057116-07

DOE/OR/20722-173

M-043

Formerly Utilized Sites Remedial Action Program (FUSRAP) Contract No. DE-AC05-810R20722

RADIOLOGICAL CHARACTERIZATION REPORT FOR THE RESIDENTIAL PROPERTY AT 26 LONG VALLEY ROAD

Lodi, New Jersey

November 1988



Bechtel National, Inc.

057116



Jackson Plaza Tower 800 Oak Ridge Turnpike Oak Ridge, Tennessee 37830

Mail Address P.O. Box 3;/1, Oak Aidge, TN 37831-0312. Telex: 3785873

NOV 1 5 MBK

U.S. Department of Energy Oak Ridge Operations Post Office Box 2001 Oak Ridge, Tennessee 37831-8723

Attention: Peter J. Gross, Director Technical Services Division

- Subject: Bechtel Job No. 14501, FUSRAP Project DOE Contract No. DE-AC05-810R20722 Publication of the Radiological Characterization Reports for the Residential Properties at 7 Branca Court, 11 Branca Court, 16 Long Valley Road, 18 Long Valley Road, 20 Long Valley Road, 22 Long Valley Road, 26 Long Valley Road, 11 Redstone Lane, and the Lodi Municipal Park, in Lodi, New Jersey Code: 7310/WBS: 138
- Reference: Letter from S. K. Oldham (DOE), 88-669 dated October 19, 1988, to B. W. Clemens (BNI), "Final Comments on the Prepublication Draft of the Radiological Characterization Reports for the Residential Properties at 7 Branca Court, 11 Branca Court, 16 Long Valley Road, 18 Long Valley Road, 20 Long Valley Road, 22 Long Valley Road, 26 Long Valley Road, 11 Redstone Lane, and the Lodi Municipal Park, in Lodi, New Jersey," CCN 056527.

Dear Mr. Gross:

Enclosed are six copies each of the published version of the nine characterization reports listed above. Incorporated in these reports are comments based on the reference above and additional discussions between N. C. Ring and S. K. Oldham of your office and J. D. Berger of ORAU.

Peter J. Gross

2

These publications also incorporate changes in wording regarding site release as requested by S. K. Oldham and A. Avel.

Please notify me should you require additional copies (6-1677).

Very truly yours, INTOD

B. W. Clemens for Project Manager - FUSRAP CONCURRENCE

BWC/skl:1750x Enclosures: As stated

cc:

R. G. Atkin, W/O J. D. Berger, ORAU (W/all enclosures) G. K. Hovey, W/O B. A. Hughlett, W/O M. R. McDougall, TMA/E (W/all enclosures) S. K. Oldham, W/O R. Rosen, EPA Region II, W/O R. E. Swaja, ORNL, W/O J. F. Wing, W/O

DOE/OR/20722-173

RADIOLOGICAL CHARACTERIZATION REPORT FOR THE RESIDENTIAL PROPERTY AT 26 LONG VALLEY ROAD LODI, NEW JERSEY

NOVEMBER 1988

Prepared for

UNITED STATES DEPARTMENT OF ENERGY OAK RIDGE OPERATIONS OFFICE Under Contract No. DE-AC05-810R20722

By

N. C. Ring and S. K. Livesay Bechtel National, Inc. Oak Ridge, Tennessee

Bechtel Job No. 14501

TABLE OF CONTENTS

		,	
Abbr	eviations		
1.0	Introduction and Summary		
	1.1 Introduction		
	1.2 Purpose		
	1.3 Summary		
2.0	Site History		
	2.1 Previous Radiological S	urveys	
	2.2 Remedial Action Guideli	nes	
3.0	Health and Safety Plan		
	3.1 Subcontractor Training		
	3.2 Safety Requirements		
4.0	Characterization Procedures		
	4.1 Field Radiological Char	acterization	
	4.1.1 Measurements Tak	en and Methods Used	
	4.1.2 Sample Collection	n and Analysis	
	4.2 Building Radiological c	haracterization	
5.0	Characterization Results		
	5.1 Field Radiological Char	acterization	
	5.2 Building Radiological C	haracterization	
Refe	rences		
8000	ndix A - Geologic Drill Logs	for 26 Long Valley Poad	i

iii

LIST OF FIGURES

Figure	Title	Page
1-1	Location of Lodi Vicinity Properties	2
1-2	Location of 26 Long Valley Road	4
4-1	Borehole Locations at 26 Long Valley Road	15
4-2	Surface and Subsurface Soil Sampling Locations at 26 Long Valley Road	16
4-3	Exposure Rate Measurement Locations at 26 Long Valley Road	19
5-1	Areas of Surface Contamination at 26 Long Valley Road	22
5-2	Areas of Subsurface Contamination at 26 Long Valley Road	23
	LIST OF TABLES	
Table	<u>Title</u>	Page
2-1	Summary of Residual Contamination Guidelines for the Lodi Vicinity Properties	9
5-1	Surface and Subsurface Radionuclide Concentrations in Soil for 26 Long Valley Road	25
5-2	Downhole Gamma Logging Results for 26 Long Valley Road	27

5-3 Gamma Radiation Exposure Rate for 26 Long Valley Road 33

iv

ABBREVIATIONS

cm	centimeter
cm ²	square centimeter
cpm	counts per minute
dpm	disintegrations per minute
ft	foot
h	hour
in.	inch
1	liter
l/min	liters per minute
m	meter
2 m	square meter
MeV	million electron volts
µR/h	microroentgens per hour
mi	mile
mi ²	square mile
min	minute
mrad/h	millirad per hour
mrem	millirem
mrem/yr	millirem per year
pCi/g	picocuries per gram
pCi/l	picocuries per liter
WL	working level
yd	yard
yd ³	cubic yards

v

1.0 INTRODUCTION AND SUMMARY

1.1 INTRODUCTION

The 1984 Energy and Water Appropriations Act authorized the U.S. Department of Energy (DOE) to conduct a decontamination research and development project at four sites, including the site of the former Maywood Chemical Works (now owned by the Stepan Company) and its vicinity properties. The work is being administered by the Formerly Utilized Sites Remedial Action Program (FUSRAP), one of two remedial action programs under the direction of the DOE Division of Facility and Site Decommissioning Projects. The residential properties in Lodi, New Jersey, are included in FUSRAP as vicinity properties. Figure 1-1 shows the location of the Lodi vicinity properties is relation to the former Maywood Chemical Works.

The United States Government initiated FUSRAP in 1974 to identify, clean up, or otherwise control sites where low activity radioactive contamination (exceeding current guidelines) remains from the early years of the nation's atomic energy program or from commercial operations that resulted in conditions Congress has mandated DOE to remedy (Ref. 1).

FUSRAP is currently being managed by DOE Oak Ridge Operations. As the Project Management Contractor for FUSRAP, Bechtel National, Inc. (BNI) is responsible to DOE for planning, managing, and implementing FUSRAP.

1.2 <u>PURPOSE</u>

The purpose of the 1986 survey performed by BNI was to locate the horizontal and vertical boundaries of radionuclide concentrations exceeding remedial action guidelines.

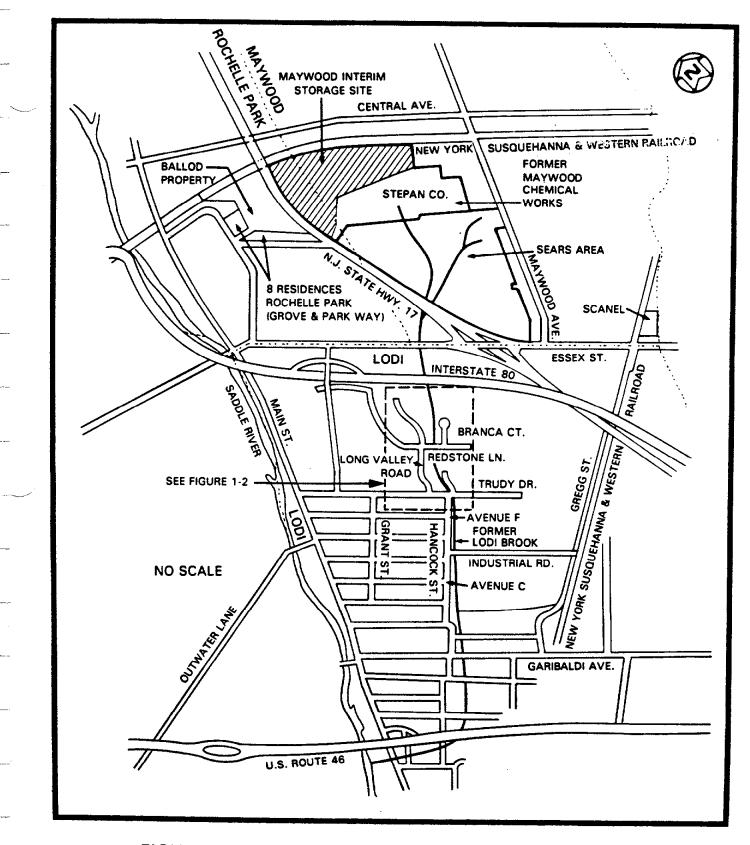


FIGURE 1-1 LOCATION OF LODI VICINITY PROPERTIES

1.3 SUMMARY

This report summarizes the procedures and results of the radiological characterization of the property at 26 Long Valley Road (Figure 1-2) in Lodi, New Jersey, conducted from September through December 1986.

Ultimately, the data generated during the radiological characterization will be used to define the complete scope of remedial action necessary to release the site.

This characterization confirmed that thorium-232 is the primary radioactive contaminant at this property. Results of surface soil samples for 26 Long Valley Road showed maximum concentrations of thorium-232 and radium-226 to be 35.5 and 2.6 pCi/g, respectively. Subsurface soil sample concentrations ranged from 1.0 to 7.7 pCi/g for thorium-232 and from 0.4 to 2.2 pCi/g for radium-226. The average background level in this area for both radium-226 and thorium-232 is 1.0 pCi/g.

Historical information indicates that uranium is not a primary contaminant in this area; therefore, analysis for uranium was not considered critical for this characterization. The soil samples have been archived and, if necessary, can be analyzed for uranium at some future date. Because the major contaminants at the vicinity properties are thorium and radium, the decontamination guidelines provide the appropriate guidance for the cleanup activities. DOE believes that these guidelines are conservatively low for considering potential adverse health effects that might occur in the future from any residual contamination. The dose contributions from uranium and any other radionuclides not numerically specified in these guidelines are not expected to be significant following decontamination. In addition, because the vicinity properties will be decontaminated in a manner to reduce future doses to levels that are as low as reasonably achievable (ALARA), DOE will ensure that most of the radioactivity present at these vicinity properties will be removed during the cleanup (Ref. 2).

3

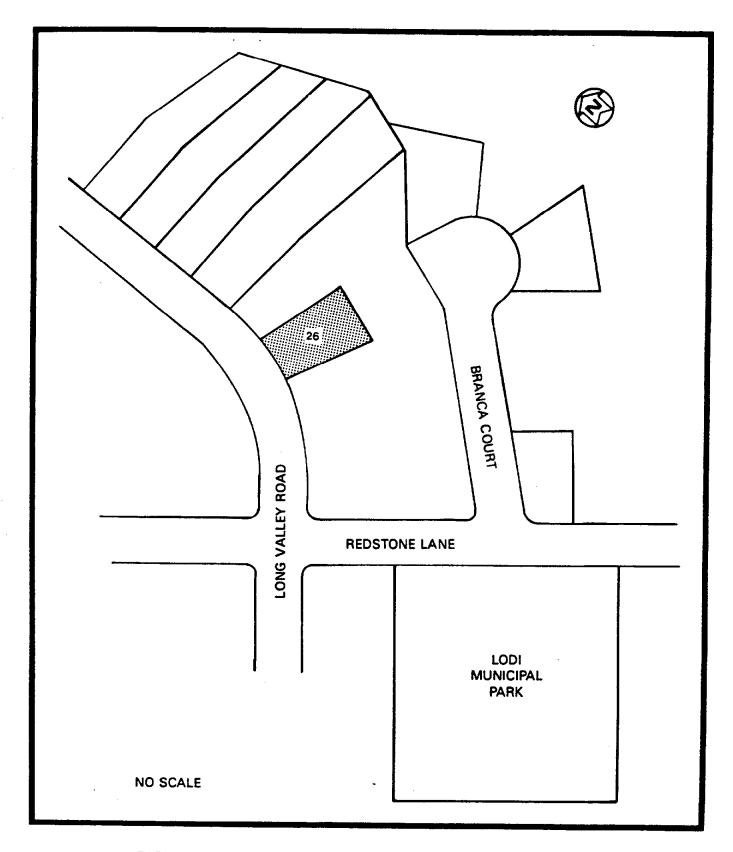


FIGURE 1-2 LOCATION OF 26 LONG VALLEY ROAD

Subsurface investigation by gamma logging showed subsurface contamination ranging from 0.5 to 5.5 ft deep.

Gamma radiation exposure rates ranged from 8 to 17 μ R/h, including background. The interior measurement was 7 μ R/h, including background.

The radon-222 measurements inside the residence indicated concentrations of less than 0.2 and 0.3 pCi/l, which are within the DOE guideline of 3.0 pCi/l.

Measurements for radon daughters ranged from 0.001 to 0.003 WL, and measurements for thoron daughters ranged from 0.0001 to 0.0008 WL.

2.0 SITE HISTORY

The Maywood Chemical Works was founded in 1895. During World War I (in 1916), the company began processing thorium from monazite sand for use in manufacturing gas mantles for various lighting devices. The company continued this work until 1956. Process wastes from manufacturing operations were pumped to two areas surrounded by earthen dikes (northern and southern diked areas) on property west of the plant. Subsequently, some of the contaminated wastes migrated onto adjacent and vicinity properties.

In 1928 and again between 1944 and 1946, some of the residues from the processing operations were moved from the company's property and used as mulch and fill in nearby low-lying areas. The fill material consisted of tea and cocoa leaves mixed with other material resulting from operations at the plant and apparently also contained thorium process wastes (Ref. 3).

It is not known for certain how the properties in Lodi were contaminated. According to an area resident, fill from an unknown source was brought to Lodi and spread over large portions of the previously low-lying and swampy area. For several reasons, however, a more plausible explanation is that the contamination migrated along a drainage ditch originating on the Maywood Chemical Works property. It can be seen from photographs and tax maps of the area that the course of a previously existing stream known as Lodi Brook, which originated at the former Maywood Chemical Works, generally coincides with the path of contamination in Lodi. The brook was subsequently replaced by a storm drain system as the area was developed. Secondly, samples taken from Lodi properties indicate elevated concentrations of a series of elements known as rare earths. Rare earth elements are typically found in monazite sands, which also include thorium. This type of sand was feedstock at the Maywood Chemical Works, and elevated levels are known to exist in the by-product of the extraction process. Third, the ratio of thorium to other radionuclides found in these Lodi properties is

comparable to the ratio found in contaminated material on other properties in Lodi (Ref. 4). And finally, long-time residents of Lodi recall chemical odors in and around the brook in Lodi and steam rising off the water. These observations suggest discharges of contaminants occurring upstream.

The Stepan Chemical Company (now called the Stepan Company) purchased Maywood Chemical Works in 1959. The Stepan Company itself has never been involved in the manufacture or processing of any radioactive materials (Ref. 5).

2.1 PREVIOUS RADIOLOGICAL SURVEYS

<u>January 1981</u> - The Nuclear Regulatory Commission (NRC) directed that a survey of the Stepan Company property and its vicinity be conducted. Using the Stepan Company plant as the center, a 4-mi² aerial survey conducted by the EG&G Energy Measurements Group identified anomalous concentrations of thorium-232 to the north and south of the Stepan Company property. The Lodi residential properties were included in this survey (Ref. 6).

<u>June 1984</u> - In June 1984, Oak Ridge National Laboratory (ORNL) conducted a "drive by" survey of Lodi using its "scanning van." Although not comprehensive, the survey indicated areas requiring further investigation (Ref. 7).

<u>September 1986</u> - At the request of DOE, ORNL conducted radiological surveys of the vicinity properties in Lodi, New Jersey, for the purpose of determining which properties contained radioactive contamination in excess of guidelines and would require remedial action (Ref. 8).

2.2 REMEDIAL ACTION GUIDELINES

Table 2-1 summarizes the DOE guidelines for residual contamination. The thorium-232 and radium-226 limits listed in Table 2-1 will be

used to determine the extent of remedial action required at the vicinity properties. DOE developed these guidelines to be consistent with the guidelines established by the Environmental Protection Agency (EPA) for the Uranium Mill Tailings Remedial Action Program.

TABLE 2-1

SUMMARY OF RESIDUAL CONTAMINATION GUIDELINES FOR THE LODI VICINITY PROPERTIES

Page 1 of 2

BASIC DOSE LIMITS

The basic limit for the annual radiation dose received by an individual member of the general public is 100 mrem/yr.

SOIL (LAND) GUIDELINES (MAXIMUM ALLOWABLE LIMITS)

Radionuclide

Soil Concentration (pCi/g) above background^{a,b,c}

Radium-226 Radium-228 Thorium-230 Thorium-232 5 pCi/g, averaged over the first 15 cm of soil below the surface; 15 pCi/g when averaged over any 15-cmthick soil layer below the surface layer.

١

STRUCTURE GUIDELINES (MAXIMUM ALLOWABLE LIMITS)

Airborne Radon Decay Products

Generic guidelines for concentrations of airborne radon decay products shall apply to existing occupied or habitable structures on private property; structures that will be demolished or buried are excluded. The applicable generic guideline (40 CFR 192) is: In any occupied or habitable building, the objective of remedial action shall be, and reasonable effort shall be made to achieve, an annual average (or equivalent) radon decay product concentration (including background) not to exceed 0.02 WL.^d In any case, the radon decay product concentration (including background) shall not exceed 0.03 WL. Remedial actions are not required in order to comply with this guideline when there is reasonable assurance that residual radioactive materials are not the cause.

External Gamma Radiation

The average level of gamma radiation inside a building or habitable structure on a site shall not exceed the background level by more than 20 μ R/h.

Indoor/Outdoor Structure Surface Contamination

	Allowable Residual Surface Contamination ^e (dpm/100 cm ²)		
<u>Radionuclide</u> f	<u>Average</u> g,h	<u>Maximum</u> h,i	<u>Removable</u> h,j
Transuranics, Ra-226, Ra-228, Th-230, Th-228 Pa-231, Ac-227, 1-125, I-129	100	300	20
Th-Natural, Th-232, Sr-90, Ra-223, Ra-224 U-232, 1-126, I-131, I-133	1,000	3,000	200

TABLE	2-1
-------	-----

(continued)

Page	2	of	2

Indoor/Outdoor Structure Surface Contamination (continued)

· · · · · · · · · · · · · · · · · · ·	Allowable Residual Surface Contaminatione (dpm/100 cm ²)		
<u>Radionuclide</u> f	<u>Average</u> g,h	<u>Maximum</u> h,i	<u>Removable</u> h,j
U-Natural, U-235, U-238, and associated decay products	5,000 a	15,000 a	1,000 œ
Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous			
fission) except Sr-90 and others noted above	5,000 β-γ	15,000 β-γ	1,000 β-γ

^aThese guidelines take into account ingrowth of radium-226 from thorium-230 and of radium-228 from thorium-232, and assume secular equilibrium. If either thorium-230 and radium-226 or thorium-232 and radium-228 are both present, not in secular equilibrium, the guidelines apply to the higher concentration. If other mixtures of radionuclides occur, the concentrations of individual radionuclides shall be reduced so that the dose for the mixtures will not exceed the basic dose limit.

^bThese guidelines represent residual concentrations above background averaged across any 15-cm-thick layer to any depth and over any contiguous 100-m² surface area.

^CLocalized concentrations in excess of these limits are allowable provided that the average concentration over a 100-m² area does not exceed these limits.

^dA working level (WL) is any combination of short-lived radon decay products in 1 liter of air that will result in the ultimate emission of 1.3×10^5 MeV of potential alpha energy.

^eAs used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

^fWhere surface contamination by both alpha- and beta-gamma-emitting radionuclides exists, the limits established for alpha- and beta-gamma-emitting radionuclides should apply independently.

9Measurements of average contamination should not be averaged over more than 1 m^2 . For objects of less surface area, the average shall be derived for each such object.

^hThe average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h and 1.0 mrad/h, respectively, at 1 cm.

¹The maximum contamination level applies to an area of not more than 100 cm^2 .

jThe amount of removable radioactive material per 100 cm² of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and measuring the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of surface area less than 100 cm² is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped. The numbers in this column are maximum amounts.

3.0 HEALTH AND SAFETY PLAN

BNI is responsible for protecting the health of personnel assigned to work at the site. As such, all subcontractors and their personnel are required to comply with the provisions of the applicable project instructions cited in this section or as directed by the on-site BNI representative.

3.1 SUBCONTRACTOR TRAINING

Before the start of work, all subcontractor personnel attend an orientation session presented by the BNI representative to explain the nature of the material to be encountered in the work and the required personnel monitoring and safety measures.

3.2 SAFETY REQUIREMENTS

Subcontractor personnel must comply with the following BNI requirements.

- Bioassay Subcontractor personnel submit bioassay samples before or at the beginning of on-site activity, upon completion of the activity, and periodically during site activities as requested by BNI.
- Protective Clothing/Equipment Subcontractor personnel are required to wear the protective clothing/equipment specified in the subcontract or as directed by the BNI representative.
- o Dosimetry Subcontractor personnel are required to wear, and return daily, the dosimeters and monitors issued by BNI.
- Controlled Area Access/Egress Subcontractor personnel and equipment entering areas wherein access and egress are controlled for radiation and/or chemical safety purposes are surveyed by the BNI representative for contamination before leaving those areas.
- Medical Surveillance Upon written direction from BNI, subcontractor personnel who work in areas where hazardous chemicals might exist are given a baseline and periodic health assessment defined in BNI's Medical Surveillance Program.

Radiation and/or chemical safety surveillance of all activities related to the scope of work is under the direct supervision of personnel representing BNI.

The health physics requirements for all activities involving radiation or radioactive material are defined in Project Instruction No. 20.01, the Project Radiation Protection Manual and implementing procedures.

The industrial hygiene requirements for activities involving chemicals or chemically contaminated materials are defined in Project Instruction No. 26.00, the Environmental Hygiene Manual and implementing procedures.

Copies of these project instructions and manuals are located on-site for the use of subcontractor personnel.

4.0 CHARACTERIZATION PROCEDURES

A master grid was established by the surveyor; BNI's radiological support subcontractor, Thermo Analytical/Eberline (TMA/E), established a grid on individual properties. The size of the grid blocks is adjusted to adequately characterize each property. The grid origin allows the grid to be reestablished during remedial action and is correlated with the New Jersey state grid system. All data correspond to coordinates on the characterization grid. The grid and its east and north coordinates are shown on all figures of the property (Sections 4 and 5).

4.1 FIELD RADIOLOGICAL CHARACTERIZATION

4.1.1 Measurements Taken and Methods Used

An initial walkover survey using unshielded gamma scintillation detectors (2-in. by 2-in. thallium-activated sodium iodide probe) to identify areas of elevated radionuclide activity was performed. Near-surface gamma measurements taken using a cone-shielded gamma scintillation detector were also used in determining areas of surface contamination. Using the shielded detector ensured that the majority of the radiation detected by the instrument originated from the ground directly beneath the unit. Shielding against lateral gamma flux, or shine, from nearby areas of contamination minimized potential sources of error in the measurements. The measurements were taken 12 in. above the ground at the intersections of 10-ft grid lines. The shielded detector was calibrated at the Technical Measurements Center (TMC) in Grand Junction, Colorado, to provide a correlation of counts per minute (cpm) to picocuries per gram (pCi/g). This calibration demonstrated that 11,000 cpm corresponds to the DOE guideline of 5 pCi/g plus local average background of 1 pCi/g for thorium-232 in surface soils (Ref. 9).

A subsurface investigation was conducted to determine the depth to which the previously identified surface contamination extends and to

locate subsurface contamination where there is no surface manifestation. The subsurface characterization consisted of drilling and gamma logging 13 boreholes (Figure 4-1) using either a 3-in.- or 6-in.-diameter auger bit; holes were drilled to depths determined in the field by the radiological and geological support representatives.

The downhole gamma logging technique was used because the procedure can be completed more quickly than collecting soil samples, and it eliminates the need for analyzing these samples in a laboratory. A 2-in. by 2-in. sodium iodide gamma scintillation detector was used to perform the downhole logging. The instrument was calibrated at TMC where it was determined that a count rate of approximately 40,000 cpm corresponds to the 15-pCi/g subsurface contamination guideline for thorium-232 for subsurface soils. This relationship has also been corroborated in results from previous characterizations where thorium-232 was found (Ref. 9).

Gamma radiation measurements were taken at 6-in. vertical intervals, and determined the depth and concentration of the contamination. The gamma logging data were reviewed to identify trends, regardless of whether concentrations exceeded the guidelines.

4.1.2 <u>Sample Collection and Analysis</u>

To identify surface areas where the level of contamination exceeded the DOE guideline of 5 pCi/g for thorium-232 in surface soils, areas with measurements of more than 11,000 cpm were plotted. Using these data as well as data from previous surveys (Refs. 5, 6, 7, and 8), the locations of biased surface soil samples were selected to better define the limits of contamination. Surface soil samples were taken at 13 locations (Figure 4-2) and analyzed for thorium-232 and radium-226. Each sample was dried, pulverized, and counted for 10 min using an intrinsic germanium detector housed in a lead counting cave lined with cadmium and copper. The pulse height distribution was sorted using a computer-based, multichannel

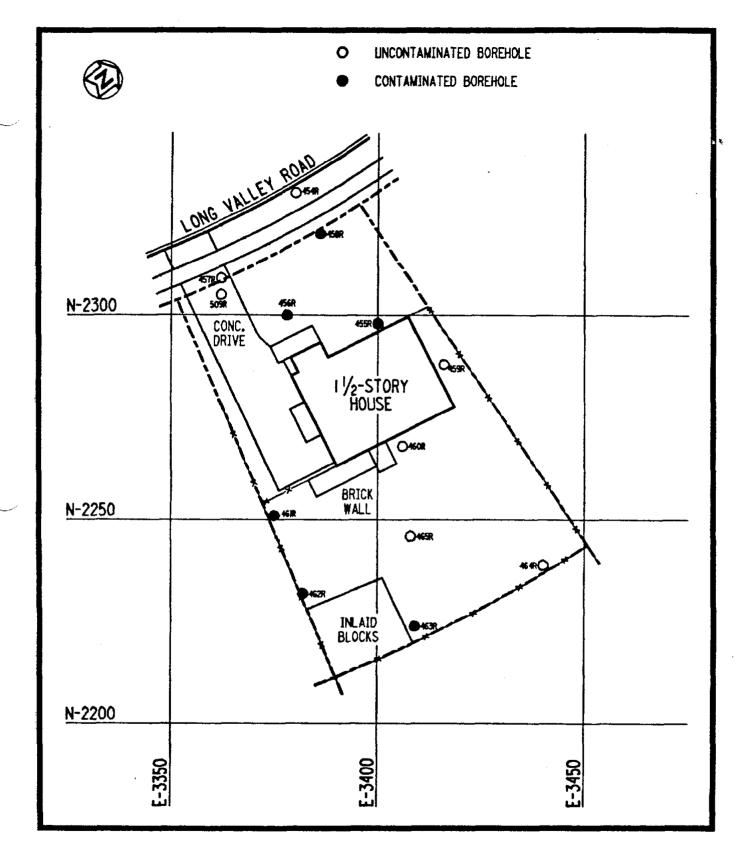


FIGURE 4-1 BOREHOLE LOCATIONS AT 26 LONG VALLEY ROAD

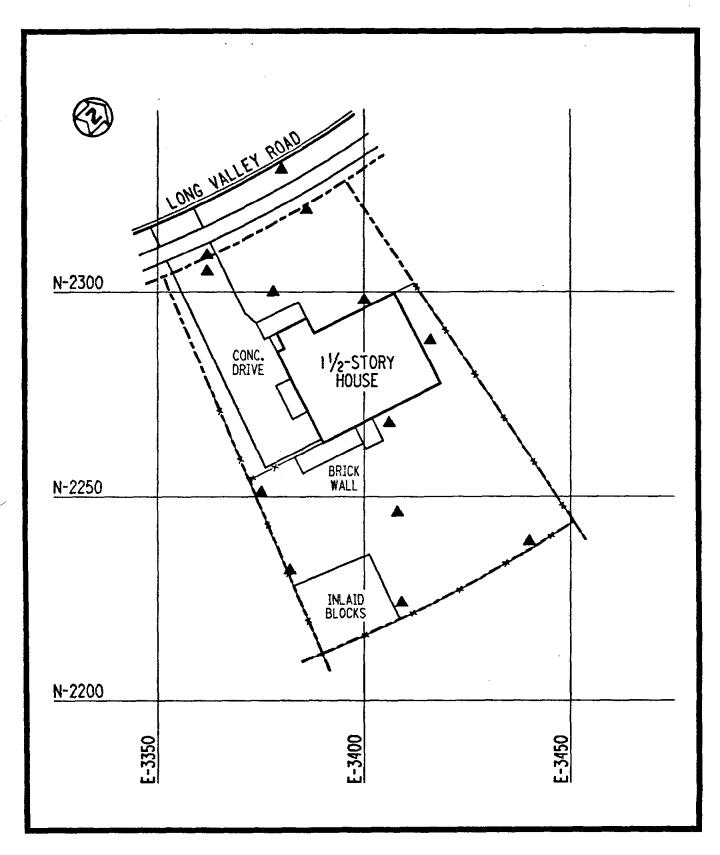


FIGURE 4-2 SURFACE AND SUBSURFACE SOIL SAMPLING LOCATIONS AT 26 LONG VALLEY ROAD

analyzer. Radionuclide concentrations were determined by comparing the gamma spectrum of each sample with the spectrum of a certified counting standard for the radionuclide of interest.

Subsurface soil samples were collected from 13 locations (Figure 4-2) using the side wall sampling method and were analyzed to compare laboratory soil sample results to downhole gamma radiation measurements. A cup or can attached to a steel pipe or wooden stake was inserted into the borehole and used to scrape samples off the side of the borehole at a specified depth. The subsurface soil samples were analyzed for radium-226 and thorium-232 in the same manner as the surface soil samples.

4.2 BUILDING RADIOLOGICAL CHARACTERIZATION

After evaluating previous radiological survey data as well as data from this characterization, it was suspected that contamination might be present under the foundation of the residence. A radon measurement was obtained to verify the presence of contaminated material under the residence and to estimate potential occupational exposures during future remedial actions.

Indoor radon measurements were taken using the Tedlar bag technique. Using this method, radon measurements are obtained by pumping air into a Tedlar bag at a rate of approximately 2 1/min and transferring the air sample directly into a scintillation cell with an interior coating of zinc sulfide and an end window for viewing the scintillations. Analysis of the sample was simplified by allowing the radon decay products to build up over time. This method allows all the radon decay products to come into secular equilibrium with the radon. The scintillation cell was placed in contact with a photomultiplier tube, and the scintillations.

Indoor air sample collection was also performed to determine working levels (WL) of radon and thoron daughters. Measurement of radon

daughters was done by collecting an air sample for exactly 5 min through a 0.45-micron membrane filter at a rate of 11 liters/min for a total sample volume of 55 1. Alpha particle activity on the filter paper was counted 40 to 90 min after sampling using an alpha scintillation detector coupled to a count-rate meter or a digital scaler. Measurements for thoron daughters were conducted using the same method as for radon daughters with the exception of the time between collection of the air sample and counting of the alpha particle activity. In the case of thoron daughters, the sample is allowed to age for at least 5 h after sampling before alpha activity is counted. This elapsed time allows radon daughters, which may be present with the thoron daughters, to decay sufficiently so as not to interfere in calculating the working levels for thoron daughters.

Exterior gamma exposure rate measurements were made at six locations throughout the property grid system and at one location inside the residence using either a 2-in. by 2-in. thallium-activated sodium iodide gamma scintillation detector used to detect gamma radiation only, or a pressurized ionization chamber (PIC) (Figure 4-3). The PIC instrument has a response to gamma radiation that is proportional to exposure in roentgens. A conversion factor for gamma scintillation to the PIC was established through a correlation of these two measurements at four locations in the vicinity of the property. The unshielded gamma scintillation detector readings were then used to estimate gamma exposure rates for each location. These measurements were taken 3 ft above the ground, and the locations were determined to be representative of the entire property. Interior measurements are generally obtained with the gamma scintillation instrument rather than the PIC because of its smaller size and the desire to minimize the technician's time inside the residence.

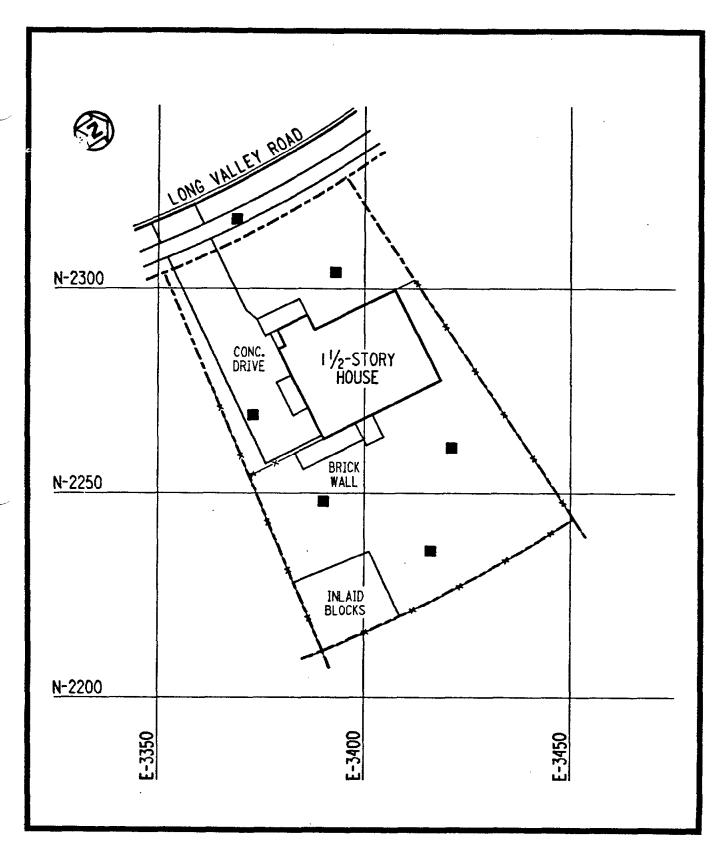


FIGURE 4-3 EXPOSURE RATE MEASUREMENT LOCATIONS AT 26 LONG VALLEY ROAD

5.0 CHARACTERIZATION RESULTS

5.1 FIELD RADIOLOGICAL CHARACTERIZATION

Near-surface gamma radiation measurements on the property ranged from 3,400 cpm to approximately 23,000 cpm. The average background level for this area is 5,000 cpm. A measurement of 11,000 cpm is approximately equal to the DOE guideline for thorium-232 of 5 pCi/g above background for surface soil contamination. Using this correlation, the near-surface gamma measurements were used to determine the extent of surface contamination as well as the basis for selecting the locations of soil samples.

Surface soil samples taken from 13 locations on the property were analyzed for thorium-232 and radium-226. The concentrations in these samples ranged from 0.9 to 35.5 pCi/g for thorium-232 and from 0.8 pCi/g to 2.6 pCi/g for radium-226. Analysis results for surface soils (depths from 0.0 to 0.5 ft) are provided in Table 5-1. Results showed concentrations of thorium-232 in excess of DOE guidelines (5 pCi/g plus background of 1 pCi/g for surface soils) with a maximum concentration of 35.5 pCi/g. Use of the "less than" (<) notation in reporting results indicates that the radionuclide was not present in concentrations that are quantitative with the instruments and techniques used. The "less than" value represents the lower bound of the quantitative capacity of the instrument and technique used and is based on various factors, including the volume, size, and weight of the sample; the type of detector used; the counting time, and the background count rate. The actual concentration of the radionuclide is less than the value indicated. In addition, since radioactive decay is a random process, a correlation between the rate of disintegration and a given radionuclide concentration cannot be precisely established. For this reason, the exact concentration of the radionuclide cannot be determined. As such, each value that can be quantitatively determined has an associated uncertainty term (+), which represents the amount by which the actual concentration can be expected to

differ from the value given in the table. The uncertainty term has an associated confidence level of 95 percent.

On the basis of near-surface gamma radiation measurements and surface soil sample anglysis, contamination of this property is consists of surface and subsurface contamination. Contamination depths range from the surface to 3.5 ft deep. Areas of surface contamination are shown in Figure 5-1 and areas of subsurface contamination are shown in Figure 5-2.

Analysis results for subsurface soil samples given in Table 5-1 (depths from 0.5 to 1.0 ft) are consistent with the gamma logging data in Table 5-2. The results in Table 5-2 showed a range from 7,000 cpm to 140,000 cpm. A measurement of 40,000 cpm is approximately equal to the DOE guideline for subsurface contamination of 15 pCi/g. Analyses of subsurface soil samples showed thorium-232 concentrations ranging from 1.0 to 7.7 pCi/g and radium-226 concentrations ranging from 0.4 to 2.2 pCi/g.

The vertical and horizontal limits of contamination as determined by this characterization effort are being evaluated to determine the volume of contaminated material that will require remedial action. To develop this estimate, BNI will consider the location of the contamination, construction techniques, and safety procedures.

5.2 BUILDING RADIOLOGICAL CHARACTERIZATION

Results of two indoor radon measurements made with the Tedlar bag method indicated that concentrations ranged from less than 0.2 pCi/l to less than 0.3 pCi/l. These measurements were substantially less than the applicable DOE guideline of 3.0 pCi/l (Ref. 10).

Results of measurements for radon daughters ranged from 0.001 to 0.003 WL, and were substantially less than the applicable generic guideline (40 CFR 192) (Ref. 10) of an annual average (or equivalent) radon decay product concentration not to exceed 0.02 WL.

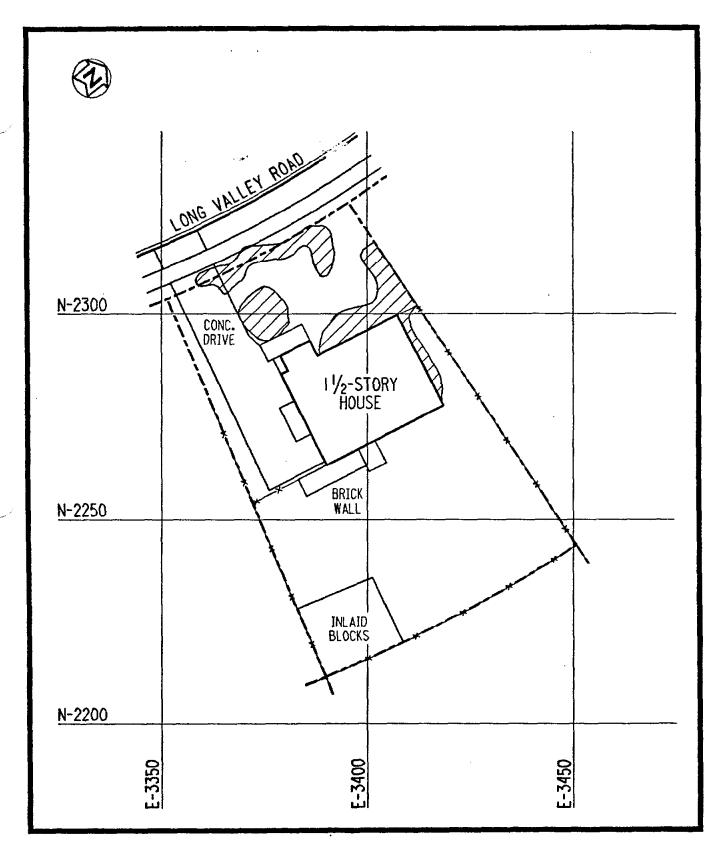


FIGURE 5-1 AREAS OF SURFACE CONTAMINATION AT 26 LONG VALLEY ROAD

22

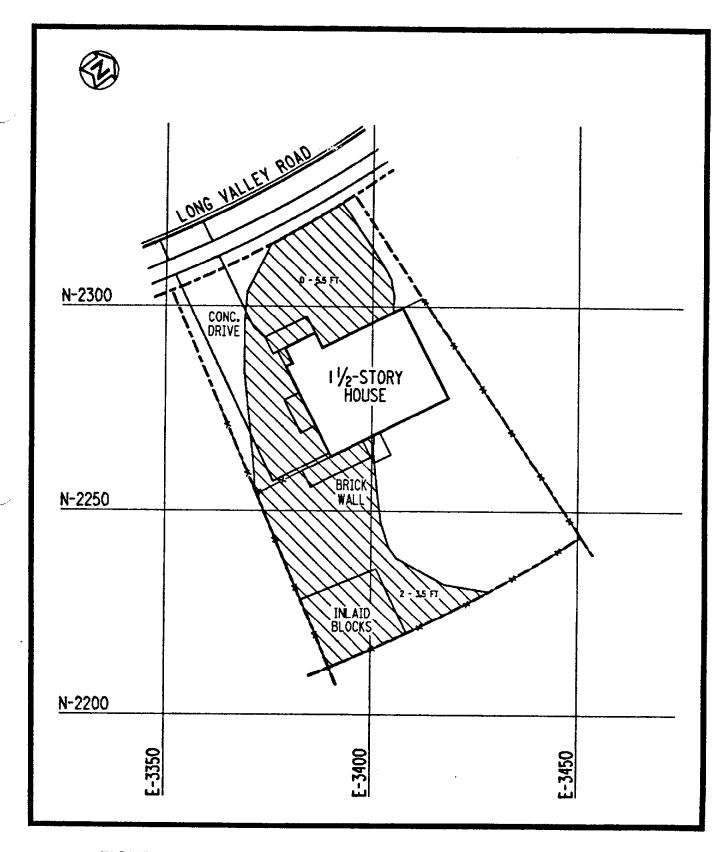


FIGURE 5-2 AREAS OF SUBSURFACE CONTAMINATION AT 26 LONG VALLEY ROAD

JKL.

Results of measurements for thoron daughters ranged from 0.0001 to 0.0008 WL. The generic guideline is more restrictive for radon-222 (radon) than for radon-220 (thoron) according to NCRP Report No. 50 (Ref. 11), which was used as the guideline for thoron daughter measurements.

Exterior gamma radiation exposure rate measurements ranged from 8 μ R/h to 17 μ R/h, including background. The indoor exposure rate measurement was 7 μ R/h, including background. None of the seven exterior measurements exceeds the DOE guideline of 100 mrem/yr for public exposure. This is based on the assumption of 16 hours occupancy per day for 365 days per year (5,840 hours) and subtracting average background of 9 μ R/h (Ref. 12). These results can be found in Table 5-3.

SURFACE AND SUBSURFACE RADIONUCLIDE CONCENTRATIONS IN SOIL FOR 26 LONG VALLEY ROAD^a

í

, , , . . ĺ

i.

÷

1

Coord	linates	Depth	Concent	ration ($pCi/q + / - 2 sig$	(ma)
East	North	(ft)	Uranium-238	Radium-226	Thorium-232
3362	2305	0.0 - 0.5	– b –	0.8 +/- 0.1	4.4 +/- 1.4
3362	2305	0.5 - 1.0	-b-	0.9 +/- 0.3	2.4 +/- 0.9
3362	2309	0.0 - 0.5	-b-	< 2.2	10.5 +/- 1.0
3362	2309	0.5 - 1.0	-b-	1.5 +/- 0.6	3.2 +/- 0.4
3375	2251	0.0 - 0.5	-b-	0.8 + / - 0.4	1.4 +/- 0.4
3375	2251	0.5 - 1.0	-b-	0.5 +/- 0.4	3.0 +/- 0.4
3378	2300	0.0 - 0.5	- b -	< 3.0	25.5 +/- 1.3
3378	2300	0.5 - 1.0	- b	0.8 +/- 0.4	2.9 +/- 0.5
3380	2330	0.0 - 0.5	- b-	1.2 +/- 0.3	1.9 +/- 0.3
3380	2330	0.5 - 1.0	- b-	0.7 +/- 0.4	1.0 +/- 0.3
3382	2232	0.0 - 0.5	- b	< 2.1	< 3.8
3382	2232	0.5 - 1.0	-b	0.4 +/- 0.3	2.5 +/- 0.3
3386	2320	0.0 - 0.5	- b	0.8 +/- 0.4	13.8 +/- 0.5
3386	2320	0.5 - 1.0	- b	0.7 +/- 0.3	4.5 +/- 0.7
3400	2298	0.0 - 0.5	- b-	2.6 +/- 0.7	35.5 +/- 1.1
3400	2298	0.5 - 1.0	- b -	2.2 +/- 0.5	7.7 +/- 0.8
3406	2268	0.0 - 0.5	b	< 1.2	0.9 +/- 0.7
3406	2268	0.5 - 1.0	- b-	1.3 +/- 0.5	3.2 +/- 0.5

(continued)

Coord	<u>linates</u>	Depth	Concent	ration (pCi/g +/- 2 sig	ma)
East	North	(ft)	Uranium-238	Radium-226	Thorium-232
3408	2246	0.0 - 0.5	-b-	0.9 +/- 0.4	1.6 +/- 0.3
3408	2246	0.5 - 1.0	- b -	< 1.7	2.0 +/- 0.4
3409	2224	0.0 - 0.5	-b-	< 1.4	1.5 +/- 0.3
3409	2224	0.5 - 1.0	b	< 1.4	2.1 +/- 0.4
3416	2288	0.0 - 0.5	-b-	1.2 + / - 0.4	8.5 +/- 0.5
3416	2288	0.5 - 1.0	- b -	< 1.5	1.6 +/- 0.4
3440	2239	0.0 - 0.5	-b-	0.8 +/- 0.5	1.4 +/- 0.4
3440	2239	0.5 - 1.0	-b-	2.1 +/- 0.5	1.1 +/- 0.6

^aSampling locations are shown in Figure 4-2.

^bAnalysis not requested.

| [

ł

TABLE 5-2

DOWNHOLE GAMMA LOGGING RESULTS

FOR 26 LONG VALLEY ROAD

TABLE 5-2

•

.

(continued)

Page 2 of 6					
<u>Coordi</u> East	nates North	Depth ^b (ft)	Count Rate ^C (cpm)		
Borehole (456R	· · · · · · · · · · · · · · · · · · ·			
3378	2300	0.5	24000		
3378	2300	1.0	29000		
3378	2300	1.5	18000		
3378	2300	2.0	14000		
3378	2300	2.5	14000		
3378	2300	3.0	13000		
3378	2300	3.5	12000		
3378	2300	4.0	13000		
3378	2300	4.5	11000		
3378	2300	5.0	12000		
3378	2300	5.5	120000		
3378	2300	6.0	12000		
3378	2300	6.5	10000		
3378	2300	7.0	90 00		
3378	2300	7.5	10000		
3378	2300	8.0	9000		
Borehole_	<u>457R</u> d				
3362	2309	0.5	18000		
3362	2309	1.0	22000		
3362	2309	1.5	17000		
3362	2309	2.0	14000		
3362	2309	2.5	12000		
3362	2309	3.0	13000		
3362	2309	3.5	12000		
3362	2309	4.0	13000		
3362	2309	4.5	12000		
3362	2309	5.0	12000		
3362	2309	5.5	14000		
3362	2309	6.0	13000		
3362	2309	6.5	12000		
3362	2309	7.0	12000		
Borehole 458R					
3386	2320	0.5	43000		
3386	2320	1.0	36000		
3386	2320	1.5	21000		

28

TABLE 5-2

(continued)

Coordinates Depth ^b (ft) Count Rate ^c (cpm) Borehole 458R (continued) 3386 2320 2.0 13000 3386 2320 2.5 13000 Borehole 459R ^d 3416 2288 0.5 19000 3416 2288 1.0 19000 3416 2288 1.0 19000 3416 2288 2.0 13000 3416 2288 2.0 13000 3416 2288 3.0 13000 3416 2288 3.0 13000 3416 2288 3.0 13000 3416 2288 5.5 12000 3416 2288 5.5 12000 3416 2288 5.5 12000 3416 2288 7.5 11000 3416 2288 7.5 11000 3416 2288 7.5 10000 3416 2288 7.5 10000	Page 3 of 6					
Borehole 458R (continued) 3386 2320 2.0 13000 3386 2320 2.5 13000 Borehole 459R ^d 3416 2288 1.0 19000 3416 2288 1.5 16000 3416 2288 2.0 13000 3416 2288 2.0 13000 3416 2288 2.5 14000 3416 2288 3.5 12000 3416 2288 3.5 12000 3416 2288 4.0 12000 3416 2288 5.5 10000 3416 2288 5.5 12000 3416 2288 5.5 12000 3416 2288 7.5 11000 3416 2288 7.5 11000 3416 2288 7.5 1000 3416 2288 7.5 1000 3416 2288 7.5 1000 3406			Depth ^b			
3386 2320 2.0 13000 3386 2320 2.5 13000 Borehole 459R ^d 3416 2288 1.0 19000 3416 2288 1.0 19000 3416 2288 1.5 16000 3416 2288 2.0 13000 3416 2288 2.0 13000 3416 2288 3.0 13000 3416 2288 3.0 13000 3416 2288 3.5 12000 3416 2288 4.0 12000 3416 2288 5.5 12000 3416 2288 5.5 12000 3416 2288 6.0 10000 3416 2288 7.5 11000 3416 2288 7.5 11000 3416 2288 7.5 11000 3416 2288 7.5 11000 3406 2268 1.0 15000 3406 2268 1.0 15000 340	East	North	(11)	(Cpm)		
3386 2320 2.0 13000 3386 2320 2.5 13000 Borehole 459R ^d 3416 2288 1.0 19000 3416 2288 1.0 19000 3416 2288 1.5 16000 3416 2288 2.0 13000 3416 2288 2.0 13000 3416 2288 3.0 13000 3416 2288 3.0 13000 3416 2288 3.5 12000 3416 2288 4.0 12000 3416 2288 5.5 12000 3416 2288 5.5 12000 3416 2288 6.0 10000 3416 2288 7.5 11000 3416 2288 7.5 11000 3416 2288 7.5 11000 3416 2288 7.5 11000 3406 2268 1.0 15000 3406 2268 1.0 15000 340		· · · · · · · · · · · · · · · · · · ·				
3386 2320 2.5 13000 Borehole 459R ^d 3416 2288 0.5 19000 3416 2288 1.0 19000 3416 2288 1.5 16000 3416 2288 2.0 13000 3416 2288 2.5 14000 3416 2288 3.0 13000 3416 2288 3.0 13000 3416 2288 3.5 12000 3416 2288 4.0 12000 3416 2288 5.5 12000 3416 2288 5.5 12000 3416 2288 6.0 10000 3416 2288 7.5 11000 3416 2288 7.5 11000 3416 2288 7.5 11000 3416 2288 7.5 11000 3416 2288 7.5 11000 3406 2268 1.5 12000 3406 2268 1.5 12000	Borehole	458R (cont	inued)			
Borehole 459R ^d 3416 2288 0.5 19000 3416 2288 1.0 19000 3416 2288 1.5 16000 3416 2288 2.0 13000 3416 2288 2.5 14000 3416 2288 3.5 12000 3416 2288 3.5 12000 3416 2288 4.0 12000 3416 2288 5.5 12000 3416 2288 5.5 12000 3416 2288 5.5 12000 3416 2288 5.5 12000 3416 2288 7.5 11000 3416 2288 7.5 11000 3416 2288 7.5 1000 3416 2288 7.5 1000 3416 2288 7.5 1000 3406 2268 1.5 12000 3406 2268 1.5 12000 3406 2268 3.5 12000 <t< td=""><td></td><td></td><td></td><td></td></t<>						
3416 2288 0.5 19000 3416 2288 1.0 19000 3416 2288 1.5 16000 3416 2288 2.0 13000 3416 2288 2.5 14000 3416 2288 3.0 13000 3416 2288 3.5 12000 3416 2288 4.0 12000 3416 2288 4.0 12000 3416 2288 5.5 12000 3416 2288 5.5 12000 3416 2288 5.5 12000 3416 2288 7.0 10000 3416 2288 7.5 11000 3416 2288 7.5 10000 3416 2288 7.5 10000 3416 2288 7.5 10000 3406 2268 1.0 15000 3406 2268 1.5 19000 3406 2268 3.0 12000 3406 2268	3386	2320	2.5	13000		
3416 2288 1.0 19000 3416 2288 1.5 16000 3416 2288 2.0 13000 3416 2288 2.5 14000 3416 2288 3.0 13000 3416 2288 3.0 13000 3416 2288 3.0 12000 3416 2288 4.0 12000 3416 2288 4.5 11000 3416 2288 5.5 12000 3416 2288 5.5 12000 3416 2288 7.0 1000 3416 2288 7.5 11000 3416 2288 7.5 11000 3416 2288 7.5 11000 3416 2288 7.5 11000 3406 2268 1.0 15000 3406 2268 1.5 19000 3406 2268 2.5 12000 3406 2268 3.5 10000 3406 2268	Borehole	<u>459R</u> d				
3416 2288 1.5 16000 3416 2288 2.0 13000 3416 2288 2.5 14000 3416 2288 3.0 13000 3416 2288 3.5 12000 3416 2288 3.5 12000 3416 2288 4.0 12000 3416 2288 4.5 11000 3416 2288 5.5 12000 3416 2288 5.5 12000 3416 2288 6.0 10000 3416 2288 6.5 12000 3416 2288 7.5 11000 3416 2288 7.5 11000 3416 2288 7.5 11000 3416 2288 7.5 1000 3406 2268 0.5 12000 3406 2268 1.5 19000 3406 2268 2.5 12000 3406 2268 3.5 10000 3406 2268				19000		
3416 2288 2.0 13000 3416 2288 2.5 14000 3416 2288 3.0 13000 3416 2288 3.5 12000 3416 2288 4.0 12000 3416 2288 4.0 12000 3416 2288 4.5 11000 3416 2288 5.5 12000 3416 2288 5.5 12000 3416 2288 6.5 12000 3416 2288 7.0 11000 3416 2288 7.5 11000 Borehole 460R 2268 1.5 3406 2268 1.5 19000 3406 2268 1.5 19000 3406 2268 2.5 12000 3406 2268 2.5 12000 3406 2268 3.5 11000 3406 2268 3.5 1000 3406 2268 3.5 1000 3406 2268				19000		
3416 2288 2.5 14000 3416 2288 3.0 13000 3416 2288 3.5 12000 3416 2288 4.0 12000 3416 2288 4.5 11000 3416 2288 4.5 11000 3416 2288 5.5 12000 3416 2288 5.5 12000 3416 2288 6.5 12000 3416 2288 6.5 12000 3416 2288 7.5 11000 3416 2288 7.5 11000 3416 2288 7.5 11000 3416 2288 7.5 11000 3416 2288 7.5 1000 3406 2268 1.5 19000 3406 2268 1.5 19000 3406 2268 2.5 12000 3406 2268 3.5 1000 3406 2268 3.5 1000 3406 2268 <t< td=""><td></td><td></td><td></td><td></td></t<>						
3416 2288 3.0 13000 3416 2288 3.5 12000 3416 2288 4.0 12000 3416 2288 4.5 11000 3416 2288 5.0 13000 3416 2288 5.5 12000 3416 2288 5.5 12000 3416 2288 6.5 12000 3416 2288 6.5 12000 3416 2288 7.0 11000 3416 2288 7.5 11000 3416 2288 7.5 11000 3416 2288 7.5 11000 3416 2288 7.5 11000 3406 2268 1.5 12000 3406 2268 1.5 19000 3406 2268 2.5 12000 3406 2268 3.5 11000 3406 2268 3.5 12000 3406 2268 3.5 12000 3406 2268						
3416 2288 3.5 12000 3416 2288 4.0 12000 3416 2288 4.5 11000 3416 2288 5.0 13000 3416 2288 5.5 12000 3416 2288 5.5 12000 3416 2288 6.0 10000 3416 2288 6.5 12000 3416 2288 7.0 11000 3416 2288 7.5 11000 3416 2288 7.5 11000 Borehole 460R 2268 1.0 15000 3406 2268 1.5 19000 3406 2268 1.5 19000 3406 2268 2.5 12000 3406 2268 3.5 11000 3406 2268 3.5 12000 3406 2268 3.5 12000 3406 2268 4.5 13000 3406 2268 5.5 13000 3406 2268 </td <td></td> <td></td> <td></td> <td></td>						
3416 2288 4.0 12000 3416 2288 4.5 11000 3416 2288 5.0 13000 3416 2288 5.5 12000 3416 2288 6.0 10000 3416 2288 6.5 12000 3416 2288 6.5 12000 3416 2288 7.0 11000 3416 2288 7.5 11000 Borehole 460R 2268 0.5 12000 3406 2268 1.0 15000 3406 2268 1.5 19000 3406 2268 1.5 19000 3406 2268 2.5 12000 3406 2268 2.5 12000 3406 2268 3.5 11000 3406 2268 3.5 10000 3406 2268 4.0 11000 3406 2268 5.5 13000 3406 2268 5.5 13000 3406 2268 </td <td></td> <td></td> <td></td> <td></td>						
3416 2288 4.5 11000 3416 2288 5.0 13000 3416 2288 5.5 12000 3416 2288 6.0 10000 3416 2288 6.5 12000 3416 2288 7.0 11000 3416 2288 7.0 11000 3416 2288 7.5 11000 Borehole 460R 268 1.0 15000 3406 2268 1.0 15000 3406 2268 1.5 19000 3406 2268 2.5 12000 3406 2268 2.5 12000 3406 2268 3.0 12000 3406 2268 3.5 11000 3406 2268 3.5 10000 3406 2268 4.5 13000 3406 2268 5.5 13000 3406 2268 5.5 13000 3406 2268 6.5 12000 3406						
3416 2288 5.0 13000 3416 2288 5.5 12000 3416 2288 6.0 10000 3416 2288 6.5 12000 3416 2288 7.0 11000 3416 2288 7.0 11000 3416 2288 7.5 11000 Borehole 460R 3406 2268 0.5 12000 3406 2268 1.0 15000 3406 2268 1.5 19000 3406 2268 2.5 12000 3406 2268 2.5 12000 3406 2268 3.0 12000 3406 2268 3.5 11000 3406 2268 4.0 11000 3406 2268 5.5 13000 3406 2268 5.5 13000 3406 2268 5.5 12000 3406 2268 6.5 12000 3406 2268 6.5 12000						
3416 2288 5.5 12000 3416 2288 6.0 10000 3416 2288 6.5 12000 3416 2288 7.0 11000 3416 2288 7.0 11000 3416 2288 7.5 11000 Borehole 460R 3406 2268 0.5 12000 3406 2268 1.0 15000 3406 2268 1.5 19000 3406 2268 2.5 12000 3406 2268 2.5 12000 3406 2268 3.0 12000 3406 2268 3.5 11000 3406 2268 3.5 13000 3406 2268 4.5 13000 3406 2268 5.5 13000 3406 2268 5.5 12000 3406 2268 6.5 12000 3406 2268 6.5 12000 3406 2268 6.5 120						
3416 2288 6.0 10000 3416 2288 6.5 12000 3416 2288 7.0 11000 3416 2288 7.5 11000 Borehole 460R 3406 2268 0.5 12000 3406 2268 1.0 15000 3406 2268 1.5 19000 3406 2268 2.0 15000 3406 2268 2.5 12000 3406 2268 2.5 12000 3406 2268 3.0 12000 3406 2268 3.5 11000 3406 2268 3.5 1000 3406 2268 4.0 11000 3406 2268 5.5 13000 3406 2268 5.5 13000 3406 2268 6.5 12000 3406 2268 6.5 12000 Borehole 461R 3375 2251 0.5 10000						
3416 2288 6.5 12000 3416 2288 7.0 11000 3416 2288 7.5 11000 Borehole 460R 3406 2268 0.5 12000 3406 2268 1.0 15000 3406 2268 1.5 19000 3406 2268 2.0 15000 3406 2268 2.5 12000 3406 2268 2.5 12000 3406 2268 3.0 12000 3406 2268 3.5 11000 3406 2268 3.5 11000 3406 2268 3.5 11000 3406 2268 4.0 11000 3406 2268 5.5 13000 3406 2268 5.5 13000 3406 2268 6.5 12000 Borehole 461R 3375 2251 0.5 10000						
3416 2288 7.0 11000 3416 2288 7.5 11000 Borehole_460R 3406 2268 0.5 12000 3406 2268 1.0 15000 3406 2268 1.5 19000 3406 2268 2.0 15000 3406 2268 2.5 12000 3406 2268 2.5 12000 3406 2268 3.0 12000 3406 2268 3.0 12000 3406 2268 3.5 11000 3406 2268 4.0 11000 3406 2268 5.0 15000 3406 2268 5.5 13000 3406 2268 5.5 13000 3406 2268 6.5 12000 3406 2268 6.5 12000 3406 2268 6.5 12000 3406 2268 6.5 12000 3406 2268 6.5 12000 Boreho						
3416 2288 7.5 11000 Borehole 460R 3406 2268 0.5 12000 3406 2268 1.0 15000 3406 2268 1.5 19000 3406 2268 2.0 15000 3406 2268 2.0 15000 3406 2268 2.5 12000 3406 2268 3.0 12000 3406 2268 3.5 11000 3406 2268 3.5 10000 3406 2268 4.0 11000 3406 2268 5.5 13000 3406 2268 5.5 13000 3406 2268 6.5 12000 3406 2268 6.5 12000 3406 2268 6.5 12000 3406 2268 6.5 12000 3406 2268 6.5 12000 3406 2268 6.5 12000 3406 2268 6.5 12000						
Borehole 460R 3406 2268 0.5 12000 3406 2268 1.0 15000 3406 2268 1.5 19000 3406 2268 2.0 15000 3406 2268 2.5 12000 3406 2268 2.5 12000 3406 2268 3.0 12000 3406 2268 3.5 11000 3406 2268 4.0 11000 3406 2268 5.5 13000 3406 2268 5.5 13000 3406 2268 5.5 12000 3406 2268 5.5 12000 3406 2268 5.5 12000 3406 2268 6.5 12000 3406 2268 6.5 12000 3406 2268 6.5 12000 3406 2268 6.5 12000 3406 2268 6.5 12000						
3406 2268 0.5 12000 3406 2268 1.0 15000 3406 2268 1.5 19000 3406 2268 2.0 15000 3406 2268 2.0 15000 3406 2268 2.5 12000 3406 2268 3.0 12000 3406 2268 3.5 11000 3406 2268 3.5 11000 3406 2268 4.0 11000 3406 2268 4.5 13000 3406 2268 5.5 13000 3406 2268 5.5 13000 3406 2268 6.0 12000 3406 2268 6.5 12000 3406 2268 6.5 12000	3416	2288	7.5	11000		
3406 2268 1.0 15000 3406 2268 1.5 19000 3406 2268 2.0 15000 3406 2268 2.5 12000 3406 2268 3.0 12000 3406 2268 3.5 11000 3406 2268 3.5 11000 3406 2268 4.0 11000 3406 2268 4.5 13000 3406 2268 5.5 13000 3406 2268 5.5 13000 3406 2268 6.0 12000 3406 2268 6.5 12000 3406 2268 6.5 12000	<u>Borehole</u>	<u>460R</u>				
3406 2268 1.5 19000 3406 2268 2.0 15000 3406 2268 2.5 12000 3406 2268 3.0 12000 3406 2268 3.0 12000 3406 2268 3.5 11000 3406 2268 4.0 11000 3406 2268 4.5 13000 3406 2268 5.0 15000 3406 2268 5.5 13000 3406 2268 6.0 12000 3406 2268 6.5 12000 3406 2268 6.5 12000 3406 2268 6.5 12000	3406	2268	0.5	12000		
3406 2268 2.0 15000 3406 2268 2.5 12000 3406 2268 3.0 12000 3406 2268 3.5 11000 3406 2268 3.5 11000 3406 2268 4.0 11000 3406 2268 4.5 13000 3406 2268 5.0 15000 3406 2268 5.5 13000 3406 2268 6.0 12000 3406 2268 6.5 12000 Borehole 461R 2251 0.5 10000						
3406 2268 2.5 12000 3406 2268 3.0 12000 3406 2268 3.5 11000 3406 2268 4.0 11000 3406 2268 4.0 11000 3406 2268 4.5 13000 3406 2268 5.0 15000 3406 2268 5.5 13000 3406 2268 6.0 12000 3406 2268 6.5 12000 3406 2268 6.5 12000 Borehole 461R 2251 0.5 10000				19000		
3406 2268 3.0 12000 3406 2268 3.5 11000 3406 2268 4.0 11000 3406 2268 4.5 13000 3406 2268 5.0 15000 3406 2268 5.5 13000 3406 2268 5.5 13000 3406 2268 6.0 12000 3406 2268 6.5 12000 Borehole 461R 2251 0.5 10000	3406	2268		15000		
3406 2268 3.5 11000 3406 2268 4.0 11000 3406 2268 4.5 13000 3406 2268 5.0 15000 3406 2268 5.5 13000 3406 2268 5.5 13000 3406 2268 6.0 12000 3406 2268 6.5 12000 Borehole 461R 3375 2251 0.5 10000	3406			12000		
3406 2268 4.0 11000 3406 2268 4.5 13000 3406 2268 5.0 15000 3406 2268 5.5 13000 3406 2268 5.5 13000 3406 2268 6.0 12000 3406 2268 6.5 12000 Borehole 461R 3375 2251 0.5 10000				12000		
3406 2268 4.5 13000 3406 2268 5.0 15000 3406 2268 5.5 13000 3406 2268 6.0 12000 3406 2268 6.5 12000 3406 2268 6.5 12000 Borehole 461R 3375 2251 0.5 10000	3406	2268		11000		
3406 2268 5.0 15000 3406 2268 5.5 13000 3406 2268 6.0 12000 3406 2268 6.5 12000 Borehole 461R 3375 2251 0.5 10000						
3406 2268 5.5 13000 3406 2268 6.0 12000 3406 2268 6.5 12000 Borehole_461R 3375 2251 0.5 10000						
3406 2268 6.0 12000 3406 2268 6.5 12000 Borehole 461R 3375 2251 0.5 10000						
3406 2268 6.5 12000 Borehole 461R 3375 2251 0.5 10000						
Borehole 461R 3375 2251 0.5 10000						
3375 2251 0.5 10000	3406	2268	6.5	12000		
	Borehole 461R					
	3375	2251	0.5	10000		

١

(continued)

<u>Page 4 o</u>	<u>f 6</u>		
<u> Coord</u>	<u>inates</u>	Depth ^b	Count Rate ^C
East	North	(ft)	(cpm)
Borehole	461R (cont	inued)	
	0053		23.000
3375	2251	1.5	21000
3375	2251	2.0	56000 37000
3375	2251 2251	2.5 3.0	19000
3375	2251	3.0	19000
<u>Borehole</u>	<u>462R</u> d		
3382	2232	0.5	8000
3382	2232	1.0	11000
3382	2232	1.5	12000
3382	2232	2.0	13000
3382	2232	2.5	16000
3382	2232	3.0	42000
3382	2232	3.5	41000
3382	2232	4.0	24000
3382	2232	4.5	17000
3382	2232	5.0	16000
<u>Borehole</u>	<u>463R</u> d		
3409	2224	0.5	8000
3409	2224	1.0	9000
3409	2224	1.5	10000
3409	2224	2.0	11000
3409	2224	2.5	11000
3409	2224	3.0	24000
3409	2224	3.5	30000
3409	2224	4.0	16000
3409	2224	4.5	17000
3409	2224	5.0	12000
3409	2224	5.5	11000
3409	2224	6.0	10000
<u>Borehole</u>	464R ^d		
3440	2239	0.5	7000
3440	2239	1.0	8000
3440	2239	1.5	9000
3440	2239	2.0	10000

30

(continued)

Page 5 of 6

ŗ

n --

	<u>inates</u>	Depth ^b	Count Rate ^C
East	North	(ft)	(cpm)
<u>Borehole</u>	<u>464R</u> d		
3440	2239	2.5	11000
3440	2239	3.0	13000
3440	2239	3.5	17000
3440	2239	4.0	18000
3440	2239	4.5	17000
3440	2239	5.0	16000
3440	2239	5.5	12000
3440	2239	6.0	11000
3440	2239	6.5	9000
3440	2239	7.0	9000
3440	2239	7.5	9000
<u>Borehole</u>	<u>465R</u>		
3408	2246	0.5	7000
3408	2246	1.0	8000
3408	2246	1.5	9000
3408	2246	2.0	10000
3408	2246	2.5	11000
3408	2246	3.0	13000
3408	2246	3.5	14000
3408	2246	4.0	14000
3408	2246	4.5	12000
3408	2246	5.0	12000
3408	2246	5.5	12000
3408	2246	6.0	10000
3408	2246	6.5	10000
<u>Borehole</u>	<u>509R</u> d		
3362	2305	0.5	15000
3362	2305	1.0	13000
3362	2305	1.5	12000
3362	2305	2.0	13000
3362	2305	2.5	12000
3362	2305	3.0	13000
3362	2305	3.5	12000
3362	2305	4.0	12000
3362	2305	4.5	12000

۱ . •

(continued)

Page 6 of 6

<u>Coordi</u> East	<u>nates</u> North	Depth ^b (ft)	Count Rate ^C (cpm)
Borehole	509R (cont	<u>inued)</u> d	
3362	2305	5.0	12000
3362	2305	5.5	12000
3362	2305	6.0	11000
3362	2305	6.5	11000
3362	2305	7.0	9000
3362	2305	7.5	9000
3362	2305	8.0	7000
3362	2305	8.5	7000
3362	2305	9.0	7000
3362	2305	9.5	7000
aBorehole Figure 4		are shown	in

^bThe variations in depths of boreholes and corresponding results given in this table are based on the boreholes penetrating the contamination or the drill reaching refusal.

^CInstrument used was 2-in. by 2-in. thallium-activated sodium iodide gamma scintillation detector.

^dBottom of borehole collapsed.

GAMMA RADIATION EXPOSURE RATES

Coordi	nates	
East	North	µR/h
3369	2317	17
3373	2269	8
3390	2248	9
3393	2304	17
3416	2236	9
3421	2261	10
INTERIOR	OF RESIDENCE	7

FOR 26 LONG VALLEY ROAD

Measurements include background.

.

×.....

· --

REFERENCES

- U.S. Department of Energy. <u>Description of the Formerly</u> <u>Utilized Sites Remedial Action Program</u>, ORO-777, Oak Ridge, TN, September 1980 (as modified by DOE in October 1983).
- Argonne National Laboratory. <u>Action Description Memorandum,</u> <u>Interim Remedial Actions at Maywood, New Jersey</u>, Argonne, IL, March 1987.
- 3. Argonne National Laboratory. <u>Action Description Memorandum,</u> <u>Proposed 1984 Remedial Actions at Maywood, New Jersey</u>, Argonne, IL, June 8, 1984.
- Bechtel National, Inc. <u>Post-Remedial Action Report for the</u> <u>Lodi Residential Properties</u>, DOE/OR/20722-89, Oak Ridge, TN, August 1986.
- 5. NUS Corporation. <u>Radiological Study of Maywood Chemical</u>, <u>Maywood</u>, <u>New Jersey</u>, November 1983.
- EG&G Energy Measurements Group. <u>An Aerial Radiologic Survey of</u> the Stepan Chemical Company and Surrounding Area, Maywood, <u>New Jersey</u>, NRC-8109, Oak Ridge, TN, September 1981.
- 7. Oak Ridge National Laboratory. <u>Results of the Mobile Gamma</u> <u>Scanning Activities in Lodi, New Jersey</u>, ORNL/RASA-84/3, Oak Ridge, TN, October 1984.
- 8. Oak Ridge National Laboratory. <u>Results of the Radiological</u> <u>Survey at 26 Long Valley Road (LJ049)</u>, Lodi, New Jersey, ORNL/RASA-86/36, Oak Ridge, TN, September 1986.
- 9. Letter, Jeff Brown, Thermo Analytical/Eberline, to Distribution. "Technical Review of Grand Junction Instrument Correlation Study," BNI CCN 035506, March 17, 1986.

- 10. <u>U.S. Code of Federal Regulations</u>. 40 CFR 192, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings, "Washington, D.C., July 1986.
- 11. National Council on Radiation Protection and Measurements. <u>Environmental Radiation Measurements</u>, NCRP Report No. 50, Washington, D.C., December 27, 1986.
- 12. Levin, S. G., R. K. Stoms, E. Kuerze, and W. Huskisson. "Summary of Natural Environmental Gamma Radiation Using a Calibrated Portable Scintillation Counter." <u>Radiological</u> <u>Health Data Report</u> 9:679-695 (1968).

APPENDIX A

GEOLOGIC DRILL LOGS FOR 26 LONG VALLEY ROAD

LODI, NEW JERSEY

Γ	-	_	~ [-	<u>.</u>	0		<u> </u>	D	DI	1	LC			PRC	JEC	T		JOB NO. SHEET NO. HOLE NO.
s	ITE		31	=	<u>л</u>							Ll		DORDI		<u>s</u>			FUSRAP 14501-138 1 OF 1 454R ANGLE FROM HORIZBEARING
Ľ		26]	La								D	[)				_			N 2330; E 3380 Vertical
	EGU	או -9-8	0 4			LET			ILL		מר	E T	DT	NCH	1				MAKE AND MODEL SIZE OVERBURDEN ROCK (FT.) TOTAL DEPT
									ORE					EL. T		ASI	ID ING		GROUND EL. DEPTH/EL. GROUND WATER DEPTH/EL. TOP OF ROCK
				/						- 10					015.	<u></u>			44.2 6.0/38.2 10-9-86 /
P	amp	PLE I	nai		κι N/		alist	/ F Al	LL	×.	421	NG L	C 7 1	IN H)NE		A./	LEI	D. McGRANE
Ĩ		ว่น	J	j.	Ţ		≻		PRI	IAT	ER	E	T		T		0		
	AND DIAM.	SAMP. ADU.		CORE REC	SAMPLE	BLOWS "N"	RECOVER	Loss Loss		PRESS.	rs : ,		E	LEV.			GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
	<u>0</u> -									<u>o.</u> p				44.2 35.2	¥	5_			 0.0-9.0 ft. SILTY SAND (SM-SC). Color stratified; fine-to medium-grained; soft; poorly consolidated (loose); moist-saturated at 6.0 ft.; difficult to distinguish between fill and native material. 0.0-5.0 ft. dark reddish brown (10R3/4); few pieces of angular sandstone gravel; numerous grass roots and organics (0.0-0.5 ft). 5.0-6.5 ft. grayish black (N2); few pale green (5G7/2) silty lenses; clayey (SC). 6.5-9.0 ft. dark yellowish brown (10YR4/2). Bottom of borehole at 9.0 ft. Auger spoils were immediately replaced in the hole, 10-9-86.
																			Description and classification of soil samples by visual examination.
50		= SP DEN										-,	SIT	E		2	6		ong Valley Rd. (LODI) HOLE NO. A-1

مر

	(GI	EC)L()G		RIL	L LO	G	PROJE	CT	JOB NO. SHEET NO. HOLE NO. FUSRAP 14501-138 1 OF 1 455R
SITE		_					·· ·		COORDIN	TES		ANGLE FROM HORIZBEARING
BEGU		L				PRILI		DI)			0071	N 2298; E 3400 Vertical
10-		86				1		RETR	ENCH			L NAKE AND MODEL SIZE OVERBURDEN ROCK (FT.) TOTAL DEP &S Little Beaver 4" 9.0 9.0
										P CAS		GROUND EL. DEPTH/EL. GROUND WATER DEPTH/EL. TOP OF ROCK
			1								·	44.8 8.0/36.8 10-9-86 /
L	LE]	N/A	1	/FALL			FT IN HO		A./L	ENGTH LOGGED BY: D. McGRANE
SAMP. TYPE AND DIAM.	SAMP. ADU.		CORE REC.	SAMPLE	X CORE RECOVERY	LOSS IN A.P.M	JATEF ESSU TESTS NH WO WO LL	RE S	ELEV.	DEPTH	GRAPHICS	U DESCRIPTION AND CLASSIFICATION WATER LEVELS, WATER RETURN, CHARACTER OF DRTUINS ST
0 ~							<u>ā</u> .a.		44 .8 \$5.8	5_ - - -		DRILLING, ETC 0.0-9.0 ft. <u>SILTY SAND</u> (SM). Color stratified; fine-to medium-grained; with a few rounded pebbles of various lithologies; soft; poorly consolidated (loose); moist-saturated at 8.0 ft.; difficult to distinguish between fill and native material. 0.0-0.5 ft. grayish black (N2); numerous organics and roots. 0.5-9.0 ft. dark reddish brown (10R3/4); with a few pale green (5G7/2) silty lenses; mixed fill and native material? 8.0 ft. ground wate observed.
												Bottom of borehole at 9.0 ft. Auger spoils were immediately replaced in the hole, 10-9-86.
												Description and classification of soil samples by visual examination.
						= SHEI CHER;		/		26	5 L	ong Valley Rd. (LODI) HOLE NO. A-2

<u>ک</u>۔۔

5---

								ļ	PROJEC	. T	_	· · · · · · · · · · · · · · · · · · ·	JOB NO.	SHE	ET NO.	HOLE NO.
	ł	G	iΕC)LOG	IC D	RILI	l lo)G				FUSRAP		-138 1		456R
	SITE							COORDINA	TES						M HORIZI	
		26 I	ong	y Valle	y Rd.	(LOI	DI)					N 2300; E 3378		Vert		
	BEGL	IN	C	MPLETED	DRILL	ER			k			MAKE AND MODEL SIZE		ROCK	(FT.)	TOTAL DEPTH
				0-9-8				ENCH					<u>4" 8.5</u>			8.5
	COKE	REC	UVEK	T (FI./7		BUXE	SISAMPE	ESEL. TO	P CASI	NG	6	COUND EL. DEPTH/EL. 44.8 ¥ 6.0/38.	GROUND WATER	DEPIN	/EL. TOP	UF RUCK
	SAMP		ANME	R WEIGHT	7FALL	CAS	ING LE	FT IN HOL	E: DI	A. /I	E	HILOGGED BY:			/	
				N/A	,			NO					D. McGH	RANE		
	w.	_*1	_		6	IATER	2	1		1	TĪ					·····
	DIAM.			SAMPLE BLOWS "N" % CORE RECOVERY	PR 1	ESSU ESTS			I	GRAPHICS	μ				NOTES	ON:
	0	-0		E 2 8 8	o Σ	s. T.	ш.	ELEV.	DEPTH	H	SAMPLE	DESCRIPTION AN	ND CLASSIFIC	ATION		LEVELS, RETURN,
	SAMP	Е X Ц Ц Ц	ΞR	φ <u></u> <u></u> <u></u> <u></u>	LOSS IN M.P.M	PRESS.	TIME MIN.		ō	A R A	5				CHARAC	TER OF
	₿A	2	¶ ¶ ∭ U		- 0	ăa.	- 2	44.8			Ц				DRILLI	NG, ETC.
			ĺ						-			0.0-8.5 ft. SILTY SAN stratified; fine-to m numerous pieces of	ND (SM). Color nedium-grained;			
												numerous pieces of ft.);and a few pebbl	concrete (0.0-6.0 les of various		Borehole 0.0-8.5 f	t. using 4"
									-]		ft.);and a few pebbl lithologies; (6.5-8.5 at 6.0 ft.; difficult t	5 ft.) moist-satural	ed	solid-ste	em augers.
									-			netween till and hat	tive material		Site chee radioact	
									-			0.0-1.0 ft. grayish organics and grass r 1.0-6.0 ft. dark red	roots.	. Juo 2 / 4).	contami	nation and
									5_ 7			fill?	TORU DLONU (TORU	•/=j;	bv Eberl	ima-logged ine-TMA,
				1				· #	<u>-</u>			6.0-6.5 ft. dark	yellowish brown		6.0 ft. gr	tion. ound water
									-			(10YR4/2). 6.5-8.5 ft. dark red	ddish brown.		observed	l.
								36.3_	-							
											Π	Bottom of borehole at	8.5 ft. Auger spoil	8		
												Bottom of borehole at were immediately re 10-9-86.	eplaced in the hole	e,		
												10-9-00.				
~ .																
										ļ						
															1	
				ł							$\ $					
				ł							$\ $					
				1												
		-									$\ $					
											$\ $					
											$\ $					
				l							$\ $					
											$\ $				Descript	ion and
				ł											classifics	tion of soil by visual
															examina	
-										ł						
											$\ $					
1				Į							Ш					
				POON; ST			/	ITE	-		_				HOLE NO.	
	U =	DENN	I SON	; P = PI	TCHER;	0 = 0	THER		2() L		ng Valley Rd.		<u> </u>	4	56R

··· ,·

·-----

		0				DIL		<u> </u>	PROJE	СТ				JOB NO		ET NO.	HOLE NO.
	SITE		EU	log		KIL			TES			FUSRAP			-138 1	OF 1	457R
	1		ong.	Valle	y Rd.	(LOI	DI)		1123		N	2309; E 3362	2		1	tical	
	BEGL			MPLETED			DETD	PNOT				KE AND MODEL	SIZE	OVERBURDEN	ROC	K (FT.)	TOTAL DEPTH
				0-9-8				ENCH	P CAS			Little Beaver UND EL. DEPTH	I/EL. GROU	9.0 JND WATER	DEPTH	/EL. TOP	9.0 OF ROCK
			/									44.4	.0/38.4 1	0-9-86		/	
	SAMP	LEH		R WEIGHT N/A	/FALL	CAS	ING LE	FT IN HOI NOI		(A./I	LENG	TH LOGGED BY:		D. McG	DANE		
	<u>n</u> .	-ti	<u>.</u>		1	JATER	2			6	Π			D. MCG	ANE		
	DIAM.	SAMP. ADU. LEN CORE	LE REC	SAMPLE BLOWS "N" X CORE RECOVERY	υΣ	ESSU TESTS	3	ELEV.	ОЕРТН	GRAPHICS	SAMPLE	DESCRIPTIO	N AND C	LASSIFIC	ATION		ON: LEVELS, RETURN,
	SAMP.	SAME	SAMP COR	2018 2018 2018	G.P.M	2 2 2 2 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3	TIME MIN.	44.4	ō	GRB	n					CHARAC	TER OF
										-		0.0-9.0 ft. <u>SILTY</u> (0.0-6.0 ft.) as Color stratifie with few nume	d: fine-to	medium-gra	ined		e drilled ft. using 4"
										1		cobble) variou	ilar gravel is lithologi	(and occasions in the fill	nal	solid-st	em augers.
										_		material; soft; sometimes cla; at 6.0 ft.	unconsoli	dated (loose)	•	radioact	cked for live nation and
									5_	-		0.0-0.3 ft. me numerous gras 0.3-6.0 ft. da	oderate br ss roots an	own (5YR3/- d organics.	4);	hole gar	nma-logged line-TMA,
								Ť	Ţ.	-		0.3-6.0 ft. da 6.0-9.0 ft. mo grayish black mixed fill and	ottled mod	i brown (10R lerate brown	3/4). ' haannan		round water
												mixed fill and horizon?.	indigenou	is upper soil	brown;	observed	.
								35.4 _								4	
												Bottom of boreho were immediat 10-9-86.	ole at 9.0 f tely replac	t. Auger spo ed in the hol	ils le,		
_					•												
								:									
																Descript	ation of soil
																samples examina	by visual tion.
- 1																	
				200N; ST				ITE	<u>ر</u>	<u> </u>	<u> </u>		од <i>(</i> 14	ווחר		HOLE NO	
	<u> </u>	DENN	SUN	; P = PI	I LHEK;	0 = 0	HEK		21			g Valley R	.u. (L		`	4	57R

	6	EC	LOG		DIF			PROJE	CT		JOB NO. SHEET NO. HOLE NO.	
SITE			LUG				COORDINA	TES			FUSRAP 14501-138 1 OF 1 458R	_
1			Valley			DI)					N 2320; E 3386 Vertical	
BEGU			MPLETED			DETD	ENCH				MAKE AND MODEL SIZE OVERBURDEN ROCK (FT.) TOTAL DEP S Little Beaver 4" 3.0 3.0	TH
			0-9-86 ((FT./%				ENCH	P CAS			GROUND EL. DEPTH/EL. GROUND WATER DEPTH/EL. TOP OF ROCK	
		_/			1040			<u> </u>			44.3 ¥ / /	
SAMP	LE M		N/A	/TALL	LAS	ING LE	NO1		A./I		NGTH LOGGED BY: D. McGRANE	
ш.	لساد			j cq	JATER				b b	Ī		-
DIAM.	SAMP. ADU. LEN CORE	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	SAMPLE BLOWS "N" X CORE RECOVERY	 	ESTS	3 	ELEV.	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION WATER LEVELS,	
SAMP.	ΕĽ	П П П П П	SAM OWS	LOSS IN G.P.M	PRESS. P.S.I.	TIME MIN.		Ũ	RAP	SAM	WATER RETURN, CHARACTER OF	
₩£	r N	A D	<u>ъ</u> , т	<u> </u>		Σ 4	44.3		C		DRILLING, ETC	:.
											0.0-3.0 ft. <u>SILTY SAND</u> (SM). Fill material; fine-to medium-grained with few numerous pieces of rounded-angular gravel (and occasional cobble) various lithologies 0.0-3.0 ft. using 4"	
									1		(and occasional cobble) various lithologies in the fill material; soft; unconsolidated (loose); few sandstone blocks and pieces of	
							41.3_				11 gravel: moist. Il Site checked for	
								_			numerous grass roots and organics. contamination and 0.5-3.0 ft. dark reddish brown (10R3/4). hole gamma-logged	1
											Bottom of borehole at 3.0 ft. Auger spoils 3.0 ft. auger refusal	
											Bottom of borehole at 3.0 ft. Auger spoils were immediately replaced in the hole, 10-9-86. Solution 10-9-86. Solution 20-9-86. No ground water	
											observed.	
:												
											•	
											Description and classification of soil samples by visual	i
											examination.	
1			POON; ST			/	ITE	21	61	0	ong Valley Rd. (LODI) HOLE NO. 458R	
					-						A-5	

× 2. ---

`----

														ET NO.	HOLE NO.		
		G	EC)LOG	IC D	RIL	L LO	G				FUSRAP		14501-	138 1		459R
	SITE						- * -	COORDIN	TES					Y		OM HORIZ	BEARING
				Valle			DI)					N 2288; E 3416				tical	
	BEGL		- 1	MPLETED			RFTP	ENCH				MAKE AND MODEL	SIZE 4"	OVERBURDEN 8.5	KOCI	K (FT.)	TOTAL DEPTH
		_			_			ESEL. TO	P CAS			OUND EL. DEPTH/	EL GROU	IND WATER	DEPTH	/EL. TOP	
			1									43.7	5/35.2 1	0-9-86		1	
	S/∴.P	LE H		R WEIGHT	/FALL	CAS	ING LE			A./L	.EN	GTH LOGGED BY:					
				<u>N/A</u>				NO		1	TT			D. McGR	ANE		
	E.	SAMP. ADU. LEN CORE		SAMPLE BLOWS "N" X CORE RECOVERY	PR	JATER	RE		-	S							-
	1 1 1 1	<u>v</u>			Σ	rests		ELEV.	ОЕРТН	GRAPHICS	SAMPLE	DESCRIPTION	AND C	LASSIFICA	TION		LEVELS,
	ê. E.	ĒZ	트폰	A S S S S S S S S S S S S S S S S S S S	G. P. H	90H 90-	HINE MIN.		BO	RAF	Ser						RETURN, TER OF
	8 d	<u>8</u> 1		5	J G	р. С. С. С. С. С. С. С. С. С. С. С. С. С.	FΣ	43.7		σ							ING, ETC.
												0.0-8.5 ft. SILTY and indigenous	SAND (S material	M-SC). Fill . Color strati	fied;		
												fine-to medium consolidated (le	i-grained	; soft; poorly	_	Borehole 0.0-8.5	e drilled ft. using 4 "
:												notes). 0.0-5.0 ft. dar	k reddish	brown (10R3	` /4);		em augers.
												occasional piec shale and sand	es of blac stone gra	k carboniferou vel; numerous	is grass	radioact	
		•							5_			shale and sands roots and organ	-	•		contami hole gan	nation and nma-logged
												5.0-6.0 ft. mo clayey (SC).		• •		by Eber Corpora	line-TMA, tion.
												6.0-8.5 ft. dar quartz pebbles; between fill and	k reddish difficult	brown few ro to distinguish	unded	4.5-5.0	ft. saturated.
1												between fill and	d native r	naterial.			
								35.2 <u>5</u>	2	µ _#	╢						round water
												Bottom of borehol were immediate	le at 8.5 f ely replac	t. Auger spoil ed in the hole	8 ,	observed	1.
				2								10-9-86.					
-																	
					1											Descript	ion and ation of soil
																	by visual
~																	
				200N; ST			/	ITE	~	- •	• •	V # ~		200		HOLE NO	
	P =	DENN	I SON ;	;	TCHER;	0 = 0	THER		2(<u>b</u> L	0	ng Valley R	d. (L(וטכ)	<u></u>	4	<u>59R</u>

		_				511			PROJE	CT				JOB NO.	SHE	ET NO.	HOLE NO.
	L		EC	LOG		KIL						FUSRAP		14501-1			460R
	SITE	-	0.00	Valle	ь р а	(1 01) I)	COORDINA	TES			N 2268; E 3406		AN	igle fri Vert	OM HORIZ	BEARING
	BEGL			MPLETED			<u>,,,</u>			DRIL			SIZE	OVERBURDEN		(FT.)	TOTAL DEPTH
				0-9-86				RENCH			_	5 Little Beaver	4"	6.5			6.5
	CORE	REC	OVER'		CORE	BOXE	SISAMPL	ESEL. TO	P CASI	ING	GI	ROUND EL. DEPTH/	'EL. GROU	ND WATER	DEPTH,	/EL. TOP	OF ROCK
	SAMP	LE H	AMMEI	NEIGHT	 /FALL	CAS	ING LE	FT IN HOL	E: DI	A./L	L Er	43.4 1 /			<u>I.</u>	/	
				N/A				NO						D. McGRA	ANE		
	Щ. Ш.	ப்ப		5, ×	PR	JATEF ESSU	? RE			S	Π		· · ·				
	SAMP. TYPE AND DIAM.	₽Ö	R R	SAMPLE X CORE X CORE RECOVERY		TESTS	<u>}</u>	ELEV.	ОЕРТН	GRAPHICS	SAMPLE	DESCRIPTION	AND C	LASSIFICA	TION	NOTES	ON: LEVELS,
		ē Z	뷥문		LOSS IN G. P. M	SH S	TIME MIN.			E E	N H H					WATER	RETURN,
	1 and 1	SA	<u> F</u> S	<u> </u>	1.9	PRESS.	FΞΣ	43.4		Ö	[1						NG, ETC.
											Π	0.0-6.5 ft. <u>SILTY</u> indigenous mat	orial Co	on stratified.			
							-					fine-to medium consolidated (lo 0.0-1.0 ft. mod rounded cobble	n-grained; oose); moi	soft; poorly st.		Borehol	e drilled [t. using 4"
									-			0.0-1.0 ft. mod rounded cobble	derate bro s of vario	wn (5YR3/4); us lithologies;	few	solid-ste	em augers.
									-			10-65 ft day	s roots and	brown (10VR)	9/41.	Site che radioact	ive
									5_			ft.); numerous j few quartz pebl to distinguish b	ate brown pieces of s	(5YR3/4) (4. andstone grav	0-6.5 el;	hole gan	nation and nma-logged
									-			tew quartz pebl	bles (4.0-) between fi	b.5 ft.); difficu ll and native	lt	Corpora	line-TMA, tion.
								36.9_			Η	material.		A		observed	nd water 1.
												Bottom of borehol were immediate 10-9-86.	ely replace	d in the hole,		cobble?	uger refusal ').
												10-5-00.					
																Ì	
e.																	
										ł							
												•					
														÷			
				•				1									
																Descript	ion and
1																classifics	ation of soil by visual
																examina	
																1	
	SS =	SPL		YOON; ST	= SHEL	BY TU	BE; S	ITE		1	L					HOLE NO	
				P = PI					2(<u>5 L</u>		ng Valley R	<u>d. (LC</u>	DDI)	1	4	<u>60R</u>
											2	4-7			·	-	

~____

`--...-

·....

			FÓ			DIL			PROJE	ст			JOB NO	. SHEI	ET NO.	HOLE NO.
	SITE		EU	DLOG		KILI		COORDIN	TES			FUSRAP		-138 1 ANGLE FR		461R
			,ong	Valley	, Rd.	(LOI	DI)					2251; E 3375		Vert		
	BEGL			MPLETED			DETD	ENCH				KE AND MODEL SIZE Little Beaver 4"	OVERBURDEN 3.0	ROCK	(FT.)	TOTAL DEPTH 3.0
				0-9-86 Y (FT./%				ESEL. TO	P CAS		-	UND EL. DEPTH/EL. GRO		DEPTH,	/EL. TOP	
1	CANO		/	N I K YOUY	16011				5. DI	A 21	ENC	43.3			/	
]	N/A		Ur.	ANG LE	NO		A./L	ENG		D. McG	RANE		
	<u>т</u> .	<u>i</u>		SAMPLE BLOWS "N" X CORE RECOVERY	l PR	JATER	? RE			ι Ω						
	DIAM.	A R	ШЩ	1 802 1 802		TESTS		ELEV.	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND	CLASSIFIC	ATION	NOTES WATER	ON: Levels,
	SAMP.	EN.	<u>T</u> H H H H H H H H H H H H H H H H H H H	SAN SAN	G. P. M	PRESS. P. S. I.	TIME MIN.			RAP	SA					RETURN, TER OF
	8ª B	SA SA	ta S S S S S			<u>a</u> a	ΕΣ	43.3				0.0-3.0 ft. <u>SILTY SAND</u> (SM) Fill Cal		DRILLI	NG, ETC.
												stratified: fine-to medi	um-grained: s	oft:	Borehold	e drilled
i										$\left\ \right\ $		poorly consolidated (lo pieces of sandstone gra (3.0 ft.); moist.			0.0-3.0	ft. using 4" em augers.
								40.3_	•	1	\mathbb{H}	0.0-0.5 ft. moderate b roots and organics. 0.5-3.0 ft. dark reddis	•	· .	Site che radioact	
									_	J		mottled moderate brow	n (5YR3/4).	100/1),	contami hole gan	nation and nma-logged
												Bottom of borehole at 3.0 were immediately repla	ft. Auger spo	ls	by Eber Corpora	line-TMA, tion.
												were immediately repla 10-9-86.	cea in the noi	e,	(cobble?	uger refusal '). nd water
															observed	1.
e																
										[
			•													
																×
									L							
																ation of soil
															samples examina	by visual tion.
				POON; ST			~~/ I	ITE		· -	L.				HOLE NO	
	D =	DENN	I SON ;	; P = P1	TCHER;	0 = 0	THER		20	b L		g Valley Rd. (L	UDI)	١	4	61R
											A	-0				

·-----

·__--

								-	PROJE	ст	·	j	JOB NO. SHEE	T NO. HOLE NO.		
	GEOLOGIC DRILL LOG							G				FUSRAP	14501-138 1 OF 1 462R			
	SITE COORDIN 26 Long Valley Rd. (LODI)							COORDIN	ATES					ANGLE FROM HORIZBEARING		
	BEGL			Valley MPLETED			<u>))</u>			NB TI		N 2232; E 3382 MAKE AND MODEL SIZE OVERE	Verti			
			-	0-9-86			RETR	ENCH				Little Beaver 4"	BURDEN ROCK	(FT.) TOTAL DEPTH		
								ESEL. TO	P CAS			OUND EL. DEPTH/EL. GROUND WA		EL. TOP OF ROCK		
		•	1						• •			43.0		1		
	SAMP	LE H		WEIGHT	/FALL	CAS	ING LE		· ·	A./L	.EN	GTH LOGGED BY:				
	111			N/A		<u>i</u> JATEF	2	NO		1	Π	D.	McGRANE			
	ц К	SAMP. ADU. LEN CORE	SAMPLE REC.	u,z∣m∕∽	PR	ESSU	RE		-	8	Ш			NOTES ON:		
	110	ΥΩ	ШĨ	SAMPLE BLOWS "N" X CORE RECOVERY	ω]		ELEV.	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASS	FICATION	WATER LEVELS,		
	망	ШШ	밀	SAL SAL	LOSS IN G.P.M	PRESS. P. S. I.	TIME NIN.		l 🖁	E E	29		1	WATER RETURN, CHARACTER OF		
	8 B B B B B B B B B B B B B B B B B B B	<u>SA</u>	<u>S</u>	Щ, Ф			FΣ	43.0		Ø				DRILLING, ETC.		
1												0.0-6.5 ft. <u>SILTY SAND</u> (SM). Fi indigenous material. Color str	ratified:			
												fine-to medium-grained; soft; consolidated (loose); moist; nu	Imerous	Borehole drilled 0.0-6.5 ft. using 4"		
												pieces of sandstone gravel. 0.0-0.5 ft. moderate brown (5 0.5-6.5 ft. dark reddish brown	5YR3/4);.	solid-stem augers.		
												0.5-6.5 ft. dark reddish brown mottled moderate brown (5YR	n (10YR3/4); 23/4); few	Site checked for radioactive		
									5			mottled moderate brown (5YR quartz pebbles; difficult to dist between fill and native materia	tingulish al.	contamination and hole gamma-logged		
													I	by Eberline-TMA, Corporation.		
								36.5_		Ľ		· · · ·		No ground water		
												Bottom of borehole at 6.5 ft. Aug were immediately replaced in t	er spoils the hole,	6.5 ft. auger refusal (cobble?).		
												10-9-86.				
2																
										ł						
													-			
													İ			
									1		$\ $	`				
									1							
											$\ $					
											$\ $					
											$\ $					
									1	1						
											$\ $					
										1	II			Description and		
									[$\ $			classification of soil samples by visual		
-									l		$\ $			examination.		
											$\ $					
										·	$\ $	· •				
	SS =	SPI	12 11	DON; ST	= SHFI	BY TH	BEIS	ITE	I	<u> </u>	Ц			HOLE NO.		
				P = PI				-	2	6 L	0	ng Valley Rd. (LODI)) 🔪	462R		
1							· · · · ·					<u>1-9</u>		•••••		

.....

2

·...-

\ .__

										PROJE	ст	•				JOB NO	ISH	EET NO.	HOLE NO.
	GEOLOGIC DRILL LOO												FUSR	AP		14501-138 1 OF 1 463R			
									COORDIN	ATES					ANGLE F	ROM HORIZ			
	BEGL					DRILL		DI)	<u> </u>		NPTI		N 2224; E Iake and mo			OVERBURDEN		rtical K (FT.)	TOTAL DEPTH
	1	.9-8	- I					RETE	RENCH				Little Be		312E 4"	0VERBORDEN 7.0		A (117)	7.0
	CORE	REC	OVER	Y (F	t./%) CORE	BOXE	S SAMPI	ESEL. TI	OP CAS	ING	GR	OUND EL.	DEPTH,	EL. GROUN	ID WATER	DEPT	H/EL. TOP	OF ROCK
	SAME	LE H		RWE	IGHT	/FALL	ICAS	ING LE	EFT IN HO	LE: DI	A./L		42.8 STH (LOGGED	BY:				/	·····,
			J	N/A					NO							D. McGl	RANE		
	д. М.	żμ	<u>сі</u> .	SAMPLE BLOWS "N"	≿	PR	JATER	RE			ဖွ								
	DIAM.	SAMP. ADU. LEN CORE		5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	8 2 2 2 2		TESTS		ELEV.	DEPTH	GRAPHICS	SAMPLE	DESCRI	PTION	I AND CL	ASSIFIC	ATION	NOTES WATER	ON: LEVELS,
	SAMD.	ĒÄ	ŤΨ	SAN OU:	200	LOSS IN A.P.A	90 90 90 10 90	TIME MIN.			RAP	SIAN							RETURN, TER OF
	8ª	S S L	ξŬ	đ	_Ω	5.6		τ	42.8		Ö	Ш							NG, ETC.
													and ind	igenous	materiàl.	1-SC). Fill Color strat	ified;		
													consolio	lated (l	oose): mois	soft; poorly t; numerou	6		t. using 4" am augers.
				Ì										of varia	derate bro ous ligholo	l. wn (5YR3/4 gies (fill)	l); few	Site che	÷
										.	┨║		0.5-3.0 (10YR3) ft. ft.	dark reddi	sh brown		radioact	
		:								5_			`3.0-6.0) ft. dar		brown; moti mixed fill as		hole gan	nma-logged line-TMA,
										.	╢║		floodpl	un sedu	ments?	brown; diffie and native		Corpora	tion. nd water
									35.8			╀╢	to disti materia	nguish l 1.	between fil	and native	•	observed 7.0 ft. at	l. uger refusal
												'						(cobble?).
													were im	mediat	le at 7.0 ft. ely replace	Auger spoi d in the hol	ls e,		
													10-9-80	.					
					1														
1																			
					1														
					1				1										
					1														
											1								
										ł									
										1		$\left \right $						Descript	ion and
									1									classifics	tion of soil by visual
					1													examina	tion.
						= SHE			ITE	 •				_				HOLE NO.	
						TCHER;				2	6 L		ng Vall	ey R	d. (LO	DI)	\	4	<u>63R</u>
												A	-10				_	_	

2____

	GEOLOGIC DRILL LOG								DIG	PROJE	CT				JOB NO. SHEET NO. HOLE NO.			
	SITE	SITE COORD INA							_	TES			FUSRAP		14501-138 1 OF 1 464R ANGLE FROM HORIZBEARING			464R
						Rd.		DI)					N 2239; E 3440			Vert	-	
	BEGL			MPLET		DRILL		ортр	ENCH					SIZE 4"	OVERBURDEN	ROCI	((FT.)	TOTAL DEPTH
^									ESEL. TO	P CASI			S Little Beaver		9.0 ND WATER -9-86	DEPTH	/EL. TOP	9.0 OF ROCK
	C 4 145		/		A.1.7									/34.7 10	•9•86	<u> </u>	/	
	SAMI	'LE M		RWEIG N/A	GHIJ	FALL	CAS	ING LE	FT IN HOL NO		A./I		IGTH LOGGED BY:		D. McGR	ANE		
	μ.	-thu			J		JATER				6	Π			D. MCOR	11112		
	DIAM.	D N N N		BLOWPLE	Ϋ́Έ	1	ESSU		ELEV.	Ŧ	GRAPHICS	Н	DESCRIPTION		ASSTETCA	TTON	NOTES	
	0. 			E SIC	й С	LOSS IN G.P.M	SS.	TIME MIN.		DEPTH	đ	SAMPLE	DESCRIPTION		-4991.104		WATER	LEVELS, RETURN,
	SAMP AND	<u>SAM</u> LE		2	2	G. L	PRESS. P. S. I.	부서보	43.2		В В	n						NG, ETC.
			B1										0.0-9.0 ft. SILTY : and indigenous	SAND (SI	M-SC). Fill Color stratifi	ed:		
										-			fine-to medium consolidated (lo	-grained; ose); moi	soft; poorly st-saturated a	t.	Borehole	drilled t. using 4"
										-			8.5 ft. 0.0-1.5 ft. darl (10YR6/6; num	•			solid-ste	m augers.
										-			organics.				Site chec radioact	
										δ_			1.5-4.5 ft. mod pieces of plastic numerous round	(2.0 and led quarts	4.0 ft.); t pebbles and	black	hole gam	ima-logged
										-			shale gravel; fill 4.5-5.0 ft. grav	? vish black	(N2) clavey		Corpora	tion.
										-			(SC). 5.0-9.0 ft. dark native?	(yellowisi	h brown (YR4	/2);		
									34.2	-			native:				85 ft or	ound water
										-			Bottom of borehole were immediate	e at 9.0 ft ly replace	. Auger spoils d in the hole,		observed	
													10-9-86.					
/					ľ													
					ľ													
			:				ŀ											
							ļ											
			:														1	
ĺ																		
												$\ $						
												$\ $					Descripti	on and tion of soil
1																	samples	by visual
								. lei	TE		L		·····				HOLE NO.	
						= SHEL CHER;				26	5 L	01	ng Valley Ro	I. (LO	DI)	۸		64R
4													-11				*	

	_		~ •						PROJEC	T		· · · · · · · · · · · · · · · · · · ·	JOB NO	. SHEE	T NO.	HOLE NO.
SITE		E		.UG	IC D	KIL			TES			FUSRAP		-138 1 ANGLE FRO		465R
		Lon	g`	Valley	y Rd.	(LOI	DI)	COORDINA	IIES		1	N 2246; E 3408		Verti	· • •	
BEGL	IN	- 10	COM	PLETED	DRILL	ER			D		LI	TAKE AND MODEL SIZE	OVERBURDEN	ROCK	(FT.)	TOTAL DEP
				-9-86 (FT./%				ENCH	P CASI			Little Beaver 4" OUND EL. <u>DEPTH/EL.</u> GROU	7.0 UND WATER	DEPTH/	EL. TOP	OF ROCK
		/	/									43.1			/	
			N	WEIGHT /A		CAS	SING LE	FT IN HOL NO		A./L	EN	GTH LOGGED BY:	D. McGl	RANE		
Ч. Н.	<u>у</u> ш		; ;	BLOWS "N" % CORE RECOVERY	PR	JATEF ESSU	RE			မ္						
DIAM.	2 Q	Ē		:0000 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1		UNH OF	1	ELEV.	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND C	CLASSIFIC			LEVELS,
SAMP		μ			L095 IN G.P.M	PRES P.S. 1	TIME NIN.		ä	BRA	BS				CHARAC	RETURN,
ng G	21-	d G		<u> </u>	0 -	<u>n</u>	<u>۳ ک</u>	43.1			\prod	0.0-7.0 ft. SILTY SAND (S	M-SC), Fill		DRILLI	ING, ETC
									-			and indigenous material fine-to medium-grained	 Color strat soft; poorly 	ified;	Borehol	e drilled
									-			consolidated (loose); mo 0.0-0.5 ft. moderate br 0.5-7.0 ft. dark reddish	oist. own (5YR3/	Ŋ.	0.0-7.0 solid-st	ft. using 4" em augers.
									-			mottled moderate brown of gravel of various lithe	n; numerous j ologies (0.0-4	pieces .5	Site che radioact	cked for
	•								5			ft.); difficult to distingu and native material.	ish between f	11]	hole gar	nation and nma-logged
									-						Corpora	line-TMA, tion. nd water
								3 6.1_	-						observe 7.0 ft. a	i. uger refusa
												Bottom of borehole at 7.0 f were immediately replace	ft. Auger spoi ced in the hol	ls e,	(cobble)	
												10-9-86.				
]						
								r -								
		1														
											$\ $					
											$\ $					
		.	1		1											
					1						$\ $					
																tion and
																ation of soil by visual ation.
SS =	SPI	 .17	SPC	ON: ST	i = Shei	 LBY TI	JBE: S	ITE			Ц				HOLE NO	
					TCHER;		/	<u></u>	26	5 L	0	ng Valley Rd. (L	ODI)	١	4	65R

ک......

۰. ----

SITE COORDINATES COORDINATES N 2305; E 3362 Vertical BEGUN COMPLETED PRILLER PROMETENCH DRILL MAKE AND MODEL SIZE OVERBURDEN ROCK (FT.) TOTAL DEPT 10-31-86/10-31-86 MORETRENCH B&SLITTLE BEAVER 4" 11.0 CORE BOXESSAMPLESEL. TOP CASING GROUND EL. DEPTH/EL. GROUND WATER DEPTH/EL. TOP OF ROCK / SAMPLE HAMMER WEIGHT/FALL CASING LEFT IN HOLE: DIA./LENGTH LOGGED BY: N/A NONE D. McGRANE W TESTS ELEU. TO PRESSURE TESTS ELEU. TO CASING LEFT IN HOLE: DIA./LENGTH LOGGED BY: N/A NONE DESCRIPTION AND CLASSIFICATION MATER RETURN, TESTS ELEU. TO CASING LEFT IN HOLE: DIA./LENGTH LOGGED BY: NOTES ON: MATER RETURN, TESTS ELEU. TO CASING LEFT IN HOLE: DIA./LENGTH LOGGED BY: NOTES ON: MATER RETURN, TESTS ELEU. TO CASING LEFT IN HOLE: DIA./LENGTH LOGGED BY: NOTES ON: MATER RETURN, TESTS ELEU. TO CASING LEFT IN HOLE: DIA./LENGTH LOGGED BY: NOTES ON: MATER RETURN, CHARACTER OF DRILLING, ETC. SAMPLE HAMMER WEIGHT/FALL CASING LEFT IN HOLE: DIA./LENGTH LOGGED BY: NOTES ON: MATER RETURN, CHARACTER OF DRILLING, ETC. SAMPLE HAMMER WEIGHT/FALL CASING LEFT IN HOLE: DIA./LENGTH LOGGED BY: NOTES ON: MATER RETURN, CHARACTER OF DRILLING, ETC. SAMPLE HAMMER CASING LEFT IN HOLE: DIA./LENGTH LOGGED BY: NOTES ON: MATER RETURN, CHARACTER OF DRILLING, ETC. ST. ON: MATER RETURN, CHARACTER OF DRILLING, ETC. SIDE CHECK OF SO - 11.0 ft. color stratified; fine-to SIDE CHECK OF SO - 5.0 ft. moderate brown (5YRS/4); NOTES ON: WATER TENDEN SIDE CHECK OF SO - 5.0 ft. moderate brown (5YRS/4); NOTES ON: SIDE CHECK OF SO - 5.0 ft. moderate brown (10YR3/4). SIDE CHECK OF TORSING STRATCH SIDE CHECK OF TORSING STRATCH SIDE CHECK OF TORSING STRATCH SIDE CHECK OF TORSING STRATCH ST	GEOLOGIC DI	RILL LOG	PROJECT	FUSRAP	JOB NO. SHE 14501-138 1	T NO. HOLE NO. OF 1 509R
BEGNAM COPPLIETED POILLER POILLANCE AND MODEL PIZE PORENDER POILLANCE AND MODEL PIZE PORENDER POILLANCE AND MODEL PIZE PORENDER POILLANCE AND MODEL PIZE POILLANCE AND MODEL PIZ	SITE	COORDIN			ANGLE FR	OM HORIZBEARING
10-31-86(10-31-86) MORETERNCH B&S Liftle Beaver 4" 11.0 11.0 CORE RECORD (F1/AL) DATING LEFT IN MOLE: OLIVICAL BOUND EL. DEPTHONEL. GOUDD WITH DEPTHONE. TO PROCE A.S. 9.4/36.5 10-31-86 SMPLE HAMPER WEIGHT/ALL DATING LEFT IN MOLE: OLIVICAL BOUND EL. DEPTHONEL. GOUDD WITH DEPTHONE. TO PROCE D. McGRANE N/A NONE D. McGRANE N/A PRESSURE ELEU. T. S. SMPLE HAMPER WEIGHT/ALL PRESSURE T. S. S. S. SMPLE HAMPER WEIGHT/ALL PRESSURE ELEU. T. S. SMPLE HAMPER WEIGHT/ALL PRESSURE T. S. S. S. SMPLE HAMPER WEIGHT/ALL PRESSURE T. S. S. S. SMPLE HAMPER WEIGHT/ALL PRESSURE T. S. S. S. SMPLE HAMPER WEIGHT/ALL PRESSURE S. S. D. SME SAL						
CODE EXCURRY (F1.7.) CODE BORESSAMPLEGEL. TO P CASING COND EL. DEPTHAGE. TO P AT CAS SAPLE HAMER RECENT/FALL DATING LEFT 14 HOLE: D1.A.CENTH LOGGED BY: SAPLE HAMER RECENT/FALL DATING LEFT 14 HOLE: D1.A.CENTH LOGGED BY: NONE B: D U U U U U U U U U U U U U U U U U U			1			
SAMPLE MAMER MEIDHT/ALL NA NONE NONE NONE NONE NONE NONE NONE NONE NONE NONE DESCRIPTION AND CLASSIFICATION MATER LEVELS, MATER				ROUND EL. DEPTH/EL		
N/A NONE D. McGRANE US Us<				44.3 ¥ /		/
SS = SPLIT SPOCK; ST = SHELPY TUBE; SS = SPLIT SPOCK; ST = SHELPY TUBE; SS = SPLIT SPOCK; ST = SHELPY TUBE; SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; P = PITCHER; P = SPLICHER; P = PITCHER; P = PIT	N/A				D. McGRANE	
SS = SPLIT SPOCK; ST = SHELPY TUBE; SS = SPLIT SPOCK; ST = SHELPY TUBE; SS = SPLIT SPOCK; ST = SHELPY TUBE; SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; P = PITCHER; P = SPLICHER; P = PITCHER; P = PIT		ESSURE	<u>σ</u>			
SS = SPLIT SPOCK; ST = SHELPY TUBE; SS = SPLIT SPOCK; ST = SHELPY TUBE; SS = SPLIT SPOCK; ST = SHELPY TUBE; SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; O = OTHER SS = SPLIT SPOCK; P = PITCHER; P = PITCHER; P = SPLICHER; P = PITCHER; P = PIT	SAMP. J AND DIA AND DIA SAMPLE R CORE RE CORE RE LOSS LOSS LOSS LOSS LOSS	MH W . ELEV.	DEPTH GRAPHIC SAMPLE	DESCRIPTION A	AND CLASSIFICATION	WATER LEVELS, WATER RETURN,
D = DENNISON; P = PITCHER; O = OTHER 26 Long Valley Road (LODI) 509R		44.5		(0.0-3.0 ft.) and in (4.0-11.0 ft.); color medium-grained; of rounded angula cobble) of various material; soft; uno sometimes clayey at 8.0 ft. 0.0-0.3 ft. moder numerous grass rc 0.3-3.0 ft. dark r 3.0-5.0 ft. dark r 3.0-5.0 ft. dark r 3.0-5.0 ft. deco yellowish brown (dark reddish brow	ndigenous material or stratified; fine-to with few-numerous pieces ur gravel (and occasional lithologies in the fill consolidated (loose); (SC-OH); moist-saturated rate brown (5YR3/4); sots and organics. eddish brown (10R3/4). erate brown (5YR3/4); horizon? mposed sandstone?; dark 10YR4/2) (5.0-8.0 ft.) and m (8.0-11.0 ft.).	Borehole drilled 0.0-11.0 ft. using 4" solid-stem augers. Site checked for radioactive contamination and hole gamma-logged by Eberline-TMA, Corporation. 8.0 ft. ground water observed. Boscription and classification of soil samples by visual
			26			
	U - VENNISON; P = PITCHER;					אפטכ ן

<u>ب</u>

.-

: - --