDL |
| 26. Anthracene | 178 | | | | <MDL |
| 27. Di-n-Butylphthalate | 149 | | | | <MDL |
| 28. Fluoranthene | 202 | | | | <MDL |
| 29. Pyrene | 202 | | | | <MDL |
| 30. Butylbenzylphthalate | 149 | | | | <MDL |
| 31. Benz[a]anthracene | 228 | | | | <MDL |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | <MDL |
| 33. Chrysene | 228 | | | | <MDL |
| 34. Bis[2-ethylhexyl]phthalate | 149 | | | 1.1 | 0.96 |
| 35. Di-n-Octylphthalate | 149 | | | | <MDL |
| 36. Benzo[b]Fluoranthene | 252 | | | | <MDL |
| 37. Benzo[k]Fluoranthene | 252 | | | | <MDL |
| 38. Benzo[a]Pyrene | 252 | | | | <MDL |
| 39. 1,2-Diphenylhydrazine | 77 | | | | <MDL |
| 40. Benzidine | 184 | | | | <MDL |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | <MDL |
| 42. N-Nitroso-n-propylamine | 70 | | | | <MDL |

## SURROGATE RESULTS

| | Compound | Quantity m/e | Scan # | Area | Det Conc | Spiked Conc |
|---|---|---|---|---|---|---|
| 1. | Anthracene D-10 | 188 | 2421 | 120,607 | 100.5 | 100.0 |
| 2. | Chrysene D-12 | 240 | 3379 | 90,290 | 92.5 | 100.0 |
| 3. | Phenol D-5 | 99 | 783 | 12,775 | | |
| 4. | | | | | | |

## Tentatively Identified Compounds

| | Compound | Scan # | NBS LIB FIT | Base m/e | Area | Est Conc |
|---|---|---|---|---|---|---|
| 1. | | 1079 | No Match | 123 | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 24. Hexachlorobenzene | 284 | | | | <MDL |
| 25. Phenanthrene | 178 | | | | <MDL |
| 26. Anthracene | 178 | | | | <MDL |
| 27. Di-n-Butylphthalate | 149 | | | | <MDL |
| 28. Fluoranthene | 202 | | | | <MDL |
| 29. Pyrene | 202 | | | | <MDL |
| 30. Butylbenzylphthalate | 149 | | | | <MDL |
| 31. Benz[a]anthracene | 228 | | | | <MDL |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | <MDL |
| 33. Chrysene | 228 | | | | <MDL |
| 34. Bis[2-ethylhexyl]phthalate | 149 | | | | <MDL |
| 35. Di-n-Octylphthalate | 149 | | | | <MDL |
| 36. Benzo[b]Fluoranthene | 252 | | | | <MDL |
| 37. Benzo[k]Fluoranthene | 252 | | | | <MDL |
| 38. Benzo[a]Pyrene | 252 | | | | <MDL |
| 39. 1,2-Diphenylhydrazine | 77 | | | | <MDL |
| 40. Benzidine | 184 | | | | <MDL |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | <MDL |
| 42. N-Nitroso-n-propylamine | 70 | | | | |

Environmental Trace Substances Research Center
Base Neutral Result Sheet

Sample Source: Burns & McDonnell
Submitter ID#: D-890R
ETSRC ID#: 5120523 Data File#: BN5120523
Sample Matrix: Water
Method: U.S.E.P.A. #625
Date Received: December 17, 1985
Date Analyzed: January 20, 1986 Conc. Units: mcg/L
Analyst: Carl Orazio

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | <MDL |
| 2. 1,3-Dichlorobenzene | 146 | | | | <MDL |
| 3. 1,4-Dichlorobenzene | 146 | | | | <MDL |
| 4. 1,2-Dichlorobenzene | 146 | | | | <MDL |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | <MDL |
| 6. Hexachloroethane | 117 | | | | <MDL |
| 7. Nitrobenzene | 77 | | | | <MDL |
| 8. Isophorone | 82 | | | | <MDL |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | <MDL |
| 10. Trichlorobenzene | 180 | | | | <MDL |
| 11. Naphthalene | 128 | | | | <MDL |
| 12. Hexachlorobutadiene | 225 | | | | <MDL |
| 13. Hexachlorocyclopentadiene | 237 | | | | <MDL |
| 14. 2-Chloronaphthalene | 162 | | | | <MDL |
| 15. Acenaphthylene | 152 | | | | <MDL |
| 17. Dimethylphthalate | 163 | | | | <MDL |
| 18. Acenaphthene | 154 | | | | <MDL |
| 19. 2,4-Dinitrotoluene | 165 | | | | <MDL |
| 20. Fluorene | 166 | | | | <MDL |
| 21. Diethylphthalate | 149 | | | | <MDL |
| 22. N-Nitrodiphenylamine | 169 | | | | <MDL |
| 23. 4-Bromophenylphentyl ether | 248 | | | | <MDL |

## SURROGATE RESULTS

| | Compound | Quantity m/e | Scan # | Area | Det Conc | Spiked Conc |
|---|---|---|---|---|---|---|
| 1. | Anthracene D-10 | 188 | 2425 | 101,792 | 84.8 | 100.0 |
| 2. | Chrysene D-12 | 240 | 3381 | 89,410 | 91.6 | 100.0 |
| 3. | | | | | | |
| 4. | | | | | | |

## Tentatively Identified Compounds

| | Compound | Scan # | NBS LIB FIT | Base m/e | Area | Est Conc |
|---|---|---|---|---|---|---|
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 24. Hexachlorobenzene | 284 | | | | <MDL |
| 25. Phenanthrene | 178 | | | | <MDL |
| 26. Anthracene | 178 | | | | <MDL |
| 27. Di-n-Butylphthalate | 149 | 2684 | 599 | 0.31 | 0.35 |
| 28. Fluoranthene | 202 | | | | <MDL |
| 29. Pyrene | 202 | | | | <MDL |
| 30. Butylbenzylphthalate | 149 | | | | <MDL |
| 31. Benz[a]anthracene | 228 | | | | <MDL |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | <MDL |
| 33. Chrysene | 228 | | | | <MDL |
| 34. Bis[2-ethylhexyl]phthalate | 149 | | | | <MDL |
| 35. Di-n-Octylphthalate | 149 | 3683 | 2247 | 0.94 | 0.97 |
| 36. Benzo[b]Fluoranthene | 252 | | | | <MDL |
| 37. Benzo[k]Fluoranthene | 252 | | | | <MDL |
| 38. Benzo[a]Pyrene | 252 | | | | <MDL |
| 39. 1,2-Diphenylhydrazine | 77 | | | | <MDL |
| 40. Benzidine | 184 | | | | <MDL |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | <MDL |
| 42. N-Nitroso-n-propylamine | 70 | | | | <MDL |

Environmental Trace Substances Research Center
Base Neutral Result Sheet

Sample Source: Burns & McDonnell
Submitter ID#: S-88 DR
ETSRC ID#: 5120522 Data File#: BN5120522
Sample Matrix: Water
Method: U.S.E.P.A. #625
Date Received: January
Date Analyzed: January 23, 1986 Conc. Units: mcg/L
Analyst: Carl Orazio

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | <MDL |
| 2. 1,3-Dichlorobenzene | 146 | | | | <MDL |
| 3. 1,4-Dichlorobenzene | 146 | | | | <MDL |
| 4. 1,2-Dichlorobenzene | 146 | | | | <MDL |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | <MDL |
| 6. Hexachloroethane | 117 | | | | <MDL |
| 7. Nitrobenzene | 77 | | | | <MDL |
| 8. Isophorone | 82 | | | | <MDL |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | <MDL |
| 10. Trichlorobenzene | 180 | | | | <MDL |
| 11. Naphthalene | 128 | | | | <MDL |
| 12. Hexachlorobutadiene | 225 | | | | <MDL |
| 13. Hexachlorocyclopentadiene | 237 | | | | <MDL |
| 14. 2-Chloronaphthalene | 162 | | | | <MDL |
| 15. Acenaphthylene | 152 | | | | <MDL |
| 17. Dimethylphthalate | 163 | | | | <MDL |
| 18. Acenaphthene | 154 | | | | <MDL |
| 19. 2,4-Dinitrotoluene | 165 | | | | <MDL |
| 20. Fluorene | 166 | | | | <MDL |
| 21. Diethylphthalate | 149 | | | | <MDL |
| 22. N-Nitrodiphenylamine | 169 | | | | <MDL |
| 23. 4-Bromophenylphentyl ether | 248 | | | | <MDL |

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 24. Hexachlorobenzene | 284 | | | | <MDL |
| 25. Phenanthrene | 178 | | | | <MDL |
| 26. Anthracene | 178 | | | | <MDL |
| 27. Di-n-Butylphthalate | 149 | | | | <MDL |
| 28. Fluoranthene | 202 | | | | <MDL |
| 29. Pyrene | 202 | | | | <MDL |
| 30. Butylbenzylphthalate | 149 | | | | <MDL |
| 31. Benz[a]anthracene | 228 | | | | <MDL |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | <MDL |
| 33. Chrysene | 228 | | | | <MDL |
| 34. Bis[2-ethylhexyl]phthalate | 149 | | | | <MDL |
| 35. Di-n-Octylphthalate | 149 | | | | <MDL |
| 36. Benzo[b]Fluoranthene | 252 | | | | <MDL |
| 37. Benzo[k]Fluoranthene | 252 | | | | <MDL |
| 38. Benzo[a]Pyrene | 252 | | | | <MDL |
| 39. 1,2-Diphenylhydrazine | 77 | | | | <MDL |
| 40. Benzidine | 184 | | | | <MDL |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | <MDL |
| 42. N-Nitroso-n-propylamine | 70 | | | | |

Environmental Trace Substances Research Center
Base Neutral Result Sheet

Sample Source: Burns & McDonnell
Submitter ID#: D-91 OR
ETSRC ID#: 5120525D
Data File#: BN5120525D
Sample Matrix: Water
Method: U.S.E.P.A. #625
Date Received: December 17, 1985
Date Analyzed: January 22, 1986
Conc. Units: mcg/L
Analyst: Carl Orazio

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | <MDL |
| 2. 1,3-Dichlorobenzene | 146 | | | | <MDL |
| 3. 1,4-Dichlorobenzene | 146 | | | | <MDL |
| 4. 1,2-Dichlorobenzene | 146 | | | | <MDL |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | <MDL |
| 6. Hexachloroethane | 117 | | | | <MDL |
| 7. Nitrobenzene | 77 | | | | <MDL |
| 8. Isophorone | 82 | | | | <MDL |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | <MDL |
| 10. Trichlorobenzene | 180 | | | | <MDL |
| 11. Naphthalene | 128 | | | | <MDL |
| 12. Hexachlorobutadiene | 225 | | | | <MDL |
| 13. Hexachlorocyclopentadiene | 237 | | | | <MDL |
| 14. 2-Chloronaphthalene | 162 | | | | <MDL |
| 15. Acenaphthylene | 152 | | | | <MDL |
| 17. Dimethylphthalate | 163 | | | | <MDL |
| 18. Acenaphthene | 154 | | | | <MDL |
| 19. 2,4-Dinitrotoluene | 165 | | | | <MDL |
| 20. Fluorene | 166 | | | | <MDL |
| 21. Diethylphthalate | 149 | | | | <MDL |
| 22. N-Nitrodiphenylamine | 169 | | | | <MDL |
| 23. 4-Bromophenylphentyl ether | 248 | | | | <MDL |

## SURROGATE RESULTS

| | Compound | Quantity m/e | Scan # | Area | Det Conc | Spiked Conc |
|---|---|---|---|---|---|---|
| 1. | Anthracene D-10 | 188 | 2388 | 29701 | 22.4 | 20.0 |
| 2. | Chrysene D-12 | 240 | 3336 | 123162 | 15.9 | 20.0 |
| 3. | | | | | | |
| 4. | | | | | | |

## Tentatively Identified Compounds

| | Compound | Scan # | NBS LIB FIT | Base m/e | Area | Est Conc |
|---|---|---|---|---|---|---|
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 24. Hexachlorobenzene | 284 | | | | <MDL |
| 25. Phenanthrene | 178 | | | | <MDL |
| 26. Anthracene | 178 | | | | <MDL |
| 27. Di-n-Butylphthalate | 149 | | | | <MDL |
| 28. Fluoranthene | 202 | | | | <MDL |
| 29. Pyrene | 202 | | | | <MDL |
| 30. Butylbenzylphthalate | 149 | | | | <MDL |
| 31. Benz[a]anthracene | 228 | | | | <MDL |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | <MDL |
| 33. Chrysene | 228 | | | | <MDL |
| 34. Bis[2-ethylhexyl]phthalate | 149 | | | | <MDL |
| 35. Di-n-Octylphthalate | 149 | | | | <MDL |
| 36. Benzo[b]Fluoranthene | 252 | | | | <MDL |
| 37. Benzo[k]Fluoranthene | 252 | | | | <MDL |
| 38. Benzo[a]Pyrene | 252 | | | | <MDL |
| 39. 1,2-Diphenylhydrazine | 77 | | | | <MDL |
| 40. Benzidine | 184 | | | | <MDL |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | <MDL |
| 42. N-Nitroso-n-propylamine | 70 | | | | |

Environmental Trace Substances Research Center
Base Neutral Result Sheet

Sample Source: Burns & McDonnell
Submitter ID#: D-91 OR
ETSRC ID#: 5120525 Data File#: 512052BN
Sample Matrix: Water
Method: U.S.E.P.A. #625
Date Received: December 17, 1985
Date Analyzed: March 4, 1986 Conc. Units: mcg/L
Analyst: Carl Orazio

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | <MDL |
| 2. 1,3-Dichlorobenzene | 146 | | | | <MDL |
| 3. 1,4-Dichlorobenzene | 146 | | | | <MDL |
| 4. 1,2-Dichlorobenzene | 146 | | | | <MDL |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | <MDL |
| 6. Hexachloroethane | 117 | | | | <MDL |
| 7. Nitrobenzene | 77 | | | | <MDL |
| 8. Isophorone | 82 | | | | <MDL |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | <MDL |
| 10. Trichlorobenzene | 180 | | | | <MDL |
| 11. Naphthalene | 128 | | | | <MDL |
| 12. Hexachlorobutadiene | 225 | | | | <MDL |
| 13. Hexachlorocyclopentadiene | 237 | | | | <MDL |
| 14. 2-Chloronaphthalene | 162 | | | | <MDL |
| 15. Acenaphthylene | 152 | | | | <MDL |
| 17. Dimethylphthalate | 163 | | | | <MDL |
| 18. Acenaphthene | 154 | | | | <MDL |
| 19. 2,4-Dinitrotoluene | 165 | | | | <MDL |
| 20. Fluorene | 166 | | | | <MDL |
| 21. Diethylphthalate | 149 | | | | <MDL |
| 22. N-Nitrodiphenylamine | 169 | | | | <MDL |
| 23. 4-Bromophenylpnentyl ether | 248 | | | | <MDL |

## SURROGATE RESULTS

| | Compound | Quantity m/e | Scan # | Area | Det Conc | Spiked Conc |
|---|---|---|---|---|---|---|
| 1. | Anthracene D-10 | 188 | 2416 | 147,856 | 122.0 | 100.0 |
| 2. | Chrysene D-12 | 240 | 3376 | 141,120 | 137.0 | 100.0 |
| 3. | | | | | | |
| 4. | | | | | | |

## Tentatively Identified Compounds

| | Compound | Scan # | NBS LIB FIT | Base m/e | Area | Est Conc |
|---|---|---|---|---|---|---|
| 1. | Fatty Acid Octy Ester | 2057 | 966 | 119 | | |
| 2. | | 3271 | 973 | 129 | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 22. N-Nitrodiphenylamine | 169 | | | | <MDL |
| 23. 4-Bromophenylphenyl ether | 248 | | | | <MDL |
| 24. Hexachlorobenzene | 284 | | | | <MDL |
| 25. Phenanthrene | 178 | | | | <MDL |
| 26. Anthracene | 178 | | | | <MDL |
| 27. Di-n-Butylphthalate | 149 | | | | <MDL |
| 28. Fluoranthene | 202 | | | | <MDL |
| 29. Pyrene | 202 | | | | <MDL |
| 30. Butylbenzylphthalate | 149 | | | | <MDL |
| 31. Benz[a]anthracene | 228 | | | | <MDL |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | <MDL |
| 33. Chrysene | 228 | | | | <MDL |
| 34. Bis[2-ethylhexyl]phthalate | 149 | 3440 | 8084 | 6.6 | 7.4 |
| 35. Di-n-Octylphthalate | 149 | 3679 | 15452 | 7.8 | 6.4 |
| 36. Benzo[b]Fluoranthene | 252 | | | | <MDL |
| 37. Benzo[k]Fluoranthene | 252 | | | | <MDL |
| 38. Benzo[a]Pyrene | 252 | | | | <MDL |
| 39. 1,2-Diphenylhydrazine | 77 | | | | <MDL |
| 40. Benzidine | 184 | | | | <MDL |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | <MDL |
| 42. N-Nitroso-n-propylamine | 70 | | | | <MDL |

Environmental Trace Substances Research Center
Base Neutral Result Sheet

Sample Source: Burns & McDonnell
Submitter ID#: D-93 OR
ETSRC ID#: 5120527 Data File#: BN512527
Sample Matrix: Water
Method: U.S.E.P.A. #625
Date Received: December 17, 1985
Date Analyzed: January 23, 1986 Conc. Units: mcg/L
Analyst: Carl Orazio

Contaminated with phthlate esters.

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | <MDL |
| 2. 1,3-Dichlorobenzene | 146 | | | | <MDL |
| 3. 1,4-Dichlorobenzene | 146 | | | | <MDL |
| 4. 1,2-Dichlorobenzene | 146 | | | | <MDL |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | <MDL |
| 6. Hexachloroethane | 117 | | | | <MDL |
| 7. Nitrobenzene | 77 | | | | <MDL |
| 8. Isophorone | 82 | | | | <MDL |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | <MDL |
| 10. Trichlorobenzene | 180 | | | | <MDL |
| 11. Naphthalene | 128 | | | | <MDL |
| 12. Hexachlorobutadiene | 225 | | | | <MDL |
| 13. Hexachlorocyclopentadiene | 237 | | | | <MDL |
| 14. 2-Chloronaphthalene | 162 | | | | <MDL |
| 15. Acenaphthylene | 152 | | | | <MDL |
| 17. Dimethylphthalate | 163 | | | | <MDL |
| 18. Acenaphthene | 154 | | | | <MDL |
| 19. 2,4-Dinitrotoluene | 165 | | | | <MDL |
| 20. Fluorene | 166 | | | | <MDL |
| 21. Diethylphthalate | 149 | | | | <MDL |

## SURROGATE RESULTS

| | Compound | Quantity m/e | Scan # | Area | Det Conc | Spiked Conc |
|---|---|---|---|---|---|---|
| 1. | Anthracene D-10 | 188 | 3415 | 134,442 | 115.3 | 100.0 |
| 2. | Chrysene D-12 | 240 | a3372 | 121,484 | 118.6 | 100.0 |
| 3. | | | | | | |
| 4. | | | | | | |

## Tentatively Identified Compounds

| | Compound | Scan # | NBS LIB FIT | Base m/e | Area | Est Conc |
|---|---|---|---|---|---|---|
| 1. | Ethane, 1,1'-Oxy Bis[2]Ethoxy | 1029 | 924 | 59 | | |
| 2. | Trimethyl Cyclohexan-1-One | 1078 | No Match | 123 | | |
| 3. | Triethy Phosphate | 1126 | 936 | 99 | | |
| 4. | Hexane Dioic Acid, Dioctylester | 3264 | 966 | 129 | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 24. Hexachlorobenzene | 284 | | | | <MDL |
| 25. Phenanthrene | 178 | | | | <MDL |
| 26. Anthracene | 178 | | | | <MDL |
| 27. Di-n-Butylphthalate | 149 | 2675 | 1321 | 0.81 | 0.70 |
| 28. Fluoranthene | 202 | | | | <MDL |
| 29. Pyrene | 202 | | | | <MDL |
| 30. Butylbenzylphthalate | 149 | | | | <MDL |
| 31. Benz[a]anthracene | 228 | | | | <MDL |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | <MDL |
| 33. Chrysene | 228 | | | | <MDL |
| 34. Bis[2-ethylhexyl]phthalate | 149 | 3460 | 671,459 | 549.4 | 477.4 |
| 35. Di-n-Octylphthalate | 149 | 3672 | 5971 | 3.0 | 2.6 |
| 36. Benzo[b]Fluoranthene | 252 | | | | <MDL |
| 37. Benzo[k]Fluoranthene | 252 | | | | <MDL |
| 38. Benzo[a]Pyrene | 252 | | | | <MDL |
| 39. 1,2-Diphenylhydrazine | 77 | | | | <MDL |
| 40. Benzidine | 184 | | | | <MDL |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | <MDL |
| 42. N-Nitroso-n-propylamine | 70 | | | | <MDL |

Environmental Trace Substances Research Center
Base Neutral Result Sheet

Sample Source: Burns & McDonnell
Submitter ID#: D-92 OR
ETSRC ID#: 5120526 Data File#. BN5120526
Sample Matrix: Water
Method: U.S.E.P.A. #625
Date Received: December 17, 1985
Date Analyzed: January 23, 1986 Conc. Units: mcg/L
Analyst: Carl Orazio

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | <MDL |
| 2. 1,3-Dichlorobenzene | 146 | | | | <MDL |
| 3. 1,4-Dichlorobenzene | 146 | | | | <MDL |
| 4. 1,2-Dichlorobenzene | 146 | | | | <MDL |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | <MDL |
| 6. Hexachloroethane | 117 | | | | <MDL |
| 7. Nitrobenzene | 77 | | | | <MDL |
| 8. Isophorone | 82 | | | | <MDL |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | <MDL |
| 10. Trichlorobenzene | 180 | | | | <MDL |
| 11. Naphthalene | 128 | | | | <MDL |
| 12. Hexachlorobutadiene | 225 | | | | <MDL |
| 13. Hexachlorocyclopentadiene | 237 | | | | <MDL |
| 14. 2-Chloronaphthalene | 162 | | | | <MDL |
| 15. Acenaphthylene | 152 | | | | <MDL |
| 17. Dimethylphthalate | 163 | | | | <MDL |
| 18. Acenaphthene | 154 | | | | <MDL |
| 19. 2,4-Dinitrotoluene | 165 | | | | <MDL |
| 20. Fluorene | 166 | | | | <MDL |
| 21. Diethylphthalate | 149 | | | | <MDL |
| 22. N-Nitrodiphenylamine | 169 | | | | <MDL |
| 23. 4-Bromophenylphenyl ether | 248 | | | | <MDL |

## SURROGATE RESULTS

| | Compound | Quantity m/e | Scan # | Area | Det Conc | Spiked Conc |
|---|---|---|---|---|---|---|
| 1. | Anthracene D-10 | 188 | 2414 | 120131 | 99.0 | 100.0 |
| 2. | Chrysene D-12 | 240 | 3373 | 110619 | 108.0 | 100.0 |
| 3. | | | | | | |
| 4. | | | | | | |

## Tentatively Identified Compounds

| | Compound | Scan # | NBS LIB FIT | Base m/e | Area | Est Conc |
|---|---|---|---|---|---|---|
| 1. | Trimethyl Cyclohexene-1-one | 1074 | No Match | 123 | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 24. Hexachlorobenzene | 284 | | | | <MDL |
| 25. Phenanthrene | 178 | | | | <MDL |
| 26. Anthracene | 178 | | | | <MDL |
| 27. Di-n-Butylphthalate | 149 | | | | <MDL |
| 28. Fluoranthene | 202 | | | | <MDL |
| 29. Pyrene | 202 | | | | <MDL |
| 30. Butylbenzylphthalate | 149 | | | | <MDL |
| 31. Benz[a]anthracene | 228 | | | | <MDL |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | <MDL |
| 33. Chrysene | 228 | | | | <MDL |
| 34. Bis[2-ethylhexyl]phthalate | 149 | | | | <MDL |
| 35. Di-n-Octylphthalate | 149 | | | | <MDL |
| 36. Benzo[b]Fluoranthene | 252 | | | | <MDL |
| 37. Benzo[k]Fluoranthene | 252 | | | | <MDL |
| 38. Benzo[a]Pyrene | 252 | | | | <MDL |
| 39. 1,2-Diphenylhydrazine | 77 | | | | <MDL |
| 40. Benzidine | 184 | | | | <MDL |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | <MDL |
| 42. N-Nitroso-n-propylamine | 70 | | | | |

Environmental Trace Substances Research Center
Base Neutral Result Sheet

Sample Source: Burns & McDonnell
Submitter ID#: D-95 OR
ETSRC ID#: 5120529 Data File#: BN5120529
Sample Matrix: Water
Method: U.S.E.P.A. #625
Date Received: December 17, 1985
Date Analyzed: January 20, 1986 Conc. Units: mcg/L
Analyst: Carl Orazio

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | <MDL |
| 2. 1,3-Dichlorobenzene | 146 | | | | <MDL |
| 3. 1,4-Dichlorobenzene | 146 | | | | <MDL |
| 4. 1,2-Dichlorobenzene | 146 | | | | <MDL |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | <MDL |
| 6. Hexachloroethane | 117 | | | | <MDL |
| 7. Nitrobenzene | 77 | | | | <MDL |
| 8. Isophorone | 82 | | | | <MDL |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | <MDL |
| 10. Trichlorobenzene | 180 | | | | <MDL |
| 11. Naphthalene | 128 | | | | <MDL |
| 12. Hexachlorobutadiene | 225 | | | | <MDL |
| 13. Hexachlorocyclopentadiene | 237 | | | | <MDL |
| 14. 2-Chloronaphthalene | 162 | | | | <MDL |
| 15. Acenaphthylene | 152 | | | | <MDL |
| 17. Dimethylphthalate | 163 | | | | <MDL |
| 18. Acenaphthene | 154 | | | | <MDL |
| 19. 2,4-Dinitrotoluene | 165 | | | | <MDL |
| 20. Fluorene | 166 | | | | <MDL |
| 21. Diethylphthalate | 149 | | | | <MDL |
| 22. N-Nitrodiphenylamine | 169 | | | | <MDL |
| 23. 4-Bromophenylphentyl ether | 248 | | | | <MDL |

## SURROGATE RESULTS

| | Compound | Quantity m/e | Scan # | Area | Det Conc | Spiked Conc |
|---|---|---|---|---|---|---|
| 1. | Anthracene D-10 | 188 | 2415 | 115742 | 99.3 | 100.0 |
| 2. | Chrysene D-12 | 240 | 3372 | 104983 | 102.5 | 100.0 |
| 3. | | | | | | |
| 4. | | | | | | |

## Tentatively Identified Compounds

| | Compound | Scan # | NBS LIB FIT | Base m/e | Area | Est Conc |
|---|---|---|---|---|---|---|
| 1. | Trimethyl Cyclohexane-1-One | 1080 | No Match | 123 | | |
| 2. | Hexane Dioc Acid Dioctyl Ester | 3256 | 919 | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 24. Hexachlorobenzene | 284 | | | | <MDL |
| 25. Phenanthrene | 178 | | | | <MDL |
| 26. Anthracene | 178 | | | | <MDL |
| 27. Di-n-Butylphthalate | 149 | | | | <MDL |
| 28. Fluoranthene | 202 | | | | <MDL |
| 29. Pyrene | 202 | | | | <MDL |
| 30. Butylbenzylphthalate | 149 | | | | <MDL |
| 31. Benz[a]anthracene | 228 | | | | <MDL |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | <MDL |
| 33. Chrysene | 228 | | | | <MDL |
| 34. Bis[2-ethylhexyl]phthalate | 149 | 3450 | 4515 | 3.7 | 3.7 |
| 35. Di-n-Octylphthalate | 149 | | | | <MDL |
| 36. Benzo[b]Fluoranthene | 252 | | | | <MDL |
| 37. Benzo[k]Fluoranthene | 252 | | | | <MDL |
| 38. Benzo[a]Pyrene | 252 | | | | <MDL |
| 39. 1,2-Diphenylhydrazine | 77 | | | | <MDL |
| 40. Benzidine | 184 | | | | <MDL |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | <MDL |
| 42. N-Nitroso-n-propylamine | 70 | | | | <MDL |

Environmental Trace Substances Research Center
Base Neutral Result Sheet

Sample Source: Burns & McDonnell
Submitter ID#: D-94 OR
ETSRC ID#: 5120528 Data File#: BN5120528
Sample Matrix: Water
Method: U.S.E.P.A. #625
Date Received. December 17, 1985
Date Analyzed: January 23, 1986 Conc. Units: mcg/L
Analyst: Carl Orazio

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | <MDL |
| 2. 1,3-Dichlorobenzene | 146 | | | | <MDL |
| 3. 1,4-Dichlorobenzene | 146 | | | | <MDL |
| 4. 1,2-Dichlorobenzene | 146 | | | | <MDL |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | <MDL |
| 6. Hexachloroethane | 117 | | | | <MDL |
| 7. Nitrobenzene | 77 | | | | <MDL |
| 8. Isophorone | 82 | | | | <MDL |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | <MDL |
| 10. Trichlorobenzene | 180 | | | | <MDL |
| 11. Naphthalene | 128 | | | | <MDL |
| 12. Hexachlorobutadiene | 225 | | | | <MDL |
| 13. Hexachlorocyclopentadiene | 237 | | | | <MDL |
| 14. 2-Chloronaphthalene | 162 | | | | <MDL |
| 15. Acenaphthylene | 152 | | | | <MDL |
| 17. Dimethylphthalate | 163 | | | | <MDL |
| 18. Acenaphthene | 154 | | | | <MDL |
| 19. 2,4-Dinitrotoluene | 165 | | | | <MDL |
| 20. Fluorene | 166 | | | | <MDL |
| 21. Diethylphthalate | 149 | | | | <MDL |
| 22. N-Nitrodiphenylamine | 169 | | | | <MDL |
| 23. 4-Bromophenylphentyl ether | 248 | | | | <MDL |

## SURROGATE RESULTS

| | Compound | Quantity m/e | Scan # | Area | Det Conc | Spiked Conc |
|---|---|---|---|---|---|---|
| 1. | Anthracene D-10 | 188 | 2415 | 103659 | 88.9 | 100.0 |
| 2. | Chrysene D-12 | 240 | 3371 | 124926 | 122.0 | 100.0 |
| 3. | | | | | | |
| 4. | | | | | | |

## *Tentatively Identified Compounds*

| | Compound | Scan # | NBS LIB FIT | Base m/e | Area | Est Conc |
|---|---|---|---|---|---|---|
| 1. | 1,1' Ethane Bis Oxy(Ethoxy) [2]Ethoxy | 1032 | No Match | 59 | | |
| 2. | Trimethyl Cyclohexe-1-One | 1081 | No Match | 123 | | |
| 3. | Tetraoxydodecane | 1945 | 969 | 59 | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

Environmental Trace Substances Research Center

Base Neutral Result Sheet

Sample Source: Burns & McDonnell

Submitter ID#:

ETSRC ID#: 6010117 Data File#: BN6010117

Sample Matrix: Water

Method: U.S.E.P.A. #625

Date Received: January

Date Analyzed: January 23, 1986 Conc. Units: mcg/L

Analyst: Carl Orazio

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | <MDL |
| 2. 1,3-Dichlorobenzene | 146 | | | | <MDL |
| 3. 1,4-Dichlorobenzene | 146 | 861 | 542 | 1.0 | 0.94 |
| 4. 1,2-Dichlorobenzene | 146 | | | | <MDL |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | <MDL |
| 6. Hexachloroethane | 117 | | | | <MDL |
| 7. Nitrobenzene | 77 | | | | <MDL |
| 8. Isophorone | 82 | | | | <MDL |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | <MDL |
| 10. Trichlorobenzene | 180 | | | | <MDL |
| 11. Naphthalene | 128 | 1262 | 1360 | 0.90 | 0.86 |
| 12. Hexachlorobutadiene | 225 | | | | <MDL |
| 13. Hexachlorocyclopentadiene | 237 | | | | <MDL |
| 14. 2-Chloronaphthalene | 162 | | | | <MDL |
| 15. Acenaphthylene | 152 | | | | <MDL |
| 17. Dimethylphthalate | 163 | | | | <MDL |
| 18. Acenaphthene | 154 | | | | <MDL |
| 19. 2,4-Dinitrotoluene | 165 | | | | <MDL |
| 20. Fluorene | 166 | | | | <MDL |
| 21. Diethylphthalate | 149 | 2080 | 3545 | 1.85 | 1.75 |
| 22. N-Nitrodiphenylamine | 169 | | | | <MDL |
| 23. 4-Bromophenylphentyl ether | 248 | | | | <MDL |

## SURROGATE RESULTS

| | Compound | Quantity m/e | Scan # | Area | Det Conc | Spiked Conc |
|---|---|---|---|---|---|---|
| 1. | Anthracene D-10 | 188 | 2416 | 132398 | 113.5 | 100.0 |
| 2. | Chrysene D-12 | 240 | 3373 | 107540 | 105.0 | 100.0 |
| 3. | | | | | | |
| 4. | | | | | | |

## Tentatively Identified Compounds

| | Compound | Scan # | NBS LIB FIT | Base m/e | Area | Est Conc |
|---|---|---|---|---|---|---|
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

Environmental Trace Substances Research Center

Base Neutral Result Sheet

Sample Source: Burns & McDonnell

Submitter ID#:

ETSRC ID#: 5120524S; Spike Sample

Data File#: BN5120524S

Sample Matrix: Water

Method: U.S.E.P.A. #625

Date Received: December 17, 1985

Date Analyzed: January 22, 1986

Conc. Units: mcg/L

Analyst: Carl Orazio

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc | Spk Conc |
|---|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | <MDL | |
| 2. 1,3-Dichlorobenzene | 146 | | | | <MDL | |
| 3. 1,4-Dichlorobenzene | 146 | | | | <MDL | |
| 4. 1,2-Dichlorobenzene | 146 | | | | <MDL | |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | <MDL | |
| 6. Hexachloroethane | 117 | | | | <MDL | |
| 7. Nitrobenzene | 77 | | | | <MDL | |
| 8. Isophorone | 82 | | | | <MDL | |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | <MDL | |
| 10. Trichlorobenzene | 180 | | | | <MDL | |
| 11. Naphthalene | 128 | | | | <MDL | |
| 12. Hexachlorobutadiene | 225 | | | | <MDL | |
| 13. Hexachlorocyclopentadiene | 237 | | | | <MDL | |
| 14. 2-Chloronaphthalene | 162 | | | | <MDL | |
| 15. Acenaphthylene | 152 | | | | <MDL | |
| 17. Dimethylphthalate | 163 | | | | <MDL | |
| 18. Acenaphthene | 154 | | | | <MDL | |
| 19. 2,4-Dinitrotoluene | 165 | | | | <MDL | |
| 20. Fluorene | 166 | 2059 | 11222 | 17.9 | 19.2 | 20.0 |
| 21. Diethylphthalate | 149 | | | | <MDL | |
| 22. N-Nitrodiphenylamine | 169 | | | | <MDL | |

## SURROGATE RESULTS

| | Compound | Quantity m/e | Scan # | Area | Det Conc | Spiked Conc |
|---|---|---|---|---|---|---|
| 1. | Anthracene D-10 | 188 | 2410 | 213,353 | 114.5 | 100.0 |
| 2. | Chrysene D-12 | 240 | 3370 | 160,419 | | 100.0 |
| 3. | | | | | | |
| 4. | | | | | | |

## Tentatively Identified Compounds

| | Compound | Scan # | NBS LIB FIT | Base m/e | Area | Est Conc |
|---|---|---|---|---|---|---|
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 24. Hexachlorobenzene | 284 | | | | <MDL |
| 25. Phenanthrene | 178 | | 26966 | 15.8 | 20.0 |
| 26. Anthracene | 178 | | | | <MDL |
| 27. Di-n-Butylphthalate | 149 | | | | <MDL |
| 28. Fluoranthene | 202 | 2833 | 38619 | 22.7 | 20.0 |
| 29. Pyrene | 202 | | | | <MDL |
| 30. Butylbenzylphthalate | 149 | | | | <MDL |
| 31. Benz[a]anthracene | 228 | | | | <MDL |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | <MDL |
| 33. Chrysene | 228 | | 34949 | 72.4 | 75.0 |
| 34. Bis[2-ethylhexyl]phthalate | 149 | | | | <MDL |
| 35. Di-n-Octylphthalate | 149 | | | | <MDL |
| 36. Benzo[b]Fluoranthene | 252 | 3752 | 22655 | 20.1 | 20.0 |
| 37. Benzo[k]Fluoranthene | 252 | | | | <MDL |
| 38. Benzo[a]Pyrene | 252 | | | | <MDL |
| 39. 1,2-Diphenylhydrazine | 77 | | | | <MDL |
| 40. Benzidine | 184 | | | | <MDL |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | <MDL |
| 42. N-Nitroso-n-propylamine | 70 | | | | <MDL |

Environmental Trace Substances Research Center
Base Neutral Result Sheet

Sample Source: Burns & McDonnell
Submitter ID#:
ETSRC ID#: 51205RSPK
Data File#: BNRSPK
Sample Matrix: Water
Method: U.S.E.P.A. #625
Date Received: January 14, 1986
Date Analyzed: January 15, 1986
Conc. Units: mcg/L
Analyst: Carl Orazio

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | <MDL |
| 2. 1,3-Dichlorobenzene | 146 | | | | <MDL |
| 3. 1,4-Dichlorobenzene | 146 | | | | <MDL |
| 4. 1,2-Dichlorobenzene | 146 | | | | <MDL |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | <MDL |
| 6. Hexachloroethane | 117 | | | | <MDL |
| 7. Nitrobenzene | 77 | | | | <MDL |
| 8. Isophorone | 82 | | | | <MDL |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | <MDL |
| 10. Trichlorobenzene | 180 | | | | <MDL |
| 11. Naphthalene | 128 | | | | <MDL |
| 12. Hexachlorobutadiene | 225 | | | | <MDL |
| 13. Hexachlorocyclopentadiene | 237 | | | | <MDL |
| 14. 2-Chloronaphthalene | 162 | | | | <MDL |
| 15. Acenaphthylene | 152 | | | | <MDL |
| 17. Dimethylphthalate | 163 | | | | <MDL |
| 18. Acenaphthene | 154 | | | | <MDL |
| 19. 2,4-Dinitrotoluene | 165 | | | | <MDL |
| 20. Fluorene | 166 | 2054 | 16555 | 19.3 | 20.0 |
| 21. Diethylphthalate | 149 | | | | <MDL |
| 22. N-Nitrodiphenylamine | 169 | | | | <MDL |
| 23. 4-Bromophenylphenyl ether | 248 | | | | <MDL |

## SURROGATE RESULTS

| | Compound | Quantity m/e | Scan # | Area | Det Conc | Spiked Conc |
|---|---|---|---|---|---|---|
| 1. | Anthracene D-10 | 188 | | 132,499 | 110.4 | 100.0 |
| 2. | Chrysene D-12 | 240 | | 76,944 | 91.7 | 100.0 |
| 3. | | | | | | |
| 4. | | | | | | |

## Tentatively Identified Compounds

| | Compound | Scan # | NBS LIB FIT | Base m/e | Area | Est Conc |
|---|---|---|---|---|---|---|
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 24. Hexachlorobenzene | 284 | | | | <MDL |
| 25. Phenanthrene | 178 | | | | <MDL |
| 26. Anthracene | 178 | | | | <MDL |
| 27. Di-n-Butylpnthalate | 149 | | | | <MDL |
| 28. Fluoranthene | 202 | | | | <MDL |
| 29. Pyrene | 202 | | | | <MDL |
| 30. Butylbenzylphthalate | 149 | | | | <MDL |
| 31. Benz[a]anthracene | 228 | | | | <MDL |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | <MDL |
| 33. Chrysene | 228 | | | | <MDL |
| 34. Bis[2-ethylhexyl]phthalate | 149 | | | | 2.9 |
| 35. Di-n-Octylphthalate | 149 | | | | <MDL |
| 36. Benzo[b]Fluoranthene | 252 | | | | <MDL |
| 37. Benzo[k]Fluoranthene | 252 | | | | <MDL |
| 38. Benzo[a]Pyrene | 252 | | | | <MDL |
| 39. 1,2-Diphenylhydrazine | 77 | | | | <MDL |
| 40. Benzidine | 184 | | | | <MDL |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | <MDL |
| 42. N-Nitroso-n-propylamine | 70 | | | | <MDL |

Environmental Trace Substances Research Center
Base Neutral Result Sheet

Sample Source: Burns & McDonnell
Submitter ID#: S-84 OR
ETSRC ID#: 5120519 Data File#: BN5120519
Sample Matrix: Water
Method: U.S.E.P.A. #625
Date Received: December 17, 1985
Date Analyzed: January 21, 1986 Conc. Units: mcg/L
Analyst: Carl Orazio

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | <MDL |
| 2. 1,3-Dichlorobenzene | 146 | | | | <MDL |
| 3. 1,4-Dichlorobenzene | 146 | | | | <MDL |
| 4. 1,2-Dichlorobenzene | 146 | | | | <MDL |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | <MDL |
| 6. Hexachloroethane | 117 | | | | <MDL |
| 7. Nitrobenzene | 77 | | | | <MDL |
| 8. Isophorone | 82 | | | | <MDL |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | <MDL |
| 10. Trichlorobenzene | 180 | | | | <MDL |
| 11. Naphthalene | 128 | | | | <MDL |
| 12. Hexachlorobutadiene | 225 | | | | <MDL |
| 13. Hexachlorocyclopentadiene | 237 | | | | <MDL |
| 14. 2-Chloronapnthalene | 162 | | | | <MDL |
| 15. Acenaphthylene | 152 | | | | <MDL |
| 17. Dimethylphthalate | 163 | | | | <MDL |
| 18. Acenaphthene | 154 | | | | <MDL |
| 19. 2,4-Dinitrotoluene | 165 | | | | <MDL |
| 20. Fluorene | 166 | | | | <MDL |
| 21. Diethylphthalate | 149 | | | | <MDL |
| 22. N-Nitrodiphenylamine | 169 | | | | <MDL |
| 23. 4-Bromophenylphenyl ether | 248 | | | | <MDL |

## SURROGATE RESULTS

| | Compound | Quantity m/e | Scan # | Area | Det Conc | Spiked Conc |
|---|---|---|---|---|---|---|
| 1. | Anthracene D-10 | 188 | 2424 | 131211 | 109.3 | 100.0 |
| 2. | Chrysene D-12 | 240 | 3382 | 114619 | 117.5 | 100.0 |
| 3. | | | | | | |
| 4. | | | | | | |

## Tentatively Identified Compounds

| | Compound | Scan # | NBS LIB FIT | Base m/e | Area | Est Conc |
|---|---|---|---|---|---|---|
| 1. | 1,1' Ethane Bis Oxy(Ethoxy) | 1039 | | 46 | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

sc#25120518/

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 24. Hexachlorobenzene | 284 | | | | <MDL |
| 25. Phenanthrene | 178 | | | | <MDL |
| 26. Anthracene | 178 | | | | <MDL |
| 27. Di-n-Butylphthalate | 149 | | | | <MDL |
| 28. Fluoranthene | 202 | | | | <MDL |
| 29. Pyrene | 202 | | | | <MDL |
| 30. Butylbenzylphthalate | 149 | | | | <MDL |
| 31. Benz[a]anthracene | 228 | | | | <MDL |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | <MDL |
| 33. Chrysene | 228 | | | | <MDL |
| 34. Bis[2-ethylhexyl]phthalate | 149 | | | | <MDL |
| 35. Di-n-Octylphthalate | 149 | | | | <MDL |
| 36. Benzo[b]Fluoranthene | 252 | | | | <MDL |
| 37. Benzo[k]Fluoranthene | 252 | | | | <MDL |
| 38. Benzo[a]Pyrene | 252 | | | | <MDL |
| 39. 1,2-Diphenylhydrazine | 77 | | | | <MDL |
| 40. Benzidine | 184 | | | | <MDL |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | <MDL |
| 42. N-Nitroso-n-propylamine | 70 | | | | |

Environmental Trace Substances Research Center
Base Neutral Result Sheet

Sample Source: Burns & McDonnell
Submitter ID#: D-83 OR
ETSRC ID#: 5120518 Data File#: BN5120518
Sample Matrix: Water
Method: U.S.E.P.A. #625
Date Received: December 17, 1985
Date Analyzed: January 21, 1986 Conc. Units: mcg/L
Analyst: Carl Orazio

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | <MDL |
| 2. 1,3-Dichlorobenzene | 146 | | | | <MDL |
| 3. 1,4-Dichlorobenzene | 146 | | | | <MDL |
| 4. 1,2-Dichlorobenzene | 146 | | | | <MDL |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | <MDL |
| 6. Hexachloroethane | 117 | | | | <MDL |
| 7. Nitrobenzene | 77 | | | | <MDL |
| 8. Isophorone | 82 | | | | <MDL |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | <MDL |
| 10. Trichlorobenzene | 180 | | | | <MDL |
| 11. Naphthalene | 128 | | | | <MDL |
| 12. Hexachlorobutadiene | 225 | | | | <MDL |
| 13. Hexachlorocyclopentadiene | 237 | | | | <MDL |
| 14. 2-Chloronaphthalene | 162 | | | | <MDL |
| 15. Acenaphthylene | 152 | | | | <MDL |
| 17. Dimethylphthalate | 163 | | | | <MDL |
| 18. Acenaphthene | 154 | | | | <MDL |
| 19. 2,4-Dinitrotoluene | 165 | | | | <MDL |
| 20. Fluorene | 166 | | | | <MDL |
| 21. Diethylphthalate | 149 | | | | <MDL |
| 22. N-Nitrodiphenylamine | 169 | | | | <MDL |
| 23. 4-Bromophenylphentyl ether | 248 | | | | <MDL |

## SURROGATE RESULTS

| | Compound | Quantity m/e | Scan # | Area | Det Conc | Spiked Conc |
|---|---|---|---|---|---|---|
| 1. | Anthracene D-10 | 188 | 2426 | 159,063 | 85.3 | 100.0 |
| 2. | Chrysene D-12 | 240 | 3384 | 88,236 | 105.0 | 100.0 |
| 3. | | | | | | |
| 4. | | | | | | |

## Tentatively Identified Compounds

| | Compound | Scan # | NBS LIB FIT | Base m/e | Area | Est Conc |
|---|---|---|---|---|---|---|
| 1. | Ethane 1,1'-Oxy Bis (2-Ethoxy) | 1029 | 943 | 59 | | |
| 2. | Diethyl Carbitol | 1085 | | | | |
| 3. | | 1632 | | | | |
| 4. | | 2051 | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 24. Hexachlorobenzene | 284 | | | | <MDL |
| 25. Phenanthrene | 178 | | | | <MDL |
| 26. Anthracene | 178 | | | | <MDL |
| 27. Di-n-Butylphthalate | 149 | | | | <MDL |
| 28. Fluoranthene | 202 | | | | <MDL |
| 29. Pyrene | 202 | | | | <MDL |
| 30. Butylbenzylphthalate | 149 | | | | <MDL |
| 31. Benz[a]anthracene | 228 | | | | <MDL |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | <MDL |
| 33. Chrysene | 228 | | | | <MDL |
| 34. Bis[2-ethylhexyl]phthalate | 149 | | | | <MDL |
| 35. Di-n-Octylphthalate | 149 | | | | <MDL |
| 36. Benzo[b]Fluoranthene | 252 | | | | <MDL |
| 37. Benzo[k]Fluoranthene | 252 | | | | <MDL |
| 38. Benzo[a]Pyrene | 252 | | | | <MDL |
| 39. 1,2-Diphenylhydrazine | 77 | | | | <MDL |
| 40. Benzidine | 184 | | | | <MDL |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | <MDL |
| 42. N-Nitroso-n-propylamine | 70 | | | | |

Environmental Trace Substances Research Center
Base Neutral Result Sheet

Sample Source: Burns & McDonnell
Submitter ID#: S-820R
ETSRC ID#: 5120517 Data File#: BN5120517
Sample Matrix: Water
Method: U.S.E.P.A. #625
Date Received: December 17, 1985
Date Analyzed: January 20, 1986 Conc. Units: mcg/L
Analyst: Carl Orazio

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | <MDL |
| 2. 1,3-Dichlorobenzene | 146 | | | | <MDL |
| 3. 1,4-Dichlorobenzene | 146 | | | | <MDL |
| 4. 1,2-Dichlorobenzene | 146 | | | | <MDL |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | <MDL |
| 6. Hexachloroethane | 117 | | | | <MDL |
| 7. Nitrobenzene | 77 | | | | <MDL |
| 8. Isophorone | 82 | | | | <MDL |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | <MDL |
| 10. Trichlorobenzene | 180 | | | | <MDL |
| 11. Naphthalene | 128 | | | | <MDL |
| 12. Hexachlorobutadiene | 225 | | | | <MDL |
| 13. Hexachlorocyclopentadiene | 237 | | | | <MDL |
| 14. 2-Chloronaphthalene | 162 | | | | <MDL |
| 15. Acenaphthylene | 152 | | | | <MDL |
| 17. Dimethylphthalate | 163 | | | | <MDL |
| 18. Acenaphthene | 154 | | | | <MDL |
| 19. 2,4-Dinitrotoluene | 165 | | | | <MDL |
| 20. Fluorene | 166 | | | | <MDL |
| 21. Diethylphthalate | 149 | | | | <MDL |
| 22. N-Nitrodiphenylamine | 169 | | | | <MDL |
| 23. 4-Bromophenylphentyl ether | 248 | | | | <MDL |

## SURROGATE RESULTS

| | Compound | Quantity m/e | Scan # | Area | Det Conc | Spiked Conc |
|---|---|---|---|---|---|---|
| 1. | Anthracene D-10 | 188 | 2253 | 67,653 | 56.4 | 100.0 |
| 2. | Chrysene D-12 | 240 | 3211 | 44,472 | 45.6 | 100.0 |
| 3. | | | | | | |
| 4. | | | | | | |

## Tentatively Identified Compounds

| | Compound | Scan # | NBS LIB FIT | Base m/e | Area | Est Conc |
|---|---|---|---|---|---|---|
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 23. 4-Bromophenylphentyl ether | 248 | | | | <MDL |
| 24. Hexachlorobenzene | 284 | | | | <MDL |
| 25. Phenanthrene | 178 | | | | <MDL |
| 26. Anthracene | 178 | | | | <MDL |
| 27. Di-n-Butylphthalate | 149 | | | | <MDL |
| 28. Fluoranthene | 202 | | | | <MDL |
| 29. Pyrene | 202 | | | | <MDL |
| 30. Butylbenzylphthalate | 149 | | | | <MDL |
| 31. Benz[a]anthracene | 228 | | | | <MDL |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | <MDL |
| 33. Chrysene | 228 | | | | <MDL |
| 34. Bis[2-ethylhexyl]phthalate | 149 | | | | <MDL |
| 35. Di-n-Octylphthalate | 149 | | | | <MDL |
| 36. Benzo[b]Fluoranthene | 252 | | | | <MDL |
| 37. Benzo[k]Fluoranthene | 252 | | | | <MDL |
| 38. Benzo[a]Pyrene | 252 | | | | <MDL |
| 39. 1,2-Diphenylhydrazine | 77 | | | | <MDL |
| 40. Benzidine | 184 | | | | <MDL |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | <MDL |
| 42. N-Nitroso-n-propylamine | 70 | | | | <MDL |

Environmental Trace Substances Research Center

Base Neutral Result Sheet

Sample Source: Burns & McDonnell
Submitter ID#: D-81 6R
ETSRC ID#: 5120516 Data File#: BN0516RP
Sample Matrix: Water
Method: U.S.E.P.A. #625
Date Received: December 17, 1985
Date Analyzed: February 10, 1986 Conc. Units: mcg/L
Analyst: Carl Urazio

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | <MDL |
| 2. 1,3-Dichlorobenzene | 146 | | | | <MDL |
| 3. 1,4-Dichlorobenzene | 146 | | | | <MDL |
| 4. 1,2-Dichlorobenzene | 146 | | | | <MDL |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | <MDL |
| 6. Hexachloroethane | 117 | | | | <MDL |
| 7. Nitrobenzene | 77 | | | | <MDL |
| 8. Isophorone | 82 | | | | <MDL |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | <MDL |
| 10. Trichlorobenzene | 180 | | | | <MDL |
| 11. Naphthalene | 128 | | | | <MDL |
| 12. Hexachlorobutadiene | 225 | | | | <MDL |
| 13. Hexachlorocyclopentadiene | 237 | | | | <MDL |
| 14. 2-Chloronaphthalene | 162 | | | | <MDL |
| 15. Acenaphthylene | 152 | | | | <MDL |
| 17. Dimethylphthalate | 163 | | | | <MDL |
| 18. Acenaphthene | 154 | | | | <MDL |
| 19. 2,4-Dinitrotoluene | 165 | | | | <MDL |
| 20. Fluorene | 166 | | | | <MDL |
| 21. Diethylphthalate | 149 | | | | <MDL |
| 22. N-Nitrodiphenylamine | 169 | | | | <MDL |

## SURROGATE RESULTS

| | Compound | Quantity m/e | Scan # | Area | Det Conc | Spiked Conc |
|---|---|---|---|---|---|---|
| 1. | Anthracene D-10 | 188 | 2423 | 134,889 | 112.4 | 100.0 |
| 2. | Chrysene D-12 | 240 | 3381 | 117,819 | 120.8 | 100.0 |
| 3. | | | | | | |
| 4. | | | | | | |

## Tentatively Identified Compounds

| | Compound | Scan # | NBS LIB FIT | Base m/e | Area | Est Conc |
|---|---|---|---|---|---|---|
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 24. Hexachlorobenzene | 284 | | | | <MDL |
| 25. Phenantnrene | 178 | | | | <MDL |
| 26. Anthracene | 178 | | | | <MDL |
| 27. Di-n-Butylphthalate | 149 | 3225 | 885 | 0.48 | 0.43 |
| 28. Fluoranthene | 202 | | | | <MDL |
| 29. Pyrene | 202 | | | | <MDL |
| 30. Butylbenzylphthalate | 149 | | | | <MDL |
| 31. Benz[a]anthracene | 228 | | | | <MDL |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | <MDL |
| 33. Chrysene | 228 | | | | <MDL |
| 34. Bis[2-ethylhexyl]phthalate | 149 | 3459 | 33,100 | 24.8 | 22.1 |
| 35. Di-n-Octylphthalate | 149 | 3681 | 5769 | 2.6 | 2.3 |
| 36. Benzo[b]Fluoranthene | 252 | | | | <MDL |
| 37. Benzo[k]Fluoranthene | 252 | | | | <MDL |
| 38. Benzo[a]Pyrene | 252 | | | | <MDL |
| 39. 1,2-Diphenylhydrazine | 77 | | | | <MDL |
| 40. Benzidine | 184 | | | | <MDL |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | <MDL |
| 42. N-Nitroso-n-propylamine | 70 | | | | <MDL |

Environmental Trace Substances Research Center

Base Neutral Result Sheet

Sample Source: Burns & McDonnell

Submitter ID#: D-87 OR

ETSRC ID#: 5120521 Data File#: BN5120521

Sample Matrix: Water

Method: U.S.E.P.A. #625

Date Received: December 17, 1985

Date Analyzed: January 21, 1986 Conc. Units: mcg/L

Analyst: Carl Orazio

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | <MDL |
| 2. 1,3-Dichlorobenzene | 146 | | | | <MDL |
| 3. 1,4-Dichlorobenzene | 146 | | | | <MDL |
| 4. 1,2-Dichlorobenzene | 146 | | | | <MDL |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | <MDL |
| 6. Hexachloroethane | 117 | | | | <MDL |
| 7. Nitrobenzene | 77 | | | | <MDL |
| 8. Isophorone | 82 | | | | <MDL |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | <MDL |
| 10. Trichlorobenzene | 180 | | | | <MDL |
| 11. Naphthalene | 128 | | | | <MDL |
| 12. Hexachlorobutadiene | 225 | | | | <MDL |
| 13. Hexachlorocyclopentadiene | 237 | | | | <MDL |
| 14. 2-Chloronaphthalene | 162 | | | | <MDL |
| 15. Acenaphthylene | 152 | | | | <MDL |
| 17. Dimethylphthalate | 163 | | | | <MDL |
| 18. Acenaphthene | 154 | | | | <MDL |
| 19. 2,4-Dinitrotoluene | 165 | | | | <MDL |
| 20. Fluorene | 166 | | | | <MDL |
| 21. Diethylphthalate | 149 | | | | <MDL |
| 22. N-Nitrodiphenylamine | 169 | | | | <MDL |
| 23. 4-Bromophenylphentyl ether | 248 | | | | <MDL |

## SURROGATE RESULTS

| | Compound | Quantity m/e | Scan # | Area | Det Conc | Spiked Conc |
|---|---|---|---|---|---|---|
| 1. | Anthracene D-10 | 188 | 2421 | 138,263 | 115.2 | 100.0 |
| 2. | Chrysene D-12 | 240 | 3378 | 77,436 | 79.4 | 100.0 |
| 3. | | | | | | |
| 4. | | | | | | |

## Tentatively Identified Compounds

| | Compound | Scan # | NBS LIB FIT | Base m/e | Area | Est Conc |
|---|---|---|---|---|---|---|
| 1. | Methyl-3-Amino-1,24 Triazol | 777 | 976 | 98 | | |
| 2. | Propanol, 1-(2-Ethoxypropoxy) | 848 | 868 | 59 | | |
| 3. | 3,5 Dimethyl-3-Hexanol | 885 | 868 | 73 | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

Result Summary Sheet

Submitter ID: Burns and McDonnel # I-59 OR

ETSRC ID: 5120514 R. Data File: A5120514

Sample Matrix: Water

Analytes: Priority pollutant phenols

Method: EPA604 - GC/MS

Date Recieved/Analyzed. December 1986/Jan. 1, 1986

Analyst: Carl Orazio

Conc. Units: mcg/L

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Phenol | | | | | <MDL |
| 2. 2-Chlorophenol | | | | | <MDL |
| 3. 2-Nitrophenol | | | | | <MDL |
| 4. 2,4-Dimethylphenol | | | | | <MDL |
| 5. 2,4-Dichlorophenol | | | | | <MDL |
| 6. 4-Chloro, 3-Methylphenol | | | | | <MDL |
| 7. 2,4,6-Trichlorophenol | | | | | <MDL |
| 8. 2,4-Dinitrophenol | 1695 | 878 | | | 10.0 |
| 9. 4-Nitrophenol | | | | | <MDL |
| 10. 4,6-Dinitro, 2-Methylphenol | | | | | <MDL |
| 11. Pentachlorophenol | 2119 | 4948 | | | 9.6 |
| Phenol D-5 (Surrogate) rec | | | | | 38% |

Result Summary Sheet

Submitter ID: Burns and McDonnel # S-80 OR

ETSRC ID: 5120515 R. Data File. A5120515

Sample Matrix: Water

Analytes: Priority pollutant phenols

Method: EPA604 - GC/MS

Date Recieved/Analyzed: Dec. 1986/Jan. 1, 1986

Analyst: Carl Orazio

Conc Units: mcg/L

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Phenol | | | | | <MDL |
| 2. 2-Chlorophenol | | | | | <MDL |
| 3. 2-Nitrophenol | | | | | <MDL |
| 4. 2,4-Dimethylphenol | | | | | <MDL |
| 5. 2,4-Dichlorophenol | | | | | <MDL |
| 6. 4-Chloro, 3-Methylphenol | | | | | <MDL |
| 7. 2,4,6-Trichlorophenol | | | | | <MDL |
| 8. 2,4-Dinitrophenol | | | | | <MDL |
| 9. 4-Nitrophenol | | | | | <MDL |
| 10. 4,6-Dinitro, 2-Methylphenol | | | | | <MDL |
| 11. Pentachlorophenol | | | | | <MDL |
| Phenol D-5 (Surrogate) rec | | | | | 37.6% |

Result Summary Sheet

Submitter ID: Burns and McDonnel #

ETSRC ID: 1 L Samples-Detection Levels Table R. Data File:

Sample Matrix: Water

Analytes. Priority pollutant phenols

Method: EPA604 - GC/MS

Date Recieved/Analyzed: Dec 1986/Jan. 1, 1986

Analyst: Carl Orazio

Conc Units: MCG/L

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Phenol | | 639 | 9714 | | 1.7 |
| 2 2-Chlorophenol | | 656 | 9004 | | 0.9 |
| 3. 2-Nitrophenol | | 960 | 2254 | | 3.4 |
| 4 2,4-Dimethylphenol | | 989 | 5515 | | 8.0 |
| 5. 2,4-Dichlorophenol | | 1030 | 4478 | | 1.8 |
| 6. 4-Chloro, 3-Methylphenol | | 1283 | 20354 | | 1.5 |
| 7. 2,4,6-Trichlorophenol | | 1406 | 12807 | | 1.6 |
| 8. 2,4-Dinitrophenol | | 1687 | 2070 | | 9.2 |
| 9. 4-Nitrophenol | | 1733 | 7940 | | 6.8 |
| 10. 4,6-Dinitro, 2-Methylphenol | | 1871 | 8309 | | 5.1 |
| 11. Pentachlorophenol | | 2108 | 16647 | | 1.9 |

Phenol D-5 (Surrogate) rec

Result Summary Sheet

Submitter ID: Burns and McDonnel # S-51 OR

ETSRC ID: 5120513d R. Data File: A5120513

Sample Matrix: Water

Analytes: Priority pollutant phenols

Method: EPA604 - GC/MS

Date Recieved/Analyzed. Dec. 1986/Jan. 1, 1986

Analyst: Carl Orazio

Conc. Units: mcg/L

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Phenol | | 644 | 3951 | 2.4 | 6.9 |
| 2. 2-Chlorophenol | | | | | <MDL |
| 3. 2-Nitrophenol | | | | | <MDL |
| 4. 2,4-Dimethylphenol | | | | | <MDL |
| 5. 2,4-Dichlorophenol | | | | | <MDL |
| 6. 4-Chloro, 3-Methylphenol | | | | | <MDL |
| 7. 2,4,6-Trichlorophenol | | | | | <MDL |
| 8. 2,4-Dinitrophenol | | | | | <MDL |
| 9. 4-Nitrophenol | | | | | <MDL |
| 10. 4,6-Dinitro, 2-Methylphenol | | | | | <MDL |
| 11. Pentachlorophenol | | | | | <MDL |
| Phenol D-5 (Surrogate) rec | | | | | 45% |

RESULT SUMMARY SHEETS

PHENOLIC PRIORITY POLLUTANTS

## SURROGATE RESULTS

| | Compound | Quantity m/e | Scan # | Area | Det Conc | Spiked Conc |
|---|---|---|---|---|---|---|
| 1. | Anthracene D-10 | 188 | 2416 | 121366 | 100.0 | 100.0 |
| 2. | Chrysene D-12 | 240 | 3374 | 117996 | 114.4 | 114.4 |
| 3. | | | | | | |
| 4. | | | | | | |

## Tentatively Identified Compounds

| | Compound | Scan # | NBS LIB FIT | Base m/e | Area | Est Conc |
|---|---|---|---|---|---|---|
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

Environmental Trace Substances Research Center
Base Neutral Result Sheet

Sample Source: ETSRC AQ/QC
Submitter ID#:
ETSRC ID#: 51095 1Reagent Blank  Data File#: BN51205RB
Sample Matrix: Water
Method: U.S.E.P.A. #625
Date Received:
Date Analyzed: January 22, 1986  Conc. Units: mcg/L
Analyst: Carl Orazio

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Bis[2-Chloroethyl]ether | 93 | | | | <MDL |
| 2. 1,3-Dichlorobenzene | 146 | | | | <MDL |
| 3. 1,4-Dichlorobenzene | 146 | | | | <MDL |
| 4. 1,2-Dichlorobenzene | 146 | | | | <MDL |
| 5. Bis[2-Chlorophropyl]ether | 45 | | | | <MDL |
| 6. Hexachloroethane | 117 | | | | <MDL |
| 7. Nitrobenzene | 77 | | | | <MDL |
| 8. Isophorone | 82 | | | | <MDL |
| 9. Bis[2-Chloroethoxy]methane | 93 | | | | <MDL |
| 10. Trichlorobenzene | 180 | | | | <MDL |
| 11. Naphthalene | 128 | | | | <MDL |
| 12. Hexachlorobutadiene | 225 | | | | <MDL |
| 13. Hexachlorocyclopentadiene | 237 | | | | <MDL |
| 14. 2-Chloronaphthalene | 162 | | | | <MDL |
| 15. Acenaphthylene | 152 | | | | <MDL |
| 17. Dimethylphthalate | 163 | | | | <MDL |
| 18. Acenaphthene | 154 | | | | <MDL |
| 19. 2,4-Dinitrotoluene | 165 | | | | <MDL |
| 20. Fluorene | 166 | | | | <MDL |
| 21. Diethylphthalate | 149 | | | | <MDL |
| 22. N-Nitrodiphenylamine | 169 | | | | <MDL |
| 23. 4-Bromophenylphentyl ether | 248 | | | | <MDL |

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 24. Hexachlorobenzene | 284 | | | | <MDL |
| 25. Phenanthrene | 178 | | | | <MDL |
| 26. Anthracene | 178 | | | | <MDL |
| 27. Di-n-Butylphthalate | 149 | | | | <MDL |
| 28. Fluoranthene | 202 | | | | <MDL |
| 29. Pyrene | 202 | | | | <MDL |
| 30. Butylbenzylphthalate | 149 | | | | <MDL |
| 31. Benz[a]anthracene | 228 | | | | <MDL |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | <MDL |
| 33. Chrysene | 228 | | | | <MDL |
| 34. Bis[2-ethylhexyl]phthalate | 149 | 3453 | 9480 | 3.5 | 3.5 |
| 35. Di-n-Octylphthalate | 149 | | | | <MDL |
| 36. Benzo[b]Fluoranthene | 252 | | | | <MDL |
| 37. Benzo[k]Fluoranthene | 252 | | | | <MDL |
| 38. Benzo[a]Pyrene | 252 | | | | <MDL |
| 39. 1,2-Diphenylhydrazine | 77 | | | | <MDL |
| 40. Benzidine | 184 | | | | <MDL |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | <MDL |
| 42. N-Nitroso-n-propylamine | 70 | | | | <MDL |

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc | Spk Conc |
|---|---|---|---|---|---|---|
| 23. 4-Bromophenylphentyl ether | 248 | | | | <MDL | |
| 24. Hexachlorobenzene | 284 | | | | <MDL | |
| 25. Phenanthrene | 178 | 2403 | 18634 | 15.3 | 16.4 | 20.0 |
| 26. Anthracene | 178 | | | | <MDL | |
| 27. Di-n-Butylphthalate | 149 | | | | <MDL | |
| 28. Fluoranthene | 202 | 2838 | 23796 | 21.7 | 23.3 | 20.0 |
| 29. Pyrene | 202 | | | | <MDL | |
| 30. Butylbenzylphthalate | 149 | | | | <MDL | |
| 31. Benz[a]anthracene | 228 | | | | <MDL | |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | <MDL | |
| 33. Chrysene | 228 | 3379 | 23610 | 68.0 | 73.1 | 75.0 |
| 34. Bis[2-ethylhexyl]phthalate | 149 | 3452 | 2961 | 2.7 | 2.90 | |
| 35. Di-n-Octylphthalate | 149 | | | | <MDL | |
| 36. Benzo[b]Fluoranthene | 252 | 3753 | 17421 | 21.4 | 23.0 | 20.0 |
| 37. Benzo[k]Fluoranthene | 252 | | | | <MDL | |
| 38. Benzo[a]Pyrene | 252 | | | | <MDL | |
| 39. 1,2-Diphenylhydrazine | 77 | | | | <MDL | |
| 40. Benzidine | 184 | | | | <MDL | |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | <MDL | |
| 42. N-Nitroso-n-propylamine | 70 | | | | <MDL | |

## SURROGATE RESULTS

| | Compound | Quantity m/e | Scan # | Area | Det Conc | Spiked Conc |
|---|---|---|---|---|---|---|
| 1. | Anthracene D-10 | 188 | 2410 | 110,948 | 91.4 | 100.0 |
| 2. | Chrysene D-12 | 240 | 3372 | 98,791 | 96.0 | 100.0 |
| 3. | | | | | | |
| 4. | | | | | | |

## *Tentatively Identified Compounds*

| | Compound | Scan # | NBS LIB FIT | Base m/e | Area | Est Conc |
|---|---|---|---|---|---|---|
| 1. | | | | | | |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

Result Summary Sheet

Submitter ID: Burns and McDonnel # D-83 CR

ETSRC ID: 5120518 R. Data File: A5120518

Sample Matrix: Water

Analytes: Priority pollutant phenols

Method. EPA604 - GC/MS

Date Recieved/Analyzed. Dec. 1986/Jan. 1, 1986

Analyst: Carl Orazio

Conc. Units: mcg/L

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Phenol | | 653 | 4214 | | 7.30 |
| 2. 2-Chlorophenol | | | | | <MDL |
| 3. 2-Nitrophenol | | | | | <MDL |
| 4 2,4-Dimethylphenol | | | | | <MDL |
| 5. 2,4-Dichlorophenol | | | | | <MDL |
| 6. 4-Chloro, 3-Methylphenol | | | | | <MDL |
| 7. 2,4,6-Trichlorophenol | | | | | <MDL |
| 8. 2,4-Dinitrophenol | | | | | <MDL |
| 9. 4-Nitrophenol | | | | | <MDL |
| 10. 4,6-Dinitro 2-Methylphenol | | | | | <MDL |
| 11. Pentachlorophenol | | | | | <MDL |
| Phenol D-5 (Surrogate) rec | | | | | 36.4% |

Result Summary Sheet

Submitter ID: Burns and McDonnel # S-84 OR

ETSRC ID. 5120519 R. Data File: 5120519

Sample Matrix: Water

Analytes: Priority pollutant phenols

Method: EPA604 - GC/MS

Date Recieved/Analyzed: Dec. 1986/Jan. 1, 1986

Analyst: Carl Orazio

Conc. Units: mcg/L

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Phenol | | | | | <MDL |
| 2 2-Chlorophenol | | | | | <MDL |
| 3. 2-Nitrophenol | | | | | <MDL |
| 4. 2,4-Dimethylphenol | | | | | <MDL |
| 5. 2,4-Dichlorophenol | | | | | <MDL |
| 6. 4-Chloro, 3-Methylphenol | | | | | <MDL |
| 7. 2,4,6-Trichlorophenol | | | | | <MDL |
| 8. 2,4-Dinitrophenol | | | | | <MDL |
| 9. 4-Nitrophenol | | | | | <MDL |
| 10. 4,6-Dinitro, 2-Methylphenol | | | | | <MDL |
| 11. Pentachlorophenol | | | | | <MDL |
| Phenol D-5 (Surrogate) rec | | | | | 35.5% |

Result Summary Sheet

Submitter ID: Burns and McDonnel # D-81 OR

ETSRC ID. 5120516 R. Data File. A5120516

Sample Matrix: Water

Analytes. Priority pollutant phenols

Method. EPA604 - GC/MS

Date Recieved/Analyzed: Dec. 1986/Jan. 1 1986

Analyst: Carl Orazio

Conc. Units: mcg/L

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Phenol | | | | | <MDL |
| 2. 2-Chlorophenol | | | | | <MDL |
| 3. 2-Nitrophenol | | | | | <MDL |
| 4. 2,4-Dimethylphenol | | | | | <MDL |
| 5. 2,4-Dichlorophenol | | | | | <MDL |
| 6 4-Chloro 3-Methylphenol | | | | | <MDL |
| 7. 2,4,6-Trichlorophenol | | | | | <MDL |
| 8. 2,4-Dinitrophenol | | | | | <MDL |
| 9. 4-Nitrophenol | | | | | <MDL |
| 10. 4,6-Dinitro, 2-Methylphenol | | | | | <MDL |
| 11. Pentachlorophenol | | | | | <MDL |
| Phenol D-5 (Surrogate) rec | | | | | 27.9% |

Result Summary Sheet

Submitter ID: Burns and McDonnel # S-82 OR

ETSRC ID: 5120517 R. Data File: A5120517

Sample Matrix: Water

Analytes: Priority pollutant phenols

Method: EPA604 - GC/MS

Date Recieved/Analyzed: Dec. 1986/Jan. 1, 1986

Analyst: Carl Orazio

Conc Units: mcg/L

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Phenol | | 647 | 4067 | | 7.1 |
| 2. 2-Chlorophenol | | | | | <MDL |
| 3. 2-Nitrophenol | | | | | <MDL |
| 4 2,4-Dimethylphenol | | | | | <MDL |
| 5. 2,4-Dichlorophenol | | | | | <MDL |
| 6. 4-Chloro, 3-Methylphenol | | | | | <MDL |
| 7. 2,4,6-Trichlorophenol | | | | | <MDL |
| 8. 2,4-Dinitrophenol | | | | | <MDL |
| 9. 4-Nitrophenol | | | | | <MDL |
| 10. 4,6-Dinitro, 2-Methylphenol | | | | | <MDL |
| 11. Pentachlorophenol | | | | | <MDL |
| Phenol D-5 (Surrogate) rec | | | | | 24.0% |

Result Summary Sheet

Submitter ID: Burns and McDonnel # D-92 OR

ETSRC ID: 5120526 R. Data File: 5120526

Sample Matrix: Water

Analytes. Priority pollutant phenols

Method: EPA604 - GC/MS

Date Recieved/Analyzed: Dec. 1986/Jan. 1, 1986

Analyst: Carl Orazio

Conc Units: mcg/L

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Phenol | | 652 | 3675 | | 18.6 |
| 2. 2-Chlorophenol | | | | | <MDL |
| 3. 2-Nitrophenol | | | | | <MDL |
| 4. 2,4-Dimethylphenol | | | | | <MDL |
| 5. 2,4-Dichlorophenol | | | | | <MDL |
| 6. 4-Chloro, 3-Methylphenol | | | | | <MDL |
| 7. 2,4,6-Trichlorophenol | | | | | <MDL |
| 8. 2,4-Dinitrophenol | | | | | <MDL |
| 9. 4-Nitrophenol | | | | | <MDL |
| 10. 4,6-Dinitro, 2-Methylphenol | | | | | <MDL |
| 11. Pentachlorophenol | | | | | <MDL |
| Phenol D-5 (Surrogate) rec | | | | | 20.5% |

Result Summary Sheet

Submitter ID: Burns and McDonnel # D-93 OR

ETSRC ID. 5120527 R. Data File: A5120527

Sample Matrix: Water

Analytes: Priority pollutant phenols

Method: EPA604 - GC/MS

Date Recieved/Analyzed. Dec. 1986/Jan. 1, 1986

Analyst: Carl Orazio

Conc. Units: mcg/L

| | Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|---|
| 1. | Phenol | | | 1349 | | 6.6 |
| 2. | 2-Chlorophenol | | | | | <MDL |
| 3. | 2-Nitrophenol | | | | | <MDL |
| 4. | 2,4-Dimethylphenol | | | | | <MDL |
| 5. | 2,4-Dichlorophenol | | | | | <MDL |
| 6. | 4-Chloro, 3-Methylphenol | | | | | <MDL |
| 7. | 2,4,6-Tricnlorophenol | | | | | <MDL |
| 8. | 2,4-Dinitrophenol | | | | | <MDL |
| 9. | 4-Nitrophenol | | | | | <MDL |
| 10. | 4,6-Dinitro, 2-Methylphenol | | | | | <MDL |
| 11. | Pentachlorophenol | | | | | <MDL |
| | Phenol D-5 (Surrogate) rec | | | | | 21.2% |

Result Summary Sheet

Submitter ID: Burns and McDonnel # D-90 OR

ETSRC ID: 5120524 R. Data File: 5120524

Sample Matrix: Water

Analytes: Priority pollutant phenols

Method. EPA604 - GC/MS

Date Recieved/Analyzed. Dec. 1986/Jan. 1, 1986

Analyst: Carl Orazio

Conc. Units: mcg/L

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Phenol | | | | | <MDL |
| 2. 2-Chlorophenol | | | | | <MDL |
| 3. 2-Nitrophenol | | | | | <MDL |
| 4. 2,4-Dimethylphenol | | | | | <MDL |
| 5. 2,4-Dichlorophenol | | | | | <MDL |
| 6. 4-Chloro, 3-Methylphenol | | | | | <MDL |
| 7. 2,4,6-Trichlorophenol | | | | | <MDL |
| 8. 2,4-Dinitrophenol | | | | | <MDL |
| 9. 4-Nitrophenol | | | | | <MDL |
| 10. 4,6-Dinitro, 2-Methylphenol | | | | | <MDL |
| 11. Pentachlorophenol | | | | | <MDL |

Phenol D-5 (Surrogate) rec

Result Summary Sheet

Submitter ID: Burns and McDonnel # D-91 CR

ETSRC ID: 5120525 R. Data File: A5120525

Sample Matrix: Water

Analytes: Priority pollutant phenols

Method: EPA604 - GC/MS

Date Recieved/Analyzed. Dec. 1986/Jan. 1, 1986

Analyst: Carl Orazio

Conc. Units: mcg/L

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Phenol | | | | | <MDL |
| 2 2-Chlorophenol | | | | | <MDL |
| 3. 2-Nitrophenol | | | | | <MDL |
| 4. 2,4-Dimethylphenol | | | | | <MDL |
| 5. 2,4-Dichlorophenol | | | | | <MDL |
| 6. 4-Chloro, 3-Methylphenol | | | | | <MDL |
| 7. 2,4,6-Trichlorophenol | | | | | <MDL |
| 8. 2,4-Dinitrophenol | | | | | <MDL |
| 9. 4-Nitrophenol | | | | | <MDL |
| 10. 4,6-Dinitro, 2-Methylphenol | | | | | <MDL |
| 11. Pentachlorophenol | | | | | <MDL |
| Phenol D-5 (Surrogate) rec | | | | | 21.3% |

Result Summary Sheet

Submitter ID: Burns and McDonnel # S-88 OR

ETSRC ID: 5120522 R. Data File: 5120522

Sample Matrix: Water

Analytes: Priority pollutant phenols

Method: EPA604 - GC/MS

Date Recieved/Analyzed: Dec. 1986/Jan. 1, 1986

Analyst: Carl Orazio

Conc. Units: mcg/L

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Phenol | | | | | <MDL |
| 2 2-Chlorophenol | | | | | <MDL |
| 3. 2-Nitrophenol | | | | | <MDL |
| 4. 2,4-Dimethylphenol | | | | | <MDL |
| 5. 2,4-Dichlorophenol | | | | | <MDL |
| 6. 4-Chloro, 3-Methylphenol | | | | | <MDL |
| 7. 2,4,6-Trichlorophenol | | | | | <MDL |
| 8. 2,4-Dinitrophenol | | | | | <MDL |
| 9. 4-Nitrophenol | | | | | <MDL |
| 10. 4,6-Dinitro, 2-Methylphenol | | | | | <MDL |
| 11. Pentachlorophenol | | | | | <MDL |
| Phenol D-5 (Surrogate) rec | | | | | 27% |

Result Summary Sheet

Submitter ID: Burns and McDonnel # D-89 OR

ETSRC ID. 5120523 R. Data File: 5120523

Sample Matrix: Water

Analytes: Priority pollutant phenols

Method: EPA604 - GC/MS

Date Recieved/Analyzed: Dec. 1986/Jan. 1, 1986

Analyst: Carl Orazio

Conc. Units: mcg/L

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Phenol | | | | | <MDL |
| 2. 2-Chlorophenol | | | | | <MDL |
| 3. 2-Nitrophenol | | | | | <MDL |
| 4. 2,4-Dimethylphenol | | | | | <MDL |
| 5. 2,4-Dichlorophenol | | | | | <MDL |
| 6. 4-Chloro, 3-Methylphenol | | | | | <MDL |
| 7. 2,4,6-Trichlorophenol | | | | | <MDL |
| 8. 2,4-Dinitrophenol | | | | | <MDL |
| 9. 4-Nitrophenol | | | | | <MDL |
| 10. 4,6-Dinitro, 2-Methylphenol | | | | | <MDL |
| 11. Pentachlorophenol | | | | | <MDL |
| Phenol D-5 (Surrogate) rec | | | | | 21.6% |

RESULT SUMMARY SHEETS

PESTICIDES AND PCBs

Result Summary Sheet

Submitter ID: Burns and McDonnel # D-91 CR (DUP.)

ETSRC ID: 5120525d R. Data File: A5120525D

Sample Matrix: Water

Analytes: Priority pollutant phenols

Method: EPA604 - GC/MS

Date Recieved/Analyzed: Dec. 1986/Jan. 1, 1986

Analyst: Carl Orazio

Conc Units: ncg/L

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Phenol | | | | | <MDL |
| 2 2-Chlorophenol | | | | | <MDL |
| 3. 2-Nitrophenol | | | | | <MDL |
| 4. 2,4-Dimethylphenol | | | | | <MDL |
| 5. 2,4-Dichlorophenol | | | | | <MDL |
| 6. 4-Chloro, 3-Methylphenol | | | | | <MDL |
| 7. 2,4,6-Trichlorophenol | | | | | <MDL |
| 8. 2,4-Dinitrophenol | | | | | <MDL |
| 9. 4-Nitrophenol | | | | | <MDL |
| 10. 4,6-Dinitro, 2-Methylphenol | | | | | <MDL |
| 11. Pentachlorophenol | | | | | <MDL |
| Phenol D-5 (Surrogate) rec | | | | | 20.8% |

Result Summary Sheet

Submitter ID: Burns and McDonnel # D-9c OR (SPK)

ETSRC ID: 5120524S R. Data File: 5120524S

Sample Matrix: Water

Analytes: Priority pollutant phenols

Method: EPA604 - GC/MS

Date Recieved/Analyzed: Dec. 1986/Jan. 1, 1986

Analyst: Carl Orazio

Conc. Units: mcg/L

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Phenol | | | 2593 | | 6.8 |
| 2. 2-Chlorophenol | | | | | <MDL |
| 3. 2-Nitrophenol | | | 739 | | 4.8 |
| 4. 2,4-Dimethylphenol | | | | | <MDL |
| 5. 2,4-Dichlorophenol | | | | | <MDL |
| 6. 4-Chloro, 3-Methylphenol | | | 678 | | 19.0 |
| 7. 2,4,6-Trichlorophenol | | | | | <MDL |
| 8. 2,4-Dinitrophenol | | | | | <MDL |
| 9. 4-Nitrophenol | | | 475 | | 4.5 |
| 10. 4,6-Dinitro, 2-Methylphenol | | | | | <MDL |
| 11. Pentachlorophenol | | | 5708 | | 19.0 |

Phenol D-5 (Surrogate) rec

Result Summary Sheet

Submitter ID: Burns and McDonnel # D-94 OR

ETSRC ID: 5120528 R. Data File: A5120528

Sample Matrix: Water

Analytes: Priority pollutant phenols

Method: EPA604 - GC/MS

Date Recieved/Analyzed: Dec. 1986/Jan. 1, 1986

Analyst: Carl Orazio

Conc Units mcg/L

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Phenol | | | | | <MDL |
| 2. 2-Chlorophenol | | | | | <MDL |
| 3. 2-Nitrophenol | | | | | <MDL |
| 4. 2,4-Dimethylphenol | | | | | <MDL |
| 5. 2,4-Dichlorophenol | | | | | <MDL |
| 6. 4-Chloro, 3-Methylphenol | | | | | <MDL |
| 7. 2,4,6-Trichlorophenol | | | | | <MDL |
| 8. 2,4-Dinitrophenol | | | | | <MDL |
| 9. 4-Nitrophenol | | | | | <MDL |
| 10. 4,6-Dinitro, 2-Methylphenol | | | | | <MDL |
| 11. Pentachlorophenol | | | | | <MDL |
| Phenol D-5 (Surrogate) rec | | | | | 21.2% |

Result Summary Sheet

Submitter ID: Burns and McDonnel # D-95 OR

ETSRC ID: 5120529 R. Data File: A5120529

Sample Matrix: Water

Analytes: Priority pollutant phenols

Method: EPA604 - GC/MS

Date Recieved/Analyzed: Dec. 1986/Jan. 1, 1986

Analyst: Carl Orazio

Conc. Units: mcg/L

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Phenol | | | | | <MDL |
| 2. 2-Chlorophenol | | | | | <MDL |
| 3. 2-Nitrophenol | | | | | <MDL |
| 4. 2,4-Dimethylphenol | | | | | <MDL |
| 5. 2,4-Dichlorophenol | | | | | <MDL |
| 6. 4-Chloro, 3-Methylphenol | | | | | <MDL |
| 7. 2,4,6-Trichlorophenol | | | | | <MDL |
| 8. 2,4-Dinitrophenol | | | | | <MDL |
| 9. 4-Nitrophenol | | | | | <MDL |
| 10. 4,6-Dinitro, 2-Methylphenol | | | | | <MDL |
| 11. Pentachlorophenol | | | | | <MDL |
| Phenol D-5 (Surrogate) rec | | | | | 36.7% |

Environmental Trace Substances Research Center

Volatile Result Summary

Detection Limits

Sample Source: Burns & McDonnell
Submitter ID#:
ETSRC ID#: Data File#:
Sample Matrix: Water
Method: U.S.E.P.A. #624
Date Received: December 17, 1985
Date Analyzed: Conc. Units: mcg/L
Analyst: C. Urazio

| Compound | Qantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 1. Methylene chloride | 84 | | | | 2.5 |
| 2. 1,1 Dichloroethylene | 96 | | | | 2.5 |
| 3. 1,1 Dichloroethane | 63 | | | | 4.0 |
| 4. 1,2 Dichloroethylene | 96 | | | | 1.5 |
| 5. Chloroform | 83 | | | | 2.5 |
| 6. 1,2, Dichloroethane | 62 | | | | 2.5 |
| 7. 1,1,1 Trichloroethane | 97 | | | | 3.0 |
| 8. Carbon tetrachloride | 117 | | | | 2.5 |
| 9. Bromodichloromethane | 127 | | | | 2.0 |
| 10. 1,2 Dichloropropane | 65 | | | | 5.0 |
| 11. 1,3 Dichloropropylene | 75 | | | | 4.0 |
| 12. Trichloroethylene | 130 | | | | 1.5 |
| 13. Benzene | 78 | | | | 4.0 |
| 14. cis 1,3 Dichloropropylene | 75 | | | | 2.5 |
| 15. 1,1,2 Trichloroethane | 97 | | | | 4.0 |
| 16. Dibromochloromethane | 127 | | | | 2.5 |
| 17. 2 Chloroethylvinyl ether | 63 | | | | 5.0 |
| 18. Bromoform | 173 | | | | 4.0 |
| 19. Tetrachloroethylene | 164 | | | | 3.0 |
| 20. 1,1,2,2 Tetrachloroethane | 83 | | | | 5.5 |
| 21. Toluene | 92 | | | | 5.0 |
| 22. Chlorobenzene | 112 | | | | 5.0 |
| 23. Ethylbenzene | 91 | | | | 6.0 |

Environmental Trace Substances Research Center
Volatile Result Summary

Sample Source: Burns & McDonnell
Submitter ID#: D-81
ETSRC ID#: 85120501 Data File#: VOL 501B
Sample Matrix: Water
Method: U.S.E.P.A. #624
Date Received: December 17, 1985
Date Analyzed: Conc. Units: mcg/L
Analyst: C. Orazio

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Methylene chloride | 84 | 209 | 27740 | 26.3 | 23.3 |
| 2 1,1 Dichloroethylene | 96 | | | | <MDL |
| 3. 1,1 Dichloroethane | 63 | | | | <MDL |
| 4. 1,2 Dichloroethylene | 96 | | | | <MDL |
| 5. Chloroform | 83 | | | | <MDL |
| 6. 1,2, Dichloroethane | 62 | | | | <MDL |
| 7. 1,1,1 Trichloroethane | 97 | | | | <MDL |
| 8. Carbon tetrachloride | 117 | | | | <MDL |
| 9. Bromodichloromethane | 127 | | | | <MDL |
| 10. 1,2 Dichloropropane | 65 | | | | <MDL |
| 11. 1,3 Dichloropropylene | 75 | | | | <MDL |
| 12. Trichloroethylene | 130 | | | | <MDL |
| 13. Benzene | 78 | | | | <MDL |
| 14. cis 1,3 Dichloropropylene | 75 | | | | <MDL |
| 15. 1,1,2 Trichloroethane | 97 | | | | <MDL |
| 16. Dibromochloromethane | 127 | | | | <MDL |
| 17. 2 Chloroethylvinyl ether | 63 | | | | <MDL |
| 18. Bromoform | 173 | | | | <MDL |
| 19. Tetrachloroethylene | 164 | | | | <MDL |
| 20. 1,1,2,2 Tetrachloroethane | 83 | | | | <MDL |
| 21. Toluene | 92 | | | | <MDL |
| 22. Chlorobenzene | 112 | | | | <MDL |
| 23. Ethylbenzene | 91 | | | | <MDL |

## SURROGATE RESULTS

| | Compound | Quantity m/e | Scan # | Area | Det Conc | Spiked Conc |
|---|---|---|---|---|---|---|
| 1. | Anthracene D-10 | 188 | 2419 | 116205 | 106.3 | 100.0 |
| 2. | Chrysene D-12 | 240 | 3374 | 84859 | 110.2 | 100.0 |
| 3. | | | | | | |
| 4. | | | | | | |

## Tentatively Identified Compounds

| | Compound | Scan # | NBS LIB FIT | Base m/e | Area | Est Conc |
|---|---|---|---|---|---|---|
| 1. | Trimethyl Benzene | 816 | 986 | 105 | | |
| 2. | Triethyl Phosphate | 1129 | 938 | | | |
| 3. | Ethyl Benzyl Alcohol | 1044 | | | | |
| 4. | 2 Naphthylamine | 2006 | | | | |
| 5. | Sulfur | 2828 | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
| 8. | | | | | | |
| 9. | | | | | | |
| 10. | | | | | | |

| Compound | Quantity m/e | Scan # | Area | Conc | Corr Conc |
|---|---|---|---|---|---|
| 24. Hexachlorobenzene | 284 | | | | <MDL |
| 25. Phenanthrene | 178 | | | | <MDL |
| 26. Anthracene | 178 | | | | <MDL |
| 27. Di-n-Butylphthalate | 149 | | | | <MDL |
| 28. Fluoranthene | 202 | | | | <MDL |
| 29. Pyrene | 202 | | | | <MDL |
| 30. Butylbenzylphthalate | 149 | | | | <MDL |
| 31. Benz[a]anthracene | 228 | | | | <MDL |
| 32. 3,3'-Dichlorobenzidine | 252 | | | | <MDL |
| 33. Chrysene | 228 | | | | <MDL |
| 34. Bis[2-ethylhexyl]phthalate | 149 | 3453 | 2940 | 1.84 | 1.74 |
| 35. Di-n-Octylphthalate | 149 | | | | <MDL |
| 36. Benzo[b]Fluoranthene | 252 | | | | <MDL |
| 37. Benzo[k]Fluoranthene | 252 | | | | <MDL |
| 38. Benzo[a]Pyrene | 252 | | | | <MDL |
| 39. 1,2-Diphenylhydrazine | 77 | | | | <MDL |
| 40. Benzidine | 184 | | | | <MDL |
| 41. 4-Chlorophenyl phenyl ether | 204 | | | | <MDL |
| 42. N-Nitroso-n-propylamine | 70 | | | | <MDL |

RESULT SUMMARY SHEETS

VOLATILE PRIORITY POLLUTANTS

SUMMARY OF POLYCHLORINATED BIPHENYLS AND CHLORINATED PESTICIDE RESIDUE CONCENTRATIONS

(ng/L)

| | HCB | Hepta-chlor | Aldrin | pp'DDE | Aroclor 1242 | Aroclor 1254 | Aroclor 1260 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 85120513 S-510R | <2.0 | <2.0 | <2.0 | 10.6 | <50.0 | <50.0 | <50.0 | | | | | |
| 85120514 I-590R | <2.0 | <2.0 | <2.0 | 11.6 | <50.0 | <50.0 | <50.0 | | | | | |
| 85120515 S-800R | <2.0 | <2.0 | <2.0 | 25.0 | <50.0 | <50.0 | <50.0 | | | | | |
| 85120516 D-810R | <2.0 | <2.0 | <2.0 | 12.5 | <50.0 | <50.0 | <50.0 | | | | | |
| 85120517 S-820R | 29.3 | <2.0 | <2.0 | 37.3 | <50.0 | <50.0 | <50.0 | | | | | |
| 85120518 D830R | <2.0 | <2.0 | <2.0 | <5.0 | <50.0 | <50.0 | <50.0 | | | | | |
| 851205519 S840R | <2.0 | <2.0 | <2.0 | 5.1 | <50.0 | <50.0 | <50.0 | | | | | |
| 85120520 D-850R | <2.0 | <2.0 | <2.0 | <5.0 | <50.0 | <50.0 | <50.0 | | | | | |
| 85120521 D-870R | <2.0 | <2.0 | <2.0 | 14.0 | <50.0 | <50.0 | <50.0 | | | | | |
| 85120522 S-880R | 8.5 | <2.0 | <2.0 | 6.2 | <50.0 | <50.0 | <50.0 | | | | | |

SUMMARY OF POLYCHLORINATED BIPHENYLS AND CHLORINATED PESTICIDE RESIDUE CONCENTRATIONS

(ng/L)

| | HCB | Hepta-chlor | Aldrin | pp'DDE | Aroclor 1242 | Aroclor 1254 | Aroclor 1260 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 851205523 D-890R | 8.2 | <2.0 | <2.0 | 117.0 | <50.0 | <50.0 | <50.0 | | | | | |
| 85120524 D-900R | 31.4 | <2.0 | <2.0 | <5.0 | <50.0 | <50.0 | <50.0 | | | | | |
| 85120525 D-910R | 48.8 | <2.0 | <2.0 | 36.4 | <50.0 | <50.0 | <50.0 | | | | | |
| 85120526 D-920R | 9.3 | <2.0 | <2.0 | 23.3 | <50.0 | <50.0 | <50.0 | | | | | |
| 85120527 D-930R | 3.8 | <2.0 | <2.0 | <5.0 | <50.0 | <50.0 | <50.0 | | | | | |
| 85120528 D-940R | 16.7 | <2.0 | <2.0 | <5.0 | <50.0 | <50.0 | <50.0 | | | | | |
| 85120529 D-950R | 5.4 | <2.0 | <2.0 | <5.0 | <50.0 | <50.0 | <50.0 | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

SUMMARY OF CHLORINATED PESTICIDE RESIDUE CONCENTRATIONS ng/L (parts per trillion)

| | αBHC | γBHC | βBHC | δBHC | Hept. Epox. | Chlor-danes | Dieldrin | Endrin | pp'DDD | pp'DDT | Methoxy-chlor | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 85120513 S-510R | 5.0 | <5.0 | <10.0 | <10.0 | <5.0 | <15.0 | <5.0 | <5.0 | <10.0 | <10.0 | <20.0 | |
| 85120514 I-590R | <5.0 | <5.0 | <10.0 | <10.0 | <5.0 | <15.0 | <5.0 | <5.0 | <10.0 | <10.0 | <20.0 | |
| 85120515 S-800R | <5.0 | <5.0 | <10.0 | <10.0 | <5.0 | <15.0 | <5.0 | <5.0 | <10.0 | <10.0 | <20.0 | |
| 85120516 D-810R | <5.0 | <5.0 | <10.0 | <10.0 | <5.0 | <15.0 | <5.0 | <5.0 | <10.0 | <10.0 | <20.0 | |
| 85120517 S-820R | <5.0 | 100.0 | <10.0 | <10.0 | <5.0 | 258.0 | 14.6 | <5.0 | 658.0 | <10.0 | <20.0 | |
| 85120518 D-830R | <5.0 | <5.0 | <10.0 | 504.0 | <5.0 | 72.4 | 18.8 | <5.0 | 197.0 | 50.6 | <20.0 | |
| 85120519 S-840R | <5.0 | <5.0 | <10.0 | 312.0 | <5.0 | 89.0 | <5.0 | 140.0 | <10.0 | <10.0 | <20.0 | |
| 85120520 D-850R | <5.0 | <5.0 | <10.0 | 70.0 | <5.0 | 28.5 | <5.0 | <5.0 | <10.0 | <10.0 | <20.0 | |
| 85120521 D-870R | <5.0 | <5.0 | <10.0 | <10.0 | <5.0 | 23.0 | <5.0 | <5.0 | <10.0 | <10.0 | <20.0 | |
| 85120522 S-880R | <5.0 | <5.0 | <10.0 | <10.0 | <5.0 | 23.0 | <5.0 | <5.0 | <10.0 | <10.0 | <20.0 | |

SUMMARY OF CHLORINATED PESTICIDE RESIDUE CONCENTRATIONS ng/L (parts per trillion)

| | αBHC | γBHC | βBHC | δBHC | Hept. Epox. | Chlor-danes | Dieldrin | Endrin | pp'DDD | pp'DDT | Methoxy-chlor | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 85120523 D-890R | <5.0 | <5.0 | <10.0 | <10.0 | <5.0 | <15.0 | <5.0 | <5.0 | <10.0 | <10.0 | <20.0 | |
| 85120524 D-900R | <5.0 | <5.0 | <10.0 | <10.0 | <5.0 | <15.0 | <5.0 | <5.0 | <10.0 | <10.0 | <20.0 | |
| 85120525 D-910R | <5.0 | <5.0 | <10.0 | <10.0 | <5.0 | <15.0 | <5.0 | <5.0 | <10.0 | <10.0 | <20.0 | |
| 85120526 D-920R | <5.0 | <5.0 | <10.0 | <10.0 | <5.0 | <15.0 | <5.0 | <5.0 | <10.0 | <10.0 | <20.0 | |
| 85120527 D-930R | <5.0 | <5.0 | <10.0 | <10.0 | <5.0 | <15.0 | <5.0 | <5.0 | <10.0 | <10.0 | <20.0 | |
| 85120528 D-940R | <5.0 | <5.0 | <10.0 | <10.0 | <5.0 | <15.0 | <5.0 | <5.0 | <10.0 | <10.0 | <20.0 | |
| 85120529 D-950R | <5.0 | <5.0 | <10.0 | <10.0 | <5.0 | <15.0 | <5.0 | <5.0 | <10.0 | <10.0 | <20.0 | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

## Surrogate Results

| | Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|---|
| 1. | Benzene D-8 | 84 | 528 | 71067 | 31.4 | 30.0 |
| 2. | Toluene D-8 | 100 | 715 | 31698 | 32.2 | 30.0 |
| 3. | p-Bromofluorobenzene | 95 | 903 | 21185 | 33.5 | 30.0 |

## Tentatively Identified Compounds

| | Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|---|
| 1. | Acetone | 58 | 226 | | -NQ- | |

Environmental Trace Substances Research Center

Volatile Result Summary

Sample Source Burns & McDonnell

Submitter ID#: D-87

ETSRC ID#: 85120505 Data File#: VOL505

Sample Matrix: Water

Method: U.S.E.P.A. #624

Date Received: December 17, 1985

Date Analyzed: Conc. Units: mcg/L

Analyst: C. Orazio

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Methylene chloride | 84 | 209 | 6367 | 6.0 | 6.0 |
| 2. 1,1 Dichloroethylene | 96 | | | | <MDL |
| 3. 1,1 Dichloroethane | 63 | | | | <MDL |
| 4. 1,2 Dichloroethylene | 96 | | | | <MDL |
| 5. Chloroform | 83 | | | | <MDL |
| 6. 1,2, Dichloroethane | 62 | | | | <MDL |
| 7. 1,1,1 Trichloroethane | 97 | | | | <MDL |
| 8. Carbon tetrachloride | 117 | | | | <MDL |
| 9. Bromodichloromethane | 127 | | | | <MDL |
| 10. 1,2 Dichloropropane | 65 | | | | <MDL |
| 11. 1,3 Dichloropropylene | 75 | | | | <MDL |
| 12. Trichloroethylene | 130 | | | | <MDL |
| 13. Benzene | 78 | | | | <MDL |
| 14. cis 1,3 Dichloropropylene | 75 | | | | <MDL |
| 15. 1,1,2 Trichloroethane | 97 | | | | <MDL |
| 16. Dibromochloromethane | 127 | | | | <MDL |
| 17. 2 Chloroethylvinyl ether | 63 | | | | <MDL |
| 18. Bromoform | 173 | | | | <MDL |
| 19. Tetrachloroethylene | 164 | | | | <MDL |
| 20. 1,1,2,2 Tetrachloroethane | 83 | | | | <MDL |
| 21. Toluene | 92 | | | | <MDL |
| 22. Chlorobenzene | 112 | | | | <MDL |
| 23. Ethylbenzene | 91 | | | | <MDL |

## Surrogate Results

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Benzene D-8 | 84 | 528 | 65302 | 28.8 | <MDL |
| 2. Toluene D-8 | 100 | 715 | 27951 | 28.4 | <MDL |
| 3. p-Bromofluorobenzene | 95 | 905 | 17151 | 27.4 | <MDL |

## Tentatively Identified Compounds

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Acetone | 58 | 228 | 184247 | -NQ- | |

Environmental Trace Substances Research Center

Volatile Result Summary

Sample Source. Burns & McDonnell

Submitter ID#: D-85

ETSRC ID#: 85120504 Data File#. VOL504

Sample Matrix: Water

Method: U.S.E.P.A. #624

Date Received: December 17, 1985

Date Analyzed: Conc. Units: mcg/L

Analyst. C. Orazio

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Methylene chloride | 84 | 209 | 6947 | 6.6 | 6.3 |
| 2. 1,1 Dichloroethylene | 96 | | | | <MDL |
| 3. 1,1 Dichloroethane | 63 | | | | <MDL |
| 4. 1,2 Dichloroethylene | 96 | | | | <MDL |
| 5. Chloroform | 83 | | | | <MDL |
| 6. 1,2, Dichloroethane | 62 | | | | <MDL |
| 7. 1,1,1 Trichloroethane | 97 | | | | <MDL |
| 8 Carbon tetrachloride | 117 | | | | <MDL |
| 9. Bromodichloromethane | 127 | | | | <MDL |
| 10. 1,2 Dichloropropane | 65 | | | | <MDL |
| 11. 1,3 Dichloropropylene | 75 | | | | <MDL |
| 12. Trichloroethylene | 130 | | | | <MDL |
| 13. Benzene | 78 | | | | <MDL |
| 14. cis 1,3 Dichloropropylene | 75 | | | | <MDL |
| 15. 1,1,2 Trichloroethane | 97 | | | | <MDL |
| 16. Dibromochloromethane | 127 | | | | <MDL |
| 17. 2 Chloroethylvinyl ether | 63 | | | | <MDL |
| 18. Bromoform | 173 | | | | <MDL |
| 19. Tetrachloroethylene | 164 | | | | <MDL |
| 20. 1,1,2,2 Tetrachloroethane | 83 | | | | <MDL |
| 21. Toluene | 92 | | | | <MDL |
| 22. Chlorobenzene | 112 | | | | <MDL |
| 23. Ethylbenzene | 91 | | | | |

## Surrogate Results

| Compound | Qantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Benzene D-8 | 84 | 528 | 78043 | 34.4 | 30.0 |
| 2. Toluene D-8 | 100 | 716 | 34953 | 35.5 | 30.0 |
| 3. p-Bromofluorobenzene | 95 | 904 | 2311 | 36.9 | 30.0 |

## Tentatively Identified Compounds

| Compound | Qantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Acetone | 58 | 226 | 17749 | -NA- | |

Environmental Trace Substances Research Center
Volatile Result Summary

Sample Source: Burns & McDonnell
Submitter ID#: S-84
ETSRC ID#: 85120503 Data File#: VOL503
Sample Matrix: Water
Method: U.S.E.P.A. #624
Date Received: December 17, 1985
Date Analyzed: Conc. Units: mcg/L
Analyst: C. Orazio

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Methylene chloride | 84 | 211 | 6248 | 5.9 | 6.1 |
| 2. 1,1 Dichloroethylene | 96 | | | | <MDL |
| 3. 1,1 Dichloroethane | 63 | | | | <MDL |
| 4. 1,2 Dichloroethylene | 96 | | | | <MDL |
| 5. Chloroform | 83 | | | | <MDL |
| 6. 1,2, Dichloroethane | 62 | | | | <MDL |
| 7. 1,1,1 Trichloroethane | 97 | | | | <MDL |
| 8. Carbon tetrachloride | 117 | | | | <MDL |
| 9. Bromodichloromethane | 127 | | | | <MDL |
| 10. 1,2 Dichloropropane | 65 | | | | <MDL |
| 11. 1,3 Dichloropropylene | 75 | | | | <MDL |
| 12. Trichloroethylene | 130 | | | | <MDL |
| 13. Benzene | 78 | | | | <MDL |
| 14. cis 1,3 Dichloropropylene | 75 | | | | <MDL |
| 15. 1,1,2 Trichloroethane | 97 | | | | <MDL |
| 16. Dibromochloromethane | 127 | | | | <MDL |
| 17. 2 Chloroethylvinyl ether | 63 | | | | <MDL |
| 18. Bromoform | 173 | | | | <MDL |
| 19. Tetrachloroethylene | 164 | | | | <MDL |
| 20. 1,1,2,2 Tetrachloroethane | 83 | | | | <MDL |
| 21. Toluene | 92 | | | | <MDL |
| 22. Chlorobenzene | 112 | | | | <MDL |
| 23. Ethylbenzene | 91 | | | | <MDL |

## Surrogate Results

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Benzene D-8 | 84 | 528 | 77305 | 34.1 | |
| 2. Toluene D-8 | 100 | 716 | 33920 | 34.4 | |
| 3. p-Bromofluorobenzene | 95 | 904 | 27581 | 43.8 | |

## Tentatively Identified Compounds

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Acetone | 58 | 226 | 131557 | -NQ- | |

Environmental Trace Substances Research Center

Volatile Result Summary

Sample Source Burns & McDonnell

Submitter ID#: D-83

ETSRC ID#: 85120502 Data File#: Vol 502

Sample Matrix: Water

Method: U.S.E.P.A. #624

Date Received: December 17, 1985

Date Analyzed: Conc. Units: mcg/L

Analyst: C. Orazio

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Methylene chloride | 84 | 210 | 66538 | 63.0 | 55.2 |
| 2. 1,1 Dichloroethylene | 96 | | | | <MDL |
| 3. 1,1 Dichloroethane | 63 | | | | <MDL |
| 4. 1,2 Dichloroethylene | 96 | | | | <MDL |
| 5. Chloroform | 83 | | | | <MDL |
| 6. 1,2, Dichloroethane | 62 | | | | <MDL |
| 7. 1,1,1 Trichloroethane | 97 | | | | <MDL |
| 8. Carbon tetrachloride | 117 | | | | <MDL |
| 9. Bromodichloromethane | 127 | | | | <MDL |
| 10. 1,2 Dichloropropane | 65 | | | | <MDL |
| 11. 1,3 Dichloropropylene | 75 | | | | <MDL |
| 12. Trichloroethylene | 130 | | | | <MDL |
| 13. Benzene | 78 | | | | <MDL |
| 14. cis 1,3 Dichloropropylene | 75 | | | | <MDL |
| 15. 1,1,2 Trichloroethane | 97 | | | | <MDL |
| 16. Dibromochloromethane | 127 | | | | <MDL |
| 17. 2 Chloroethylvinyl ether | 63 | | | | <MDL |
| 18. Bromoform | 173 | | | | <MDL |
| 19. Tetrachloroethylene | 164 | | | | <MDL |
| 20. 1,1,2,2 Tetrachloroethane | 83 | | | | <MDL |
| 21. Toluene | 92 | | | | <MDL |
| 22. Chlorobenzene | 112 | | | | <MDL |
| 23. Ethylbenzene | 91 | | | | <MDL |

## Surrogate Results

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Benzene D-8 | 84 | 527 | 57577 | 25.4 | 30.0 |
| 2. Toluene D-8 | 100 | 714 | 24133 | 24.5 | 30.0 |
| 3. p-Bromofluorobenzene | 95 | 903 | 17133 | 27.4 | 30.0 |

## Tentatively Identified Compounds

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Acetone | 58 | 226 | | -NQ- | |

Environmental Trace Substances Research Center

Volatile Result Summary

Sample Source: Burns & McDonnell

Submitter ID#: D-90

ETSRC ID#: 85120507 Data File#: VOL507

Sample Matrix: Water

Method: U.S.E.P.A. #624

Date Received: December 17, 1985

Date Analyzed: Conc. Units: mcg/L

Analyst: C. Orazio

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Methylene chloride | 84 | 209 | 96851 | 75.7 | 83.2 |
| 2. 1,1 Dichloroethylene | 96 | | | | <MDL |
| 3. 1,1 Dichloroethane | 63 | | | | <MDL |
| 4. 1,2 Dichloroethylene | 96 | | | | <MDL |
| 5. Chloroform | 83 | | | | <MDL |
| 6. 1,2, Dichloroethane | 62 | | | | <MDL |
| 7. 1,1,1 Trichloroethane | 97 | | | | <MDL |
| 8. Carbon tetrachloride | 117 | | | | <MDL |
| 9. Bromodichloromethane | 127 | | | | <MDL |
| 10. 1,2 Dichloropropane | 65 | | | | <MDL |
| 11. 1,3 Dichloropropylene | 75 | | | | <MDL |
| 12. Trichloroethylene | 130 | | | | <MDL |
| 13. Benzene | 78 | | | | <MDL |
| 14. cis 1,3 Dichloropropylene | 75 | | | | <MDL |
| 15. 1,1,2 Trichloroethane | 97 | | | | <MDL |
| 16. Dibromochloromethane | 127 | | | | <MDL |
| 17. 2 Chloroethylvinyl ether | 63 | | | | <MDL |
| 18. Bromoform | 173 | | | | <MDL |
| 19. Tetrachloroethylene | 164 | | | | <MDL |
| 20. 1,1,2,2 Tetrachloroethane | 83 | | | | <MDL |
| 21. Toluene | 92 | | | | <MDL |
| 22. Chlorobenzene | 112 | | | | <MDL |
| 23. Ethylbenzene | 91 | | | | <MDL |

## Surrogate Results

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Benzene D-8 | 84 | 528 | 69364 | 30.6 | |
| 2. Toluene D-8 | 100 | 715 | 31487 | 31.9 | |
| 3. p-Bromofluorobenzene | 95 | 905 | 22001 | 35.2 | |

## Tentatively Identified Compounds

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Acetone | 58 | 227 | | -NQ- | |

Environmental Trace Substances Research Center

Volatile Result Summary

Sample Source: Burns & McDonnell

Submitter ID#: D-88

ETSRC ID#: 85120506 Data File#: VOL506

Sample Matrix: Water

Method: U.S.E.P.A. #624

Date Received. December 17, 1985

Date Analyzed: Conc. Units mcg/L

Analyst. C. Orazio

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Methylene chloride | 84 | 209 | 5464 | 5.2 | 6.1 |
| 2 1,1 Dichloroethylene | 96 | | | | <MDL |
| 3. 1,1 Dichloroethane | 63 | | | | <MDL |
| 4. 1,2 Dichloroethylene | 96 | | | | <MDL |
| 5. Chloroform | 83 | | | | <MDL |
| 6. 1,2, Dichloroethane | 62 | | | | <MDL |
| 7. 1,1,1 Trichloroethane | 97 | | | | <MDL |
| 8. Carbon tetrachloride | 117 | | | | <MDL |
| 9. Bromodichloromethane | 127 | | | | <MDL |
| 10. 1,2 Dichloropropane | 65 | | | | <MDL |
| 11. 1 3 Dichloropropylene | 75 | | | | <MDL |
| 12. Trichloroethylene | 130 | | | | <MDL |
| 13. Benzene | 78 | | | | <MDL |
| 14. cis 1,3 Dichloropropylene | 75 | | | | <MDL |
| 15. 1,1,2 Trichloroethane | 97 | | | | <MDL |
| 16. Dibromochloromethane | 127 | | | | <MDL |
| 17. 2 Chloroethylvinyl ether | 63 | | | | <MDL |
| 18. Bromoform | 173 | | | | <MDL |
| 19. Tetrachloroethylene | 164 | | | | <MDL |
| 20. 1,1,2,2 Tetrachloroethane | 83 | | | | <MDL |
| 21. Toluene | 92 | | | | <MDL |
| 22. Chlorobenzene | 112 | | | | <MDL |
| 23. Ethylbenzene | 91 | | | | <MDL |

## Surrogate Results

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Benzene D-8 | 84 | 527 | 107515 | 42.5 | 30.0 |
| 2. Toluene D-8 | 100 | 715 | 50046 | 42.6 | 30.0 |
| 3. p-Bromofluorobenzene | 95 | 904 | 25339 | 31.1 | 30.0 |

## Tentatively Identified Compounds

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Acetone | 58 | 230 | 3842 | -NQ- | |
| 2. 2-Methylheptadienedial | 71 | 333 | | -NQ- | |
| 3. Hexane | | 488 | | -NQ- | |

Environmental Trace Substances Research Center

Volatile Result Summary

Sample Source: Burns & McDonnell

Submitter ID#: D-92

ETSRC ID#: 85120509

Data File#: VOL509

Sample Matrix: Water

Method: U.S.E.P.A. #624

Date Received: December 17, 1985

Date Analyzed:

Conc. Units: mcg/L

Analyst: C. Urazio

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Methylene chloride | 84 | 211 | 45017 | 35.2 | 51.0 |
| 2. 1,1 Dichloroethylene | 96 | | | | |
| 3. 1,1 Dichloroethane | 63 | | | | |
| 4. 1,2 Dichloroethylene | 96 | | | | |
| 5. Chloroform | 83 | | | | |
| 6. 1,2, Dichloroethane | 62 | | | | |
| 7. 1,1,1 Trichloroethane | 97 | | | | |
| 8. Carbon tetrachloride | 117 | | | | |
| 9. Bromodichloromethane | 127 | | | | |
| 10. 1,2 Dichloropropane | 65 | | | | |
| 11. 1,3 Dichloropropylene | 75 | | | | |
| 12. Trichloroethylene | 130 | | | | |
| 13. Benzene | 78 | | | | |
| 14. cis 1,3 Dichloropropylene | 75 | | | | |
| 15. 1,1,2 Trichloroethane | 97 | | | | |
| 16. Dibromochloromethane | 127 | | | | |
| 17. 2 Chloroethylvinyl ether | 63 | | | | |
| 18. Bromoform | 173 | | | | |
| 19. Tetrachloroethylene | 164 | | | | |
| 20. 1,1,2,2 Tetrachloroethane | 83 | | | | |
| 21. Toluene | 92 | | | | |
| 22. Chlorobenzene | 112 | | | | |
| 23. Ethylbenzene | 91 | | | | |

## Surrogate Results

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Benzene D-8 | 84 | 527 | 59317 | 26.2 | |
| 2. Toluene D-8 | 100 | 715 | 25144 | 25.5 | |
| 3. p-Bromofluorobenzene | 95 | 904 | 15144 | 24.2 | |

## Tentatively Identified Compounds

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Acetone | 71 | 332 | | -NQ- | |

Environmental Trace Substances Research Center

Volatile Result Summary

Sample Source: Burns & McDonnell

Submitter ID#: D-91

ETSRC ID#: 85120508D

Data File#: VOL 50.8D

Sample Matrix: Water

Method: U.S.E.P.A. #624

Date Received: December 17, 1985

Date Analyzed:

Conc. Units: mcg/L

Analyst: C. Orazio

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Methylene chloride | 84 | 210 | 3842 | 3.0 | 2.1 |
| 2. 1,1 Dichloroethylene | 96 | | | | <MDL |
| 3. 1,1 Dichloroethane | 63 | | | | <MDL |
| 4. 1,2 Dichloroethylene | 96 | | | | <MDL |
| 5. Chloroform | 83 | | | | <MDL |
| 6. 1,2, Dichloroethane | 62 | | | | <MDL |
| 7. 1,1,1 Trichloroethane | 97 | | | | <MDL |
| 8. Carbon tetrachloride | 117 | | | | <MDL |
| 9. Bromodichloromethane | 127 | | | | <MDL |
| 10. 1,2 Dichloropropane | 65 | | | | <MDL |
| 11. 1,3 Dichloropropylene | 75 | | | | <MDL |
| 12. Trichloroethylene | 130 | | | | <MDL |
| 13. Benzene | 78 | | | | <MDL |
| 14. cis 1,3 Dichloropropylene | 75 | | | | <MDL |
| 15. 1,1,2 Trichloroethane | 97 | | | | <MDL |
| 16. Dibromochloromethane | 127 | | | | <MDL |
| 17. 2 Chloroethylvinyl ether | 63 | | | | <MDL |
| 18. Bromoform | 173 | | | | <MDL |
| 19. Tetrachloroethylene | 164 | | | | <MDL |
| 20. 1,1,2,2 Tetrachloroethane | 83 | | | | <MDL |
| 21. Toluene | 92 | | | | <MDL |
| 22. Chlorobenzene | 112 | | | | <MDL |
| 23. Ethylbenzene | 91 | | | | <MDL |

## Surrogate Results

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Benzene D-8 | 84 | 527 | 69199 | 27.3 | 30.0 |
| 2. Toluene D-8 | 100 | | 27544 | 23.4 | 30.0 |
| 3. p-Bromofluorobenzene | 95 | | 18556 | 22.7 | 30.0 |

## Tentatively Identified Compounds

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Acetone | 58 | | | | |

Environmental Trace Substances Research Center

Volatile Result Summary

Sample Source: Burns & McDonnell

Submitter ID#: D-91

ETSRC ID#: 85120508 Data File#: VOL508

Sample Matrix: Water

Method: U.S.E.P.A. #624

Date Received: December 17, 1985

Date Analyzed: Conc. Units: mcg/L

Analyst: C. Orazio

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Methylene chloride | 84 | 209 | 1764 | 1.4 | 1.6 |
| 2. 1,1 Dichloroethylene | 96 | | | | <MDL |
| 3. 1,1 Dichloroethane | 63 | | | | <MDL |
| 4. 1,2 Dichloroethylene | 96 | | | | <MDL |
| 5. Chloroform | 83 | | | | <MDL |
| 6. 1,2, Dichloroethane | 62 | | | | <MDL |
| 7. 1,1,1 Trichloroethane | 97 | | | | <MDL |
| 8. Carbon tetrachloride | 117 | | | | <MDL |
| 9. Bromodichloromethane | 127 | | | | <MDL |
| 10. 1,2 Dichloropropane | 65 | | | | <MDL |
| 11. 1,3 Dichloropropylene | 75 | | | | <MDL |
| 12. Trichloroethylene | 130 | | | | <MDL |
| 13. Benzene | 78 | | | | <MDL |
| 14. cis 1,3 Dichloropropylene | 75 | | | | <MDL |
| 15. 1,1,2 Trichloroethane | 97 | | | | <MDL |
| 16. Dibromochloromethane | 127 | | | | <MDL |
| 17. 2 Chloroethylvinyl ether | 63 | | | | <MDL |
| 18. Bromoform | 173 | | | | <MDL |
| 19. Tetrachloroethylene | 164 | | | | <MDL |
| 20. 1,1,2,2 Tetrachloroethane | 83 | | | | <MDL |
| 21. Toluene | 92 | | | | <MDL |
| 22. Chlorobenzene | 112 | | | | <MDL |
| 23. Ethylbenzene | 91 | | | | <MDL |

## Surrogate Results

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Benzene D-8 | 84 | 528 | 56116 | 22.8 | 30.0 |
| 2. Toluene D-8 | 100 | 714 | 22687 | 19.3 | 30.0 |
| 3. p-Bromofluorobenzene | 95 | 904 | 15317 | 18.8 | 30.0 |

## Tentatively Identified Compounds

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Acetone | 58 | | | | |

Environmental Trace Substances Research Center

Volatile Result Summary

Sample Source: Burns & McDonnell

Submitter ID#: D-95

ETSRC ID#: 5120512 Data File#: VOL512

Sample Matrix: Water

Method: U.S.E.P.A. #624

Date Received: December 17, 1985

Date Analyzed: Conc. Units: mcg/L

Analyst: C. Orazio

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Methylene chloride | 84 | 211 | 14849 | 11.6 | 10.3 |
| 2. 1,1 Dichloroethylene | 96 | | | | <MDL |
| 3. 1,1 Dichloroethane | 63 | | | | <MDL |
| 4. 1,2 Dichloroethylene | 96 | | | | <MDL |
| 5. Chloroform | 83 | | | | <MDL |
| 6. 1,2, Dichloroethane | 62 | | | | <MDL |
| 7. 1,1,1 Trichloroethane | 97 | | | | <MDL |
| 8. Carbon tetrachloride | 117 | | | | <MDL |
| 9. Bromodichloromethane | 127 | | | | <MDL |
| 10. 1,2 Dichloropropane | 65 | | | | <MDL |
| 11. 1,3 Dichloropropylene | 75 | | | | <MDL |
| 12. Trichloroethylene | 130 | | | | <MDL |
| 13. Benzene | 78 | | | | <MDL |
| 14. cis 1,3 Dichloropropylene | 75 | | | | <MDL |
| 15. 1,1,2 Trichloroethane | 97 | | | | <MDL |
| 16. Dibromochloromethane | 127 | | | | <MDL |
| 17. 2 Chloroethylvinyl ether | 63 | | | | <MDL |
| 18. Bromoform | 173 | | | | <MDL |
| 19. Tetrachloroethylene | 164 | | | | <MDL |
| 20. 1,1,2,2 Tetrachloroethane | 83 | | | | <MDL |
| 21. Toluene | 92 | | | | <MDL |
| 22. Chlorobenzene | 112 | | | | <MDL |
| 23. Ethylbenzene | 91 | | | | <MDL |

## Surrogate Results

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Benzene D-8 | 84 | 528 | 47338 | 18.7 | 30.0 |
| 2. Toluene D-8 | 100 | 714 | 18824 | 16.0 | 30.0 |
| 3. p-Bromofluorobenzene | 95 | 903 | 13356 | 23.1 | 30.0 |

## Tentatively Identified Compounds

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. 1,3-Oxathiolane | 60 | 475 | -NQ- | | |

Environmental Trace Substances Research Center

Volatile Result Summary

Sample Source: Burns & McDonnell

Submitter ID#: D-94

ETSRC ID#: 85120511 Data File#: VOL511

Sample Matrix: Water

Method: U.S.E.P.A. #624

Date Received: December 17, 1985

Date Analyzed: Conc. Units: mcg/L

Analyst: C. Grazio

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Methylene chloride | 84 | 210 | 2333 | 9.1 | 11.9 |
| 2. 1,1 Dichloroethylene | 96 | | | | <MDL |
| 3. 1,1 Dichloroethane | 63 | | | | <MDL |
| 4. 1,2 Dichloroethylene | 96 | | | | <MDL |
| 5. Chloroform | 83 | | | | <MDL |
| 6. 1,2, Dichloroethane | 62 | | | | <MDL |
| 7. 1,1,1 Trichloroethane | 97 | | | | <MDL |
| 8. Carbon tetrachloride | 117 | | | | <MDL |
| 9. Bromodichloromethane | 127 | | | | <MDL |
| 10. 1,2 Dichloropropane | 65 | | | | <MDL |
| 11. 1,3 Dichloropropylene | 75 | | | | <MDL |
| 12. Trichloroethylene | 130 | | | | <MDL |
| 13. Benzene | 78 | | | | <MDL |
| 14. cis 1,3 Dichloropropylene | 75 | | | | <MDL |
| 15. 1,1,2 Trichloroethane | 97 | | | | <MDL |
| 16. Dibromochloromethane | 127 | | | | <MDL |
| 17. 2 Chloroethylvinyl ether | 63 | | | | <MDL |
| 18. Bromoform | 173 | | | | <MDL |
| 19. Tetrachloroethylene | 164 | | | | <MDL |
| 20. 1,1,2,2 Tetrachloroethane | 83 | | | | <MDL |
| 21. Toluene | 92 | | | | <MDL |
| 22. Chlorobenzene | 112 | | | | <MDL |
| 23. Ethylbenzene | 91 | | | | <MDL |

## Surrogate Results

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Benzene D-8 | 84 | 529 | 53026 | 20.9 | 30.0 |
| 2. Toluene D-8 | 100 | 715 | 21994 | 18.7 | 30.0 |
| 3. p-Bromofluorobenzene | 95 | 906 | 14013 | 17.2 | 30.0 |

## Tentatively Identified Compounds

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Acetone | 258 | | | | |

Environmental Trace Substances Research Center

Volatile Result Summary

Sample Source: Burns & McDonnell

Submitter ID#: D-93

ETSRC ID#: 85120510 Data File#: VOL 510

Sample Matrix: Water

Method: U.S.E.P.A. #624

Date Received: December 17, 1985

Date Analyzed: Conc. Units: mcg/L

Analyst: C. Orazio

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Methylene chloride | 84 | 211 | 1731 | 6.8 | 10.9 |
| 2. 1,1 Dichloroethylene | 96 | | | | <MDL |
| 3. 1,1 Dichloroethane | 63 | | | | <MDL |
| 4. 1,2 Dichloroethylene | 96 | | | | <MDL |
| 5. Chloroform | 83 | | | | <MDL |
| 6. 1,2, Dichloroethane | 62 | | | | <MDL |
| 7. 1,1,1 Trichloroethane | 97 | | | | <MDL |
| 8. Carbon tetrachloride | 117 | | | | <MDL |
| 9. Bromodichloromethane | 127 | | | | <MDL |
| 10. 1,2 Dichloropropane | 65 | | | | <MDL |
| 11. 1,3 Dichloropropylene | 75 | | | | <MDL |
| 12. Trichloroethylene | 130 | | | | <MDL |
| 13. Benzene | 78 | | | | <MDL |
| 14. cis 1,3 Dichloropropylene | 75 | | | | <MDL |
| 15. 1,1,2 Trichloroethane | 97 | | | | <MDL |
| 16. Dibromochloromethane | 127 | | | | <MDL |
| 17. 2 Chloroethylvinyl ether | 63 | | | | <MDL |
| 18. Bromoform | 173 | | | | <MDL |
| 19. Tetrachloroethylene | 164 | | | | <MDL |
| 20. 1,1,2,2 Tetrachloroethane | 83 | | | | <MDL |
| 21. Toluene | 92 | | | | <MDL |
| 22. Chlorobenzene | 112 | | | | <MDL |
| 23. Ethylbenzene | 91 | | | | <MDL |

## Surrogate Results

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|
| 1. Benzene D-8 | 84 | 529 | 53927 | 21.3 | 30.0 |
| 2. Toluene D-8 | 100 | 716 | 24314 | 20.7 | 30.0 |
| 3. p-Bromofluorobenzene | 95 | 906 | 15796 | 19.4 | 30.0 |

## Tentatively Identified Compounds

| Compound | Quantity m/e | Scan # | Area | Conc. | Corr Conc |
|---|---|---|---|---|---|

GROSS ALPHA AND BETA

DECEMBER, 1985

Controls for Environmental Pollution, Inc.
P.O. BOX 5351 • Santa Fe, New Mexico 87502
IN STATE 505/988-9788
OUT OF STATE 800/545-2188



# REPORT OF ANALYSIS

LAB # 85-12-462

| SAMPLE IDENTIFICATION | DATE COLLECTED | TYPE OF ANALYSIS | pCi/liter |
|---|---|---|---|
| D 83 | 12/12/85 | Gross Alpha | <2 |
| | | Gross Beta | 31+/-20 |
| D 85 | 12/11/85 | Gross Alpha | 17+/-13 |
| | | Gross Beta | 23+/-10 |
| D 92 | 12/12/85 | Gross Alpha | 19+/-13 |
| | | Gross Beta | 11+/-10 |
| S 84 | 12/11/85 | Gross Alpha | 270+/-114 |
| | | Gross Beta | 171+/-28 |

PRIORITY POLLUTANTS

MAY, 1986

ENVIRODYNE ENGINEERS

12161 Lackland Road,
St. Louis, Missouri 63146
(314) 434-6960

# REPORT OF ANALYSIS

CLIENT: BURNS AND McDONNELL
P.O. Box 173
Kansas City, Missouri 64141
ATTN: Ms. Mary Erio

PROJ. #: 3060-00377
P.O. #:

REPORT DATE: July 8,1986
SAMPLE ANALYZED: 18 groundwater samples for priority pollutants.

DATE RECEIVED: May 20 & 21,1986
METHODS USED: EPA Approved Methods

| VOA COMPOUND | DETECTION LIMITS (ug/l) | S-51 (ug/l) | S-80 (ug/l) | D-83 (ug/l) | D-89 (ug/l) | D-90 (ug/l) |
|---|---|---|---|---|---|---|
| BENZENE | 5 | ND | ND | ND | ND | ND |
| BROMOFORM | 10 | ND | ND | ND | ND | ND |
| CARBON TETRACHLORIDE | 5 | ND | ND | ND | ND | ND |
| CHLOROBENZENE | 5 | ND | ND | ND | ND | ND |
| CHLORODIBROMOMETHANE | 5 | ND | ND | ND | ND | ND |
| CHLOROETHANE | 10 | ND | ND | ND | ND | ND |
| 2-CHLOROETHYLVINYL ETHER | 10 | ND | ND | ND | ND | ND |
| CHLOROFORM | 5 | ND | ND | ND | ND | ND |
| DICHLOROBROMOMETHANE | 5 | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | 5 | ND | ND | ND | ND | ND |
| 1,2-DICHLOROETHANE | 1 | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHYLENE | 5 | ND | ND | ND | ND | ND |
| 1,2-DICHLOROPROPANE | 10 | ND | ND | ND | ND | ND |
| 1,3-DICHLOROPROPYLENE | 5 | ND | ND | ND | ND | ND |
| ETHYL BENZENE | 5 | ND | ND | ND | ND | ND |
| METHYL BROMIDE | 10 | ND | ND | ND | ND | ND |
| METHYL CHLORIDE | 10 | ND | ND | ND | ND | ND |
| METHYLENE CHLORIDE | 5 | ND | ND | ND | 10 | 6 |
| 1,1,2,2-TETRACHLOROETHANE | 10 | ND | ND | ND | ND | ND |
| TETRACHLOROETHYLENE | 5 | ND | ND | ND | ND | ND |
| TOLUENE | 5 | ND | ND | ND | ND | ND |
| 1,2-TRANS-DICHLOROETHYLENE | 5 | ND | ND | ND | ND | ND |
| 1,1,1-TRICHLOROETHANE | 5 | ND | ND | ND | ND | ND |
| 1,1,2-TRICHLOROETHANE | 5 | ND | ND | ND | ND | ND |
| TRICHLOROETHYLENE | 5 | ND | ND | ND | ND | ND |
| TRICHLOROFLUOROMETHANE | 5 | ND | ND | ND | ND | ND |
| VINYL CHLORIDE | 10 | ND | ND | ND | ND | ND |

| SURROGATE COMPOUNDS | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY |
|---|---|---|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 97 | 98 | 99 | 87 | 94 |
| TOLUENE-D8 | 89 | 87 | 85 | 104 | 98 |
| p-BFB | 93 | 90 | 96 | 122 | 108 |

ND = None Detected.

ENVIRODYNE
ENGINEERS

# REPORT OF ANALYSIS - PAGE 2

CLIENT: BURNS AND McDONNELL
P.O. Box 173
Kansas City, Missouri 64141
ATTN: Ms. Mary Erio
3060-00377

| VOA COMPOUND | DETECTION LIMITS (ug/l) | D-91 (ug/l) | D-92 (ug/l) | I-59 (ug/l) | I-66 (ug/l) | D-81 (ug/l) |
|---|---|---|---|---|---|---|
| BENZENE | 5 | ND | ND | ND | ND | ND |
| BROMOFORM | 10 | ND | ND | ND | ND | ND |
| CARBON TETRACHLORIDE | 5 | ND | ND | ND | ND | ND |
| CHLOROBENZENE | 5 | ND | ND | ND | ND | ND |
| CHLORODIBROMOMETHANE | 5 | ND | ND | ND | ND | ND |
| CHLOROETHANE | 10 | ND | ND | ND | ND | ND |
| 2-CHLOROETHYLVINYL ETHER | 10 | ND | ND | ND | ND | ND |
| CHLOROFORM | 5 | ND | ND | ND | ND | ND |
| DICHLOROBROMOMETHANE | 5 | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | 5 | ND | ND | ND | ND | ND |
| 1,2-DICHLOROETHANE | 1 | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHYLENE | 5 | ND | ND | ND | ND | ND |
| 1,2-DICHLOROPROPANE | 10 | ND | ND | ND | ND | ND |
| 1,3-DICHLOROPROPYLENE | 5 | ND | ND | ND | ND | ND |
| ETHYL BENZENE | 5 | ND | ND | ND | ND | ND |
| METHYL BROMIDE | 10 | ND | ND | ND | ND | ND |
| METHYL CHLORIDE | 10 | ND | ND | ND | ND | ND |
| METHYLENE CHLORIDE | 5 | ND | ND | 7 | ND | ND |
| 1,1,2,2-TETRACHLOROETHANE | 10 | ND | ND | ND | ND | ND |
| TETRACHLOROETHYLENE | 5 | ND | ND | ND | ND | ND |
| TOLUENE | 5 | ND | ND | ND | ND | ND |
| 1,2-TRANS-DICHLOROETHYLENE | 5 | ND | ND | ND | ND | ND |
| 1,1,1-TRICHLOROETHANE | 5 | ND | ND | ND | ND | ND |
| 1,1,2-TRICHLOROETHANE | 5 | ND | ND | ND | ND | ND |
| TRICHLOROETHYLENE | 5 | ND | ND | ND | ND | ND |
| TRICHLOROFLUOROMETHANE | 5 | ND | ND | ND | ND | ND |
| VINYL CHLORIDE | 10 | ND | ND | ND | ND | ND |

| SURROGATE COMPOUNDS | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY |
|---|---|---|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 100 | 92 | 92 | 92 | 91 |
| TOLUENE-D8 | 103 | 95 | 105 | 105 | 103 |
| p-BFB | 116 | 110 | 106 | 108 | 105 |

ND = None Detected.

ENVIRODYNE
ENGINEERS

# REPORT OF ANALYSIS — PAGE 3

CLIENT: BURNS AND McDONNELL
P.O. Box 173
Kansas City, Missouri 64141
ATTN: Ms. Mary Erio
3060-00377

| VOA COMPOUND | DETECTION LIMITS (ug/l) | S-82 (ug/l) | S-84 (ug/l) | D-85 (ug/l) | D-87 (ug/l) | D-88 (ug/l) |
|---|---|---|---|---|---|---|
| BENZENE | 5 | ND | ND | ND | ND | ND |
| BROMOFORM | 10 | ND | ND | ND | ND | ND |
| CARBON TETRACHLORIDE | 5 | ND | ND | ND | ND | ND |
| CHLOROBENZENE | 5 | ND | ND | ND | ND | ND |
| CHLORODIBROMOMETHANE | 5 | ND | ND | ND | ND | ND |
| CHLOROETHANE | 10 | ND | ND | ND | ND | ND |
| 2-CHLOROETHYLVINYL ETHER | 10 | ND | ND | ND | ND | ND |
| CHLOROFORM | 5 | ND | ND | ND | ND | ND |
| DICHLOROBROMOMETHANE | 5 | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | 5 | ND | ND | ND | ND | ND |
| 1,2-DICHLOROETHANE | 1 | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHYLENE | 5 | ND | ND | ND | ND | ND |
| 1,2-DICHLOROPROPANE | 10 | ND | ND | ND | ND | ND |
| 1,3-DICHLOROPROPYLENE | 5 | ND | ND | ND | ND | ND |
| ETHYL BENZENE | 5 | ND | ND | ND | ND | ND |
| METHYL BROMIDE | 10 | ND | ND | ND | ND | ND |
| METHYL CHLORIDE | 10 | ND | ND | ND | ND | ND |
| METHYLENE CHLORIDE | 5 | ND | ND | ND | ND | ND |
| 1,1,2,2-TETRACHLOROETHANE | 10 | ND | ND | ND | ND | ND |
| TETRACHLOROETHYLENE | 5 | ND | ND | ND | ND | ND |
| TOLUENE | 5 | ND | ND | ND | ND | ND |
| 1,2-TRANS-DICHLOROETHYLENE | 5 | ND | ND | ND | ND | ND |
| 1,1,1-TRICHLOROETHANE | 5 | ND | ND | ND | ND | ND |
| 1,1,2-TRICHLOROETHANE | 5 | ND | ND | ND | ND | ND |
| TRICHLOROETHYLENE | 5 | ND | ND | ND | ND | ND |
| TRICHLOROFLUOROMETHANE | 5 | ND | ND | ND | ND | ND |
| VINYL CHLORIDE | 10 | ND | ND | ND | ND | ND |

| SURROGATE COMPOUNDS | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY |
|---|---|---|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 91 | 90 | 87 | 85 | 87 |
| TOLUENE-D8 | 105 | 105 | 106 | 108 | 104 |
| p-BFB | 109 | 107 | 110 | 111 | 110 |

ND = None Detected.

ENVIRODYNE
ENGINEERS

# REPORT OF ANALYSIS — PAGE 4

CLIENT: BURNS AND McDONNELL
P.O. Box 173
Kansas City, Missouri 64141
ATTN: Ms. Mary Erio
3060-00377

| VOA COMPOUND | DETECTION LIMITS (ug/l) | D-93 (ug/l) | D-94 (ug/l) | D-95 (ug/l) | L.BLK. (ug/l) | L.BLK. (ug/l) |
|---|---|---|---|---|---|---|
| BENZENE | 5 | ND | ND | ND | ND | ND |
| BROMOFORM | 10 | ND | ND | ND | ND | ND |
| CARBON TETRACHLORIDE | 5 | ND | ND | ND | ND | ND |
| CHLOROBENZENE | 5 | ND | ND | ND | ND | ND |
| CHLORODIBROMOMETHANE | 5 | ND | ND | ND | ND | ND |
| CHLOROETHANE | 10 | ND | ND | ND | ND | ND |
| 2-CHLOROETHYLVINYL ETHER | 10 | ND | ND | ND | ND | ND |
| CHLOROFORM | 5 | ND | ND | ND | ND | ND |
| DICHLOROBROMOMETHANE | 5 | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHANE | 5 | ND | ND | ND | ND | ND |
| 1,2-DICHLOROETHANE | 1 | ND | ND | ND | ND | ND |
| 1,1-DICHLOROETHYLENE | 5 | ND | ND | ND | ND | ND |
| 1,2-DICHLOROPROPANE | 10 | ND | ND | ND | ND | ND |
| 1,3-DICHLOROPROPYLENE | 5 | ND | ND | ND | ND | ND |
| ETHYL BENZENE | 5 | ND | ND | ND | ND | ND |
| METHYL BROMIDE | 10 | ND | ND | ND | ND | ND |
| METHYL CHLORIDE | 10 | ND | ND | ND | ND | ND |
| METHYLENE CHLORIDE | 5 | ND | ND | ND | 17 | 15 |
| 1,1,2,2-TETRACHLOROETHANE | 10 | ND | ND | ND | ND | ND |
| TETRACHLOROETHYLENE | 5 | ND | ND | ND | ND | ND |
| TOLUENE | 5 | ND | ND | ND | ND | ND |
| 1,2-TRANS-DICHLOROETHYLENE | 5 | ND | ND | ND | ND | ND |
| 1,1,1-TRICHLOROETHANE | 5 | ND | ND | ND | ND | ND |
| 1,1,2-TRICHLOROETHANE | 5 | ND | ND | ND | ND | ND |
| TRICHLOROETHYLENE | 5 | ND | ND | ND | ND | ND |
| TRICHLOROFLUOROMETHANE | 5 | ND | ND | ND | ND | ND |
| VINYL CHLORIDE | 10 | ND | ND | ND | ND | ND |

| SURROGATE COMPOUNDS | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY |
|---|---|---|---|---|---|
| 1,2-DICHLOROETHANE-D4 | 86 | 86 | 88 | 96 | 98 |
| TOLUENE-D8 | 106 | 102 | 102 | 93 | 95 |
| p-BFB | 108 | 106 | 107 | 86 | 108 |

ND = None Detected.

ENVIRODYNE
ENGINEERS

# REPORT OF ANALYSIS — PAGE 5

CLIENT: BURNS AND McDONNELL
P.O. Box 173
Kansas City, Missouri 64141
ATTN: Ms. Mary Erio
3060-00377

| ACID COMPOUNDS | DETECTION LIMITS (ug/l) | S-51 (ug/l) | S-80 (ug/l) | D-83 (ug/l) | D-89 (ug/l) | D-90 (ug/l) |
|---|---|---|---|---|---|---|
| 2-CHLOROPHENOL | 10 | ND | ND | ND | ND | ND |
| 2,4-DICHLOROPHENOL | 10 | ND | ND | ND | ND | ND |
| 2,4-DIMETHYLPHENOL | 10 | ND | ND | ND | ND | ND |
| 4,6-DINITRO-o-CRESOL | 20 | ND | ND | ND | ND | ND |
| 2,4-DINITROPHENOL | 50 | ND | ND | ND | ND | ND |
| 2-NITROPHENOL | 20 | ND | ND | ND | ND | ND |
| 4-NITROPHENOL | 50 | ND | ND | ND | ND | ND |
| p-CHLORO-m-CRESOL | 10 | ND | ND | ND | ND | ND |
| PENTACHLOROPHENOL | 10 | ND | ND | ND | ND | ND |
| PHENOL | 10 | ND | ND | ND | ND | ND |
| 2,4,6-TRICHLOROPHENOL | 10 | ND | ND | ND | ND | ND |

| SURROGATE COMPOUNDS | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY |
|---|---|---|---|---|---|
| 2-F-PHENOL | 59 | 45 | 57 | 39 | 104 |
| PHENOL-D6 | 48 | 37 | 50 | 31 | 43 |
| 2,4,6-TRIBROMOPHENOL | 84 | 75 | 78 | 77 | 86 |

| BASE/NEUTRAL COMPOUNDS | DETECTION LIMITS (ug/l) | S-51 (ug/l) | S-80 (ug/l) | D-83 (ug/l) | D-89 (ug/l) | D-90 (ug/l) |
|---|---|---|---|---|---|---|
| ACENAPHTHENE | 10 | ND | ND | ND | ND | ND |
| ACENAPHTHYLENE | 10 | ND | ND | ND | ND | ND |
| ANTHRACENE | 10 | ND | ND | ND | ND | ND |
| BENZO(a)ANTHRACENE | 10 | ND | ND | ND | ND | ND |
| BENZO(a)PYRENE | 10 | ND | ND | ND | ND | ND |
| 3,4-BENZOFLUORANTHENE | 10 | ND | ND | ND | ND | ND |
| BENZO(ghi)PERYLENE | 10 | ND | ND | ND | ND | ND |
| BENZO(k)FLUORANTHENE | 10 | ND | ND | ND | ND | ND |
| BIS(2-CHLOROETHOXY)METHANE | 10 | ND | ND | ND | ND | ND |

ND = Not Detected

ENVIRODYNE
ENGINEERS

# REPORT OF ANALYSIS — PAGE 6

CLIENT: BURNS AND McDONNELL
P.O. Box 173
Kansas City, Missouri 64141
ATTN: Ms. Mary Erio
3060-00377

| BASE/NEUTRAL COMPOUNDS CONT'D | DETECTION LIMITS (ug/l) | S-51 (ug/l) | S-80 (ug/l) | D-83 (ug/l) | D-89 (ug/l) | D-90 (ug/l) |
|---|---|---|---|---|---|---|
| BIS(2-CHLOROETHYL)ETHER | 10 | ND | ND | ND | ND | ND |
| BIS(2-CHLOROISOPROPYL)ETHER | 10 | ND | ND | ND | ND | ND |
| BIS(2-ETHYLHEXYL)PHTHALATE | 10 | ND | ND | ND | 25 | ND |
| 4-BROMOPHENYL PHENYL ETHER | 10 | ND | ND | ND | ND | ND |
| BUTYL BENZYL PHTHALATE | 10 | ND | ND | ND | ND | ND |
| 2-CHLORONAPHTHALENE | 10 | ND | ND | ND | ND | ND |
| 4-CHLOROPHENYL PHENYL ETHER | 10 | ND | ND | ND | ND | ND |
| CHRYSENE | 10 | ND | ND | ND | ND | ND |
| DIBENZO(a,h)ANTHRACENE | 10 | ND | ND | ND | ND | ND |
| 1,2-DICHLOROBENZENE | 10 | ND | ND | ND | ND | ND |
| 1,3-DICHLOROBENZENE | 10 | ND | ND | ND | ND | ND |
| 1,4-DICHLOROBENZENE | 10 | ND | ND | ND | ND | ND |
| 3,3'-DICHLOROBENZIDINE | 20 | ND | ND | ND | ND | ND |
| DIETHYL PHTHALATE | 10 | ND | ND | ND | ND | ND |
| DIMETHYL PHTHALATE | 10 | ND | ND | ND | ND | ND |
| DI-n-BUTYL PHTHALATE | 10 | ND | ND | ND | ND | ND |
| 2,4-DINITROTOLUENE | 10 | ND | ND | ND | ND | ND |
| 2,6-DINITROTOLUENE | 10 | ND | ND | ND | ND | ND |
| DI-n-OCTYL PHTHALATE | 10 | ND | ND | ND | ND | ND |
| BENZO(b)FLUORANTHENE | 10 | ND | ND | ND | ND | ND |
| 1,2-DIPHENYLHYDRAZINE | 20 | ND | ND | ND | ND | ND |
| FLUORANTHENE | 10 | ND | ND | ND | ND | ND |
| FLUORENE | 10 | ND | ND | ND | ND | ND |
| HEXACHLOROBENZENE | 10 | ND | ND | ND | ND | ND |
| HEXACHLOROBUTADIENE | 10 | ND | ND | ND | ND | ND |
| HEXACHLOROCYCLOPENTADIENE | 10 | ND | ND | ND | ND | ND |
| HEXACHLOROETHANE | 10 | ND | ND | ND | ND | ND |
| INDENO(1,2,3-cd)PYRENE | 10 | ND | ND | ND | ND | ND |
| ISOPHORONE | 10 | ND | ND | ND | ND | ND |
| NAPHTHALENE | 10 | ND | ND | ND | ND | ND |
| NITROBENZENE | 10 | ND | ND | ND | ND | ND |
| N-NITROSODI-n-PROPYLAMINE | 10 | ND | ND | ND | ND | ND |
| N-NITROSODIPHENYLAMINE | 10 | ND | ND | ND | ND | ND |
| PHENANTHRENE | 10 | ND | ND | ND | ND | ND |
| PYRENE | 10 | ND | ND | ND | ND | ND |
| 1,2,4-TRICHLOROBENZENE | 10 | ND | ND | ND | ND | ND |

ND = Not Detected

ENVIRODYNE
ENGINEERS

# REPORT OF ANALYSIS — PAGE 7

CLIENT: BURNS AND McDONNELL
P.O. Box 173
Kansas City, Missouri 64141
ATTN: Ms. Mary Erio
3060-00377

| BASE/NEUTRAL SURROGATE COMPOUNDS | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY |
|---|---|---|---|---|---|
| NITROBENZENE-D5 | 59 | 55 | 66 | 61 | 43 |
| 2-FLUOROBIPHENYL | 67 | 62 | 86 | 72 | 48 |
| TERPHENYL-D14 | 98 | 73 | 94 | 90 | 107 |

| PESTICIDES | DETECTION LIMITS (ug/l) | S-51 (ug/l) | S-80 (ug/l) | D-83 (ug/l) | D-89 (ug/l) | D-90 (ug/l) |
|---|---|---|---|---|---|---|
| ALDRIN | 0.0018 | ND | ND | ND | ND | ND |
| ALPHA-BHC | 0.0015 | ND | ND | ND | ND | ND |
| BETA-BHC | 0.0023 | ND | ND | ND | ND | ND |
| GAMMA-BHC (LINDANE) | 0.0019 | ND | ND | ND | ND | ND |
| DELTA-BHC | 0.0024 | ND | ND | ND | ND | ND |
| CHLORDANE | 0.0148 | ND | ND | ND | ND | ND |
| 4,4'-DDT | 0.0028 | ND | ND | ND | ND | ND |
| 4,4'-DDE | 0.0015 | ND | ND | ND | ND | ND |
| 4,4'-DDD | 0.0015 | ND | ND | ND | ND | ND |
| DIELDRIN | 0.0019 | ND | ND | ND | ND | ND |
| ALPHA-ENDOSULFAN | 0.0027 | ND | ND | ND | ND | ND |
| BETA-ENDOSULFAN | 0.0017 | ND | ND | ND | ND | ND |
| ENDOSULFAN SULFATE | 0.0021 | ND | ND | ND | ND | ND |
| ENDRIN | 0.0022 | ND | ND | ND | ND | ND |
| ENDRIN ALDEHYDE | 0.0026 | ND | ND | ND | ND | ND |
| HEPTACHLOR | 0.0019 | ND | ND | ND | ND | ND |
| HEPTACHLOR EPOXIDE | 0.0019 | ND | ND | ND | ND | ND |
| PCB-1242 | 0.036 | ND | ND | ND | ND | ND |
| PCB-1254 | 0.013 | ND | ND | ND | ND | ND |
| PCB-1221 | 0.133 | ND | ND | ND | ND | ND |
| PCB-1232 | 0.062 | ND | ND | ND | ND | ND |
| PCB-1248 | 0.023 | ND | ND | ND | ND | ND |
| PCB-1260 | 0.012 | ND | ND | ND | ND | ND |
| PCB-1016 | 0.034 | ND | ND | ND | ND | ND |
| TOXAPHENE | 0.437 | ND | ND | ND | ND | ND |

ND = Not Detected

ENVIRODYNE
ENGINEERS

# REPORT OF ANALYSIS — PAGE 8

CLIENT: BURNS AND McDONNELL REVISED 8/19/86
P.O. Box 173
Kansas City, Missouri 64141
ATTN: Ms. Mary Erio
3060-00377

| ACID COMPOUNDS | DETECTION LIMITS (ug/l) | D-91 (ug/l) | D-92 (ug/l) | I-59 (ug/l) | I-66 (ug/l) | D-81 (ug/l) |
|---|---|---|---|---|---|---|
| 2-CHLOROPHENOL | 10 | ND | ND | ND | ND | ND |
| 2,4-DICHLOROPHENOL | 10 | ND | ND | ND | ND | ND |
| 2,4-DIMETHYLPHENOL | 10 | ND | ND | ND | ND | ND |
| 4,6-DINITRO-o-CRESOL | 20 | ND | ND | ND | ND | ND |
| 2,4-DINITROPHENOL | 50 | ND | ND | ND | ND | ND |
| 2-NITROPHENOL | 20 | ND | ND | ND | ND | ND |
| 4-NITROPHENOL | 50 | ND | ND | ND | ND | ND |
| p-CHLORO-m-CRESOL | 10 | ND | ND | ND | ND | ND |
| PENTACHLOROPHENOL | 10 | ND | ND | ND | ND | ND |
| PHENOL | 10 | ND | ND | ND | ND | ND |
| 2,4,6-TRICHLOROPHENOL | 10 | ND | ND | ND | ND | ND |

| SURROGATE COMPOUNDS | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY |
|---|---|---|---|---|---|
| 2-F-PHENOL | 31 | 46 | 48 | 45 | 29 |
| PHENOL-D6 | 26 | 34 | 44 | 38 | 22 |
| 2,4,6-TRIBROMOPHENOL | 38 | 55 | 64 | 79 | 29 |

| BASE/NEUTRAL COMPOUNDS | DETECTION LIMITS (ug/l) | D-91 (ug/l) | D-92 (ug/l) | I-59 (ug/l) | I-66 (ug/l) | D-81 (ug/l) |
|---|---|---|---|---|---|---|
| ACENAPHTHENE | 10 | ND | ND | ND | ND | ND |
| ACENAPHTHYLENE | 10 | ND | ND | ND | ND | ND |
| ANTHRACENE | 10 | ND | ND | ND | ND | ND |
| BENZO(a)ANTHRACENE | 10 | ND | ND | ND | ND | ND |
| BENZO(a)PYRENE | 10 | ND | ND | ND | ND | ND |
| 3,4-BENZOFLUORANTHENE | 10 | ND | ND | ND | ND | ND |
| BENZO(ghi)PERYLENE | 10 | ND | ND | ND | ND | ND |
| BENZO(k)FLUORANTHENE | 10 | ND | ND | ND | ND | ND |
| BIS(2-CHLOROETHOXY)METHANE | 10 | ND | ND | ND | ND | ND |

ND = Not Detected

ENVIRODYNE
ENGINEERS

# REPORT OF ANALYSIS — PAGE 9

CLIENT: BURNS AND McDONNELL
P.O. Box 173
Kansas City, Missouri 64141
ATTN: Ms. Mary Erio
3060-00377

| BASE/NEUTRAL COMPOUNDS CONT'D | DETECTION LIMITS (ug/l) | D-91 (ug/l) | D-92 (ug/l) | I-59 (ug/l) | I-66 (ug/l) | D-81 (ug/l) |
|---|---|---|---|---|---|---|
| BIS(2-CHLOROETHYL)ETHER | 10 | ND | ND | ND | ND | ND |
| BIS(2-CHLOROISOPROPYL)ETHER | 10 | ND | ND | ND | ND | ND |
| BIS(2-ETHYLHEXYL)PHTHALATE | 10 | ND | ND | ND | ND | ND |
| 4-BROMOPHENYL PHENYL ETHER | 10 | ND | ND | ND | ND | ND |
| BUTYL BENZYL PHTHALATE | 10 | ND | ND | ND | ND | ND |
| 2-CHLORONAPHTHALENE | 10 | ND | ND | ND | ND | ND |
| 4-CHLOROPHENYL PHENYL ETHER | 10 | ND | ND | ND | ND | ND |
| CHRYSENE | 10 | ND | ND | ND | ND | ND |
| DIBENZO(a,h)ANTHRACENE | 10 | ND | ND | ND | ND | ND |
| 1,2-DICHLOROBENZENE | 10 | ND | ND | ND | ND | ND |
| 1,3-DICHLOROBENZENE | 10 | ND | ND | ND | ND | ND |
| 1,4-DICHLOROBENZENE | 10 | ND | ND | ND | ND | ND |
| 3,3'-DICHLOROBENZIDINE | 20 | ND | ND | ND | ND | ND |
| DIETHYL PHTHALATE | 10 | ND | ND | ND | ND | ND |
| DIMETHYL PHTHALATE | 10 | ND | ND | ND | ND | ND |
| DI-n-BUTYL PHTHALATE | 10 | ND | ND | ND | ND | ND |
| 2,4-DINITROTOLUENE | 10 | ND | ND | ND | ND | ND |
| 2,6-DINITROTOLUENE | 10 | ND | ND | ND | ND | ND |
| DI-n-OCTYL PHTHALATE | 10 | ND | ND | ND | ND | ND |
| BENZO(b)FLUORANTHENE | 10 | ND | ND | ND | ND | ND |
| 1,2-DIPHENYLHYDRAZINE | 20 | ND | ND | ND | ND | ND |
| FLUORANTHENE | 10 | ND | ND | ND | ND | ND |
| FLUORENE | 10 | ND | ND | ND | ND | ND |
| HEXACHLOROBENZENE | 10 | ND | ND | ND | ND | ND |
| HEXACHLOROBUTADIENE | 10 | ND | ND | ND | ND | ND |
| HEXACHLOROCYCLOPENTADIENE | 10 | ND | ND | ND | ND | ND |
| HEXACHLOROETHANE | 10 | ND | ND | ND | ND | ND |
| INDENO(1,2,3-cd)PYRENE | 10 | ND | ND | ND | ND | ND |
| ISOPHORONE | 10 | ND | ND | ND | ND | ND |
| NAPHTHALENE | 10 | ND | ND | ND | ND | ND |
| NITROBENZENE | 10 | ND | ND | ND | ND | ND |
| N-NITROSODI-n-PROPYLAMINE | 10 | ND | ND | ND | ND | ND |
| N-NITROSODIPHENYLAMINE | 10 | ND | ND | ND | ND | ND |
| PHENANTHRENE | 10 | ND | ND | ND | ND | ND |
| PYRENE | 10 | ND | ND | ND | ND | ND |
| 1,2,4-TRICHLOROBENZENE | 10 | ND | ND | ND | ND | ND |

ND = Not Detected

ENVIRODYNE
ENGINEERS

# REPORT OF ANALYSIS - PAGE 10

CLIENT: BURNS AND McDONNELL
P.O. Box 173
Kansas City, Missouri 64141
ATTN: Ms. Mary Erio
3060-00377

| BASE/NEUTRAL SURROGATE COMPOUNDS | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY |
|---|---|---|---|---|---|
| NITROBENZENE-D5 | 30 | 51 | 59 | 58 | 44 |
| 2-FLUOROBIPHENYL | 36 | 60 | 73 | 71 | 48 |
| TERPHENYL-D14 | 78 | 73 | 81 | 87 | 99 |

| PESTICIDES | DETECTION LIMITS (ug/l) | D-91 (ug/l) | D-92 (ug/l) | I-59 (ug/l) | I-66 (ug/l) | D-81 (ug/l) |
|---|---|---|---|---|---|---|
| ALDRIN | 0.0018 | ND | ND | ND | ND | ND |
| ALPHA-BHC | 0.0015 | ND | ND | ND | ND | ND |
| BETA-BHC | 0.0023 | ND | ND | ND | ND | ND |
| GAMMA-BHC (LINDANE) | 0.0019 | ND | ND | ND | ND | ND |
| DELTA-BHC | 0.0024 | ND | ND | ND | ND | ND |
| CHLORDANE | 0.0148 | ND | ND | ND | ND | ND |
| 4,4'-DDT | 0.0028 | ND | ND | ND | ND | ND |
| 4,4'-DDE | 0.0015 | ND | ND | ND | ND | ND |
| 4,4'-DDD | 0.0015 | ND | ND | ND | ND | ND |
| DIELDRIN | 0.0019 | ND | ND | ND | ND | ND |
| ALPHA-ENDOSULFAN | 0.0027 | ND | ND | ND | ND | ND |
| BETA-ENDOSULFAN | 0.0017 | ND | ND | ND | ND | ND |
| ENDOSULFAN SULFATE | 0.0021 | ND | ND | ND | ND | ND |
| ENDRIN | 0.0022 | ND | ND | ND | ND | ND |
| ENDRIN ALDEHYDE | 0.0026 | ND | ND | ND | ND | ND |
| HEPTACHLOR | 0.0019 | ND | ND | ND | ND | ND |
| HEPTACHLOR EPOXIDE | 0.0019 | ND | ND | ND | ND | ND |
| PCB-1242 | 0.036 | ND | ND | ND | ND | ND |
| PCB-1254 | 0.013 | ND | ND | ND | ND | ND |
| PCB-1221 | 0.133 | ND | ND | ND | ND | ND |
| PCB-1232 | 0.062 | ND | ND | ND | ND | ND |
| PCB-1248 | 0.023 | ND | ND | ND | ND | ND |
| PCB-1260 | 0.012 | ND | ND | ND | ND | ND |
| PCB-1016 | 0.034 | ND | ND | ND | ND | ND |
| TOXAPHENE | 0.437 | ND | ND | ND | ND | ND |

ND = Not Detected

ENVIRODYNE
ENGINEERS

# REPORT OF ANALYSIS — PAGE 11

CLIENT: BURNS AND McDONNELL REVISED 8/19/86
P.O. Box 173
Kansas City, Missouri 64141
ATTN: Ms. Mary Erio
3060-00377

| ACID COMPOUNDS | DETECTION LIMITS (ug/l) | S-82 (ug/l) | S-84 (ug/l) | D-85 (ug/l) | D-87 (ug/l) | D-88 (ug/l) |
|---|---|---|---|---|---|---|
| 2-CHLOROPHENOL | 10 | ND | ND | ND | ND | ND |
| 2,4-DICHLOROPHENOL | 10 | ND | ND | ND | ND | ND |
| 2,4-DIMETHYLPHENOL | 10 | ND | ND | ND | ND | ND |
| 4,6-DINITRO-o-CRESOL | 20 | ND | ND | ND | ND | ND |
| 2,4-DINITROPHENOL | 50 | ND | ND | ND | ND | ND |
| 2-NITROPHENOL | 20 | ND | ND | ND | ND | ND |
| 4-NITROPHENOL | 50 | ND | ND | ND | ND | ND |
| p-CHLORO-m-CRESOL | 10 | ND | ND | ND | ND | ND |
| PENTACHLOROPHENOL | 10 | ND | ND | ND | ND | ND |
| PHENOL | 10 | ND | ND | ND | ND | ND |
| 2,4,6-TRICHLOROPHENOL | 10 | ND | ND | ND | ND | ND |

| SURROGATE COMPOUNDS | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY |
|---|---|---|---|---|---|
| 2-F-PHENOL | 22 | 35 | 30 | 42 | 30 |
| PHENOL-D6 | 21 | 28 | 27 | 36 | 23 |
| 2,4,6-TRIBROMOPHENOL | 34 | 43 | 38 | 71 | 36 |

| BASE/NEUTRAL COMPOUNDS | DETECTION LIMITS (ug/l) | S-82 (ug/l) | S-84 (ug/l) | D-85 (ug/l) | D-87 (ug/l) | D-88 (ug/l) |
|---|---|---|---|---|---|---|
| ACENAPHTHENE | 10 | ND | ND | ND | ND | ND |
| ACENAPHTHYLENE | 10 | ND | ND | ND | ND | ND |
| ANTHRACENE | 10 | ND | ND | ND | ND | ND |
| BENZO(a)ANTHRACENE | 10 | ND | ND | ND | ND | ND |
| BENZO(a)PYRENE | 10 | ND | ND | ND | ND | ND |
| 3,4-BENZOFLUORANTHENE | 10 | ND | ND | ND | ND | ND |
| BENZO(ghi)PERYLENE | 10 | ND | ND | ND | ND | ND |
| BENZO(k)FLUORANTHENE | 10 | ND | ND | ND | ND | ND |
| BIS(2-CHLOROETHOXY)METHANE | 10 | ND | ND | ND | ND | ND |

ND = Not Detected



John J. Coughlin

ENVIRODYNE
ENGINEERS

# REPORT OF ANALYSIS — PAGE 12

CLIENT: BURNS AND McDONNELL
P.O. Box 173
Kansas City, Missouri 64141
ATTN: Ms. Mary Erio
3060-00377

| BASE/NEUTRAL COMPOUNDS CONT'D | DETECTION LIMITS (ug/l) | S-82 (ug/l) | S-84 (ug/l) | D-85 (ug/l) | D-87 (ug/l) | D-88 (ug/l) |
|---|---|---|---|---|---|---|
| BIS(2-CHLOROETHYL)ETHER | 10 | ND | ND | ND | ND | ND |
| BIS(2-CHLOROISOPROPYL)ETHER | 10 | ND | ND | ND | ND | ND |
| BIS(2-ETHYLHEXYL)PHTHALATE | 10 | ND | ND | ND | ND | ND |
| 4-BROMOPHENYL PHENYL ETHER | 10 | ND | ND | ND | ND | ND |
| BUTYL BENZYL PHTHALATE | 10 | ND | ND | ND | ND | ND |
| 2-CHLORONAPHTHALENE | 10 | ND | ND | ND | ND | ND |
| 4-CHLOROPHENYL PHENYL ETHER | 10 | ND | ND | ND | ND | ND |
| CHRYSENE | 10 | ND | ND | ND | ND | ND |
| DIBENZO(a,h)ANTHRACENE | 10 | ND | ND | ND | ND | ND |
| 1,2-DICHLOROBENZENE | 10 | ND | ND | ND | ND | ND |
| 1,3-DICHLOROBENZENE | 10 | ND | ND | ND | ND | ND |
| 1,4-DICHLOROBENZENE | 10 | ND | ND | ND | ND | ND |
| 3,3'-DICHLOROBENZIDINE | 20 | ND | ND | ND | ND | ND |
| DIETHYL PHTHALATE | 10 | ND | ND | ND | ND | ND |
| DIMETHYL PHTHALATE | 10 | ND | ND | ND | ND | ND |
| DI-n-BUTYL PHTHALATE | 10 | ND | ND | ND | ND | ND |
| 2,4-DINITROTOLUENE | 10 | ND | ND | ND | ND | ND |
| 2,6-DINITROTOLUENE | 10 | ND | ND | ND | ND | ND |
| DI-n-OCTYL PHTHALATE | 10 | ND | ND | ND | ND | ND |
| BENZO(b)FLUORANTHENE | 10 | ND | ND | ND | ND | ND |
| 1,2-DIPHENYLHYDRAZINE | 20 | ND | ND | ND | ND | ND |
| FLUORANTHENE | 10 | ND | ND | ND | ND | ND |
| FLUORENE | 10 | ND | ND | ND | ND | ND |
| HEXACHLOROBENZENE | 10 | ND | ND | ND | ND | ND |
| HEXACHLOROBUTADIENE | 10 | ND | ND | ND | ND | ND |
| HEXACHLOROCYCLOPENTADIENE | 10 | ND | ND | ND | ND | ND |
| HEXACHLOROETHANE | 10 | ND | ND | ND | ND | ND |
| INDENO(1,2,3-cd)PYRENE | 10 | ND | ND | ND | ND | ND |
| ISOPHORONE | 10 | ND | ND | ND | ND | ND |
| NAPHTHALENE | 10 | ND | ND | ND | ND | ND |
| NITROBENZENE | 10 | ND | ND | ND | ND | ND |
| N-NITROSODI-n-PROPYLAMINE | 10 | ND | ND | ND | ND | ND |
| N-NITROSODIPHENYLAMINE | 10 | ND | ND | ND | ND | ND |
| PHENANTHRENE | 10 | ND | ND | ND | ND | ND |
| PYRENE | 10 | ND | ND | ND | ND | ND |
| 1,2,4-TRICHLOROBENZENE | 10 | ND | ND | ND | ND | ND |

ND = Not Detected

ENVIRODYNE
ENGINEERS

# REPORT OF ANALYSIS — PAGE 13

CLIENT: BURNS AND McDONNELL
P.O. Box 173
Kansas City, Missouri 64141
ATTN: Ms. Mary Erio
3060-00377

| BASE/NEUTRAL SURROGATE COMPOUNDS | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY |
|---|---|---|---|---|---|
| NITROBENZENE-D5 | 72 | 72 | 39 | 73 | 84 |
| 2-FLUOROBIPHENYL | 79 | 73 | 58 | 77 | 87 |
| TERPHENYL-D14 | 96 | 85 | 91 | 92 | 91 |

| PESTICIDES | DETECTION LIMITS (ug/l) | S-82 (ug/l) | S-84 (ug/l) | D-85 (ug/l) | D-87 (ug/l) | D-88 (ug/l) |
|---|---|---|---|---|---|---|
| ALDRIN | 0.0018 | ND | ND | ND | ND | ND |
| ALPHA-BHC | 0.0015 | ND | ND | ND | ND | ND |
| BETA-BHC | 0.0023 | ND | ND | ND | ND | ND |
| GAMMA-BHC (LINDANE) | 0.0019 | ND | ND | ND | ND | ND |
| DELTA-BHC | 0.0024 | ND | ND | ND | ND | ND |
| CHLORDANE | 0.0148 | ND | ND | ND | ND | ND |
| 4,4'-DDT | 0.0028 | ND | ND | ND | ND | ND |
| 4,4'-DDE | 0.0015 | ND | ND | ND | ND | ND |
| 4,4'-DDD | 0.0015 | ND | ND | ND | ND | ND |
| DIELDRIN | 0.0019 | ND | ND | ND | ND | ND |
| ALPHA-ENDOSULFAN | 0.0027 | ND | ND | ND | ND | ND |
| BETA-ENDOSULFAN | 0.0017 | ND | ND | ND | ND | ND |
| ENDOSULFAN SULFATE | 0.0021 | ND | ND | ND | ND | ND |
| ENDRIN | 0.0022 | ND | ND | ND | ND | ND |
| ENDRIN ALDEHYDE | 0.0026 | ND | ND | ND | ND | ND |
| HEPTACHLOR | 0.0019 | ND | ND | ND | ND | ND |
| HEPTACHLOR EPOXIDE | 0.0019 | ND | ND | ND | ND | ND |
| PCB-1242 | 0.036 | ND | ND | ND | ND | ND |
| PCB-1254 | 0.013 | ND | ND | ND | ND | ND |
| PCB-1221 | 0.133 | ND | ND | ND | ND | ND |
| PCB-1232 | 0.062 | ND | ND | ND | ND | ND |
| PCB-1248 | 0.023 | ND | ND | ND | ND | ND |
| PCB-1260 | 0.012 | ND | ND | ND | ND | ND |
| PCB-1016 | 0.034 | ND | ND | ND | ND | ND |
| TOXAPHENE | 0.437 | ND | ND | ND | ND | ND |

ND = Not Detected

ENVIRODYNE
ENGINEERS

# REPORT OF ANALYSIS — PAGE 14

CLIENT: BURNS AND McDONNELL
P.O. Box 173
Kansas City, Missouri 64141
ATTN: Ms. Mary Erio
3060-00377

| ACID COMPOUNDS | DETECTION LIMITS (ug/l) | D-93 (ug/l) | D-94 (ug/l) | D-95 (ug/l) | L.BLK. (ug/l) | L.BLK. (ug/l) |
|---|---|---|---|---|---|---|
| 2-CHLOROPHENOL | 10 | ND | ND | ND | ND | ND |
| 2,4-DICHLOROPHENOL | 10 | ND | ND | ND | ND | ND |
| 2,4-DIMETHYLPHENOL | 10 | ND | ND | ND | ND | ND |
| 4,6-DINITRO-o-CRESOL | 20 | ND | ND | ND | ND | ND |
| 2,4-DINITROPHENOL | 50 | ND | ND | ND | ND | ND |
| 2-NITROPHENOL | 20 | ND | ND | ND | ND | ND |
| 4-NITROPHENOL | 50 | ND | ND | ND | ND | ND |
| p-CHLORO-m-CRESOL | 10 | ND | ND | ND | ND | ND |
| PENTACHLOROPHENOL | 10 | ND | ND | ND | ND | ND |
| PHENOL | 10 | ND | ND | ND | ND | ND |
| 2,4,6-TRICHLOROPHENOL | 10 | ND | ND | ND | ND | ND |

| SURROGATE COMPOUNDS | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY |
|---|---|---|---|---|---|
| 2-F-PHENOL | 63 | 49 | 59 | 61 | 56 |
| PHENOL-D6 | 53 | 39 | 44 | 50 | 46 |
| 2,4,6-TRIBROMOPHENOL | 92 | 87 | 92 | 93 | 93 |

| BASE/NEUTRAL COMPOUNDS | DETECTION LIMITS (ug/l) | D-93 (ug/l) | D-94 (ug/l) | D-95 (ug/l) | L.BLK. (ug/l) | L.BLK. (ug/l) |
|---|---|---|---|---|---|---|
| ACENAPHTHENE | 10 | ND | ND | ND | ND | ND |
| ACENAPHTHYLENE | 10 | ND | ND | ND | ND | ND |
| ANTHRACENE | 10 | ND | ND | ND | ND | ND |
| BENZO(a)ANTHRACENE | 10 | ND | ND | ND | ND | ND |
| BENZO(a)PYRENE | 10 | ND | ND | ND | ND | ND |
| 3,4-BENZOFLUORANTHENE | 10 | ND | ND | ND | ND | ND |
| BENZO(ghi)PERYLENE | 10 | ND | ND | ND | ND | ND |
| BENZO(k)FLUORANTHENE | 10 | ND | ND | ND | ND | ND |
| BIS(2-CHLOROETHOXY)METHANE | 10 | ND | ND | ND | ND | ND |

ND = Not Detected

ENVIRODYNE
ENGINEERS

# REPORT OF ANALYSIS — PAGE 15

CLIENT: BURNS AND McDONNELL
P.O. Box 173
Kansas City, Missouri 64141
ATTN: Ms. Mary Erio
3060-00377

| BASE/NEUTRAL COMPOUNDS CONT'D | DETECTION LIMITS (ug/l) | D-93 (ug/l) | D-94 (ug/l) | D-95 (ug/l) | L.BLK. (ug/l) | L.BLK. (ug/l) |
|---|---|---|---|---|---|---|
| BIS(2-CHLOROETHYL)ETHER | 10 | ND | ND | ND | ND | ND |
| BIS(2-CHLOROISOPROPYL)ETHER | 10 | ND | ND | ND | ND | ND |
| BIS(2-ETHYLHEXYL)PHTHALATE | 10 | ND | ND | ND | ND | ND |
| 4-BROMOPHENYL PHENYL ETHER | 10 | ND | ND | ND | ND | ND |
| BUTYL BENZYL PHTHALATE | 10 | ND | ND | ND | ND | ND |
| 2-CHLORONAPHTHALENE | 10 | ND | ND | ND | ND | ND |
| 4-CHLOROPHENYL PHENYL ETHER | 10 | ND | ND | ND | ND | ND |
| CHRYSENE | 10 | ND | ND | ND | ND | ND |
| DIBENZO(a,h)ANTHRACENE | 10 | ND | ND | ND | ND | ND |
| 1,2-DICHLOROBENZENE | 10 | ND | ND | ND | ND | ND |
| 1,3-DICHLOROBENZENE | 10 | ND | ND | ND | ND | ND |
| 1,4-DICHLOROBENZENE | 10 | ND | ND | ND | ND | ND |
| 3,3'-DICHLOROBENZIDINE | 20 | ND | ND | ND | ND | ND |
| DIETHYL PHTHALATE | 10 | ND | ND | ND | ND | ND |
| DIMETHYL PHTHALATE | 10 | ND | ND | ND | ND | ND |
| DI-n-BUTYL PHTHALATE | 10 | ND | ND | ND | ND | ND |
| 2,4-DINITROTOLUENE | 10 | ND | ND | ND | ND | ND |
| 2,6-DINITROTOLUENE | 10 | ND | ND | ND | ND | ND |
| DI-n-OCTYL PHTHALATE | 10 | ND | ND | ND | ND | ND |
| BENZO(b)FLUORANTHENE | 10 | ND | ND | ND | ND | ND |
| 1,2-DIPHENYLHYDRAZINE | 20 | ND | ND | ND | ND | ND |
| FLUORANTHENE | 10 | ND | ND | ND | ND | ND |
| FLUORENE | 10 | ND | ND | ND | ND | ND |
| HEXACHLOROBENZENE | 10 | ND | ND | ND | ND | ND |
| HEXACHLOROBUTADIENE | 10 | ND | ND | ND | ND | ND |
| HEXACHLOROCYCLOPENTADIENE | 10 | ND | ND | ND | ND | ND |
| HEXACHLOROETHANE | 10 | ND | ND | ND | ND | ND |
| INDENO(1,2,3-cd)PYRENE | 10 | ND | ND | ND | ND | ND |
| ISOPHORONE | 10 | ND | ND | ND | ND | ND |
| NAPHTHALENE | 10 | ND | ND | ND | ND | ND |
| NITROBENZENE | 10 | ND | ND | ND | ND | ND |
| N-NITROSODI-n-PROPYLAMINE | 10 | ND | ND | ND | ND | ND |
| N-NITROSODIPHENYLAMINE | 10 | ND | ND | ND | ND | ND |
| PHENANTHRENE | 10 | ND | ND | ND | ND | ND |
| PYRENE | 10 | ND | ND | ND | ND | ND |
| 1,2,4-TRICHLOROBENZENE | 10 | ND | ND | ND | ND | ND |

ND = Not Detected

ENVIRODYNE
ENGINEERS

# REPORT OF ANALYSIS - PAGE 16

CLIENT: BURNS AND McDONNELL
P.O. Box 173
Kansas City, Missouri 64141
ATTN: Ms. Mary Erio
3060-00377

| BASE/NEUTRAL SURROGATE COMPOUNDS | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY | PERCENT RECVRY |
|---|---|---|---|---|---|
| NITROBENZENE-D5 | 77 | 71 | 54 | 68 | 53 |
| 2-FLUOROBIPHENYL | 85 | 76 | 60 | 73 | 60 |
| TERPHENYL-D14 | 92 | 90 | 81 | 85 | 79 |

| PESTICIDES | DETECTION LIMITS (ug/l) | D-93 (ug/l) | D-94 (ug/l) | D-95 (ug/l) | L.BLK. (ug/l) | L.BLK. (ug/l) |
|---|---|---|---|---|---|---|
| ALDRIN | 0.0018 | ND | ND | ND | ND | ND |
| ALPHA-BHC | 0.0015 | ND | ND | ND | ND | ND |
| BETA-BHC | 0.0023 | ND | ND | ND | ND | ND |
| GAMMA-BHC (LINDANE) | 0.0019 | ND | ND | ND | ND | ND |
| DELTA-BHC | 0.0024 | ND | ND | ND | ND | ND |
| CHLORDANE | 0.0148 | ND | ND | ND | ND | ND |
| 4,4'-DDT | 0.0028 | ND | ND | ND | ND | ND |
| 4,4'-DDE | 0.0015 | ND | ND | ND | ND | ND |
| 4,4'-DDD | 0.0015 | ND | ND | ND | ND | ND |
| DIELDRIN | 0.0019 | ND | ND | ND | ND | ND |
| ALPHA-ENDOSULFAN | 0.0027 | ND | ND | ND | ND | ND |
| BETA-ENDOSULFAN | 0.0017 | ND | ND | ND | ND | ND |
| ENDOSULFAN SULFATE | 0.0021 | ND | ND | ND | ND | ND |
| ENDRIN | 0.0022 | ND | ND | ND | ND | ND |
| ENDRIN ALDEHYDE | 0.0026 | ND | ND | ND | ND | ND |
| HEPTACHLOR | 0.0019 | ND | ND | ND | ND | ND |
| HEPTACHLOR EPOXIDE | 0.0019 | ND | ND | ND | ND | ND |
| PCB-1242 | 0.036 | ND | ND | ND | ND | ND |
| PCB-1254 | 0.013 | ND | ND | ND | ND | ND |
| PCB-1221 | 0.133 | ND | ND | ND | ND | ND |
| PCB-1232 | 0.062 | ND | ND | ND | ND | ND |
| PCB-1248 | 0.023 | ND | ND | ND | ND | ND |
| PCB-1260 | 0.012 | ND | ND | ND | ND | ND |
| PCB-1016 | 0.034 | ND | ND | ND | ND | ND |
| TOXAPHENE | 0.437 | ND | ND | ND | ND | ND |

ND = Not Detected

ENVIRODYNE
ENGINEERS

# REPORT OF ANALYSIS - PAGE 17

CLIENT: BURNS AND McDONNELL
P.O. Box 173
Kansas City, Missouri 64141
ATTN: Ms. Mary Erio
3060-00377

| GROUNGWATER SAMPLE | TOTAL CYANIDE (ug/l) | TOTAL PHENOLS (mg/l) |
|---|---|---|
| S-51 | < 5 | < 0.002 |
| S-80 | < 5 | < 0.002 |
| D-83 | < 5 | < 0.002 |
| D-89 | < 5 | < 0.002 |
| D-90 | 7 | < 0.002 |
| D-91 | < 5 | < 0.002 |
| D-92 | < 5 | < 0.002 |
| I-59 | < 5 | < 0.002 |
| I-66 | < 5 | < 0.002 |
| D-81 | < 5 | < 0.002 |
| S-82 | < 5 | < 0.002 |
| S-84 | < 5 | < 0.002 |
| D-85 | < 5 | < 0.002 |
| D-87 | < 5 | < 0.002 |
| D-88 | < 5 | < 0.002 |
| D-93 | < 5 | < 0.002 |
| D-94 | < 5 | < 0.002 |
| D-95 | < 5 | < 0.002 |

ENVIRODYNE
ENGINEERS

REPORT OF ANALYSIS - PAGE 18

CLIENT: BURNS AND McDONNELL

REVISED JULY 31, 1986

P.O. Box 173
Kansas City, Missouri 64141
ATTN: Ms. Mary Erio
3060-00377

GROUNGWATER

| SAMPLE | Sb (mg/l) | As (mg/l) | Be (mg/l) | Cd (mg/l) | Cr (mg/l) | Cu (mg/l) | Pb (mg/l) |
|---|---|---|---|---|---|---|---|
| S-51 | 0.017 | < 0.002 | < 0.001 | < 0.001 | < 0.004 | < 0.004 | < 0.005 |
| S-80 | 0.029 | < 0.002 | < 0.001 | < 0.001 | < 0.004 | 0.005 | < 0.005 |
| D-83 | 0.034 | < 0.002 | < 0.001 | < 0.001 | < 0.004 | 0.004 | < 0.005 |
| D-89 | 0.026 | < 0.002 | < 0.001 | < 0.001 | < 0.004 | < 0.004 | < 0.005 |
| D-90 | 0.008 | < 0.002 | < 0.001 | < 0.001 | < 0.004 | 0.007 | < 0.005 |
| D-91 | 0.026 | 0.004 | < 0.001 | < 0.001 | < 0.004 | 0.01 | 0.013 |
| D-92 | 0.020 | < 0.002 | < 0.001 | < 0.001 | < 0.004 | 0.009 | < 0.005 |
| I-59 | 0.035 | < 0.002 | < 0.001 | < 0.001 | < 0.004 | 0.011 | < 0.005 |
| I-66 | 0.013 | < 0.002 | < 0.001 | < 0.001 | < 0.004 | 0.009 | < 0.005 |
| D-81 | 0.034 | < 0.002 | < 0.001 | < 0.001 | < 0.004 | 0.008 | < 0.005 |
| S-82 | 0.040 | < 0.002 | < 0.001 | < 0.001 | < 0.004 | 0.04 | < 0.005 |
| S-84 | 0.024 | 0.009 | < 0.001 | 0.001 | < 0.004 | 0.01 | < 0.005 |
| D-85 | 0.025 | 0.008 | < 0.001 | < 0.001 | < 0.004 | 0.005 | < 0.005 |
| D-87 | 0.021 | < 0.002 | < 0.001 | < 0.001 | < 0.004 | 0.011 | < 0.005 |
| D-88 | 0.041 | 0.003 | < 0.001 | < 0.001 | < 0.004 | 0.007 | < 0.005 |
| D-93 | 0.116 | < 0.002 | < 0.001 | < 0.001 | < 0.004 | 0.01 | < 0.005 |
| D-94 | 0.022 | < 0.002 | < 0.001 | < 0.001 | < 0.004 | 0.004 | 0.007 |
| D-95 | 0.011 | 0.006 | < 0.001 | < 0.001 | < 0.004 | 0.004 | < 0.005 |

Sb = Antimony; As = Arsenic; Be = Beryllium; Cd = Cadmium; Cr = Chromium
Cu = Copper; Pb = Lead

ENVIRODYNE
ENGINEERS

REPORT OF ANALYSIS - PAGE 19

CLIENT: BURNS AND McDONNELL

REVISED JULY 31, 1986

P.O. Box 173
Kansas City, Missouri 64141
ATTN: Ms. Mary Erio
3060-00377

| GROUNGWATER SAMPLE | Hg (ug/l) | Ni (mg/l) | Se (mg/l) | Ag (mg/l) | Tl (mg/l) | Zn (mg/l) |
|---|---|---|---|---|---|---|
| S-51 | < 0.2 | < 0.004 | < 0.002 | 0.002 | 0.005 | 2 |
| S-80 | < 0.2 | < 0.004 | < 0.002 | 0.004 | 0.010 | 0.01 |
| D-83 | < 0.2 | 0.011 | < 0.002 | 0.005 | 0.013 | 0.02 |
| D-89 | < 0.2 | 0.007 | < 0.002 | 0.004 | 0.010 | 0.04 |
| D-90 | < 0.2 | 0.007 | < 0.002 | < 0.002 | 0.005 | < 0.002 |
| D-91 | < 0.2 | 0.024 | < 0.002 | 0.004 | 0.009 | 0.02 |
| D-92 | < 0.2 | 0.019 | < 0.002 | 0.007 | 0.015 | 0.02 |
| I-59 | < 0.2 | 0.02 | < 0.002 | 0.007 | 0.019 | 0.01 |
| I-66 | < 0.2 | < 0.004 | < 0.002 | 0.003 | 0.009 | 0.01 |
| D-81 | < 0.2 | 0.006 | < 0.002 | 0.005 | 0.012 | 0.02 |
| S-82 | < 0.2 | 0.062 | < 0.002 | 0.006 | 0.016 | 0.03 |
| S-84 | < 0.2 | 0.008 | < 0.002 | 0.004 | 0.007 | 0.03 |
| D-85 | < 0.2 | 0.013 | < 0.002 | 0.005 | 0.009 | 0.01 |
| D-87 | < 0.2 | 0.015 | < 0.002 | 0.006 | 0.013 | 0.01 |
| D-88 | < 0.2 | 0.011 | < 0.002 | 0.005 | 0.009 | 0.04 |
| D-93 | < 0.2 | 0.012 | < 0.002 | 0.004 | 0.027 | < 0.002 |
| D-94 | < 0.2 | < 0.004 | < 0.002 | 0.003 | 0.008 | 0.01 |
| D-95 | < 0.2 | 0.004 | < 0.002 | 0.003 | 0.008 | 0.07 |

Hg = Mercury; Ni = Nickel; Se = Selenium; Ag = Silver; Tl = Thallium
Zn = Zinc

Attachment I "STANDARD CLAUSES" is included herein by reference.

APPROVED: John J. Coughlin

ENVIRODYNE
ENGINEERS

12161 Lackland Road,
St. Louis, Missouri 63146
(314) 434-6960

# REPORT OF ANALYSIS

CLIENT: BURNS AND McDONNELL
P.O. Box 173
Kansas City, Missouri 64141
ATTN: Ms. Mary Erio

REPORT DATE: August 22, 1986
SAMPLE ANALYZED: Lab Blank data from acid extractable organics reruns.

DATE RECEIVED: N/A
METHODS USED: N/A

PROJ. #: 3060-00377
P.O. #:

| ACID COMPOUNDS | DETECTION LIMITS (ug/l) | LAB BLANK (ug/l) | LAB BLANK (ug/l) |
|---|---|---|---|
| 2-CHLOROPHENOL | 10 | ND | ND |
| 2,4-DICHLOROPHENOL | 10 | ND | ND |
| 2,4-DIMETHYLPHENOL | 10 | ND | ND |
| 4,6-DINITRO-o-CRESOL | 20 | ND | ND |
| 2,4-DINITROPHENOL | 50 | ND | ND |
| 2-NITROPHENOL | 20 | ND | ND |
| 4-NITROPHENOL | 50 | ND | ND |
| p-CHLORO-m-CRESOL | 10 | ND | ND |
| PENTACHLOROPHENOL | 10 | ND | ND |
| PHENOL | 10 | ND | ND |
| 2,4,6-TRICHLOROPHENOL | 10 | ND | ND |

| SURROGATE COMPOUNDS | PERCENT RECVRY | PERCENT RECVRY |
|---|---|---|
| 2-F-PHENOL | 32 | 41 |
| PHENOL-D6 | 26 | 33 |
| 2,4,6-TRIBROMOPHENOL | 25 | 30 |

The lab blank data from the orininal acid/base-neutral analyses can be found on pages 14, 15, and 16 of our July 8, 1986 report to you.

APPROVED: John J. Caingle

ATTACHMENT I - STANDARD CLAUSES

ENVIRODYNE ENGINEERS, INC.

CLIENT: BURNS AND McDONNELL REPORT DATE: JULY 8,1986

---

The testing services provided herein have been performed, findings obtained, and reports prepared in accordance with generally accepted testing laboratory principles and practices. This warrenty is in lieu of all other warrenties, either expressed or implied.

These tests were conducted in accordance with the standards and procedures specified. Interpretations of the results should take into account that there is a generally recognized and accepted degree of error associated with these and all laboratory analytical tests.

These analyses have been made (tests performed) and report prepared based upon the specific sample(s) provided to us by the client or his/her representative for testing. We assume no responsiblity for variations in quality, composition, appearance, performance, etc. or any other feature of similar subject matter produced, manufactured, fabricated, etc. by persons or under conditions over which we have no control.

Samples will not be held by the laboratory for more than 60 days after the date of receipt. Any extension of this time must be evidenced by written agreement between the laboratory and the client.

This REPORT OF ANALYSIS is furnished in strict confidence for the exclusive use of the client and his/her representatives, and no distribution of all or part of the report shall be made to third parties without the prior written approval of Envirodyne Engineers, Inc. (EEI).

---

GROSS ALPHA AND BETA

MAY, 1986

Oak Ridge Associated Universities
Post Office Box 117
Oak Ridge, Tennessee 37831-0117

Manpower Education, Research, and Training Division

May 27, 1986

WEST LAKE COMPANIES
RECEIVED
JUN 03 1986
PRESIDENT

Dr. Germain LaRoche
Uranium Fuel Licensing Branch
Division of Fuel Cycle and Material Safety
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: GROSS ALPHA AND GROSS BETA RESULTS - WEST LAKE LANDFILL WELLS

Dear Dr. LaRoche:

Enclosed are the results of our gross alpha and gross beta analyses, performed on 32 well water samples, collected May 7 and 8 at the West Lake Landfill site near St. Charles, Missouri. As can be noted, many of the samples exceed the 5 pCi/l gross alpha level requiring isotopic analyses. Therefore, analyses for Ra-226, Ra-228, isotopic uranium, and isotopic thorium have been initiated; results of these analyses will be available in about 3 weeks.

If you have any questions, please contact me at FTS 626-3305.

Sincerely,

James D. Berger
Program Manager
Radiological Site Assessment Program

JDB/clt

cc: W. Crow - NMSS
S. Banerji - University of Missouri (Columbia)

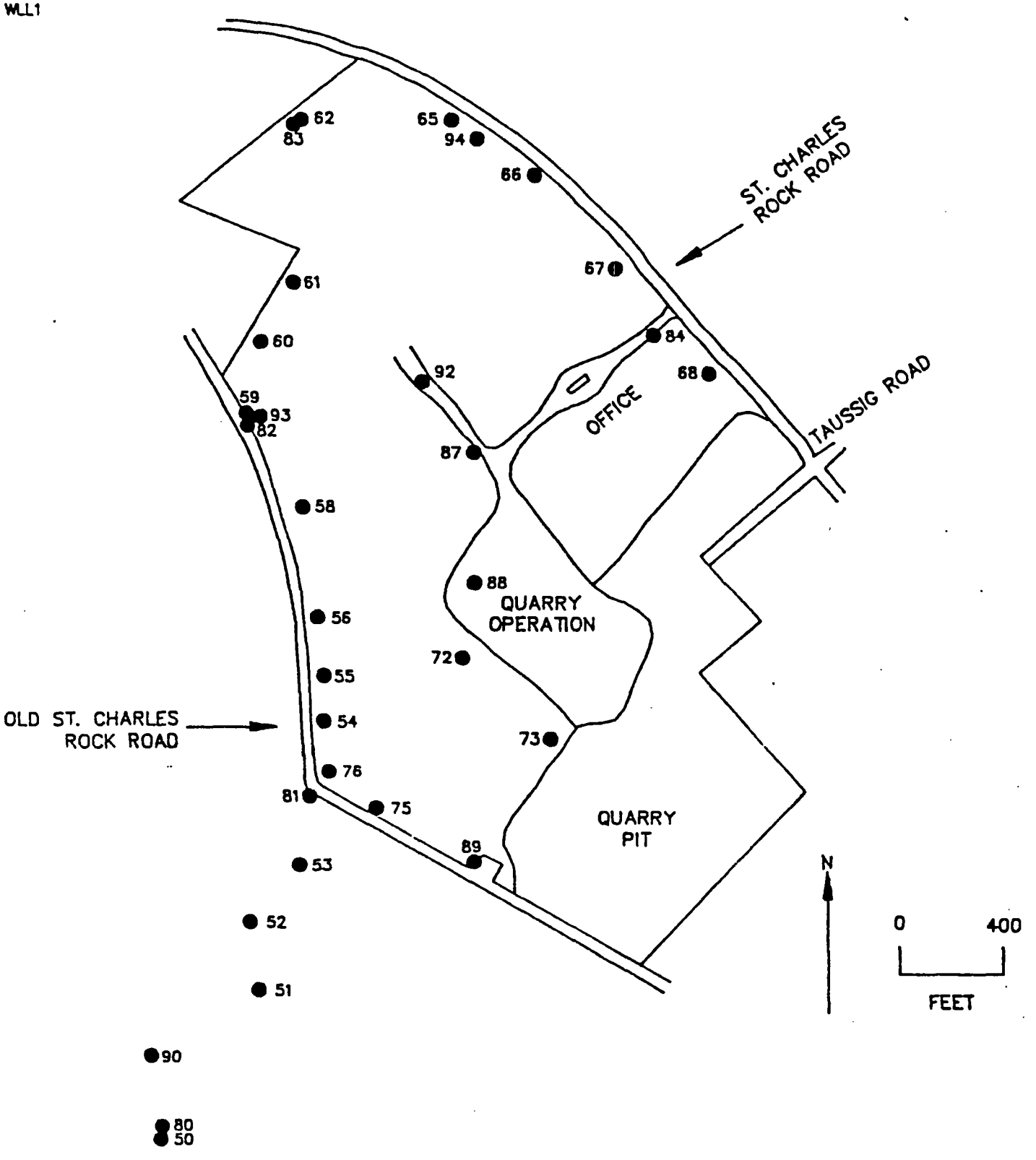
Enclosures

GROSS ALPHA AND GROSS BETA CONCENTRATIONS
IN WELL WATER SAMPLES: MAY 7-8, 1986
WEST LAKE LANDFILL
ST. LOUIS, MISSOURI

| Well[a] Identification | Date Sampled | Depth To Water[b] (m) | Radioactivity Concentrations (pCi/l) Gross Alpha | Gross Beta |
|---|---|---|---|---|
| 50 | 5/8 | 5.0 | 2.23 ± 1.07[c] | 7.45 ± 1.36 |
| 51 | 5/7 | 3.8 | 2.24 ± 1.12 | 4.37 ± 1.30 |
| 52 | 5/7 | 3.2 | 1.88 ± 0.83 | 7.51 ± 1.16 |
| 53 | 5/7 | 3.3 | 10.6 ± 1.8 | 15.5 ± 1.7 |
| 54 | 5/7 | 15.5 | 4.35 ± 2.08 | 14.4 ± 3.1 |
| 55 | 5/7 | 11.5 | 4.84 ± 1.42 | 13.9 ± 1.7 |
| 56 | 5/7 | 12.8 | 5.69 ± 1.41 | 11.9 ± 1.6 |
| 58 | 5/7 | 14.0 | 5.76 ± 1.34 | 14.6 ± 1.6 |
| 59 | 5/7 | d | 11.3 ± 3.3 | 45.7 ± 4.4 |
| 60 | 5/7 | 3.5 | 14.3 ± 1.9 | 19.0 ± 1.9 |
| 61 | 5/7 | 4.5 | 3.33 ± 0.94 | 14.0 ± 1.4 |
| 62 | 5/7 | 4.2 | 5.55 ± 1.26 | 10.1 ± 1.3 |
| 65 | 5/7 | 1.9 | 3.53 ± 1.17 | 7.39 ± 1.40 |
| 66 | 5/7 | 1.9 | 1.75 ± 0.96 | 9.94 ± 1.38 |
| 67 | 5/7 | 1.5 | 8.42 ± 1.69 | 7.10 ± 1.55 |
| 68 | 5/7 | 4.4 | 0.90 ± 1.65 | 1.91 ± 2.83 |
| 72 | 5/8 | 10.0 | 1.39 ± 1.23 | 4.60 ± 1.65 |
| 73 | 5/8 | 8.4 | 6.50 ± 1.53 | 7.72 ± 1.57 |
| 75 | 5/7 | 7.6 | 10.5 ± 2.9 | 22.3 ± 3.5 |
| 76 | 5/8 | 13.8 | 3.60 ± 1.28 | 6.89 ± 1.77 |
| 80 | 5/8 | 5.3 | 8.28 ± 2.19 | 13.3 ± 2.5 |
| 81 | 5/7 | 4.8 | 7.91 ± 1.77 | 15.6 ± 1.9 |
| 82 | 5/7 | 5.1 | 17.0 ± 5.5 | 46.8 ± 6.6 |
| 83 | 5/7 | 3.9 | 8.99 ± 1.77 | 17.8 ± 2.1 |
| 84 | 5/8 | 7.0 | 13.1 ± 4.2 | 27.3 ± 4.7 |
| 87 | 5/8 | 9.4 | 1.47 ± 1.44 | 7.22 ± 2.36 |
| 88 | 5/8 | 8.6 | 10.7 ± 2.5 | 17.7 ± 2.7 |
| 89 | 5/8 | 7.5 | 3.73 ± 1.27 | 9.10 ± 1.55 |
| 90 | 5/7 | 4.1 | 2.23 ± 0.92 | 6.81 ± 1.52 |
| 92 | 5/8 | 13.1 | 7.25 ± 1.88 | 11.3 ± 2.5 |
| 93 | 5/7 | 4.7 | 7.42 ± 1.99 | 21.7 ± 2.9 |
| 94 | 5/7 | 2.1 | 1.62 ± 0.89 | |

[a]Refer to attached Figure.
[b]As measured below ground surface.
[c]Errors are 2σ based only on counting statistics.
[d]Depth not determined.

WLL1




Well Sampling Locations at West Lake Landfill
May 7 and 8, 1986

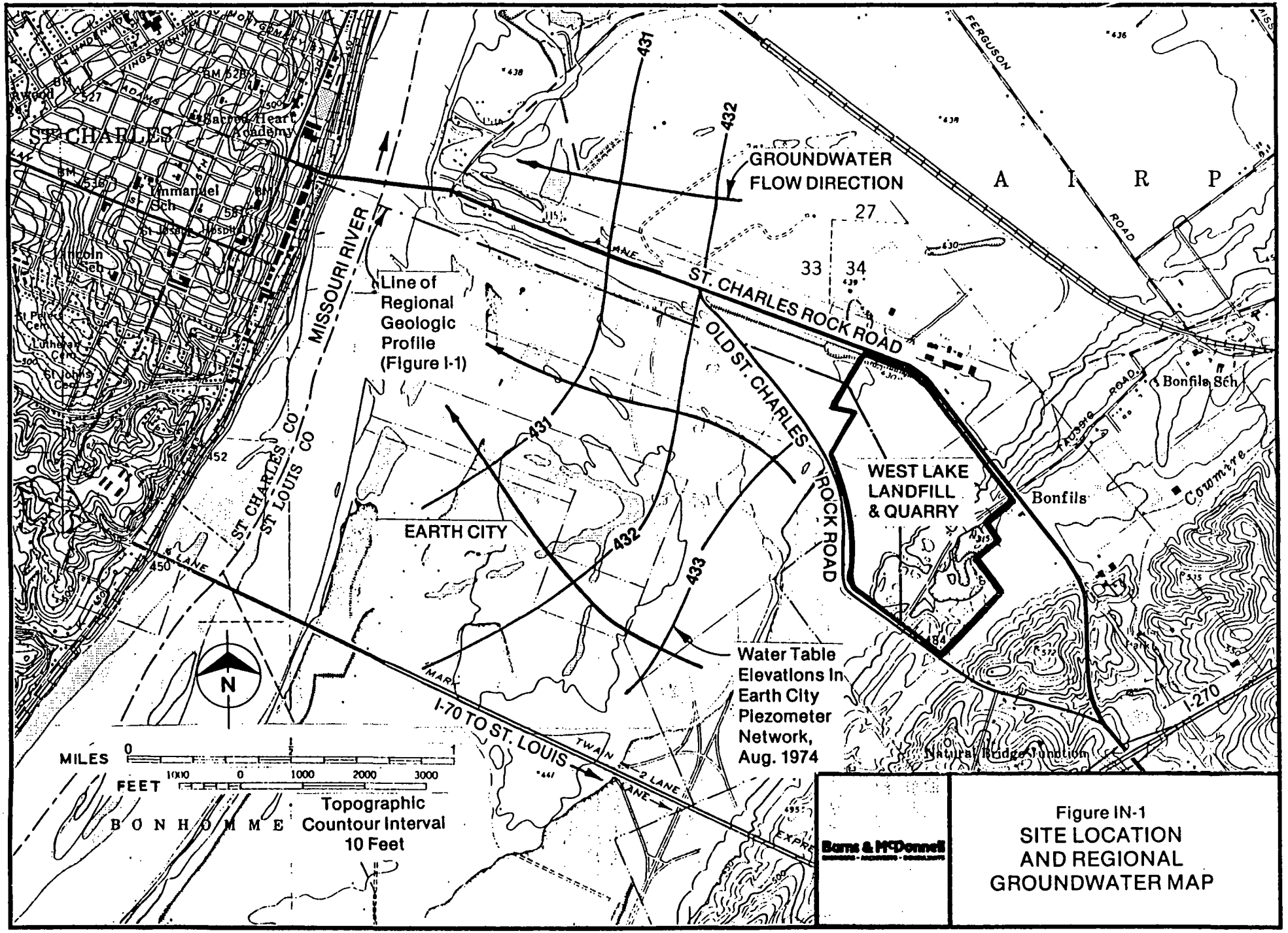
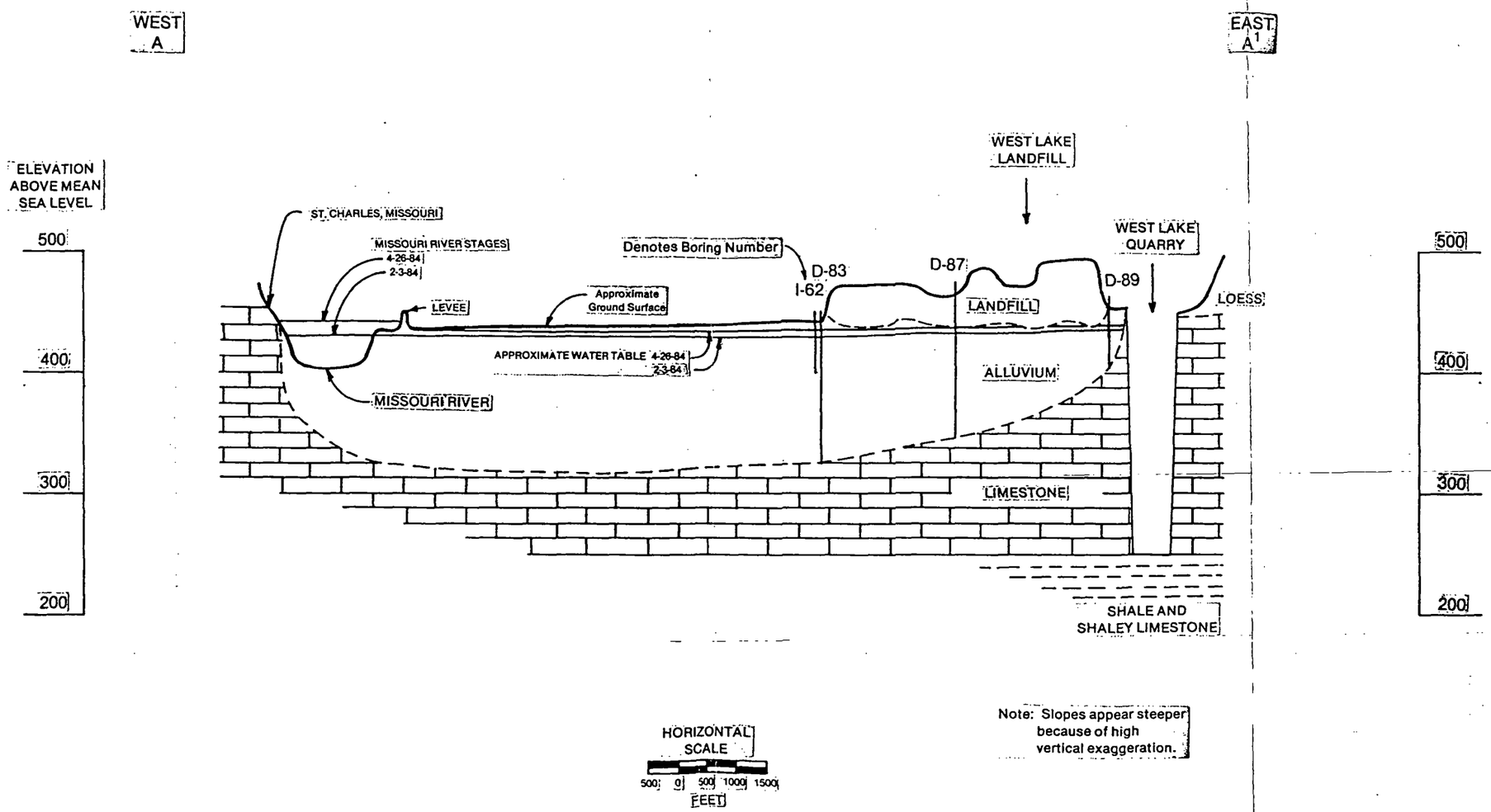
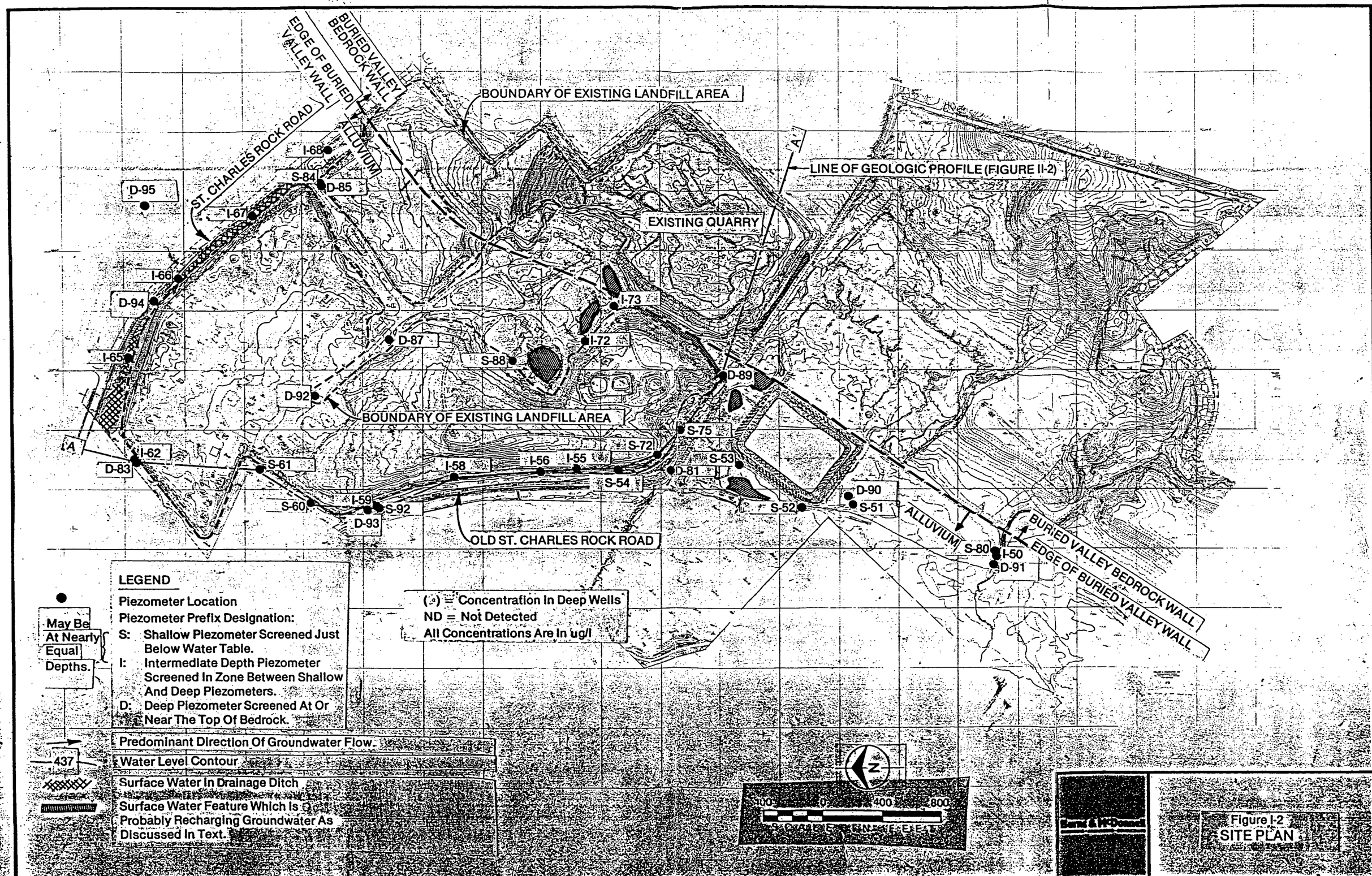



Figure IN-1
SITE LOCATION AND REGIONAL GROUNDWATER MAP




Barns & McDonnell

Figure I-1
REGIONAL GEOLOGIC PROFILE




Burns & McDonnell

Figure I-2
SITE PLAN

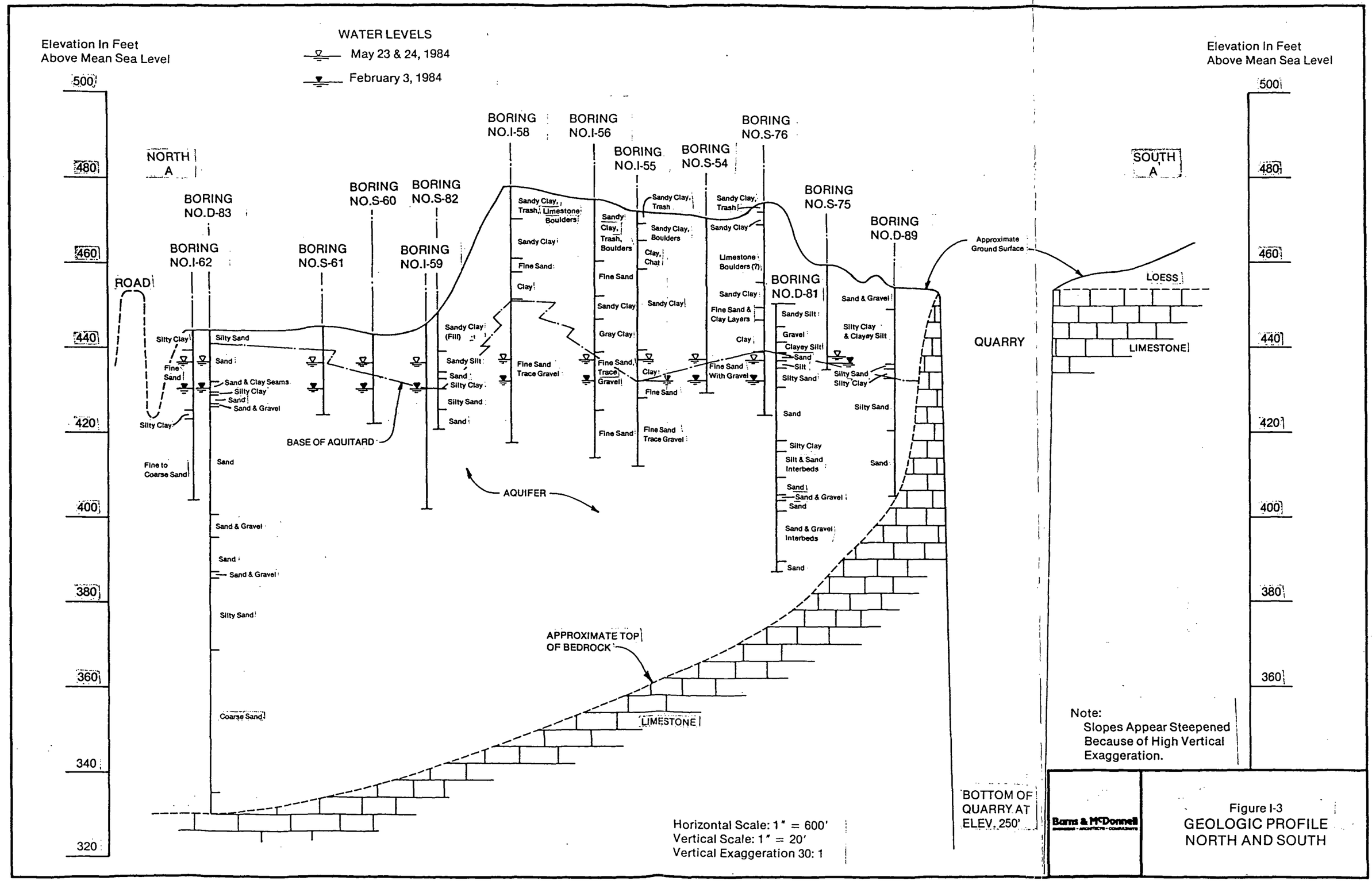



Figure I-3
GEOLOGIC PROFILE
NORTH AND SOUTH

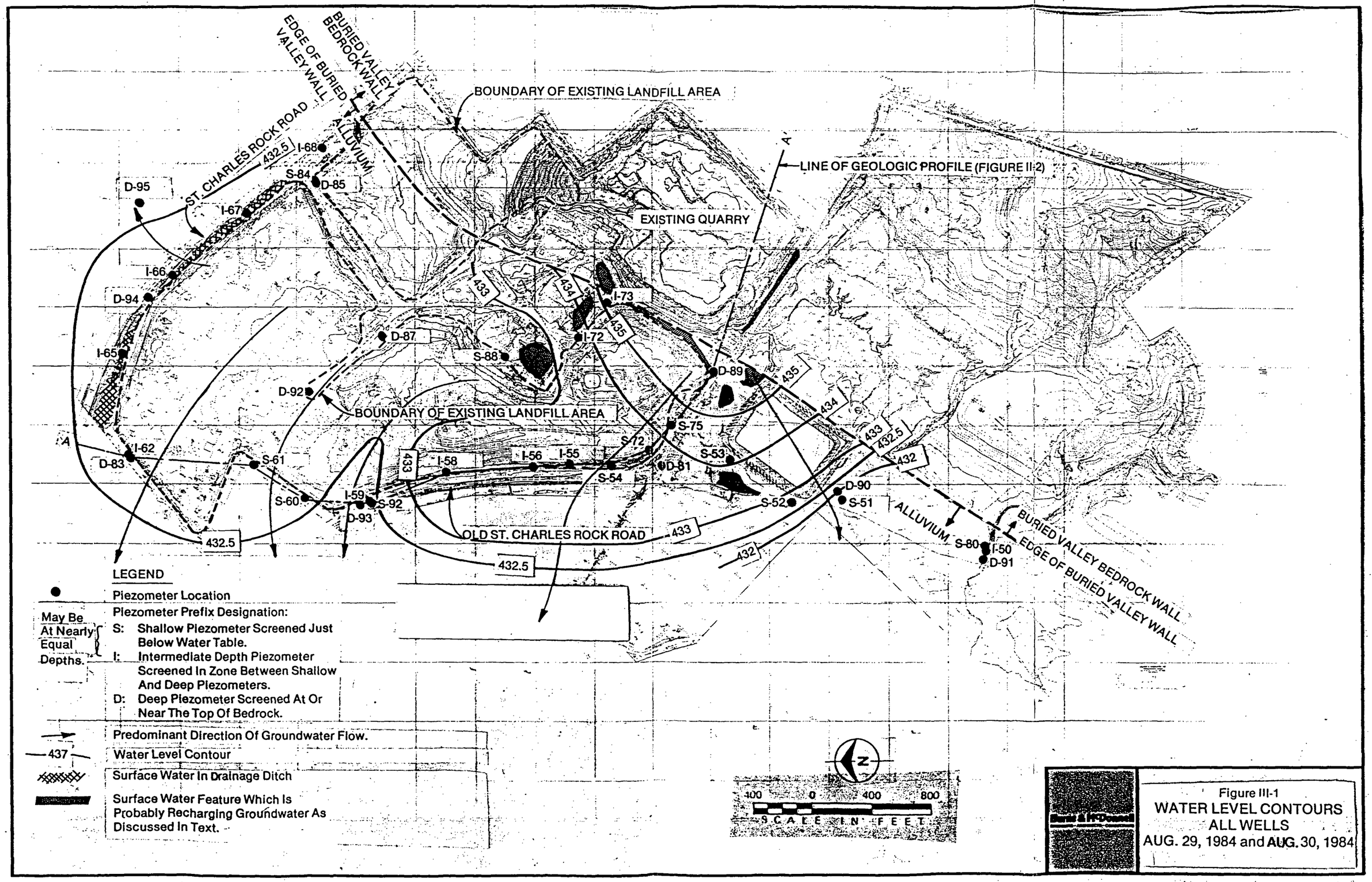



Figure III-1
WATER LEVEL CONTOURS
ALL WELLS
AUG. 29, 1984 and AUG. 30, 1984

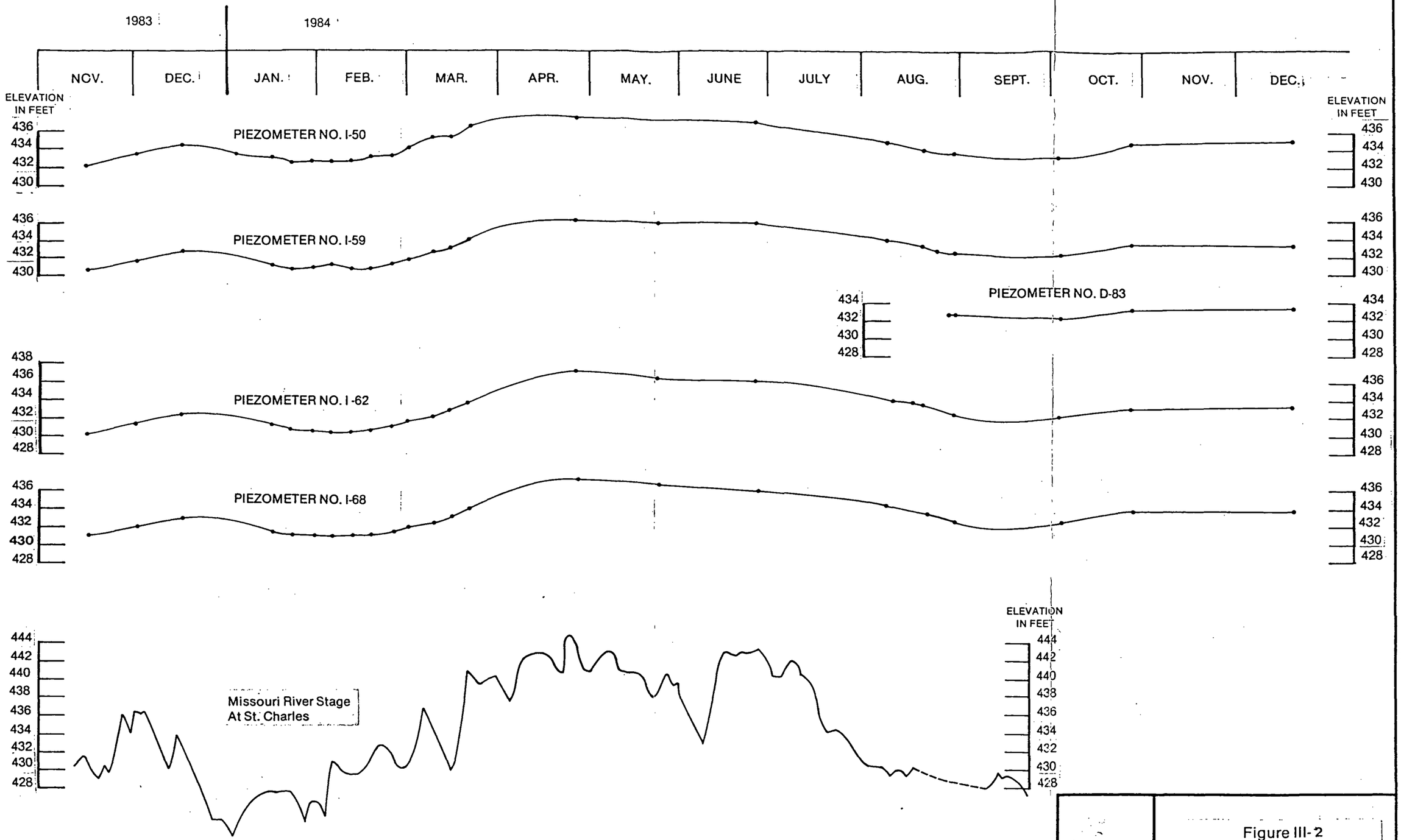
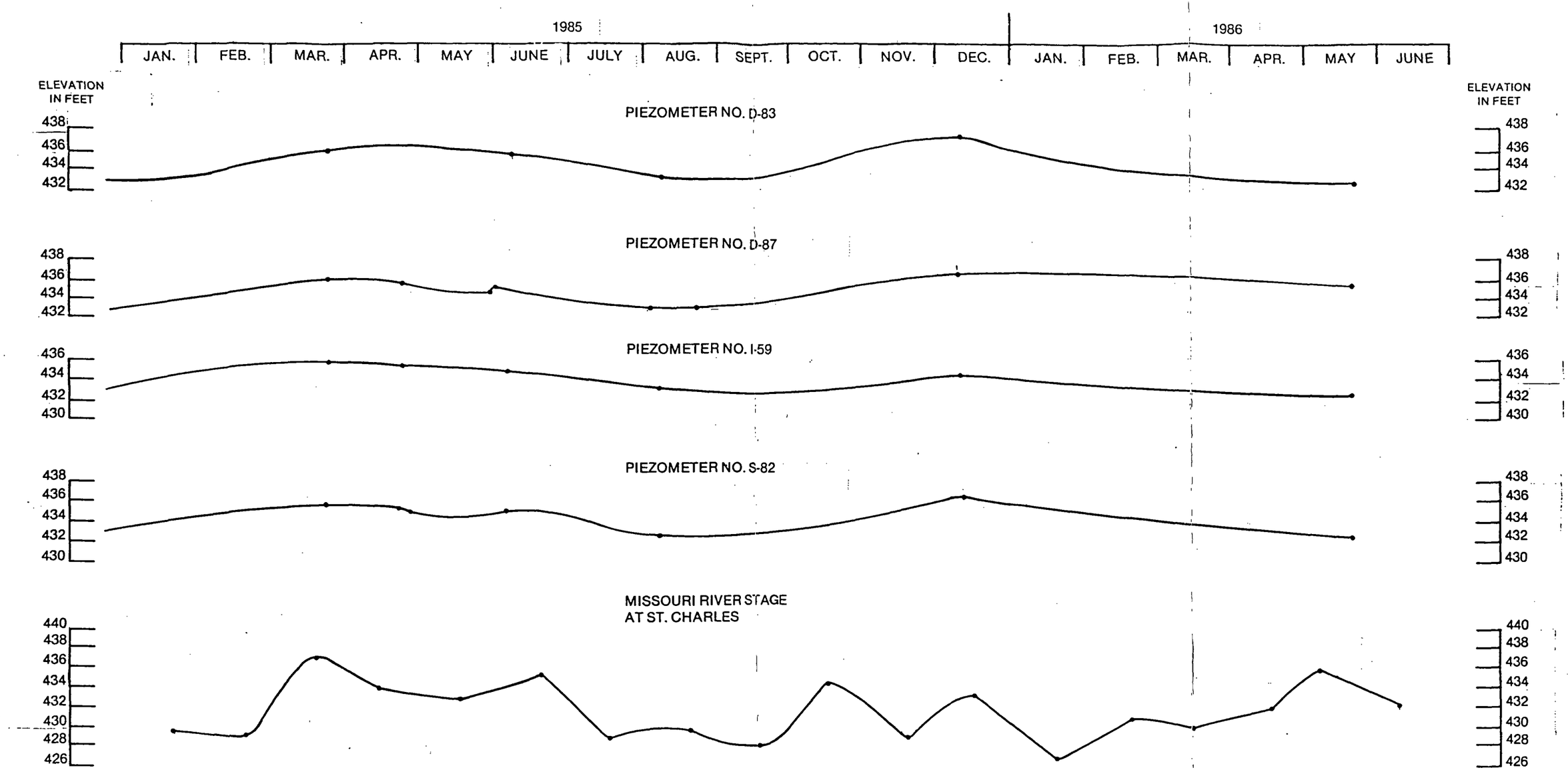



Figure III-2
PIEZOMETER AND RIVER HYDROGRAPHS
NOV. 1983-DEC. 1984




Burns & McDonnell

Figure III-3
PIEZOMETER AND RIVER HYDROGRAPHS
JAN. 1985 - JUNE 1986

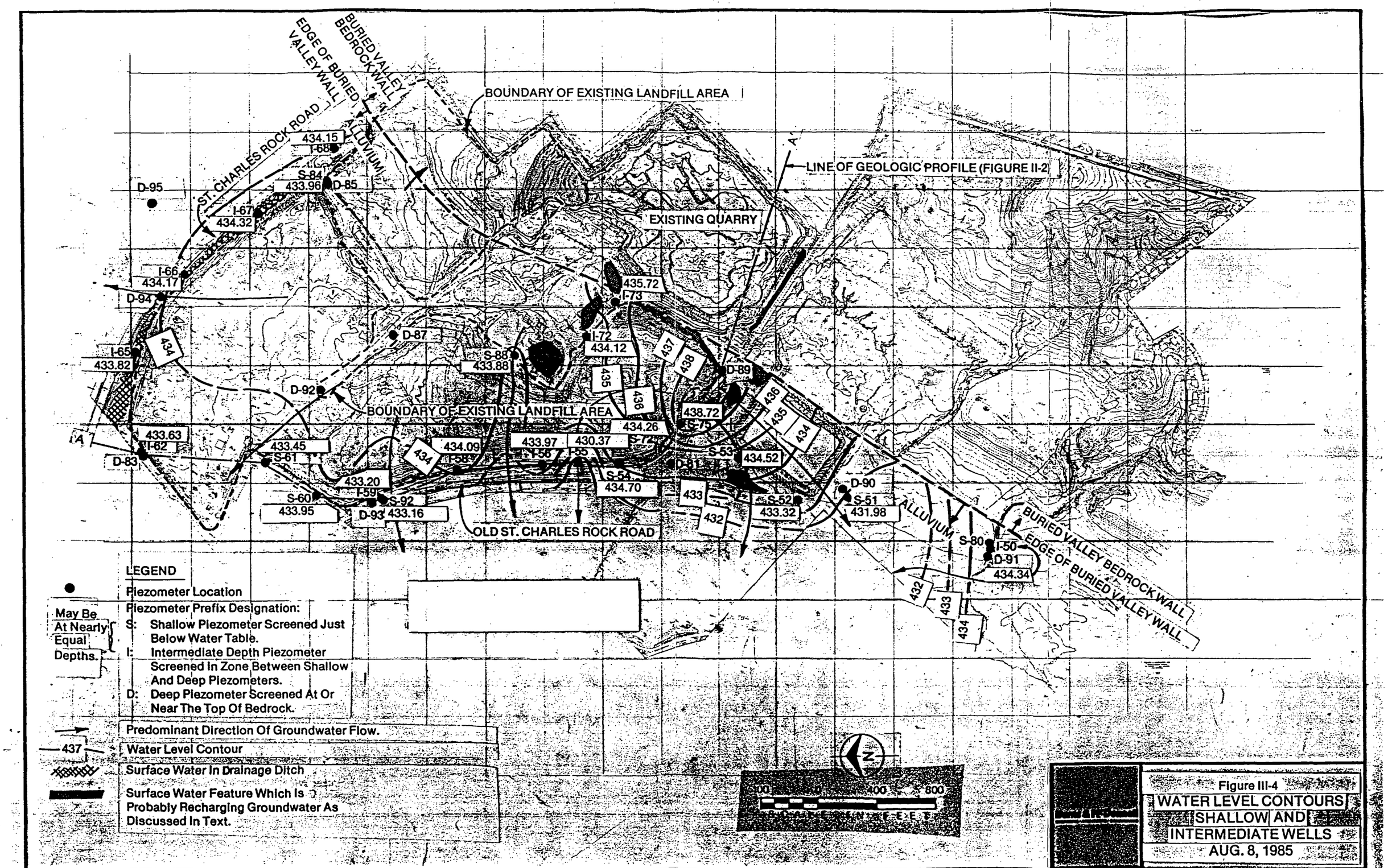



Figure III-4
WATER LEVEL CONTOURS
SHALLOW AND INTERMEDIATE WELLS
AUG. 8, 1985

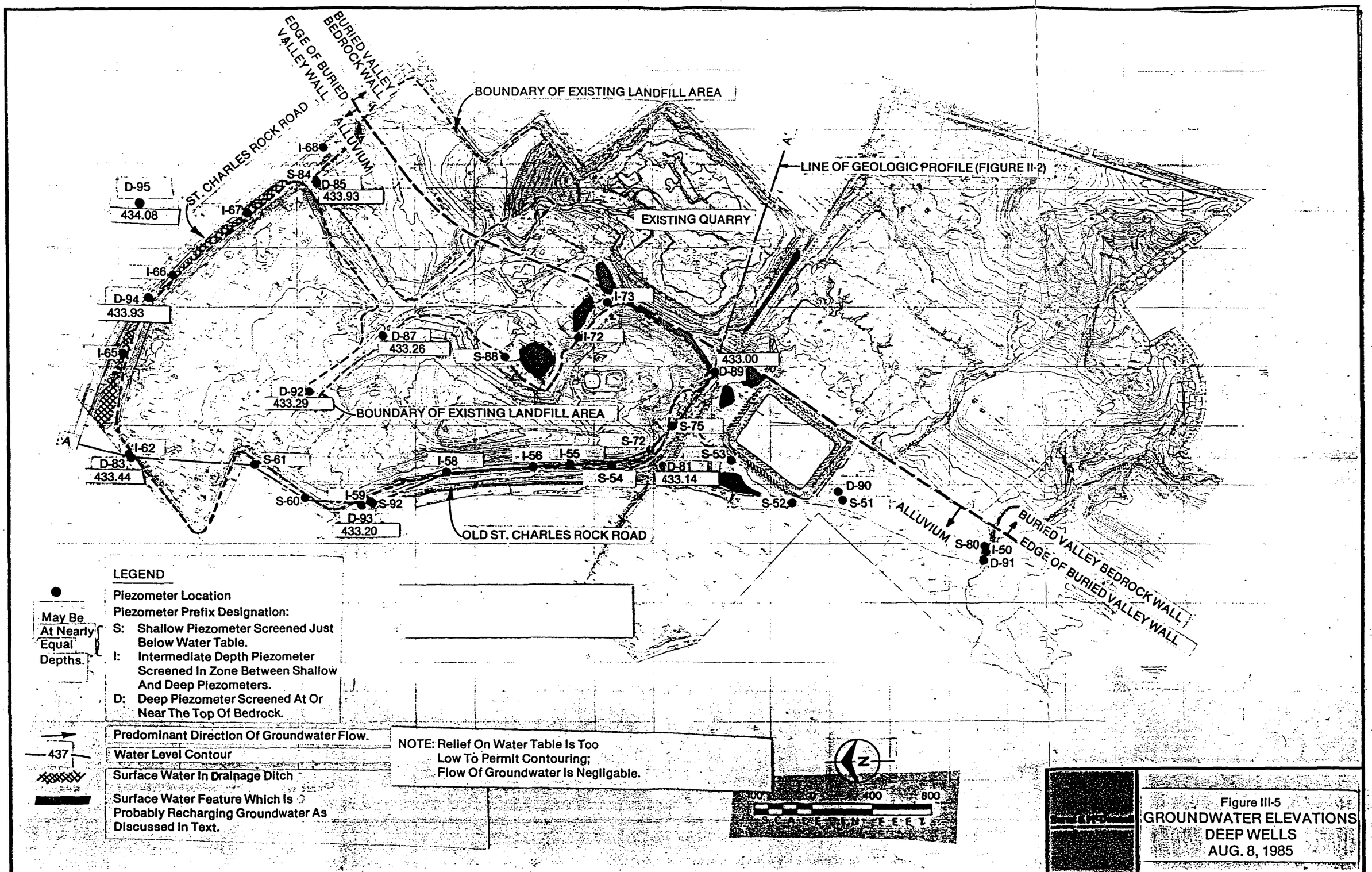



Figure III-5
GROUNDWATER ELEVATIONS
DEEP WELLS
AUG. 8, 1985

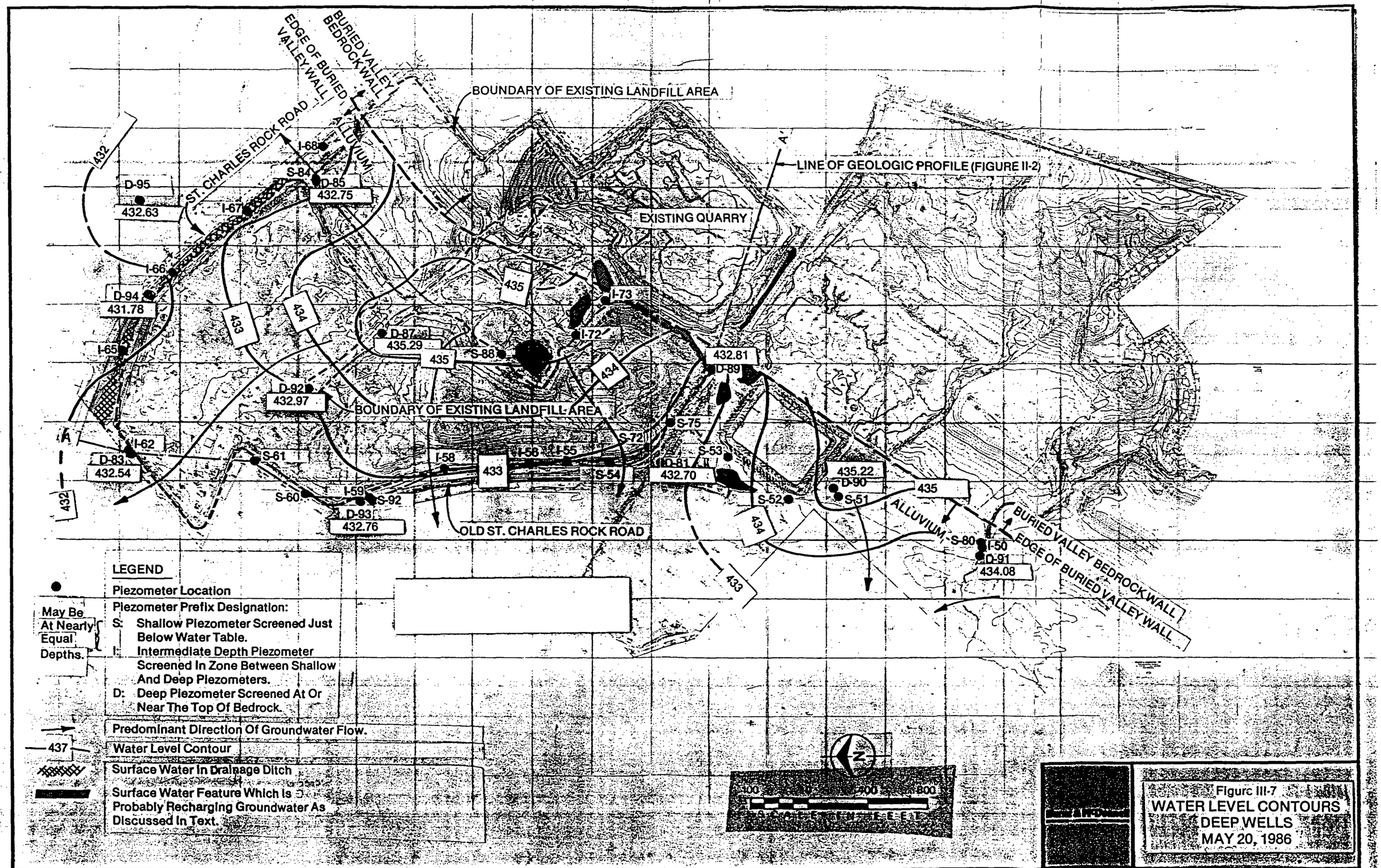



Figure III-7
WATER LEVEL CONTOURS
DEEP WELLS
MAY 20, 1986

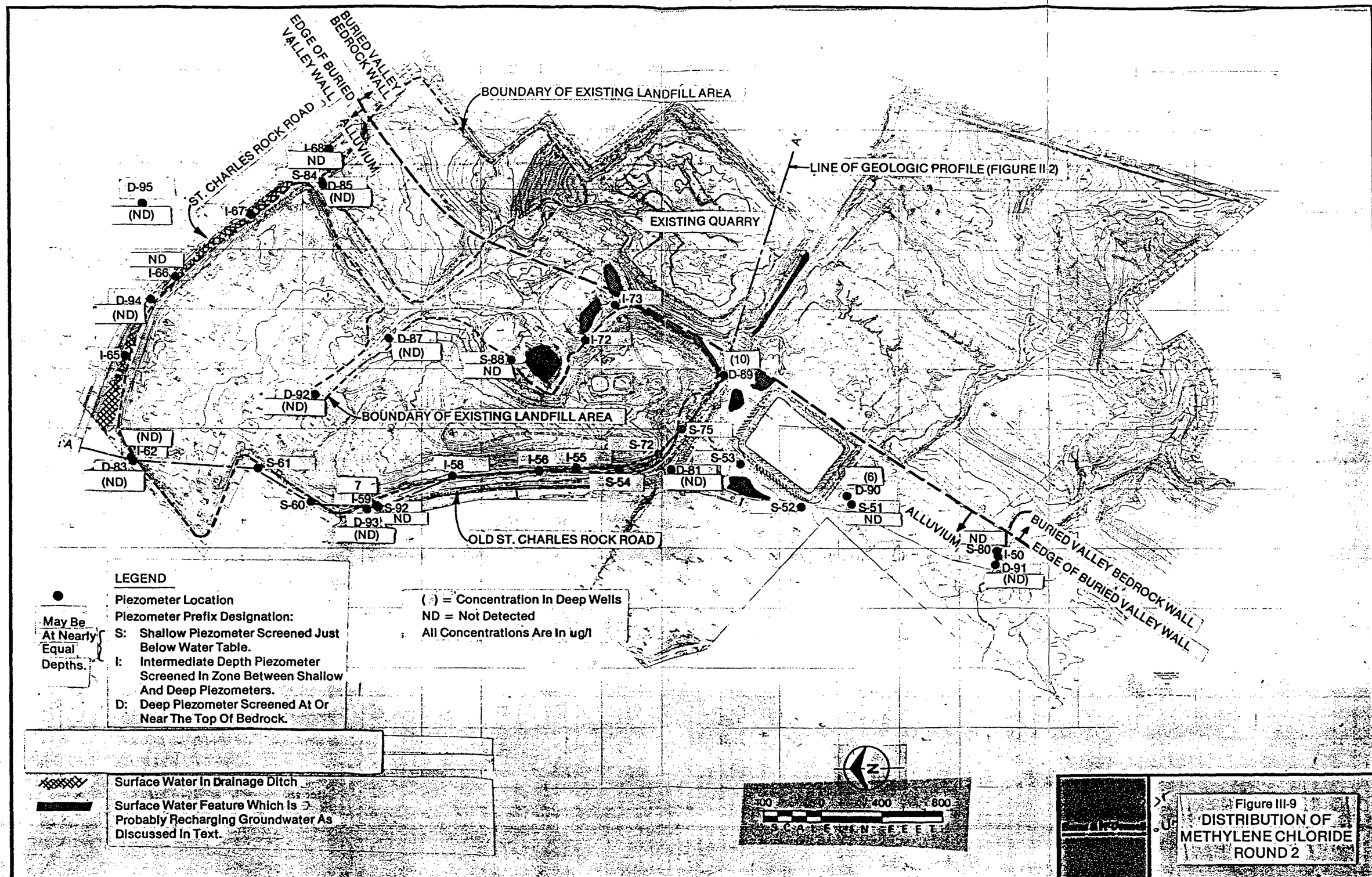



Figure III-9
DISTRIBUTION OF METHYLENE CHLORIDE ROUND 2

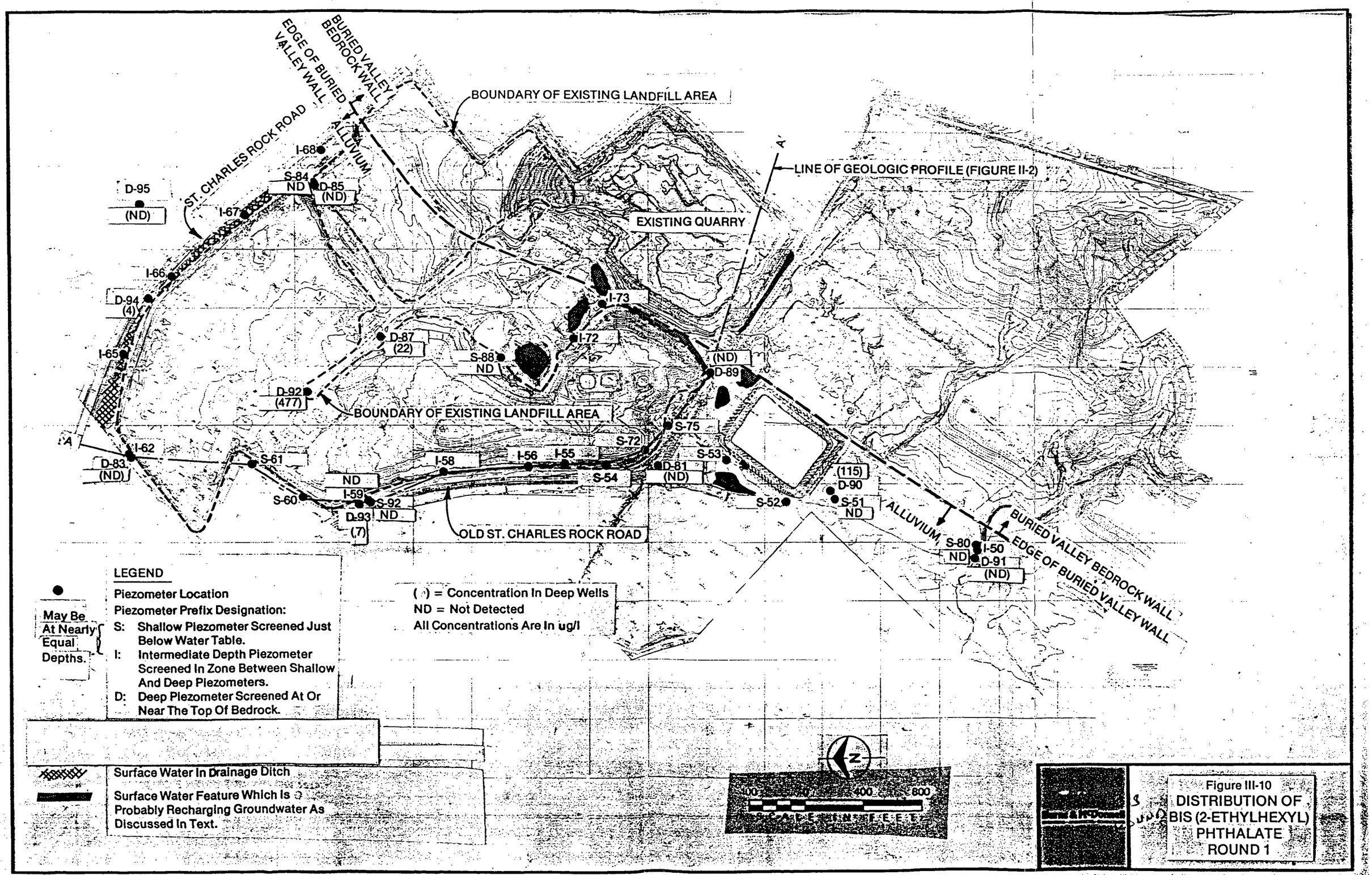



Figure III-10
DISTRIBUTION OF BIS (2-ETHYLHEXYL) PHTHALATE ROUND 1

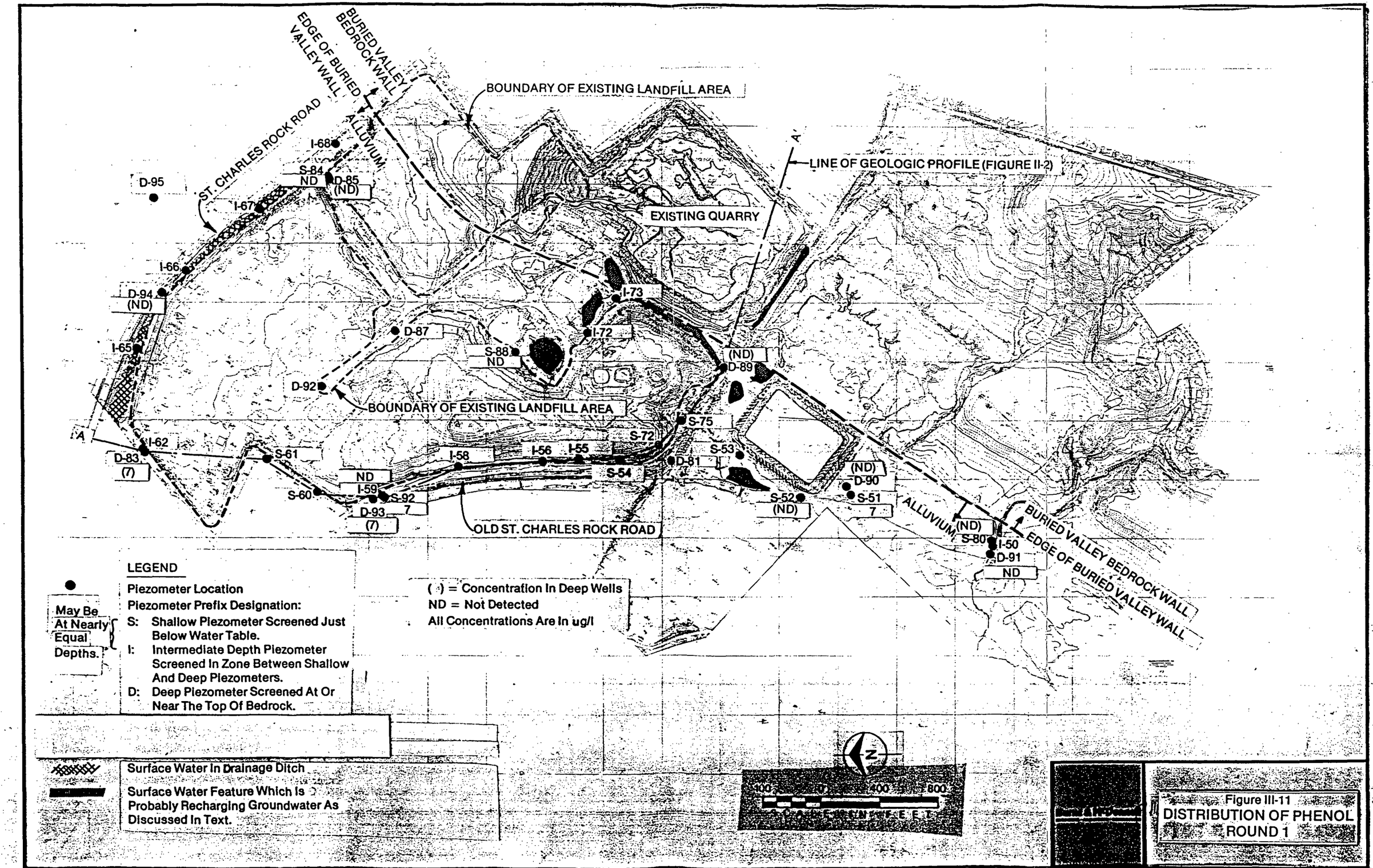



Figure III-11
DISTRIBUTION OF PHENOL
ROUND 1

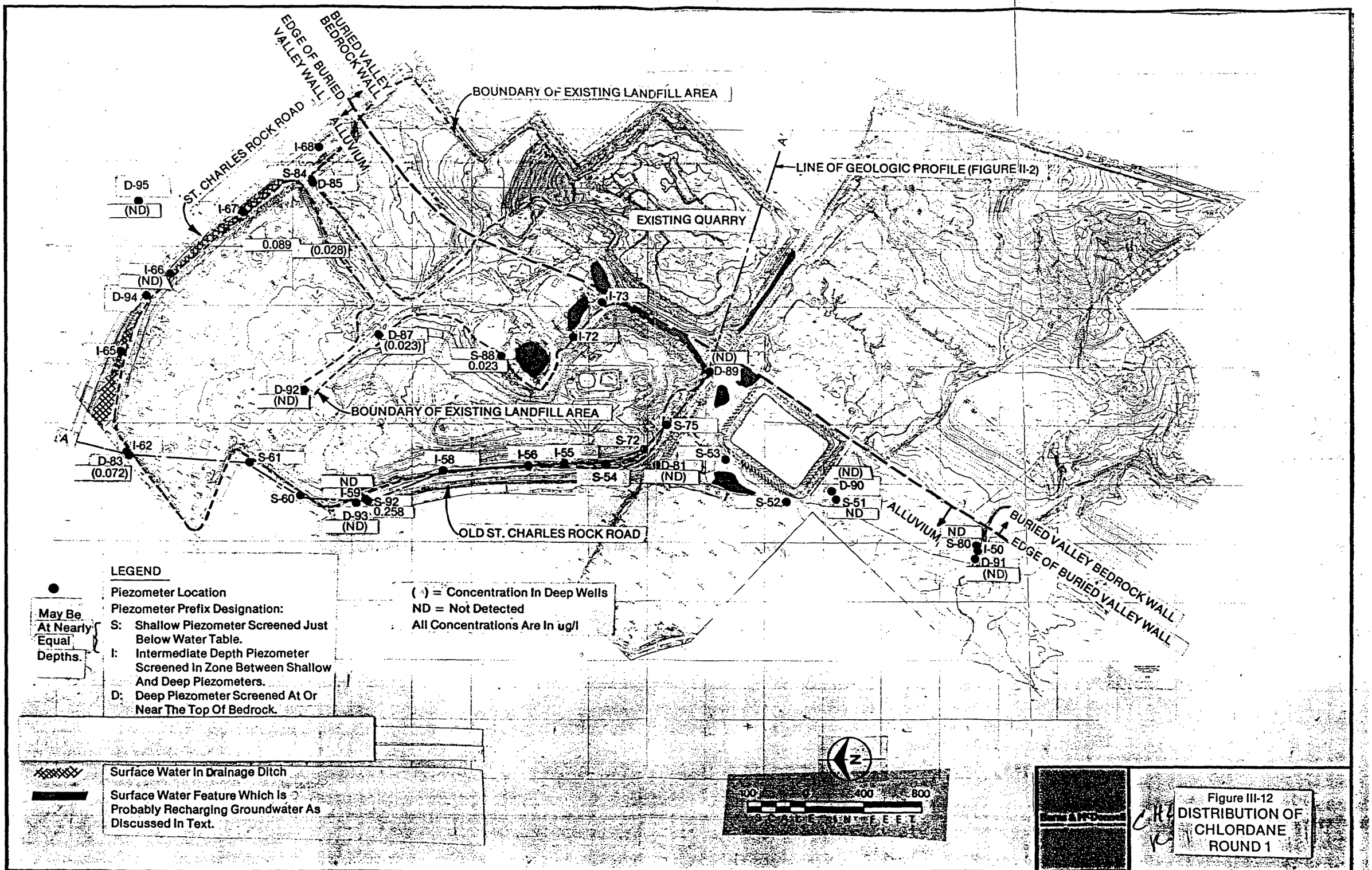



Figure III-12
DISTRIBUTION OF CHLORDANE ROUND 1

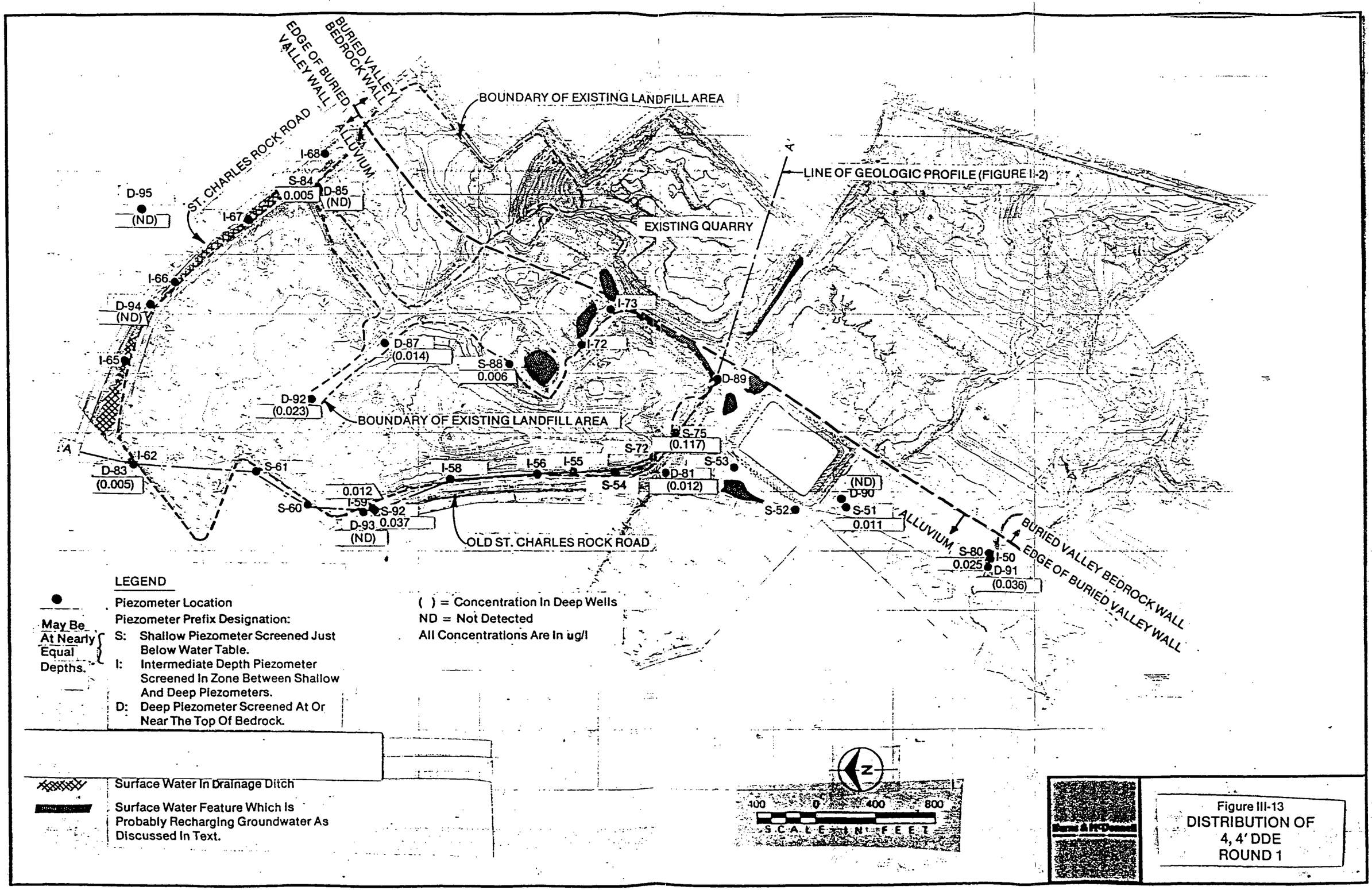



Figure III-13
DISTRIBUTION OF
4, 4' DDE
ROUND 1

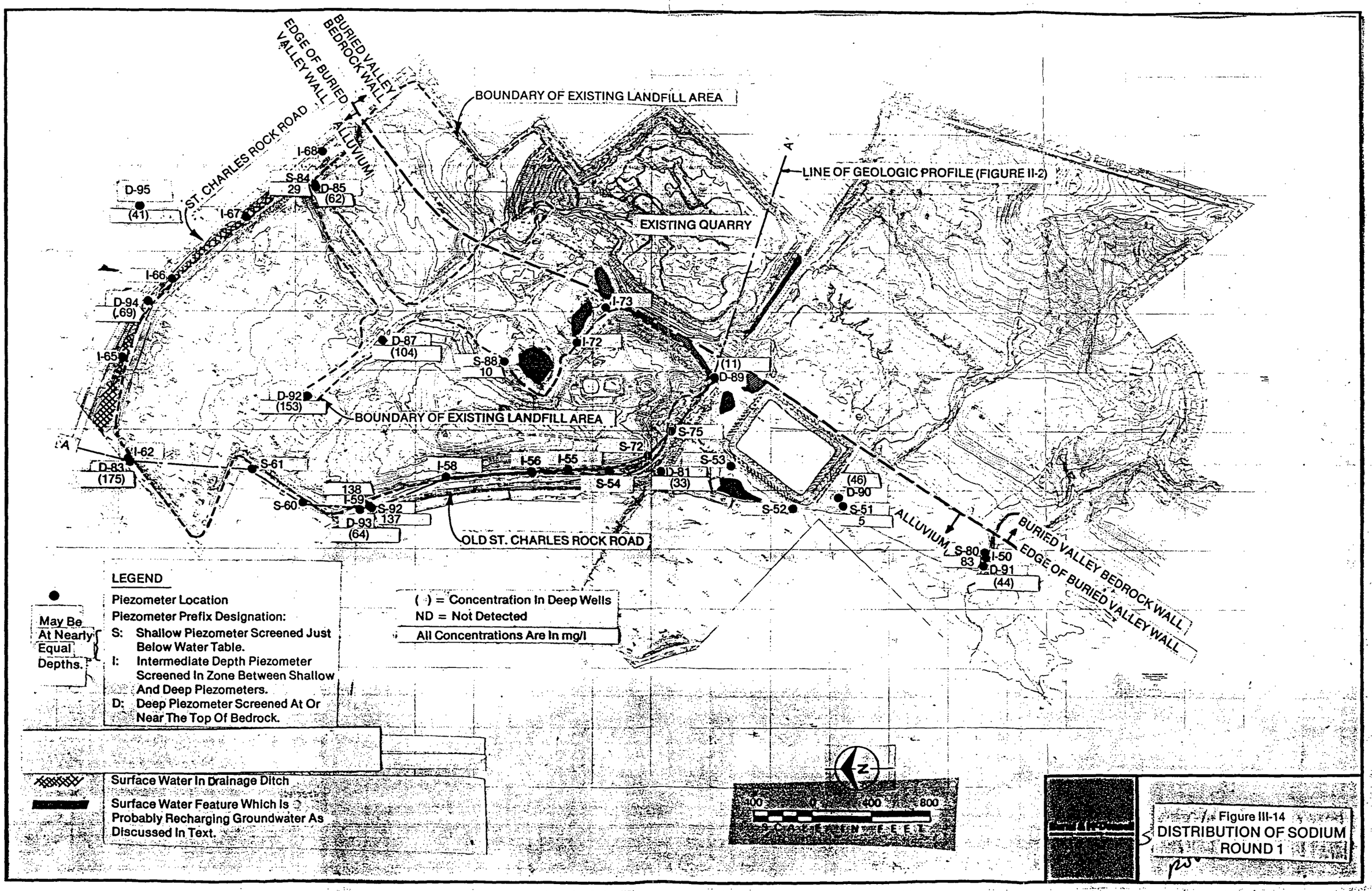



Figure III-14
DISTRIBUTION OF SODIUM
ROUND 1

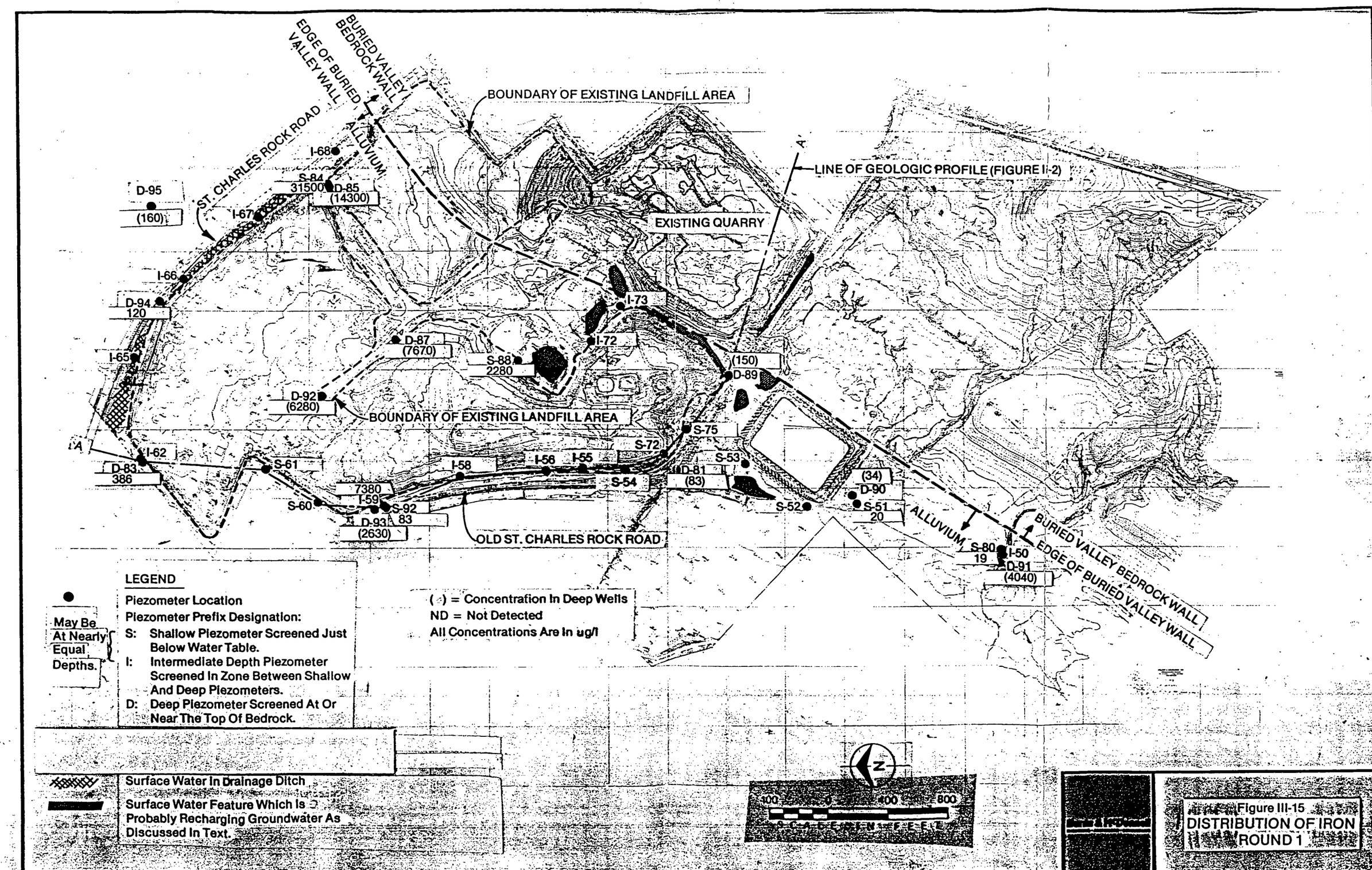



Figure III-15
DISTRIBUTION OF IRON
ROUND 1

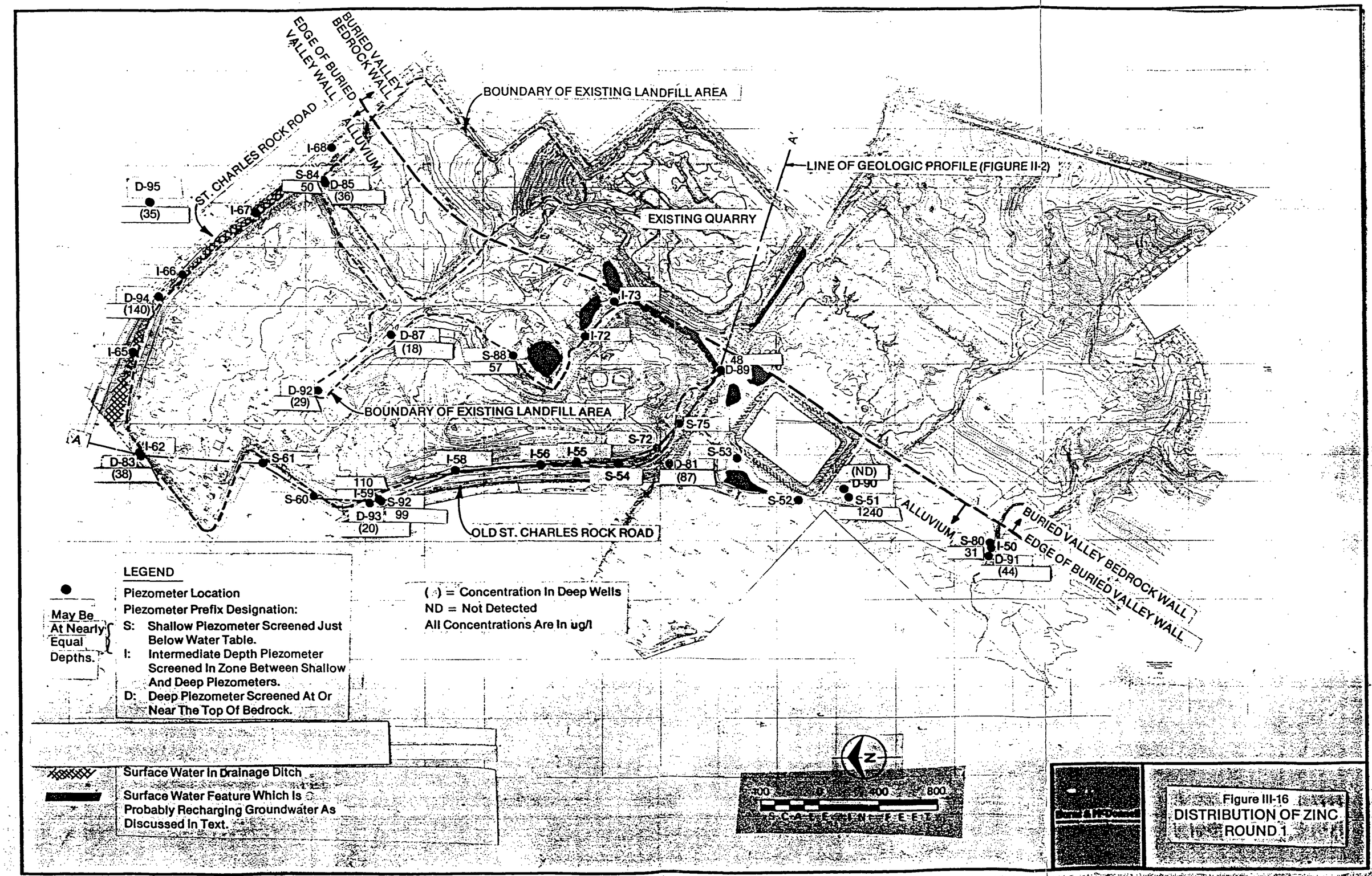



Figure III-16
DISTRIBUTION OF ZINC
ROUND 1

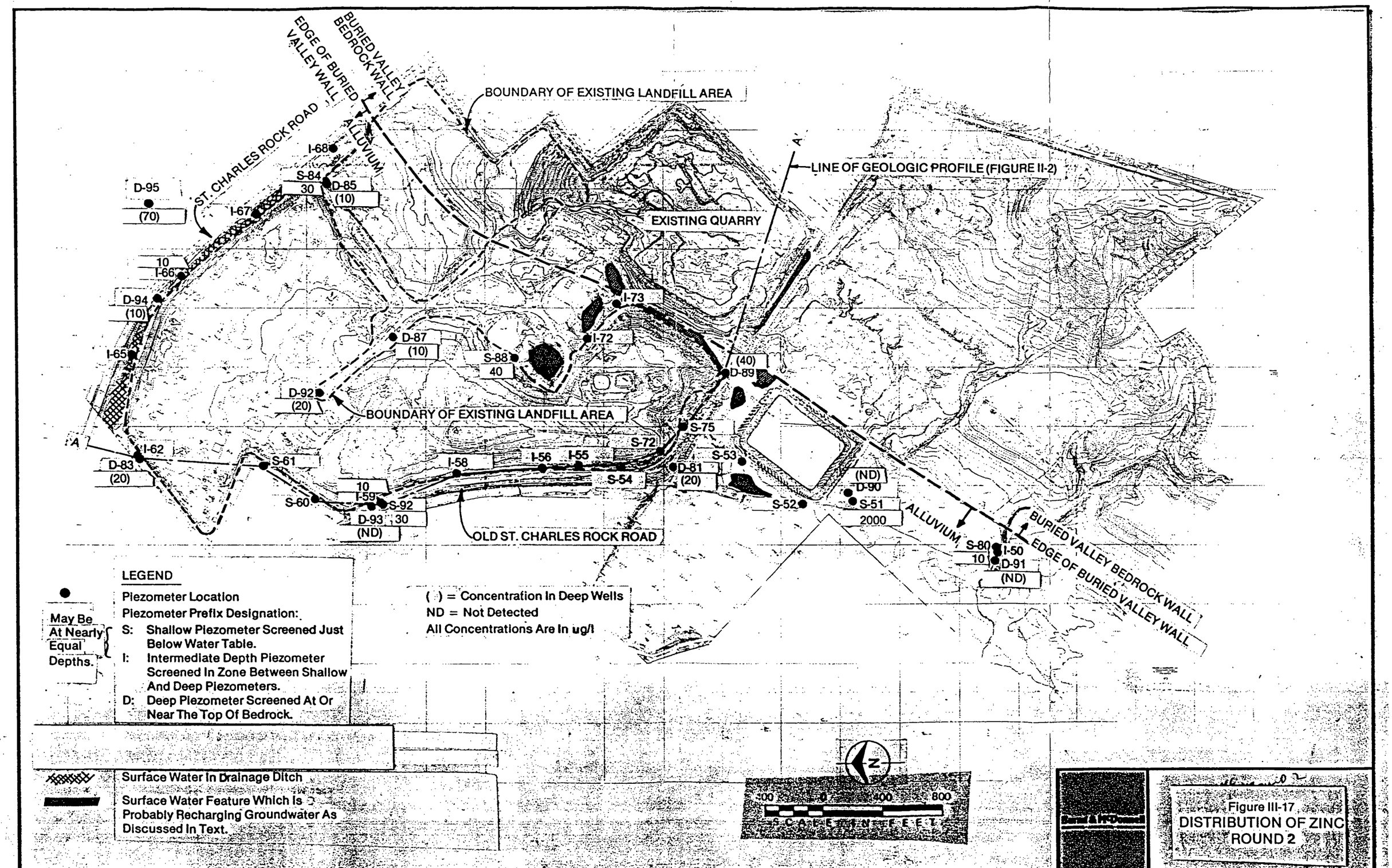



Figure III-17
DISTRIBUTION OF ZINC
ROUND 2

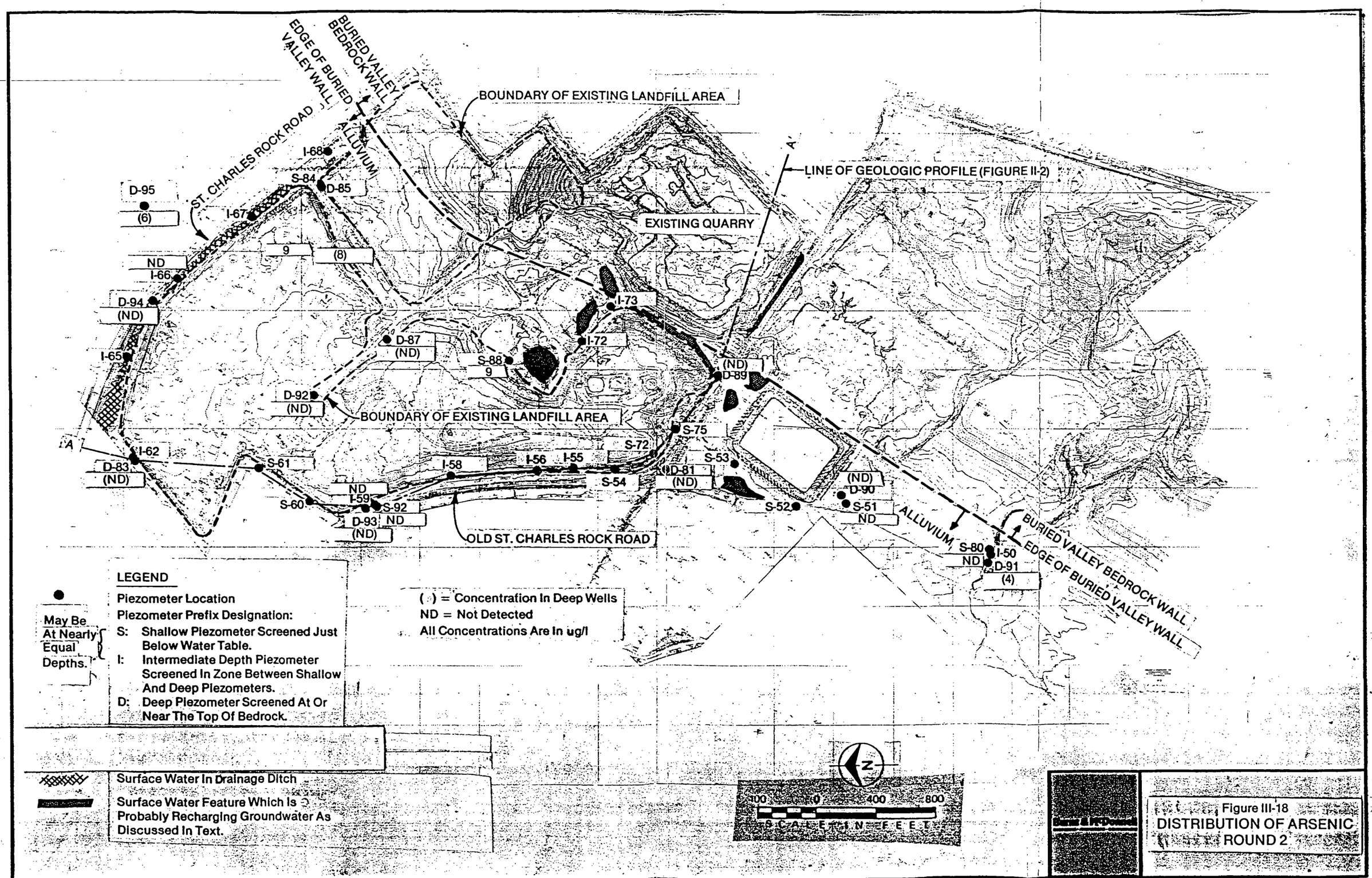



Figure III-18
DISTRIBUTION OF ARSENIC
ROUND 2

NUREG/CR-2722

# Radiological Survey of the West Lake Landfill St. Louis County, Missouri

Manuscript Completed: April 1982
Date Published: May 1982

Prepared by
L. F. Booth, D. W. Groff, G. S. McDowell, J. J. Adler,
S. I. Peck, P. L. Nyerges, F. L. Bronson

Radiation Management Corporation
3356 Commercial Avenue
Northbrook, IL 60062

Prepared for
Division of Fuel Cycle and Material Safety
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
NRC FIN B6901

EXHIBIT 13-C

ABSTRACT

This report presents the results of a radiological survey of the West Lake Landfill, St. Louis County, Missouri, performed by Radiation Management Corporation during the spring and summer of 1981. Measurements were made to determine external radiation levels, concentrations of airborne contaminants and the identity and concentrations of subsurface deposits. Results indicate that large volumes of uranium ore residues, probably originating from the Hazelwood, Missouri, Latty Avenue site, have been buried at the West Lake Landfill. Two areas of contamination, covering more than 15 acres and located at depths of up to 20 feet below the present surface, have been identified. There is no indication that significant quantities of contaminants are moving off-site at this time.

## LIST OF FIGURES


1. Aerial view of West Lake Landfill, St. Louis County Missouri. 25
2. West Lake Landfill aerial survey isopleths. 26
3. External gamma radiation levels, November, 1980. 27
4. External gamma radiation levels, May, 1981. 28
5. Grid locations for radiological survey, Area 1. 29
6. Grid locations for radiological survey, Area 2. 30
7. Location of surface soil samples, Area 1. 31
8. Location of surface soil samples, Area 2. 32
9. Location of auger holes Area 1. 33
10. Location of auger holes Area 2. 34
11. Auger hole NaI(Tl) count rate vs IG *in situ* measurements. 35
12. Location of subsurface contamination and surface radiation levels, Area 1. 36
13. Location of subsurface contamination and surface radiation levels, Area 2. 37
14. Auger hole elevations and locations of contamination. 38
15. Cross section A-A of subsurface deposits in Area 1. 39
16. Cross section B-B of subsurface deposits in Area 1. 39
17. Cross section C-C of subsurface deposits in Area 2. 40
18. Cross section D-D of subsurface deposits in Area 2. 41
19. Cross section E-E of subsurface deposits in Area 2. 42
20. Radon-222 flux measurements, at 3 locations in Area 2, for May, 1981. 43

## LIST OF TABLES


1. Gamma radiation levels and beta-gamma count rates at grid locations in Area 1. 44

2. Gamma radiation levels and beta-gamma count rates at grid locations in Area 2. 47

3. Surface soil sample gamma analyses. 56

4. Uranium and thorium radiochemical soil determinations. 58

5. Auger hole NaI counts and IG analyses. 59

6. Water sample analysis results. 73

7. Radon flux measurements using the accumulator method. 75

8. Radon flux measurements using the charcoal canister method. 79

9. Side-by-side radon flux measurements, accumulator method vs charcoal canister method. 80

10. Working level (WL) and long-lived gross alpha activity on high volume air samples. 81

11. Gamma analysis of high volume air samples for Rn-219 daughters. 83

12. Priority pollutant analyses of auger hole and leachate sludge samples. 84

13. Chemical analysis of radioactive material from Areas 1 and 2. 109

14. Summary of background measurements, in vicinity of West Lake Landfill. 110

15. Target criteria and measurements LLDs for West Lake Landfill 111

List of Figures, cont.

I-1 Portable survey instrument kit. 119

I-2 High sensitivity tissue equivalent ionization chamber system. 120

I-3 Plot of ionization chamber exposure rates versus NaI(Tl) count rate. 121

I-4 Interior of mobile laboratory. 122

I-5 *In situ* auger hole system with intrinsic germanium detector. 123

I-6 Radon sampling cells, pump and gas analyzer. 124

I-7 Automatic gas flow beta-gamma counter. 125

## I. INTRODUCTION

In August 1980, Radiation Management Corporation (RMC), under contract to the U. S. Nuclear Regulatory Commission (NRC), performed radiological evaluations of four burial grounds[1]. The first of these sites selected for evaluation was the West Lake Landfill in St. Louis County, Missouri. An initial site visit was completed in August 1980, and a preliminary radiological survey was completed in November 1980. The detailed radiological evaluation was performed in the spring and summer of 1981.

The purpose of this survey was to clearly define the radiological conditions of the West Lake Landfill site. The results of this survey should be sufficient to allow an engineering evaluation to be performed to determine whether remedial actions should and can be taken.

The methods used to evaluate this site include the following:

1) measurement of external gamma exposure rates 1 meter above the surfaces and beta-gamma count rates 1 cm above surfaces;
2) measurement of radionuclide concentrations in surface soils;
3) measurement of radionuclide concentrations in subsurface deposits;
4) measurement of gross activity and

radionuclide concentrations in surface and subsurface water samples;

5) measurement of radon flux emanating from surfaces;
6) measurement of airborne radioactivity; and
7) measurement of gross activity in vegetation.

These measurements were performed on-site using two mobile facilities designed by RMC. A small number of samples were returned to the RMC radiological laboratories in Philadelphia for analysis for nuclides which could not be detected in the field, and for quality assurance checks on the field measurements. A set of reference background measurements were made at three locations in the St. Louis area, near West Lake Landfill. In addition, a series of non-radiological measurements were performed to identify the possible presence of toxic or hazardous agents known or believed to have been buried at this landfill.

## II. SITE CHARACTERISTICS

The West Lake Landfill is located on St. Charles Rock Road just west of the Taussig Road intersection in Bridgeton, Missouri. The site is about one (1) mile northwest of Route 270 and approximately 1-1/2 miles east of the Missouri River. It is located in a combined rural-industrial area, and is bounded on three sides by farm land and on the fourth by St. Charles Rock Road, beyond which are located several commercial and industrial establishments. The nearest residential area is a trailer park located about 3/4 of a mile southeast of the landfill.

The site is approximately 200 acres and consists of a quarry, stone and limestone processing and storage areas, and several active and inactive landfills (Figure 1), which are open to the public during normal working hours. West Lake Landfill keeps track of entries for the purpose of assessing fees for disposal; however, access is not controlled for other reasons. Users are prohibited from disposing of hazardous materials at this site by current Missouri state law.

Studies indicate the landfill is on the alluvial floodplain of the Missouri River. This fact prompted the Missouri Geological Survey, in 1973, to propose classification of the site as hazardous under the then existing operating procedures. In addition, samples from perimeter monitoring wells taken in 1977 and 1978

indicated some movement of leachate into monitoring wells, based on chemcial (not radiological) analyses. However, recent studies by the Department of Natural Resources indicate little or no surface or sub-surface movement of materials from the site[2]. Leachate from the active sanitary landfill is collected and treated on-site. At this time there is no evidence of significant ground water contamination; however, geological reports indicate a potential for such problems.

In May 1976, the St. Louis Post-Dispatch[3] printed a story alleging that radioactive material had been erroneously dumped in the West Lake Landfill in 1973. The source of this material was identified as the Cotter Corporation, Hazelwood, Missouri, Latty Avenue Site.

An NRC investigation conducted by Region III in 1976 [4] concluded that about 7 tons of U3O8, contained in 8700 tons of leached barium sulfate residues, had been mixed with about 39,000 tons of soil at Latty Avenue and the entire volume disposed of at the West Lake Landfill. The earlier study by the Post- Dispatch (1976) claimed only 9000 tons (presumably the leached barium sulfate residues) had been buried, and that the remaining material had not been disposed of at West Lake. The Post-Dispatch alleged that the contractor hauling the dirt had admitted falsifying invoices for about 40,000 tons of soil. Discussions with site personnel indicated that a large quantity of soil from Latty Avenue had indeed been dumped at West Lake, although

the exact amount was unknown.

A fly-over radiological survey (ARMS flight), performed for the NRC in 1978, showed external radiation levels as high as 100 uR/hr in the area indicated by West Lake personnel as containing the Latty Avenue material. In addition, this survey revealed another possibly contaminated zone in a fill area previously believed to be "clean".

Figure 2 shows the results of the 1978 aerial survey. The area in the southeast fill was believed to contain Latty Avenue material, while that on the northeast boundary was previously unidentified.

In addition to radioactive material, it is known that hazardous chemical wastes have been disposed of at this landfill. Since disposal was unregulated prior to 1973, little is known about the actual materials present. However, it is believed that aside from normal landfill materials, there are chemical industrial wastes in the landfill.

Among the chemical wastes believed to be present are:

| | |
|---|---|
| waste ink | halogenated intermediates |
| pigments | aromatics |
| oily sludges | oils |
| esters | wastewater sludges |
| alcohols | heavy metals |
| insecticides | herbicides |

## III. RADIOLOGICAL SURVEY METHODS

### (A) Measurement of External Radiation Levels

The two areas of contamination were gridded and surveyed for both gamma radiation levels at one meter above the surface, and beta-gamma levels at the ground surface.

The basic pattern at each contaminated area was survey blocks defined by a 10 meter grid system. External gamma levels at one meter were recorded at each grid point (i.e. at each intersection of two grid lines). Initially, precise exposure rate measurements at a few specially selected grid points were made with a sensitive Tissue Equivalent Ionization Chamber System (described in Appendix I). At the same time, NaI scintillation detector (described in Appendix I) measurements were made and a conversion factor for the NaI count rate versus uR/hr established (See Figure I-3). Once this factor was confirmed, the scintillation detector was used for all grid measurements at relatively low exposure rates. For the few higher rates encountered, a Geiger-Mueller portable survey instrument was used.

At each grid point, an end window G-M tube (described in Appendix I) was used for surface measurements. An open and closed window reading was made at 1 cm, and the ratio of the two used to indicate the presence or absence of surface contamination.

(B) Measurement of Surface Radioactivity

Based on the external surface measurements, surface soil samples were collected for analysis from both contaminated areas. These samples were collected from locations on-site where surface deposits were indicated, as well as locations where the drainage characteristics indicated the possibility that radioactive materials may have been carried or washed away from original burial locations. The soils were dried, ground and sealed in 500 ml aluminum cans for counting on the intrinsic germanium (IG) gamma ray spectroscopy system (described in Appendix I).

Vegetation on-site consisted only of grass and common weeds. Off-site, crops are grown on farm land immediately north and west of the site. Since the possibility of contamination exists here, crop samples were collected where indicated by surface measurements. These samples were dried, crushed and counted as described above.

(C) Measurements of Subsurface Radioactivity

Since it was known that most, or all, of the radioactive materials at the West Lake Landfill have been buried, extensive subsurface monitoring and sampling was required. The purpose of this activity was to determine the depth and lateral extent of subsurface contamination.

A series of holes through and bordering the contaminated deposits were drilled and lined with 4-inch PVC

casing. Each hole was then scanned with a 2" by 2" NaI(Tl) scintillation detector and rate meter system.

Representative holes were then logged using an *in situ* gamma measurement system consisting of an intrinsic germanium (IG) detector coupled to a multichannel analyzer (described in Appendix I). Field analyses were then made, both qualitatively and quantitatively, thereby eliminating time consuming laboratory analyses and expensive core sampling of each hole. Measurement intervals ranged from 6" to 24", depending upon factors such as hole depth and activity. An occasional core sample was taken to verify the *in situ* measurements and to confirm the presence or absence of non-gamma emitting nuclides such as Th-230.

(D) Measurement of Radioactivity in Water

Whenever possible, water samples were taken from the bore holes and two off-site monitoring wells. Samples were also taken from standing water, run off water, and leachate liquids. Samples were filtered, evaporated and counted for gross activity, or were filtered and sealed in Marinelli beakers for gamma spectroscopic analysis.

(E) Measurement of Airborne Radioactivity

Measurements were made to determine if the material buried on-site is a source of airborne radioactivity. The isotopes of concern are Ra-226, Ra-224 and/or Ra-223, which

emanation of radon from the soil, and movement of radon and daughters off-site.

These measurements may be used to determine Rn flux emanation as a source term for off-site dose calculations, or as an indication of the presence of radium at or below the surface. Additional on-site Rn daughter measurements were made to perform working level (WL) determinations.

Radon flux measurements which are to be related to off-site dose calculations were of no value for Rn-219, due to its very short (4 sec) half-life. Therefore, only its long-lived daughters are of concern for off-site exposures. In addition, if the parent (Ra-223) is not within a few millimeters of the surface, Rn-219 is not likely to emanate into the atmosphere [5].

Due to these considerations, only Rn-222 and Rn-220 fluxes were measured. The principal measurement technique was collection of a filtered gas sample from an accumulator and subsequent counting in a radon gas analyzer (described in Appendix 1). Sequential alpha counting, starting immediately after sampling, allowed separation of Rn-222 from Rn-220 (if present). Repetitive samples were taken from several locations during the survey period in an effort to evaluate the effect of fluctuations between individual measurements, due to varying meteorological and soil conditions. A second method using charcoal canisters was also employed as a check on the accumulator technique.

The presence of Rn-219 was determined by detection of its daughters deposited on high volume particulate sample filters, using gamma spectroscopy. Total Rn daughter levels were also estimated by gross alpha activity on particulate filters. From this, a total working level (WL) determination was made.

## IV. SURVEY RESULTS

### (A) External Radiation Levels

Two areas of elevated external radiation levels have been identified by this survey. Figure 3 shows the two areas as they existed in November, 1980, at the time of the preliminary RMC site survey. As can be seen, both areas contained locations where levels exceeded 100 uR/hr at 1 meter, and in Area 2, gamma levels as high as 3-4 mR/hr were detected. The total areas exceeding 20 uR/hr were about 3 acres in Area 1 and 9 acres in Area 2.

External gamma levels measured in May and July of 1981 are shown in Figure 4. These levels had decreased significantly, especially in Area 1, due to continuing activities at the landfill. In both cases, contaminated areas were covered with additional fill material. RMC estimates that about 4 feet of sanitary fill was added to the entire area denoted as Area 1, and that an equal amount of construction fill was added to most of Area 2. As a result, only a small region of a few hundred square meters in Area 1 exceeds 20 uR/hr. In Area 2, the total area exceeding 20 uR/hr decreased by about 10%, and the highest levels are now about 1600 uR/hr, near the Shuman building.

Both areas were marked off in a 10 m by 10 m grid, based on a north-south line erected from a boundary marker, as laid out by a surveying team, as a reference line. Grid

designations are shown in Figures 5 and 6. At each grid point, external gamma levels at 1 m, and beta-gamma count rates at 1 cm, were measured. Results of these measurements are given in Tables 1 and 2.

Beta-gamma measurements at 1 cm from the surface are given in count rates, rather than dose rates, due to the difficulty in measuring beta dose rates accurately with end window G-M tubes. Large differences between open- and closed-window readings indicate the possibility of surface contamination. Little surface contamination was found in Area 1, as would be expected due to fresh land fill cover over nearly the entire area.

Several isolated spots of surface contamination in Area 2 were indicated by beta-gamma measurements, and later confirmed by surface soil sampling. These spots are generally located near the northwest edge of Area 2, which includes the berm that bounds the landfill at that point. Some erosion and run-off is evident along the top of the fill, apparently uncovering deposits of radioactive material in the process. Thus far, fresh construction fill has not been added here, due to the inaccessibility of these spots.

A second region of surface contamination is found just north of the Shuman building. It is not clear why material appears on the surface here, except that it is possible that some digging or excavation has occurred here in the past.

(B) Surface Soil Analyses

A total of 61 surface soil samples were gathered and analyzed on-site for gamma activity. Samples were normally stored 10 to 14 days to allow ingrowth of radium daughters. Concentrations of U-238, Ra-226 (from PB-214 and Bi-214), Ra-223, Pb-211 and Pb-212 were determined for each sample. Locations of surface soil samples are shown in Figures 7 and 8, and the results in Table 3.

In all soil samples nothing other than uranium and/or thorium decay chain nuclides and K-40 was detected. Off-site background samples were on the order of 2 pCi/g for Ra-226. On-site samples ranged from about 1 to 21,000 pCi/g Ra-226, and from less than 10 to 2,100 pCi/g U-238. In those cases where elevated levels of Ra-226 were detected, the concentrations of U-238 were generally anywhere from a factor of 2 to 10 lower. In cases of elevated sample activity, daughter products of both U-238 and U-235 were found.

In general, surface activity was limited to Area 2, as indicated by the surface beta-gamma measurements. Only two small regions in Area 1 showed contamination, both located near the access road across from the site offices.

In addition to on-site gamma analyses, a set of 12 samples were submitted to the RMC radiochemical laboratories for thorium and uranium radiochemical determinations. The

results of these measurements are shown in Table 4. They show that all samples contain high levels of Th-230. The ratio of Th-230 to Ra-226 (Bi-214) is about 20, which indicates an "enrichment" of thorium in these residues, as discussed in Section V.

(C) Subsurface Soil Analysis

Subsurface contamination was assessed by extensive "logging" of holes drilled through the landfill at locations known or thought to contain radioactive materials. Several holes were drilled in areas known to contain contamination, then additional holes were drilled outward in all directions until no further contamination was encountered. A total of 43 holes were drilled, (11 in Area 1 and 32 in Area 2), including 2 off-site water monitoring wells. All holes were drilled with a 6-inch auger and lined with 4-inch PVC casing. The location of these auger holes is shown in Figures 9 and 10.

Each hole was scanned with a 2-inch by 2-inch NaI(Tl) detector and rate meter system for an initial indication of the location of subsurface contamination. Based on the initial scans, certain holes were selected for detailed gamma logging using the IG detector and MCA. A total of 19 holes were logged in this manner.

The results of the NaI(Tl) counts and IG analyses are shown in Table 5. Concentrations of Bi-214, as determined

by the IG system, ranged from less than 1 to 19,000 pCi/g. For those holes where both NaI(Tl) and IG counts were made, a good correlation between gross NaI(Tl) counts and Ra-226 concentrations, as determined by *in situ* analysis of the daughter Bi-214 by the IG system, was found. Figure 11 is a plot of NaI(Tl) count rate versus IG determination of Ra-226, and shows a nearly linear relationship between the two at concentrations near the action criteria. The conclusion is that the NaI(Tl) data is a good estimation of the Ra-226 concentration in soil, so long as the radionuclide mix is reasonably constant. In the case of West Lake Landfill, this has been shown to be the case.

It was determined that the subsurface deposits extended beyond areas where surface radiation measurements exceeded action criteria. Figures 12 and 13 show the approximate area of subsurface contamination versus the area of elevated surface radiation levels. The total difference in areas is on the order of 5 acres.

The variations of contamination with depth are shown in Figure 14. As can be seen, the surface elevations vary by about 20 feet, with the highest elevations at locations of fresh fill. Contamination (> 5 pCi/g Ra-226) is found to extend from the surface, in several areas, to a depth of about 20 feet below surface, in two cases. In general, the subsurface contamination appears to be a continuous single layer, ranging from two to fifteen feet thick, located

between elevations of 455 feet and 480 feet and covering 16 acres total area.

In Figures 15-19, representations of the subsurface deposits are provided based on auger hole measurements. These representations are consistent with the operating history of the site, which suggests that the contaminated material was moved onto the site within a few days' time, and spread as cover over fill material. Thus, one would expect a fairly continuous, thin layer of contamination, as indicated by survey results.

(D) Water Analyses

A total of 37 water samples were taken during this survey, 4 in the fall of 1980, and the remainder in the spring and summer of 1981. Results of water analyses are shown in Table 6.

None of the sample alpha activities exceeded the MPC for Ra-226 (the most restrictive nuclide present) in water for unrestricted areas. Only one sample exceeded the EPA gross alpha activity guidelines for drinking water and that was a sample of standing water near the Shuman building. Several samples, including all the leachate treatment plant samples, exceeded the EPA gross beta drinking water standards. Subsequent isotopic analyses indicated that all the beta activity can be attributed to K-40. None of the off-site samples exceeded either EPA standard.

(E) Airborne Radioactivity Analyses

Both gaseous and particulate airborne radioactivity were sampled and analyzed during this study. Since it was known that the buried material consisted partially or totally of uranium ore residues, the sampling program concentrated on measuring radon and daughters in the air. Two methods were used: the first was a scintillation flask method for radon gas and the second was analysis of filter paper activity for particulate daughters.

A series of grab samples using the accumulator method (described in Appendix I) were taken between May and August of 1981.. A total of 111 samples from 32 locations were collected. Results can be found in Table 7. Radon flux levels ranged from 0.2 pCi/sq.m-s in low background areas to 868 pCi/sq.m-s in areas of surface contamination.

At three locations, repetitive measurements were made over a period of two months. These results are plotted in Figure 20. As can be seen, significant fluctuations were observed at two locations. The fact that these fluctuations were real and not measurement artifacts was later confirmed by duplicate charcoal canister samples, as described below.

A total of 35 charcoal canister samples were gathered at 19 locations over a three month period. The results are listed in Table 8, and show levels ranging from 0.3 pCi/sq.m-s to 613 pCi/sq.m-s. On 24 different occasions,

the charcoal canisters and accumulator were placed in essentially the same locations, at the same time, for duplicate sampling. The results of this side-by-side study are presented in Table 9, and show generally good correlation between the two methods.

A set of 10 minute high volume particulate air samples were taken to determine both short-lived radon daughter concentrations and long-lived gross alpha activity. Sample results are shown in Table 10. The highest levels were detected in November, 1980, near and inside the Shuman building. Only these two samples exceed MPC for radon daughters for unrestricted areas.

In addition to the routine 10 minute samples, five 20 minute high volume air samples were taken and counted immediately on the IG gamma spectroscopy system. The purpose of these analyses was to detect the presence of Rn-219 daughters. All samples were taken near surface contamination and are listed in Table 11. In addition to Rn-222 daughter gamma activities, Rn-219 daughters were detected by measuring the low abundance gamma rays of Pb-211. Concentrations of Rn-219 daughters ranged from 6E-11 uCi/cc to 9E-10 uCi/cc.

(F) Vegetation Analysis

Vegetation samples included weed samples from on-site locations and farm crop samples (winter wheat) from the

northwest boundary of the landfill. This location was chosen due to possible run off from the fill into the farm field. No elevated activities were found in these samples.

(G) Non-Radiological Analysis

Six composite samples were submitted to the RMC Environmental Chemistry Laboratory for priority pollutant analysis. Five samples were taken from auger holes (one from Area 1 and four from Area 2) and the sixth from the West Lake leachate treatment plant sludge. The results, shown in Table 12, indicate a significant presence of organic solvents in Area 2 samples. The results of the leachate sludge analysis were not as high as any of the soil samples.

A chemical analysis of radioactive material from both areas was also performed by RMC labs and reported in Table 13. Results show elevated levels of barium and lead in most cases.

(H) Background Measurements and Remedial Action Criteria

Various off-site locations were selected for reference background measurements. The results of these measurements are summarized in Table 14, and can be compared with the established NRC target criteria for remedial action, for this project, shown in Table 15.

## V. CONCLUSIONS

Based on survey results, it is evident that the West Lake Landfill contains two areas of surface and/or subsurface contamination. These deposits yield detectable external radiation levels in both areas. However, only an area of less than 0.1 acre in Area 1 exceeds 20 uR/hr, while about 8 acres in Area 2 exceeds the 20 uR/hr criteria. The highest reading detected in the most recent survey was 1.6 mR/hr in Area 2, near the Shuman Building.

Analyses of soil samples from both areas, as well as *in situ* measurements, show that the contaminants present at West Lake consist of uranium and uranium daughters. Chemical analyses reveal high concentrations of barium and sulfates in the radioactive deposits. These results tend to confirm the reports that this contaminated material is uranium and uranium ore, contained in leached barium sulfate residues, and presumably transferred from the Latty Avenue Site in Hazelwood, Missouri.

Analysis of soils also shows a high Th-230 to Ra-226 ratio. Since the target criteria for Ra-226 is the most restrictive of those contaminants present, it has been assumed that Ra-226 would be the controlling radionuclide for remedial action determinations. However, since Th-230 levels may be from 5 to 50 times higher than Ra-226 concentrations, this assumption may be erroneous. It is likely that high concentrations of the

separation of both uranium and radium from the ores, thus "depleting" the ores of uranium and radium, or, "enriching" the residues in thorium. This "enrichment" would also be evident in the U-235 chain, despite the short half-lives of Th-227 and Th-231, since the long-lived Pa-231 would remain in the residues. The concentrations of Pa-231, inferred from Ra-223 determinations, are also shown to be high.

Auger hole measurements show that nearly all the contamination present is located below the landfill surface,although a few locations near the northwest berm in Area 2 show surface, or near surface, deposits. These deposits range from 2 to 15 feet in thickness, and appear to form a contiguous layer covering an area of about 14 acres (68,000 sq.yd.) in Area 2 and about 2 acres (10,000 sq.yd.)in Area 1. If an average thickness of 2 yards is assumed, the estimated total volume is 150,000 cu.yd., which corresponds to roughly 170,000 tons of soil. This implies that if the source of contamination was the Latty Avenue material, the original volume of 40,000 tons has been diluted by a factor of about 4, which is not unexpected, with the continual movement and spreading of materials during fill operations.

As discussed previously, the auger hole measurements detected deposits exceeding 5 pCi/g Ra-226 within a few feet of the surface, in areas where surface external radiation levels were indistinguishable from normal background levels.

These results confirm suspected difficulties in detecting buried materials with surface measurements, even when using relatively sensitive portable survey instruments.

At no time has radioactivity in off-site water samples been above any applicable guidelines. These results indicate that the buried ore residues are probably not soluble and are not moving off-site via ground water. On-site samples have shown some gross beta activity above EPA drinking water guidelines (attributable to K-40); however, gross alpha and Ra-226 levels are within limits. The absence of significant contamination in the leachate liquid or sludge is consistent with the implication that the buried material is not moving through the landfill.

As would be expected, radon flux emanation rates were highest at locations of surface, or near surface, contamination. At locations where the material is covered by several feet of fill, flux levels are near background rates.

Particulate air samples established indicated the presence of Rn-222 and Rn-219 daughters near the locations of surface deposits. However, concentrations are very low, and do not exceed allowable levels for unrestricted areas, except in one location. In general, cover of a few feet of fill reduces airborne concentrations to near background levels.

The fact that West Lake is an active landfill presents several serious problems for performing radiological assessments and remedial actions. In the first place, as the landfill conditions change, so do the surface radiological characteristics. These changes were evident in the reduction of radiation levels in Area 1 between November 1980, and May 1981. It is possible that future landfill activities will obscure all detectable surface radiation levels at the site.

## REFERENCES


[1] U. S. Nuclear Regulatory Commission Letter Contract: NRC-02-080-034, August 13, 1980.

[2] Missouri Department of Natural Resources, "Groundwater Investigation, West Lake Landfill, St. Louis County, September 30 through October 1, 1980."

[3] St. Louis Post-Dispatch, May 30, 1976.

[4] U. S. Nuclear Regulatory Commission, Office of Inspection and Enforcement, Region III, IE Inspection Report No. 76-01, June and August, 1976.

[5] Crawford, D. J., "Radiological Characteristics of Rn-219", Health Physics, Vol. 39, No. 3, pp. 450.

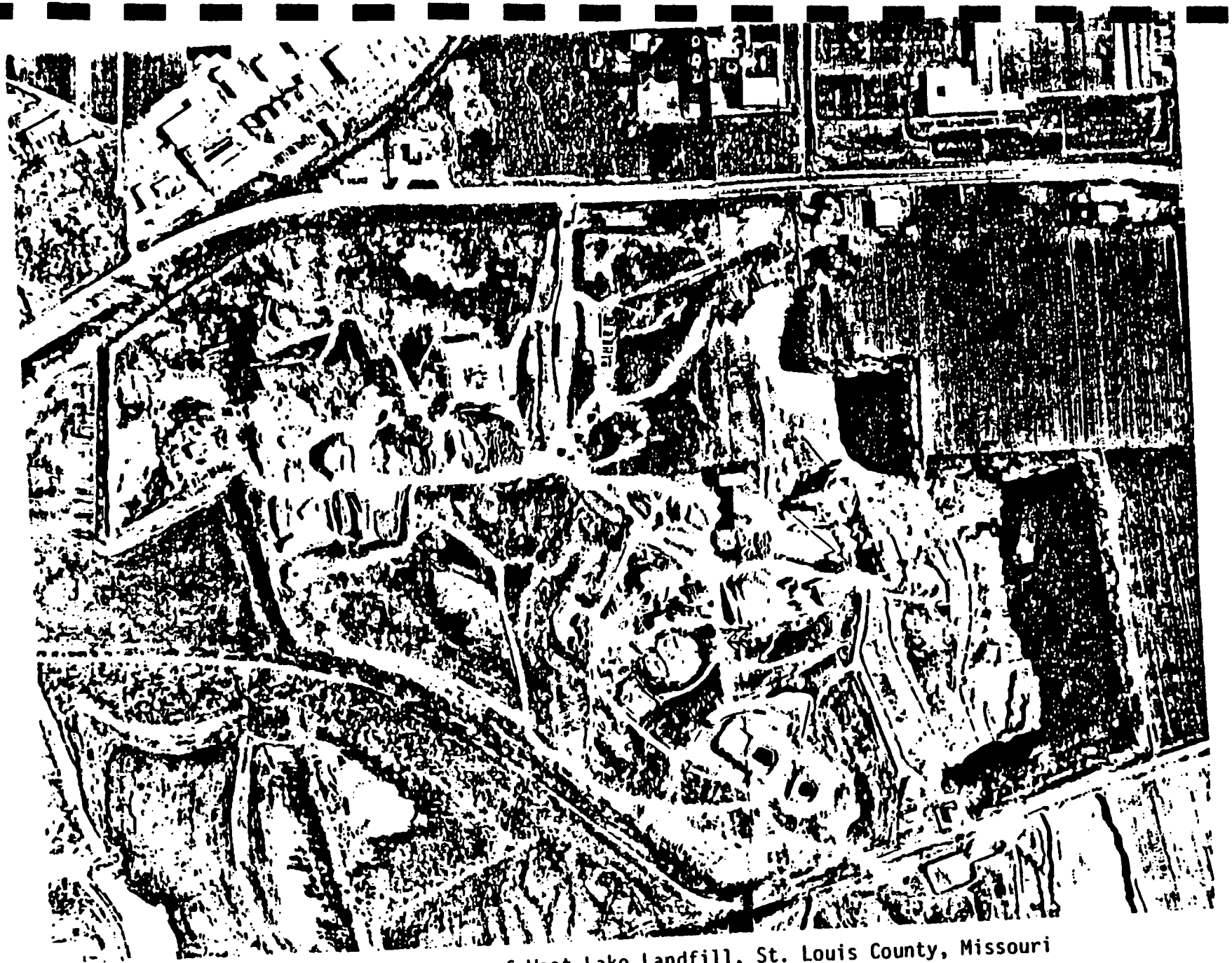
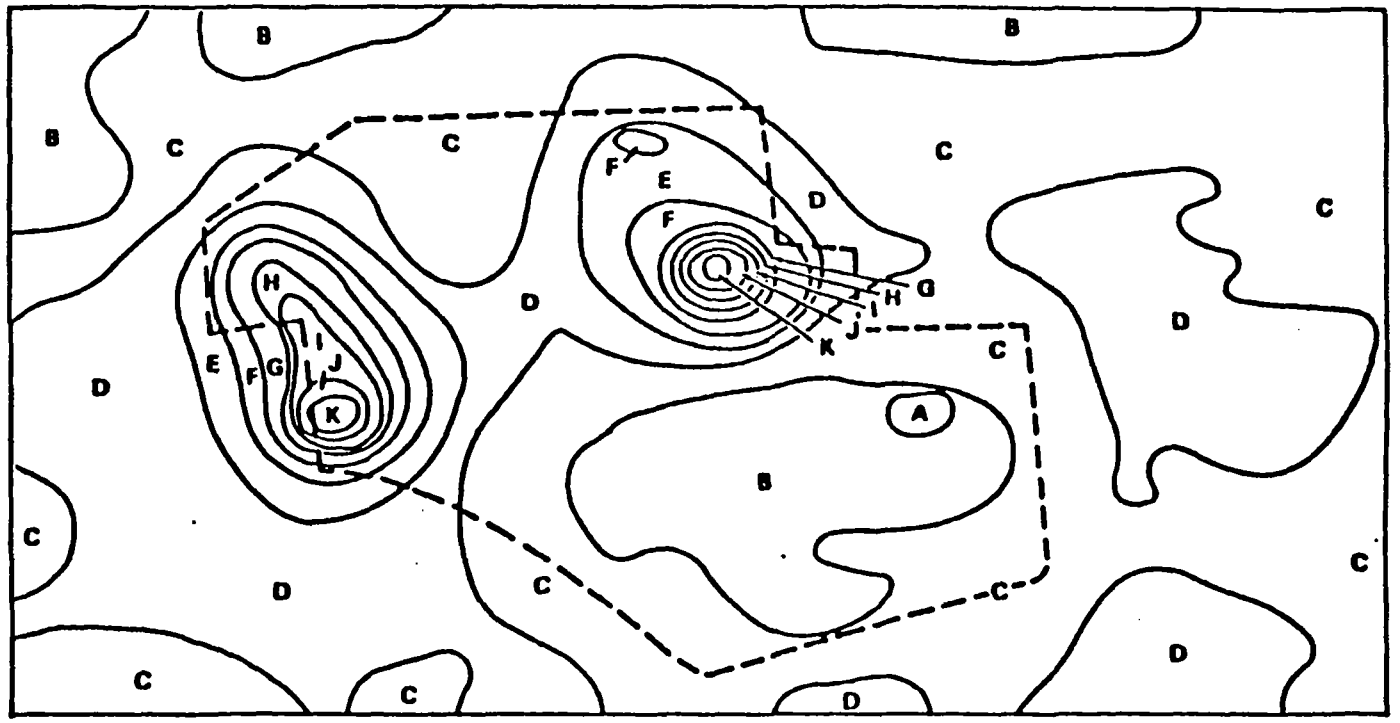
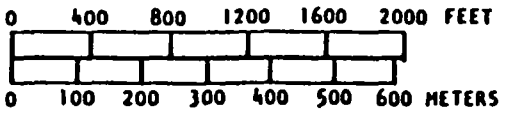
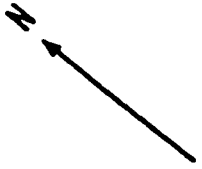


Figure 1. Aerial view of West Lake Landfill, St. Louis County, Missouri




| GROSS COUNT CONVERSION SCALE | |
|---|---|
| LETTER LABEL | GAMMA EXPOSURE RATE* 1 m LEVEL (μR/hr) |
| A | - 6 |
| B | 6 - 8 |
| C | 8 - 10 |
| D | 10 - 13 |
| E | 13 - 17 |
| F | 17 - 24 |
| G | 24 - 33 |
| H | 33 - 45 |
| I | 45 - 62 |
| J | 62 - 84 |
| K | 84 - 116 |

*AVERAGED OVER DETECTABLE FIELD-OF-VIEW AT 60 m ALTITUDE AND EXTRAPOLATED TO THE 1 m LEVEL INCLUDES 3.7 μR/hr COSMIC RADIATION.

- - - - - - ESTIMATED LANDFILL OUTLINE

Figure 2. West Lake Landfill aerial survey isopleths.

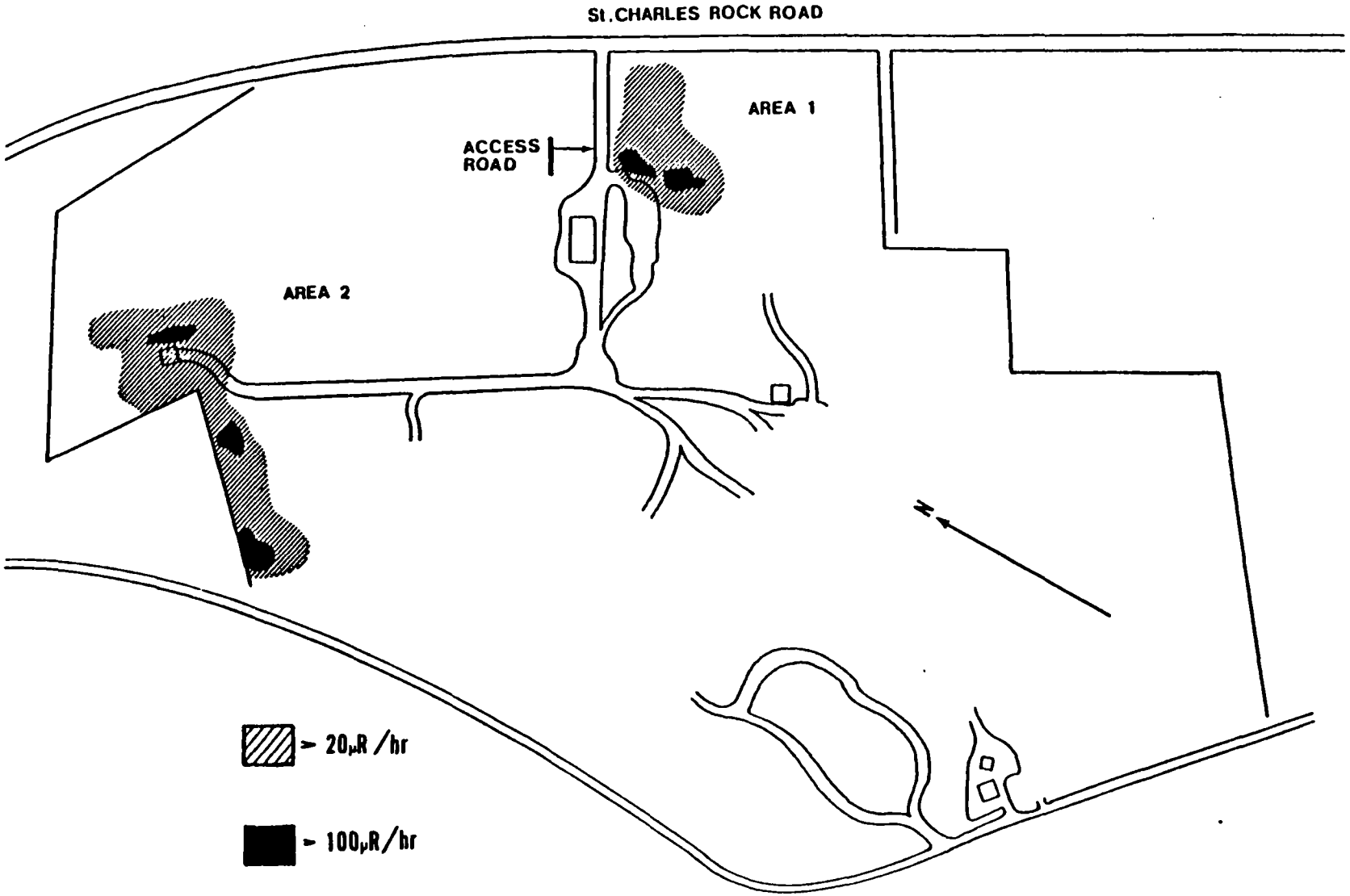



Figure 3. External gamma radiation levels, November 1980.

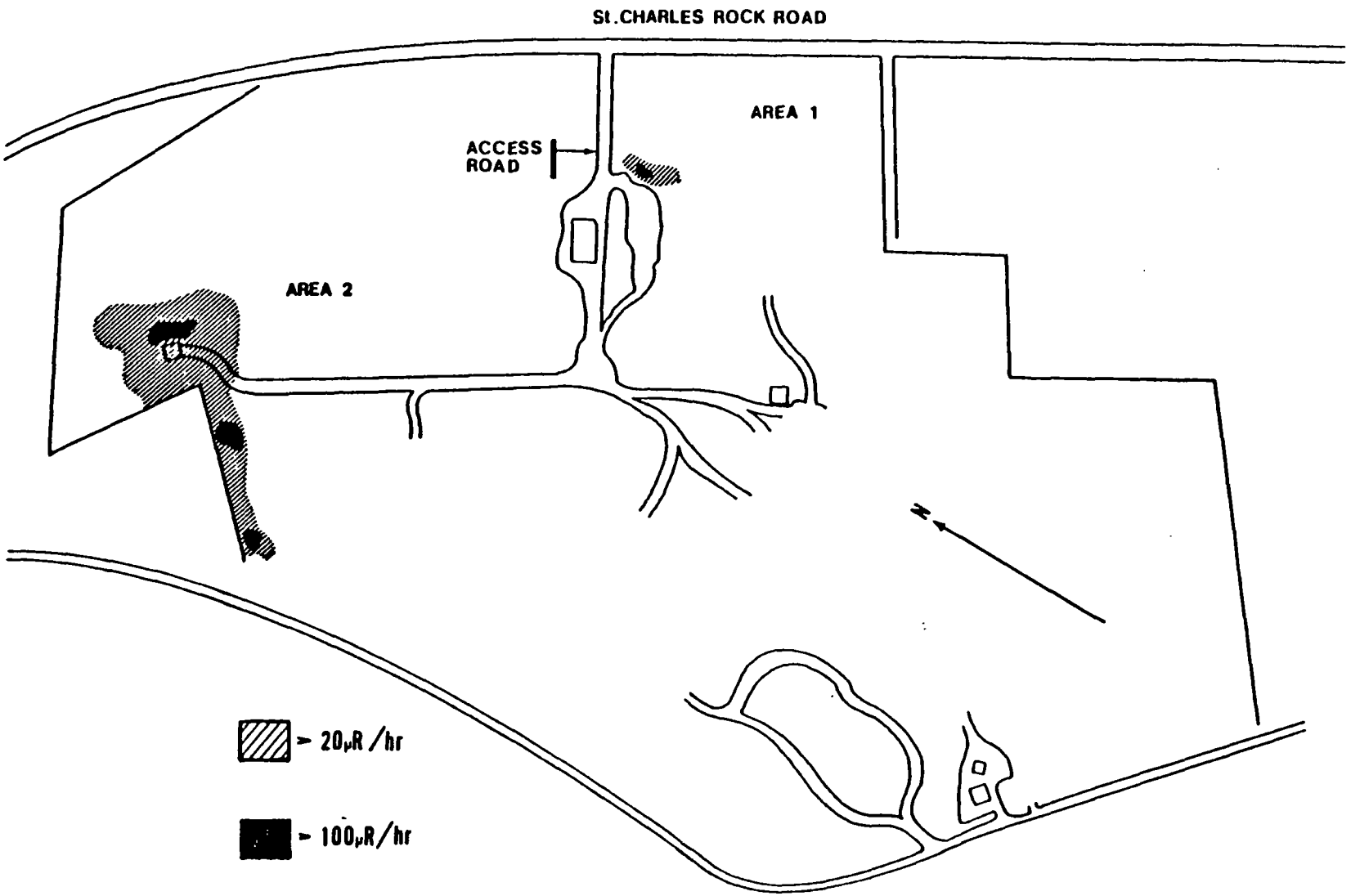



Figure 4. External gamma radiation levels, May, 1981

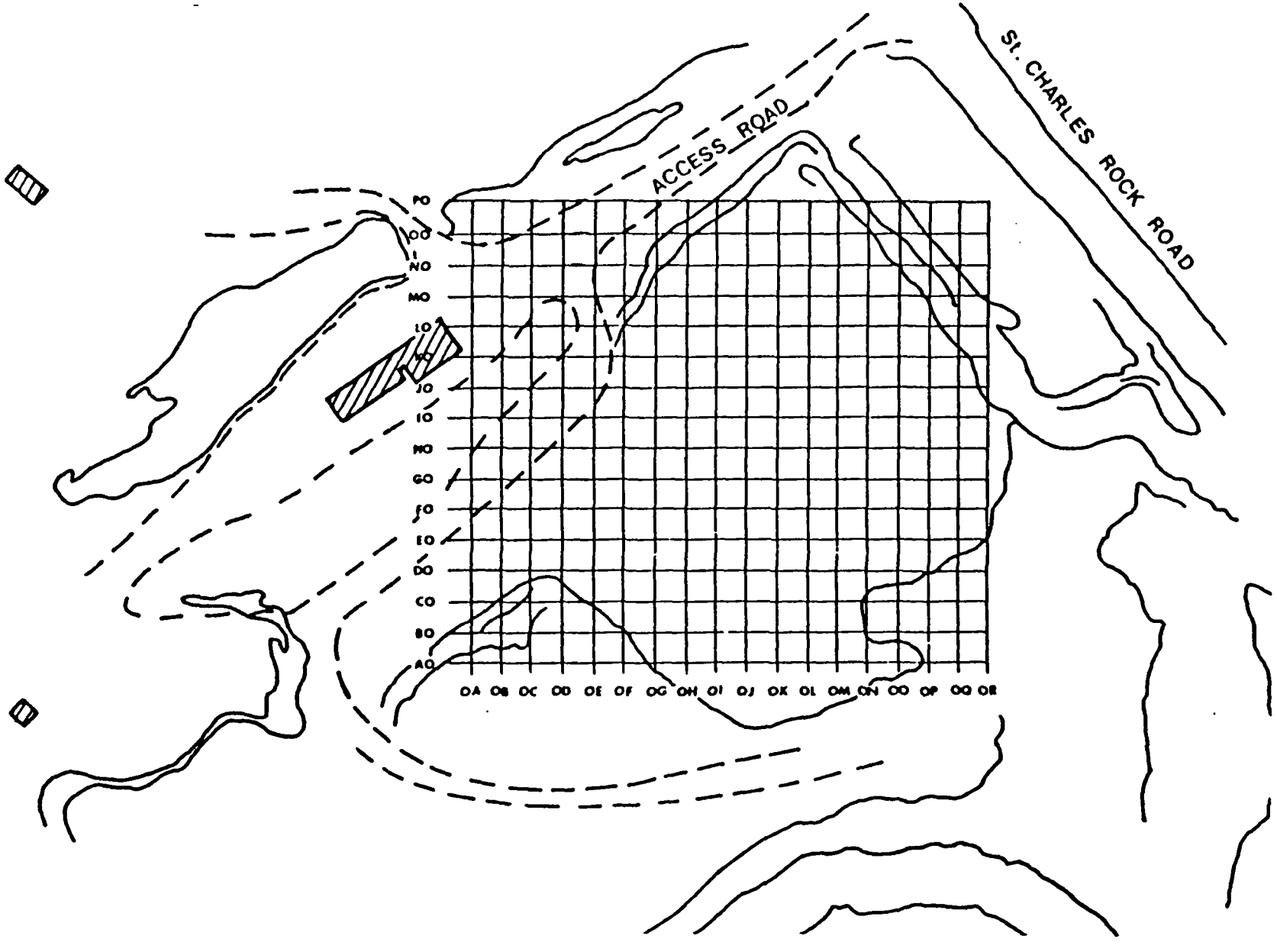



Figure 5. Grid locations for radiological survey, Area 1.

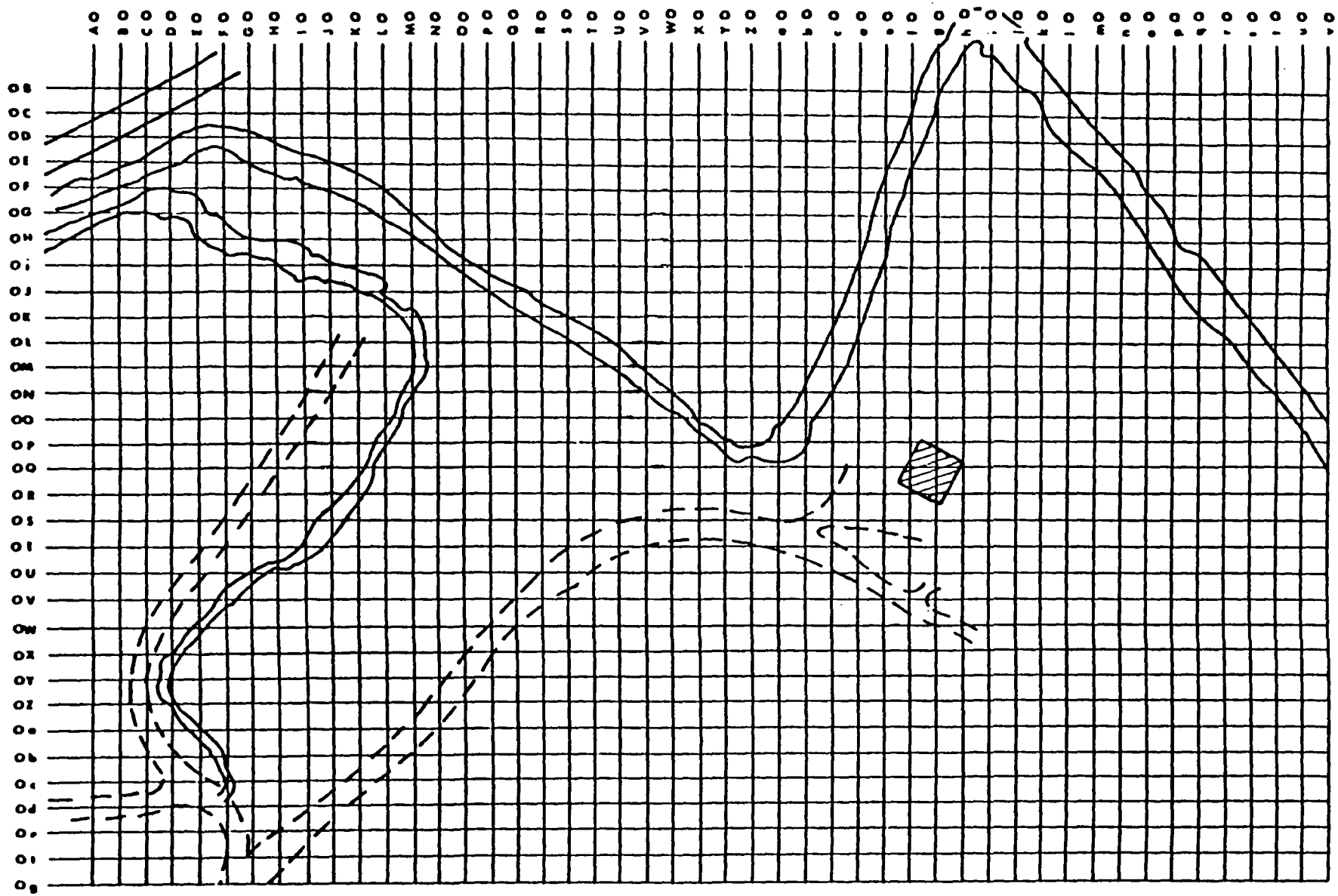


Figure 6. Grid locations for radiological survey, Area 2.

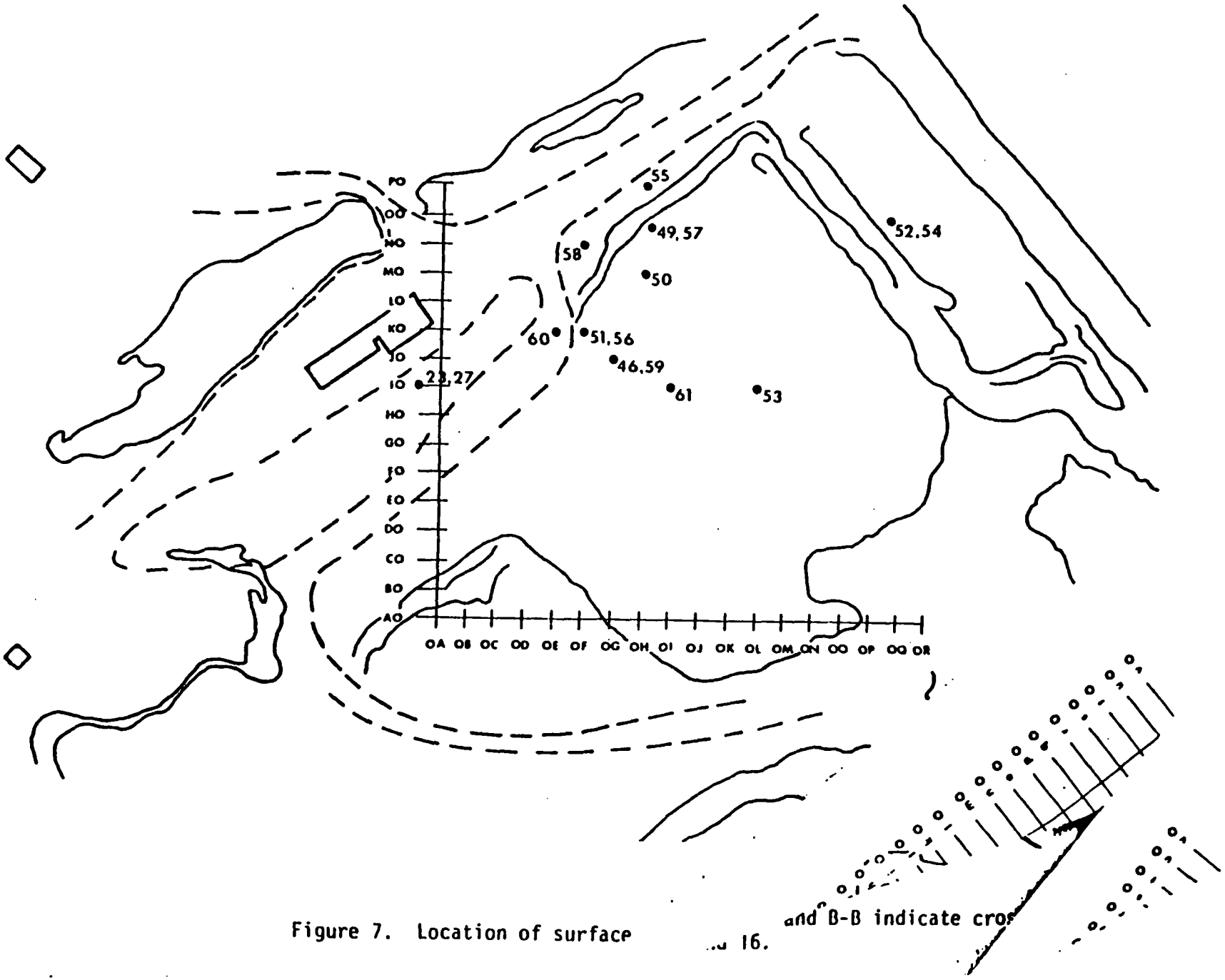



Figure 7. Location of surface ... 16. and B-B indicate cros

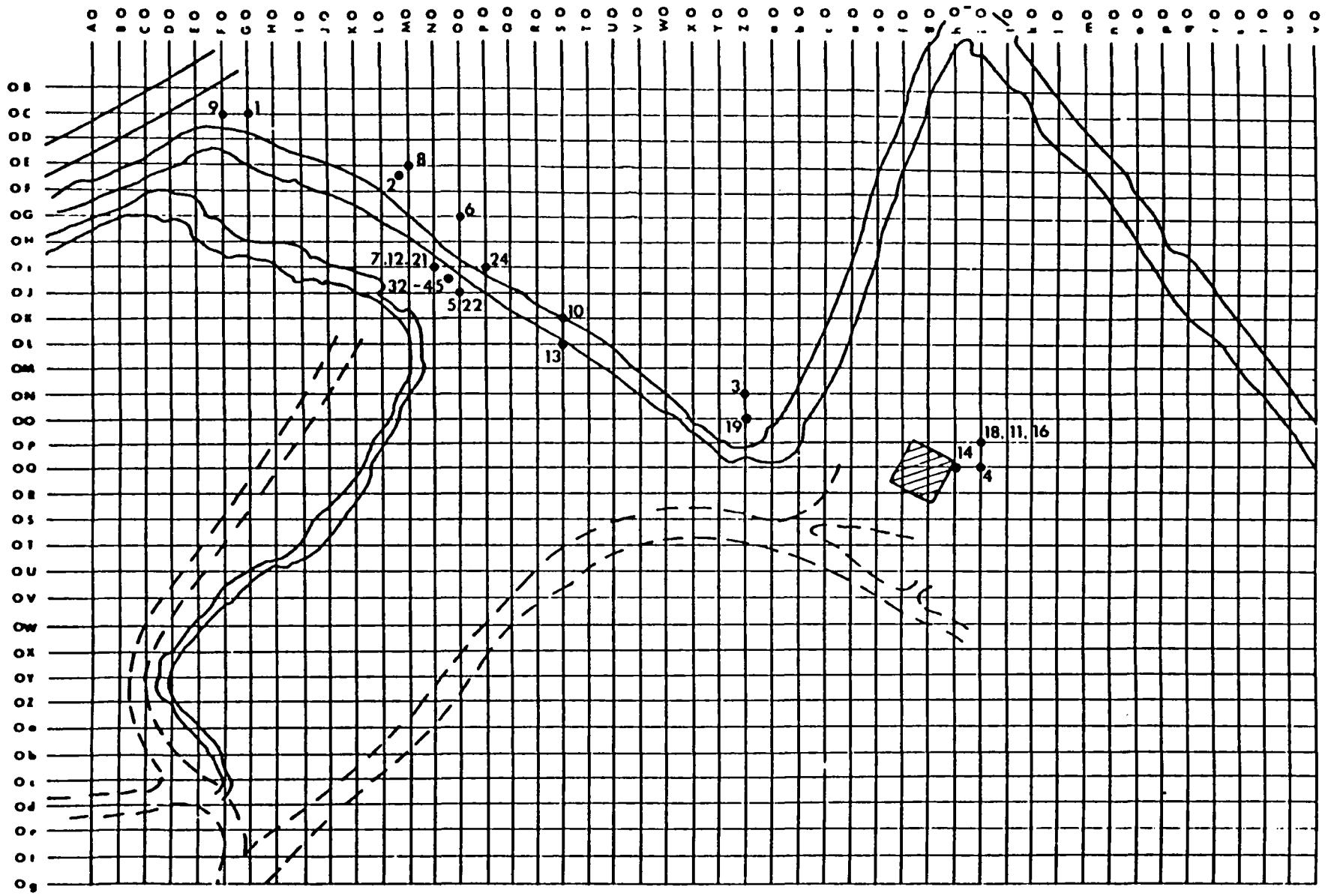



Figure 8. Location of surface soil samples, Area 2.

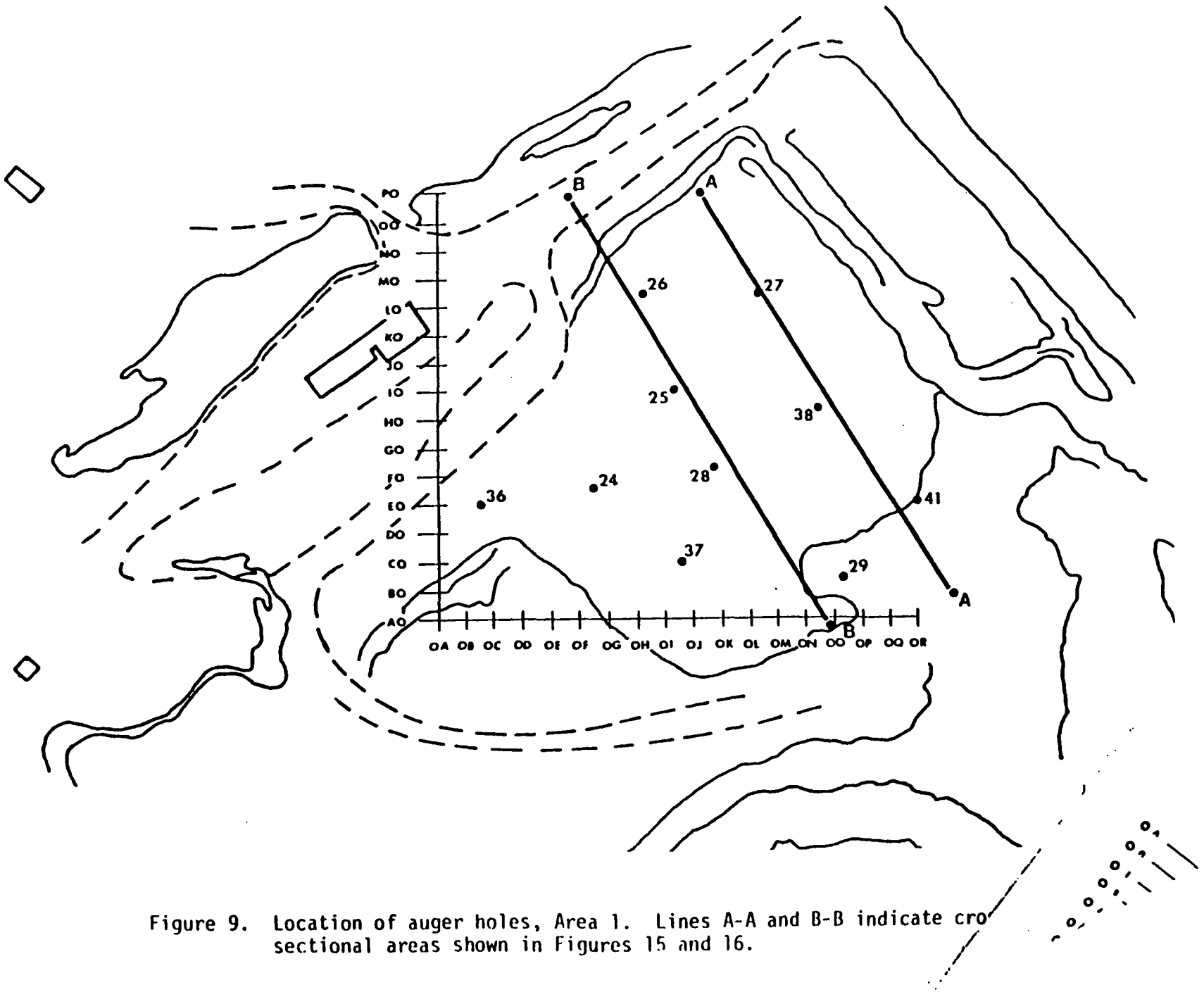



Figure 9. Location of auger holes, Area 1. Lines A-A and B-B indicate cro sectional areas shown in Figures 15 and 16.

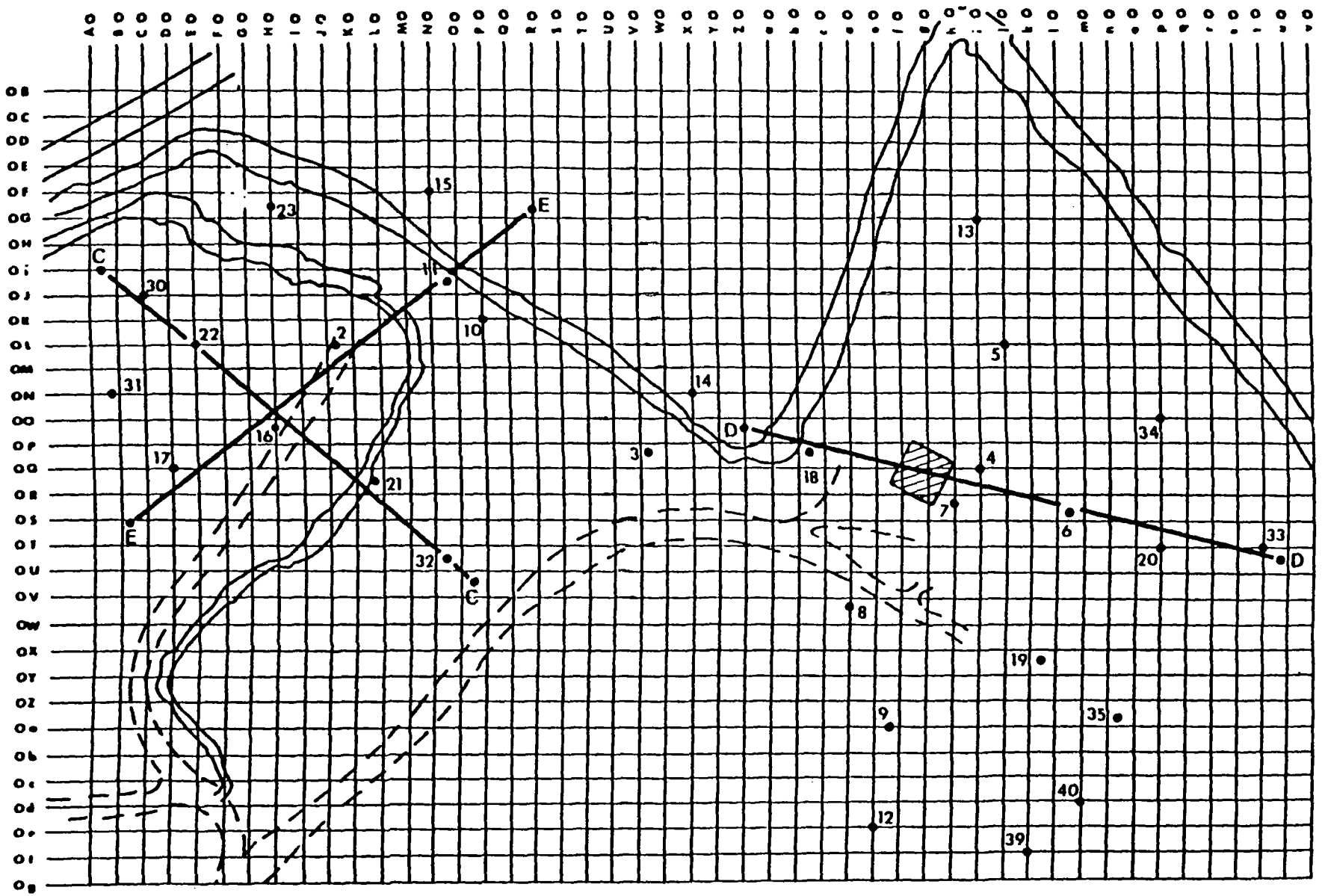



Figure 10. Location of auger holes, Area 2. Lines C-C, D-D, and E-E indicate cross sectional areas shown in Figures 17, 18, and 19.

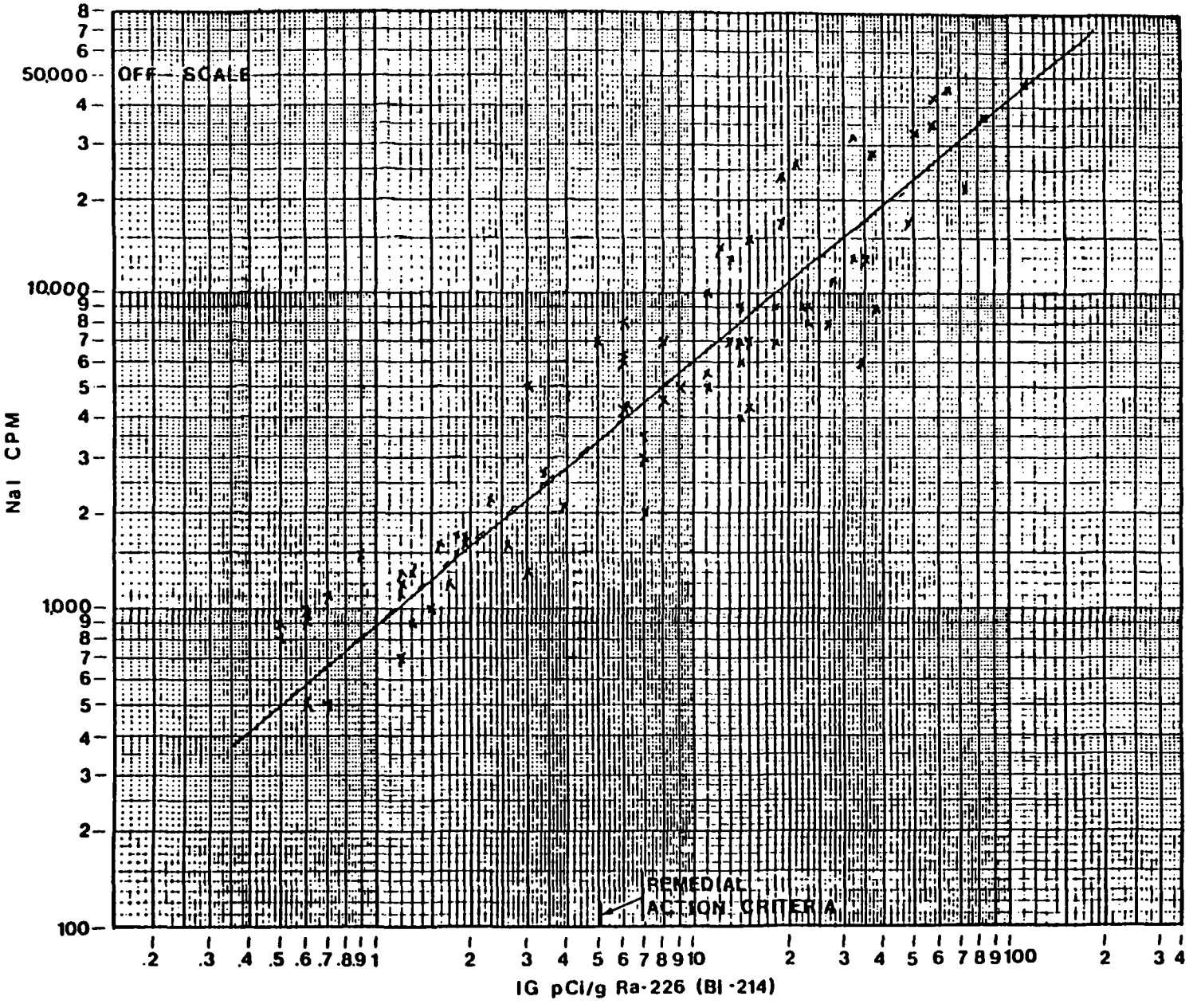



Figure 11. Auger hole NaI (Tl) count rate versus Ra-226 concentration, as determined by the I.G. in situ measurements. Data is from bore holes 16, 32, 22, 21, 31, 6, 19 and 20.

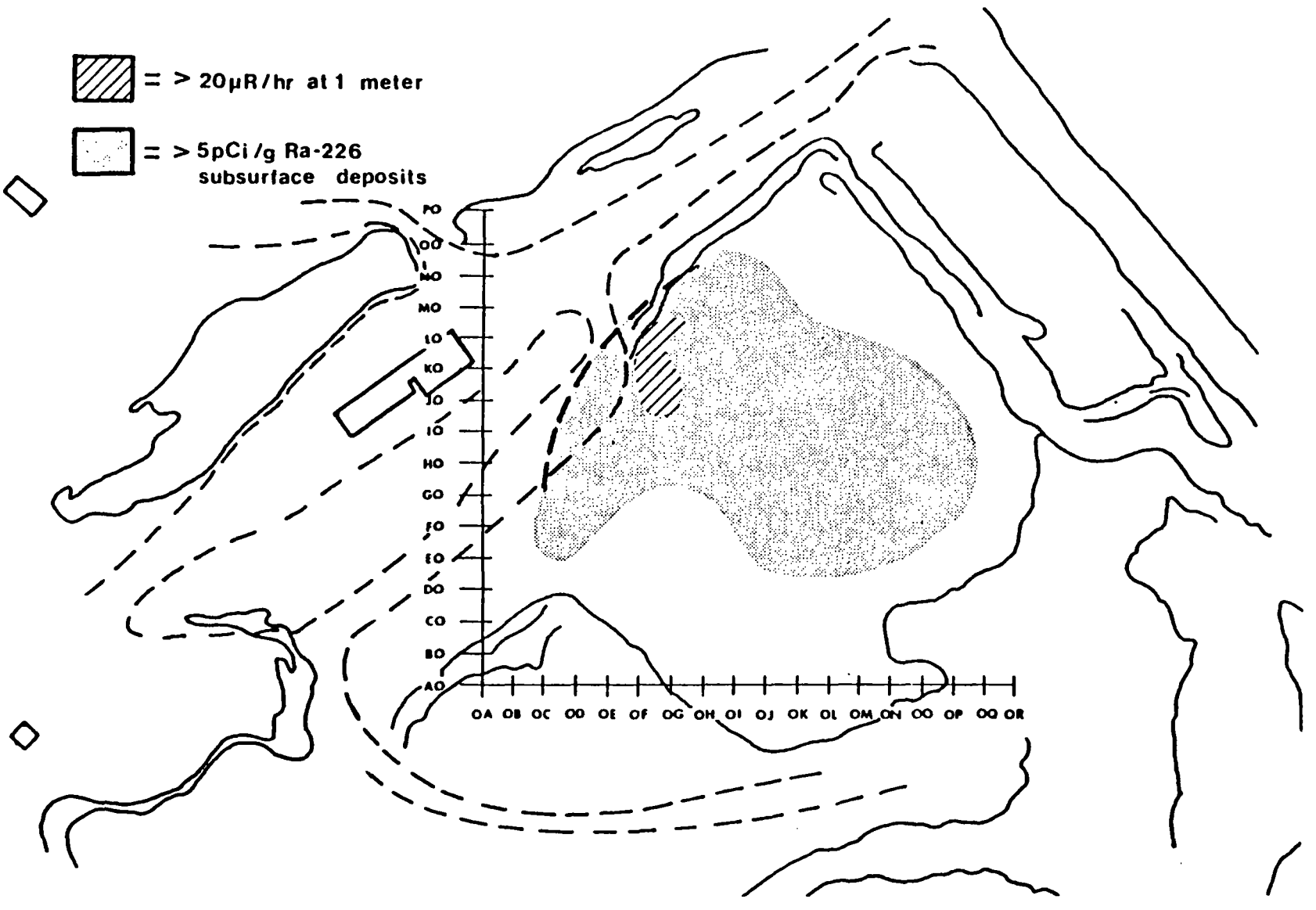



Figure 12. Location of subsurface contamination and surface radiation levels, Area 1. The shaded area shows a lateral contour for 5pCi/g Ra-226, regardless of depth. The cross hatched area shows the surface locations which exceed 20uR/hr at 1 meter.

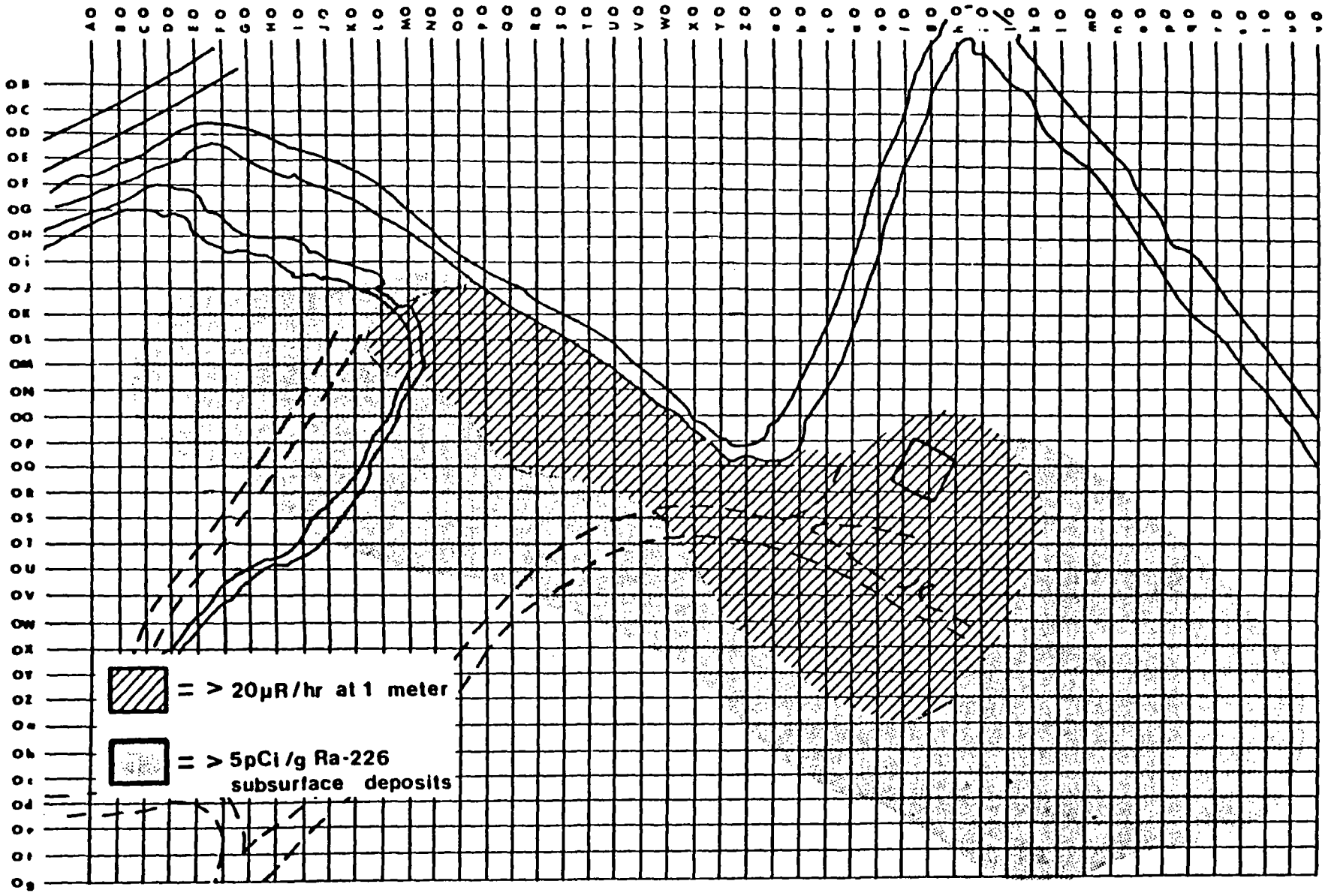



Figure 13. Location of subsurface contamination and surface radiation level, Area 2. The shaded area shows a lateral contour for 5pCi/g Ra-226, regardless of depth. The cross hatched area shows the surface location which exceeds 20uR/hr at 1 meter.

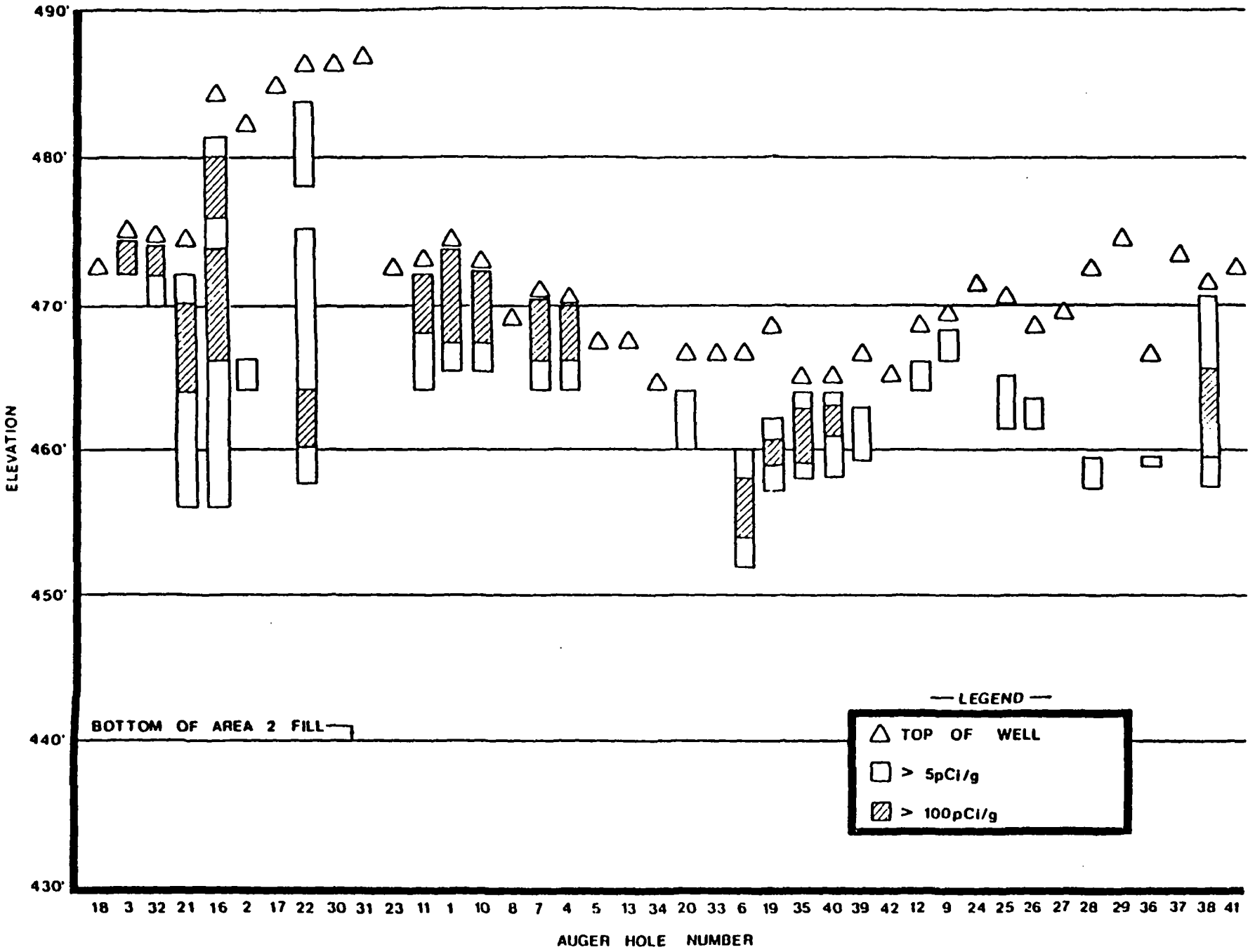



Figure 14. Auger hole elevations and location of contamination within each hole.

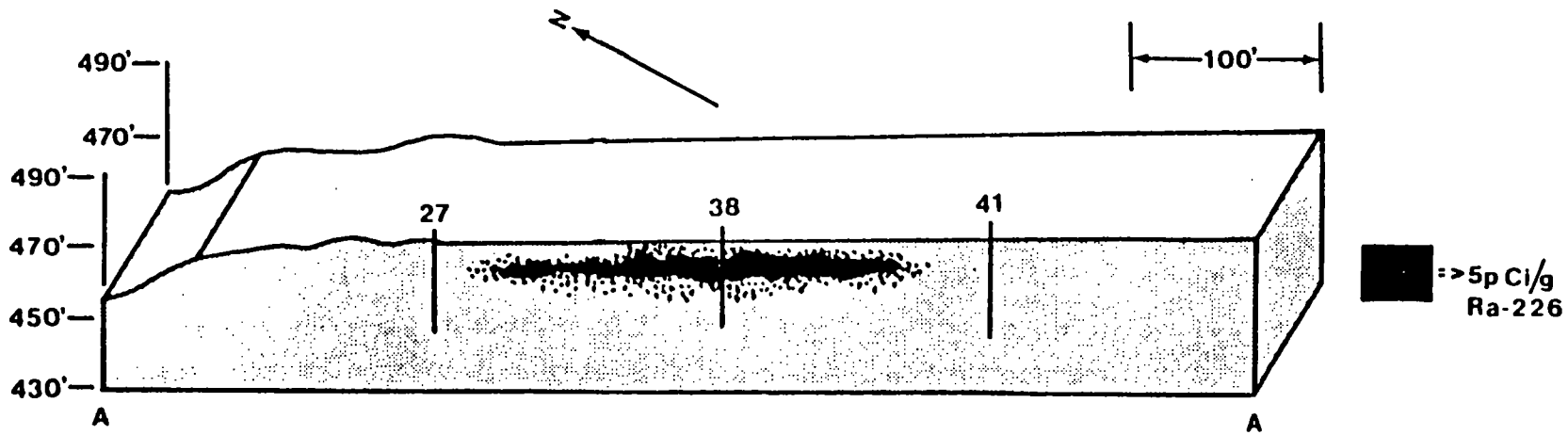



Figure 15. Cross section A-A (from Figure 9) showing subsurface deposits in Area 1. The blackened areas indicate the estimated extent of contamination exceeding 5pCi/g Ra-226, based on surface and auger hole measurements.

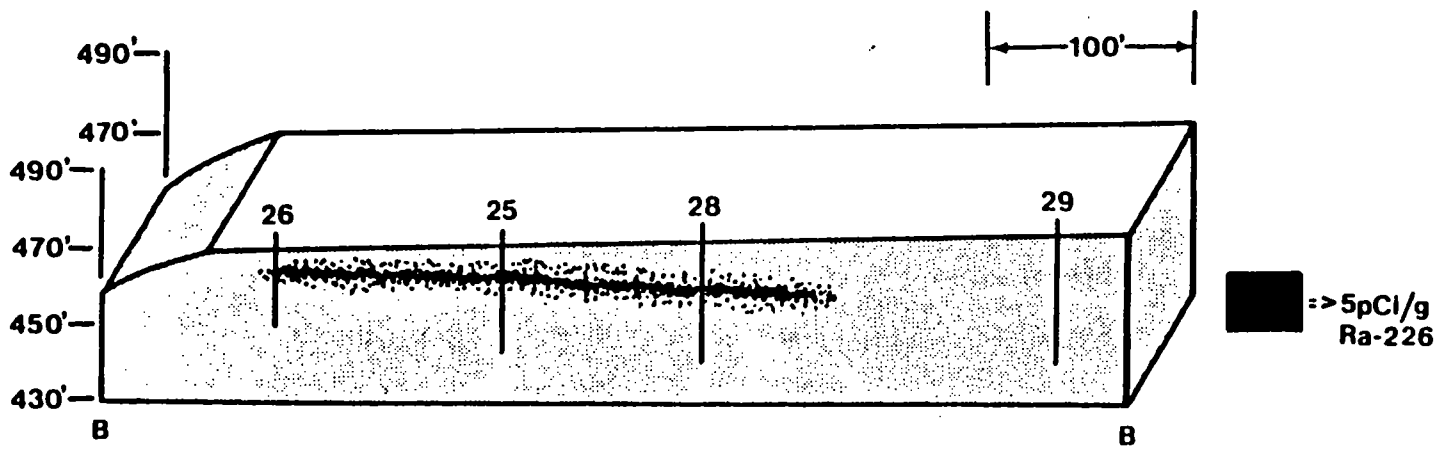



Figure 16. Cross section B-B (from Figure 9) showing subsurface deposits in Area 1. The blackened areas indicate the estimated extent of contamination exceeding 5pCi/g Ra-226, based on surface and auger hole measurements.

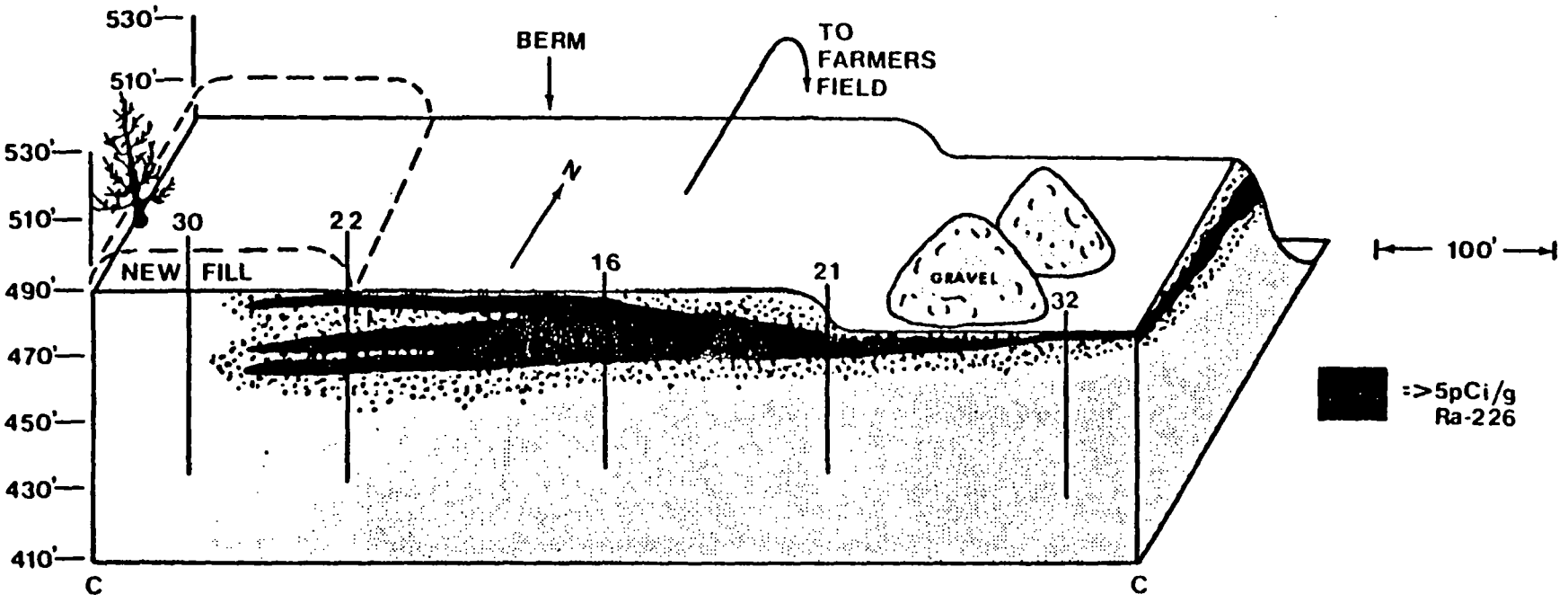



Figure 17. Cross section C-C (from Figure 10) showing subsurface deposits in Area 2. Blackened areas indicate the estimated location of contamination exceeding 5pCi/g Ra-226, based on surface and auger hole measurements.

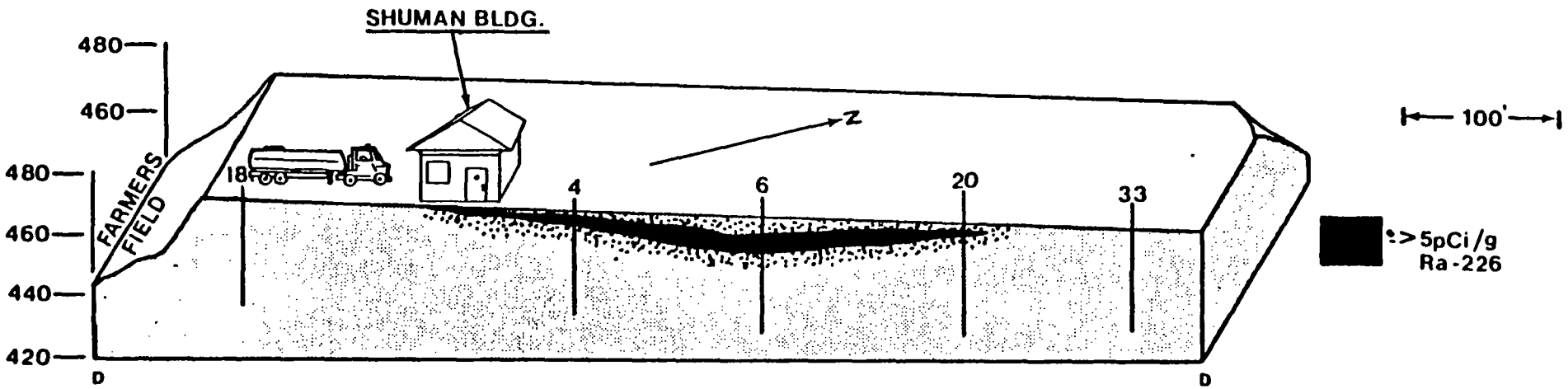



Figure 18. Cross section D-D (from Figure 10) showing subsurface deposits in Area 2. Blackened areas indicate the estimated location of contamination exceeding 5pCi/g Ra-226, based on surface and auger hole measurements.

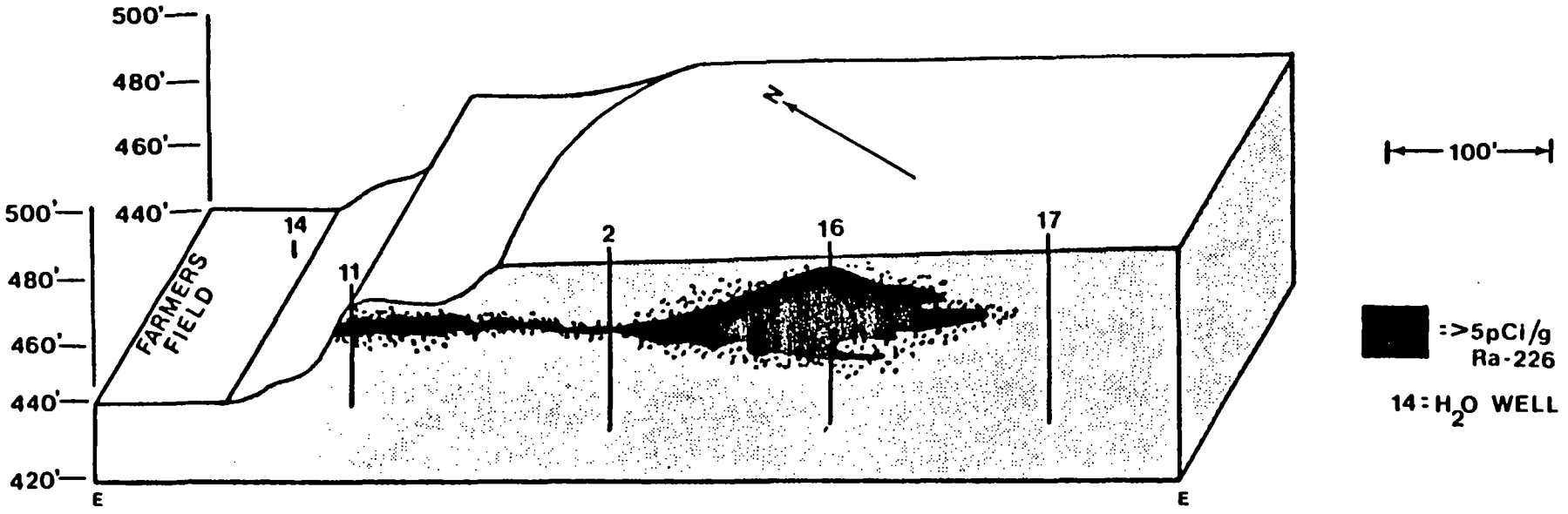



Figure 19. Cross section I-I (from Figure 10) showing subsurface deposits in Area 2. Blackened areas indicate the estimated location of contamination exceeding 5pCi/g Ra-226, based on surface and auger hole measurements.

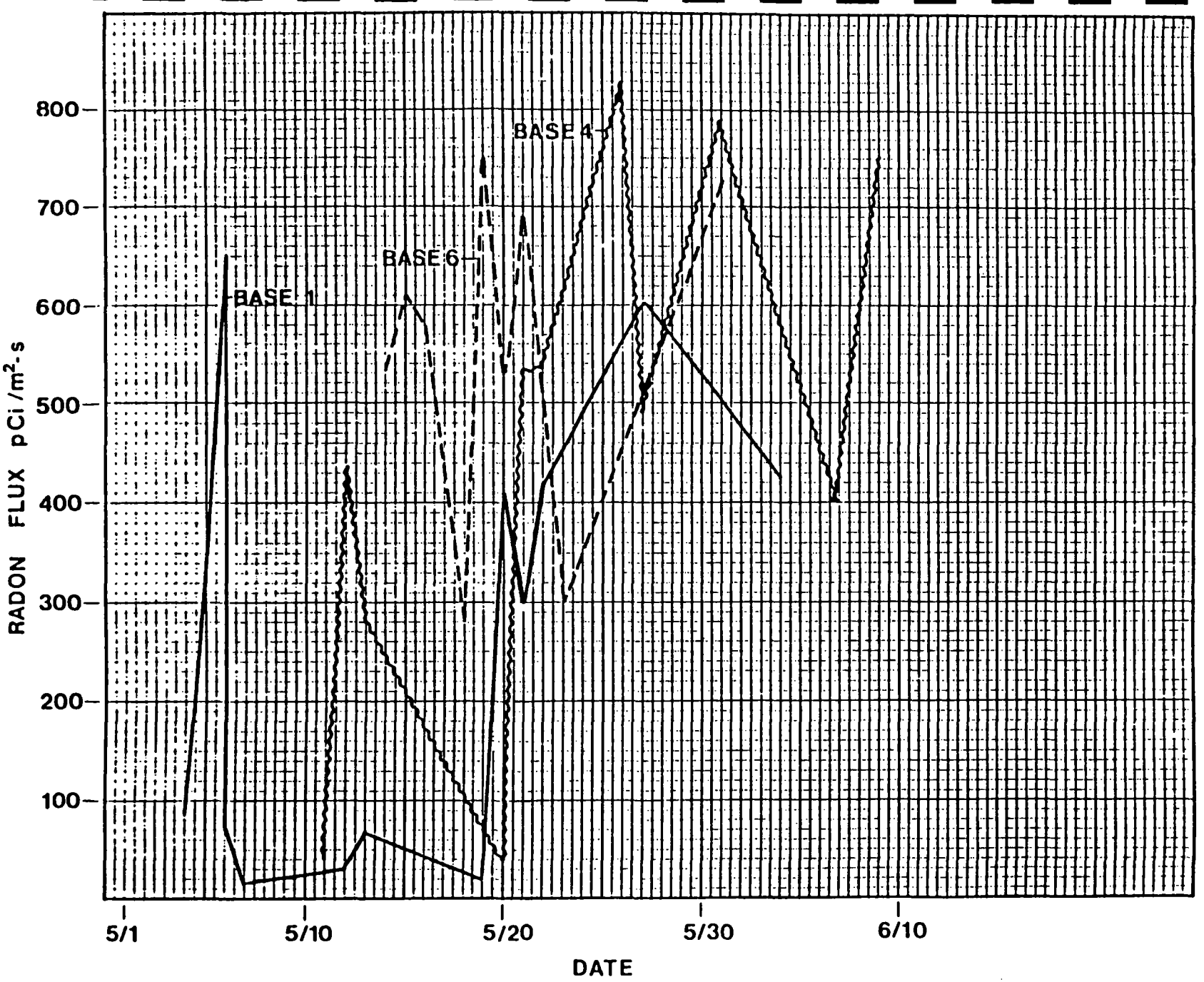



Figure 20. Radon-222 flux measurements at three locations in Area 2, for May, 1981.

Table 1

Gamma Radiation Levels and Beta-Gamma Count Rates at Grid Locations in Area 1

| Grid Location | NaI Count Rate (c/min) | Exposure Rate (uR/hr) | Beta-Gamma Count Rate w/window (c/min) | Beta-Gamma Count Rate w/o window (c/min) |
|---|---|---|---|---|
| G00E | 1000 | 10 | 30 | 40 |
| H00E | 900 | 9 | 60 | 50 |
| I00E | 1200 | 11 | 30 | 50 |
| J00E | 800 | 8 | 40 | 40 |
| K00E | 800 | 8 | 20 | 30 |
| L00E | 1200 | 11 | 20 | 30 |
| M00E | 800 | 8 | 40 | 40 |
| N00E | 760 | 7 | 40 | 30 |
| P00H | 1100 | 10 | 50 | 50 |
| P00I | 1200 | 11 | 40 | 30 |
| Q00I | 1000 | 10 | 50 | 50 |
| P00J | 1100 | 10 | 50 | 50 |
| Q00J | 1200 | 11 | 40 | 60 |
| P00K | 1100 | 10 | 40 | 30 |
| Q00K | 1200 | 11 | 30 | 50 |
| C00F | 900 | 9 | 40 | 50 |
| D00F | 900 | 9 | 30 | 40 |
| E00F | 1100 | 10 | 40 | 50 |
| F00F | 1200 | 11 | 30 | 40 |
| G00F | 900 | 9 | 40 | 40 |
| H00F | 1000 | 10 | 40 | 40 |
| I00F | 1200 | 11 | 40 | 40 |
| J00F | 2000 | 16 | 40 | 50 |
| K00F | 2700 | 20 | 50 | 50 |
| L00F | 2100 | 17 | 40 | 60 |
| M00F | 1500 | 12 | 60 | 60 |
| N00F | 1000 | 10 | 40 | 60 |
| O00F | 800 | 8 | 30 | 30 |
| E00G | 1100 | 10 | 20 | 30 |
| F00G | 1000 | 10 | 30 | 60 |
| G00G | 900 | 9 | 40 | 40 |
| H00G | 1000 | 10 | 20 | 40 |
| I00G | 1200 | 11 | 30 | 30 |
| J00G | 1000 | 10 | 30 | 40 |
| K00G | 1600 | 13 | 60 | 70 |
| L00G | 1300 | 11 | 40 | 50 |
| M00G | 2200 | 17 | 60 | 50 |
| N00G | 1300 | 11 | 30 | 40 |
| O00G | - | - | 50 | 40 |
| E00H | 1100 | 10 | 40 | 40 |
| F00H | 900 | 9 | 30 | 30 |
| G00H | 1100 | 10 | 30 | 50 |
| H00H | 1200 | 11 | 50 | 40 |
| I00H | 1000 | 10 | 40 | 50 |

Table 1, cont.

| Grid Location | NaI Count Rate (c/min) | Exposure Rate (uR/hr) | Beta-Gamma Count Rate w/window (c/min) | Beta-Gamma Count Rate w/o window (c/min) |
|---|---|---|---|---|
| J00H | 1000 | 10 | 50 | 40 |
| K00H | 1000 | 10 | 20 | 50 |
| L00H | 1100 | | 20 | 50 |
| M00H | 1200 | 11 | 50 | 40 |
| N00H | 1500 | 12 | 50 | 80 |
| O00H | - | - | 40 | 40 |
| E00I | 1000 | 10 | 40 | 30 |
| F00I | 1000 | 10 | 30 | 40 |
| G00I | 800 | 8 | 30 | 30 |
| H00I | 1000 | 10 | 50 | 40 |
| I00I | 1100 | 10 | 30 | 60 |
| J00I | 1000 | 10 | 30 | 40 |
| K00I | 900 | 9 | 30 | 40 |
| L00I | 1000 | 10 | 30 | 40 |
| M00I | 900 | 9 | 40 | 40 |
| N00I | 1100 | 10 | 40 | 40 |
| O00I | 1100 | 10 | 30 | 50 |
| E00J | 1100 | 10 | 40 | 60 |
| F00J | 1200 | 11 | 30 | 40 |
| G00J | 1300 | 11 | 50 | 40 |
| H00J | 1200 | 11 | 50 | 50 |
| I00J | 1100 | 10 | 50 | 50 |
| J00J | 1000 | 10 | 30 | 30 |
| K00J | 1100 | 10 | 40 | 40 |
| L00J | 1000 | 10 | 40 | 50 |
| M00J | 1200 | 11 | 50 | 40 |
| N00J | 900 | 9 | 40 | 30 |
| O00J | 900 | 9 | 40 | 40 |
| E00K | 1000 | 10 | 50 | 50 |
| F00K | 900 | 9 | 40 | 50 |
| G00K | 1000 | 10 | 50 | 50 |
| H00K | 1100 | 10 | 50 | 60 |
| I00K | 800 | 8 | 50 | 50 |
| J00K | 900 | 9 | 40 | 40 |
| K00K | 900 | 9 | 40 | 40 |
| L00K | 1000 | 10 | 30 | 30 |
| M00K | 900 | 9 | 30 | 60 |
| N00K | 800 | 8 | 30 | 40 |
| O00K | 900 | 9 | 40 | 40 |
| E00L | 800 | 8 | 40 | 60 |
| F00L | 1000 | 10 | 50 | 50 |
| G00L | 900 | 9 | 40 | 40 |
| H00L | 900 | 9 | 40 | 60 |
| I00L | 1000 | 10 | 50 | 50 |
| J00L | 1000 | 10 | 50 | 60 |
| K00L | 1000 | 10 | 50 | 50 |
| L00L | 900 | 9 | 20 | 30 |

Table 1, cont.

| Grid Location | NaI Count Rate (c/min) | Exposure Rate (UR/hr) | Beta-Gamma Count Rate w/window (c/min) | Beta-Gamma Count Rate w/o window (c/min) |
|---|---|---|---|---|
| M00L | 1100 | 10 | 30 | 40 |
| N00L | 1000 | 10 | 50 | 40 |
| O00L | 900 | 9 | 20 | 40 |
| F00M | 900 | 7 | 30 | 40 |
| G00M | 1100 | 10 | 20 | 30 |
| H00M | 1000 | 10 | 30 | 40 |
| I00M | 1000 | 10 | 40 | 50 |
| J00M | 800 | 8 | 30 | 40 |
| K00M | 1000 | 10 | 40 | 40 |
| L00M | 1100 | 10 | 40 | 30 |
| M00M | 1000 | 10 | 30 | 30 |
| N00M | 1000 | 10 | 30 | 50 |
| O00M | 1000 | 10 | 30 | 40 |
| F00N | 900 | 9 | 30 | 50 |
| G00N | 1000 | 10 | 30 | 30 |
| H00N | 1100 | 10 | 30 | 30 |
| I00N | 900 | 9 | 40 | 30 |
| J00N | 900 | 9 | 40 | 50 |
| K00N | 800 | 8 | 40 | 60 |
| L00N | 900 | 9 | 40 | 30 |
| M00N | 1100 | 10 | 30 | 30 |
| G00O | 1000 | 10 | 40 | 60 |
| H00O | 1100 | 10 | 20 | 30 |
| I00O | 1000 | 10 | 20 | 30 |
| J00O | 1200 | 11 | 30 | 40 |
| K00O | 1000 | 10 | 40 | 50 |

Table 2

Gamma Radiation Levels and Beta-Gamma Count Rates at Grid Locations in Area 2

| Grid Location | NaI Count Rate (c/min) | Exposure Rate (uR/hr) | Beta-Gamma Count Rate w/window (c/min) | Beta-Gamma Count Rate w/o window (c/min) |
|---|---|---|---|---|
| B00F | 600 | 10 | 40 | 40 |
| C00E | 600 | 10 | 20 | 20 |
| C00F | 600 | 10 | 20 | 30 |
| C00G | 700 | 11 | 30 | 40 |
| D00B | 800 | 12 | - | - |
| D00C | 800 | 12 | - | - |
| D00D | 700 | 11 | 20 | 40 |
| D00E | 500 | 9 | 20 | 20 |
| D00F | 600 | 10 | 20 | 20 |
| D00G | 700 | 11 | 30 | 50 |
| D00H | 800 | 12 | 50 | 50 |
| D00I | 700 | 11 | 30 | 50 |
| D00J | 1100 | 15 | 30 | 40 |
| E00A | 500 | 9 | - | - |
| E00B | 800 | 12 | - | - |
| E00C | 800 | 12 | - | - |
| E00D | 700 | 11 | - | - |
| E00E | 700 | 11 | 30 | 30 |
| E00F | 500 | 9 | 20 | 20 |
| E00G | 500 | 9 | 30 | 30 |
| E00H | 800 | 12 | 30 | 40 |
| E00I | 700 | 11 | 30 | 30 |
| E00J | 900 | 13 | 30 | 30 |
| F00A | 800 | 12 | - | - |
| F00B | 900 | 13 | - | - |
| F00C | 800 | 12 | 40 | 40 |
| F00D | 900 | 13 | 30 | 30 |
| F00E | 1000 | 14 | 30 | 40 |
| F00F | 500 | 9 | 30 | 30 |
| F00G | 800 | 12 | 40 | 40 |
| F00H | 700 | 11 | 50 | 50 |
| F00I | 800 | 12 | 30 | 40 |
| F00J | 800 | 12 | 30 | 30 |
| G00A | 800 | 12 | - | - |
| G00B | 900 | 13 | - | - |
| G00C | 800 | 12 | 30 | 40 |
| G00D | 900 | 13 | 40 | 40 |
| G00E | 700 | 11 | 30 | 40 |
| G00F | 1000 | 14 | 30 | 40 |
| G00G | 1000 | 14 | 40 | 40 |
| G00H | 800 | 12 | 30 | 40 |
| G00I | 800 | 12 | 30 | 30 |
| G00J | 800 | 12 | 20 | 40 |
| H00A | 800 | 12 | - | - |

Table 2, cont.

| Grid Location | NaI Count Rate (c/min) | Exposure Rate (uR/hr) | Beta-Gamma Count Rate w/window (c/min) | Beta-Gamma Count Rate w/o window (c/min) |
|---|---|---|---|---|
| H00B | 800 | 12 | - | - |
| H00C | 800 | 12 | 30 | 30 |
| H00D | 1000 | 14 | 30 | 40 |
| H00E | 900 | 13 | 40 | 40 |
| H00F | 800 | 12 | 30 | 30 |
| H00G | 800 | 12 | 30 | 40 |
| H00H | 700 | 11 | 30 | 30 |
| H00I | 600 | 10 | 30 | 30 |
| H00J | 900 | 13 | 30 | 30 |
| H00K | 800 | 12 | 40 | 60 |
| H00L | 800 | 12 | 30 | 50 |
| I00A | 900 | 13 | - | - |
| I00B | 1000 | 14 | - | - |
| I00C | 1000 | 14 | 30 | 30 |
| I00D | 900 | 13 | 40 | 40 |
| I00E | 800 | 12 | 40 | 40 |
| I00F | 800 | 12 | 20 | 40 |
| I00G | 900 | 13 | 30 | 40 |
| I00H | 800 | 12 | 30 | 30 |
| I00I | 600 | 10 | 40 | 40 |
| I00J | 900 | 13 | 40 | 40 |
| I00K | 900 | 13 | 40 | 60 |
| I00L | 1100 | 15 | 40 | 80 |
| J00A | 900 | 13 | - | - |
| J00B | 800 | 12 | - | - |
| J00C | 900 | 13 | - | - |
| J00D | 1000 | 14 | 30 | 50 |
| J00E | 900 | 13 | 40 | 40 |
| J00F | 1200 | 16 | 30 | 40 |
| J00G | 1000 | 14 | 40 | 40 |
| J00H | 800 | 12 | 40 | 40 |
| J00I | 600 | 10 | 40 | 50 |
| J00J | 900 | 13 | 30 | 30 |
| J00K | 900 | 13 | 40 | 40 |
| J00L | 600 | 10 | 30 | 30 |
| K00B | 1000 | 14 | - | - |
| K00C | 1100 | 15 | - | - |
| K00D | 1200 | 16 | 40 | 50 |
| K00E | 1100 | 15 | 40 | 60 |
| K00F | 2000 | 23 | 30 | 40 |
| K00G | 1400 | 18 | 40 | 40 |
| K00H | 1000 | 14 | 40 | 40 |
| K00I | 1000 | 14 | 40 | 60 |
| K00J | 800 | 12 | 20 | 30 |
| K00K | 800 | 12 | 30 | 30 |
| K00L | 800 | 12 | 20 | 40 |
| L00B | 1000 | 14 | - | - |

Table 2, cont.

| Grid Location | NaI Count Rate (c/min) | Exposure Rate (uR/hr) | Beta-Gamma Count Rate w/window (c/min) | Beta-Gamma Count Rate w/o window (c/min) |
|---|---|---|---|---|
| L00C | 1100 | 15 | - | - |
| L00D | 1800 | 21 | 50 | 50 |
| L00E | 2600 | 27 | 40 | 40 |
| L00F | 2500 | 27 | 940 | 1000 |
| * L00G | >50000 | 640 | 2100 | 2200 |
| L00H | 7000 | 55 | 70 | 120 |
| L00I | 2300 | 25 | 140 | 140 |
| L00J | 1300 | 17 | 40 | 80 |
| L00K | 2100 | 24 | 50 | 50 |
| L00L | 700 | 11 | 40 | 60 |
| * L73E | >50000 | 400 | - | - |
| M00B | 1100 | 15 | - | - |
| M00C | 1500 | 19 | - | - |
| M00D | 1900 | 22 | - | - |
| M00E | 3700 | 35 | 80 | 80 |
| M00F | 8000 | 60 | 80 | 90 |
| M00G | 3600 | 35 | 50 | 50 |
| M00H | 5000 | 44 | 40 | 50 |
| M00I | 7000 | 55 | 80 | 90 |
| M00J | 1800 | 21 | 60 | 70 |
| M00K | 900 | 13 | 30 | 40 |
| M00L | 900 | 13 | 30 | 60 |
| N00B | 1200 | 16 | - | - |
| N00C | 1300 | 17 | - | - |
| N00D | 1600 | 20 | - | - |
| N00E | 2000 | 23 | - | - |
| N00F | 3300 | 32 | - | - |
| N00G | 1000 | 14 | 30 | 40 |
| N00H | 1000 | 14 | 40 | 50 |
| N00I | 47000 | 210 | 680 | 1020 |
| N00J | 2300 | 25 | 30 | 30 |
| N00K | 1000 | 14 | 40 | 50 |
| N00L | 900 | 13 | 30 | 50 |
| O00C | 1200 | 16 | - | - |
| O00D | 1100 | 15 | - | - |
| O00E | 1400 | 18 | - | - |
| O00F | 1400 | 18 | 50 | 60 |
| O00G | 900 | 13 | 40 | 40 |
| O00H | 1000 | 14 | 40 | 50 |
| O00I | 900 | 13 | 20 | 40 |
| * O00J | >50000 | 840 | 4800 | 5200 |
| O00K | 1500 | 19 | 50 | 50 |
| O00L | 600 | 10 | 20 | 20 |
| P00D | 1100 | 15 | - | - |
| P00E | 1200 | 16 | - | - |
| P00F | 1000 | 14 | 40 | 60 |
| P00G | 1000 | 14 | 30 | 50 |

Table 2, cont.

| Grid Location | NaI Count Rate (c/min) | Exposure Rate (uR/hr) | Beta-Gamma Count Rate w/window (c/min) | Beta-Gamma Count Rate w/o window (c/min) |
|---|---|---|---|---|
| P00H | 1100 | 14 | 30 | 50 |
| P00I | 1000 | 14 | 50 | 60 |
| P00J | 1000 | 14 | 400 | 50 |
| P00K | 20000 | 115 | 240 | 300 |
| P00L | 3300 | 32 | 130 | 130 |
| P00M | 500 | 9 | - | - |
| P00N | 500 | 9 | - | - |
| Q00E | 1000 | 14 | - | - |
| Q00F | 900 | 13 | - | - |
| Q00G | 1000 | 14 | 30 | 40 |
| Q00H | 1000 | 14 | 30 | 40 |
| Q00I | 800 | 12 | 30 | 60 |
| Q00J | 800 | 12 | 30 | 40 |
| Q00K | 800 | 12 | 30 | 40 |
| Q00L | 1200 | 16 | 40 | 40 |
| Q00M | 1300 | 17 | 70 | 70 |
| Q00N | 600 | 10 | 20 | 40 |
| R00F | 1000 | 14 | - | - |
| R00G | 900 | 13 | - | - |
| R00H | 900 | 13 | 40 | 40 |
| R00I | 1000 | 14 | 30 | 30 |
| R00J | 800 | 12 | 40 | 40 |
| R00K | 900 | 13 | 40 | 40 |
| R00L | 1000 | 14 | 60 | 60 |
| R00M | 700 | 11 | 40 | 40 |
| R00N | 700 | 11 | 40 | 50 |
| R00O | 600 | 10 | 20 | 30 |
| S00G | 800 | 12 | - | - |
| S00H | 900 | 13 | 30 | 60 |
| S00I | 900 | 13 | 40 | 50 |
| S00J | 1000 | 14 | 50 | 60 |
| S00K | 900 | 13 | 40 | 40 |
| S00L | 1200 | 16 | 40 | 40 |
| S00M | 6000 | 48 | 80 | 80 |
| S00N | 500 | 9 | 30 | 30 |
| S00O | 2300 | 25 | 90 | 90 |
| S00P | 800 | 12 | 30 | 40 |
| T00G | 800 | 12 | - | - |
| T00H | 1100 | 15 | - | - |
| T00I | 1000 | 14 | - | - |
| T00J | 900 | 13 | 30 | 50 |
| T00K | 1000 | 14 | 30 | 40 |
| T00L | 1000 | 14 | 40 | 40 |
| T00M | 1600 | 20 | 60 | 70 |
| T00N | 2500 | 27 | 180 | 200 |
| T00O | 3100 | 31 | 70 | 70 |
| T00P | 16000 | 98 | 600 | 700 |

Table 2, cont.

| Grid Location | NaI Count Rate (c/min) | Exposure Rate (uR/hr) | Beta-Gamma Count Rate w/window (c/min) | Beta-Gamma Count Rate w/o window (c/min) |
|---|---|---|---|---|
| T00Q | 1500 | 19 | 30 | 40 |
| T00R | 500 | 9 | 30 | 40 |
| T00S | 700 | 11 | - | - |
| U00H | 700 | 11 | - | - |
| U00I | 900 | 13 | - | - |
| U00J | 800 | 12 | - | - |
| U00K | 700 | 11 | 40 | 50 |
| U00L | 900 | 13 | 50 | 50 |
| U00M | 1000 | 14 | 40 | 50 |
| U00N | 2800 | 29 | 100 | 140 |
| U00O | 3500 | 34 | 20 | 80 |
| * U00P | >50000 | 450 | 1300 | 1500 |
| U00Q | 35000 | 170 | 400 | 720 |
| U00R | 1500 | 19 | 40 | 40 |
| U00S | 1000 | 14 | - | - |
| V00J | 800 | 12 | - | - |
| V00K | 900 | 13 | 40 | 40 |
| V00L | 1000 | 14 | 50 | 50 |
| V00M | 900 | 13 | 40 | 40 |
| V00N | 900 | 13 | 40 | 40 |
| V00O | 13000 | 85 | 500 | 500 |
| V00P | 4700 | 42 | 70 | 70 |
| V00Q | 12000 | 80 | 170 | 190 |
| V00R | 5000 | 44 | 100 | 100 |
| V00S | 700 | 11 | - | - |
| W00K | 800 | 12 | - | - |
| W00L | 800 | 12 | 30 | 30 |
| W00M | 800 | 12 | 30 | 30 |
| W00N | 900 | 13 | 40 | 50 |
| W00O | 1000 | 14 | 50 | 50 |
| W00P | 2100 | 120 | 600 | 800 |
| W00Q | 40000 | 190 | 900 | 1100 |
| W00R | 20000 | 115 | 140 | 170 |
| W00S | 1100 | 15 | - | - |
| X00K | 900 | 13 | - | - |
| X00L | 1100 | 15 | - | - |
| X00M | 1100 | 15 | 40 | 40 |
| X00N | 1000 | 14 | 40 | 40 |
| X00O | 1100 | 15 | 30 | 50 |
| X00P | 4000 | 37 | 120 | 160 |
| X00Q | 12000 | 80 | 300 | 400 |
| * X00R | >50000 | 740 | 1900 | 2000 |
| X00S | 1500 | 19 | - | - |
| Y00I | 1000 | 14 | - | - |
| Y00J | 1300 | 17 | - | - |
| Y00K | 1600 | 20 | - | - |
| Y00L | 1600 | 20 | - | - |

Table 2, cont.

| Grid Location | NaI Count Rate (c/min) | Exposure Rate (uR/hr) | Beta-Gamma Count Rate w/window (c/min) | Beta-Gamma Count Rate w/o window (c/min) |
|---|---|---|---|---|
| Y00M | 1100 | 15 | 40 | 40 |
| Y00N | 3000 | 30 | 30 | 50 |
| Y00O | 1700 | 20 | 40 | 50 |
| Y00P | 2100 | 24 | 40 | 60 |
| Y00Q | 9000 | 66 | 200 | 280 |
| Y00R | 40000 | 190 | 1000 | 1400 |
| Y00S | 3600 | 35 | - | - |
| Z00I | 800 | 10 | 40 | 40 |
| Z00J | 1000 | 14 | 40 | 50 |
| Z00K | 1800 | 21 | 70 | 90 |
| Z00L | 3200 | 32 | 80 | 80 |
| Z00M | 3700 | 35 | 120 | 150 |
| Z00N | 5000 | 44 | 110 | 130 |
| Z00O | 3300 | 32 | 80 | 120 |
| Z00P | 1900 | 22 | 50 | 60 |
| Z00Q | 2400 | 26 | 50 | 60 |
| Z00R | 12000 | 80 | 300 | 380 |
| Z00S | 2600 | 27 | - | - |
| a00I | 900 | 13 | 40 | 50 |
| a00J | 900 | 13 | 20 | 40 |
| a00K | 1300 | 17 | 50 | 90 |
| a00L | 1800 | 21 | 60 | 80 |
| a00M | 1900 | 22 | 120 | 140 |
| a00N | 1200 | 16 | 90 | 100 |
| a00O | 1300 | 17 | 40 | 40 |
| a00P | 1000 | 14 | 20 | 30 |
| a00Q | 2200 | 24 | 60 | 60 |
| a00R | 2300 | 25 | 70 | 100 |
| a00S | 2600 | 27 | - | - |
| b00I | 900 | 13 | - | - |
| b00J | 900 | 13 | - | - |
| b00P | 800 | 12 | 40 | 50 |
| b00Q | 700 | 11 | 30 | 70 |
| b00R | 2400 | 26 | 60 | 90 |
| b00S | 2400 | 26 | - | - |
| c00N | 700 | 11 | - | - |
| c00O | 700 | 11 | 40 | 40 |
| c00P | 1000 | 14 | 50 | 50 |
| c00Q | 1300 | 17 | 60 | 80 |
| c00R | 1900 | 22 | 50 | 80 |
| c00S | 1800 | 21 | - | - |
| d00O | 1400 | 18 | 40 | 60 |
| d00P | | | 30 | 50 |
| d00Q | | | 30 | 60 |
| d00R | 2000 | 23 | 60 | 70 |
| d00S | 2000 | 23 | - | - |
| d00T | 900 | 13 | - | - |

Table 2, cont.

| Grid Location | NaI Count Rate (c/min) | Exposure Rate (uR/hr) | Beta-Gamma Count R ate w/window (c/min) | Beta-Gamma Count Rate w/o window (c/min) |
|---|---|---|---|---|
| d00U | 1800 | 21 | - | - |
| d00V | 2200 | 24 | 50 | 50 |
| d00W | 2500 | 27 | 100 | 100 |
| d00X | 700 | 11 | 30 | 30 |
| e00L | 600 | 10 | 70 | 70 |
| e00O | 1700 | 14 | - | - |
| e95O | 1000 | 14 | - | - |
| e00P | - | - | 70 | 100 |
| e95Q | 1000 | 14 | 40 | 40 |
| e95R | 1300 | 17 | 40 | 80 |
| e95S | 1800 | 21 | - | - |
| e95T | 2500 | 27 | - | - |
| e95U | 3500 | 34 | - | - |
| e95V | 3400 | 33 | 100 | 100 |
| e95W | 4000 | 37 | 120 | 140 |
| e95X | 3000 | 30 | 100 | 100 |
| e95Y | 1500 | 19 | 50 | 60 |
| e95Z | 1700 | 20 | 70 | 80 |
| e00a | 2300 | 25 | 90 | 100 |
| f00K | 600 | 10 | 60 | 60 |
| f00L | 700 | 11 | 50 | 80 |
| f00O | 1100 | 15 | 40 | 60 |
| f57Q | 3400 | 33 | - | - |
| f00R | 2700 | 28 | 60 | 60 |
| f00S | 2700 | 28 | - | - |
| f00T | 4500 | 41 | - | - |
| f00U | 6000 | 50 | - | - |
| f00V | 50000 | 230 | 1060 | 1080 |
| f00W | 6000 | 50 | 120 | 140 |
| f00X | 6000 | 50 | 100 | 100 |
| f00Y | 1500 | 19 | 50 | 60 |
| f00Z | 1000 | 14 | 40 | 40 |
| f00a | 1000 | 14 | 30 | 50 |
| f00M | - | - | 60 | 60 |
| g00K | 700 | 11 | 50 | 50 |
| g00L | 600 | 10 | 80 | 90 |
| g00M | 600 | 10 | 60 | 90 |
| g00O | 2000 | 23 | 80 | 110 |
| g00P | 2000 | 23 | 50 | 90 |
| g00Q | 3300 | 32 | 70 | 100 |
| g00R | 21000 | 120 | 300 | 420 |
| g00S | 8000 | 62 | - | - |
| g00T | 6000 | 50 | - | - |
| g00U | 15000 | 95 | - | - |
| g00V | 11000 | 77 | 180 | 260 |
| g00W | 7000 | 56 | 110 | 140 |
| g00X | 2500 | 27 | 50 | 60 |

Table 2, cont.

| Grid Location | NaI Count Rate (c/min) | Exposure Rate (uR/hr) | Beta-Gamma Count Rate w/window (c/min) | Beta-Gamma Count Rate w/o window (c/min) |
|---|---|---|---|---|
| g00Y | 2200 | 24 | 90 | 120 |
| g00Z | 1500 | 19 | 50 | 70 |
| g00a | 1000 | 14 | 30 | 30 |
| h00K | 700 | 11 | 30 | 30 |
| h00L | 800 | 12 | 70 | 70 |
| h00M | 900 | 13 | 70 | 80 |
| h00N | 1000 | 14 | - | - |
| h00O | 3100 | 31 | 70 | 70 |
| h00P | 17000 | 105 | 180 | 280 |
| * h00Q | >50000 | 1050 | 4200 | 4200 |
| h00R | 27000 | 140 | 560 | 660 |
| h00S | 45000 | 205 | 900 | 1080 |
| h00T | 4000 | 37 | 150 | 150 |
| h00U | 6500 | 52 | 170 | 190 |
| h00V | 10000 | 72 | 240 | 250 |
| h00W | 3800 | 36 | 200 | 300 |
| h00X | 1000 | 14 | 60 | 80 |
| h00Y | 1800 | 21 | 50 | 50 |
| h00Z | 700 | 11 | 20 | 30 |
| h00a | 700 | 11 | 40 | 40 |
| h72P | - | - | 8000 | 9400 |
| i00K | 800 | 12 | 40 | 50 |
| i00L | 900 | 13 | 60 | 60 |
| i00M | 1700 | 20 | 90 | 110 |
| i00N | 8000 | 60 | 110 | 110 |
| i00O | 36000 | 175 | 1000 | 1100 |
| * i00P | >50000 | 1600 | 7200 | 8400 |
| * i00Q | >50000 | 1170 | 2800 | 3600 |
| i00R | 30000 | 155 | 900 | 1120 |
| i00S | 800 | 60 | 180 | 300 |
| i00T | 1600 | 20 | 40 | 40 |
| i00U | 3000 | 30 | 130 | 180 |
| i00V | 2200 | 24 | - | - |
| i00W | 1400 | 18 | 40 | 60 |
| i00X | 1000 | 14 | 40 | 60 |
| i00Y | 1500 | 19 | 70 | 70 |
| j00K | 800 | 12 | 60 | 60 |
| j00L | 900 | 13 | 60 | 80 |
| j00M | 2000 | 23 | 90 | 90 |
| j00N | 6000 | 49 | 130 | 160 |
| j00O | 10000 | 70 | 130 | 180 |
| j00P | 20000 | 115 | 400 | 420 |
| j00Q | 16000 | 98 | 410 | 500 |
| j00R | 21000 | 120 | 560 | 700 |
| j00S | 1900 | 22 | 70 | 90 |
| j00T | 1200 | 16 | 50 | 60 |
| j00U | 1000 | 14 | 60 | 60 |

Table 2, cont.

| Grid Location | NaI Count Rate (c/min) | Exposure Rate (uR/hr) | Beta-Gamma Count Rate w/window (c/min) | Beta-Gamma Count Rate w/o window (c/min) |
|---|---|---|---|---|
| j00V | 1800 | 21 | 70 | 70 |
| j00W | 1200 | 16 | 70 | 80 |
| j00X | 1000 | 14 | 50 | 50 |
| j00Y | 1100 | 15 | 60 | 60 |
| k00L | 1000 | 14 | 70 | 70 |
| k00M | 1100 | 15 | 90 | 110 |
| k00N | 1000 | 14 | 60 | 90 |
| k00O | 1000 | 14 | 70 | 90 |
| k00P | 1100 | 15 | 80 | 110 |
| k00Q | 1400 | 18 | 40 | 40 |
| k00R | 7500 | 58 | 140 | 180 |
| k00S | 1100 | 15 | 50 | 50 |
| k00T | 1100 | 15 | 30 | 50 |
| k00U | 1700 | 20 | 60 | 60 |
| k00V | 1700 | 20 | 50 | 60 |
| k00W | 700 | 11 | 40 | 40 |
| k00X | 700 | 11 | 40 | 50 |
| k00Y | 1000 | 14 | 40 | 50 |
| l00L | 900 | 13 | 70 | 70 |
| l00M | 900 | 13 | 70 | 80 |
| l00N | 800 | 12 | 70 | 70 |
| l00O | 900 | 13 | 80 | 90 |
| l00P | 700 | 11 | 60 | 70 |
| l00Q | 900 | 13 | 50 | 50 |
| l00R | 800 | 12 | 40 | 40 |
| l00S | 1200 | 16 | 40 | 50 |
| l00T | 1200 | 16 | 60 | 70 |
| l00U | 1100 | 15 | 60 | 80 |
| l00V | 900 | 13 | 30 | 40 |
| m00O | 800 | 12 | 80 | 80 |
| m00P | 700 | 11 | 60 | 60 |
| m00Q | 700 | 11 | 40 | 40 |
| m00R | 900 | 13 | 30 | 50 |
| m00S | 1000 | 14 | 40 | 40 |

* Reading >50,000 on NaI, reading was made with end window GM tube with beta shield.

Table 3

Surface Soil Sample Radionuclide Concentrations
(pCi/g), by Gamma Analysis

| Location | Sample | K-40 | U-238 | Ra-226 | Pb-214 | Bi-214 | Ra-223 | Rn-219 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|---|
| G00C | Area 2, Berm | 2.4E1 | ----- | 2.1E0 | 2.1E0 | 2.1E0 | ----- | ----- | ----- | ----- |
| i00Q | Area 2, Near Shuman Bld | ----- | 3.0E2 | 8.6E2 | 9.6E2 | 7.6E2 | 1.6E2 | 3.1E2 | 3.6E2 | ----- |
| Z00N | Area 2, Road Surface | ----- | 4.4E1 | 6.0E2 | 6.6E2 | 5.4E2 | 2.0E1 | 2.0E1 | ----- | ----- |
| O00J | Area 2, Near Berm | ----- | 5.7E2 | 2.3E3 | 2.5E3 | 2.0E3 | 6.0E2 | 7.8E2 | 9.6E2 | ----- |
| O00G | Area 2, Near Berm | 2.1E1 | ----- | 1.0E1 | 1.1E1 | 9.6E0 | ----- | ----- | ----- | ----- |
| N00I | Area 2, Near Berm | ----- | 5.5E2 | 2.0E3 | 2.0E3 | 2.1E3 | 4.9E2 | 7.9E2 | 8.9E2 | ----- |
| M00E | Area 2, Berm | 1.3E1 | ----- | 3.9E1 | 4.2E1 | 3.6E0 | ----- | ----- | ----- | ----- |
| F00C | Area 2, Berm | 1.4E1 | ----- | 1.7E0 | 1.9E0 | 1.5E0 | ----- | ----- | ----- | ----- |
| S00K | Area 2, Near Gravel Pile | 3.2E1 | ----- | 3.9E0 | 3.9E0 | ----- | ----- | ----- | ----- | ----- |
| i00P | Area 2, Near Shuman Bldg | ----- | 8.3E2 | 4.0E3 | 4.4E3 | 3.6E3 | 9.6E2 | 9.6E2 | 1.5E3 | ----- |
| S00L | Area 2, Near Gravel Pile | 2.8E1 | ----- | 2.5E0 | 2.4E0 | 2.6E0 | ----- | ----- | ----- | ----- |
| h00Q | Area 2, Near Shuman Bldg | ----- | 1.5E2 | 3.0E1 | 3.4E2 | 2.6E2 | 1.7E2 | 1.9E2 | 1.5E2 | ----- |
| SPEC | Off-site Bkg Earth City | 2.6E1 | ----- | 2.5E0 | 2.5E0 | 2.5E0 | ----- | ----- | ----- | ----- |
| i00P | Area 2, Duplicate | ----- | 6.4E2 | 2.7E3 | 3.0E3 | 2.4E3 | 2.3E3 | 1.2E3 | 1.1E3 | ----- |
| SPEC | Off-site Bkg Earth City | 1.9E1 | ----- | 2.7E0 | 2.5E0 | 2.9E0 | ----- | ----- | ----- | ----- |
| Z00O | Area 2, Road Surface | ----- | 2.8E1 | 5.2E1 | 5.7E1 | 4.8E1 | 3.1E1 | 3.1E1 | 3.4E1 | ----- |
| SPEC | Leachate Treatment Sludge | ----- | ----- | 6.9E0 | 7.9E0 | 5.9E0 | ----- | ----- | ----- | ----- |
| N00I | Area 2, Near Berm | ----- | 7.6E2 | 7.1E3 | 1.0E4 | 4.2E3 | 2.2E3 | 2.0E3 | 1.8E3 | ----- |
| SPEC | Area 1, Base 6 Near Road | ----- | 6.5E2 | 2.4E3 | 2.7E3 | 2.1E3 | 1.6E3 | 1.4E3 | 1.0E3 | ----- |
| P00I | Area 2, Near Berm | 1.7E1 | 1.0E0 | 7.0E0 | 7.3E0 | 6.8E0 | ----- | ----- | ----- | ----- |
| SPEC | Area 1, Base 7 Near Road | ----- | 3.7E1 | 2.7E2 | 3.4E2 | 2.1E2 | 2.9E1 | ----- | 5.8E1 | 2.2E0 |
| SPEC | Leachate Treatment Sludge | ----- | ----- | 2.3E0 | ----- | 2.3E0 | ----- | ----- | ----- | ----- |
| SPEC | Area 1, Base 6 Near Road | ----- | 6.5E2 | 2.7E3 | 3.1E3 | 2.5E3 | 1.2E3 | 1.1E3 | 9.5E2 | ----- |
| SPEC | Area 1, Base 5 Brown Soil | ----- | 3.9E2 | 1.1E3 | 1.6E3 | 8.2E2 | 2.8E2 | 3.8E2 | 3.7E2 | ----- |
| SPEC | Area 1, Base 5 Black Soil | ----- | 3.1E2 | 6.8E2 | 7.8E2 | 5.8E2 | 3.1E2 | 3.2E2 | 3.2E2 | ----- |
| SPEC | Off-site Bkg Taussig Road | 3.2E1 | ----- | 2.5E0 | 2.4E0 | 2.6E0 | ----- | ----- | ----- | 2.4E0 |
| SPEC | Area 1, Base 5 White Soil | ----- | 2.1E3 | 2.1E4 | 2.3E4 | 1.9E4 | 5.3E3 | 5.3E3 | 5.0E3 | ----- |
| i00P | Area 2, Duplicate | ----- | 6.2E2 | 3.5E3 | 3.7E3 | 3.2E3 | 1.3E3 | 1.3E3 | 1.7E3 | ----- |
| J00G | Area 1, Hot Spot | ----- | 3.4E1 | 9.7E1 | 1.1E2 | 8.3E1 | 4.3E1 | 4.3E1 | 4.6E1 | ----- |
| M00H | Area 1, Low Level Area | 2.2E1 | ----- | 2.7E0 | 2.6E0 | 2.8E0 | ----- | ----- | ----- | 3.0E0 |
| K00F | Area 1 | 2.0E1 | ----- | 3.7E0 | 3.6E0 | 3.8E0 | ----- | ----- | ----- | 2.1E0 |
| SPEC | Area 1, East Berm | 2.4E1 | ----- | 2.6E0 | 2.2E0 | 2.9E0 | ----- | ----- | ----- | ----- |

Table 3 cont.

| Location | Sample | K-40 | U-238 | Ra-226 | Pb-214 | Bi-214 | Ra-223 | Rn-219 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|---|
| I00L | Area 1 | ----- | ----- | 2.9E0 | 3.2E0 | 2.6E0 | ----- | ----- | ----- | 2.3E0 |
| SPEC | Area 1, East Berm | 1.8E1 | ----- | 2.4E0 | 2.2E0 | 2.6E0 | ----- | ----- | ----- | ----- |
| P00H | Area 1, Near Road | 3.0E1 | ----- | 4.3E0 | 5.2E0 | 3.3E0 | ----- | ----- | ----- | 1.8E0 |
| N62H | Area 1 | 2.5E1 | ----- | 4.1E0 | 3.4E0 | 4.7E0 | ----- | ----- | ----- | 3.0E0 |
| O11J | Area 1, Near Berm | ----- | 9.4E2 | 4.2E3 | 4.6E3 | 3.9E3 | 2.0E3 | 2.1E3 | 2.1E3 | ----- |
| L73E | Area 2, Side of Hill | ----- | 3.8E2 | 1.1E3 | 1.2E3 | 1.0E3 | 4.5E2 | 4.6E2 | 3.8E2 | ----- |
| K00F | Area 1 | 3.9E1 | ----- | 4.4E0 | 5.2E0 | 3.5E0 | ----- | ----- | ----- | ----- |
| N62H | Area 1, Fill | 2.7E1 | ----- | 3.1E0 | 3.1E0 | 3.1E0 | ----- | ----- | ----- | 1.3E0 |
| N00F | Area 1, Fill | ----- | ----- | 2.6E0 | 3.0E0 | 2.1E0 | ----- | ----- | ----- | 2.6E0 |
| J00G | Area 1, Fill | ----- | ----- | 2.3E0 | 3.5E0 | 1.1E0 | ----- | ----- | ----- | 1.5E0 |
| K66E | Area 1, Near Parking Lot | ----- | ----- | 1.5E1 | 1.7E1 | 1.3E1 | ----- | ----- | ----- | ----- |
| I00I | Area 1, Fill | 3.1E1 | ----- | 3.8E0 | ----- | 3.8E0 | ----- | ----- | ----- | 1.6E0 |

Soil Radiochemical Analysis

Table 4

Bi-214 from Gamma Spectroscopy

| Sample | Activity pCi/gm | | |
|---|---|---|---|
| | U-238 | Th-230 | Bi-214 |
| | (All +/- 25%) | (All +/- 25%) | (All +/- 25%) |
| Area 1 Surface (1980) | 3.8 | 82 | 2.1 |
| Area 1 Surface (1980) | 12 | 597 | 25 |
| Area 1 Borehole 1 (1980) | 21 | 188 | 44 |
| Area 2 Surface (1980) | 175 | 6,095 | 1,488 |
| Area 2 Surface (1980) | 18 | 338 | 9.4 |
| Base 5 Surface (1981) | 101 | 178,000 | 19,000 |
| Base 6 Surface (1981) | 54 | 46,100 | 2,600 |
| Borehole 11 (1981) | 82 | 29,200 | 1,800 |
| N11J Surface (1981) | 127 | 27,200 | 2,000 |
| O11J Surface (1981) | 1.0 | 52,000 | 3,900 |

## Auger Hole NaI Counts and IG Analysis

Table 5

Borehole #1

| Depth | Gross NaI | Radionuclide Concentrations [pCi/g] Ra-226 | Pb-214 | Bi-214 | U-238 | Ra-223 | K-40 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|
| 00 | >50,000 | 1.6E1 | 1.6E2 | 1.7E2 | 1.6E2 | ------ | ------ | ------ | ------- |
| 01 | >50,000 | 7.5E2 | 6.5E2 | 9E2 | 1.7E2 | ------ | ------ | 1.4E2 | ------- |
| 02 | >50,000 | 2.2E4 | 2.4E4 | 1.9E4 | ------ | ------ | ------ | 4.2E3 | ------- |
| 03 | >50,000 | 4.0E3 | 3.0E3 | 4.8E3 | ------ | 1.1E3 | ------ | 2.1E2 | ------- |
| 04 | >50,000 | 1.3E3 | 1.2E3 | 1.4E3 | 9.3E1 | ------ | ------ | ------ | ------- |
| 05 | 20,000 | 2.4E1 | ------- | 2.4E1 | ------ | ------ | 8.0E0 | ------ | ------- |
| 06 | 4,500 | 3.9E0 | 3.5E0 | 4.3E0 | ------ | ------ | 1.1E1 | ------ | ------- |
| 08 | 2,200 | 2.3E0 | 2.3E0 | 2.2E0 | ------ | ------ | 1.4E1 | ------ | 7.2E-1 |
| 10 | 2,000 | 2.3E0 | 2.4E0 | 2.2E0 | ------ | ------ | 1.3E1 | ------ | 8.3E-1 |
| 12 | 1,500 | 1.9E0 | 2.2E0 | 1.6E0 | ------ | ------ | 1.3E1 | ------ | ------- |
| 14 | 1,300 | 1.8E0 | 1.9E0 | 1.7E0 | ------ | ------ | 9.7E0 | ------ | 6.3E-1 |
| 16 | 800 | 1.3E0 | 1.2E0 | 1.3E0 | ------ | ------ | 1.0E1 | ------ | 3.9E-1 |
| 18 | 800 | 1.2E0 | 1.6E0 | 8.0E-1 | ------ | ------ | 3.3E0 | ------ | 3.0E-1 |
| 20 | 800 | 8.1E-1 | 7.4E-2 | 8.7E-1 | ------ | ------ | 1.0E1 | ------ | 3.2E-1 |
| 22 | 500 | 6.5E-1 | 4.0E-1 | 9.0E-1 | ------ | ------ | 2.5E0 | ------ | ------- |
| 24 | 150 | 2.5E-1 | 2.8E-1 | 2.1E-1 | ------ | ------ | 1.5E0 | ------ | ------- |
| 26 | 1,000 | 6.3E-1 | 7.2E-1 | 5.4E-1 | ------ | ------ | 6.3E0 | ------ | 3.1E-1 |
| 28 | 1,300 | 8.7E-1 | 8.4E-1 | 8.9E-1 | ------ | ------ | 1.2E1 | ------ | 5.7E-1 |
| 30 | 500 | 4.3E-1 | ------- | 4.3E-1 | ------ | ------ | 3.0E0 | ------ | 2.1E-1 |
| 32 | 700 | 1.3E0 | 1.E0 | 1.2E0 | ------ | ------ | 6.1E0 | ------ | 4.2E-1 |
| 34 | 1,400 | 2.4E0 | 2.5E0 | 2.2E0 | ------ | ------ | 6.1E0 | ------ | 5.4E-1 |
| 36 | 1,800 | 1.4E0 | 1.5E0 | 1.2E0 | ------ | ------ | 1.2E1 | ------ | ------- |

Borehole #3

| Depth | Gross NaI | Radionuclide Concentrations [pCi/g] Ra-226 | Pb-214 | Bi-214 | U-238 | Ra-223 | K-40 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|
| 00 | >50,000 | 8.4E2 | 7.8E2 | 8.4E2 | ------ | ------ | ------ | 6.4E1 | ------- |
| 01 | >50,000 | 1.5E4 | 1.3E4 | 1.9E4 | 1.4E3 | ------ | ------ | ------ | ------- |
| 02 | >50,000 | 7.0E3 | 5.3E3 | 8.7E3 | ------ | ------ | ------ | ------ | ------- |
| 03 | 1,400 | 2.3E1 | 1.4E1 | 3.2E1 | ------ | ------ | 1.2E1 | ------ | ------- |
| 05 | 2,300 | 6.2E0 | 5.8E0 | 6.6E0 | ------ | ------ | 8.9E0 | ------ | ------- |
| 07 | 3,000 | 4.7E0 | 4.9E0 | 4.4E0 | ------ | ------ | 6.9E0 | ------ | ------- |
| 09 | 1,800 | 3.5E0 | 4.2E0 | 2.8E0 | ------ | 3.6E0 | 8.2E0 | ------ | ------- |
| 11 | 1,000 | 1.8E0 | 2.1E0 | 1.5E0 | ------ | ------ | 4.1E0 | ------ | ------- |
| 13 | 600 | 1.7E0 | 1.4E0 | 2.0E0 | ------ | ------ | ------ | ------ | ------- |
| 15 | 1,800 | 4.5E0 | 4.6E0 | 4.4E0 | ------ | 4.7E0 | 4.2E0 | ------ | ------- |

Table 5, cont.

Borehole #3, cont.

| Depth | Gross NaI | Ra-226 | Pb-214 | Bi-214 | U-238 | Ra-223 | K-40 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|
| | | Radionuclide Concentrations [pCi/g] | | | | | | | |
| 17 | 1,000 | 9.0E-1 | 1.1E0 | 7.3E-1 | ------ | ------ | 6.4E0 | ------ | 4.4E-1 |
| 19 | 500 | 2.9E-1 | 3.E-1 | 2.1E-1 | ------ | ------ | 2.2E0 | ------ | ------- |
| 21 | 500 | 5.0E-1 | 7.E-1 | 2.2E-1 | ------ | ------ | 2.0E0 | ------ | ------- |
| 23 | 700 | 1.0E0 | 1.1E0 | 8.7E-1 | ------ | ------ | 6.3E0 | ------ | 5.3E-1 |
| 25 | 600 | 3.3E-1 | 3.7E-1 | 2.9E-1 | ------ | ------ | ------ | ------ | ------- |
| 27 | 900 | 9.7E-1 | 1.1E0 | 8.4E-1 | ------ | ------ | 6.5E0 | ------ | 5.4E-1 |
| 29 | 1,000 | 5.4E-1 | 4.8E-1 | 6.0E-1 | ------ | ------ | 7.6E0 | ------ | ------- |

Borehole #4

| Depth | Gross NaI | U-238 | Pb-214 | Bi-214 | Ra-226 | Ra-223 | K-40 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|
| | | Radionuclide Concentrations [pCi/g] | | | | | | | |
| 00 | >50,000 | ------ | 1.5E2 | 1.7E2 | 1.3E2 | 9.5E1 | ------ | 9.9E1 | ------- |
| 01 | >50,000 | 5.3E2 | 2.1E3 | 1.7E3 | 2.5E3 | 9.8E2 | ------ | 1.2E3 | ------- |
| 02 | >50,000 | ------ | 1.2E2 | 9.E1 | 1.5E2 | ------ | 3.6E0 | ------ | ------- |
| 03 | 14,000 | ------ | 2.8E0 | 2.1E0 | 3.5E0 | ------ | 3.8E0 | ------ | ------- |
| 04 | 2,900 | ------ | 1.6E0 | 1.6E0 | 1.6E0 | ------ | 3.6E0 | ------ | ------- |
| 06 | 1,100 | ------ | 1.4E0 | 1.5E0 | 1.2E0 | 8.6E-1 | 4.1E0 | ------ | ------- |
| 08 | 1,200 | ------ | 1.7E0 | 1.9E0 | 1.5E0 | 9.0E-1 | 7.1E0 | ------ | ------- |
| 10 | 1,500 | ------ | 2.7E | 2.8E0 | 2.5E0 | 8.3E-1 | 9.3E0 | 3.8E0 | ------- |
| 12 | 2,600 | ------ | ------- | ------ | ------ | ------ | ------ | ------ | ------- |
| 14 | 1,500 | ------ | 1.7E0 | 1.6E0 | 1.7E0 | 7.0E-1 | 7.0E0 | ------ | ------- |
| 16 | 1,400 | ------ | 1.0E0 | 1.2E0 | 8.4E-1 | ------ | ------ | ------ | ------- |
| 18 | 1,100 | ------ | 8.0E-1 | 8.E1-1 | 8.0E-1 | ------ | 8.5E0 | ------ | 3.8E-1 |
| 20 | 800 | ------ | 7.6E-1 | 8.6E-1 | 6.6E-1 | ------ | ------ | ------ | ------- |
| 22 | 1,100 | ------ | 1.1E0 | .1E0 | 1.1E0 | ------ | 7.7E0 | ------ | 4.1E1 |
| 24 | 1,200 | ------ | 7.5E-1 | 8.1E-1 | 7.0E-1 | ------ | 1.6E-1 | ------ | 3.5E-1 |
| 26 | 1,000 | ------ | 4.8E-1 | 4.2E-1 | 5.4E-1 | ------ | 6.6E0 | ------ | 3.0E-1 |
| 28 | 700 | ------ | 7.1E-1 | 7.2E-1 | 7.0E-1 | ------ | ------ | ------ | ------- |
| 30 | 1,300 | ------ | 8.7E-1 | 9.9E-1 | 7.5E-1 | ------ | 1.4E1 | ------ | 6.4E-1 |
| 32 | 1,500 | ------ | 9.5E-1 | 9.5E-1 | 9.5E-1 | ------ | 1.5E1 | ------ | ------- |
| 34 | 1,700 | ------ | 1.9E0 | 2.2E0 | 1.6E0 | ------ | 1.3E1 | ------ | 5.5E-1 |

Borehole #5

| Depth | Gross NaI | Ra-226 | Pb-214 | Bi-214 | U-238 | Ra-223 | K-40 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|
| | | Radionuclide Concentrations [pCi/g] | | | | | | | |
| 00 | 1,800 | 1.8E0 | ------- | 1.7E0 | ------ | ------ | 6.3E0 | ------ | ------- |
| 02 | 1,500 | 2.5E0 | 2.9E0 | 2.0E0 | ------ | 3.4E0 | 4.0E0 | ------ | ------- |
| 04 | 2,700 | 3.4E0 | 3.7E0 | 3.1E0 | ------ | ------ | 4.4E0 | ------ | ------- |
| 06 | 1,600 | 1.7E0 | 1.5E0 | 1.9E0 | ------ | ------ | 1.1E1 | ------ | 9.2E-1 |

Table 5, cont.

Borehole #5, cont.

| Depth | Gross NaI | Ra-226 | Pb-214 | Bi-214 | U-238 | Ra-223 | K-40 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|
| | | Radionuclide Concentrations [pCi/g] | | | | | | | |
| 08 | 1,000 | 1.3E0 | 1.6E0 | 1.0E0 | ------ | ------ | 1.0E1 | ------ | ------- |
| 10 | 3,000 | 4.3E0 | 4.3E0 | 4.3E0 | ------ | ------ | 4.7E0 | ------ | 2.0E0 |
| 12 | 1,700 | 2.1E0 | 1.9E0 | 2.3E0 | ------ | ------ | 2.9E0 | 2.2E0 | ------- |
| 14 | 1,000 | 1.8E0 | 1.3E0 | 2.3E0 | ------ | ------ | 3.0E0 | ------ | ------- |
| 16 | 700 | 8.3E-1 | 6.0E-1 | 1.1E0 | ------ | ------ | 2.1E0 | ------ | ------- |
| 18 | 500 | 8.9E-1 | 6.8E-1 | 1.1E0 | ------ | ------ | 2.1E0 | ------ | ------- |

Borehole #6

| Depth | Gross NaI | U-238 | Pb-214 | Bi-214 | Ra-226 | Ra-223 | K-40 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|
| | | Radionuclide Concentrations [pCi/g] | | | | | | | |
| 00 | 2,000 | ------ | 7.3E0 | 8.3E0 | 6.4E0 | 7.4E0 | 9.4E0 | 1.2E1 | ------- |
| 02 | 2,000 | ------ | ------- | ------ | ------ | ------ | ------ | ------ | ------- |
| 04 | 3,200 | 2.2E1 | 2.5E0 | 3.0E1 | .0E1 | 2.0E1 | ------ | 1.9E1 | ------- |
| 06 | 3,500 | ------ | 2.1E0 | 2.2E1 | 2.1E1 | 1.9E1 | ------ | 1.6E1 | ------- |
| 07 | 6,000 | 1.6E1 | 1.5E1 | 1.7E1 | 1.3E1 | 8.1E0 | ------ | ------ | ------- |
| 08 | 26,000 | 3.9E1 | 2.1E1 | 2.2E1 | 2.1E1 | 1.8E1 | ------ | 1.5E1 | ------- |
| 09 | >50,000 | ------ | 4.0E1 | 4.1E1 | 4.0E1 | 3.6E1 | ------ | ------ | ------- |
| 10 | 43,000 | ------ | 5.8E1 | 5.3E1 | 6.3E1 | 4.1E1 | ------ | 4.01E | ------- |
| 11 | >50,000 | ------ | 3.6E2 | 2.8E2 | 2.3E2 | 2.0E2 | ------ | 1.7E2 | ------- |
| 12 | 16,000 | 4.4E1 | 9.9E1 | 9.1E1 | 1.1E2 | 3.9E1 | ------ | 5.6E1 | ------- |
| 13 | 2,600 | ------ | 6.4E0 | 7.2E0 | 5.5E0 | 4.4E0 | 8.5E0 | ------ | ------- |
| 15 | 1,100 | ------ | ------- | ------ | ------ | ------ | ------ | ------ | ------- |

Borehole #8

| Depth | Gross NaI | U-238 | Pb-214 | Bi-214 | Ra-226 | Ra-223 | K-40 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|
| | | Radionuclide Concentrations [pCi/g] | | | | | | | |
| 00 | 2,000 | ------ | 3.7E0 | 4.0E0 | 3.4E0 | 1.5E0 | 5.2E0 | ------ | 4.9E-1 |
| 02 | 1,500 | ------ | 1.4E0 | 1.5E0 | 1.3E0 | ------ | 6.5E0 | ------ | ------- |
| 04 | 1,100 | ------ | 1.1E0 | 1.2E0 | 9.2E-1 | ------ | 4.7E0 | ------ | ------- |
| 06 | 1,400 | ------ | 1.1E0 | 1.1E0 | 1.1E0 | ------ | 1.1E1 | ------ | 8.3E-1 |
| 08 | 1,400 | ------ | 1.1E0 | 1.1E0 | 1.1E0 | ------ | 1.1E1 | ------ | 8.E-1 |
| 10 | 1,500 | ------ | 1.2E0 | 1.2E0 | 1.1E0 | ------ | 1.1E1 | ------ | ------- |
| 12 | 1,400 | ------ | 1,2E0 | 1.1E0 | 1.3E0 | ------ | 1.3E1 | ------ | 7.E-1 |
| 14 | 1,600 | ------ | 1.1E0 | 1.1E0 | 1.1E0 | ------ | 1.5E1 | ------ | ------- |
| 16 | 1,000 | ------ | 1.1E0 | 1.3E0 | 8.2E-1 | ------ | 1.1E1 | ------ | ------- |
| 18 | 1,400 | ------ | 1.2E0 | 1.4E | 1.1E0 | ------ | 1.4E1 | ------ | 4.7E-1 |
| 20 | 1,700 | ------ | 1.8E0 | 2.0E0 | 1.6E0 | 1.1E0 | ------ | ------ | 8.4E-1 |

Table 5, cont.

Borehole #9

| Depth | Gross NaI | U-238 | Pb-214 | Bi-214 | Ra-226 | Ra-223 | K-40 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Radionuclide Concentrations [pCi/g] | | | | | |
| 00 | 1,400 | ------ | 2.2E0 | 2.3E0 | 2.0E0 | ------ | ------ | ------ | 3.2E-1 |
| 02 | 22,000 | 4.6E1 | 5.6E1 | 5.6E1 | 5.5E1 | 3.5E1 | 1.1E1 | 3.1E1 | ------- |
| 03 | 11,000 | ------ | 5.4E0 | 4.2E0 | 6.5E0 | ------ | 1.2E1 | ------ | ------- |
| 04 | 2,000 | ------ | 1.3E0 | 1.3E0 | 1.4E0 | ------ | 9.3E0 | ------ | ------- |
| 06 | 600 | ------ | 7.0E-1 | 8.4E-1 | 5.6E-1 | ------ | 3.8E0 | ------ | ------- |
| 08 | 1,000 | ------ | 9.8E-1 | 7.8E-1 | 1.2E0 | ------ | 6.1E0 | ------ | ------- |
| 10 | 900 | ------ | 8.0E-1 | 9.5E-1 | 6.5E-1 | ------ | 5.E0 | 1.6E0 | ------- |
| 12 | 1,000 | ------ | 1.1E0 | 1.3E0 | 1.0E0 | ------ | 8.1E0 | ------ | 3.4E-1 |
| 14 | 700 | 2.7E0 | 7.7E1 | 8.3E-1 | 7.0E-1 | ------ | 4.9E0 | ------ | 5.0E-1 |
| 16 | 1,100 | ------ | 1.0E0 | 1.0E0 | 1.0E0 | ------ | ------ | ------ | 4.7E-1 |
| 18 | 1,300 | ------ | ------- | ------ | ------ | ------ | ------ | ------ | ------- |
| 20 | 1,000 | 7.6E-1 | 1.1E0 | 1.2E0 | 9.8E-1 | ------ | 8.7E0 | ------ | ------- |
| 22 | 1,200 | ------ | 1.3E0 | 1.3E0 | 1.2E | ------ | 9.5E0 | ------ | 5.3E-1 |

Borehole #10

| Depth | Gross NaI | U-238 | Pb-214 | Bi-214 | Ra-226 | Ra-223 | K-40 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Radionuclide Concentrations [pCi/g] | | | | | |
| 00 | 7,000 | ------ | 3.5E0 | 3.3E0 | 3.7E0 | 9.4E-1 | 3.6E0 | ------ | ------- |
| 01 | 35,000 | ------ | 1.4E1 | 9.2E0 | 1.8E1 | 4.4E0 | 3.6E0 | ------ | ------- |
| 02 | >50,000 | ------ | 4.2E2 | 3.7E2 | 4.8E2 | ------ | ------ | ------ | ------- |
| 03 | >50,000 | ------ | 4.8E2 | 4.4E2 | 5.2E2 | ------ | ------ | ------ | ------- |
| 04 | 35,000 | ------ | 2.5E1 | 1.8E1 | 3.E1 | ------ | ------ | ------ | ------- |
| 05 | 13,000 | ------ | 9.4E0 | 8.3E0 | 1.E1 | ------ | ------ | ------ | ------- |
| 06 | 4,500 | ------ | 1.2E1 | 1.4E1 | 1.0E1 | 3.9E0 | ------ | 5.0E0 | 3.1E-1 |
| 08 | 2,000 | ------ | 1.3E1 | 1.1E1 | 1.5E1 | ------ | ------ | ------ | 2.4E-1 |
| 10 | 1,800 | 7.3E1 | 1.2E2 | 1.3E2 | 1.0E2 | 7.0E1 | ------ | 4.5E1 | ------- |
| 12 | 2,000 | 1.2E1 | 1.6E1 | 1.8E1 | 1.3E1 | 1.1E1 | 4.2E0 | 1.1E1 | ------- |
| 14 | 500 | 4.9E0 | 5.1E0 | 6.1E0 | 4.0E0 | 2.7E0 | 3.0E0 | ------ | ------- |

Borehole #11

| Depth | Gross NaI | Ra-226 | Pb-214 | Bi-214 | U-238 | Ra-223 | K-40 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Radionuclide Concentrations [pCi/g] | | | | | |
| 00 | >50,000 | 8.4E1 | 6.6E1 | 1.0E2 | ------ | 2.2E1 | 5.6E0 | ------ | ------- |
| 01 | >50,000 | 3.6E3 | 2.9E3 | 4.4E3 | 7.7E2 | ------ | ------ | ------ | ------- |
| 02 | >50,000 | 1.3E4 | ------- | 1.3E4 | 2.9E3 | ------ | ------ | ------ | ------- |
| 03 | >50,000 | 1.7E3 | 1.1E3 | .2E3 | ------ | ------ | ------ | ------ | ------- |
| 04 | 30,000 | 7.0E0 | 5.3E0 | 8.6E0 | ------ | ------ | ------ | ------ | ------- |
| 05 | 22,000 | 4.9E0 | 4.6E0 | 5.2E0 | ------ | 3.6E0 | 1.3E1 | 7.1E0 | 7.4E0 |

Table 5, cont.

Borehole #11, cont.

| Depth | Gross NaI | Ra-226 | Pb-214 | Bi-214 | U-238 | Ra-223 | K-40 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|
| | | Radionuclide Concentrations [pCi/g] | | | | | | | |
| 06 | 20,000 | 7.1E0 | 7.4E0 | 6.7E0 | ------ | 4.6E0 | 1.5E1 | ------ | |
| 07 | 20,000 | 8.3E0 | 8.8E0 | 7.8E0 | ------ | ------ | 1.1E1 | ------ | |
| 08 | 20,000 | 1.3E1 | 1.5E1 | 1.2E1 | ------ | 2.0E1 | 1.0E1 | 5.8E0 | ------- |
| 09 | 20,000 | ------ | ------- | ------ | ------ | ------ | ------ | ------ | ------- |

Borehole #16

| Depth | Gross NaI | U-238 | Pb-214 | Bi-214 | Ra-226 | Ra-223 | K-40 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|
| | | Radionuclide Concentrations [pCi/g] | | | | | | | |
| 02 | 6,000 | 1.3E1 | 1.4E1 | 1.6E1 | 1.1E1 | 4.3E0 | 6.2E0 | 6.1E0 | ------- |
| 03 | 9,000 | ------ | 1.8E1 | 2.2E1 | 1.5E1 | 6.9E0 | 7.9E0 | 8.8E0 | ------- |
| 04 | 33,000 | 2.8E1 | 5.0E1 | 5.9E1 | 4.2E1 | 2.0E1 | 5.0E0 | 1.6E1 | ------- |
| 05 | 48,000 | 6.5E1 | 1.1E2 | 1.3E2 | 9.8E1 | 5.6E1 | 1.0E1 | 3.7E1 | ------- |
| 06 | 35,000 | ------ | 1.2E2 | 1.4E2 | 1.0E2 | 7.8E1 | 6.7E0 | 4.3E1 | ------- |
| 07 | 9,000 | ------ | 4.8E1 | 5.5E1 | 3.1E1 | 3.1E1 | ------ | 2.0E1 | 8.2E-1 |
| 08 | 6,000 | 1.2E1 | 1.4E1 | 1.5E1 | 1.2E1 | 4.8E0 | 3.7E0 | ------ | ------- |
| 09 | 15,000 | ------ | 1.5E1 | 1.7E1 | 1.3E1 | 7.0E0 | 4.1E0 | 5.5E0 | ------- |
| 10 | 35,000 | ------ | 5.8E1 | 6.6E1 | 5.0E1 | 7.5E1 | 2.3E0 | 2.5E1 | ------- |
| 11 | >50,000 | 1.7E2 | 3.8E2 | 4.5E2 | 3.1E2 | 1.7E2 | ------ | 1.4E2 | 8.5E-1 |
| 12 | >50,000 | 1.9E2 | 5.1E2 | 6.0E2 | 4.8E2 | 3.0E2 | ------ | 1.4E2 | 2.8E0 |
| 13 | >50,000 | 1.2E2 | 2.4E2 | 2.4E2 | 2.4E2 | 7.2E1 | ------ | 2.6E1 | ------- |
| 14 | >50,000 | 3.3E2 | 5.4E2 | 4.7E2 | 6.0E | 2.4E2 | ------ | 4.0E2 | ------- |
| 15 | >50,000 | ------ | 9.2E3 | 6.9E3 | 1.1E4 | ------ | ------ | ------ | ------- |
| 16 | >50,000 | ------ | 7.7E3 | 6.1E3 | 9.2E3 | ------ | ------ | ------ | ------- |
| 17 | 37,000 | ------ | 8.2E1 | 8.1E1 | 8.3E1 | 1.6E1 | 5.7E0 | 2.6E1 | ------- |
| 18 | 8,000 | ------ | 2.9E1 | 3.0E1 | 2.7E1 | 6.1E0 | ------ | 1.5E1 | ------- |
| 19 | 6,000 | 1.3E1 | 3.4E1 | 4.2E1 | 2.6E1 | 1.5E2 | ------ | 1.9E1 | ------- |

Borehole #17

| Depth | Gross NaI | U-238 | Pb-214 | Bi-214 | Ra-226 | Ra-223 | K-40 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|
| | | Radionuclide Concentrations [pCi/g] | | | | | | | |
| 00 | 700 | ------ | 1.2E0 | 1.1E0 | 1.2E0 | ------ | 4.4E0 | ------ | ------- |
| 02 | 600 | ------ | 5.4E-1 | 5.3E-1 | 5.4E-1 | ------ | 2.3E0 | ------ | 1.3E-1 |
| 04 | 300 | ------ | 3.3E-1 | 3.7E-1 | 2.9E-1 | ------ | 1.8E0 | ------ | 1.8E-1 |
| 06 | 250 | ------ | 2.6E-1 | 2.4E-1 | 2.7E-1 | ------ | 1.9E0 | ------ | ------- |
| 08 | 300 | ------ | 2.4E-1 | 2.9E-1 | 1.9E-1 | ------ | ------ | ------ | ------- |
| 10 | 300 | ------ | 2.9E-1 | 3.6E-1 | 2.2E-1 | ------ | 2.0E0 | ------ | ------- |
| 12 | 400 | ------ | 2.7E-1 | ------ | 2.7E-1 | ------ | 3.0E0 | ------ | 2.1E-1 |
| 14 | 700 | ------ | 5.9E-1 | 5.3E-1 | 6.5E-1 | ------ | 4.7E0 | ------ | 6.5E-1 |

Table 5, cont.

Borehole #17, cont.

| Depth | Gross NaI | U-238 | Pb-214 | Bi-214 | Ra-226 | Ra-223 | K-40 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|
| | | Radionuclide Concentrations [pCi/g] | | | | | | | |
| 16 | 1,500 | ------ | 1.2E0 | ------ | 1.2E0 | ------ | 1.E1 | ------ | ------- |
| 18 | 800 | ------ | 1.5E0 | 1.5E0 | 1.4E0 | ------ | 5.3E0 | ------ | ------- |
| 20 | 3,000 | ------ | 8.5E0 | 9.0E0 | 8.0E0 | 2.9E0 | 6.5E0 | ------ | ------- |
| 22 | 1,000 | ------ | 1.6E0 | 1.7E0 | 1.5E0 | ------ | 4.3E0 | ------ | ------- |

Borehole #18

| Depth | Gross NaI | U-238 | Pb-214 | Bi-214 | Ra-226 | Ra-223 | K-40 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|
| | | Radionuclide Concentrations [pCi/g] | | | | | | | |
| 00 | 1,000 | ------ | ------- | ------ | ------ | ------ | ------ | ------ | ------- |
| 02 | 1,500 | ------ | 1.3E0 | 1.3E0 | 1.2E0 | 7.2E-1 | 7.8E0 | ------ | ------- |
| 04 | 1,100 | ------ | 9.3E-1 | 1.0E0 | 8.3E-1 | ------ | ------ | ------ | ------- |
| 06 | 1,000 | ------ | 9.9E-1 | 1.1E0 | 8.8E-1 | ------ | 6.90E | ------ | ------- |
| 08 | 600 | ------ | 4.1E-1 | 3.3E-1 | 4.8E-1 | ------ | 2.5E0 | ------ | ------- |
| 10 | 600 | ------ | 5.7E-1 | 6.5E-1 | 4.9E-1 | ------ | 2.5E0 | ------ | ------- |
| 12 | 1,100 | ------ | 7.7E-1 | 9.4E-1 | 6.1E-1 | ------ | ------ | ------ | ------- |
| 14 | 1,000 | ------ | 6.7E-1 | 7.2E-1 | 6.1E-1 | ------ | ------ | ------ | ------- |
| 16 | 1,000 | ------ | 7.6E-1 | 1.0E0 | 5.0E-1 | ------ | ------ | ------ | 4.8E-1 |
| 18 | 1,200 | ------ | ------- | ------ | ------ | ------ | ------ | ------ | ------- |

Borehole #19

| Depth | Gross NaI | U-238 | Pb-214 | Bi-214 | Ra-226 | Ra-223 | K-40 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|
| | | Radionuclide Concentrations [pCi/g] | | | | | | | |
| 00 | 1,000 | ------ | 1.3E0 | 1.4E0 | 1.3E0 | ------ | 1.6E0 | ------ | ------- |
| 02 | 1,700 | ------ | 3.9E0 | 4.3E0 | 3.4E0 | 2.1E0 | 4.4E0 | ------ | 4.1E-1 |
| 04 | 2,100 | ------ | 3.9E0 | 4.2E0 | 3.5E0 | ------ | 1.4E1 | ------ | 8.1E-1 |
| 06 | 4,400 | ------ | 6.0E0 | 6.3E0 | 5.8E0 | 2.3E0 | 1.0E1 | ------ | 8.6E-1 |
| 07 | 28,000 | 3.3E1 | 3.7E1 | 3.5E1 | 3.9E1 | 2.2E1 | 1.3E1 | 2.5E1 | ------- |
| 08 | >50,000 | 4.2E1 | 3.4E2 | 3.4E2 | 3.4E2 | 2.3E2 | 7.5E0 | 2.3E2 | ------- |
| 09 | 17,000 | 2.7E1 | 1.9E1 | 1.7E1 | 2.2E1 | 5.3E0 | ------ | 1.3E1 | ------- |
| 10 | 4,600 | ------ | 4.2E0 | 3.9E0 | 4.4E0 | ------ | 6.1E0 | ------ | ------- |
| 12 | 1,000 | ------ | 6.5E-1 | 6.0E-1 | 7.0E-1 | ------ | 4.9E0 | ------ | ------- |
| 14 | 600 | ------ | 8.6E-1 | 1.1E0 | 6.4E-1 | ------ | ------ | ------ | 2.1E-1 |
| 16 | 500 | ------ | 6.4E-1 | 7.1E-1 | 5.7E-1 | ------ | 2.4E0 | ------ | ------- |

Table 5, cont.

Borehole #20

| Depth | Gross NaI | U-238 | Pb-214 | Bi-214 | Ra-226 | Ra-223 | K-40 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|
| | | | Radionuclide Concentrations [pCi/g] | | | | | | |
| 00 | 10,000 | ------ | 8.9E0 | 3.8E0 | 1.4E1 | 6.9E0 | 6.8E0 | ------ | ------- |
| 01 | 23,000 | ------ | 7.2E1 | 6.8E1 | 7.6E1 | 4.3E1 | 1.0E1 | 3.9E1 | ------- |
| 02 | 9,000 | ------ | 1.4E1 | 9.9E0 | 1.7E1 | 2.9E0 | 8.2E0 | 1.7E1 | ------- |
| 03 | 2,200 | ------ | 2.7E0 | ------ | 2.7E0 | ------ | 6.0E0 | ------ | ------- |
| 05 | 900 | ------ | 1.3E0 | 1.4E0 | 1.1E0 | ------ | ------ | ------ | ------- |
| 07 | 700 | ------ | 1.2E0 | 1.2E0 | 1.1E0 | ------ | 9.9E0 | ------ | ------- |
| 09 | 1,000 | ------ | 1.5E0 | 2.0E0 | 1.0E0 | ------ | 1.5E1 | ------ | ------- |
| 11 | 1,600 | ------ | 1.9E0 | 1.9E0 | 1.8E0 | ------ | 2.7E1 | ------ | 1.3E0 |
| 13 | 1,200 | ------ | 1.2E0 | 1.3E0 | ------ | ------ | ------ | ------ | 1.2E0 |
| 15 | 1,100 | ------ | 1.2E0 | 1.3E0 | 1.1E0 | ------ | 1.8E0 | ------ | 6.6E-1 |
| 17 | 500 | ------ | 7.0E-1 | 7.7E-1 | 6.4E-1 | ------ | ------ | ------ | 3.6E-1 |

Borehole #21

| Depth | Gross NaI | U-238 | Pb-214 | Bi-214 | Ra-226 | Ra-223 | K-40 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|
| | | | Radionuclide Concentrations [pCi/g] | | | | | | |
| 00 | 14,000 | 2.1E1 | 3.4E1 | 4.2E1 | 2.7E1 | ------ | ------ | ------ | ------- |
| 01 | 13,000 | ------ | 1.3E1 | 1.3E1 | 1.2E1 | 3.2E0 | 1.8E0 | ------ | ------- |
| 02 | 1,300 | ------ | 1.2E0 | 9.5E-1 | 1.4E0 | ------ | 2.1E0 | ------ | ------- |
| 03 | 1,300 | ------ | 1.3E0 | 1.3E0 | 1.3E0 | ------ | ------ | ------ | ------- |
| 04 | 7,000 | ------ | 5.4E0 | 5.2E0 | 5.6E0 | ------ | ------ | ------ | ------- |
| 05 | 46,000 | 1.8E1 | 6.2E1 | 6.0E1 | 6.4E1 | 3.2E1 | 9.2E0 | 2.1E1 | ------- |
| 06 | >50,000 | 1.7E1 | 6.6E2 | 5.4E2 | 7.8E2 | ------ | ------ | 3.3E2 | ------- |
| 07 | >50,000 | 4.5E2 | 3.2E3 | 2.8E3 | 3.7E3 | 8.3E2 | ------ | 1.5E3 | ------- |
| 08 | >50,000 | 3.2E1 | 7.3E1 | 6.7E1 | 7.9E1 | 2.9E1 | ------ | 3.2E1 | ------- |
| 09 | 32,000 | ------ | 3.6E1 | 3.6E1 | 3.5E1 | 9.3E0 | 8.2E0 | 1.2E1 | ------- |
| 10 | 9,000 | ------ | 2.2E1 | 2.8E1 | 2.0E1 | 1.9E0 | 5.6E0 | ------ | ------- |
| 11 | 4,300 | ------ | 1.5E1 | 1.7E1 | 1.2E1 | ------ | 3.3E0 | ------ | ------- |
| 12 | 6,000 | ------ | 5.8E0 | 6.2E0 | 5.4E0 | ------ | 5.9E0 | ------ | ------- |
| 13 | 7,000 | ------ | 8.1E0 | 8.8E0 | 7.3E0 | 3.8E0 | 1.1E1 | ------ | 8.5E-1 |
| 14 | 7,000 | ------ | 1.3E1 | 1.5E1 | 1.1E1 | 6.1E0 | 1.1E1 | ------ | ------- |
| 15 | 10,000 | 5.6E0 | 1.1E1 | 1.3E1 | 9.4E0 | 5.3E0 | 9.4E0 | 5.1E0 | 6.7E-1 |
| 16 | 8,000 | ------ | 6.5E0 | 7.2E0 | 5.7E0 | 3.2E0 | 4.4E0 | ------ | ------- |
| 17 | ,000 | ------ | 6.1E0 | 7.1E0 | 5.2E0 | 3.7E0 | 3.1E0 | ------ | ------- |
| 18 | 3,500 | 5.6E0 | 5.7E6 | 6.4E0 | 4.4E9 | 2.7E0 | 3.0E0 | ------ | ------- |
| 20 | 3,000 | ------ | 6.9E0 | 8.3E0 | 5.5E0 | 4.4E0 | ------ | ------ | ------- |

Table 5, cont.

Borehole #22

| Depth | Gross NaI | U-238 | Pb-214 | Bi-214 | Ra-226 | Ra-223 | K-40 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|
| | | | Radionuclide Concentrations [pCi/g] | | | | | | |
| 00 | 10,000 | ------ | 2.4E1 | 2.7E1 | 2.1E1 | 1.6E1 | 2.7E0 | ------ | ------- |
| 01 | 13,000 | 2.0E1 | 3.2E1 | 3.8E1 | 2.5E1 | 1.5E1 | 5.9E0 | 1.7E1 | 5.6E-1 |
| 02 | 11,000 | 1.9E1 | 2.8E1 | 3.2E1 | 2.5E1 | 1.6E1 | 4.1E0 | 1.5E1 | ------- |
| 03 | 4,300 | ------ | 5.6E0 | 6.3E0 | 4.9E0 | 2.2E0 | 4.1E0 | ------ | 6.7E-1 |
| 04 | 5,500 | ------ | 1.1E1 | 1.2E1 | 8.8E0 | 5.9E0 | 6.5E0 | ------ | ------- |
| 06 | 4,500 | ------ | 8.1E0 | 9.4E0 | 6.7E0 | 5.4E0 | 3.8E0 | 5.7E0 | 3.6E-1 |
| 07 | 5,000 | 9.4E0 | 8.9E0 | 1.0E1 | 7.3E0 | 5.4E0 | 6.3E0 | ------ | 7.0E-1 |
| 08 | 5,000 | 1.0E1 | 1.0E1 | 1.3E1 | 8.4E0 | 7.1E0 | 3.7E0 | 6.6E0 | ------- |
| 10 | 4,300 | ------ | 1.5E1 | 1.8E1 | 1.2E1 | 7.3E0 | 2.8E0 | 5.E0 | ------- |
| 12 | 7,000 | ------ | 1.4E1 | 1.7E1 | 1.1E1 | ------ | 4.1E0 | ------ | ------- |
| 13 | 4,000 | 1.5E1 | 1.4E1 | 1.6E1 | 1.1E1 | 6.9E0 | 2.9E0 | 6.1E0 | ------- |
| 14 | 7,000 | 9.1E0 | 1.3E1 | 1.6E1 | 1.1E1 | 4.7E0 | 4.8E0 | ------ | ------- |
| 15 | 9,000 | ------ | 2.3E1 | 2.9E1 | 1.7E1 | 1.3E1 | 3.7E0 | 1.0E1 | ------- |
| 16 | 8,000 | ------ | 2.3E1 | 2.8E1 | 1.9E1 | 1.6E1 | 2.0E0 | 1.1E1 | ------- |
| 17 | 3,500 | 7.3E0 | 7.4E0 | 8.3E0 | 6.4E0 | 5.0E0 | 2.3E0 | ------ | ------- |
| 18 | 7,000 | 1.8E1 | 1.8E1 | 2.0E1 | 1.5E1 | 6.1E0 | ------ | ------ | ------- |
| 19 | 9,000 | ------ | 1.7E1 | 2.0E1 | 1.4E1 | 1.2E1 | 3.8E0 | ------ | ------- |
| 20 | 13,000 | ------ | 3.5E1 | 4.0E1 | 3.0E1 | 2.5E1 | 3.7E0 | 1.5E1 | ------- |
| 21 | 10,000 | ------ | 1.1E1 | 1.1E1 | 1.1E1 | 3.5E0 | 3.6E0 | ------ | ------- |
| 22 | 24,000 | ------ | 1.9E1 | 1.6E1 | 2.1E1 | 4.1E0 | 4.3E0 | 6.3E0 | ------- |
| 23 | >50,000 | ------ | 5.8E3 | 5.8E3 | 5.8E3 | 3.0E2 | ------ | 2.6E2 | ------- |
| 24 | >50,000 | ------ | 7.0E2 | 6.4E2 | 7.5E2 | 2.9E2 | ------ | 3.3E2 | ------- |
| 25 | >50,000 | ------ | 6.4E2 | 6.4E2 | 6.4E2 | 3.6E2 | ------ | 3.4E2 | ------- |

Borehole #31

| Depth | Gross NaI | U-238 | Pb-214 | Bi-214 | Ra-226 | Ra-223 | K-40 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|
| | | | Radionuclide Concentrations [pCi/g] | | | | | | |
| 00 | 1,200 | ------ | 6.5E-1 | 5.6E-1 | 7.4E-1 | ------ | 7.8E0 | ------ | 5.6E-1 |
| 02 | 900 | ------ | 5.6E-1 | 5.9E-1 | 5.3E-1 | ------ | ------ | ------ | 4.5E-1 |
| 04 | 1,500 | ------ | 9.1E-1 | 9.3E-1 | 8.9E-1 | ------ | 6.5E0 | 1.7E0 | ------- |
| 06 | 1,000 | ------ | 6.3E-1 | 6.4E-1 | 6.3E-1 | ------ | 6.1E0 | ------ | ------- |
| 08 | 800 | ------ | 5.1E-1 | 4.5E-1 | 5.7E-1 | ------ | ------ | ------ | ------- |
| 10 | 800 | ------ | 4.9E-1 | 5.2E-1 | 4.5E-1 | ------ | ------ | ------ | 3.8E-1 |
| 12 | 1,500 | ------ | 3.7E-1 | 3.7E-1 | ------ | ------ | 3.7E0 | ------ | ------- |
| 14 | 1,100 | ------ | 7.1E-1 | ------ | 7.1E-1 | ------ | 1.3E1 | ------ | ------- |
| 16 | 1,000 | ------ | 5.1E-1 | ------ | 5.1E-1 | ------ | 4.0E0 | ------ | 3.1E-1 |
| 18 | 1,500 | 8.5E-1 | 8.1E-1 | 8.6E-1 | 7.7E-1 | ------ | 8.1E0 | ------ | 8.0E-1 |

Table 5, cont.

Borehole #31, cont.

| Depth | Gross NaI | U-238 | Pb-214 | Bi-214 | Ra-226 | Ra-223 | K-40 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|
| | | Radionuclide Concentrations [pCi/g] | | | | | | | |
| 20 | 600 | ------ | 4.9E-1 | 4.8E-1 | 5.0E-1 | ------ | ------ | ------ | 6.2E-1 |
| 22 | 1,300 | ------ | 7.1E-1 | 8.4E-1 | 5.9E-1 | ------ | ------ | ------ | ------- |
| 24 | 1,300 | ------ | 1.1E0 | 1.1E-1 | 1.0E0 | ------ | 6.2E0 | ------ | ------- |

Borehole #32

| Depth | Gross NaI | U-238 | Pb-214 | Bi-214 | Ra-226 | Ra-223 | K-40 | Pb-211 | Pb-212 |
|---|---|---|---|---|---|---|---|---|---|
| | | Radionuclide Concentrations [pCi/g] | | | | | | | |
| 00 | 16,000 | ------ | 8.3E0 | 6.5E0 | 1.0E1 | 2.0E0 | 2.2E0 | ------ | ------- |
| 01 | >50,000 | ------ | 1.5E2 | 1.4E2 | 1.6E2 | 1.1E2 | ------ | 6.9E1 | ------- |
| 02 | 17,000 | ------ | 4.9E1 | 4.1E1 | 5.7E1 | 2.0E1 | 3.9E0 | 1.9E1 | ------- |
| 03 | 5,000 | ------ | 3.1E0 | 2.1E0 | 4.2E0 | ------ | ------ | ------ | ------- |
| 04 | 1,300 | ------ | 3.1E0 | 2.1E0 | 4.2E0 | ------ | ------ | ------ | ------- |
| 06 | 1,700 | ------ | 1.7E0 | 1.9E0 | 1.4E0 | ------ | ------ | ------ | 3.1E-1 |
| 08 | 1,700 | ------ | 1.9E0 | 2.2E0 | 1.6E0 | ------ | 8.2E0 | ------ | 3.8E-1 |
| 10 | 1,700 | ------ | 1.8E0 | 2.0E0 | 1.5E0 | ------ | 1.2E1 | ------ | ------- |
| 12 | 1,600 | ------ | 1.6E0 | 1.7E0 | 1.5E0 | ------ | 1.2E1 | ------ | 6.0E-1 |
| 14 | 1,600 | ------ | 2.6E0 | 2.7E0 | 2.4E0 | ------ | ------ | ------ | ------- |
| 16 | 1,800 | ------ | 1.7E0 | 1.5E0 | 1.9E0 | ------ | ------ | ------ | 7.1E-1 |
| 18 | 1,900 | ------ | 9.3E-1 | 8.7E-1 | 9.9E-1 | ------ | 1.4E1 | ------ | 8.5E-1 |

Auger Hole NaI (Tl) Counts

Table 5, cont.

| Borehole #2 | | Borehole #7 | | Borehole #12 | |
|---|---|---|---|---|---|
| Depth | NaI CPM | Depth | NaI CPM | Depth | NaI CPM |
| ft | | ft | | ft | |
| 00 | 700 | 00 | >50,000 | 00 | 1,000 |
| 01 | 1,300 | 01 | >50,000 | 01 | 1,500 |
| 02 | 1,000 | 02 | >50,000 | 02 | 1,300 |
| 03 | 1,000 | 03 | 23,000 | 03 | 2,000 |
| 04 | 1,400 | 04 | 7,000 | 04 | 3,000 |
| 05 | 1,000 | 05 | 3,600 | 05 | 3,500 |
| 06 | 1,400 | 06 | 1,300 | 06 | 1,500 |
| 07 | 1,400 | 07 | 1,000 | 07 | 1,000 |
| 08 | 1,300 | 08 | 1,000 | 08 | 800 |
| 09 | 1,200 | 09 | 1,100 | 09 | 700 |
| 10 | 1,000 | 10 | 1,000 | 10 | 700 |
| 11 | 700 | 11 | 1,100 | 11 | 500 |
| 12 | 800 | 12 | 1,200 | 12 | 500 |
| 13 | 800 | 13 | 1,400 | 13 | 350 |
| 14 | 1,200 | 14 | 1,200 | 14 | 350 |
| 15 | 3,500 | 15 | 1,200 | 15 | 500 |
| 16 | 11,000 | 16 | 1,400 | 16 | 350 |
| 17 | 2,500 | 17 | 1,500 | 17 | 900 |
| 18 | 1,400 | 18 | 1,700 | 18 | 900 |
| 19 | 1,000 | 19 | 1,700 | 19 | 1,000 |
| 20 | 1,000 | 20 | 4,000 | 20 | 1,500 |
| 21 | 800 | 21 | 2,200 | 21 | 1,500 |
| 22 | 1,000 | 22 | 2,000 | 22 | 1,300 |
| 23 | 800 | -- | ----- | 23 | 500 |
| 24 | 800 | -- | ----- | 24 | 600 |
| 25 | 800 | -- | ----- | -- | ----- |
| 26 | 1,500 | -- | ----- | -- | ----- |
| 26 | 1,500 | -- | ----- | -- | ----- |
| 27 | 1,000 | -- | ----- | -- | ----- |
| 28 | 800 | -- | ----- | -- | ----- |
| 29 | 600 | -- | ----- | -- | ----- |
| 30 | 600 | -- | ----- | -- | ----- |
| 31 | 500 | -- | ----- | -- | ----- |
| 32 | 700 | -- | ----- | -- | ----- |
| 33 | 1,000 | -- | ----- | -- | ----- |
| 34 | 1,000 | -- | ----- | -- | ----- |
| 35 | 1,000 | -- | ----- | -- | ----- |

| Borehole #13 | | Borehole #23 | | Borehole #24 | |
|---|---|---|---|---|---|
| 00 | 900 | 00 | 1,100 | -- | ----- |
| 01 | 1,300 | 01 | 1,100 | 01 | 1,200 |
| 02 | 800 | 02 | 700 | 02 | 2,000 |
| 03 | 600 | 03 | 1,200 | 03 | 1,600 |
| 04 | 700 | 04 | 1,300 | 04 | 1,800 |
| 05 | 400 | 05 | 900 | 05 | 1,600 |
| 06 | 500 | 06 | 600 | 06 | 1,500 |

Table 5, cont.

| Borehole #13 | | Borehole #23 | | Borehole #24 | |
|---|---|---|---|---|---|
| Depth | NaI CPM | Depth | NaI CPM | Depth | NaI CPM |
| ft | | ft | | ft | |
| 07 | 400 | 07 | 400 | 07 | 1,000 |
| 08 | 700 | 08 | 300 | 08 | 1,000 |
| 09 | 1,000 | 09 | 300 | 09 | 300 |
| 10 | 900 | 10 | 300 | 10 | 700 |
| 11 | 600 | 11 | 400 | 11 | 1,000 |
| 12 | 600 | 12 | 400 | 12 | 1,800 |
| 13 | 900 | 13 | 500 | 13 | 1,200 |
| 14 | 600 | 14 | 600 | 14 | 1,500 |
| 15 | 500 | 15 | 600 | 15 | 700 |
| 16 | 600 | 16 | 400 | 16 | 600 |
| 17 | 700 | 17 | 500 | 17 | 500 |
| 18 | 1,000 | 18 | 700 | 18 | 1,000 |
| 19 | 800 | 19 | 600 | 19 | 900 |
| 20 | 900 | 20 | 600 | 20 | 1,200 |
| 21 | 800 | 21 | 500 | 21 | 1,500 |
| 22 | 800 | 22 | 400 | 22 | 800 |
| 23 | 700 | -- | ----- | 23 | 500 |
| 24 | 900 | -- | ----- | 24 | 500 |

| Borehole #25 | | Borehole #26 | | Borehole #27 | |
|---|---|---|---|---|---|
| 00 | 1,200 | -- | ----- | -- | ----- |
| 01 | 1,900 | 01 | 1,600 | 01 | 1,300 |
| 02 | 1,800 | 02 | 2,500 | 02 | 1,800 |
| 03 | 2,600 | 03 | 2,600 | 03 | 1,200 |
| 04 | 2,400 | 04 | 3,500 | 04 | 1,200 |
| 05 | 2,200 | 05 | 19,000 | 05 | 1,300 |
| 06 | 12,000 | 06 | 10,000 | 06 | 600 |
| 07 | 19,000 | 07 | 2,100 | 07 | 700 |
| 08 | 5,000 | 08 | 1,300 | 08 | 300 |
| 09 | 1,900 | 09 | 800 | 09 | 300 |
| 10 | 1,700 | 10 | 500 | 10 | 600 |
| 11 | 800 | 11 | 500 | 11 | 700 |
| 12 | 1,100 | 12 | 500 | 12 | 700 |
| 13 | 800 | 13 | 600 | 13 | 600 |
| 14 | 500 | 14 | 500 | 14 | 1,000 |
| 15 | 700 | 15 | 600 | 15 | 1,300 |
| 16 | 800 | 16 | 1,100 | 16 | 800 |
| 17 | 500 | 17 | 800 | 17 | 900 |
| 18 | 500 | 18 | 600 | 18 | 500 |
| 19 | 700 | 19 | 900 | 19 | 400 |
| 20 | 400 | 20 | 1,200 | 20 | 500 |
| 21 | 400 | 21 | 1,000 | 21 | 500 |
| 22 | 400 | 22 | 1,200 | 22 | 700 |
| 23 | 400 | 23 | 900 | 23 | 1,000 |
| 24 | 900 | 24 | 600 | 24 | 1,000 |
| 25 | 1,000 | 25 | 500 | -- | ----- |
| 26 | 600 | 26 | 800 | -- | ----- |

Table 5, cont.

| Borehole #25 | | Borehole #26 | | Borehole #27 | |
|---|---|---|---|---|---|
| Depth | NaI CPM | Depth | NaI CPM | Depth | NaI CPM |
| ft | | ft | | | |
| 27 | 400 | 27 | 500 | -- | ----- |
| 28 | 500 | 28 | 500 | -- | ----- |
| 29 | 600 | 29 | 600 | -- | ----- |
| 30 | 700 | 30 | 500 | -- | ----- |
| 31 | 700 | 31 | 600 | -- | ----- |
| 32 | 1,000 | 32 | 700 | -- | ----- |
| 33 | 1,700 | 33 | 900 | -- | ----- |
| 34 | 1,100 | 34 | 600 | -- | ----- |
| 35 | 1,000 | 35 | 800 | -- | ----- |
| 36 | 1,600 | 36 | 1,500 | -- | ----- |
| 37 | 1,700 | 37 | 1,500 | -- | ----- |
| 38 | 1,100 | 38 | 1,000 | -- | ----- |
| -- | ----- | 39 | 1,000 | -- | ----- |

| Borehole #28 | | Borehole #29 | | Borehole #30 | |
|---|---|---|---|---|---|
| 01 | 1,600 | 01 | 1,300 | 01 | 600 |
| 02 | 1,200 | 02 | 1,300 | 02 | 600 |
| 03 | 600 | 03 | 1,300 | 03 | 800 |
| 04 | 700 | 04 | 1,000 | 04 | 300 |
| 05 | 1,000 | 05 | 800 | 05 | 500 |
| 06 | 1,500 | 06 | 1,200 | 06 | 400 |
| 07 | 1,400 | 07 | 1,800 | 07 | 500 |
| 08 | 1,100 | 08 | 1,400 | 08 | 300 |
| 09 | 1,400 | 09 | 2,000 | 09 | 600 |
| 10 | 1,800 | 10 | 2,000 | 10 | 1,100 |
| 11 | 1,900 | 11 | 1,200 | 11 | 600 |
| 12 | 2,800 | 12 | 1,200 | 12 | 800 |
| 13 | 2,900 | 13 | 1,500 | 13 | 700 |
| 14 | 9,000 | 14 | 1,700 | 14 | 1,000 |
| 15 | 32,000 | 15 | 1,300 | 15 | 1,200 |
| 16 | 4,200 | 16 | 600 | 16 | 800 |
| 17 | 2,000 | 17 | 500 | 17 | 300 |
| 18 | 1,600 | 18 | 500 | 18 | 250 |
| 19 | 1,200 | 19 | 600 | 19 | 400 |
| 20 | 1,300 | 20 | 700 | 20 | 500 |
| 21 | 1,100 | 21 | 600 | 21 | 700 |
| 22 | 500 | 22 | 600 | 22 | 600 |
| 23 | 500 | 23 | 500 | 23 | 500 |
| -- | ----- | -- | ----- | 24 | 400 |
| -- | ----- | -- | ----- | 25 | 600 |
| -- | ----- | -- | ----- | 26 | 1,200 |
| -- | ----- | -- | ----- | 27 | 500 |
| -- | ----- | -- | ----- | 28 | 300 |
| -- | ----- | -- | ----- | 29 | 300 |
| -- | ----- | -- | ----- | 30 | 600 |
| -- | ----- | -- | ----- | 31 | 500 |
| -- | ----- | -- | ----- | 32 | 400 |
| -- | ----- | -- | ----- | 33 | 400 |

Table 5, cont.

| Borehole #33 | | Borehole #34 | | Borehole #35 | |
|---|---|---|---|---|---|
| Depth | NaI CPM | Depth | NaI CPM | Depth | NaI CPM |
| ft | | ft | | ft | |
| 01 | 1,900 | 01 | 2,600 | 01 | 10,000 |
| 02 | 1,200 | 02 | 1,300 | 02 | 38,000 |
| 03 | 800 | 03 | 1,400 | 03 | >50,000 |
| 04 | 700 | 04 | 1,000 | 04 | >50,000 |
| 05 | 600 | 05 | 1,500 | 05 | 22,000 |
| 06 | 1,000 | 06 | 1,500 | 06 | 22,000 |
| 07 | 1,000 | 07 | 1,000 | 07 | 1,500 |
| 08 | 800 | 08 | 400 | 08 | 1,500 |
| 09 | 800 | 09 | 300 | 09 | 800 |
| 10 | 500 | 10 | 400 | 10 | 700 |
| 11 | 500 | 11 | 500 | 11 | 700 |
| 12 | 400 | 12 | 800 | 12 | 600 |
| 13 | 300 | 13 | 700 | 13 | 00 |
| 14 | 00 | 14 | 500 | 14 | 1,100 |
| 15 | 400 | 15 | 600 | 15 | 1,400 |
| 16 | 500 | 16 | 900 | 16 | 1,400 |
| 17 | 900 | 17 | 600 | 17 | 800 |
| 18 | 900 | 18 | 700 | 18 | 700 |
| 19 | 1,000 | 19 | 1,300 | 19 | 600 |
| 20 | 1,100 | 20 | 800 | 20 | 600 |
| 21 | 800 | 21 | 400 | 21 | 600 |
| 22 | 800 | 22 | 300 | 22 | 700 |
| -- | ----- | 23 | 300 | -- | ----- |

| Borehole #36 | | Borehole #37 | | Borehole #38 | |
|---|---|---|---|---|---|
| 01 | 1,200 | 01 | 1,500 | 01 | 7.000 |
| 02 | 700 | 02 | 1,400 | 02 | 7,000 |
| 03 | 900 | 03 | 1,100 | 03 | 8,000 |
| 04 | 1,600 | 04 | 1,100 | 04 | 12,000 |
| 05 | 1,800 | 05 | 1,200 | 05 | 22,000 |
| 06 | 2,500 | 06 | 1,500 | 06 | >50,000 |
| 07 | 5,000 | 07 | 1,700 | 07 | >50,000 |
| 08 | 1,700 | 08 | 800 | 08 | >50,000 |
| 09 | 1,000 | 09 | 800 | 09 | >50,000 |
| 10 | 800 | 10 | 800 | 10 | >50,000 |
| 11 | 900 | 11 | 1,000 | 11 | >50,000 |
| 12 | 700 | 12 | 1,600 | 12 | 21,000 |
| 13 | 700 | 13 | 1,400 | 13 | 7,000 |
| 14 | 800 | 14 | 1,500 | 14 | 5,000 |
| 15 | 500 | 15 | 1,700 | 15 | 1,600 |
| 16 | 500 | 16 | 1,900 | 16 | 1,000 |
| 17 | 600 | 17 | 1,800 | 17 | 1,000 |
| 18 | 900 | 18 | 1,400 | 18 | 600 |
| 19 | 800 | 19 | 900 | 19 | 800 |
| 20 | 700 | 20 | 1,000 | 20 | 600 |
| 21 | 600 | 21 | 1,500 | 21 | 400 |
| -- | ----- | 22 | 600 | 22 | 700 |
| -- | ----- | 23 | 600 | 23 | 1,000 |
| -- | ----- | 24 | 500 | -- | ----- |

Table 5, cont.

| Borehole #39 | | Borehole #40 | | Borehole #41 | |
|---|---|---|---|---|---|
| Depth | NaI CPM | Depth | NaI CPM | Depth | NaI CPM |
| ft | | ft | | ft | |
| 01 | 3,000 | 01 | 7,000 | 01 | 1,400 |
| 02 | 11,000 | 02 | 26,000 | 02 | 1,400 |
| 03 | 4,000 | 03 | 6,000 | 03 | 1,200 |
| 04 | 1,900 | 04 | 2,100 | 04 | 1,500 |
| 05 | 1,000 | 05 | 1,600 | 05 | 1,900 |
| 06 | 1,500 | 06 | 1,900 | 06 | 1,200 |
| 07 | 1,000 | 07 | 3,500 | 07 | 700 |
| 08 | 700 | 08 | 5,000 | 08 | 600 |
| 09 | 500 | 09 | 3,200 | 09 | 700 |
| 10 | 500 | 10 | 1,500 | 10 | 1,000 |
| 11 | 400 | 11 | 800 | 11 | 1,000 |
| 12 | 500 | 12 | 1,200 | 12 | 1,300 |
| 13 | 400 | 13 | 1,500 | 13 | 1,000 |
| 14 | 800 | 14 | 1,500 | 14 | 600 |
| 15 | 1,200 | 15 | 1,300 | 15 | 600 |
| 16 | 1,300 | 16 | 1,000 | 16 | 600 |
| 17 | 900 | 17 | 800 | 17 | 500 |
| 18 | 600 | 18 | 600 | 18 | 500 |
| 19 | 700 | 19 | 1,200 | 19 | 200 |
| 20 | 1,000 | 20 | 1,200 | 20 | 200 |
| -- | ----- | 21 | 1,300 | 21 | 300 |
| -- | ----- | 22 | 1,300 | 22 | 300 |
| -- | ----- | -- | ----- | 23 | 300 |
| -- | ----- | -- | ----- | 24 | 500 |

Water Sample Analysis Results

Table 6

| Sample No. | Date | Location | Gross Alpha | | Gross Beta | |
|---|---|---|---|---|---|---|
| | | | pCi/l | | pCi/l | |
| 7001 | 6/8/81 | Surface Water North of Shuman Building | 3.11E0 | +/-8.8% | 2.25E1 | +/-3.0% |
| 7002 | 6/9/81 | Surface Water West of Shuman Building | 8.00E0 | +/-9.9% | 2.34E1 | +/-4.4% |
| 7003 | 6/10/81 | Drainage Pipe at NE Boundary | 1.56E0 | +/-22% | 9.88E0 | +/-6.8% |
| 7004 | 6/11/81 | Stream Beneath Earth City Expressway (offsite) | 1.04E0 | +/-14% | 1.97E1 | +/-4.8% |
| 7009 | 6/29/81 | Borehole #14 | 4.50E0 | +/-39% | 2.23E1 | +/-14% |
| 7010 | 6/29/81 | Borehole #15 | 2.60E0 | +/-52% | 1.52E1 | +/-17% |
| 7011 | 6/18/81 | Borehole #14 | 3.12E0 | +/-47% | 1.06E1 | +/-20% |
| 7012 | 6/18/81 | Borehole #15 | 7.10E0 | +/-31% | 1.66E1 | +/-16% |
| 7013 | 6/3/81 | Middle Leachate Treatment Lagoon | -1.04E0 | +/-275% | 1.30E2 | +/-5.7% |
| 7014 | 6/3/81 | North Leachate Treatment Lagoon | 1.35E0 | +/-55% | 1.36E2 | +/-5.5% |
| 7015 | 6/3/81 | South Leachment Treatment Lagoon | 2.43E0 | +/-55% | 1.03E2 | +/-6.4% |
| 7016 | 6/3/81 | Sludge Drainage Pipe | -1.21E0 | +/-234% | 9.89E1 | +/-6.5% |
| 7017 | 7/10/81 | Borehole #14 | 5.20E-1 | +/-115% | 3.36E1 | +/-11% |
| 7018 | 7/10/81 | Borehole #15 | 6.76E0 | +/-32% | 3.61E1 | +/-11% |
| 7019 | 6/29/81 | Surface Pond North of Entrance on St. Charles Rock Road | 1.91E0 | +/-60% | 3.00E1 | +/-12% |
| 7020 | 6/17/81 | Borehole #15 | 8.84E0 | +/-28% | 3.01E1 | +/-12% |
| 7021 | 7/20/81 | Tap Water | 1.56E0 | +/-67% | 2.91E1 | +/-12% |
| 7022 | 7/10/81 | Middle Leachate Treatment Lagoon | 3.45E0 | +/-141% | 1.07E2 | +/----% |
| 7023 | 7/10/81 | North Leachate Treatment Lagoon | -2.95E0 | +/-189% | 1.22E2 | +/-5.8% |
| 7024 | 7/10/81 | South Leachment Treatment Lagoon | -1.56E0 | +/-179% | 8.67E1 | +/-6.9% |
| 7025 | 7/21/81 | Settling Pond at North Boundary of Site | 1.56E0 | +/-67% | 3.65E1 | +/-11% |
| 7026 | 6/17/81 | Borehole #14 | -8.66E-1 | +/-332% | 3.89E1 | +/-10% |
| 7027 | 5/11/81 | Standing Water at Earth City Background Site | 1.04E0 | +/-82% | 3.25E1 | +/-11% |
| 7028 | 4/29/81 | Standing Water at NW Corner of Shuman Building | 4.52E1 | +/-6.2% | 8.78E1 | +/-6.9% |
| 7029 | 4/29/81 | West Ditch Runoff | -2.08E0 | +/-131% | -3.62E0 | +/-137% |
| 7030 | 7/28/81 | Pond at North Boundary of Site | 5.20E-1 | +/-115% | 3.51E1 | +/-11% |
| 7031 | 7/28/81 | Surface Pond North of Entrance on St. Charles Rock Road | -1.39E0 | +/-203% | 2.63E1 | +/-13% |
| 7032 | 7/30/81 | Missouri River Water | -2.6E0 | +/-102% | 2.63E1 | +/-13% |
| 7033 | 7/30/81 | Missouri River Water | 1.04E0 | +/-82% | 2.90E1 | +/-12% |
| 7034 | 7/28/81 | North Leachate Treatment Lagoon | -1.39E0 | +/-203% | 1.03E2 | +/-6.3% |
| 7035 | 7/28/81 | Middle Leachate Treatment Lagoon | 1.04E0 | +/-82% | 8.45E1 | +/-7.0% |

Table 6, cont.

| Sample No. | Date | Location | Gross Alpha | | Gross Beta | |
|---|---|---|---|---|---|---|
| | | | pCi/l | | pCi/l | |
| 7036 | 7/28/81 | South Leachate Treatment Lagoon | -2.95E0 | +/-189% | 6.96E1 | +/-7.7% |
| 1 | 11/80 | Leachate Observation Well | 7.3E0 | +/-120% | 8.0E1 | +/-25% |
| 2 | 10/80 | Off-site Sample Well 3, West Boundary of Landfill | 1.5E1 | +/-17% | 4.1E1 | +/-10% |
| 3 | 10/80 | Off-site Sample Well 4, North Boundary of Landfill | 2.9E0 | +/-29% | 7.6E0 | +/-26% |
| 4 | 11/80 | Settling Pond North of Landfill | 2.9E0 | +/-150% | 2.6E1 | +/-110% |

| Sample No. | Date | Location | Isotopic Analysis K-40 pCi/l | | Ra-226 pCi/l | |
|---|---|---|---|---|---|---|
| 7014 | 6/3/81 | North Leachate Treatment Lagoon | 1.38E2 | +/-15% | 1.20E0 | +/-21% |
| 7015 | 6/3/81 | South Leachate Treatment Lagoon | 1.36E2 | +/-16% | 3.92E0 | +/-233% |
| 7016 | 6/3/81 | Sludge Drainage Pipe | 1.02E2 | +/-15% | 2.40E0 | +/-290% |
| 7022 | 7/10/81 | Middle Leachate Treatment Lagoon | 1.04E2 | +/-18% | 2.40E0 | +/-290% |
| 7028 | 4/29/81 | Standing Water at NE Corner Shuman Bldg. | 1.24E2 | +/-28% | 1.15E0 | +/-195% |

Radon Flux Measurements Using Accumulator Method

Table 7

| Date | Time | Location | Environmental Conditions | Flux |
|---|---|---|---|---|
| | | | | pCi/sq.m-s |
| 04/21 | 09:33 | Base 1 (Area 2, O11J) | 10 degrees C, damp ground, moderate wind | 28 |
| 04/21 | 10:21 | Base 2 (Area 2, L38K) | 10 degrees C, damp ground, moderate wind | 6.7 |
| 04/22 | 11:48 | Base 1 (Area 2, O11J) | 15 degrees C, soaked ground, 1 hour after rain | 332 |
| 04/22 | 12:38 | Base 3 (Area 2, M99H) | 15 degrees C, soaked ground, 1 hour after rain | 1.7 |
| 04/23 | 08:24 | Base 1 (Area 2, O11J) | 15 degrees C, damp ground, sunny, last rain approx. 12 hours | 293 |
| 04/23 | 09:12 | Base 3 (Area 2, M99H) | 15 degrees C, damp ground, sunny, last rain approx. 12 hours | 7.9 |
| 04/23 | 10:00 | Base 2 (Area 2, L38K) | 15 degrees C, damp ground, sunny, last rain approx. 12 hours | 5.9 |
| 04/24 | 08:38 | Base 3 (Area 2, M99H) | 7 degrees C, damp ground, cloudy, last rain approx. 2 days | 2.7 |
| 04/24 | 08:40 | Base 1 (Area 2, O11J) | 7 degrees C, damp ground, cloudy, last rain approx. 2 days | 9.8 |
| 04/24 | 09:29 | Base 2 (Area 2, L38K) | 7 degrees C, damp ground, cloudy, last rain approx. 2 days | 1.5 |
| 04/27 | 09:05 | Base 3 (Area 2, M99H) | 21 degrees C, hot, ground dry, sunny | 2.2 |
| 04/29 | 08:52 | Base 3 (Area 2, M99H) | 18 degrees C, sunny, last rain approx. 12 hours, light breeze | 14 |
| 04/29 | 09:36 | Base 1 (Area 2, O11J) | 18 degrees C, sunny, last rain approx. 12 hours, light breeze | 540 |
| 04/29 | 11:10 | Base 4 (Area 2, i00P) | 18 degrees C, sunny, last rain approx. 12 hours, light breeze | 63 |
| 05/04 | 10:05 | Base 1 (Area 2, O11J) | Cloudy, drizzle, last heavy rain approx. 1 day | 43 |
| 05/04 | 15:34 | Base 1 (Area 2, O11J) | Cloudy, drizzle, last heavy rain approx. 1 day | 33 |
| 05/05 | 09:44 | Base 1 (Area 2, O11J) | Cloudy, drizzle, soaked ground, no wind | 177 |
| 05/06 | 09:49 | Base 1 (Area 2, O11J) | 7 degrees C, windy, wet ground, last rain approx. 12 hours | 269 |
| 05/07 | 09:32 | Base 1 (Area 2, O11J) | 10 degrees C, windy, ground dry at surface, sunny | 34 |
| 05/07 | 10:48 | Base 3 (Area 2, M99H) | 10 degrees C, windy, ground dry at surface, sunny | 1.5 |
| 05/08 | 09:45 | Base 3 (Area 2, M99H) | 15 degrees C, cloudy, moderate wind, ground moist | 8.5 |
| 05/08 | 10:28 | Base 4, (Area 2, i00P) | 15 degrees C, cloudy, moderate wind, ground moist | 243 |
| 05/11 | 11:43 | Base 4 (Area 2, i00P) | 13 degrees C, light wind, soaked ground, rain approx. 12 hours ago | 28 |

Table 7, cont.

| Date | Time | Location | Environmental Conditions | Flux |
|---|---|---|---|---|
| | | | | pCi/sq.m-s |
| 05/12 | 11:15 | Base 4 (Area 2, i00P) | 15 degrees C, windy, cloudy, last rain approx. 1 day | 310 |
| 05/12 | 12:08 | Base 1 (Area 2, O11J) | 15 degrees C, windy, cloudy, last rain approx. 1 day | 18 |
| 05/13 | 10:10 | Base 4 (Area 2, i00P) | 13 degrees C, cloudy, ground moist, last rain approx. 8 hours | 206 |
| 05/13 | 10:50 | Base 1 (Area 2, O11J) | 13 degrees C, cloudy, ground moist, last rain approx. 8 hours | 30 |
| 05/14 | 10:30 | Base 5 (Area 2, ) | 13 degrees C, cloudy, light wind, drizzle | 43 |
| 05/14 | 11:04 | Base 6 (Area 1, I00A) | 13 degrees C, cloudy, light wind, drizzle | 376 |
| 05/15 | 09:51 | Base 6 (Area 1, I00A) | 15 degrees C, sunny, light wind | 380 |
| 05/18 | 10:13 | Base 6 (Area 1, I00A) | 10 degrees C, cloudy, heavy rain last 2 days, strong wind | 188 |
| 05/19 | 09:44 | Base 1 (Area 2, O11J) | 10 degrees C, drizzle, ground soaked | 8.0 |
| 05/19 | 10:24 | Base 4 (Area 2, i00P) | 10 degrees C, drizzle, ground soaked | 17 |
| 05/19 | 10:24 | Base 6 (Area 1, I00A) | 10 degrees C, drizzle, ground soaked | 538 |
| 05/20 | 10:01 | Base 1 (Area 2, O11J) | 18 degrees C, no wind, sunny, ground damp | 276 |
| 05/20 | 10:41 | Base 4 (Area 2, i00P) | 18 degrees C, no wind, sunny ground damp | 119 |
| 05/20 | 11:23 | Base 6 (Area 1, I00A) | 18 degrees C, no wind, sunny ground damp | 353 |
| 05/21 | 09:53 | Base 1 (Area 2, O11J) | 21 degrees C, sunny, no wind, dry soil | 212 |
| 05/21 | 10:27 | Base 4 (Area 2, i00P) | 21 degrees C, suny, no wind, dry soil | 406 |
| 05/27 | 08:51 | Base 6 (Area 1, I00A) | 21 degrees C, sunny, light breeze, dry soil | 350 |
| 05/27 | 09:33 | Base 1 (Area 2, O11J) | 21 degrees C, sunny, light breeze, dry soil | 596 |
| 05/27 | 10:12 | Base 4 (Area 2, i00P) | 21 degrees C, sunnny, light breze, dry soil | 865 |
| 05/28 | 08:43 | Base 4 (Area 2, i00P) | 28 degrees C, dry soil, last rain 2 days 29.90" hg | 400 |
| 05/28 | 11:44 | Base 4 (Area 2, i00P) | 28 degrees C, dry soil, last rain 2 days 29,90" hg | 397 |
| 05/29 | 09:14 | Area 2, k00R | 29 degrees C, damp soil, light wind | 1.8 |
| 06/02 | 08:45 | Base 6 (Area 1, I00A) | 30 degrees C, dry soil, 29.90" hg | 620 |
| 06/03 | 14:54 | Base 4 (Area 2, i00P) | 32 degrees C, slight wind, dry soil 29.85 hg | 580 |
| 06/04 | 09:03 | Base 1 (Area 2, O11J) | 34 degrees C, light wind, dry soil | 388 |
| 06/04 | 10:10 | Area 2, I00F | 39 degrees C, no wind, damp soil | 0.6 |
| 06/08 | 11:37 | Base 4 (Area 2, i00P) | 33 degrees C, dry soil, moderate breeze | 245 |
| 06/09 | 09:21 | Base 4 (Area 2, i00P) | 33 degrees C, dry soil, slight breeze | 579 |
| 06/09 | 10:39 | Base 8 (Area 1, I00I) | 33 degrees C, dry soil, strong wind | 3.0 |
| 06/10 | 11:17 | Area 2, M62J | 21 degrees C, dry soil, no wind 29.92" | 1.3 |
| 06/11 | 10:16 | Area 2, U00P | 18 degrees C, dry soil, light breeze | 38 |

Table 7, cont.

| Date | Time | Location | Environmental Conditions | Flux |
|---|---|---|---|---|
| | | | | pCi/sq.m-2 |
| 06/11 | 10:39 | Area 2, T00P | 18 degrees C, dry soil, light breeze | 85 |
| 06/11 | 12:07 | Area 2, h00X | 18 degrees C, dry soil, light breeze | 1.8 |
| 06/11 | 12:20 | Area 2, j00W | 18 degrees C, dry soil, light breeze | 1.9 |
| 06/12 | 09:56 | Area 2, U00P | 26 degrees C, damp soil, light breeze 29.98" hg | 14 |
| 06/12 | 10:08 | Area 2, T00P | 26 degrees C, damp soil, light breeze 29.98" hg | 35 |
| 06/12 | 11:20 | Area 2, h00X | 26 degrees C, damp soil, light breeze 29,98" hg | 0.6 |
| 06/12 | 11:30 | Area 2, j00W | 26 degrees C, damp soil, light breeze 29.98" hg | 1.0 |
| 06/15 | 10:03 | Area 2, I00L | 29 degrees C, dry soil, gusty, 760.5mm hg | 0.8 |
| 06/15 | 10:15 | Area 2, J00L | 29 degrees C, dry soil, gusty, 760.5mm hg | 0.7 |
| 06/23 | 10:17 | Earth City, offsite bkg | 27 degrees C, damp soil, no wind 30.14 hg | 0.5 |
| 06/23 | 13:50 | Taussig Rd, offsite bkg | 27 degrees C, damp soil, no wind 30.14 hg | 1.5 |
| 06/29 | 10:03 | Area 2m U00P | n/a | 16 |
| 07/06 | 10:20 | Base 4 (Area 2, i00P) | Damp soil, slight breeze | 138 |
| 07/06 | 11:24 | Taussig Rd, offsite bkg | Damp soil, slight breeze | 0.3 |
| 07/08 | 14:00 | Area 2, J30L | 31 degrees C, dry soil, slight breeze, 30.20" hg | 0.4 |
| 07/08 | 14:30 | Area 2, H04O | 31 degrees C, dry soil, slight brze, 30.20" hg | 0.4 |
| 07/10 | 10:19 | Taussig Rd, offsite bkg | Damp soil, started to rain during accumulation | 0.3 |
| 07/10 | 10:09 | Old St. Charles Rock Rd Bkg | Damp soil, started to rain during accumulation | 1.0 |
| 07/16 | 10:49 | Area 1, M10G | 26 degrees C, damp soil, 29.96" hg | 22 |
| 07/17 | 10:10 | Area 1, M10G | 25 degrees C, dry soil, no wind, 30.02" hg | 14 |
| 07/20 | 10:25 | Base 6 (Area 1, I00A) | 30 degrees C, damp soil, mild wind, 29.86" hg | 59 |
| 07/22 | 11:25 | Old St. Charles Rock Rd Bkg | 26 degrees C, damp soil, no wind 30.10" hg | <0.1 |
| 07/24 | 08:14 | Area 1, M10G | 24 degrees C, damp soil, light wind, 30.06" hg | 15 |
| 07/24 | 08:31 | Area 2, p07S | 24 degrees C, damp soil, light wind, 30.05" hg | 168 |
| 07/28 | 09:05 | Area 2, p07S | 23 degrees C, damp soil, mild wind, 30.06" hg | 34 |
| 07/28 | 09:23 | Area 1, M10G | 23 degrees C, damp soil, mild wind, 30.06" hg | 61 |
| 07/29 | 08:09 | Base 8 (Area 1, I00I) | 18 degrees C, damp soil, light wind, 30.21" hg | 0.5 |
| 07/29 | 08:26 | Area 2, p07S | 18 degrees C, damp soil, light wind, 30.21" hg | 173 |
| 07/29 | 10:04 | Old St. Charles Rock Rd Bkg | 21 degrees C, damp soil, light wind, 30.21" hg | 0.3 |
| 07/29 | 10:50 | Taussig Road offsite bkg | 21 degrees C, damp soil, light wind, 30.21" hg | 0.2 |
| 07/30 | 08:09 | Area 2, p07S | 23 degrees C, dry soil, sunny, light wind, 30.21" hg | 38 |
| 07/30 | 08:16 | Area 1, O00M | 23 degrees C, dry soil, sunny, light wind, 30.21" hg | 3.2 |
| 07/30 | 09:20 | Old St. Charles Rock Rd Bkg | 23 degrees C, dry soil, sunny, light wind, 30.21'hg | 0.2 |
| 07/31 | 10:08 | Area 1, O00M | 24 degrees C, very dry soil, sunny, light wind, 30.25" hg | 2.0 |

Table 7, cont.

| Date | Time | Location | Environmental Conditions | Flux |
|---|---|---|---|---|
| | | | | pCi/sq.m-2 |
| 07/31 | 10:13 | Area 1, E00F | 24 degrees C, very dry soil, sunny, light wind, 30.25" hg | 0.5 |
| 08/03 | 10:11 | Area 1, E00F | 25 degrees C, dry soil, light wind, 29.94" hg | 3.4 |
| 08/03 | 10:14 | Area 1, O00M | 25 degrees C, dry soil, light wind, 29.94" hg | 0.4 |
| 08/04 | 09:05 | Area 1, E00F | 29 degrees C, dry soil, light wind, 30.04" hg | 6.4 |
| 08/04 | 09:11 | Area 1, O00M | 29 degrees C, dry soil, light wind, 30.04" hg | 0.5 |
| 08/05 | 09:21 | Area 1, E00F | 28 degrees C, dry soil, light wind, 30.07" hg | 9.6 |
| 08/05 | 09:25 | Area 1, O00M | 28 degrees C, dry soil, light wind, 30.07" hg | 9.6 |
| 08/06 | 08:35 | Area 1, E00F | 27 degrees C, dry soil, light wind, 30.01" hg | 0.4 |
| 08/06 | 08:40 | Area 1, M10G | 27 degrees C, dry soil, light wind, 30.01" hg | 5.1 |
| 08/07 | 09:08 | Area 2, p07S | 27 degrees C, dry soil, light wind, 30.01" hg | 122 |
| 08/07 | 09:15 | Base 8 (Area 1, I00I) | 27 degrees C, dry soil, light wind, 30.01" hg | 0.4 |
| 08/17 | 10:05 | Area 2, I00F | 20 degrees C, dry soil, light wind, 30.08" hg | 0.6 |
| 08/17 | 10:10 | Area 2, I00L | 20 degrees C, dry soil, light wind, 30.08" hg | 0.3 |
| 08/18 | 09:14 | Area 2, I00L | 18 degrees C, dry soil, no wind, 30.11" hg | <0.1 |
| 08/18 | 09:17 | Area 2, I00F | 18 degrees C, dry soil, no wind, 30.11" hg | 0.5 |
| 08/19 | 09:34 | Area 2, I00L | 18 degrees C, dry soil, no wind, 30.11" hg | 0.3 |
| 08/19 | 09:40 | Area 2, I00F | 18 degrees C, dry soil, no wind, 30.11" hg | 0.4 |

Radon Flux Measurements Using the Charcoal Canister Method

Table 8

| Date | Location | Sampling Time(sec) | Enviromental Conditions | Flux |
|---|---|---|---|---|
| | | | | pCi/sq.m-s |
| 06/02 | Base 6 (Area 1, I00a) | 6,000 | 30 degrees C, dry soil, 29.90" hg | 362 |
| 06/03 | Base 4 (Area 2, i00P) | 4,980 | 32 degrees C, dry soil, light wind, 29.85" hg | 29 |
| 06/03 | Base 4 (Area 2, i00P) | 1,200 | 32 degrees C, dry soil, light wind, 29.85" hg | 613 |
| 06/04 | Base 1 (Area 1, O11J) | 7,200 | 34 degrees C, dry soil light wind | 147 |
| 06/10 | Base 8 (Area 2, I00I) | 55,320 | 21 degrees C, dry soil, no wind, 29.92" hg | 2.0 |
| 06/10 | Area 2, M00I | 18,000 | 21 degrees C, dry soil, no wind, 29.92" hg | 2.3 |
| 06/11 | Area 2, L00G | 60,300 | 18 degrees C, dry soil, light breeze | 163 |
| 06/11 | Area 2, U00P | 22,500 | 18 degrees C, dry soil, light breeze | 44 |
| 06/18 | Area 2, 100S | 54,900 | n/a | 2.2 |
| 06/12 | Area 2, T00P | 17,640 | 26 degrees C, damp soil, light breeze, 29.98" hg | 30 |
| 06/23 | Earth City, offsite bkg | 21,600 | 27 degrees C, damp soil, no wind, 30.14" hg | 0.9 |
| 06/24 | Taussig Road, offsite bkg | 61,200 | n/a | 0.8 |
| 06/30 | Area 2, p00J | 55,320 | n/a | 8.7 |
| 06/30 | Area 2, U00P | 20,940 | n/a | 74 |
| 07/01 | Old St. Charles Rd, bkg | 20,040 | n/a | 0.8 |
| 07/06 | Area 2, i00P | 50,400 | Damp soil, light breeze | 178 |
| 07/08 | Area 1, H25N | 14,100 | 31 degrees C, dry soil, slight breeze, 30.20" hg | 0.9 |
| 07/08 | Area 2, J30L | 50,140 | 31 degrees C, dry soil, slight breeze, 30.20" hg | 0.3 |
| 07/10 | Area 1, I00L | 22,540 | Damp soil, during rain | 0.6 |
| 07/15 | Old St. Charles Rock Rd, bkg | 54,540 | n/a | 1.6 |
| 07/16 | Area 1, M10G | 22.380 | 26 degrees C, damp soil, 29.96" hg | 24 |
| 07/17 | Area 1, M10G | 57,240 | 25 degrees C, dry soil, no wind, 30.20" hg | 14 |
| 07/20 | Base 6 (Area 1, I00A) | 5,880 | 30 degrees C, damp soil, mild wind, 29.86" hg | 13 |
| 07/22 | Old St. Charles Rock Rd, bkg | 68,640 | 26 degrees C, damp soil, no wind, 30.10" hg | 0.3 |
| 07/23 | Area 1, M10G | 60,960 | n/a | 4.5 |
| 07/28 | Area 1, M10G | 61,560 | 23 degrees C, damp soil, 30.06" hg | 9.1 |
| 07/28 | Area 2, p04S | 63,240 | 23 degrees C, damp soil, 30.06" hg | 32 |
| 07/29 | Area 1, I00I, Base 6 | 57,540 | 18 degrees C, damp soil, light wind, 30.21"hg | 0.4 |
| 07/29 | Area 1, O00I | 57,960 | 18 degrees C, damp soil, light wind, 30.21" hg | 1.3 |
| 07/30 | Area 2, p04S | 55,080 | 23 degrees C, dry soil, light wind, 30.21" hg | 212 |
| 07/30 | Area 1, O00M | 56,820 | 23 degrees C, dry soil, light wind, 30.21" hg | 7.6 |
| 07/31 | Area 1, E00F | 56,340 | 24 degrees C, very dry soil, light wind, 30.25" hg | 0.4 |
| 07/31 | Area 1, O00M | 56,220 | 24 degrees C, very dry soil, light wind, 30.25" hg | 5.2 |
| 08/05 | Area 1, E00F | 52,800 | 28 degrees C, dry soil, light wind, 30.07" hg | 0.6 |

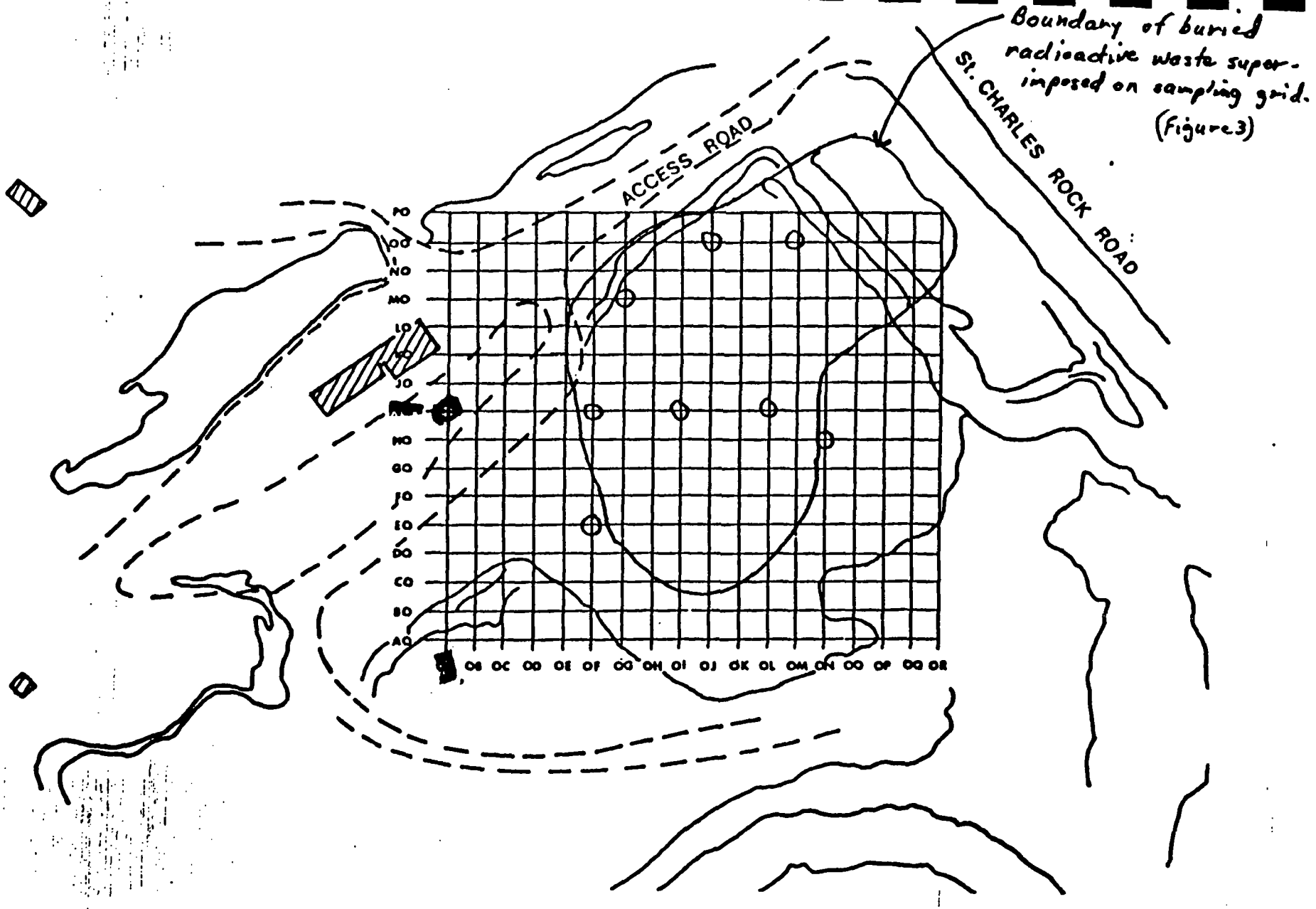
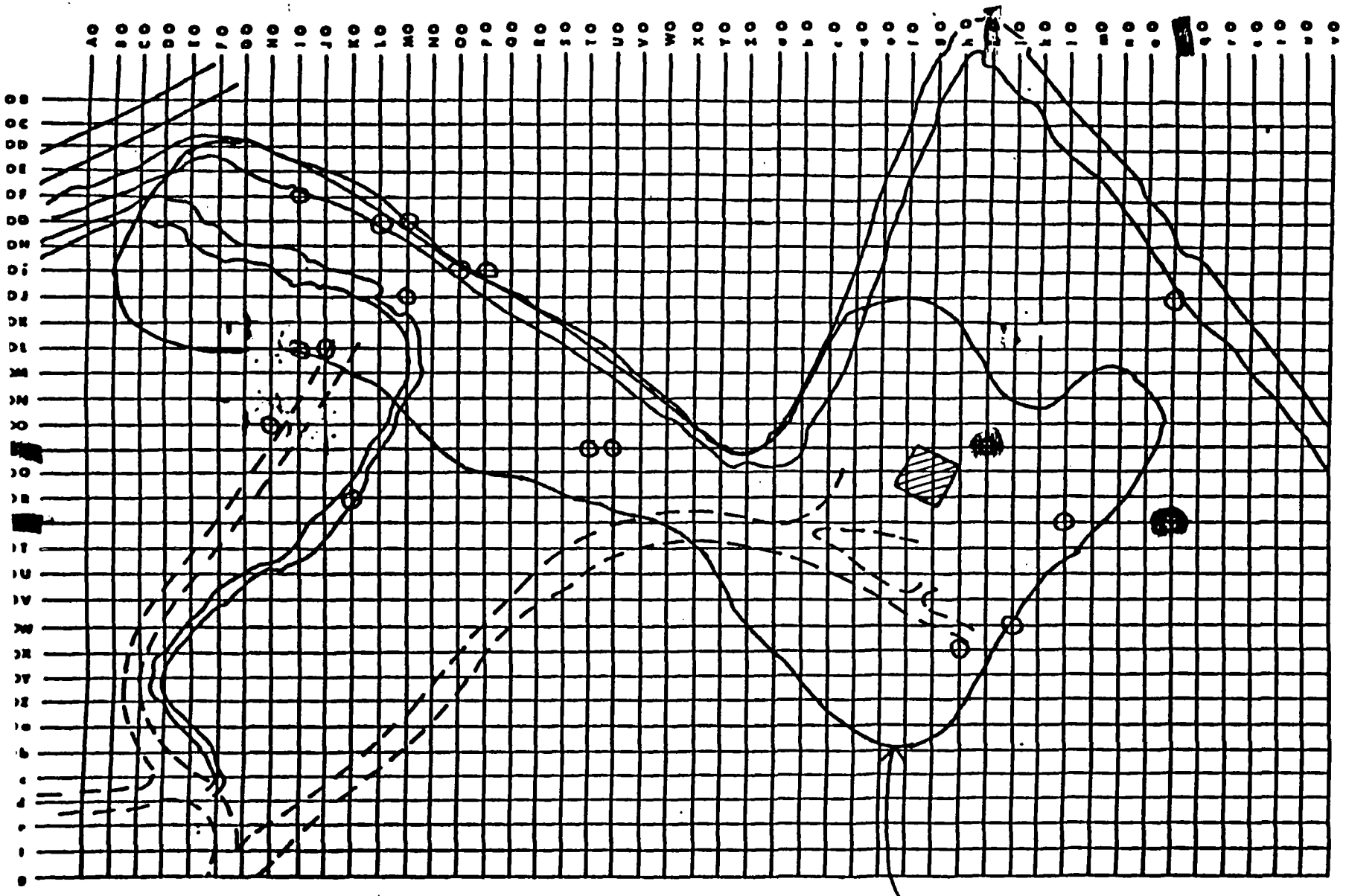



Figure 5. Grid locations for radiological survey, Area 1.



Boundary of buried radioactive waste superimposed on sampling grid. (Figure 3)

Figure 6. Grid locations for radiological survey, Area 2.

Side-By-Side Radon Flux Measurements,
Accumulator versus Charcoal Canister Methods

Table 9

| Location | Date | Charcoal Canister | Accumulator |
|---|---|---|---|
| | | pCi/sq.m-2 | pCi/sq.m-2 |
| Base 6 | 6-2 | 400 | 740 |
| Base 4 | 6-3 | 680 | 790 |
| Base 1 | 6-4 | 170 | 370 |
| Base 8 | 6-9 | 2.1 | 3.0 |
| Base 3 | 6-10 | 2.4 | 1.3 |
| Borehole 3 | 6-11 | 50 | 38 |
| T00P(Area 2) | 6-12 | 30 | 35 |
| Earth City | 6-23 | 0.9 | <1 |
| Taussig Road | 6-24 | 0.8 | 1.5 |
| Base 4 | 7-6 | 180 | 140 |
| Borehole 2 | 7-8 | <0.5 | <1 |
| M10G(Area 1) | 7-16 | 22.2 | 22.3 |
| M10G(Area 1) | 7-17 | 13.4 | 14.0 |
| Base 6 | 7-20 | 14.1 | 59.2 |
| Old St. Charles Rd | 7-22 | 0.3 | <1 |
| M10G(Area 1) | 7-24 | 4.6 | 15.3 |
| M10G(Area 1) | 7-28 | 9.8 | 60.5 |
| 20' W of Borehole #20 | 7-28 | 36.4 | 34.3 |
| Base 8 | 7-29 | 0.5 | 0.5 |
| 20' W of Borehole #20 | 7-30 | 218 | 38 |
| O00M(Area 1) | 7-30 | 2.9 | 3 |
| O00M(Area 1) | 7-31 | 5.8 | 0.2 |

Working Level (WL) and Long-Lived Gross Alpha Activity
on High Volume Air Samples

Table 10

Sample Duration: 10 min.
Flow Rate: 570 l/min.
Total Volume: 1.4E6 ml

| Date/Time | Location | 7 Day Activity | WL |
|---|---|---|---|
| | | uCi/cc | |
| 8105010805 | Outside Trailer | 2.03E-13+/-122% | .0016 |
| 8105010819 | Outside Trailer | 2.66E-13+/-103% | .0015 |
| 8105010918 | Base 3 | 0+/-211% | .0010 |
| 8105010931 | Base 1 | 3.13E-13+/-93% | .0008 |
| 8105040942 | Outside Trailer | 4.69E-14+/-365% | .0010 |
| 8105041013 | Base 1 | 1.09E-13+/-188% | .0009 |
| 8105041124 | C00G | 4.69E-14+/-365% | .0012 |
| 8105041150 | Base 4 | 2.66E-13+/-103% | .0016 |
| 8105111034 | Earth City Background | 4.69E-14+/-365% | .0003 |
| 8105121046 | Earth City Background | 4.69E-14+/-365% | .0004 |
| 8105121402 | Outside Trailer | 0+/-211% | .0002 |
| 8105121447 | Base 4 | 4.22E-13+/-78% | .0006 |
| 8105121504 | Outside W-L Office Bldg | 7.34E-13+/-57% | .0003 |
| 8105121528 | Base 1 | 1.56E-13+/-145% | .0002 |
| 8105121551 | T00P | 4.69E-14+/-365% | .0003 |
| 8105131154 | Z00N | 4.69E-14+/-365% | .0010 |
| 8105151010 | Base 6 | 2.03E-13+/-122% | .0003 |
| 8105151035 | Base 7 | 1.09E-13+/-188% | .0002 |
| 8105181022 | Base 6 | 2.03E-13+/-122% | .0003 |
| 8105201107 | Base 4 | 2.66E-13+/-103% | .0004 |
| 8105201137 | Base 6 | 2.66E-13+/-103% | .0004 |
| 8105270821 | Inside Trailer | 1.41E-12+/-40% | .0110 |
| 8105271040 | Base 6 | 7.81E-13+/-55% | .0002 |
| 8106021429 | O00J | 2.03E-13+/-122% | .0007 |
| 8106021450 | h00O | 4.69E-14+/-365% | .0007 |
| 8106080957 | Drilling Borehole #1 | 1.56E-13+/-146% | .0006 |
| 8106081335 | Drilling Borehole #2 | 4.69E-14+/-365% | .0005 |
| 8106091015 | Drilling Borehole #3 | 7.34E-13+/-57% | .0009 |
| 8106091318 | Drilling Borehole #4 | 1.15E-11+/-14% | .0020 |
| 8106091350 | Drilling Borehole #4 | 8.55E-12+/-16% | .0027 |

Table 10, cont.

| Date/Time | Location | 7 Day Activity | WL |
|---|---|---|---|
| | | uCi/cc | |
| 8106100945 | Drilling Borehole #5 | 2.66E-13+/-103% | .0012 |
| 8106101231 | Drilling Borehole #7 | 4.22E-13+/-78% | .0015 |
| 8106101411 | Drilling Borehole #8 | 4.22E-13+/-78% | .0012 |
| 8106231028 | Earth City Background | 1.09E-13+/-188% | .0005 |
| 8106231146 | Inside Shuman | 1.98E-12+/-33% | .0011 |
| 8106231407 | Taussig Rd Background | 4.69E-14+/-365% | .0005 |
| 8106300931 | Borehole #32 | 4.69E-14+/-365% | .0006 |
| 8107070919 | Old St. Charles Rd Bkg | 0+/-211% | .0017 |
| 8011130845 | Area 1, Near Road | ---------- | .017 |
| 8011131030 | Area 1 Highest Ext. Level | ---------- | .014 |
| 8011131445 | Area 2 Highest Ext. Level | ---------- | .019 |
| 8011131507 | Area 2 Suspected Surface Mat. | ---------- | .038 |
| 8011140735 | Inside Shuman Building | ---------- | .031 |

| Date/Time | Location | Isotopic Activities U-238 | Isotopic Activities Ra-226 |
|---|---|---|---|
| Composite Sample | All Onsite Samples | 9.1E-14+/-1% | 4.3E-14+/-1% |

Note: Individual sample sensitivities are low due to short sampling time. However, all gross alpha activities except two are less than the maximum permissible concentrations (MPCs) for U-238 or Ra-226, for unrestricted areas, as listed in Appendix B, Table II, of 10CFR20. (These MPCs are 3.0E-12 uCi/cc for either nuclide.) The two exceptions occurred when drilling through contaminated materials.

Gamma Analysis of High Volume Air Samples for Rn-219 Daughters (Pb-211)

Table 11

| Date | Time | Location | ---Sample Activity (uCi/cc) at--- 405 KeV (3.4% ab) | 427 KeV (1.8% ab) | 832 KeV (3.4% ab) | Average uCi/cc |
|---|---|---|---|---|---|---|
| 6/3 | 14:21 | Base 4 (Area 2, i00P) | 2.3E-10 | --------- | 2.5E-10 | 2.4E-10 |
| 6/4 | 8:31 | Base 1 (Area 2, O00J) | 5.7E-11 | --------- | --------- | 5.7E-11 |
| 6/4 | 12:30 | Base 4 | 1.0E-9 | 8.9E-10 | 9.3E-10 | 9.5E-10 |
| 6/18 | 14:00 | Base 4 | 5.6E-10 | 4.8E-10 | 4.6E-10 | 5.0E-10 |
| 6/29 | 12:23 | Base 6 (Area 1, N00A) | 9.0E-11 | --------- | 1.3E-10 | 1.1E-10 |

Table 12: Priority Pollutant Analyses of Auger Hole and Leachate Sludge Samples

**Results of Chemical Analyses of**
West Lake Landfill
**7 July 1981**

| Parameter | Units | WTP * | BH-2 * | BH-13 * | BH-25 * | BH-31 * | BH-35 * |
|---|---|---|---|---|---|---|---|
| Antimony | mg/kg | 0.077 | 0.268 | 0.325 | 0.355 | 0.218 | 21.0 |
| Arsenic | mg/kg | 0.62 | 6.0 | 7.0 | 2.0 | 4.0 | 1.0 |
| Beryllium | mg/kg | 0.038 | 0.12 | 0.24 | 0.18 | 0.20 | 0.14 |
| Cadmium | mg/kg | 0.052 | 2.2 | 2.3 | 2.27 | 4.0 | 37.5 |
| Chromium | mg/kg | 1.41 | 40.9 | 34 | 7.0 | 26.2 | 215 |
| Copper | mg/kg | 0.459 | 1039 | 88 | 23.2 | 131.6 | 356 |
| Cyanide | mg/kg | 0.10 | 0.028 | 0.12 | 1.61 | 0.376 | 0.97 |
| Lead | mg/kg | 19.7 | 356 | 431 | 49.0 | 251.6 | 1490 |
| Mercury | mg/kg | 5 | 0.22 | 0.36 | 0.14 | 0.10 | 0.84 |
| Nickel | mg/kg | 3.00 | 20.0 | 45.1 | 11.3 | 4 | 218.0 |
| Selenium | mg/kg | 0.12 | 1.6 | 1.2 | 1.2 | 1.2 | 0.9 |
| Silver | mg/kg | 0.134 | 0.580 | 0.369 | 0.165 | 0.264 | 0.409 |
| Thallium | mg/kg | 14.0 | 10.0 | 2.0 | <0.1 | 0.6 | 3.5 |
| Zinc | mg/kg | 41.4 | 246 | 270 | 180 | 89 | 2395 |

* WTP - Waste treatment plant leachate sludge
BH-2 - Auger hole 2, Area 2
BH-13 - Auger hole 13, Area 2
BH-25 - Auger hole 25, Area 1
BH-31 - Auger hole 31, Area 2
BH-35 - Auger hole 35, Area 2

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. W.T.P. (NPDES) DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #569 DATE ANALYSIS COMPLETED 16 July 1981

### ACID COMPOUNDS

| | µg/l |
|---|---|
| 2,4,6-trichlorophenol | ND |
| o-chloro-m-cresol | ND |
| 2-chlorophenol | ND |
| 2,4-dichlorophenol | ND |
| 2,4-dimethylphenol | ND |
| 2-nitrophenol | ND |
| 4-nitrophenol | * |
| 2,4-dinitrophenol | * |
| 4,6-dinitro-o-cresol | ND |
| pentachlorophenol | ND |
| phenol | 8.1 |

ND - Less than 1 µg/l
* - Less than 25 µg/l
** - Less than 250 µg/l

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. W.T.P. (NPDES) DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #569 DATA ANALYSIS COMPLETED 22 July 1981

### BASE/NEUTRAL COMPOUNDS

| | µg/l | | µg/l |
|---|---|---|---|
| acenaphthene | ND | nitrobenzene | ND |
| benzidine | ** | N-nitrosodimethylamine | ** |
| 1,2,4-trichlorobenzene | ND | N-nitrosodiphenylamine | ** |
| hexachlorobenzene | ND | N-nitrosodi-n-propylamine | ** |
| hexachloroethane | ND | bis(2-ethylhexyl)phthalate | * |
| bis(2-chloroethyl)ether | ND | butyl benzyl phthalate | ND |
| 2-chloronaphthalene | ND | di-n-butyl phthalate | ND |
| 1,2-dichlorobenzene | ND | di-n-octyl phthalate | ND |
| 1,3-dichlorobenzene | ND | diethyl phthalate | ND |
| 1,4-dichlorobenzene | ND | dimethyl phthalate | ND |
| 3,3'-dichlorobenzidine | * | benzo(a)anthracene | ND |
| 2,4-dinitrotoluene | ** | benzo(a)pyrene | ND |
| 2,6-dinitrotoluene | * | benzo(b)fluoranthene[1] | ND |
| 1,2-diphenylhydrazine | ND | benzo(k)fluoranthene[1] | ND |
| fluoranthene | ND | chrysene | ND |
| 4-chlorophenyl phenyl ether | ND | acenaphthylene | ND |
| 4-bromophenyl phenyl ether | ND | anthracene | ND |
| bis(2-chloroisopropyl)ether | * | benzo (g.h.i.) perylene | * |
| bis(2-chloroethoxy)methane | ND | fluorene | ND |
| hexachlorobutadiene | ND | phenanthrene | ND |
| hexachlorocyclopentadiene | * | dibenzo (a,h)anthracene | * |
| isophorone | ND | indeno(1,2,3-c,d)pyrene | ND |
| naphthalene | ND | pyrene | ND |
| bis(chloromethyl)ether | ** | 2,3,7,8-tetrachlorodibenzo-p-dioxin | ** |

ND - Less than 1 µg/l
* - Less than 10 µg/l
** - Less than 25 µg/l

[1] Benzo(b)fluoranthene and benzo(k)fluoranthene could not be resolved, values reported indicate the sum of both compounds.

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. W.T.P. (NPDES) DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #569 DATE ANALYSIS COMPLETED 24 July 1981

### PESTICIDES

| | µg/l | | µg/l |
|---|---|---|---|
| aldrin | ND | a-BHC | ND |
| dieldrin | ND | b-BHC | ND |
| chlordane | ND | d-BHC | * |
| 4,4'-DDT | ND | g-BHC | ND |
| 4,4'-DDE | ND | PCB - 1242 | ND |
| 4,4'-DDD | ND | PCB - 1254 | ND |
| endosulfan I | * | PCB - 1221 | ND |
| endosulfan II | * | PCB - 1232 | ND |
| endosulfan sulfate | * | PCB - 1248 | ND |
| endrin | * | PCB - 1260 | ND |
| endrin aldehyde | * | PCB - 1016 | ND |
| heptachlor | ND | toxaphene | ND |
| heptachlor epoxide | * | | |

ND - Less than 1 µg/l
* - Less than 10 µg/l

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. W.T.P. (NPDES) DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #569 DATE ANALYSIS COMPLETED 5 August 1981

### VOLATILES

| | µg/l | | µg/l |
|---|---|---|---|
| acrolein | ** | 1,2-dichloropropane | ND |
| acrylonitrile | ** | 1,3-dichloropropylene[1] | * |
| benzene | 2.0 | ethylbenzene | ND |
| carbon tetrachloride | * | methylene chloride | 15.6 |
| chlorobenzene | ND | methyl chloride | * |
| 1,2-dichloroethane | ND | methyl bromide | * |
| 1,1,1-trichloroethane | ND | bromoform | ND |
| 1,1-dichloroethane | ND | dichlorobromomethane | ND |
| 1,1,2-trichloroethane | ND | trichlorofluoromethane | 2.3 |
| 1,1,2,2-tetrachloroethane | ND | dichlorodifluoromethane | * |
| chloroethane | * | chlorodibromomethane | ND |
| 2-chloroethylvinyl ether | * | tetrachloroethylene | ND |
| chloroform | 4.3 | toluene | 1.8 |
| 1,1-dichloroethylene | ND | trichloroethylene | ND |
| 1,2-trans-dichloroethylene | * | vinyl chloride | * |

ND - Less than 1 µg/l
* - Less than 10 µg/l
** - Less than 100 µg/l

[1] 1,3-cis-dichloropropylene and 1,3-trans-dichloropropylene could not be resolved, values reported indicate the sum of both compounds.

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. BH-2 (NPDES) DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #570 DATE ANALYSIS COMPLETED 16 July 1981

### ACID COMPOUNDS

| | µg/l |
|---|---|
| 2,4,6-trichlorophenol | ND |
| o-chloro-m-cresol | ND |
| 2-chlorophenol | ND |
| 2,4-dichlorophenol | ND |
| 2,4-dimethylphenol | ND |
| 2-nitrophenol | ND |
| 4-nitrophenol | * |
| 2,4-dinitrophenol | * |
| 4,6-dinitro-o-cresol | ND |
| pentachlorophenol | ND |
| phenol | 7.8 |

ND - Less than 1 µg/l
* - Less than 25 µg/l
** - Less than 250 µg/l

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. BH-2 (NPDES) DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #570 DATA ANALYSIS COMPLETED 22 July 1981

### BASE/NEUTRAL COMPOUNDS

| | µg/l | | |
|---|---|---|---|
| acenaphthene | ND | nitrobenzene | - |
| benzidine | ** | N-nitrosodimethylamine | - |
| 1,2,4-trichlorobenzene | ND | N-nitrosodiphenylamine | - |
| hexachlorobenzene | ND | N-nitrosodi-n-propylamine | - |
| hexachloroethane | ND | bis(2-ethylhexyl)phthalate | - |
| bis(2-chloroethyl)ether | ND | butyl benzyl phthalate | - |
| 2-chloronaphthalene | ND | di-n-butyl phthalate | - |
| 1,2-dichlorobenzene | ND | di-n-octyl phthalate | - |
| 1,3-dichlorobenzene | ND | diethyl phthalate | - |
| 1,4-dichlorobenzene | ND | dimethyl phthalate | - |
| 3,3'-dichlorobenzidine | * | benzo(a)anthracene | - |
| 2,4-dinitrotoluene | ** | benzo(a)pyrene | - |
| 2,6-dinitrotoluene | ND | benzo(b)fluoranthene[1] | - |
| 1,2-diphenylhydrazine | ND | benzo(k)fluoranthene[1] | - |
| fluoranthene | ND | chrysene | - |
| 4-chlorophenyl phenyl ether | ND | acenaphthylene | - |
| 4-bromophenyl phenyl ether | ND | anthracene | - |
| bis(2-chloroisopropyl)ether | ND | benzo (g.h.i.) perylene | - |
| bis(2-chloroethoxy)methane | ND | fluorene | - |
| hexachlorobutadiene | ND | phenanthrene | - |
| hexachlorocyclopentadiene | * | dibenzo (a,h)anthracene | - |
| isophorone | ND | indeno(1,2,3-c,d)pyrene | - |
| naphthalene' | ND | pyrene | - |
| bis(chloromethyl)ether | ** | 2,3,7,8-tetrachlorodibenzo-p-dioxin | - |

ND - Less than 1 µg/l
* - Less than 10 µg/l
** - Less than 25 µg/l

[1] Benzo(b)fluoranthene and benzo(k)fluoranthene could not be resolved, values reported indicate the sum of both compounds.

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. BH-2 (NPDES) DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #570 DATE ANALYSIS COMPLETED 24 July 1981

### PESTICIDES

| | µg/l | | µg/l |
|---|---|---|---|
| aldrin | * | a-BHC | * |
| dieldrin | ND | b-BHC | ND |
| chlordane | ND | d-BHC | * |
| 4,4'-DDT | ND | g-BHC | ND |
| 4,4'-DDE | ND | PCB - 1242 | ND |
| 4,4'-DDD | ND | PCB - 1254 | ND |
| endosulfan I | * | PCB - 1221 | ND |
| endosulfan II | * | PCB - 1232 | ND |
| endosulfan sulfate | * | PCB - 1248 | ND |
| endrin | * | PCB - 1260 | ND |
| endrin aldehyde | * | PCB - 1016 | ND |
| heptachlor | ND | toxaphene | ND |
| heptachlor epoxide | * | | |

ND - Less than 1 µg/l
* - Less than 10 µg/l

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. BH-2 (NPDES) DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #570 DATE ANALYSIS COMPLETED 5 August 1981

### VOLATILES

| | µg/l | | µg/l |
|---|---|---|---|
| acrolein | ** | 1,2-dichloropropane | ND |
| acrylonitrile | ** | 1,3-dichloropropylene[1] | * |
| benzene | 1.4 | ethylbenzene | 1.2 |
| carbon tetrachloride | * | methylene chloride | 21.4 |
| chlorobenzene | 1.9 | methyl chloride | * |
| 1,2-dichloroethane | 7.1 | methyl bromide | 13.1 |
| 1,1,1-trichloroethane | ND | bromoform | ND |
| 1,1-dichloroethane | ND | dichlorobromomethane | ND |
| 1,1,2-trichloroethane | ND | trichlorofluoromethane | 2.4 |
| 1,1,2,2-tetrachloroethane | ND | dichlorodifluoromethane | * |
| chloroethane | * | chlorodibromomethane | ND |
| 2-chloroethylvinyl ether | ND | tetrachloroethylene | 1.7 |
| chloroform | 6.2 | toluene | 7.3 |
| 1,1-dichloroethylene | ND | trichloroethylene | 1.7 |
| 1,2-trans-dichloroethylene | 3.4 | vinyl chloride | * |

ND - Less than 1 µg/kg
* - less than 10 µg/kg
** - Less than 100 µg/kg

[1] 1,3-cis-dichloropropylene and 1,3-trans-dichloropropylene could not be resolved, Values reported indicate the sum of both compounds.

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. BH-13 (NPDES) DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #571 DATE ANALYSIS COMPLETED 16 July 1981

### ACID COMPOUNDS

| | µg/l |
|---|---|
| 2,4,6-trichlorophenol | ND |
| o-chloro-m-cresol | ND |
| 2-chlorophenol | ND |
| 2,4-dichlorophenol | ND |
| 2,4-dimethylphenol | ND |
| 2-nitrophenol | ND |
| 4-nitrophenol | * |
| 2,4-dinitrophenol | ND |
| 4,6-dinitro-o-cresol | ND |
| pentachlorophenol | ND |
| phenol | 2.6 |

ND - Less than 1 µg/l
* - Less than 25 µg/l
** - Less than 250 µg/l

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. BH-13 (NPDES) DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #571 DATA ANALYSIS COMPLETED 22 July 1981

### BASE/NEUTRAL COMPOUNDS

| | µg/l | | µg/l |
|---|---|---|---|
| acenaphthene | ND | nitrobenzene | ND |
| benzidine | ** | N-nitrosodimethylamine | ** |
| 1,2,4-trichlorobenzene | ND | N-nitrosodiphenylamine | ** |
| hexachlorobenzene | ND | N-nitrosodi-n-propylamine | ** |
| hexachloroethane | * | bis(2-ethylhexyl)phthalate | 10.1 |
| bis(2-chloroethyl)ether | * | butyl benzyl phthalate | * |
| 2-chloronaphthalene | ND | di-n-butyl phthalate | ND |
| 1,2-dichlorobenzene | ND | di-n-octyl phthalate | ND |
| 1,3-dichlorobenzene | ND | diethyl phthalate | ND |
| 1,4-dichlorobenzene | ND | dimethyl phthalate | ND |
| 3,3'-dichlorobenzidine | * | benzo(a)anthracene | ND |
| 2,4-dinitrotoluene | ** | benzo(a)pyrene | * |
| 2,6-dinitrotoluene | * | benzo(b)fluoranthene[1] | * |
| 1,2-diphenylhydrazine | * | benzo(k)fluoranthene[1] | * |
| fluoranthene | ND | chrysene | * |
| 4-chlorophenyl phenyl ether | * | acenaphthylene | ND |
| 4-bromophenyl phenyl ether | * | anthracene | ND |
| bis(2-chloroisopropyl)ether | * | benzo (g.h.i.) perylene | ** |
| bis(2-chloroethoxy)methane | * | fluorene | ND |
| hexachlorobutadiene | * | phenanthrene | ND |
| hexachlorocyclopentadiene | * | dibenzo (a,h)anthracene | ** |
| isophorone | * | indeno(1,2,3-c,d)pyrene | * |
| naphthalene | ND | pyrene | ND |
| bis(chloromethyl)ether | ** | 2,3,7,8-tetrachlorodibenzo-p-dioxin | ** |

ND - Less than 1 µg/l
* - Less than 10 µg/l
** - Less than 25 µg/l

[1] Benzo(b)fluoranthene and benzo(k)fluoranthene could not be resolved, values reported indicate the sum of both compounds.

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. BH-13 (NPDES) DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #571 DATE ANALYSIS COMPLETED 24 July 1981

### PESTICIDES

| | µg/l | | µg/l |
|---|---|---|---|
| aldrin | * | a-BHC | * |
| dieldrin | * | b-BHC | * |
| chlordane | ND | d-BHC | * |
| 4,4'-DDT | * | g-BHC | * |
| 4,4'-DDE | * | PCB - 1242 | ND |
| 4,4'-DDD | * | PCB - 1254 | ND |
| endosulfan I | * | PCB - 1221 | ND |
| endosulfan II | * | PCB - 1232 | ND |
| endosulfan sulfate | * | PCB - 1248 | ND |
| endrin | * | PCB - 1260 | ND |
| endrin aldehyde | * | PCB - 1016 | ND |
| heptachlor | * | toxaphene | ND |
| heptachlor epoxide | * | | |

ND - Less than 1 µg/l
* - Less than 10 µg/l

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. BH-13 (NPDES) DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #571 DATE ANALYSIS COMPLETED 5 August 1981

### VOLATILES

| | µg/l | | µg/l |
|---|---|---|---|
| acrolein | ** | 1,2-dichloropropane | ND |
| acrylonitrile | ** | 1,3-dichloropropylene[1] | * |
| benzene | ND | ethylbenzene | 4.4 |
| carbon tetrachloride | * | methylene chloride | ND |
| chlorobenzene | ND | methyl chloride | * |
| 1,2-dichloroethane | ND | methyl bromide | * |
| 1,1,1-trichloroethane | ND | bromoform | ND |
| 1,1-dichloroethane | ND | dichlorobromomethane | ND |
| 1,1,2-trichloroethane | ND | trichlorofluoromethane | 33.8 |
| 1,1,2,2-tetrachloroethane | ND | dichlorodifluoromethane | * |
| chloroethane | * | chlorodibromomethane | ND |
| 2-chloroethylvinyl ether | ND | tetrachloroethylene | 4.6 |
| chloroform | 7.8 | toluene | ND |
| 1,1-dichloroethylene | ND | trichloroethylene | 1.8 |
| 1,2-trans-dichloroethylene | ND | vinyl chloride | * |

ND - Less than 1 µg/kg
* - Less than 10 µg/kg
** - Less than 100 µg/kg

[1] 1,3-cis-dichloropropylene and 1,3-trans-dichloropropylene could not be resolved, values reported indicate the sum of both compounds.

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. BH-25 (NPDES) DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #572 DATE ANALYSIS COMPLETED 16 July 1981

### ACID COMPOUNDS

| | µg/l |
|---|---|
| 2,4,6-trichlorophenol | ND |
| o-chloro-m-cresol | ND |
| 2-chlorophenol | ND |
| 2,4-dichlorophenol | ND |
| 2,4-dimethylphenol | ND |
| 2-nitrophenol | ND |
| 4-nitrophenol | * |
| 2,4-dinitrophenol | ** |
| 4,6-dinitro-o-cresol | * |
| pentachlorophenol | ND |
| phenol | 52.8 |

ND - Less than 1 µg/l
* - Less than 25 µg/l
** - Less than 250 µg/l

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. BH-25 (NPDES) DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #572 DATA ANALYSIS COMPLETED 22 July 1981

### BASE/NEUTRAL COMPOUNDS

| | µg/l | | µg/l |
|---|---|---|---|
| acenaphthene | ND | nitrobenzene | * |
| benzidine | ** | N-nitrosodimethylamine | ** |
| 1,2,4-trichlorobenzene | ND | N-nitrosodiphenylamine | ** |
| hexachlorobenzene | ND | N-nitrosodi-n-propylamine | ** |
| hexachloroethane | * | bis(2-ethylhexyl)phthalate | 3.5 |
| bis(2-chloroethyl)ether | * | butyl benzyl phthalate | * |
| 2-chloronaphthalene | ND | di-n-butyl phthalate | ND |
| 1,2-dichlorobenzene | ND | di-n-octyl phthalate | ND |
| 1,3-dichlorobenzene | ND | diethyl phthalate | ND |
| 1,4-dichlorobenzene | ND | dimethyl phthalate | ND |
| 3,3'-dichlorobenzidine | * | benzo(a)anthracene | ND |
| 2,4-dinitrotoluene | ** | benzo(a)pyrene | * |
| 2,6-dinitrotoluene | * | benzo(b)fluoranthene[1] | * |
| 1,2-diphenylhydrazine | ND | benzo(k)fluoranthene[1] | * |
| fluoranthene | ND | chrysene | ND |
| 4-chlorophenyl phenyl ether | * | acenaphthylene | ND |
| 4-bromophenyl phenyl ether | * | anthracene | ND |
| bis(2-chloroisopropyl)ether | * | benzo (g.h.i.) perylene | * |
| bis(2-chloroethoxy)methane | * | fluorene | ND |
| hexachlorobutadiene | * | phenanthrene | ND |
| hexachlorocyclopentadiene | * | dibenzo (a,h)anthracene | ** |
| isophorone | * | indeno(1,2,3-c,d)pyrene | * |
| naphthalene | ND | pyrene | ND |
| bis(chloromethyl)ether | ** | 2,3,7,8-tetrachlorodibenzo-p-dioxin | ** |

ND - Less than 1 µg/l
* - Less than 10 µg/l
** - Less than 25 µg/l

[1] Benzo(b)fluoranthene and benzo(k)fluoranthene could not be resolved, values reported indicate the sum of both compounds.

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. BH-25 (NPDES) DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #572 DATE ANALYSIS COMPLETED 24 July 1981

### PESTICIDES

| | µg/l | | µg/l |
|---|---|---|---|
| aldrin | * | a-BHC | * |
| dieldrin | ND | b-BHC | ND |
| chlordane | ND | d-BHC | * |
| 4,4'-DDT | ND | g-BHC | ND |
| 4,4'-DDE | ND | PCB - 1242 | ND |
| 4,4'-DDD | ND | PCB - 1254 | ND |
| endosulfan I | * | PCB - 1221 | ND |
| endosulfan II | * | PCB - 1232 | ND |
| endosulfan sulfate | * | PCB - 1248 | ND |
| endrin | * | PCB - 1260 | ND |
| endrin aldehyde | * | PCB - 1016 | ND |
| heptachlor | ND | toxaphene | ND |
| heptachlor epoxide | * | | |

ND - Less than 1 µg/l
* - Less than 10 µg/l

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. BH-25 (NPDES) DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #572 DATE ANALYSIS COMPLETED 5 August 1981

### VOLATILES

| | µg/l | | µg/l |
|---|---|---|---|
| acrolein | ** | 1,2-dichloropropane | ND |
| acrylonitrile | ** | 1,3-dichloropropylene[1] | * |
| benzene | 1.1 | ethylbenzene | 21.3 |
| carbon tetrachloride | * | methylene chloride | 11.4 |
| chlorobenzene | ND | methyl chloride | * |
| 1,2-dichloroethane | 5.4 | methyl bromide | * |
| 1,1,1-trichloroethane | ND | bromoform | ND |
| 1,1-dichloroethane | ND | dichlorobromomethane | ND |
| 1,1,2-trichloroethane | ND | trichlorofluoromethane | * |
| 1,1,2,2-tetrachloroethane | ND | dichlorodifluoromethane | * |
| chloroethane | * | chlorodibromomethane | ND |
| 2-chloroethylvinyl ether | ND | tetrachloroethylene | 48.4 |
| chloroform | ND | toluene | 45.3 |
| 1,1-dichloroethylene | * | trichloroethylene | 4.4 |
| 1,2-trans-dichloroethylene | 23.1 | vinyl chloride | * |

ND - Less than 1 µg/kg
* - Less than 10 µg/kg
** - Less than 100 µg/kg

[1] 1,3-cis-dichloropropylene and 1,3-trans-dichloropropylene could not be resolved, values reported indicate the sum of both compounds.

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. BH-31 (NPDES) DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #573 DATE ANALYSIS COMPLETED 16 July 1981

### ACID COMPOUNDS

| | µg/l |
|---|---|
| 2,4,6-trichlorophenol | * |
| o-chloro-m-cresol | ND |
| 2-chlorophenol | 26.0 |
| 2,4-dichlorophenol | ND |
| 2,4-dimethylphenol | ND |
| 2-nitrophenol | ND |
| 4-nitrophenol | * |
| 2,4-dinitrophenol | * |
| 4,6-dinitro-o-cresol | ND |
| pentachlorophenol | ND |
| phenol | 2.6 |

ND - Less than 1 µg/l
* - Less than 25 µg/l
** - Less than 250 µg/l

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. BH-31 (NPDES) DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #573 DATA ANALYSIS COMPLETED 22 July 1981

### BASE/NEUTRAL COMPOUNDS

| | µg/l | | µg/l |
|---|---|---|---|
| acenaphthene | ND | nitrobenzene | ND |
| benzidine | ** | N-nitrosodimethylamine | ** |
| 1,2,4-trichlorobenzene | ND | N-nitrosodiphenylamine | ** |
| hexachlorobenzene | ND | N-nitrosodi-n-propylamine | ** |
| hexachloroethane | ND | bis(2-ethylhexyl)phthalate | * |
| bis(2-chloroethyl)ether | ND | butyl benzyl phthalate | 16.2 |
| 2-chloronaphthalene | ND | di-n-butyl phthalate | ND |
| 1,2-dichlorobenzene | ND | di-n-octyl phthalate | 1.4 |
| 1,3-dichlorobenzene | ND | diethyl phthalate | ND |
| 1,4-dichlorobenzene | ND | dimethyl phthalate | ND |
| 3,3'-dichlorobenzidine | * | benzo(a)anthracene | ND |
| 2,4-dinitrotoluene | ** | benzo(a)pyrene | ND |
| 2,6-dinitrotoluene | ND | benzo(b)fluoranthene[1] | ND |
| 1,2-diphenylhydrazine | ND | benzo(k)fluoranthene[1] | ND |
| fluoranthene | ND | chrysene | ND |
| 4-chlorophenyl phenyl ether | ND | acenaphthylene | ND |
| 4-bromophenyl phenyl ether | ND | anthracene | ND |
| bis(2-chloroisopropyl)ether | ND | benzo (g.h.i.) perylene | * |
| bis(2-chloroethoxy)methane | ND | fluorene | ND |
| hexachlorobutadiene | ND | phenanthrene | ND |
| hexachlorocyclopentadiene | * | dibenzo (a,h)anthracene | * |
| isophorone | ND | indeno(1,2,3-c,d)pyrene | ND |
| naphthalene | ND | pyrene | ND |
| bis(chloromethyl)ether | ** | 2,3,7,8-tetrachlorodibenzo-p-dioxin | ** |

ND - Less than 1 µg/l
* - Less than 10 µg/l
** - Less than 25 µg/l

[1] Benzo(b)fluoranthene and benzo(k)fluoranthene could not be resolved, values reported indicate the sum of both compounds.

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. BH-31 (NPDES) DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #573 DATE ANALYSIS COMPLETED 24 July 1981

### PESTICIDES

| | µg/l | | µg/l |
|---|---|---|---|
| aldrin | ND | a-BHC | * |
| dieldrin | ND | b-BHC | ND |
| chlordane | ND | d-BHC | 8.5 |
| 4,4'-DDT | ND | g-BHC | ND |
| 4,4'-DDE | ND | PCB - 1242 | ND |
| 4,4'-DDD | ND | PCB - 1254 | ND |
| endosulfan I | * | PCB - 1221 | ND |
| endosulfan II | * | PCB - 1232 | ND |
| endosulfan sulfate | * | PCB - 1248 | ND |
| endrin | * | PCB - 1260 | ND |
| endrin aldehyde | * | PCB - 1016 | ND |
| heptachlor | ND | toxaphene | ND |
| heptachlor epoxide | * | | |

ND - Less than 1 µg/l
* - Less than 10 µg/l

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. EH-31 (NPDES) DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #573 DATE ANALYSIS COMPLETED 5 August 1981

### VOLATILES

| | µg/l | | µg/l |
|---|---|---|---|
| acrolein | ** | 1,2-dichloropropane | ND |
| acrylonitrile | ** | 1,3-dichloropropylene[1] | * |
| benzene | ND | ethylbenzene | 30.4 |
| carbon tetrachloride | * | methylene chloride | 1.4 |
| chlorobenzene | 9.6 | methyl chloride | * |
| 1,2-dichloroethane | 4.2 | methyl bromide | * |
| 1,1,1-trichloroethane | 1.4 | bromoform | ND |
| 1,1-dichloroethane | ND | dichlorobromomethane | ND |
| 1,1,2-trichloroethane | ND | trichlorofluoromethane | 2.6 |
| 1,1,2,2-tetrachloroethane | ND | dichlorodifluoromethane | * |
| chloroethane | * | chlorodibromomethane | ND |
| 2-chloroethylvinyl ether | ND | tetrachloroethylene | 19.3 |
| chloroform | 3.1 | toluene | 30.9 |
| 1,1-dichloroethylene | ND | trichloroethylene | 13.1 |
| 1,2-trans-dichloroethylene | 40.2 | vinyl chloride | * |

ND - Less than 1 µg/kg
* - Less than 10 µg/kg
** - Less than 100 µg/kg

[1] 1,3-cis-dichloropropylene and 1,3-trans-dichloropropylene could not be resolved, values reported indicate the sum of both compounds.

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. BH-35 DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #574 DATE ANALYSIS COMPLETED 16 July 1981

### ACID COMPOUNDS

| | µg/l |
|---|---|
| 2,4,6-trichlorophenol | * |
| o-chloro-m-cresol | ND |
| 2-chlorophenol | 1414.7 |
| 2,4-dichlorophenol | ND |
| 2,4-dimethylphenol | ND |
| 2-nitrophenol | ND |
| 4-nitrophenol | * |
| 2,4-dinitrophenol | ** |
| 4,6-dinitro-o-cresol | * |
| pentachlorophenol | * |
| phenol | 159.0 |

ND - Less than 1 µg/l
* - Less than 25 µg/l
** - Less than 250 µg/l

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. BH-35 (NPDES) DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #574 DATA ANALYSIS COMPLETED 22 July 1981

### BASE/NEUTRAL COMPOUNDS

| | µg/l | | µg/l |
|---|---|---|---|
| acenaphthene | ND | nitrobenzene | * |
| benzidine | ** | N-nitrosodimethylamine | ** |
| 1,2,4-trichlorobenzene | ND | N-nitrosodiphenylamine | ** |
| hexachlorobenzene | ND | N-nitrosodi-n-propylamine | ** |
| hexachloroethane | ND | bis(2-ethylhexyl)phthalate | ** |
| bis(2-chloroethyl)ether | ND | butyl benzyl phthalate | 18.4 |
| 2-chloronaphthalene | ND | di-n-butyl phthalate | * |
| 1,2-dichlorobenzene | ND | di-n-octyl phthalate | ND |
| 1,3-dichlorobenzene | ND | diethyl phthalate | ND |
| 1,4-dichlorobenzene | ND | dimethyl phthalate | ND |
| 3,3'-dichlorobenzidine | * | benzo(a)anthracene | ND |
| 2,4-dinitrotoluene | ** | benzo(a)pyrene | ND |
| 2,6-dinitrotoluene | * | benzo(b)fluoranthene[1] | ND |
| 1,2-diphenylhydrazine | ND | benzo(k)fluoranthene[1] | ND |
| fluoranthene | ND | chrysene | ND |
| 4-chlorophenyl phenyl ether | ND | acenaphthylene | ND |
| 4-bromophenyl phenyl ether | ND | anthracene | ND |
| bis(2-chloroisopropyl)ether | ND | benzo (g.h.i.) perylene | * |
| bis(2-chloroethoxy)methane | ND | fluorene | ND |
| hexachlorobutadiene | ND | phenanthrene | ND |
| hexachlorocyclopentadiene | * | dibenzo (a,h)anthracene | * |
| isophorone | ND | indeno(1,2,3-c,d)pyrene | ND |
| naphthalene | 3.8 | pyrene | ND |
| bis(chloromethyl)ether | ** | 2,3,7,8-tetrachlorodibenzo-p-dioxin | ** |

ND - Less than 1 µg/l
* - Less than 10 µg/l
** - Less than 25 µg/l

[1] Benzo(b)fluoranthene and benzo(k)fluoranthene could not be resolved, values reported indicate the sum of both compounds.

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. BH-35 (NPDES) DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #574 DATE ANALYSIS COMPLETED 24 July 1981

### PESTICIDES

| | µg/l | | µg/l |
|---|---|---|---|
| aldrin | * | a-BHC | ND |
| dieldrin | ND | b-BHC | ND |
| chlordane | 940 | d-BHC | * |
| 4,4'-DDT | ND | g-BHC | ND |
| 4,4'-DDE | ND | PCB - 1242 | ND |
| 4,4'-DDD | ND | PCB - 1254 | ND |
| endosulfan I | * | PCB - 1221 | ND |
| endosulfan II | * | PCB - 1232 | ND |
| endosulfan sulfate | * | PCB - 1248 | ND |
| endrin | * | PCB - 1260 | ND |
| endrin aldehyde | * | PCB - 1016 | ND |
| heptachlor | ND | toxaphene | ND |
| heptachlor epoxide | * | | |

ND - Less than 1 µg/l
* - Less than 10 µg/l

## SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT West Lake

CLIENT I.D. BH-35 DATE SAMPLE RECEIVED 6 July 1981

RMC I.D. #574 DATE ANALYSIS COMPLETED 5 August 1981

### VOLATILES

| | µg/l | | µg/l |
|---|---|---|---|
| acrolein | ** | 1,2-dichloropropane | ND |
| acrylonitrile | ** | 1,3-dichloropropylene[1] | * |
| benzene | 15.7 | ethylbenzene | 487.9 |
| carbon tetrachloride | 22.4 | methylene chloride | 26.4 |
| chlorobenzene | ND | methyl chloride | * |
| 1,2-dichloroethane | 81.6 | methyl bromide | 57.6 |
| 1,1,1-trichloroethane | ND | bromoform | ND |
| 1,1-dichloroethane | 18.4 | dichlorobromomethane | ND |
| 1,1,2-trichloroethane | ND | trichlorofluoromethane | 147.9 |
| 1,1,2,2-tetrachloroethane | ND | dichlorodifluoromethane | * |
| chloroethane | * | chlorodibromomethane | ND |
| 2-chloroethylvinyl ether | * | tetrachloroethylene | 45.3 |
| chloroform | 25.1 | toluene | 277.1 |
| 1,1-dichloroethylene | 5.2 | trichloroethylene | 724.9 |
| 1,2-trans-dichloroethylene | 7.7 | vinyl chloride | ** |

ND - Less than 1 µg/kg
* - Less than 10 µg/kg
** - Less than 100 µg/kg

[1] 1,3-cis-dichloropropylene and 1,3-trans-dichloropropylene could not be resolved, values reported indicate the sum of both compounds.

Chemical Analysis of Radioactive Material From Areas 1 and 2

Table 13

Concentration in ppm

| | Offsite Bkg Sample | Area 1 Surface (#101) | Area 1 Surface (#102) | Area 1 Borehole (#103) | Area 2 Surface (#104) | Area 2 Surface (#105) |
|---|---|---|---|---|---|---|
| Barium | 250 | 300 | 1811 | 2386 | 1158 | 1197 |
| Lead | 16 | 15 | 108 | 121 | 11 | 50 |
| Zinc | 132 | 146 | 94 | 76 | 28 | 167 |
| Sulfate | 20 | 15 | 108 | 121 | 11 | 50 |

Summary of Background Measurements in the Vicinity of West Lake Landfill, St. Louis County Missouri

Table 14

| Sample Type | Background Location: Earth City | Background Location: Taussig Road | Background Location: Old St. Charles Rock Road |
|---|---|---|---|
| Flux (Av)(pCi/m2.s) | 0.50 +/- 54% | 0.58 +/- 27% | 0.50 +/- 30% |
| Exposure Rate (uR/hr) | 10.6 | 8.0 | ---------- |
| Soil Conc. (Ra-226 pCi/gm) | 2.6 +/- 23% | 2.5 +/- 19% | ---------- |
| HVAS (W.L.) | 1.1E-3 | 5E-3 | 1.7E-3 |

Target Criteria and Measurements LLDs for West Lake Landfill

Table 15

Soil Contaminants

| Nuclide | Target Criteria | LLD |
|---|---|---|
| Ra-226 | 5pCi/g | 1pCi/g |
| Total U | 15pCi/g | 3pCi/g |
| U-238 | 30pCi/g | 6pCi/g |
| U-235 | 30pCi/g | 6pCi/g |
| Th-232 | 5pCi/g | 1pCi/g |
| Th-230 | 15pCi/g | 3pCi/g |

Water and Airborne Contaminants

| Nuclide | Target Criteria | LLD |
|---|---|---|
| All | MPC Unrestricted | 20% MPC |
| Radon Daughters | 0.03 W.L. | 0.006 W.L. |
| Ra-226 (water) | 3E-8 uCi/ml | 6E-9 uCi/ml |

External Radiation

| Nuclide | Target Criteria | LLD |
|---|---|---|
| All | 20 uR/hr | 4 uR/hr |

APPENDIX I

# Radiological Survey Instruments and Methods

A. Portable Survey Instrument

The portable survey instruments used at West Lake included two complete sets of Johnson equipment, which consist of battery operated rate meters, scalers and alpha, beta and gamma probes. These systems (see Figure I-1) are totally portable and can be used in the field for both measurements and sample counting.

The alpha probes use a ZnS (Ag) scintillation detector; the beta detector is a thin window (1.4mg/cm2 mica) GM tube, and the gamma detector is a 2" by 2" NaI(Tl) crystal. The alpha and beta probes were calibrated with "NBS traceable" sources at the RMC calibration facility in Philadelphia and the gamma scintillator was cross-calibrated with a primary ionization chamber system, described below.

B. Ionization Chamber System

External gamma dose rates were accurately measured with the RMC constructed Tissue Equivalent Ionization Chamber System (Figure I-2). This system consisted of a 16 liter tissue equivalent, gas filled ionization chamber (Shonka chamber), a Keithley vibrating capacitor electrometer, a printer and battery pack. It is capable of measuring dose rates at background levels to a precision of a few percent.

Since this system is bulky and somewhat fragile, it is not as suited for extensive field measurements as a smaller, lightweight NaI(Tl) portable survey instrument. Therefore,

the NaI(Tl) detector was used for the majority of the field gamma measurements. Since this detector's response is energy dependent, it cannot be used as a "micro R meter" unless it is initially calibrated for such use.

The calibration performed by RMC consisted of accurately measuring the exposure rate at several locations at West Lake Landfill, using the Tissue Equivalent Ionization Chamber, then recording NaI(Tl) measurements at the same location. In this manner a set of NaI(Tl) count-rate versus exposure rates were obtained and a uR/hr calibration factor established, as shown in Figure I-3.

Due to the energy dependence of the NaI detector, this conversion factor will apply only to the radionuclides and geometries for which the calibrations were made. In the case of West Lake, analyses have verified the presence only of naturally occurring nuclides of the uranium series (Ra-226 and daughters), thorium series and potassium. Therefore, the conversion factor established at West Lake will apply only to naturally occurring radionuclides distributed in soil.

C. Mobile Lab Gamma Analysis System

The mobile lab gamma analysis system (Figure I-4) consists of a PGT 15% efficient (relative to a 3" x 3" NaI(Tl) crystal) intrinsic germanium (IG) detector, shield and Tennecomp TP-50 laboratory computer data acquisition

module. The analysis system was calibrated for all counting geometries with an NBS supplied Eu-152 source.

Each count was analyzed by a computer program for determination of gamma energies and peak areas. All results were printed out immediately following analysis on-site, and data was stored on floppy discs for future analysis, as needed.

Samples were sealed in counting containers and stored to allow for complete ingrowth of radon and daughters, whenever possible. In these cases, Ra-226 was determined by counting the daughter Bi-214 gamma-ray lines at 609 and 1764 KeV. Pb-214 was determined by the 295 and 352 KeV lines, U-238 from its 93 KeV line, Ra-223 from its 270 KeV line, Rn-219 from its 401 KeV line, Pb-211 from its 405 and 832 KeV lines, Th-227 from its 237 KeV line and K-40 from its 1462 KeV line.

Typical LLDs for Ra-226 were 0.1 pCi/g in soil and vegetation, and 0.4 pCi/l in water. For Rn-219 daughters on air filters, LLDs were 0.4 pCi/l. The LLD for U-238 in soil was on the order of 1 pCi/g.

D. Auger Hole Logging System

Detailed logging of selected auger holes was performed with the system shown in Figure I-5. This system consists of a custom designed EG&G Ortec intrinsic germanium detector (10% eff) with a narrow dewar, coupled to a Tracor-Northern

1750 MCA used for data acquisition and initial field evaluations. Data was stored on a tape cassette recorder, then transferred to the lab computer system for final analysis. The entire system, including an NIM module power supply with a bias power supply and amplifier, was powered in the field by a portable 5000 watt gasoline-driven generator.

The logging system was calibrated as described in Attachment 1. Field counting times varied from 2 minutes to 10 minutes at each location, depending upon the level of activity present. Typical LLDs for this system and relatively short count times are 0.3 pCi/g for Bi-214, 1 pCi/g for U-238, 0.2 pCi/g for Pb-212 and 0.1 pCi/g for K-40.

The field use of this system was somewhat limited by initial failure due to high humidity effects on the pre-amp components and thermal insulation of the detector housing. These problems were partially corrected by sealing the detector in an outer container and allowing dry air to flow through the container.

E. Radon Analysis Systems

Radon flux was determined using the accumulator system shown in Figure I-6, which is similar to those used by Wilkening [1] and others. Accumulation times varied from 15 minutes to 2 hours. Gas samples were drawn and counted in

the EDA Radon Detector, usually 2 hours after sampling, to allow for daughter ingrowth. Standard MSA charcoal canisters were used for the canister method, as described by Countess [2].

F. Alpha-Beta Counting System.

All samples were counted for gross alpha or beta activity on the Gamma Products low background gas flow proportional counter, shown in Figure I-7. The system is automatic and can be programmed for a variety of counting parameters.

## REFERENCES

[1] M. Wilkening, "Measurement of Radon Flux by the Accumulation Method", Workshops on Methods for Measuring Radiation in and Around Uranium Mills, 3, 9, 1977, pp. 131-137.

[2] R. J. Countess, "Measurements of Rn-222 Flux with Charcoal Canisters" ibid. pp. 139-147.

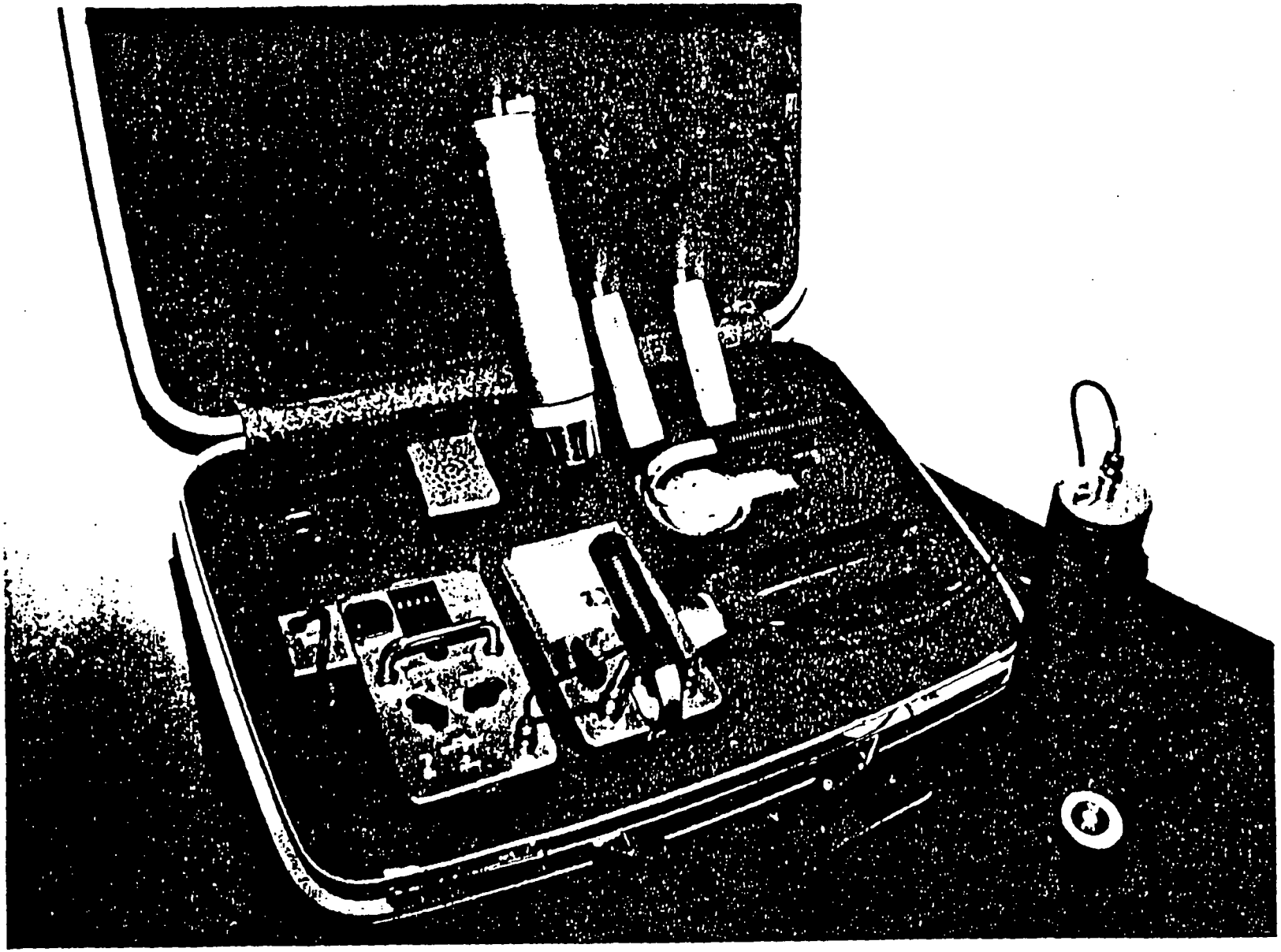


Figure I-1. Portable Survey Instrument Kit.

... Landfill site.

K•E LOGARITHMIC 2 X 3 CYCLES KEUFFEL & ESSER CO. MADE IN U.S.A. 46 7320

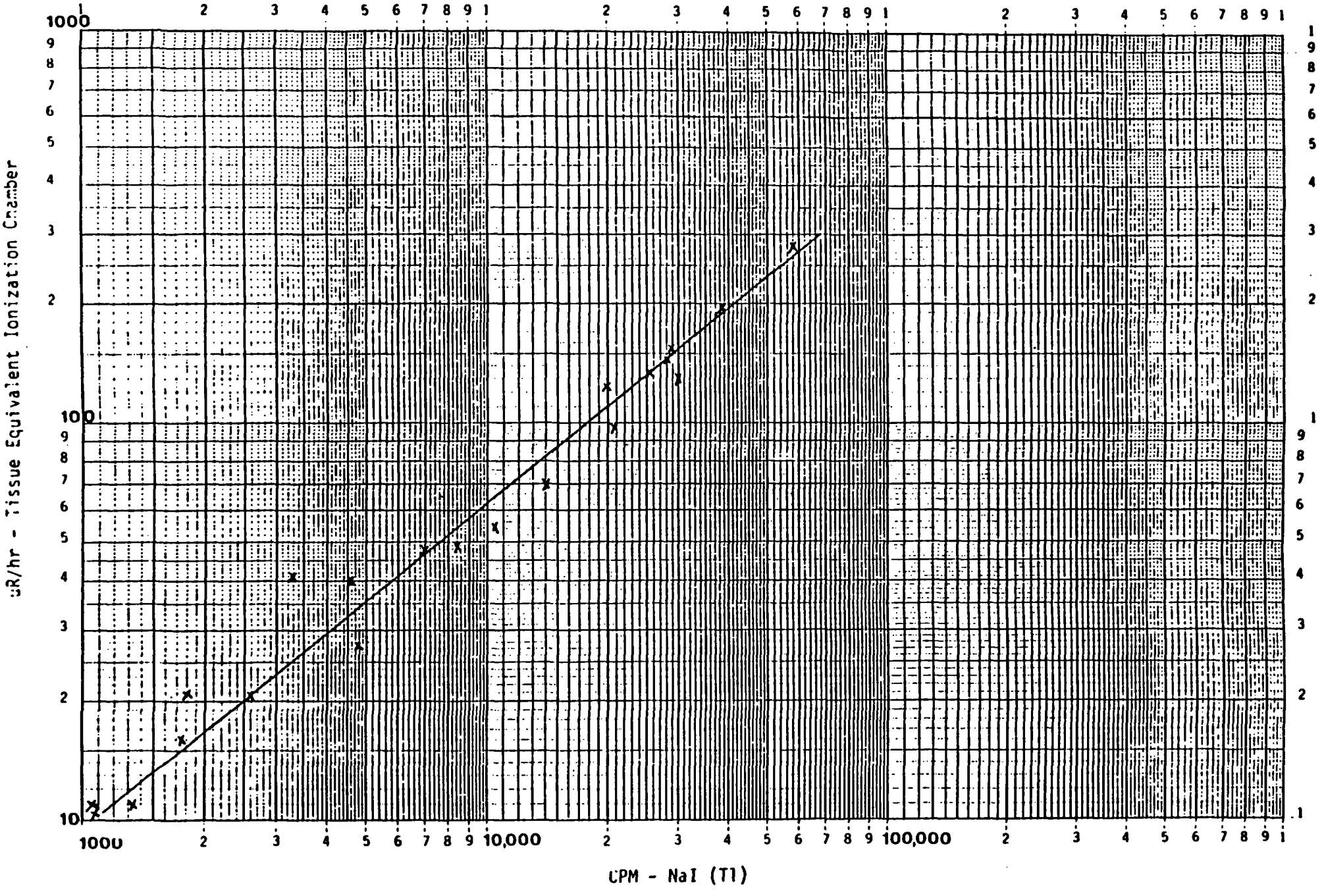



Figure I-3. Ion chamber exposure rates versus NaI (Tl) count rates, West Lake Landfill site.

Figure I-4. Interior of mobile lab showing gamma counting system and other equipment.

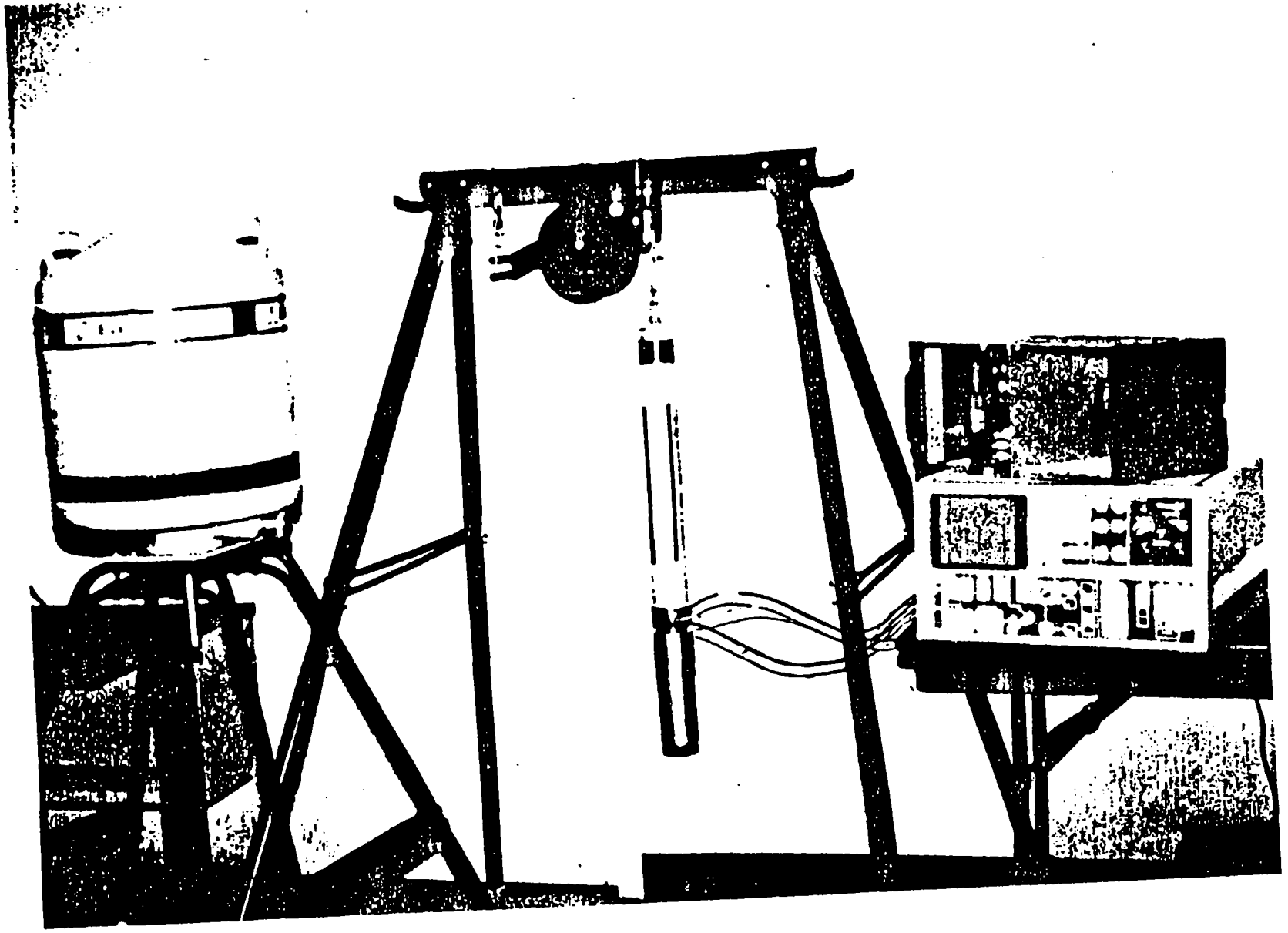


Figure I-5. In-situ auger hole logging system with intrinsic germanium detector and narrow dewar assembly, data acquisition equipment and storage/fill dewar.

Figure I-7. Automatic beta-gamma gas flow proportional counter.

ATTACHMENT 1 TO APPENDIX I

## INTRINSIC GERMANIUM WELL LOG

## DETECTOR CALIBRATION

The intrinsic germanium detector was connected to the pulse height analysis system consisting of the following components:

Ortec Model 459 High Voltage Power Supply

Canberra 2011 Spectroscopy Amplifier

Tracor Northern 1750 MCA

Teletype Model 43 Printer

Gain and voltage supply settings were adjusted to obtain an energy spectrum of 0 to 2000 kev, which corresponds to approximately 1 kev per channel.

Calibration of the well logging system was performed using the calibration rig shown in Figure 1. This rig is constructed as a series of four concentric rings surrounding a 6 inch PVC casing. Each ring contains thin plastic tubes 1-1/4" diameter by 36" long. A set of "source rods" and "background rods" were prepared and loaded into these tubes in a variety of configurations for the various calibration and test counts.

The geometry of the rig is such that the distance from the center of the casing (or detector) to the center of the innermost ring is 3.75 inches, to the center of the second ring is 5.0 inches, to the center of the third ring is 6.25

inches, and to the center of the fourth ring is 7.50 inches. All voids between tubes were filled with low background sand. It was determined that the ratio of source volume in each ring to the total ring area was about 0.6. Hence, when source rods were fully loaded into a given ring, the activity counted represented approximately 60% of the total area (volume) the detector viewed, and counts were adjusted accordingly.

Each source tube is a 12 inch high by 1 inch diameter tube filled with a material containing Eu-152. The source material was prepared by mixing the standard Eu-152 source solution with plaster of paris, at a constant ratio designed to give a uniform specific activity of 440 pCi/gram. Background rods were filled with "clean" plaster of paris. Plaster of paris was chosen because of its ease of handling, ability to uniformly distribute the source throughout the material, and its density, which approximates that of common soil. (Density of soil, 1.7-2.3 g/cubic cm; density of plaster, 1.5 g/cubic cm; density of sand, 1.4 g/cubic cm)

Four different configurations of source and blank tubes were used for the calibration. Source tubes were placed three high in one of the four concentric rings of the rig for each count while the balance of the rig was filled with blanks. These configurations correspond to the source material being a radial distance of 3.75, 5.00, 6.25 and 7.50 inches from the detector.

Each configuration was counted for 900 seconds, and the area under each of the eight major Eu-152 photopeaks determined for each count.

Calculation of counts per gamma per gram was determined by the following method:

NCNTS/GAMMA/GRAM =

[NCNTS]/[(440pCi/g)(3.7E-2d/s/pCi)(900s)(ABUNDANCEgamma/d)]

For each gamma energy, the net counts/gamma/gram vs distance from the center of the detector was listed. These response curves were then plotted for each energy, for distances and activities which extend to zero net counts. This represents an "infinite" distance from the detector. Using these curves, the total counts from the detector to an infinite distance was calculated by integrating the area under the curve using Simpson's rule for approximating integrals. Of prime importance is the integral from 2 inches to infinity, since this is the area the detector will view when placed inside a 4 inch PVC casing.

Finally, the integrated net count/gamma/gram, from 2 inches to infinity, was plotted vs energy, for each of the Eu-152 photons. With this efficiency curve, a specific activity in soil (pCi/gram) can be determined from a bore hole count, assuming the radionuclide can be identified and its gamma abundance determined. The calculation is:

count, with a 95% confidence level and precision of 0.4 pCi/g.

Figure 1

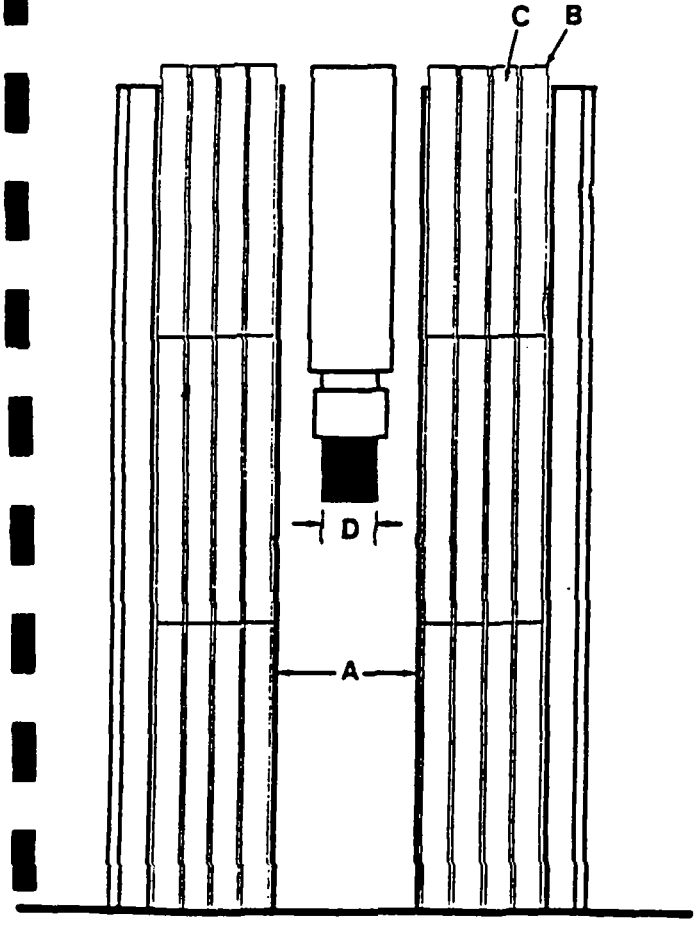
CALIBRATION RIG ASSEMBLY

"A" - 6" I.D. PVC Pipe

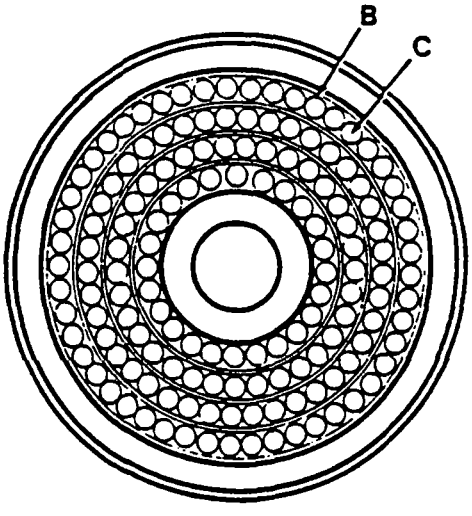
"B" - 1.25" diameter x 36" long butyrate source holder tubes

"C" - 1" diameter x 12" long source tubes. 3 per holder tube

"D" - IG Detector




Cross Section




Top View

NRC FORM 335 (11 81)

U.S. NUCLEAR REGULATORY COMMISSION

# BIBLIOGRAPHIC DATA SHEET

1. REPORT NUMBER (Assigned by DDC): NUREG/CR-2722

4. TITLE AND SUBTITLE (Add Volume No., if appropriate):
Radiological Survey of the West Lake Landfill
St. Louis County, Missouri

2. (Leave blank)

3. RECIPIENT'S ACCESSION NO.

7. AUTHOR(S)
L.F. Booth, D.W. Groff, G.S. McDowell, J.J. Adler,
S.I. Peck, P.L. Nyerges, F.L. Bronson

5. DATE REPORT COMPLETED
MONTH: April | YEAR: 1982

9. PERFORMING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code)
Radiation Management Corporation
3356 Commercial Avenue
Northbrook, IL 60062

DATE REPORT ISSUED
MONTH: May | YEAR: 1982

6. (Leave blank)

8. (Leave blank)

12. SPONSORING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code)
Division of Fuel Cycle and Material Safety
Office of Nuclear Material Safety and Safeguards
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

10. PROJECT/TASK/WORK UNIT NO.

11. FIN NO. B6901

13. TYPE OF REPORT: Final Report

PERIOD COVERED (Inclusive dates): April 1981 - February 1982

15. SUPPLEMENTARY NOTES

14. (Leave blank)

16. ABSTRACT (200 words or less)

This report presents the results of a radiological survey of the West Lake Landfill, St. Louis County, Missouri, performed by Radiation Management Corporation during the spring and summer of 1981. Measurements were made to determine external radiation levels, concentrations of airborne contaminants and the identity and concentrations of subsurface deposits. Results indicate that large volumes of uranium ore residues, probably originating from the Hazelwood, Missouri, Latty Avenue site, have been buried at the West Lake Landfill. Two areas of contamination, covering more than 15 acres and located at depths of up to 20 feet below the present surface, have been identified. There is no indication that significant quantities of contaminants are moving off-site at this time.

17. KEY WORDS AND DOCUMENT ANALYSIS

17a. DESCRIPTORS

17b. IDENTIFIERS/OPEN-ENDED TERMS

18. AVAILABILITY STATEMENT: Unlimited

19. SECURITY CLASS (This report): Unclassified

20. SECURITY CLASS (This page): Unclassified

21. NO. OF PAGES

22. PRICE: $

NRC FORM 335 (11 81)