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Assessment and Clean-up of the Taxi Strip Waste Storage Area at the Lawrence Livermore National Laboratory

January 26, 1983

SUMMARY

In September 1982 the Hazards Control Department of the Lawrence Livermore National Laboratory (LLNL) began a final radiological survey of a former low-level radioactive waste storage area called the Taxi Strip so that the area could be released for construction of an office building. Collection of soil samples at the location of a proposed sewer line led to the discovery of an old disposal pit containing soil contaminated with low-level radioactive waste and organic solvents. The Taxi Strip area was excavated leading to the discovery of three additional small pits. Chemical and radiological assessment of the contamination is underway, and clean-up is expected to be completed by mid-February 1983.

HISTORY OF THE TAXI STRIP

The Taxi Strip was a fenced area located in the south-east quadrant of the LLNL Livermore site (see Fig. 1). It was used to store and treat radioactively contaminated liquid waste. The waste was collected in glass 5 gallon carboys and stored in this area beginning in 1953. In 1959, the waste was being generated at the rate of 1-3 carboys per week. This same year the records indicate that there were approximately 1500 carboys stored at the north end of the Taxi Strip. Samples from 200 of these carboys were analyzed and indicated that 75% were acid solutions, 15% were alkaline, 10% were neutral and 1-2% were organic solvents. The radioactivity content of these sampled carboys indicated that 90% of them contained less than 1×10^4 dpm/liter (gross alpha), 80% contained between 1×10^3 to 1×10^6 dpm/liter (gross beta) and 10% contained between 1×10^7 to 10^8 dpm/liter

(gross beta). The records do not list the organic solvents specifically; however, it is known that chlorinated hydrocarbons were widely used. There are no records describing disposal pits in the area. Treatment operations are not described in the records until approximately 1962 with the operation of solar evaporation trays. The actual number of trays used throughout the years is unknown. From the documents that are available, it appears that evaporation trays were constructed and torn down throughout their operational history (1962 to 1976). The trays all seemed to be situated at the south end of the Taxi Strip and were approximately 10 feet x 20 feet x 1 foot deep and were placed above ground. They were monolithic concrete units coated with 12 mils of polyamide cured epoxy paint and usually lined with PVC (polyethylene was also used). In addition to carboy waste, rejection solutions from reverse osmosis treatment of radioactive contaminated liquids and evaporator bottoms were also placed in these trays. As the liquid evaporated, additional wastes were added. When a basin evaporated nearly to dryness, the crystallized salts were rolled up in the plastic liner and placed in 55-gallon drums, and disposed of.

Besides liquid waste, the Taxi Strip was also used to store other radioactively contaminated material such as concrete blocks, steel tanks, magnets, and shipping pallets.

SURFACE RADIOLOGICAL SURVEY

The present Taxi Strip Survey started in September 1982. The purpose of the survey was to find any surface or near surface contamination before the area was graded for construction of a new office building. Similar surveys had been conducted in 1978 after the Taxi Strip was decommissioned and in 1981

during construction of the road leading to building 543. The existence of buried contamination was unknown at the beginning of the present survey therefore it was set up to find fixed surface contamination by taking 28 uniformly spaced 9" deep core samples, designated A1 through C10 in Figure 2. The 9" core samples were split into four sections; an asphalt section (if the sample came from the paved area of the Taxi Strip), the top 3" of soil, the middle 3" and the bottom 3".

The samples were prepared and assayed for radioactivity content by the Hazards Control Department Radiation Counting Section. The first samples were counted using a 1/16" x 5" OD FIDLER detector and a 2" x 2" NaI detector located in a mobile counting laboratory. Other samples were counted using a 1/16" x 4 1/2" OD Phoswich detector at the Whole Body Counter with occasional use of x-ray planar and coaxial GeLi detectors for isotope identification and to determine more accurate gamma-ray ratios of the radionuclides in the soil. Americium-241, Uranium-235 and other transuranics were observed in some samples in addition to small amounts of Cesium-137, Cobalt-60, Europium-152 and Thorium-232. Calibration factors for these nuclides were established using 100 gram standardized soil samples. Typical measurement accuracies and Minimum Detectable Activities (MDA's) are listed in Table 1. The radioactivity content of the 9" core samples are listed in Table 2. Soil samples were also analyzed for tritium content but none of the results indicated activity levels that exceeded DOE concentration guides for controlled areas.

In addition, the Taxi Strip was surveyed with a "Field Instrument for Detection of Low Level Radiation" (FIDLER). This instrument, developed at LLNL contains a 1/16" x 5" NaI crystal with a thin beryllium window.

Detection limits for transuranic and fission products are below disposal limits derived from EPA guidelines and DOE concentration guides. Any area reading above twice natural background with the FIDLER was sampled and radioactivity content was verified by the Radiation Counting Section Laboratory. Soil or asphalt reading above twice background was removed for disposal as radioactive waste. Approximately 5 cubic yards of contaminated soil was removed as a result of the surface survey.

Near its conclusion, the surface survey was expanded to include sampling the soil for radioactivity from 4 to 10 foot depths at the proposed location of the sewer line for the new building. This was done by removing soil from several locations along the proposed sewer line with a backhoe and surveying the soil with a FIDLER. During the digging of one of these test holes, buried waste was found as evidenced by broken glass, solvent odor, and elevated FIDLER readings. The remainder of this report describes the procedures used to locate additional small pits, assess and remove the contamination and the ultimate disposal plans.

SURVEY FOR ADDITIONAL PITS

After the discovery of the first pit, (Pit #1, as shown in Figure 3) it became necessary to search for additional pits. Deciphering of old notes from the Toxic Waste Control Group and examination of aerial photographs led to the discovery of Pit #2. To insure discovery of all pits in the area, the entire unpaved section of the Taxi Strip was scraped away to a depth of 6 feet using conventional paddle wheel scrapers. The scrapers, which removed soil in 6 inch increments were continuously followed by Health and Safety Technicians using FIDLERS. An attempt was made to detect pits with a portable organic

vapor analyzer with a flame ionization, detector however this method was discontinued when the instrument failed to produce any readings at a known pit (Pit #1). Upon any sign of visible debris, discontinuity of the soil surface, or FIDLER readings, scraping was stopped and the contamination was excavated with a backhoe. Locations were immediately recorded by the LLNL Plant Engineering Department. A small section of the Taxi Strip could not be scraped because it had been covered by the road leading to Building 543. Therefore soil was removed to a depth of 6 feet along the edge of the road thus creating a bank. A four inch diameter auger was then inserted horizontally through the bank and under the road at 4 feet intervals. No debris or contamination was found.

ASSESSMENT AND EXCAVATION OF PITS

Pit #1 This was by far the largest pit. It contained approximately 50 to 100 broken bottles sized from 10 ml to 1 gallon along with other visible debris such as glass tubing, plastic tape and plastic bags. No industrial size containers such as drums were found in this pit or any other pit. The debris was distributed between 2 to 12 feet below surface. The soil in this pit had a noticeable solvent odor, and produced elevated FIDLER readings.

The first step of the excavation process was the removal of the mixed solvent-radioactive contamination with a backhoe. (Assessment of solvent contamination will be described later). The mixed contamination was removed until background levels were obtained with a FIDLER. This produced a hole approximately 50' W x 50'L x 12-15'D. The soil was stockpiled for disposal. Samples from Pit #1 and the other pits were assayed for radioactivity as shown in Table 3.

Analysis of composite samples taken during the first 6 feet of excavation identified the organic solvents 1,1,1 - trichlorethane (methyl chloroform), 1,1,2,2-tetrachloroethylene (perchloroethylene) and trichloroethylene. After removal of the radioactive contamination to a depth of 15 feet, further assessment of solvent contamination was started. First, soil samples were taken from the corners of the pit to a depth of 26.5 feet using a backhoe. These samples were immediately transferred from the backhoe bucket into sealed glass jars and chilled with ice to minimize solvent loss. After analysis of these samples by gas chromatography an auger rig was used to obtain additional samples to further determine the extent of solvent contamination. Nine boreholes were dug in and around Pit #1 with the auger rig. Locations of the boreholes and backhoe samples are shown in Fig. 4.

Borehole samples were taken with a truck mounted auger rig utilizing hollow stem flight augers. The augering method was chosen because it does not introduce cross contamination as does traditional hydraulic rotary drilling or purging of volatile solvents as is possible with air drilling. After completion, the boreholes were immediately grouted to prevent migration of contamination.

A 3" O.D. California sampler was used to obtain the soil samples. This sampler recovers soil within a steel liner thus reducing exposure to air and loss of volatiles. The six inch steel liners were rinsed with acetone and distilled water prior to use. Before the sample liner ends were sealed with aluminum foil and tape, they were quickly examined and logged by a geologist. The borehole logs are shown in Appendix A. The samples were immediately placed in a portable ice chest and transported to the Hazards Control

Analytical Laboratory where they were refrigerated until analysis. All samples were analyzed within 1-3 days after they were taken. Chlorinated hydrocarbons in the soil samples were extracted with hexane followed by quantification by gas chromatography with an electron capture detector. The 10-gram soil aliquots (without pebbles) were weighed out and transferred to the extraction vessels as quickly as possible to avoid significant loss of solvent to the air. The extraction was done with two 5 ml volumes of HPLC-grade n-hexane. After extraction, the hexane was dried with anhydrous sodium sulfate. The column temperature was kept at 60°C. Injection volumes were two microliters. The lower quantification limit is below 0.01 µg/g of soil for each of the three compounds.

Quality control consisted of an accuracy determination and a duplicate analysis with each batch of samples. To determine accuracy, a mixture of known spikes in hexane was injected into a second aliquot of soil, and the spiked aliquot was left standing for one hour. The results are shown as follows:

Accuracy and Precision of Analysis of
Chlorinated Solvents in Soil

	Accuracy(1)	Precision(2)
trichloroethylene	106 ± 17%	11.8 ± 2%
1,1,1 - trhichloroethane	108 ± 8%	5.4 ± 3.2%
perchloroethylene	97 ± 11%	13.0 ± 4.9%

(1) percent recovery
(2) relative range between duplicates

The Hazards Control Analytical Laboratory is approved for a number of parameters by the State of California Department of Health Services.

Results of chlorinated solvent analysis of the soil around Pit #1 are shown in Table 4. These results show that the solvents penetrated to 27 to 33 feet at locations C-4 and C-5 and stopped at a clayey sand layer. The other seven boreholes show little or no contamination.

The solvent contaminated soil was then excavated to a depth of 34 feet as shown in Figure 4. After excavation, additional samples from the bottom of Pit #1 were analyzed by an outside analytical laboratory (Brown and Caldwell, Emeryville, CA) using EPA Method 624, which is a gas chromatography, mass spectrometry method for determining volatile organic compounds. These samples were analyzed to ensure that clean-up of the identified chlorinated solvents was complete, and that any other previously unidentified organic solvents were not present at unacceptable concentrations. Sample locations and analytical results are listed in Table 5. In addition to the two samples taken at the bottom of Pit #1 as shown in Table 5, a total of six additional samples from the bottom, side walls and end walls of the pit are presently being analyzed using EPA Method 624 to determine if the excavation of solvent contamination is complete.

In addition to volatile organic compounds, a total of seven samples from the bottom, sides and ends of Pit #1 are being analyzed by Brown and Caldwell for the 18 metals which have Soluble Threshold Limit Concentrations listed in the California Assessment Manual. Results of the metals analyses of samples from Pit #1 are expected in mid-February.

Pit #2: This was a small pit containing approximately 50 broken bottles, glass tubing and plastic, extending from 4 feet below surface to 12 feet below surface. Horizontal dimensions were approximately 10' x 10'. It was excavated to a depth of 20 feet to ensure that all contamination was removed. The samples did not read above background with a FIDLER. Five samples collected during excavation with the backhoe all contained less than 0.1 µg/g chlorinated solvents. A core sample was taken at the bottom of the pit and analyzed by EPA Method 624. All purgeable priority pollutants were less than the detection limit of 0.05 µg/g as shown in Table 5. The same sample is being analyzed for the metals listed in the California Assessment Manual with results expected in early February.

Pit #3: This was the smallest pit containing broken bottles from approximately 4 feet below surface to 8 feet below surface. Horizontal dimensions were approximately 6' x 6'. It was excavated to a depth of 13.5 feet. A core sample was taken at the bottom of the pit and analyzed by EPA Method 624, as shown in Table 5. The sample is being analyzed for the metals listed in the California Assessment Manual with results expected in early February.

Pit #4: This was not a disposal pit, but rather a 40'W x 80'L area of low-level radioactive contaminated soil from surface to a depth of 6 feet. A solar evaporation tray was once located at this spot and the contamination is presumed to have been caused by leakage from the tray. The contamination was removed until levels less than twice background were obtained with a FIDLER. Radioactive content of the excavated soil is listed in Table 3.

HYDROGEOLOGIC SETTING OF THE TAXI STRIP

Stratigraphy

The Livermore Valley is a structural and topographic depression filled with several thousands of feet of primarily continental sedimentary deposits. The youngest of these deposits, immediately beneath LLNL, are Quaternary alluvium consisting of complexly interstratified clays, silts, sands, and gravels. Detailed stratigraphy in the area of the Taxi Strip is shown in the geologic descriptions of the Earth Science's Departments Groundwater Observation Well #18 (MW18), and Exploratory Test Boring #22 (TB22). Figure 5 shows the loction of these subsurface explorations relative to the Taxi Strip. The variable nature of the stratigraphic sequences can be seen in the rough correlation of the logs from MW18 and TB22 and the logs from boreholes C-1 through C-9 (see Appendix A).

Water Table

The depth to the uppermost saturated zone (water table) reflects the dynamic nature of the groundwater system under LLNL. The depth to the water table is approximately 110 feet in the area of the Taxi Strip (see Figure 6). Like the majority of LLNL water table observation wells, MW18 displays a trend of gradual water table rise. Amidst the seasonal fluctuations, the hydrograph of MW18 (1981-1982) indicates a water level rise on the order of 5 feet .

The configuration of the water table (Figure 5) is a potentiometric surface which indicates general directions of shallow groundwater flow. Assuming that

the horizontal component of groundwater flow is perpendicular to the water table contour lines, it can be inferred that flow in the nine square mile area shown is generally towards the west northwest, except in the southeastern quadrant of the LLNL site. This is an important exception, for the Taxi Strip is located in this quadrant of LLNL. The letter D in Figure 5 designates a water table depression on the north side of the Las Positas Fault. This depression suggests the shallow groundwater flow under the Taxi Strip is moving generally southeastward toward the depression.

The water table configuration and general directions of groundwater flow are based on measured water levels in wells from the files of Alameda County Flood Control and Water Conservation District Zone 7 and from the LLNL groundwater observation well network. The LLNL network consists of 12 groundwater observation wells, three exploratory test borings, and a multiple level valved piezometer. The wells in general were cased with PVC which was screened at selected intervals. The annular space opposite the screened intervals was backfilled with sand topped by bentonite or fine sand and then grouted to ground elevation to prevent contaminaton from surface activities.

PERSONNEL SAFETY AND HEALTH

During excavation of the pits, the site was examined on a regular and frequent basis by a member of the Hazards Control Department's Industrial Safety Group. Operations were conducted within the parameters set forth in U.S. Department of Labor, Regulations for the Construction Industry (29 CFR 1926) and the LLNL Health and Safety Manual.

Radiological Safety and Industrial Hygiene precautions were minimal due to the low concentrations of radioactive material and organic solvents. All personnel wore dosimeters to measure any external radiation and they were monitored for contamination before leaving the area. In addition, air samples were taken to verify air quality. No air concentrations above background were found. The project was supervised by professional Health Physicists and Industrial Hygienists.

CONTROL OF STOCKPILED SOIL

Solvent and radioactive contaminated soil was stockpiled separately adjacent to the Taxi Strip. The stockpiled soil was kept covered with polyethylene sheeting except for non-rainy days when soil was being added to the piles. The plastic was extended 2 feet beyond the edge of the piles and onto the adjacent clean soil surface. Clean soil was then piled on top of the extended plastic. This method effectively prevented surface rain water from running into the pile and also prevented entrapment of the uncontaminated run-off.

DISPOSAL OF CONTAMINATED SOIL

It is estimated that approximately 3000 cubic yards of soil will have to be disposed of. The radioactive contaminated soil will be shipped to the Federal Nevada Test Site for disposal while the solvent contaminated soil will be disposed of at a California Class I landfill (either the Martinez site, Casmalia or Kettleman City). The soil shipped to Nevada will use covered dump trucks. This material will be described as Radioactive Material, LSA, n.o.s. with a hazard class UN2912. The soil disposed of in California will be

transported by one of the commercial disposal companies such as IT Corporation, Chemical Waste Management, Inc., and disposed of in bulk at a licensed Class I landfill. The waste will be described as Waste Hazardous Substance, solid, n.o.s. with a hazard class ORM-E. In both cases, all analytical information, such as radioisotopes, chemical contaminants, etc., will be listed and quantified in the packing list.

It is currently estimated that approximately half of this soil will go to Nevada and half to California.

CONCLUSIONS

The clean-up of Pit #1 is considered to be complete for radioactive contamination. The results from the chlorinated solvent analysis of the borehole samples and the limited number of samples analyzed by gas chormatography/mass spectrometry indicate that solvent clean-up at this pit is complete. This is being verified by gas chromatography/mass spectrometry analysis of a few additional soil samples from the bottom sides and ends of the pit. As a precaution samples are also being analyzed for metals to determine if further excavation is necessary, with results expected in early Feburary.

Clean-up of Pits #2 and #3 is considered to be complete for radioactive and solvent contamination. Results of analysis for metals which are expected in early February, will determine if excavation is complete. Excavation of Pit #4 which resulted from surface leakage of radioactive contamination from an evaporation tray is complete.

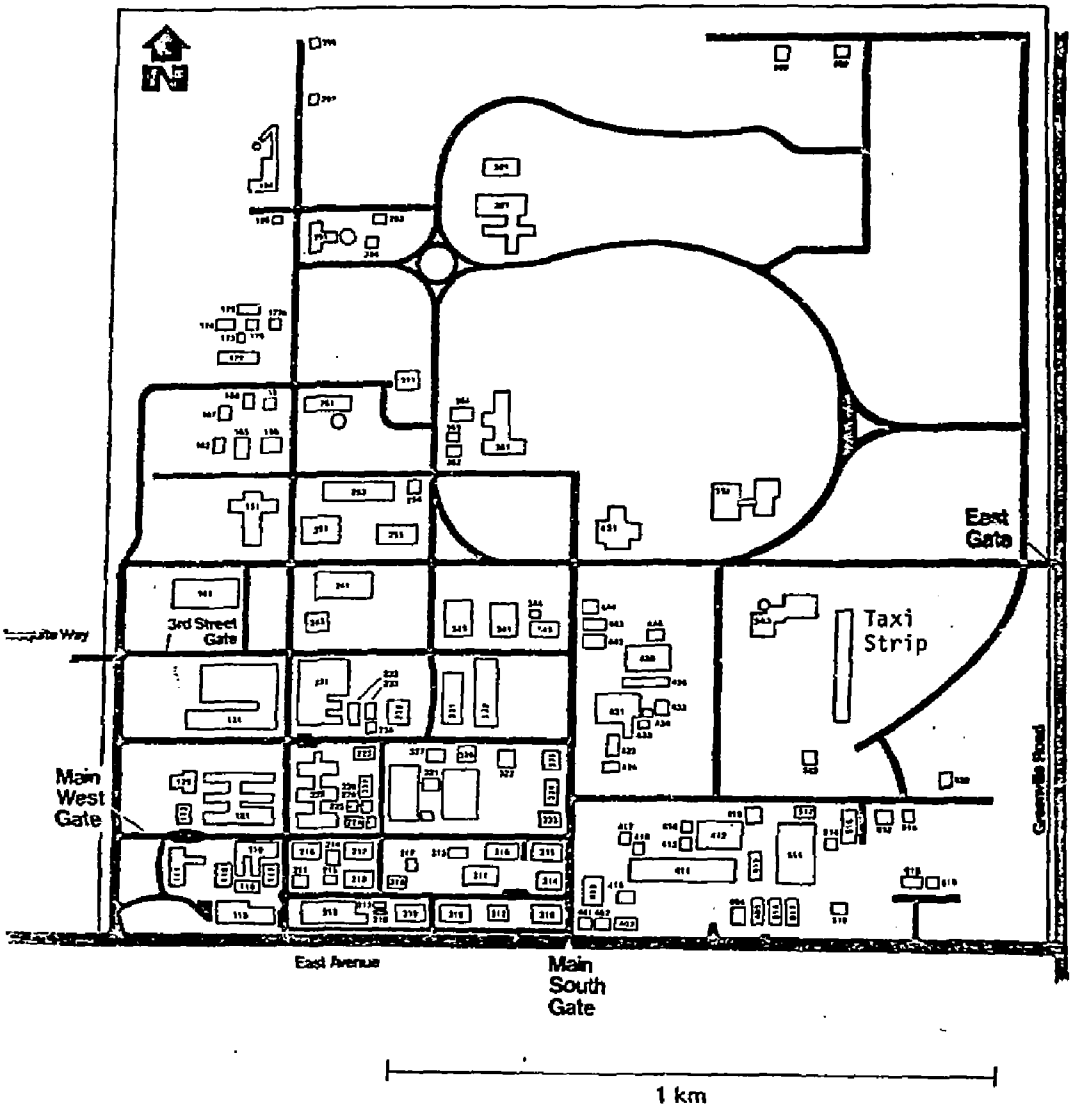
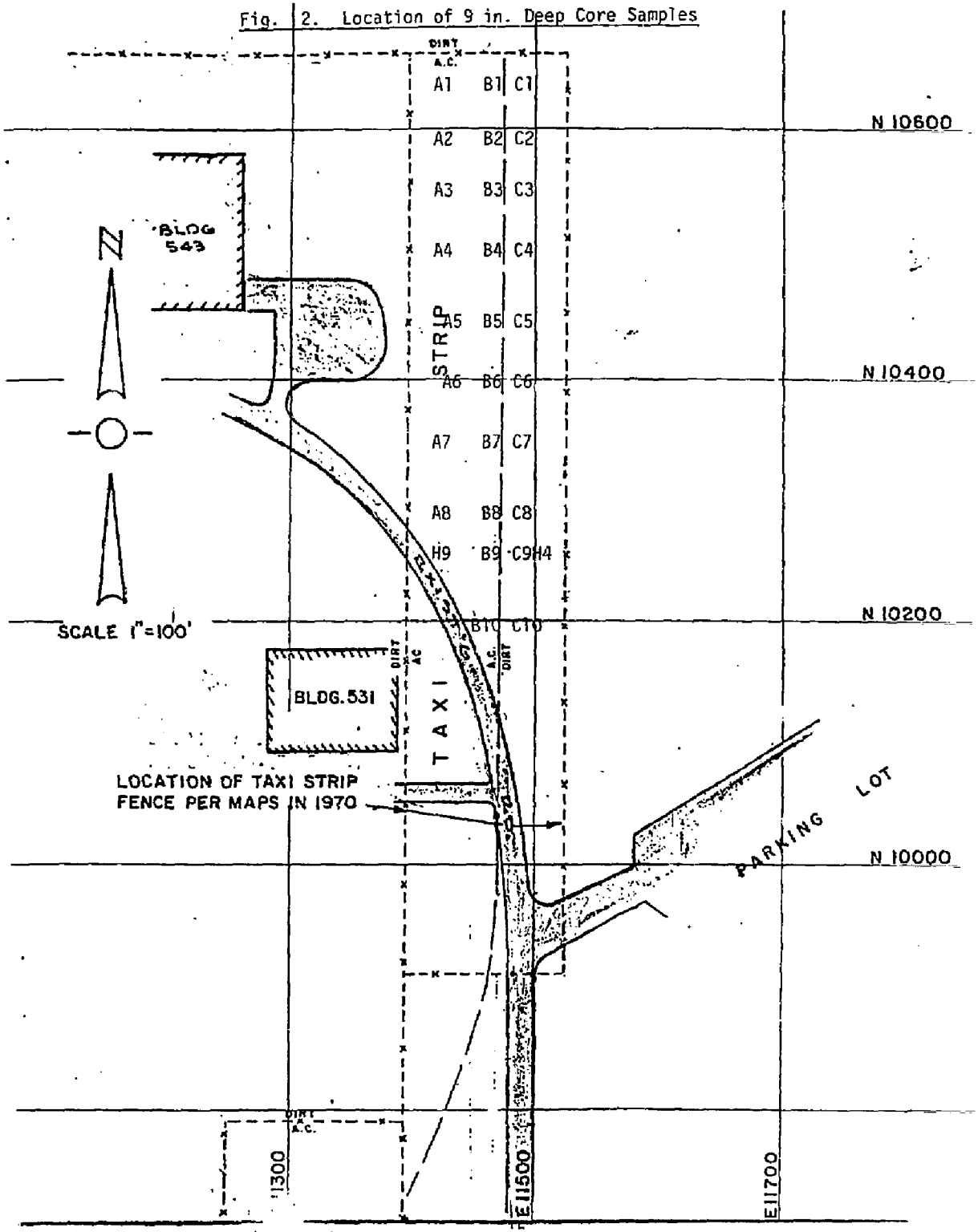


Fig. 1. Layout of LLNL Site and Location of the Taxi Strip

TAXI STRIP PROJECT

Fig. 2. Location of 9 in. Deep Core Samples



TAXI STRIP PROJECT

Fig. 3. Location of Pits

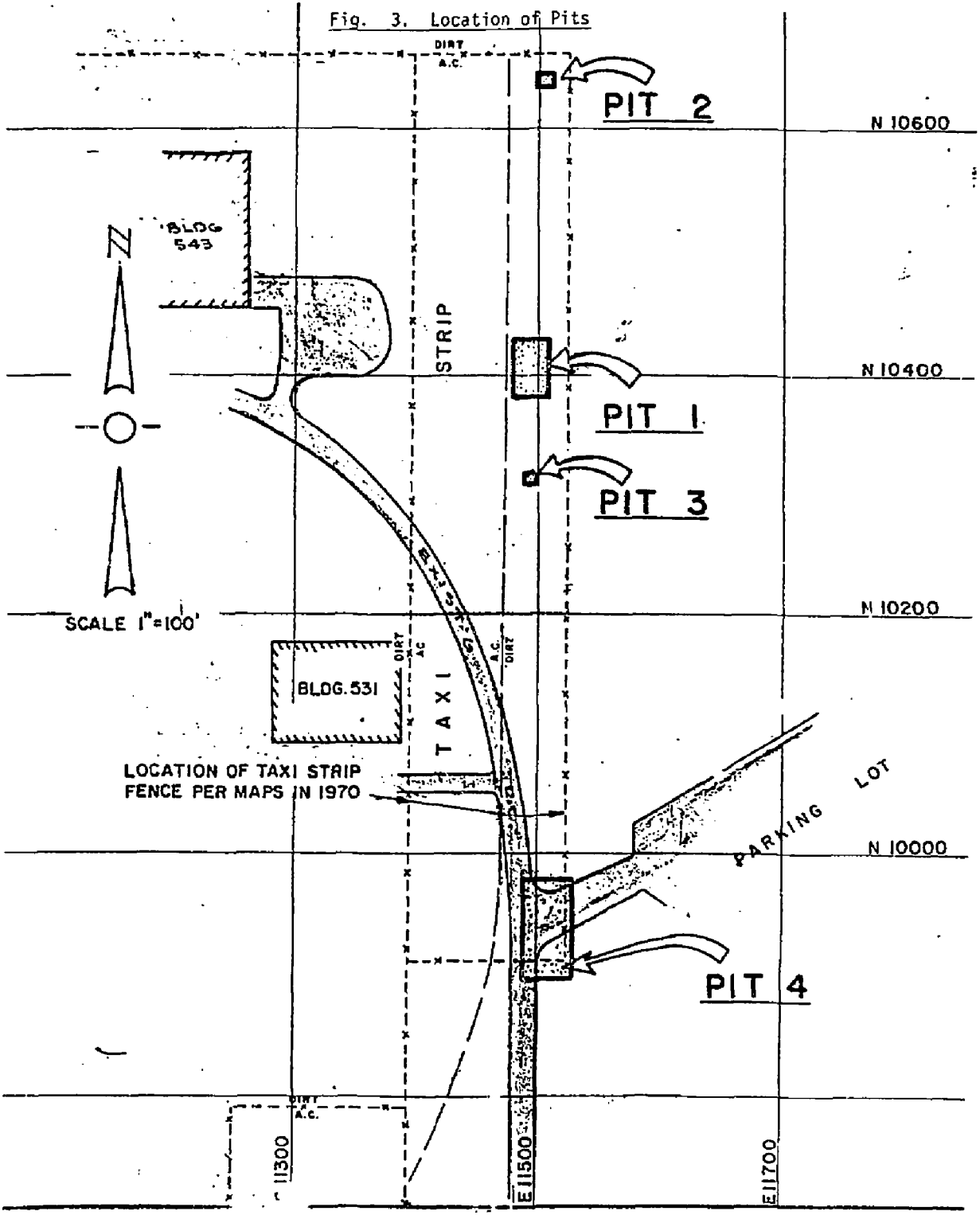


Figure 4. Loction of Pit 1 Excavation Boundaries and Chlorinated Solvent Assessment Boreholes

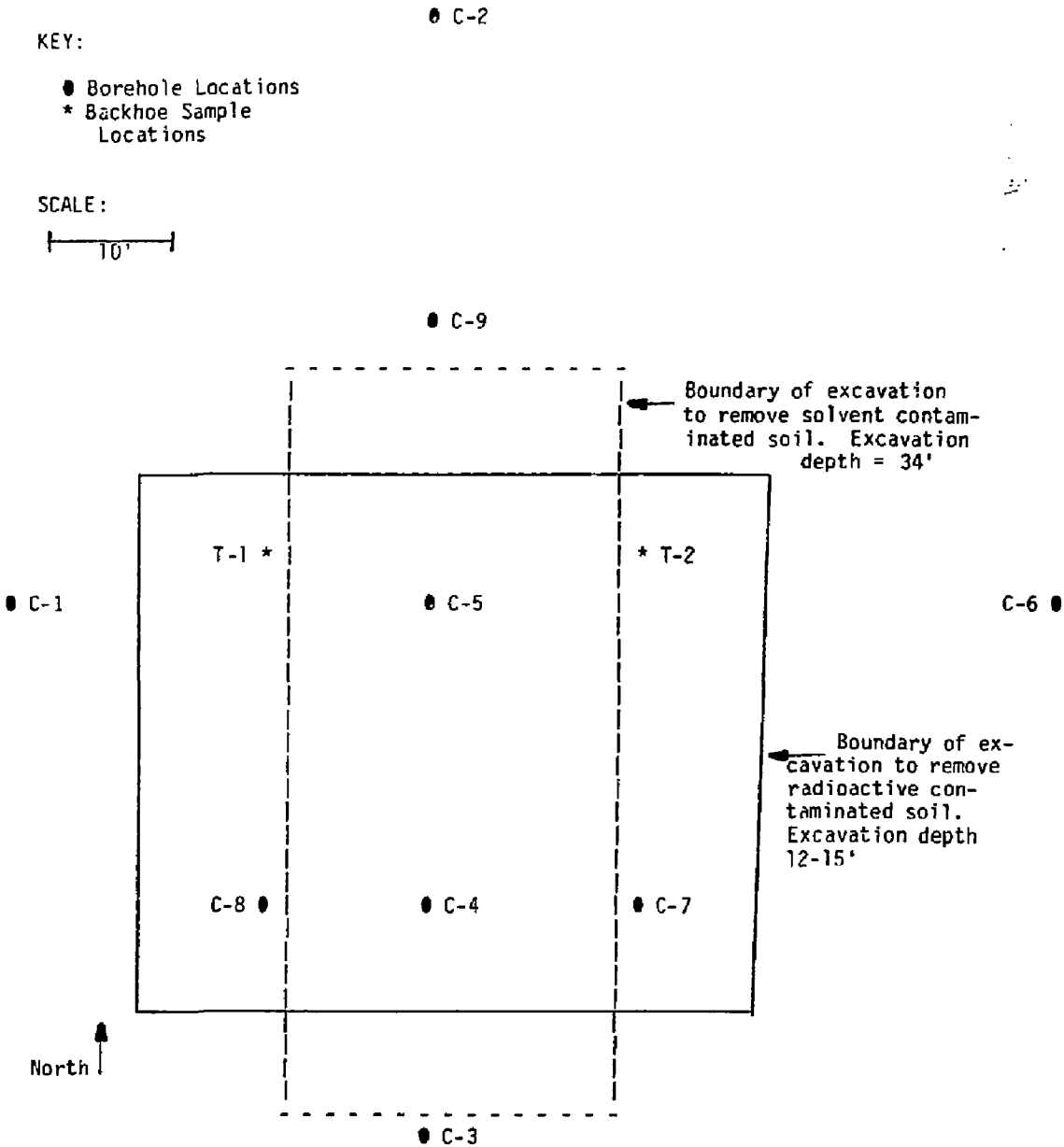
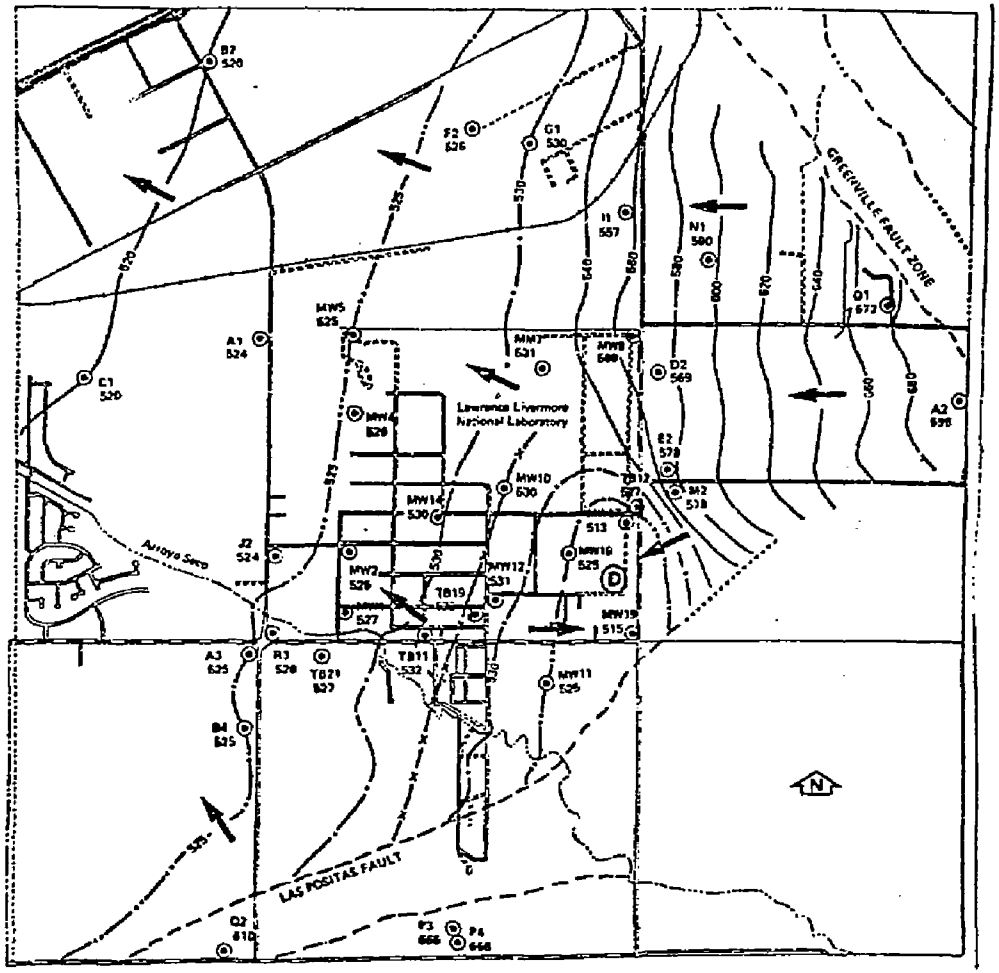


Figure 5. General directions of shallow groundwater flow for Lawrence Livermore National Laboratory site and surrounding sections.



Explanation

- Direction of groundwater flow
- J3 804 — Water well and water table elevation (MSL)
- Fault
- Inferred fault
- Concealed fault
- Water table contour line (20 foot interval)
- Half-interval water table contour line
- Quarter-interval water table contour line
- Groundwater divide

0 — 1 Mile

Contour interval 20 feet

Figure 6.
Depth-to-water table for
site and surrounding sections.

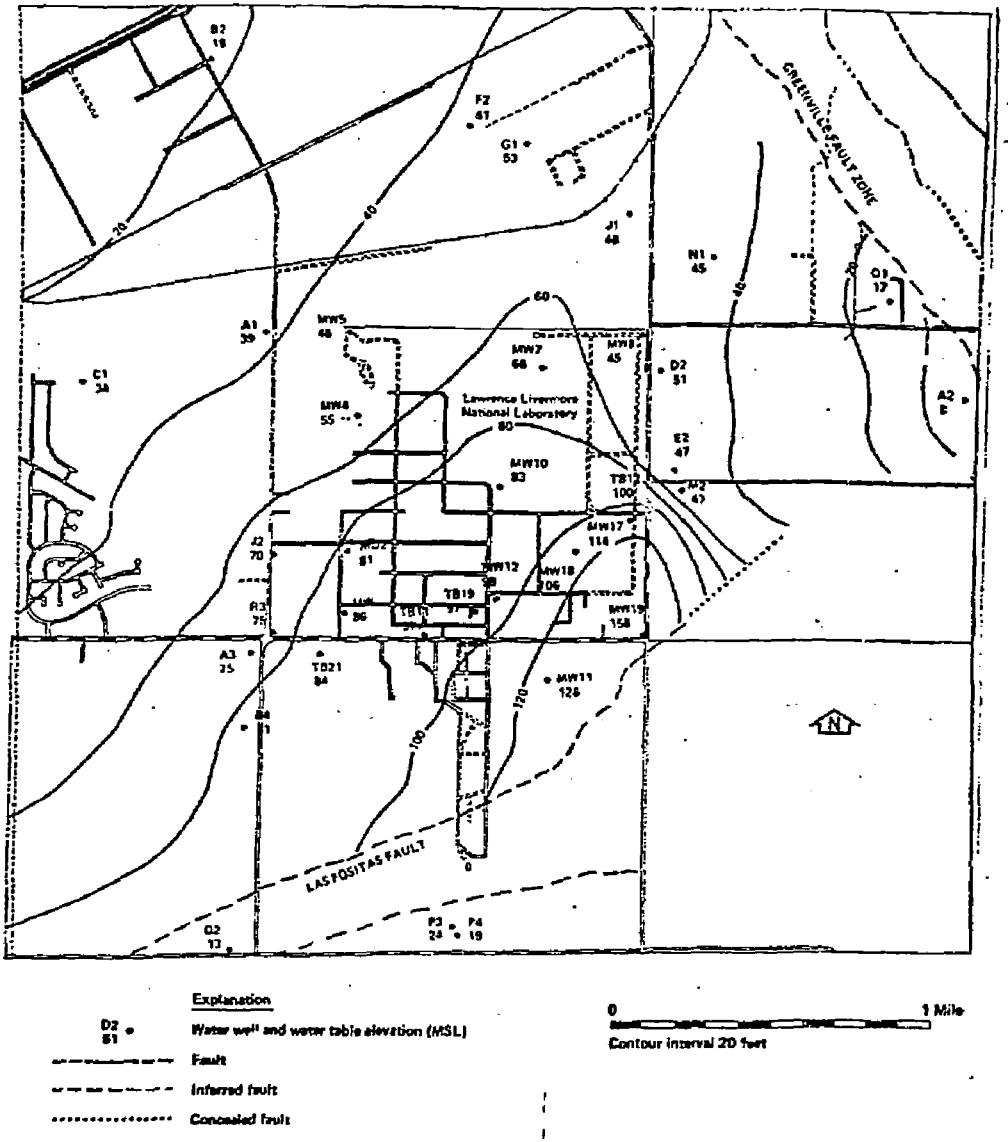


Table 1. Accuracies and Minimum Detectable Actives for Radioactivity Analysis of Soil Samples

	Accuracy (1σ)	MDA (95% Confidence Level)
Am-241	± 25%	1 pCi/gm
U-235	± 35%	2 pCi/gm
OTU	± 200%	55 pCi/gm (Based on low energy x-ray analysis)
Cs-137	± 25%	2 pCi/gm
Co-60	± 25%	2 pCi/gm
Eu-152	± 35%	5 pCi/gm

Table 2. Radioactivity Content of 9-in. Surface Core Samples

Sample No.	pCi/g ^{241}Am	pCi/g OTRU	pCi/g ^{137}Cs	Miscellaneous	Date Counted
A-1 Asphalt	--	--	--		9/28/82
Top	--	--	--		9/30/82
Mid	--	--	--		12/1/82
Bottom	--	--	--		12/8/82
A-2 Asphalt	--	--	0.15		9/28/82
Top	--	--	--		10/7/82
Mid	--	--	--		12/1/82
Bottom	--	--	--		12/8/82
A-3 Asphalt	--	--	0.4		9/28/82
Top	--	--	--		10/7/82
Mid	--	--	--		12/1/82
Bottom	--	--	--		12/10/82
A-4 Asphalt	--	--	0.5		9/28/82
Top	--	--	--		10/7/82
Mid	--	--	--		12/1/82
Bottom	--	--	--		12/10/82
A-5 Asphalt	--	--	--	17.5 cpm unknown	9/28/82
Top	--	--	--		10/7/82
Mid	--	--	--		12/1/82
Bottom	--	--	--		12/10/82
A-6 Asphalt	--	--	--		9/29/82
Top	--	--	--		10/7/82
Mid	--	--	--		12/1/82
Bottom	--	--	--		12/10/82
A-7 SAMPLE LOST					
Top					
Mid					
Bottom					

-- = Minimum detectable activity at 95% confidence level. In many cases, values less than the MDA are reported; however, they are not significant at the 95% confidence level.

OTRU = Other transuranics

Table 2. (Continued)

Sample No.	pCi/g ^{241}Am	OTRU	^{137}Cs	Miscellaneous	Date Counted
A-8 Asphalt	--	--	--		9/30/82
Top	--	--	1.2		10/8/82
Mid	--	--	--		12/15/82
Bottom	--	--	--		12/15/82
B-1 Asphalt	--	--	--		9/29/82
Top	--	--	--		10/13/82
Mid	--	--	--		12/1/82
Bottom	--	--	--		12/8/82
B-2 Asphalt	--	--	--		
Top	--	--	--		10/14/82
Mid	--	--	--		12/15/82
Bottom	--	--	--		12/15/82
B-3 Asphalt	--	--	--		9/29/82
Top)					
Mid)Mixed	--	--	--		10/14/82
Bottom)					
B-4 Asphalt	--	--	--		9/29/82
Top	--	--	--	Trace @ 240 keV	10/14/82
Mid	--	--	0.6		12/13/82
Bottom	--	--	--		12/15/82
B-5 Asphalt	--	--	10.7		9/29/82
Top	--	--	--		10/14/82
Mid	--	--	--		12/15/82
Bottom	--	--	--		12/15/82
B-6 Asphalt	--	--	6.4		9/29/82
Top	--	--	--		10/13/82
Mid	--	--	--		12/8/82
Bottom	--	--	--		12/15/82

-- = Minimum detectable activity at 95% confidence level. In many cases, values less than the MDA are reported; however, they are not significant at the 95% confidence level.

OTRU = Other transuranics

Table 2. (Continued)

Sample No.	^{241}Am (pCi/g)	OTRU (pCi/g)	^{137}Cs (pCi/g)	Miscellaneous	Date Counted
B-7 Asphalt	--	--	1.1		9/29/82
Top	--	--	--		10/14/82
Mid	--	--	--		12/13/82
Bottom	--	--	--		12/15/82
B-8 Asphalt	--	--	0.3		9/30/82
Top	--	--	--		10/14/82
Mid	--	--	--		12/14/82
Bottom	--	--	--		12/15/82
B-9					
Top	--	--	--		10/14/82
Mid	--	--	0.4		12/15/82
Bottom	--	--	--		12/15/82
B-10					
Top	0.9	--	5.1	337 cpm @ 220 keV	10/14/82
Mid	0.6	56	2.3		12/15/82
Bottom	--	--	2.6		12/15/82
C-1 Top	--	--	--		10/14/82
C-2 Top	--	--	--		10/15/82
C-3 Top	--	--	4.5		10/25/82
C-4 Top	--	--	--		10/15/82
C-5 Top	--	--	8.4		10/15/82
C-6 Top	--	--	1.0		10/15/82

-- = Minimum detectable activity at 95% confidence level. In many cases, values less than the MDA are reported; however, they are not significant at the 95% confidence level.

OTRU = Other transuranics

Table 2. (Continued)

Sample No.	pCi/g ^{241}Am	OTRU	^{137}Cs	Miscellaneous	Date Counted
C-7 Top	--	--	--		10/15/82
C-8 Top	--	--	1.2		10/18/82
C-9 Top	--	--	--		10/18/82
C-10 Top	--	--	--		10/18/82
H-4 @ 4'	--	--	--		10/13/82
H-9 @ 2'	--	--	--		12/16/82
@ 4'	--	--	--		12/16/82

-- = Minimum detectable activity at 95% confidence level. In many cases, values less than the MDA are reported; however, they are not significant at the 95% confidence level.

OTRU = Other transuranics

Table 3. Radioactivity Content of Pits 1-4 Soil Samples

Sample No.	Pit No.	pCi/g ^{241}Am	pCi/g OTRU	pCi/g ^{137}Cs	Miscellaneous	Date Counted
S-34 (Wet)	1	39	--	283	51 ^{60}Co, 200 ^{152}Eu	10/15/82
S-35	1	981	7348	--		10/20/82
S-36	1	7.4	727	20.4	9.1 ^{60}Co, 14.3 ^{152}Eu	10/20/82
S-37	1	166	15,932	--	691 ^{235}U	10/21/82
S-38	3	21	137	--	58 ^{235}U	10/28/82
S-40	1	16,716	7,312	--		10/28/82
S-41	2	--	--	--	19,977 ^{235}U	11/1/82
S-42	2	--	--	--	14,897 ^{235}U	11/1/82
S-46	1	--	--	--		11/29/82
S-47	1	--	--	--		11/29/82
S-49	4	358	1669	11.6		12/8/82
S-50	4	1,061	7,223	144		12/9/82
S-51	4	1,115	11,000	3.5		12/9/82
S-52	4	583	6,634	--		1/5/83
S-53	4	10.1	97.5	--		1/5/83

-- = Minimum detectable activity at 95% confidence level. In many cases, values less than the MDA are reported; however, they are not significant at the 95% confidence level.

OTRU = Other transuranics

Table 4. Chlorinated Solvent Concentration From Borehole Samples In and Around Pit #1

BOREHOLE C-1

	Solvent Concentration (µg/g)		
Depth (ft.)	1,1,1 Trichloroethane	Trichloroethylene	1,1,2,2 Tetrachloroethylene
10	0.02	0.40	0.02
15	0.02	0.16	0.01
20	0.02	0.27	0.07
25	0.03	0.32	0.10
30	0.02	0.14	0.06
40	0.02	0.20	0.01
50	0.02	0.07	0.05

Table 4. Continued

BOREHOLE C-2

	Solvent Concentration (μg/g)		
Depth (ft.)	1,1,1 Trichloroethane	Trichloroethylene	1,1,2,2 Tetrachloroethylene
11	0.02	0.10	0.01
16	0.02	0.25	0.01
21	0.02	0.10	0.005
26	0.02	0.10	0.01
31	0.02	0.10	0.01
41	0.04	0.65	0.10
51	0.03	0.47	0.10

Table 4. Continued

BOREHOLE C-3

	Solvent Concentration (µg/g)		
Depth (ft.)	1,1,1 Trichloroethane	Trichloroethylene	1,1,2,2 Tetrachloroethylene
14	0.01	0.15	0.01
19	0.01	0.13	0.01
22	0.01	0.13	0.06
25	0.02	0.05	0.006
28	0.02	0.04	0.001
31	0.01	0.10	0.04
34	0.01	0.23	0.02
39	0.01	0.20	0.02
44	0.01	0.33	0.02
54	0.01	0.60	0.10

Table 4. Continued

BOREHOLE C-4

	Solvent Concentration (μg/g)		
Depth (ft.)	1,1,1 Trichloroethane	Trichloroethylene	1,1,2,2 Tetrachloroethylene
17.5	3	4	35
20.5	4	23	162
23.5	9	121	306
27	0.04	0.07	0.03
30	0.03	0.25	0.04
33	0.03	0.50	0.63
36	0.06	1.0	0.20
39	0.10	1.71	0.30
42	0.06	0.80	0.14
47	0.03	0.50	0.03
52	0.02	0.23	0.02
62	0.04	0.50	0.13

Table 4. Continued

BOREHOLE C-5

	Solvent Concentration (μg/g)		
Depth (ft.)	1,1,1 Trichloroethane	Trichloroethylene	1,1,2,2 Tetrachloroethylene
14.5	25	14	39
16.5	42	27	58
19.5	185	220	110
21	133	163	81
22.5	55	77	36
25	40	58	38
27	209	461	227
30	0.30	0.50	0.06
33	3.0	6.0	2.0
36	1.0	0.20	0.04
39	0.02	0.06	0.01
42	0.16	0.46	0.10
47	0.22	0.64	0.20
52	0.07	0.24	0.10
62	0.12	0.65	0.10

Table 4. Continued

BOREHOLE C-6

	Solvent Concentration (μg/g)		
Depth (ft.)	1,1,1 Trichloroethane	Trichloroethylene	1,1,2,2 Tetrachloroethylene
10	0.02	0.04	0.01
15	0.01	0.12	0.05
20	0.01	0.20	0.03
25	0.01	0.05	0.07
30	0.02	0.10	0.02
40	0.02	0.40	0.07
50	0.02	0.50	0.08

Table 4. Continued

BOREHOLE C-7

	Solvent Concentration (ug/g)		
Depth (ft.)	1,1,1 Trichloroethane	Trichloroethylene	1,1,2,2 Tetrachloroethylene
17	0.04	0.40	0.10
27	0.03	0.24	0.001
30	0.03	0.21	0.02
33	0.04	0.40	0.05
36	0.03	0.22	0.02
39	0.06	0.76	0.12
42	0.04	0.44	0.03
52	0.05	0.65	0.05
62	0.06	0.18	0.15

Table 4. Continued

BOREHOLE C-8

	Solvent Concentration (ug/g)		
Depth (ft.)	1,1,1 Trichloroethane	Trichloroethylene	1,1,2,2 Tetrachloroethylene
17	0.02	0.34	0.11
27	0.03	0.33	0.05
30	0.10	0.87	0.24
33	0.10	0.78	0.20
36	0.03	0.30	0.03
39	0.11	1.29	0.25
42	0.05	0.56	0.13
52	0.03	0.17	0.03

Table 4. Continued

BOREHOLE C-9

	Solvent Concentration (µg/g)		
Depth (ft.)	1,1,1 Trichloroethane	Trichloroethylene	1,1,2,2 Tetrachloroethylene
10	0.12	0.16	0.21
15	0.22	0.17	0.20
20	0.18	0.16	0.20
25	0.35	0.54	0.25
30	0.20	0.20	0.22
40	0.24	0.34	0.20
50	0.26	0.50	0.21

Table 4. Continued

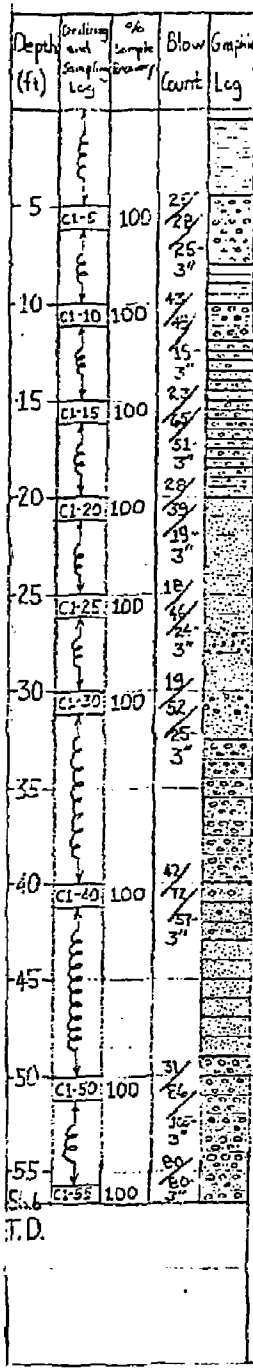
BACKHOE SAMPLE LOCATION T-1 and T-2

	Solvent Concentration (ug/g)		
Depth (ft.)	1,1,1 Trichloroethane	Trichloroethylene	1,1,2,2 Tetrachloroethylene
T-1:			
20.5	0.01	0.005	0.04
23.5	0.03	0.24	1.45
26.5	0.06	1.10	2.60
T-2:			
20.5	0.01	<0.002	<0.002
23.5	0.01	<0.002	<0.002
26.5	0.01	<0.002	<0.002

Table 5. Volatile Organic Compound Concentrations (EPA Method 624) of Soil at Bottom of Pits

Sample Locations	Volatile Organic Compound	Concentration µg/g
Borehole C-4 (30' depth)	All purgeable priority pollutants	<0.005
Bottom center of Pit #1 (34' depth) after excavation	Methylene chloride	0.12
	Chloroform	0.02
	Trichloroethylene	0.29
	Benzene	0.02
	Perchloroethylene	0.08
	Toluene	0.02
	1,2 Dichloroethane	0.22
	All other purgeable priority pollutants	<0.01
Bottom of Pit #2 (20' depth)	All purgeable priority pollutants	<0.005
Bottom of Pit #3 (13.5' depth)	All purgeable priority pollutants	<0.005
	Acetone	0.045
	Isopropanol	0.53

Test Hole C-1, Taxi Strip Project



Lithologic Description	
0.0 - 0.5	Gravel fill.
0.5 - 4.5	Sandy Silt (Ml): brown, damp, no odor.
4.5 - 8.0	Sandy Gravel (GP): pink and white coating on gravel clasts, no odor.
8.0 - 10.0	Silty Clay (CL): gravelly, brown to red brown, no odor.
10.0 - 10.5	Silty Gravel (GP): light tan locally, pink, no odor.
10.5 - 12.0	Silty Gravel (GP): sandy, Subrounded gravels to 2" in diameter, orange brown, damp, no odor.
12.0 - 20.0	Sandy Clay (CL-SC): fine sand and subangular gravel to 1/4" diameter, scattered caliche stringers, orange brown, no odor.
20.0 - 32.5	Silty Sand (SM-ML): with local silt and sand lenses, light brown to yellow brown, damp, no odor.
27.0 - 27.5	local subrounded gravel to 2" diameter.
30.6 - 31.2	Clean medium to coarse sand with well rounded gravel to 2" diameter.
32.5 - 40.0	Clayey Gravel (GC): Sandy, gravel well rounded to Subrounded to 2 1/2" diameter.
40.0 - 43.0	Clayey Sand (SC-CL): Silty, scattered subrounded gravel to 3/4" diameter, Slight manganese oxide coating on gravel, light brown to brown, damp, no odor.
43.0 - 49.0	Clayey Sand (SC-CL): grey brown to brown, no odor.
49.0 - 56.6	Sandy Gravel (GP): clayey grading to silty, subangular to Subrounded moderately weathered to decomposed gravel to 3" diameter, with iron oxide, manganese oxide and caliche coating, scattered caliche stringers and nodules, orange brown to orange, dry to damp, no odor.

Notes

Geologic Logging: Dennis Perfer

Hole Location: East of Bldg. 543

Coordinates: N 10403.85, E 11446.8

Elevation: 628.1

Dates Drilled: 11/30/82

Detailed Notes:

Key: Drilling and Sampling Log

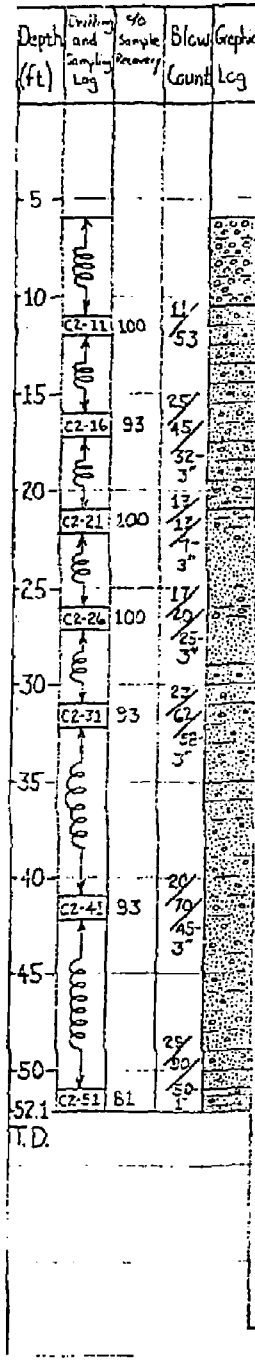
Dry, Hollow Stem Auger, 7 1/4 inch Bit.

C1-5 3 inch O.D., 2 1/2 inch I.D, Split Tube Sampler, With 2 1/2 inch O.D. 6 inch Long Stainless Steel Sample Liners. Driven By a 140 Pound Hammer, Dropped 30 inches.

Key: % Sample Recovery: Length of Sample Recovered ÷ By length of Sampler Drive X 100.

Key: Blow Count: 25/3" = Number of Hammer Blows Per 6 inch Drive Increment and Fraction of Drive Increment.

Test Hole C-2, Taxi Strip Project



Lithologic Description

0.0-6.0 Hole started 6 feet below natural ground surface.

6.0-10.5 Sandy Gravel (GP): Silty, very coarse subangular to subrounded moderately to highly weathered gravel to 4" diameter, caliche coated with local iron oxide staining, light brown to brown, dry; no odor.

10.5-21.0 Clayey Sand (SC): fine to medium, scattered fine to coarse subangular to subrounded gravel with caliche and manganese oxide coating to 1 1/2" diameter, caliche stringers, brown, damp, no odor.

21.0-29.0 Sand (SM-SP): very fine to fine, clean, locally silty, scattered fine gravel, abundant caliche stringers, light brown to tan, damp, no odor.

29.0-51.0 Silty Sand (SM-ML): fine to coarse, scattered fine to coarse gravel to 3" diameter, locally clayey, locally abundant caliche stringers, brown to yellow brown, dry to damp, no odor.

51.0-52.1 Sandy Clay (CL-ML): fine to medium sand, scattered subrounded gravel to 3/4" diameter, scattered caliche stringers and manganese dendrites, brown to orange brown, dry, no odor.

Notes

Geologic Logging: Dennis Peifer

Hole Location: East of Bldg. 543
Coordinates: N10452.0 E11494.7
Elevation: 622.7

Dates Drilled: 11/30/82-12/1/82

Detailed Notes:

Key: Drilling and Sampling Log

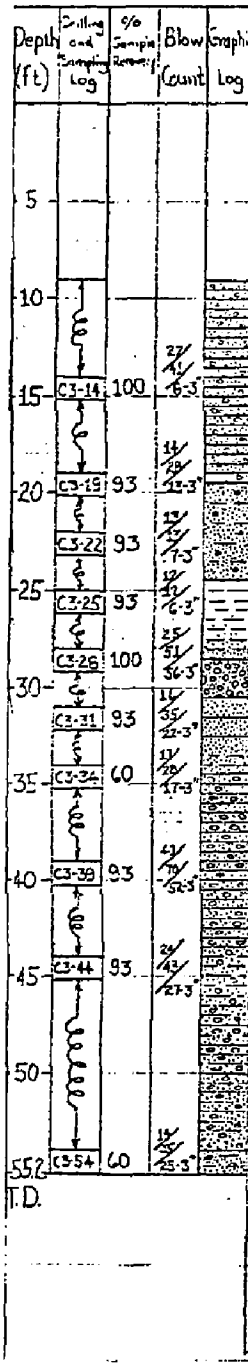
Dry, Hollow Stem Auger, 7 1/4" Bit.

C2-11 3" O.D, 2 1/2" I.D, Split Tube Sampler, With 2 1/2" O.D. 6" Long Stainless Steel Sample Liners. Driven By a 140 Pound Hammer, Dropped 30".

Key: % Sample Recovery
Length of Sample Recovered ÷ By Length of Sampler Drive X 100.

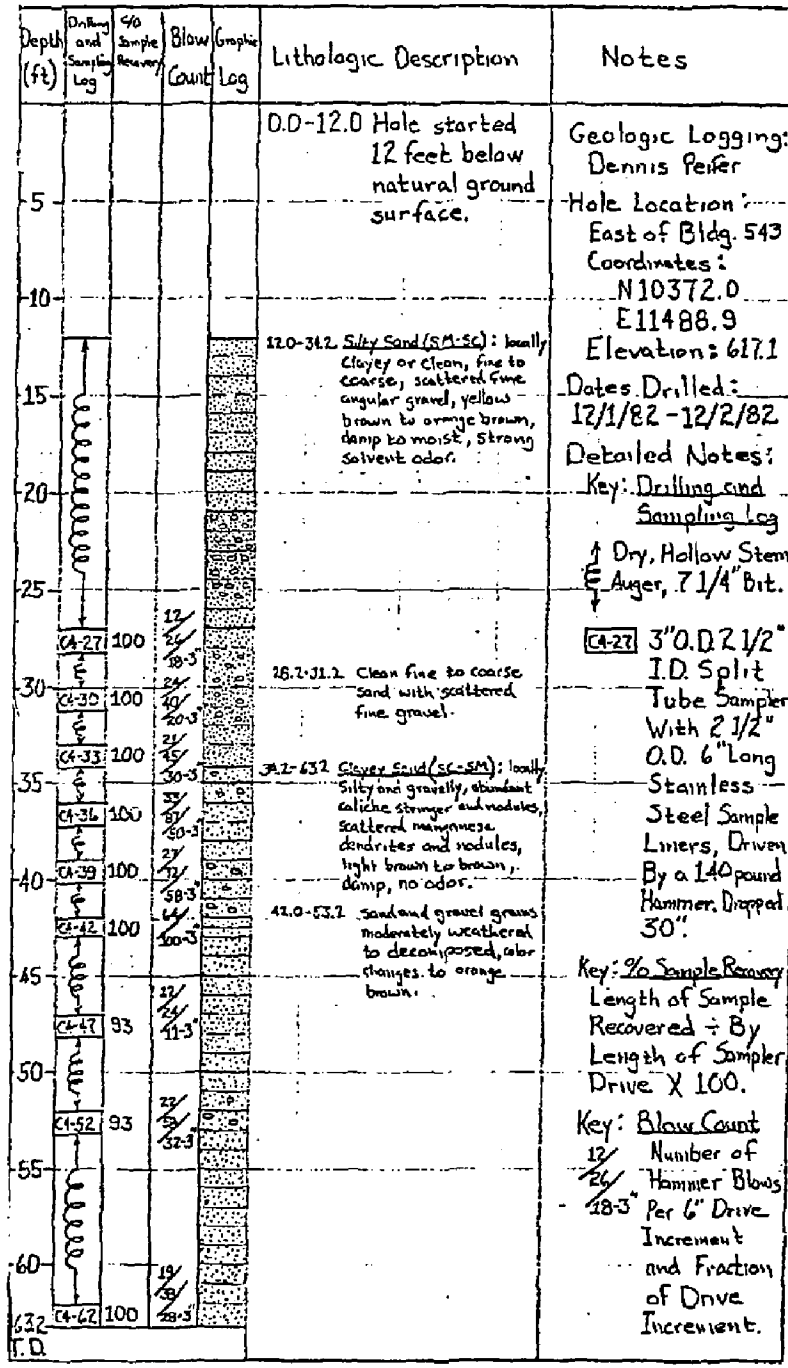
Key: Blow Count
25/45/32-3" Number of Hammer Blows Per 6" Drive Increment and Fraction of Drive Increment.

Test Hole C-3, Taxi Strip Project

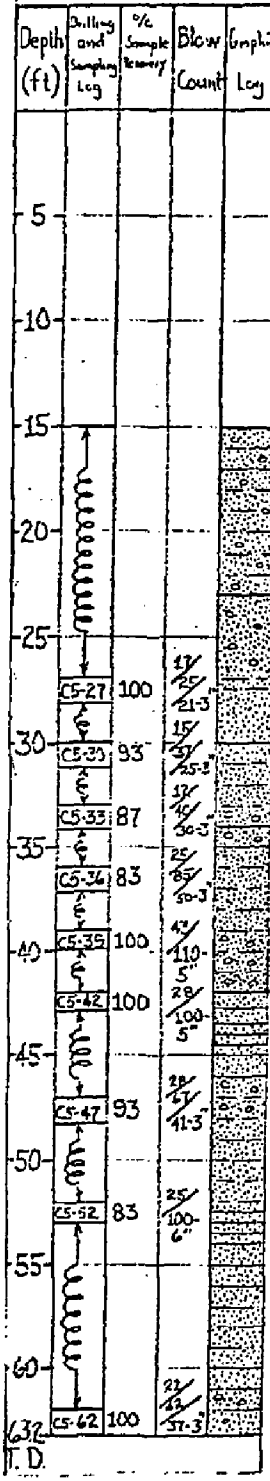


Lithologic Description		Notes
0.0-9.0	Hole started 9 feet below natural ground surface.	Geologic Logging: Dennis Peifer
9.0-19.5	Sandy Clay (CL-SC): Scattered fine angular gravel, increasing sand with depth, scattered caliche stringers and manganese dendrites, yellow brown to orange brown, locally greenish grey, damp to moist, no odor.	Hole Location: East of Bldg. 543 Coordinates: N10351.0 E11495.3 Elevation: 621.0
19.5-24.5	Silty Sand (SM-SP): Fine to medium with scattered coarse sand and fine gravel to 1/2" diameter, locally clean, scattered caliche stringers and nodules, orange brown to yellow brown, damp to moist, no odor.	Dates Drilled: 12/1/82
24.5-28.5	Silt (ML-SM): Locally sandy, locally concentrated caliche and hard caliche concretions, yellow to tan, orange brown sandy, damp to moist, no odor.	Detailed Notes:
28.5-30.5	Sandy Gravel (GP): Fine to coarse, subangular slightly to moderately weathered with clean medium to coarse sand, clasts to 1" diameter, local iron oxide staining, moist, no odor.	Key: Drilling and Sampling Log
30.5-34.5	Clayey Sand (SC-SM): Locally silty or clean, brown to orange brown, damp to moist, no odor.	↑ Dry, Hollow Stem Auger, 7 1/4" Bit.
34.5-54.0	Sandy Clay (CL-SC): Silty, with fine to coarse subrounded gravel to 1" diameter, highly weathered to decomposed, abundant caliche stringers and nodules, local iron staining and manganese dendrites, brown to orange brown, damp, no odor.	C3-14 3" O.D., 2 1/2" I.D., Split Tube Sampler, With 2 1/2" O.D. 6" Long Stainless Steel Sample Liners, Driven By a 140 pound Hammer, Dropped 30".
54.0-55.2	Silty Sand (SM): Fine, scattered gravel, caliche stringers and manganese dendrites, orange brown, damp, no odor.	Key: % Sample Recovery Length of Sample Recovered ÷ By Length of Sampler Drive X 100.
		Key: Blow Count 27/41/6-3" Number of Hammer Blows Per 6" Drive Increment and Fraction of Drive Increment.

Test Hole C-4, Taxi Strip Project



Test Hole C-5, Taxi Strip Project



Lithologic Description

0.0-15.0 Hole started 15 feet below natural ground surface.

15.0-23.0 Silty Sand (SM-SC): gravelly, yellow brown, Strong Solvent odor.

23.0-30.0 Sand (SP-SM): medium to coarse, clean, locally silty, scattered gravel, grey brown, moist to wet, Strong solvent odor.

30.0-33.0 Clayey Sand (SC-SM): locally Silty, scattered gravel, abundant caliche stringers and nodules, greenish grey, damp, less strong solvent odor.

33.0-42.0 Silty Sand (SM-SC): locally Clayey, scattered fine gravel, abundant caliche stringers and nodules, local iron oxide and manganese oxide staining, brown to orange brown, damp, no odor.

42.0-63.2 Clayey Sand (SC-CL): locally silty, scattered fine gravel, abundant caliche stringers and nodules, manganese oxide coating on gravel and desiccation fractures, orange brown, damp, no odor.

Notes

Geologic Logging: Dennis Perfer

Hole Location: East of Bldg. 543
Coordinates:
N10401.3
E11487.6
Elevation: 614.8

Dates Drilled: 12/2/82

Detailed Notes:

Key: Drilling and Sampling Log

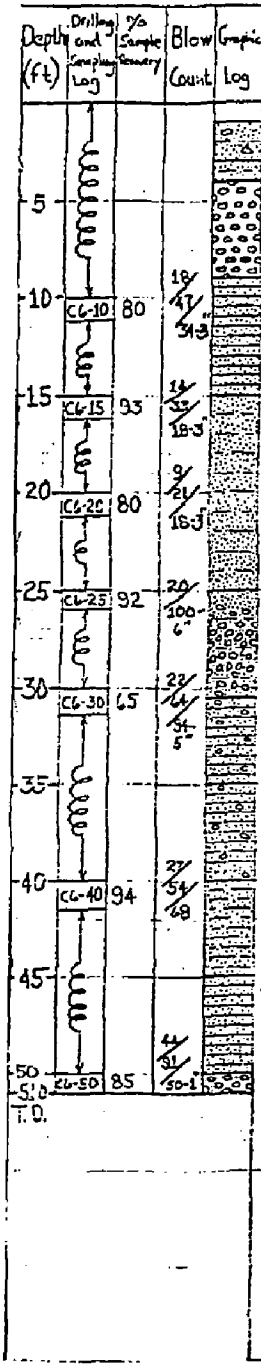
↕ Dry, Hollow Stem Auger, 7 1/4" Bit.

C5-27 3" O.D. 2 1/2" I.D. Split Tube Sampler With 2 1/2" O.D. 6" Long Stainless Steel Sample Liners, Driven By a 140 pound Hammer, Dropped 30".

Key: % Sample Recovery
Length of Sample Recovered ÷ By Length of Sampler Drive X 100.

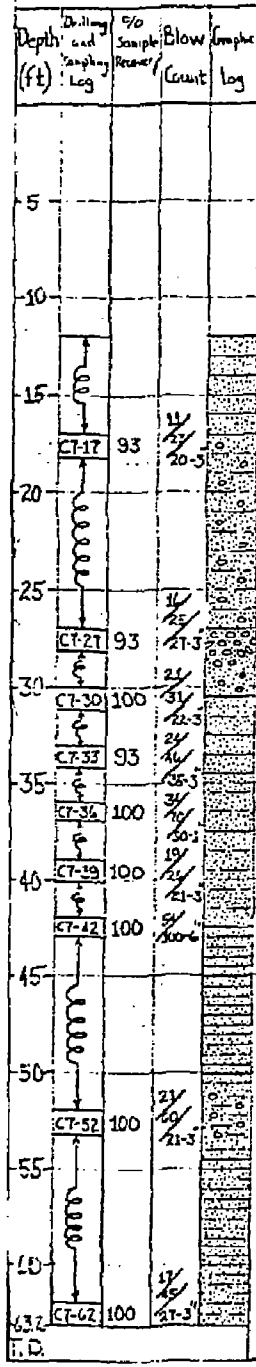
Key: Blow Count
17/25/21-3" Number of Hammer Blows Per 6" Drive Increment and Fraction of Drive Increment.

Test Hole C-6, Taxi Strip Project



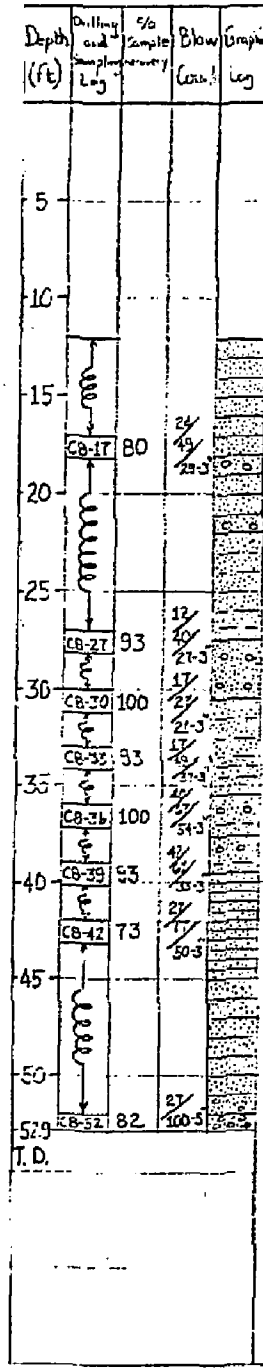
Lithologic Description	Notes
0.0-1.0 Fill: dark brown sandy clay.	Geologic Logging: Dennis Perfer
1.0-3.0 Clayey Sand (SC): scattered gravel, orange brown, damp-moist, no odor.	Hole Location: East of Bldg. 543 Coordinates: N10402.3 E11546.5 Elevation: 626.7
3.0-4.0 Silty Sand (SM): orange brown, damp, no odor.	Dates Drilled: 1/3/82
4.0-9.0 Gravel (GP): coarse subrounded to 3" diameter caliche coating on gravel clasts, no odor.	Detailed Notes:
9.0-15.0 Sandy Clay (CL-SC): fine to coarse, scattered caliche stringers and manganese oxide staining, orange brown to yellow brown, no odor.	Key: Drilling and Sampling Log: Dry, Hollow Stem Auger, 7 1/4" Bit.
15.0-25.0 Silty Sand (SM-ML): fine, with scattered to abundant caliche strings and nodules, scattered manganese oxide staining, yellow brown, damp, no odor.	C6-10 3" O.D. 2 1/2" I.D. Split Tube Sampler With 2 1/2" O.D. 6" Long Stainless Steel Sample Liners, Driven By a 140 pound Hammer, Dropped 30".
25.0-30.5 Sandy Gravel (GP-SP): locally a Silty Sand, fine to coarse moderately weathered to decomposed clasts to 1 1/2" diameter, locally very clean coarse sand (2S.3), abundant iron oxide and manganese oxide staining, orange-brown, damp, no odor.	Key: % Sample Recovery: Length of Sample Recovered ÷ By Length of Sampler Drive X 100.
30.5-40.0 Sandy Clay (CL): scattered coarse sand and fine gravel, locally abundant caliche stringers iron oxide and manganese oxide staining, grey brown to grey, damp, no odor.	Key: Blow Count: 18/ 47/ 34-3" Number of Hammer Blows Per 6" Drive Increment and Fraction of Drive Increment.
40.0-45.0 Sandy Silt (ML): fine, with scattered caliche stringers and manganese oxide staining, brown, damp, no odor.	
45.0-51.0 Sandy Clay (CL): locally gravelly, with fine to coarse subangular clasts to 2 1/2", moderately weathered to decomposed, local heavy iron oxide staining, orange brown to orange, damp, no odor.	

Test Hole C-7, Taxi Strip Project



Lithologic Description	Notes
0.0-12.0 Hole started 12 feet below natural ground surface.	Geologic Logging: Dennis Perter Hole Location: East of Bldg. 543 Coordinates: N10372.1 E11506.2 Elevation: 617.3 Dates Drilled: 12/3/82 Detailed Notes: Key: Drilling and Sampling Log Dry, Hollow Stem Auger, 7 1/4" Bit.
12.0-17.0 Clayey Sand (SC): yellow brown, no odor.	
17.0-27.0 Silty Sand (SM): fine to medium with scattered coarse sand and fine subrounded gravel to 3/4" diameter, orange brown to brown, damp, no odor.	
27.0-30.5 Sandy Gravel (GP-SP): fine to coarse clean sand, fine to coarse subangular moderately to highly weathered gravel, light brown, damp, no odor.	C7-17 3"O.D. 2 1/2" I.D. Split Tube Sampler With 2 1/2" O.D. 6" Long Stainless Steel Sample Liners, Driven By a 140 pound Hammer, Dropped 30".
30.5-42.5 Silty Sand (SM-SC): Fine, locally Clayey, abundant caliche stringers, scattered manganese oxide staining, brown to orange brown, damp, no odor.	
42.5-63.2 Sandy Clay (CL-ML): locally Silty, Scattered fine gravel, abundant caliche stringers, scattered manganese oxide staining, brown to orange brown, damp, no odor.	Key: % Sample Recovery Length of Sample Recovered ÷ By Length of Sampler Drive X 100. Key: Blow Count 11/12"/20-3" Number of Hammer Blows Per 6" Drive Increment and Fraction of Drive Increment.

Test Hole C-8, Taxi Strip Project



Lithologic Description

0.0-12.0 Hole started 12 feet below natural ground surface.

12.0-22.0 Clayey Sand (SC-CL): fine to medium with local scattered coarse sand and fine to coarse gravel to 3" diameter, scattered caliche stringers, brown to orange brown, damp, slight solvent odor at 20 feet.

22.0-27.5 Silty Sand (SM): fine to medium, orange brown, damp, solvent odor at 25 feet.

27.5-30.5 Sand (SP): clean, fine to medium, scattered coarse sand and fine gravel, orange brown to grey brown, damp, solvent odor.

30.5-52.9 Sandy Clay (CL-ML): locally silty, fine to medium with scattered fine sub-angular gravel, scattered caliche nodule and stringers and manganese oxide staining, abundant caliche at 42 feet and abundant manganese staining at 52 feet, brown to orange brown, locally yellow brown and red brown, damp, solvent odor no longer present after 33 feet.

Notes

Geologic Logging: Dennis Perfer

Hole Location: East of Bldg. 543
Coordinates:
N10372.1
E11474.5
Elevation: 617.0

Dates Drilled: 12/6/82

Detailed Notes:

Key: Drilling and Sampling Log

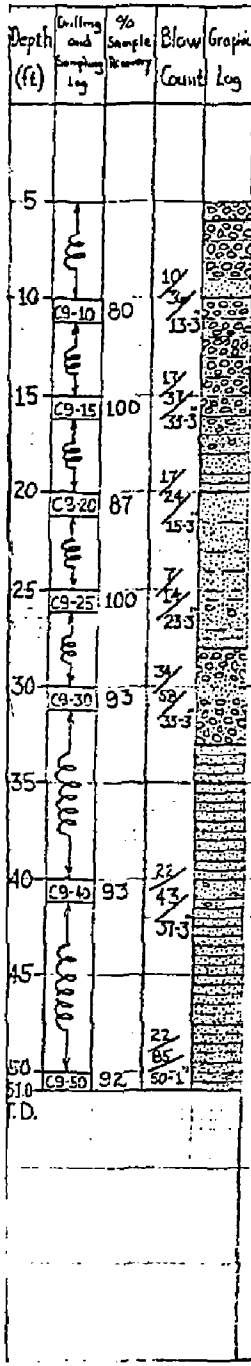
↕ Dr., Hollow Stem Auger, 7 1/4" Bit.

C8-1T 3" O.D 2 1/2" I.D. Split Tube Sampler With 2 1/2" O.D. 6" Long Stainless Steel Sample Liners, Driven By a 140 pound Hammer, Dropped 30".

Key: % Sample Recovery
Length of Sample Recovered ÷ By Length of Sampler Drive X 100.

Key: Blow Count
24/19/29-3" Number of Hammer Blows Per 6" Drive Increment and Fraction of Drive Increment.

Test Hole C-9, Taxi Strip Project



Lithologic Description	Notes
0.0 - 5.0 Hole started 5 feet below natural ground surface.	Geologic Logging: Dennis Peifer
5.0-20.0 Sandy Gravel (GP-SC): Clayey locally silty, fine to coarse sand, fine to coarse subrounded gravel, moderately weathered to decomposed, locally abundant iron oxide and manganese oxide staining, brown to orange brown, damp, no odor.	Hole Location: East of Bldg. 543 Coordinates: N10422.3 E11489.5 Elevation: 624.0
20.0-28.0 Silty Sand (SM-ML): Fine to medium, locally abundant subrounded gravel to 2½" diameter, locally abundant caliche, scattered manganese oxide staining, brown to orange brown, damp, no odor.	Dates Drilled: 12/6/82
28.0-33.0 Sandy Gravel (GP-SP): Clean coarse sand and fine to coarse subrounded gravel to 2" diameter, moderately weathered to decomposed, local iron oxide staining, light brown to orange brown, damp, no odor.	Detailed Notes: Key: Drilling and Sampling Log: Dry, Hollow Stem Auger, 7 1/4" Bit. C9-10 3" O.D. 2½" I.D. Split Tube Sampler With 2 1/2" O.D. 6" Long Stainless Steel Sample Liners, Driven By a 140 pound Hammer, Dropped 30".
33.0-51.0 Sandy Clay (CL-SC): Locally a silty fine to medium sand, scattered fine subrounded to subangular slightly weathered gravel, locally abundant caliche nodules and stringers, scattered Manganese oxide staining, red brown to orange brown, dry to damp, no odor.	Key: % Sample Recovery: Length of Sample Recovered ÷ By Length of Sampler Drive X 100.
	Key: Blow Count: 10/16/13-3" Number of Hammer Blows Per 6" Drive Increment - and fraction of Drive Increment.

Rough Correlation of MW18 and TB22 Logs

MW18

GEOLOGIC DESCRIPTION

0-1.7 Fill
3" asphalt over gray brown Silty Gravel.
1.7-160.3 Quaternary alluvial deposits
1.7-2.0 Sandy Silt, brown fine gravel, dark brown, orange mottling.
2.0-2.3 Silty and Clayey Sand and Gravel, gravel clasts weathered, dark brown to brown.
2.0-2.3 Yellow-orange veinlets.
6-8
11-12 Possible clay rich zones.
12-15 Possibly clean gravel.
15-23.5 Predominately Sandy Clay, Sand and Sandy Silt interbeds, brown.
23.5-27 Silty Sand, gravelly, brown, weathered gravel noted in samples.
27-30 Possibly clean.
37-45 Predominately Sandy Clay, scattered gravel, brown.
41-42.6 Scattered caliche veinlets and nodules noted in sample.
45-51 Fine Gravel and Sand.
49-51 Clayey, red orange.
51-55.5 Clayey and Sandy Silt and Silty Clay, light brown.
@ 53.5' Scattered caliche noted in sample.
55.5-65.5 Predominately fine Gravel and Sand based on cuttings and drill action.
65.5-77 Sandy Clay and Silt, locally gravelly, brown.
68.6-71 Sand, clean to silty, some fine gravel, brown.
77-88 Gravel.
87-88 Clayey.
88-100 Sandy Silt and Sandy Clay, light brown, locally gravelly..
100-104 Gravelly Sand.
104-107 Sandy Clay, poorly sorted, gravelly, mottled brown, gray brown, red brown.
107-110 Probable Sand.
110-116 Sandy Clay.
119-124 Silty Sand, brown.
118-119
122-120.5 Gravel bearing.
124-127 Silt.
127-133 Sand.
130-136 Clay, some sand and fine gravel, brown, abundant Mn-oxide staining.
134-137 Sand, gravelly at 136'±.
133-160.3 Predominately Clay, grades to Clayey Silt and Very Clayey Sand, brown, Mn-oxide staining.
145-148 Sand grading to Gravel in 147-148' interval, possibly clean.
150.0-160.3 Abundant caliche noted in sample.
160.3-161.0 No Recovery.

Graphic Log

TB22

GEOLOGIC DESCRIPTION

0-2.0 Fill
Clay - gravel mixture
2.0-102.5 Quaternary alluvial deposits
2.0-4 Sandy Clay, brown, trace of caliche.
4-9 Silty Gravel, brown, difficult drilling.
9-14 Sandy Clay, light brown, Mn-oxide and clay coatings on fractures.
14-20 Predominately Silty Sand, scattered gravel, frequently highly weathered, red brown.
17-19 Sandy Silt, light brown, Mn-oxide and clay-coated fractures.
24-28 Grades to clean Gravelly Sand, gray brown.
28-31.5 Sandy Clay, yellow brown, trace coarse sand and fine, rounded gravel.
31.5-51 Predominately Sand, silty to clean, scattered mostly fine, frequently highly weathered, gravel, brown-yellow brown.
36-37 Possible Clay bed.
40.5-46.5 Sandy Gravel interbeds, brown to red brown.
48-49 Possible Clay bed.
51-53 Sandy Clay, brown, Mn-oxide and clay coated fractures.
53-63 Interbedded Silty Sand and Silty Gravel, variably weathered, brown to red brown.
At 54' Thin Clay bed.
63-66 Probable Clay.
66-86 Predominately Sand, silty to clean, scattered variably weathered gravel, yellow-red brown.
71-72.5 Clayey Gravel.
74-78 Possible Clay beds.
79-80
80-82.5 Highly weathered Sandy Gravel beds, red brown.
82.5-86 Abundant Silt or Clay.
86-99.5 Predominately Sandy Clay and Silt, brown to yellow brown, Mn-oxide and clay coatings on fractures.
89-90.5 Silty Sand bed.
At 92.5 Caliche nodules noted in sample.
99.5-102.5 Silty Sand, grading to Sandy Silt, contains scattered lumps of red brown clay at 100'.

Graphic Log

* Note Ground Level at TB22 was 2 feet above MW18
TB22 : 632.5
MW18 : 630.5