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Formerly Utilized Sites Remedial Action Program (FUSRAP) Contract No. DE-AC05-81OR20722

RADIOLOGICAL CHARACTERIZATION REPORT FOR THE COMMERCIAL PROPERTY AT 80 HANCOCK STREET (AIRCO)

Lodi, New Jersey

September 1989



Bechtel National, Inc.

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SEP 29 1989

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

Attention: Robert G. Atkin Technical Services Division

Subject: Bechtel Job No. 14501, FUSRAP Project DOE Contract No. DE-AC05-810R20722 Publication of Radiological Characterization Report for seventeen residential properties, four municipe properties, and seven commercial properties in Lodi and Maywood, New Jersey Code: 7315/WBS: 138

Dear Mr. Atkin:

Enclosed is one copy each of the 28 subject published reports for the properties listed in Attachment 1. These reports incorporate all comments received in this review cycle (CCNs 063165, 063327, 062285, and 061568) and are being published with approval of Steve Oldham, as reported in CCN 063868.

Also enclosed (as Attachment 2) is a proposed distribution list for these reports. Please send us any changes to the proposed distribution list at your earliest convenience so we may distribute the reports.

BNI would like to express our thanks to Mr. Oldham for his cooperation and efforts to review these drafts in an accelerate manner. His efforts have allowed us to publish these reports or schedule. If you have any questions about these documents, please call me at 576-4718.

Very truly yours,

user

R. C. Robertson Project Manager - FUSRAP

DAS 14-

RCR:wfs:1756x Enclosure: As stated

cc: J. D. Berger, ORAU (w/e)
 N. J. Beskid, ANL (w/e)

DOE/OR/20722-253

RADIOLOGICAL CHARACTERIZATION REPORT FOR THE COMMERCIAL PROPERTY AT 80 HANCOCK STREET LODI, NEW JERSEY

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SEPTEMBER 1989

Prepared for

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

By

N. C. Ring, D. J. Whiting, and W. F. Stanley Bechtel National, Inc. Oak Ridge, Tennessee

Bechtel Job No. 14501

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		Page
List	t of Figures	iv
List	t of Tables	iv
Abbr	reviations	v
1.0	Introduction and Summary	1
	1.1 Introduction	l
	1.2 Purpose	3
	1.3 Summary	3
	1.4 Conclusions	6
2.0	Site History	8
	2.1 Previous Radiological Surveys	9
	2.2 Remedial Action Guidelines	10
3.0	Health and Safety Plan	13
	3.1 Subcontractor Training	13
	3.2 Safety Requirements	13
4.0	Characterization Procedures	15
	4.1 Field Radiological Characterization	15
	4.1.1 Measurements Taken and Methods Used	15
	4.1.2 Sample Collection and Analysis	18
	4.2 Building Radiological Characterization	20
5.0	Characterization Results	23
	5.1 Field Radiological Characterization	23
	5.2 Building Radiological Characterization	28
Refe	erences	46
Appe	endix A - Geologic Drill Logs for 80 Hancock Stree	≥t A-1

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*

LIST OF FIGURES

1000

I

l

Figure	Title	<u>Page</u>
1-1	Location of Lodi Vicinity Properties	2
1-2	Location of 80 Hancock Street	4
4-1	Borehole Locations at 80 Hancock Street	17
4-2	Surface and Subsurface Soil Sampling Locations at 80 Hancock Street	19
4-3	Gamma Exposure Rate Measurement Locations at 80 Hancock Street	22
5-1	Areas of Surface Contamination at 80 Hancock Street	24
5-2	Areas of Subsurface Contamination at 80 Hancock Street	27

LIST OF TABLES

<u>Table</u>	Title	<u>Page</u>
2-1	Summary of Residual Contamination Guidelines for the Lodi Vicinity Properties	11
5-1	Surface and Subsurface Radionuclide Concentrations in Soil for 80 Hancock Street	30
5-2	Downhole Gamma Logging Results for 80 Hancock Street	36
5-3	Gamma Radiation Exposure Rates for 80 Hancock Street	43

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Cm	centimeter
cm ²	square centimeter
cpm	counts per minute
dpm	disintegrations per minute
ft	foot
h	hour
in.	inch
km ²	square kilometer
L	liter
L/min	liters per minute
m	meter
m ²	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	picocuri e s per liter
WL	working level
yd	yard
yd ³	cubic yard

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1.0 INTRODUCTION AND SUMMARY

This section provides a brief description of the history and background of the Maywood site and its vicinity properties. Data obtained from the radiological characterization of this vicinity property are also presented.

1.1 INTRODUCTION

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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 under the Formerly Utilized Sites Remedial Action Program (FUSRAP) under the direction of the DOE Division of Facility and Site Decommissioning Projects. Several residential, commercial, and municipal properties in Lodi, New Jersey, are included in FUSRAP as vicinity properties. Figure 1-1 shows the location of the Lodi vicinity properties in relation to the former Maywood Chemical Works.

The U.S. 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 that DOE 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.



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FIGURE 1-1 LOCATION OF LODI VICINITY PROPERTIES

1.2 <u>PURPOSE</u>

The purpose of the 1987 survey performed by BNI was to locate the horizontal and vertical boundaries of radionuclide concentrations exceeding remedial action guidelines.

1.3 <u>SUMMARY</u>

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This report details the procedures and results of the radiological characterization of the property at 80 Hancock Street (Figure 1-2) in Lodi, New Jersey, which was conducted in December 1987. Additional data were obtained in September and December 1988 to complete characterization of the property.

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

The property located at 80 Hancock Street is a commercial property used primarily for the filling and distribution of liquid gas cylinders. It consists of a concrete block structure, with an office area in the front and a work area (including loading docks) in the rear. The structure is bordered on three sides by an asphalt-paved parking/shipping area. The property is situated on the corner of Hancock Street and Industrial Road in a densely populated residential neighborhood. It is bordered on three sides by other commercial properties, with residences located across from it on Hancock Street. Because of the significant safety hazards presented by the type of business operated on this property, indoor characterization activities were severely limited and had to be confined to the office area of the building.



FIGURE 1-2 LOCATION OF 80 HANCOCK STREET

This characterization confirmed that thorium-232 is the primary radioactive contaminant at this property. Results of surface soil samples for 80 Hancock Street showed maximum concentrations of thorium-232 and radium-226 to be less than 8.6 and less than 1.4 pCi/g, respectively. The maximum concentration of uranium-238 in surface soil samples was less than 7.7 pCi/g.

Subsurface soil sample concentrations ranged from 0.4 to 34.8 pCi/g for thorium-232 and from 0.3 to 4.0 pCi/g for radium-226. The average background level in this area for both radium-226 and thorium-232 is 1.0 pCi/g. The concentrations of uranium-238 in subsurface soil samples ranged from 0.5 to 31.8 pCi/g. 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 conservative 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, the vicinity properties will be decontaminated in a manner so as to reduce future doses to levels that are as low as reasonably achievable (ALARA) (Ref. 2).

Soil analysis data for this property indicated surface contamination. Subsurface investigation by gamma logging indicated contamination to a depth of 1.83 m (6.0 ft).

Exterior gamma radiation exposure rates ranged from 4 to 9 μ R/h, including background. The indoor measurement showed a rate of 13 μ R/h, including background.

The radon-222 measurement inside the office area indicated a concentration of 1.1 pCi/L, which is within the DOE guideline of 3.0 pCi/L.

The measurement for radon daughters was 0.001 working level (WL), and the measurement for thoron daughters was 0.001 WL.

All data tables for this property appear at the end of this report.

1.4 <u>CONCLUSIONS</u>

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Evaluation of data collected, analyses performed, and historical documentation reviewed indicates the presence of radiological contamination on the property located at 80 Hancock Street. This contamination is primarily subsurface contamination ranging from a depth of 0.30 m (1.0 ft) to 1.83 m (6.0 ft) with an isolated area of surface contamination in front of the building. In addition, the subsurface contamination appears to extend beneath the building, and there is a high probability that the contamination extends beneath the streets (Hancock Street and Industrial Road) adjacent to the property. The total affected area is estimated to be approximately 70 percent of the property. These conclusions are supported by documentation that establishes the presence of the former channel of Lodi Brook in this area. This channel is the suspected transport mechanism for the radiological contamination.

From review of aerial photographs of the area, it has been determined that the former channel of Lodi Brook was realigned and buried in concrete conduit parallel to Hancock Street on this property. Prior to this realignment, it is suspected that the former channel flowed across the property in a southwesterly direction in the area where the building now stands. Confirmation of this suspicion could not be obtained because of severe access limitations to the interior of the building other than the office area. Indoor boreholes could not be drilled to confirm the presence of contamination beneath the building because of the significant safety hazards associated with drilling in areas where gas cylinders are filled, stored, and handled.

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2.0 SITE HISTORY

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

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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 coca leaves mixed with other material resulting from operations at the plant. Some fill material apparently contained thorium process wastes (Ref. 3).

Uncertainty exists as to 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. First, 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. Second, 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 contain

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 on 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 recalled chemical odors in and around the brook in Lodi and steam rising off the water. These observations suggest that discharges of contaminants occurred 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

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Numerous surveys of the Maywood site and its vicinity properties have been conducted. Among the past surveys, three that are pertinent to this vicinity property are detailed in this section.

<u>January 1981</u>--The Nuclear Regulatory Commission directed that a survey be conducted of the Stepan Company property and its vicinity properties in January 1981. Using the Stepan Company plant as the center, a $10.3 - \text{km}^2$ (4-mi²) aerial survey was conducted by the EG&G Energy Measurements Group, which identified anomalous concentrations of thorium-232 to the north and south of the Stepan Company property. The Lodi vicinity properties were included in this survey (Ref. 6).

June 1984--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 in September 1986 to determine which properties contained radioactive contamination in excess of DOE guidelines and would, therefore, require remedial action (Ref. 8).

2.2 <u>REMEDIAL ACTION GUIDELINES</u>

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 U.S. Environmental Protection Agency (EPA) for the Uranium Mill Tailings Remedial Action Program.

TABLE 2-1 SUMMARY OF RESIDUAL CONTAMINATION GUIDELINES

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 GUIDELINES

Radionuciide

Radium-226 Radium-228 Thorium-230 Thorium-232 Solf Concentration (pCi/g) Above Background^{e,b,c}

5 pCi/g when averaged over the first 15 cm of soil below the surface; 15 pCi/g when averaged over any 15-cm-thick soil layer below the surface layer.

Soil guidelines will be calculated on a site-specific basis using the DOE manual developed for this use.

STRUCTURE GUIDELINES

Other Radionuclides

Airborne Radon Decay Products

Generic guidelines for concentrations of airborne radon decay products shall apply to existing occupied or habitable structures on private property that has no radiological restrictions on its use; 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 that has no radiological restrictions on its use shall not exceed the background level by more than 20 µR/h.

Indoor/Outdoor Structure Surface Contamination

	Allowable Surface Residual Contamination [®] (dpm/100 cm ²)						
Radionuciide [†]	Average ^{g,h}	Maximum ^{h,i}	Removable ^{h,j}				
Transuranics, Ra-226, Ra-228, Th-230, Th-228 Pa-231, Ac-227, I-125, I-129	100	300	20				
Th-Natural, Th-232, St-90, Ra-223, Ra-224 U-232, I-126, I-131, I-133	1,000	3,000	200				
U-Natural, U-235, U-238, and associated decay products	5,000 α	15,000 a	1,000 a				
Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above	5,000 B - y	15,000 8 - γ	1,000 B - γ				

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TABLE 2-1 (CONTINUED)

- These 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 1) the dose for the mixtures will not exceed the basic dose limit, or 2) the sum of ratios of the soil concentration of each radionuclide to the allowable limit for that radionuclide will not exceed 1 ("unity").
- ^DThese guidelines represent allowable 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. In addition, every reasonable effort shall be made to remove any source of radionuclide that exceeds 30 times the appropriate soil limit, regardless of the average concentration in the soil.
- ^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 x 105 MeV of potential alpha energy.
- "As 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.
- Where 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 m². 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.
- The maximum contamination level applies to an area of not more than 100 cm².
- ¹The 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.

BNI is responsible for protecting the health of personnel assigned to work at the site. As such, all subcontractors and their personnel were required to comply with the provisions of BNI health and safety requirements and as directed by the on-site BNI Health and Safety Officer.

3.1 <u>SUBCONTRACTOR TRAINING</u>

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Before the start of work, all subcontractor personnel attended an orientation session presented by the BNI Health and Safety Officer to explain the nature of the material to be encountered in the work and the personnel monitoring and safety measures that are required.

3.2 SAFETY REQUIREMENTS

Subcontractor personnel complied with the following BNI requirements:

- Bioassay--Subcontractor personnel submitted 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 were required to wear the protective clothing/equipment specified in the subcontract or as directed by the BNI Health and Safety Officer.
- Dosimetry--Subcontractor personnel were required to wear and return daily the dosimeters and monitors issued by BNI.
- Controlled Area Access/Egress--Subcontractor personnel and equipment entering areas where access and egress were controlled for radiation and/or chemical safety purposes were surveyed by the BNI Health and Safety Officer (or personnel representing BNI) for contamination before leaving those areas.

 Medical Surveillance--Upon written direction from BNI, subcontractor personnel who work in areas where hazardous chemicals might exist were 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 was under the direct supervision of personnel representing BNI.

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Health and safety-related requirements for all activities involving exposure to radiation, radioactive material, chemicals, and/or chemically contaminated materials and other associated industrial safety hazards are generated in compliance with applicable regulatory requirements and industry-wide standards. Copies of these requirements are located at the BNI project office for use by project 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 was adjusted to characterize each property adequately. 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 with the east and north coordinates is shown on all figures included in Sections 4.0 and 5.0 of this report.

4.1 FIELD RADIOLOGICAL CHARACTERIZATION

This section provides a description of the instrumentation and methodologies used to obtain exterior surface and subsurface measurements during radiological characterization of this property.

4.1.1 <u>Measurements Taken and Methods Used</u>

An initial walkover survey was performed using an unshielded gamma scintillation detector [5.0- by 5.0-cm (2- by 2-in.) thallium-activated sodium iodide probe] to identify areas of elevated radionuclide activity. Near-surface gamma measurements taken using a cone-shielded gamma scintillation detector were also used to determine areas of surface contamination. 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 30.4 cm (12 in.) above the ground at the intersections of 3.0-m (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 approximately 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).

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A subsurface investigation was conducted to determine the depth to which the previously identified surface contamination extended and to locate subsurface contamination where there was no surface manifestation. The subsurface characterization consisted of drilling 16 boreholes (Figure 4-1), using either a 7.6-cm- (3-in.-) or 15.2-cm-(6-in.-) diameter auger bit, and gamma logging the boreholes. The boreholes 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 accomplished in less time than collecting soil samples, and the need for analyzing these samples in a laboratory is eliminated. A 5.0- by 5.0-cm (2- 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. This relationship has also been corroborated by results from previous characterizations where thorium-232 was found (Ref. 9).

Gamma radiation measurements were taken at 15.2-cm (6-in.) vertical intervals to determine the depth and concentration

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FIGURE 4-1 BOREHOLE LOCATIONS AT 80 HANCOCK STREET

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of the contamination. The gamma-logging data were reviewed to identify trends, whether or not concentrations exceeded the guidelines.

4.1.2 Sample Collection and Analysis

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To identify surface areas where the level of contamination exceeded the DOE guideline of 5 pCi/g for thorium-232, 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 ten locations (Figure 4-2) and analyzed for thorium-232, uranium-238, 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 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 15 locations (Figure 4-2) using a 7.6-cm (3.0-in.) outside diameter (0.D.) split-spoon sampler mounted on a tripod or attached to a truck-mounted auger stem. The subsurface soil samples were analyzed for radium-226, uranium-238, and thorium-232 in the same manner as the surface soil samples.



FIGURE 4-2 SURFACE AND SUBSURFACE SOIL SAMPLING LOCATIONS AT 80 HANCOCK STREET

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4.2 BUILDING RADIOLOGICAL CHARACTERIZATION

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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 building. A radon measurement was obtained to verify the presence of contaminated material under the building and to estimate potential occupational exposures during future remedial actions.

An indoor radon measurement was made using the Tedlar bag method. Samples were collected by pumping air into a Tedlar bag at a rate of approximately 2 L/min. The air sample was transferred 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 allowed 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 were counted using standard nuclear counting instrumentation.

Indoor air samples were also collected to determine a WL for radon and thoron daughters. To measure radon daughters, an air sample was collected for exactly 5 min through a 0.45-micron membrane filter at a rate of 11 L/min for a total sample volume of 55 L. Alpha particle activity on the filter paper was counted 40 to 90 min after sampling. An alpha scintillation detector coupled to a count-rate meter or a digital scaler was used. Measurements for thoron daughters were made 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 was allowed to age for

at least 5 h after sampling before alpha activity was counted. This elapsed time allowed radon daughters, which may have been present with the thoron daughters, to decay sufficiently so as not to interfere in calculating the WL for thoron daughters.

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Exterior gamma exposure rate measurements were made at seven locations throughout the property grid system and at one location inside the office area of the building. To obtain these measurements, either a 5.0- by 5.0-cm (2- by 2-in.) thallium-activated sodium iodide gamma scintillation detector designed to detect gamma radiation only or a pressurized ionization chamber (PIC) was used. Measurement locations are shown in 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 1 m (3 ft) above the ground. 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 building.



FIGURE 4-3 GAMMA EXPOSURE RATE MEASUREMENT LOCATIONS AT 80 HANCOCK STREET

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5.0 CHARACTERIZATION RESULTS

Radiological characterization results are presented in this section. The data included represent exterior surface and subsurface radiation measurements and interior radiation measurements.

5.1 FIELD RADIOLOGICAL CHARACTERIZATION

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Near-surface gamma radiation measurements on the property ranged from 5,000 cpm to approximately 13,000 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 and the basis for selecting the locations of soil samples. Areas of surface contamination are shown in Figure 5-1.

Surface soil samples [depths from 0.0 to 15.2 cm (6.0 in.)] were taken at six locations on the property and four locations in the streets (Hancock Street and Industrial Road) adjacent to the property (Figure 4-2). These samples were analyzed for thorium-232, uranium-238, and radium-226. The concentrations in these samples ranged from 1.9 to less than 7.7 pCi/g for uranium-238, from less than 1.0 to 8.6 pCi/g for thorium-232, and from less than 0.6 to less than 1.4 pCi/g for radium-226. Analytical results for surface soils are provided in Table 5-1; these data showed that concentrations of thorium-232 in one soil sample exceeded DOE guidelines (5 pCi/g plus background of 1 pCi/g for surface soils) with a maximum concentration of 8.6 pCi/g. Use of the "less than" (<) notation in reporting results indicates that the radionuclide was not present in

						HANCO	ICK ST	REET					
	Æ					GRASS		AINAGE EASE	MENT		ASPH		 N 1950
	ASP	HALT	I s	GRASS				GRASS	· · · · ·		×	CONC. PAD	N 1900
INDUS	IGRASS	<u> </u>	34			1/2 ST BLOCK	ORY CO BUILI	DNCRET	E				N 1850
TRIAL RO				0									
ð				0	LOADING DOC]	Asphi	ALT	 N 1800
		ASPHA	LT 	o 									N 1750
 									·			CONC. BLO	N 1700
E 1950		E 2000		E 2050		E 2100		E 2150	•	E 2200		E 2250	

FIGURE 5-1 AREAS OF SURFACE CONTAMINATION AT 80 HANCOCK STREET

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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. The "less than" value 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.

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Thorium-232, the primary contaminant at the site, is the radionuclide most likely to exceed a specific DOE guideline in soil. Parameters for soil sample analysis were selected to ensure that the thorium-232 would be detected and measured at concentrations well below the lower quideline value of 5 pCi/g in excess of background level. Radionuclides of the uranium series, specifically uranium-238 and radium-226, are also potential contaminants but at lower concentrations than thorium-232. Therefore, these radionuclides (considered secondary contaminants) would not be present in concentrations in excess of guidelines unless thorium-232 was also present in concentrations in excess of its guideline level. Parameters selected for the thorium-232 analyses also provide detection sensitivities for uranium-238 and radium-226 that demonstrate that concentrations of these radionuclides are below guidelines. However, because of the

relatively low gamma photon abundance of uranium-238, many of the uranium-238 concentrations were below the detection sensitivity of the analytical procedure; these concentrations are reported in the data tables as "less than" values. To obtain more sensitive readings for the uranium-238 radionuclide with these analytical methods, much longer instrument counting times would be required than were necessary for analysis of thorium-232, the primary contaminant.

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Analytical results for subsurface soil samples are given in Table 5-1, and gamma logging data are given in Table 5-2. The results in Table 5-2 showed a range from 5,000 cpm to 184,000 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 indicated uranium-238 concentrations ranging from 0.5 to 31.8 pCi/g, thorium-232 concentrations ranging from 0.4 to 34.8 pCi/g, and radium-226 concentrations ranging from 0.3 to 4.0 pCi/g.

On the basis of near-surface gamma radiation measurements, surface and subsurface soil sample analyses, and downhole gamma logging, contamination on this property is believed to consist primarily of subsurface contamination at depths ranging from 0.30 m (1.0 ft) to 1.83 m (6.0 ft). The areas of subsurface contamination are shown in Figure 5-2. The subsurface contamination appears to extend beneath the building and the streets (Hancock Street and Industrial Road) adjacent to the property.

It is apparent from review of historical documentation (e.g., aerial photographs of the area, interviews with local residents, and previous radiological surveys) that the subsurface contamination on this property lies along the former channel of Lodi Brook and its associated floodplain.



FIGURE 5-2 AREAS OF SUBSURFACE CONTAMINATION AT 80 HANCOCK STREET

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The contamination is similar to contamination found on two commercial properties in close proximity to this property. It has been established that the Lodi Brook channel through these neighboring properties once occupied locations connecting to those where stream sediments were found at 80 Hancock Street. Thus, the elevated gamma readings shown on gamma logs from boreholes drilled on this property serve as further indication of the suspected mechanism of transport for radiological contamination (i.e., stream deposition from Lodi Brook).

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

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Results of an indoor radon measurement using the Tedlar bag method indicated a concentration of 1.1 pCi/L. This measurement was substantially less than the applicable DOE guideline of 3.0 pCi/L above background (Ref. 10).

Results of a measurement for radon daughters was 0.001 WL. This result was substantially less than the applicable generic guideline detailed in the Code of Federal Regulations, 40 CFR 192 (Ref. 10), which states that an annual average (or equivalent) radon decay product concentration not exceed 0.02 WL.

Results of a measurement for thoron daughters was 0.001 WL. The generic guideline is more restrictive for radon-222 (radon) than for radon-220 (thoron) according to the National

Council on Radiological Protection [see NCRP Report No. 50 (Ref. 11), which was used as the guideline for thoron daughter measurements].

Exterior gamma radiation exposure rate measurements ranged from 4 to 9 μ R/h, including background. These results can be found in Table 5-3. The average exterior exposure rate of 6 μ R/h does not exceed the average background level of 9 μ R/h (Ref. 12). Therefore, no dose in excess of average background would be received as a result of contamination present on the property by employees spending time outside the building.

Indoor exposure rate measurement was 13 μ R/h, including background (Table 5-3). For comparison, the DOE guideline for indoor exposure rate is 20 μ R/h. Assuming an employee spends 40 hours per week for 50 weeks per year (2,000 hours or 8 hours per day for 5 days per week) inside the building, and assuming the average indoor exposure rate is 13 μ R/h, a yearly dose of 8 mrem could be expected (after subtracting average background of 9 μ R/h; Ref.12).

Based on the above information, the exposure rates and doses at this property are within DOE guidelines. Further, it should be emphasized that natural background exposure rates vary widely across the United States and are significantly higher than average background for this area.

SURFACE AND SUBSURFACE RADIONUCLIDE CONCENTRATIONS IN SOIL

FOR 80 HANCOCK STREET

Page 1 of 6

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<u>Coordinates^a</u>		Depth		<u>Concentration (pCi/g ± 2 sigma)</u>								
East	North	orth (ft		Uranium-238		Radium-226		Tho	Thorium-232			
1953	1785	0.0	- 0.5	<	3.4	<	0.6	<	1.3			
1953	1785	0.0	- 2.0	<	3.0	<	0.6	<	1.0			
1953	1785	0.5	- 2.0	<	3.7	<	0.9	<	1.4			
1953	1785	2.0	- 4.0	<	3.4	<	0.6	<	1.3			
1953	1785	6.0	- 7.0	<	3.7	<	0.8	<	1.2			
1953	1785	8.0	- 10.0	<	2.0	<	0.5	<	0.7			
1953	1785	8.0	- 10.0	<	2.6	<	0.5	<	0.9			
1953	1785	10.0	- 11.0	<	3.4	<	0.7	<	1.1			
1953	1785	11.0	- 12.0	<	3.6	<	0.8	<	1.5			
1980	1986	0.0	- 0.5	<	3.2	<	0.8	<	1.1			
1980	1986	0.0	- 2.0	<	2.8	<	0.6	<	0.9			
1980	1986	2.0	- 4.0	<	2.7	<	0.6	<	0.9			
1980	1986	6.0	- 8.0	<	2.6	<	0.5	<	0.8			
1980	1986	8.0	- 9.0	<	4.4	<	1.0	<	1.7			
1980	1986	9.0	- 10.0	<	4.9	<	0.9	<	1.5			
1980	1986	10.0	- 11.0	<	4.9	<	1.0	<	1.6			
1980	1986	11.0	- 12.0	<	5.7	<	1.4	<	2.2			
1995	1870	0.5	- 2.0	<	4.3	<	1.1	<	1.6			
1995	1870	4.0	- 6.0	<	6.6	<	1.4	<	2.0			
1995	1870	9.0	- 10.0	<	5.4	<	1.2	<	1.5			
2017	1800	0.0	- 0.5	<	5.1	<	0.9	<	1.6			
2017	1800	2.5	~ 4.0	<	4.7	<	0.8	2.2	± 0.2			
2017	1800	6.0	- 7.5	<	3.8	<	0.9	<	1.4			

(continued)

Page 2 of 6

Coord	linates ^a	Depth	Concentration ($pCi/q + 2$ sigma)								
East	North	(ft)	Urar	nium-238	Rad	lium-226	Thorium-232				
2027	1932	0.0 - 0.5	<	5.8	<	1.0	<	2.3			
2027	1932	3.0 - 4.0	<	5.8	<	1.3	è	1.7			
2027	1932	4.0 - 6.0	<	7.7	<	1.0	è	3.0			
2027	1932	8.0 - 9.0	<	4.7	<	1.0	è	1.6			
2027	1932	9.0 - 10.0	<	6.7	<	1.4	<	1.8			
2035	1711	1.0 - 1.5	<	2.0	<	1.0	1.0	± 0.1			
2035	1711	1.5 - 2.0	<	2.0	0.8	± 0.1	0.8	± 0.5			
2035	1711	2.0 - 2.5	<	2.0	. <	1.0	<	1.0			
2035	1711	2.5 - 3.0	<	2.0	0.4	± 0.1	0.9	± 0.5			
2035	1711	3.0 - 3.5	<	2.0	0.5	± 0.2	<	1.0			
2035	1711	3.5 - 4.0	<	2.0	<	1.0	<	1.0			
2035	1711	4.0 - 4.5	<	1.0	0.5	± 0.2	1.0	± 0.1			
2035	1711	4.5 - 5.0	<	2.0	0.5	± 0.2	0.8	± 0.2			
2035	1711	5.0 - 5.5	<	1.0	<	1.0	0.6	± 0.3			
2035	1711	5.5 - 6.0	<	2.0	0.5	± 0.1	<	1.0			
2035	1711	6.0 - 6.5	0.5	± 0.3	0.3	± 0.1	0.4	± 0.1			
2035	1711	6.5 - 7.0	<	2.0	0.4	± 0.2	0.7	± 0.3			
2035	1711	7.0 - 7.5	<	2.0	0.5	± 0.1	<	1.0			
2035	1711	7.5 - 8.0	<	2.0	<	1.0	<	1.0			
2035	1711	8.0 - 8.5	<	1.0	0.4	± 0.1	<	1.0			
2035	1711	8.5 - 9.0	<	2.0	0.4	± 0.2	0.7	± 0.3			
2035	1711	9.0 - 9.5	<	2.0	0.6	± 0.1	1.1	± 0.4			
2035	1711	9.5 - 10.0	1.5	± 1.5	0.6	± 0.1	0.8	± 0.1			

(continued)

Page 3 of 6

Coordinates ^a		Depth		Concentration ($pCi/q + 2 sigma$)								
East	North	(ft)	Ura	nium-238	Rad	lium-226	Thor	ium-232			
2067	1988	0.5	- 2.0	<	3.7	<	0.9	<	1.4			
2067	1988	2.0	- 4.0	<	3.4	<	0.6	<	1.3			
2067	1988	6.0	- 7.0	<	3.7	<	0.8	<	1.2			
2067	1988	8.0	- 10.0	<	2.6	<	0.5	` <	0.9			
2100	1705	0.5	- 1.0	<	2.0	0.6	± 0.1	<	1.0			
2100	1705	1.0	- 1.5	<	2.0	0.9	± 0.3	<	1.0			
2100	1705	1.5	- 2.0	<	2.0	0.6	± 0.1	0.8	± 0.4			
2100	1705	3.0	- 3.5	<	2.0	<	1.0	<	1.0			
2100	1705	3.5	- 4.0	<	2.0	0.5	± 0.3	1.0	± 0.2			
2100	1705	4.0	- 4.5	<	1.0	<	1.0	<	1.0			
2100	1705	4.5	- 5.0	<	2.0	0.5	± 0.3	0.8	± 0.2			
2100	1705	5.0	- 5.5	<	2.0	0.6	± 0.2	0.7	± 0.4			
2100	1705	5.5	- 6.0	<	1.0	<	1.0	<	1.0			
2100	1705	6.0	- 6.5	<	2.0	0.5	± 0.2	<	1.0			
2100	1705	6.5	- 7.0	<	1.0	0.3	± 0.1	<	1.0			
2100	1705	7.0	- 7.5	<	2.0	<	1.0	<	1.0			
2100	1705	7.5	- 8.0	<	1.0	0.5	± 0.2	0.7	± 0.4			
2100	1705	8.0	- 8.5	<	2.0	<	1.0	<	1.0			
2100	1705	8.5	- 9.0	<	2.0	0.7	± 0.2	1.2	± 0.8			
2100	1705	9.0	- 9.5	<	2.0	<	1.0	<	1.0			
2100	1705	9.5	- 10.0	<	2.0	0.5	± 0.1	0.8	± 0.5			
2172	1991	0.0	- 0.5	<	4.8	<	1.1	<	1.6			
2172	1991	4.0	- 5.0	<	5.2	<	1.0	<	1.7			
2172	1991	6.0	- 7.0	<	4.9	<	1.0	<	1.2			
2172	1991	7.0	- 8.0	<	4.5	<	1.0	<	1.5			

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Page 4 of 6

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<u>Coordinates</u> a		Depth	<u>Concentration (pCi/g ± 2 sigma)</u>							
East	North	(ft)	Uranium-238	Radium-226	Thorium-232					
2177	1811	0.0 - 0.5	1.9 ± 1.7	0.9 ± 0.3	1.6 ± 0.9					
2177	1811	1.0 - 1.5	1.6 ± 1.5	< 1.0	< 1.0					
2177	1811	1.5 - 2.0	< 3.0	0.8 ± 0.1	< 1.0					
2177	1811	2.0 - 2.5	< 2.0	< 1.0	< 1.0					
2177	1811	2.5 - 3.0	< 3.0	0.8 ± 0.1	1.6 ± 0.4					
2182	1711	0.5 - 1.0	1.9 ± 1.6	0.9 ± 0.1	1.2 ± 0.2					
2182	1711	1.0 - 1.5	2.1 ± 0.4	0.6 ± 0.1	1.0 ± 0.5					
2182	1711	1.5 - 2.0	< 2.0	0.8 ± 0.3	1.3 ± 0.2					
2182	1711	4.0 - 4.5	< 2.0	0.4 ± 0.2	0.5 ± 0.3					
2182	1711	4.5 - 5.0	< 2.0	< 1.0	< 1.0					
2182	1711	5.0 - 5.0	< 2.0	0.6 ± 0.3	< 1.0					
2182	1711	5.5 - 6.0	< 2.0	0.4 ± 0.1	0.6 ± 0.2					
2182	1711	6.0 - 6.5	< 2.0	0.7 ± 0.2	0.8 ± 0.2					
2182	1711	6.5 - 7.0	< 2.0	< 1.0	< 1.0					
2182	1711	7.0 - 7.5	< 2.0	0.4 ± 0.1	< 1.0					
2182	1711	7.5 - 8.0	2.4 ± 1.7	0.7 ± 0.6	< 1.0					
2182	1711	8.0 - 8.5	< 2.0	< 1.0	< 1.0					
2182	1711	8.5 - 9.0	< 2.0	< 1.0	< 1.0					
2182	1711	9.0 - 9.5	< 2.0	0.6 ± 0.2	1.1 ± 0.7					
2182	1711	9.5 - 10.0	< 2.0	< 1.0	< 1.0					
2186	1933	0.0 - 0.5	< 6.9	< 1.0	8.6 ± 0.8					
2186	1933	0.0 - 1.0	< 4.7	< 0.9	< 1.9					
2186	1933	3.0 - 4.0	< 4.0	< 0.9	< 1.7					
2186	1933	4.0 - 5.0	< 3.7	< 0.7	< 1.5					
2186	1933	5.0 - 6.0	< 13.6	4.0 ± 0.3	34.8 ± 1.0					
2186	1933	6.0 - 7.0	< 7.7	< 1.0	12.4 ± 0.8					
2186	1933	7.0 - 8.0	< 4.5	< 1.0	< 1.4					

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Page 5 of 6

Coord	iinates ^a	Depth	Concentration ($pCi/g \pm 2$ sigma)								
East	North	(ft)	(ft) Uranium-238		Thorium-232						
2211	1844	0.0 - 0.5	< 7.7	< 1.4	5.3 ± 0.7						
2211	1844	0.5 - 2.0	< 4.3	< 0.8	< 1.6						
2211	1844	2.0 - 4.0	< 5.0	< 1.1	< 1.8						
2211	1844	4.0 - 6.0	< 3.4	< 0.7	< 1.5						
2211	1844	6.0 - 7.0	< 5.8	< 1.4	< 2.0						
2211	1844	7.0 - 8.0	< 5.7	< 1.1	< 2.1						
2211	1844	8.0 - 9.0	< 3.3	< 0.6	< 1.1						
2211	. 1844	9.0 - 10.0	< 3.3	< 0.7	< 1.2						
2250	1763	0.0 - 0.5	< 2.0	< 1.0	< 1.0						
2250	1763	0.5 - 1.0	< 3.0	< 1.0	< 1.0						
2250	1763	1.0 - 1.5	< 3.0	1.0 ± 0.2	< 1.0						
2250	1763	1.5 - 2.0	< 2.0	0.6 ± 0.2	< 1.0						
2250	1763	2.0 - 2.5	< 2.0	< 1.0	1.4 ± 0.6						
2250	1763	2.5 - 3.0	< 3.0	0.5 ± 0.1	1.1 ± 0.6						
2250	1763	4.0 - 4.5	< 2.0	< 1.0	< 1.0						
2250	1763	4.5 - 5.0	< 2.0	0.5 ± 0.1	< 1.0						
2250	1763	5.0 - 5.5	< 2.0	< 1.0	< 1.0						
2250	1763	5.5 - 6.0	< 2.0	< 1.0	< 1.0						
2250	1763	6.0 - 6.5	< 2.0	< 1.0	< 1.0						
2250	1763	6.5 - 7.0	< 2.0	< 1.0	< 1.0						
2250	1763	7.0 - 7.5	< 2.0	0.5 ± 0.2	0.6 ± 0.3						
2250	1763	7.5 - 8.0	< 2.0	0.6 ± 0.1	0.8 ± 0.8						

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Page 6 of 6

Coord	linates ^a	Dep	th		Concentra	ation	(pCi/q_{\pm})	2 sigma	ı)
East	North	(Ē	t)	Uran	11um-238	Ra	dium-226	Thor	ium-232
2253	1925	0.0 -	0.5	<	7.5	<	1.2	<	2.9
2253	1925	1.0 -	2.0	<	9.3	<	1.5	14.3	± 2.6
2253	1925	4.0 -	5.0	<	6.9	<	1.3	8.4	± 1.1
2253	1925	5.0 -	6.0	31.8	± 5.3	<	2.0	14.3	± 2.0
2253	1925	6.0 -	7.0	<	9.4	<	2.1	<	3.0
2253	1925	7.0 -	8.0	<	6.6	<	1.6	<	2.2
2253	1925	8.0 -	9.0	<	3.6	<	0.7	<	1.5
2253	1925	9.0 -	10.0	<	4.9	<	1.3	<	1.6

^aSampling locations are shown in Figure 4-2.

DOWNHOLE GAMMA LOGGING RESULTS

FOR 80 HANCOCK STREET

Page 1 o	<u>f 9</u>		
<u>Coordi</u> East	nates ^a North	Depth ^b (ft)	Count Rate ^C (cpm)
Borehole	1192R ^d		
1953	1785	0.5	8000
1953	1785	1.0	12000
1953	1785	1.5	14000
1953	1785	2.0	14000
1953	1785	2.5	12000
1953	1785	3.0	12000
1953	1785	3.5	· 12000
1953	1785	4.0	11000
1953	1785	4.5	11000
1953	1785	5.0	9000
1953	1785	5.5	9000
1953	1785	6.0	7000
1953	1785	6.5	7000
1953	1785	7.0	7000
1053	1785	7.5	7000
1953	1785	8.0	7000
1953	1785	8.5	7000
1953	1785	9.0	6000
1953	1785	9.5	7000
Borehole	<u>= 1189R</u>		
1980	1986	0.5	6000
1980	1986	1.0	6000
1980	1986	1.5	6000
1980	1986	2.0	7000
1980	1986	2.5	9000
1980	1986	3.0	9000
1980	1986	3.5	9000
1980	1986	4.0	8000
1980	1986	4.5	8000
1980	1986	5.0	8000
1980	1986	5.5	8000
1980	1986	6.0	9 000
1980	1986	6.5	9000
1980	1986	7.0	10000
1980	1986	7.5	10000
1980	1986	8.0	9000

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<u>Page 4 c</u> Coordi	nates ^a	Denthb	Count Pate
East	North	(ft)	(cpm)
Borehole	2025R (cont	inued) ^d	
2035	1711	2.5	9000
2035	1711	3.0	9000
2035	1711	3.5	9000
2035	1711	· 4.0	9000
2035	· 1711	4.5	8000
2035	1711	5.0	8000
2035	1711	5.5	8000
2035	1711	6.0	7000
2035	1711	6.5	8000
2035	1711	7.0	8000
2035	1711	7.5	8000
2035	1711	8.0	9000
2035	1711	8.5	9000
2035	1711	9.0	9000
2035	1711	9.5	9000
Borehole	<u>1193R</u>		
2067	1988	0.5	7000
2067	1988	1.0	11000
2067	1988	1.5	11000
2067	1988 🕓	2.0	10000
2067	1988	2.5	10000
2067	1988	3.0	10000
2067	1988	3.5	11000
2067	1988	4.0	11000
2067	1988	4.5	11000
2067	1988	5.0	10000
2067	1988	5.5	10000
2067	1988	6.0	10000
2067	1988	6.5	9000
2067	1988	7.0	9000
2067	1988	7.5	8000
2067	1988	8.0	8000
2067	1988	8.5	8000
2067	1988	9.0	8000
Borehole	2024R ^d		
2100	1705	0.5	7000
2100	1705	1.0	11000

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<u>Coordi</u> East	North	Depth ^b (ft)	Count Rate ^C (cpm)
Borehole	2024R (cont	inued) ^d	***
2100	1705	1.5	12000
2100	1705	2.0	12000
2100	1705	2.5	10000
2100	1705	3.0	9000
2100	1705	3.5	9000
2100	1705	4.0	10000
2100	1705	4.5	10000
2100	1705	5.0	8000
2100	1705	5.5	9000
2100	1705 .	6.0	8000
2100	1705	6.5	8000
2100	1705	7.0	8000
2100	1705	7.5	8000
2100	1705	8.0	8000
2100	1705	8.5	8000
2100	1705	9.0	8000
2100	1705	9.5	8000
Borehole	2_1225R		
2172	1991	0.5	6000
2172	19 91	1.0	10000
2172	1991	1.5	11000
2172	1991	2.0	11000
2172	1991	2.5	10000
2172	1991	3.0	9000
2172	1991	3.5	9000
2172	1991	4.0	9000
2172	1991	4.5	8000
2172	1991	5.0	8000
2172	1991	5.5	7000
2172	1991	6.0	6000
2172	1991	6.5	5000
2172	1991	7.0	5000
Borehole	2022R ^d		
2182	1711	0.5	7000
2182	1711	1.0	9000
2182	1711	1.5	11000
2182	1711	2.0	11000

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Page 6 OI	9		
<u>Coordin</u> East	ates ^a North	Depth ^b (ft)	Count Rate ^C (Cpm)
Borehole	2022R (cont	inued) ^d	•
2182	1711	2.5	11000
2182	1711	3.0	10000
2182	1711	3.5	9000
2182	1711	4.0	8000
2182	1711	4.5	9000
2182	1711	5 0	9000
2182	1711	55	9000
2182	1711	5.0	8000
2182	1711	6 5	8000
2182	1711	7 0	8000
2182	1711	7.5	9000
2182	1711	2.5	9000
2182	1711	0.0	9000
2182	1711	0.5	8000
2192	+/⊥⊥ 1711	9.0	9000
2102	1/11	9.5	9000
<u>Borehole</u>	<u>1222R</u> đ		
2186	1933	0.5	16000
2186	1933	1.0	18000
2186	1933	1.5	18000
2186	1933	2.0	17000
2186	1933	2.5	15000
2186	1933	3.0	17000
2186	1933	3.5	28000
2186	1933	4.0	47000
2186	1933	4.5	94000
2186	1933	5.0	184000
2186	1933	5.5	159000
2186	1933	6.0	57000
2186	1933	6.5	24000
2186	1933	7 0	15000
2186	1033	7.5	13000
2186	1033	8.0	13000
~ * ~ ~ ~	1999	0.0	12000
Borehole 2	2023R ^d		
2194	1800	0.5	7000
2194	1800	1.0	10000
2194	1800	1.5	11000
2194	1800	2.0	11000

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Page 7 o	f 9		
<u>Coordi</u> East	nates ^a North	Depth ^b (ft)	Count Rate ^C (cpm)
Borehole	2023R (cont	inued) ^d	
2194	1800	2.5	11000
2194	1800	3.0	11000
2194	1800	3.5	10000
2194	1800	4.0	9000
2194	1800	4.5	9000
2194	1800	5.0	10000
2194	1800	5.5	9000
2194	1800	6.0	9000
2194	1800	6.5	8000
2194	1800	7.0	8000
2194	1800	7.5	9000
2194	1800	8.0	8000
2194	1800	8.5	8000
2194	1800	9.0	8000
2194	1800	9.5	8000
2194	1800	10.0	8000
2194	1800	10.5	8000
2194	1800	11.0	8000
2194	1800	11.5	8000
2194	1800	12.0	8000
2194	1800	12.5	7000
<u>Borehole</u>	1228R ^d		
2211	1844	0.5	23000
2211	1844	1.0	35000
2211	1844	1.5	35000
2211	1844	2.0	29000
2211	1844	2.5	28000
2211	1844	3.0	29000
2211	1844	3.5	32000
2211	1844	4.0	45000
2211	1844	4.5	43000 68000
2211	1844	5.0	35000
2211	1844	5.5	20000
2211	1844	6.0	19000
2211	1844	6.5	18000
2211	1844	7.0	18000
2211	1844	7.5	17000
2211	1844	8.0	17000

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Page 8 of 9

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_ Coord	linates ^a	Depthb	Count Rate ^C
East	North	(ft)	(cpm)
Borehol	le 2021R ^d		
2250	1763	0.5	11000
2250	1763	1.0	13000
2250	1763	1.5	14000
2250	1763	2.0	14000
2250	1763	2.5	14000
2250	1763	3.0	14000
2250	1763	3.5	14000
2250	1763	4.0	12000
2250	1763	4.5	11000
2250	1763	5.0	11000
22 50	1763	5.5	11000
2250	1763	6.0	10000
2250	1763	6.5	9000
2250	1763	7.0	8000
2250	1763	7.5	7000
2250	1763	8.0	6000
2250	1763	8.5	6000
Boreho]	<u>e 1224R</u> d		
2253	1925	0.5	17000
2253	1925	1.0	21000
2253	1925	1.5	30000
22 53	1925	2.0	56000
2253	1925	2.5	95000
2253	1925	3.0	54000
2253	1925	3.5	27000
2253	1925	4.0	26000
2253	1925	4.5	40000
2253	1925	5.0	76000
2253	1925	5.5	42000

(continued)

Coord	inates ^a	Depthb	Count Rate ^C
East	North	(ft)	(cpm)
Borehol	e 1224R (cont	inued) ^d	
2253	1925	6.0	17000
2253	1925	6.5	12000
	1925	7.0	12000
2253			

^aBorehole locations are shown in Figure 4-1.

^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 5.0- by 5.0-cm (2- by 2-in.) thallium-activated sodium iodide gamma scintillation detector.

d_{Bottom} of borehole collapsed.

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GAMMA RADIATION EXPOSURE RATES

Coord	Rateb			
East	North	(µR/h)		
2000	1750	5		
2000	1950	7		
2100	1700	4		
2100	1950	9		
2175	1825	5		
2220	1875	7		
2225	1925	6		
Interior	of Building	13		

FOR 80 HANCOCK STREET

^aMeasurement locations are shown in Figure 4-3.

^bMeasurements include background.

- U.S. Department of Energy. <u>Description of the Formerly</u> <u>Utilized Sites Remedial Action Program</u>, ORO-777, Oak Ridge, Tenn., September 1980 (as modified by DOE in October 1983).
- 2. Argonne National Laboratory. <u>Action Description</u> <u>Memorandum, Interim Remedial Actions at Maywood,</u> <u>New Jersey</u>, Argonne, Ill., March 1987.

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- 3. Argonne National Laboratory. <u>Action Description</u> <u>Memorandum, Proposed 1984 Remedial Actions at Maywood,</u> <u>New Jersey</u>, Argonne, Ill., June 8, 1984.
- Bechtel National, Inc. <u>Post-Remedial Action Report for</u> <u>the Lodi Residential Properties</u>, DOE/OR/20722-89, Oak Ridge, Tenn., August 1986.
- 5. NUS Corporation. <u>Radiological Study of Maywood</u> <u>Chemical, Maywood, New Jersey</u>, November 1983.
- EG&G Energy Measurements Group. <u>An Aerial Radiologic</u> <u>Survey of the Stepan Chemical Company and Surrounding</u> <u>Area, Maywood, New Jersey</u>, NRC-8109, Oak Ridge, Tenn., September 1981.
- Oak Ridge National Laboratory. <u>Results of the Mobile</u> <u>Gamma Scanning Activities in Lodi, New Jersey</u>, ORNL/RASA-84/3, Oak Ridge, Tenn., October 1984.
- Oak Ridge National Laboratory. <u>Results of the</u> <u>Radiological Survey at 80 Hancock Street (LJ059)</u>, Lodi, New Jersey, ORNL/RASA-88/16, Oak Ridge, Tenn., March 1989.

- 9. Thermo Analytical/Eberline. "Technical Review of FUSRAP Instrument Calibrations by Comparison to TMC Calibration Pads," May 1989.
- 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.

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- 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 Health Data Report</u> 9:679-695 (1968).

APPENDIX A GEOLOGIC DRILL LOGS FOR 80 HANCOCK STREET

A.

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GEOLOGIC DRILL LOG	PROJECT	FUSRAP	14501	-138 1 OF 1	HOLE 119
80 Hancock St. (LODI)	DINATES	N 1.785 E 1.953	I	ANGLE FROM HORI: Vertical	BEARIN
BEGUN COMPLETED DRILLER	DRIL	L MAKE AND MODEL S	IZE OVERBURDEN	ROCK (FT.)	TOTAL
CORE RECOVERY (FT./2) CORE BOXESISAMPLESIE	TOP CASING	MOBILE B-57	6.5" 12.0	DEPTH/EL TO	
7.4/70 6		¥/			/
SAMPLE HAMMER WEIGHT/FALL CASING LEFT I 140 lbs./ 30 in	i HOLE: DIA./I NONE	LENGTH LOGGED BY:	D Her	nich	
				<u> 11311</u>	
AND - CORE SAMP - AND - IAN SAMP - AD SAMP - A	DEPTH GRAPHIC	N DESCRIPTION	and classific	ATION WATER WATER CHARA DRILL	ON: LEVE RETU CTER ING.
SS 1.5 1.3 8-10-8		0.0 - 6.0 Ft. <u>SILT</u> (ML, GP-GM).	and GRAVEL FILL	Boreho	le advai
		0.0-0.5 Ft. Grav	el, broken basalt.	o.d. ho auger.	llow-ste
35 2.0 1.1 5-1-9-0		0.5-1.2 Ft. Silt,	reddish brown with	Radiole sample	d and
SS 1.0 1.1 3-4		and soft pebbles silt.	of yellow and olive	TMA-1 0-0.5 F	Eberline t. No s
	5	1.2-2.0 Ft. Silt,	mixed light gray an	d roadbe	d.
SS 2.0 1.1 11-17 19-26		2.0-2.7 Ft. Silt,	mixed brown and re	ddish 5.0 Ft.	Rock b
SS 2.0 0.6 19-22		27-81 Ft Silan	orevel honken have		-
15-15		pieces 0.5-2 in. in	gravel, broken bass n diameter.	ut,	
SS 2.0 1.6 11-12 18-14	10_	3.1-5.0 Ft. Grav with minor black	elly silt, reddish bro , grayish green and	own	
		gravel.	int mixed in, some i	ungular	
		5.0-6.0 Ft. Rock	, basalt?	/]	
		(7.5YR4/2), very	[SP]. Brown fine-grained, satur	ated,	
		10.0-12.0 Ft. Sa	nd and silt, interbed	lded,	
		beds 3-10 mm th	1CK.	/	
		Bottom of borehole : Borehole backfilled	at 12.0 Ft. with spoils, 12/3/87		
				Descript	tion en
				classific soils by	ation of visual
				examin	ation.
]]		·	
S3 = 3" SPLIT SPOON; ST = SHELBY TUBESITE D = DENNISON; P = PITCHER; O = OTHER	80	Hancock St.	(LODI)	HOLE N). 192 F
				<u>_</u>	

	G	EO	LOG	IC D	RIL	L LO	G	PROJEC	T	FUSRAP	JOB NO. SHE	ET NO. HOLE NO. OF 1 1189
SITE	1	Han	cock S	t. (1.0	וומ		COORDIN	ATES		1 986 F 1 980	ANGLE FR	ON HORIZBEARING
EGU	N	CO	MPLETED	DRILL	ER			•	RILL	MAKE AND NODEL SIZE OVE	RBURDEN ROCK	(FT.) TOTAL DE
12-	2-8	7 1	2-2-87	7	ROXE	E.D.	I.	P CASI	NG I	OBILE B-57 6.5"	12.0	(FL. TOP OF ROCK
	5	i.4/4	15			6						/
Samp	LE H. 14	AMMER A th	: WEIGHT c./ 30	7FALL In	CAS	SING LE	FT IN HO	LE: DI NF	A./L	NGTH LOGGED BY:	D Hernish	
ш.			1. v	····	JATE	2	NO					······
SAMP . TYF	SAMP. ADI	SAMPLE RE CORE REC	SAMPLE BLOWS "N X CORE RECOVER'	LOSS IN G.P.M	EST: EST: SSU: BSU: BSU: BSU: BSU: BSU: BSU: BSU	TIME NIN.	ELEV.	OEPTH	GRAPHICS	DESCRIPTION AND CLAS	SIFICATION	NOTES ON: Water Levels Water Return Character Of Drilling, Et
SS	2.0	0.1						-		0.0 - 5.3 Ft. <u>GRAVEL and SIL</u> (GP, ML).	<u>T FILL</u>	Borehole advance 0-12 Ft. using 6.5
SS	2.0	1.2	11-14 10-11		-			-		0.0-2.0 Ft. Gravel, broken h cobbles on top, some silt.	pasalt,	auger. Radiologically sampled and
SS	2.0	1.5	4-3-9 20					5		(2.5Y4/2) with pieces of yell gray, black and grayish greet green tint.	owish brown, n silt, overall	TMA-Eberline, Ir
SS	2.0	0.0	16-20 22-24				-	.		5.3 - 8.0 Ft. SILT and SAND (Brown (10YR5/3), sand is v fine-grained, finely interbed	(ML, SP). ery ded, damp.	0-2 Ft. Grab san from auger flights
SS	2.0	1.1	8-12 14-21				-			6.0-8.0 Ft. Saturated lique 8.0 - 12.0 Ft. SILT (ML). Yell brown (10YR5/4). laminated	fied lowish J.	6-8 Ft. Grab sam from auger flights Sampler pushing : rock.
SS	2.0	1.5	8-10					10_		10.2-10.8 Ft West red		
							-			10.8-10.9 Ft. Brownish yells	ow.	1
										10.9-11.1 Ft. Dark brown.		
										Bottom of borehole at 12.0 Ft. Borehole backfilled with spoils,	12/2/87.	
							1					
			-									Description and classification of
												examination.
\$S =	SPL	IT SF	POON; ST	= SHE	LBY TU	JBE; S	ITE					HOLE NO.

[

80 7-81 RECO 9 A 300 320 2.0 2.0 2.0	Ha COU B 9. VVERY 5/9 100 100 100 100 2.0 2.0 2.0	ncock MPLETED -27-88 (FT./X. -24 -27-88 (FT./X. -24 -27-88 (FT./X. -24 -27-88 (FT./X. -24 -27-88 (FT./X. -24 -27-88 (FT./X. -24 -27-88 (FT./X. -24 -27-88 (FT./X. -24 -27-88 (FT./X. -24 -27-88 (FT./X. -24 -27-88 (FT./X. -24 -27-7 (FT./X. -27-7 -27-88 (FT./X. -27-7	St. (L DRILL) CORE /FALL in. /FALL in. T SNL SOL SOL SOL SOL SOL SOL SOL SOL SOL SO	ODI) ER EMI BOXES CAS CAS ESTS SUS SUS CAS		SOILS ESEL. TO FT IN HO NO	P CASI	A./L		1,725 E 1,983 IKE AND MODEL SIZE CME 45B 12' UND EL. DEPTH/EL. GI S.O/ 9/2' TH LOGGED BY: DESCRIPTION AND	DVERBURDEN 10.0 ROUND WATER 7/88 J. Lord CLASSIFICAT:	Verti ROCK DEPTH/	CAL (FT.) TOTAL DI 10.1 EL. TOP OF ROCK / NOTES ON: WATER LEVELS WATER RETURN
7-81 RECO 9. 300 NMU- 1.5 2.0 2.0	8 9. WERY 5/9 1b: 10 2.0 2.0 2.0	-27-88 (FT./X) 55 WEIGHT s./ 24 **N* SMOD **N* SMOD **N* **N* ***************************	/FALL in. PR T SSO J G	EMI BOXES CAS CAS ESTS SI ESTS SI ESTS ESTS ESTS ESTS ES		SOILS ESEL. TO FT IN HO NO	P CASI	A./L		DESCRIPTION AND	10.0 COUND WATER J. Lord CLASSIFICAT:	DEPTH/	10.1 EL. TOP OF ROCK / NOTES ON: WATER LEVELS
RECO 9. E NA 300 BUD HALL	VERY .5/99 .5/99 .5/99 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0	(FT./X 5 WEIGHT, 5./ 24 WI GHT, 5./ 24 WI GHT, 4-5-4 2-2-2-3 4-18 20-15 5-5-6-9) CORE /fALL in. PRRT T SSOJ	BOXES CAS DATEFESSUS ESSUS SSIS UNS CAS	SSAMPLI S ING LE RE NII WII WII WII WII WII K	ESEL. TO	P CASI	BRAPHICS	ENG	UND EL. DEPTH/EL. GI 3 8.0/ 9/2 TH LOGGED BY: DESCRIPTION AND	J. Lord		NDTES ON: WATER LEVELS
2.0 2.0	2.0	VEIGHT, s./ 24 ■ WEIGHT, s./ 24 ■ WEIGHT, WEI	/FALL in. PRI EXI SZI SZI SZI SZI SZI SZI SZI SZI SZI SZ	CAS NATEFESSU ESTS SSUS SSUS SSUS A		FT IN HO. NO	HLANG	GRAPHICS	ENG	TH LOGGED BY:	J. Lord CLASSIFICAT:		NDTES ON: WATER LEVELS
2.0 2.0 2.0		5./ 24 "N" 5000 34-5-4 2-2-2-3 4-5-4 2-2-2-3 4-18 20-15 5-5-6-9	HI. PRT T SSZI SSOT	ATEF ESSU ESTS SSU ESTS SSU ESTS	TIME 32	ELEU.	DEPTH	GRAPHICS	AMPLE	DESCRIPTION AND	CLASSIFICAT:	IDN	NDTES ON: Water Level Water Return
	2.0 2.0	32000 X 32000 X 32000 X 4-5-4 4-5-4 2-2-2-3 4-18 20-15 5-5-6-9	Loos IN G.P.M	ESSUE SSTS SSE SSE SSE SSE SSE SSE SSE SSE	TIME 7	ELEV.	DEPTH	GRAPHIC	THUR I	DESCRIPTION AND	CLASSIFICAT:	LON	NOTES ON: WATER LEVELS WATER RETURN
2.0 2.0 2.0 2.0	1.0 2.0 2.0	4-5-4 2-2-2-3 4-18 20-15 5-5-6-9				-	1	1	ľ1				DRILLING, E
2.0 2.0 2.0 2.0	2.0 2.0 2.0	2-2-2-3 4-18 20-15 5-5-6-9		-			-			0.0 - 0.5 Ft. ASPHALT AIRCO driveway.	& GRAVEL	h	Borehole advanc
2.0 2.0 2.0	2.0	4-18 20-15 5-5-6-9								0.5 - 3.4 Ft. Silty grave (SM-SG). Moderate dusky red (5R3/4) mi brick gravel with a se	liv SAND. brown (5YR3/4) to ixed organic flecks, andy silt loam. Dr		o.d. hollow-stem augers. Radiologically sampled and
2.0	2.0	5-5-6-9					δ_			soft, crumbles easily. 3.4 - 6.5 Ft. <u>Silty SAND</u> (N6) to light bluish g	No cohesion. FIL (SM). Light gray ray (5B7/1). Wet,		gamma-logged b TMA-Eberline, I
2.0						-				foose, adhesive, slight fines component, sligh rubbery.	ly stiff. Slight htly elastic or		8.0 Ft. Groundy
	2.0	8-10-15					10			 6.5 - 10.0 Ft. Silty SAN yellowish orange (10) coarse-grained sand. sorted with 20% silt. moisture. No shear st feldspar and quartz n thread, rubbery. 8.2-8.4 Ft. Saturated Bottom of borehole at 11 Borehole backfilled with 9/27/88. 	(D (SM). Dark (R6/6) medium- tc Subangular, poorl Adhesive due to tl rength. Mixed ninerals. Compact, d to 'runny'. 0.0 Ft. clean spoils,	y he no	observed. 6.5 Ft. Top of undisturbed soil.
													Description and classification of soils by visual examination of samples.
SPL	.1T S	PDON; S	T = SHE	LBY T	UBE;	SITE		81) I I	lancock St (1)	 ODi)		HOLE NO.
	SPL	SPLIT S JENNISON	SPLIT SPOON; S DENNISON; P = P	SPLIT SPOON; ST = SHE DENNISON; P = PITCHER;	SPLIT SPOON; ST = SHELBY T DENNISON; P = PITCHER; O =	SPLIT SPOON; ST = SHELBY TUBE; DENNISON; P = PITCHER; O = OTHER	SPLIT SPOON; ST = SHELBY TUBE; SPLIT SPOON; ST = SHELBY TUBE; SENNISON; P = PITCHER; O = OTHER	SPLIT SPOON; ST = SHELBY TUBE; SPLIT SPOON; ST = SHELBY TUBE; SPLIT SPOON; P = PITCHER; O = OTHER	SPLIT SPOON; ST = SHELBY TUBE; SPLIT SPOON; ST = SHELBY TUBE; SPLIT SPOON; P = PITCHER; O = OTHER SITE SENNISON; P = PITCHER; O = OTHER	SPLIT SPOON; ST = SHELBY TUBE; SPLIT SPOON; ST = SHELBY TUBE; SENNISON; P = PITCHER; O = OTHER A-3	SPLIT SPOON; ST = SHELBY TUBE; SPLIT SPOON; ST = SHELBY TUBE; SPNISON; P = PITCHER; O = OTHER SA-3	SPLIT SPOON; ST = SHELBY TUBE; SPLIT SPOON; ST = SHELBY TUBE; STTE SERNISON; P = PITCHER; 0 = DTHER SA-3	SPLIT SPOON; ST = SHELBY TUBE; SPLIT SPOON; ST = SHELBY TUBE; SHITSON; P = PITCHER; D = OTHER SA-3

SITE	G	EU	LOG		KIL		G	4750		FUSRAP 4501-138 1 0F 1 123
	80	Ha	ncock	St. (L	,ODI)	COORDIN	AIES		N 1,870 E 1,995 Vertical
BEGU	IN	C 0	MPLETED	DRILL	.ER		<u> </u>		DRIL	MAKE AND MODEL SIZE OVERBURDEN ROCK (FT.) TOTAL
12- CORE	REC	DVER	2-6-87 ((FT./X		BOXE	E.D.	I. ESEL. T	OP CAS	ING	IOBILE B-57 6.5" 10.0 10 GROUND EL. DEPTH/EL. GROUND WATER DEPTH/EL. TOP OF ROOM
	_5	5.5/0	55		_	5	<u> .</u>			¥//
SAMP	LE N. 14	AMME# 0 115	r weight s./ 30	/FALL in.	CAS	ING LE	FT IN H	DLE: DI	A./L	ENGTH LOGGED BY: D Harnish
w.	ت ا		<u> </u>		JATER	2				
μ	D D D	REC	L N N N N N N N N N N N N N N N N N N N		ESSO TESTS		ELEU.	E	Įų̃	NOTES ON:
 ₽ <u>0</u>	d Z			P.H N B.H	S S S S S S S S S S S S S S S S S S S	ESS.			P	
B A	L S	20 CC	. <u> </u>	9° L		Ξ ΄ Ξ			ð	DRILLING, I
SS	1.5	1.2	8-7-16					.		0.0 - 4.7 Ft. Silty GRAVEL SILT, and Gravelly SILT FILL (GM, ML, GM-ML). 0-10 Ft. using
SS	1.0	0.9	8-20					.		0.0-0.5 Ft. Silty GRAVEL, broken basalt auger. gravel.
								•		0.5-2.5 Ft. Silt, dark brown (7.5YR3/4), 3-4 Ft. Grab a
SS	2.0	1.0	5-15-4-4					· _		some gravel from auger fligh
								-		brown (2.5YR3/4), some Brunswick
SS	2.0	0.9	7-27 22-25]]		silt and sand are decomposed Brunswick formation.
22	20	15	12-24					.		4.7 - 6.0 Ft. Sandy SILT (ML-SM).
			26-29					-		mottling, very fine-grained, natural undisturbed sediments.
								10.	μμ	6.0 - 10.0 Ft. SILT (ML). Brown
										(7.5 1 K4/2) with olive stain on top. [ppm 6 in. into] 69-80 Ft. Yellowish brown (10YR5/4)
										clayey.
										Bottom of borehole at 10.0 Ft.
								1		Derendie Dackliffed with spons, 12/0/01.
										Description and
										soils by visual examination.
	1									
 \$\$ =	SPL1	T SP	DON: ST	= SHEL	BY TU	BE: SI	TE	1		I NOLE NO.
0 = 1	DENNI	SON;	P = PI	TCHER;	0 # 0	THER			80	Hancock St. (LODI) 1230R

	G	EO	LOG	IC D	RIL)G				FUSRAP	<u> </u>	4501	-138 1	OF 1	12
SITI	: 80	Ha	ncock	St. (1	ODI)	COORDIN	IATES		N 1.5	100 E 2.1	017		ANGLE FR	ical	BEARI
BEG	JN .	CO	MPLETED	DRILL	.ER	<u> </u>			DRIL	L NAKE	AND MODEL	SIZE	OVERBURDE	ROC	K (FT.)	TOTA
12	-7-8	7 1 N/FR	2-7-87		BOXE	E.D.	I.		TNG	MOBI	LE B-57	6.5"	7.5	DEPTH		
	5	5.3/7	76			4		ur ung	110			/ / /			/ /	/
SAM	LE N	AMMER	WEIGHT	7FALL	CAS	SING LE	EFT IN HO	DLE: D	14./1	ENGTH	LOGGED BY:					
	14	<u>0 Ib</u>	s./ 30	<u>in.</u>	JOTE		NO	NE	T				D. Ha	rnish	1	
SAMP. TYPE	SAMP. ADU.	SAMPLE REC.	SAMPLE BLOWS "N" X CORE RECOVERY	PR BR WI SSOT	ESSU ESSU SUU EST SUU SUU SUU SUU SUU SUU SUU SUU SUU S	WIL NIN NIN	ELEV.	DEPTH	GRAPHICS	SANTE	ESCRIPTI	on and c	LASSIFIC	ATION	NOTES WATER WATER CHARAI DRILL	ON: LEVI RET CTER ING,
SS	2.0	1.5	7-24						-	0.0	GRAVEL (RAVEL and P, GM).	l Silty		Borehol 0-7.5 F	e adva t. usin
SS	1.5	1.1	7-7-7								0.0-0.5 Ft. 0.5-4.2 Ft.	Gravel, brol Silty gravel,	sen basalt gr dusky red _i	avel.	auger. Gamma TMA-E	-logge berlin
ss	2.0	2.0	3-24 16-13					- 5.			prunswick s decomposed gray sandsto	Brunsick fo one gravel.	a matrix of rmation, mi	nor olive		
ss	1.5	0.7	7-21-61 50/2"						الل	4.2	- 5.3 Ft. 5] (7.5YR3/0) clayey, soft.	<u>ULT</u> (ML). ' with some in	Very dark gr ron-oxide m	ay ottling,	Silt disc	colorec
								-	1-		5.1-5.3 Ft.	Clayey sand	, gray (7.5Y	R5/0).	moistur	e.
											gray (2.5Y6) downward () stiff.	$\frac{1}{2}$ becomin $\frac{1}{10}$ km $\frac{1}{2}$, $\frac{1}{2}$	g grayish brownin iry on top, n	own nedium	refusal.	Auge
											6.0-6.6 Ft.	Grayish bro	wn, clayey, e	lamp.	l.	
											6.6-6.7 Ft.	Grayish gre	en.			
										6.1	- 7.5 Ft. S	AND (SP). , clean.	Very			
												· · · · · · · · · · · ·		<u>-</u>		
						ł				Bo	ttom of bore rehole backfi	hole at 7.5 f lled with sp	t. oils, 12/7/87			
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								1								
						1		1								
				(·			ļ	1								
															Descript	tion at
								{	1						classific soils by	ation visual
						l									examin	tion.
						<u> </u>	<u> </u>								<u> </u>	
SS = D =	SPL	IT SF ISON:	P = P1	= SHEI TCHER:	LBY TU	JBE; S THER	ITE		80	Har	ncock S	t. (LOI	DI)		HOLE NO	221
												(/			

	G									<u></u> F	JSKAP		14501	-138 1	OF I	12201
ITE	00	T . T		S4 /7			COORDIN	TES		NT 4 AP		<u></u>		ANGLE FR	OM HORIZ	BEARING
EGU	<u>00</u> N		MPLETED	DRILL)	<u> </u>		DRILL	IN 1,93	E Z,0	27 IS125	OVERBURDE			TOTAL DE
2-	7-8	7 1	2-7-87	, [E.D.	I		N	MOBILI	E B-57	6.5"	10.0			10.0
ORE	REC	VERI	(FT./%	CORE	BOXE	SAMPL	ESEL. TO	P CAS	ING	GROUND E	L. DEPTI	K/EL. GROU	ND WATER	DEPTH	/EL. TOP	OF ROCK
	6	.3/0	53		_	5					<u> </u>				/	
	LE 14 1 A (1994E) 1 1 h	- / 30	/fALL In	CAS	ING LE	NOT	LE: DI	A./L	ENGTH L	XGGED BY:		D He	mich		
	•		s./ 30	111. L	ATER	2	NO	NC.					<u>D. 11a</u>	i µisii	T	
AND DIAN.	LEN CORE	CORE REC.	SAMPLE BLOWS "N' X CORE RECOVERY	PR W.4.0 SSOT	ESTS	MIN.	ELEV.	DEPTH	GRAPHICS	n Des	CRIPTIO	n and C	LASSIFIC	ATION	NOTES WATER WATER CHARAC DRILLI	ON: LEVELS RETURN TER OF
s	2.0	1.7	1-4-8-7							0.0 -	4.6 Ft. Gra	velly SILT	and SILT F	ILL	Borehol	e advance
s	2.0	1.8	5-7-5-7							(0 0.1 70 53)-2.5 Ft. G Idish brown	ravelly silt 5. Gravel i	; dusky red Brunswick	and	o.d. holl auger. Gamma TMA-E	-logged b berline, li
s	2.0	0.9	7-7-8-12				-	5_		2.l or Bi	-4.0 Ft. S manic, plant unswick sat	ilt; dark gr: ; fragments ndstone.	ay to black, minor grav	el of	4.0-6.6 Radiolo	Ft. gically
s	2.0	1.9	6-30-45 36				-			4.4 Vi	-4.3 Ft. S th greenish avel.	and; grayis gray silt pi	h brown (2. jeces, minor	5¥5/2)	with has probe.	nd "pance
ss	2.0	0.0	16-21 20-21							4.1 rei	-4.6 Ft. S. Idish brown	ilt; interlay and greying	ered dark sh green.			
							-			(2 6.6 -	5¥3/0), soi 7.3 Ft. SA	t. ND (SP).	Greenish gra	/	-	
										do 7.3 -	wnward, ve 10.0 Ft. <u>SI</u> llow (10YR	T (ML). 1	ined. Brownish	brown		
								1		Botte	th depth (5	YR5/4), dr	y, stiff, crui	mbly.		
					l					Borel	ole backfill	ed with spo	bils, 12/7/87	1.		
							i .									
															Descript classific soils by examina	tion and ation of visual tion.
5 =	SPL	TSF	OON; ST	= SHEL	BY TU	BE; S	ITE							······	HOLE NO	

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	~							PROJE	CT			·	JOB NO	. ISHE	ET ND.	HOLE NO.
SITE	G	EL	LUG		KIL	LLO	G	***			FUSRAP		4501	-138 1	OF 1	2025R
	80) Hs	ncock	St. (I	ODI)	LUCKOINA	ILS		N 1.	711 F 2 (035		ANGLE FR	OM HORIZ	BEARING
BEGUI	N	C	MPLETED	DRILL	ER	· · · · ·			DRIL	L NAK	AND NODEL	SIZE	OVERBURDEN	ROCK	((FT.)	TOTAL DEPT
9-2 CORE	REC	OVER	-23-88	S CORE	EM.	PIRE SISAMPL	SOILS	P CAS	ING	CN	IE 45B	12"	10.0	DEDTH	/E1 TOD	10.0
	9	.0/1	00			5						8.0/ 9/23/	88	DEP IN,	/EL. 10P /	OF ROCK
SAMPI	LE M. 30	анмеі П 11-	R WEIGHT Is./ 74	/FALL in	CAS	ING LE	FT IN HOL	LE: D	1 A./L	ENGTH	LOGGED BY:					
H •	<u>اس</u>			10.	JATE	2	1401	VE.					J. L0	ra	T	
SAMP. TY AND DIAT	LEN COR	SAMPLE RE CORE REC	SAMPLE BLOUS "N X CORE RECOVER	LOSS IN G.P.M	ESTS SSUA SSUA SSUA SSUA SSUA SSUA SSUA S	TIME	ELEV.	DEPTH	GRAPHICS	SAMPLE	DESCRIPTIO	on and C	LASSIFIC	ATION	NOTES WATER WATER CHARAC DRILLI	ON: LEVELS, RETURN, TER OF (NG, ETC.
88	10	10	7-5				_		_	0.	AIRCO drive	SPHALT &	GRAVEL.		Borehold	advanced
SS	2.0	2.0	2-2-2-2				-		-	- 1 .	(SM-SG). N dusky red (5 brick, gravel	lty gravelly loderate br R3/4) mixe with a san	SAND. own (5YR3/4 d organic flee dy silt loam.) to ks, Dry, r	0-10 Ft. o.d. holl augers. Radiolog	using 12 in. ow-stem gically
ss	2.0	2.0	9-8-11 15		•			5_		2.	8 - 6.0 Ft. Si gray (5G6/1	ity SAND (). Moist, los	o cohesion. 1 SM). Greeni sse, adhesive,	sh	sampled gamma- TMA-E	and logged by berline, Inc.
ss :	2.0	2.0	5-7-8-12				-			6.	No thread. 0 - 9.0 Ft. <u>Si</u> yellowish bro	ity SAND (wn (10YR)	SM). Modera (4) medium	ate to		6
ss	2.0	2.0	13-13 15-16				-	Ž.			poorly sorted to the moistu feldspar and thread mubb	with 20% are. No she quarts min	silt. Adhesiv ar strength. erais. Compa	e due Mixed ^{sct, no}	observed 6.0 Ft. undistur	Groundwater 1. Top of bed soil.
								10.	+++		8.0-8.2 Ft.	A 'runny' si	sturated inter	val.	1	
										9.) - 10.0 Ft. S	andy SILT	(ML). Light	/		
											Stiff, well son crumbles cas	ted, slightl ily. Dense.	y cohesive, bi	it		
										Bo	ottom of boreh rehole backfil	nole at 10.0 lied with cle	Ft. an spoils,			
											9/23/88.					
							•									
										- 14					Descripti classifica soils by v examinat samples.	ion and tion of visual tion of
S = : = D	SPL1 ENNI	T SP SON;	00N; ST P = PI1	= SHEL CHER;	BY TU 0 = 0	BE; SI	TE		80 80	Har	ncock St	. (LOI	 DI)		HOLE NO.	25R

	-				-		-	PROJE	CT	JOB NO. SHEET NO. HOLE
517		שבנ	JLUG		KIL		JG			FUSRAP 14501-138 1 OF 1 11
	- 	Han	cock S	t. (LC)DI)		LUCKDIN	AIES		N 1.988 E 2.067
BEG	UN _ 2_ 9	27	MPLETED	DRIL	ER	EP	т.		DRIL	MAKE AND MODEL SIZE OVERBURDEN ROCK (FT.) TOTAL
ORI	E REC	OVER	<u>2-3-8</u> Y (FT./3	CORE	BOXE	E.D.	.I. .ESEL. TO	DP CAS	ING	AOBILE B-57 6.5" 10.0 10 GROUND EL. DEPTH/EL. GROUND WATER DEPTH/EL. TOP OF ROOM
SAMI	PLE H	5.7/:	57 R WE1GHT	/FALL	CAS	5	ET IN NO		A /1	
_	14	<u>0 Ib</u>	s./ 30	in.			<u>NO</u>	NE	A./L	D. Harnish
	S E		u.z.u.≿	PR	JATE! ESSU	RE			Ŋ	
- H	₹ ō	ш Ш	APL NO NO NO NO NO NO NO NO NO NO NO NO NO	ωΣ	0H	<u>5</u>	ELEV.	HL	I H	DESCRIPTION AND CLASSIFICATION WATER LEVE
	LEN	N NO	R L C S	SN -	н С С С	E A E	•		GRAI	WATER RETU
1	00 ¹		-		<u> </u>		<u>_</u>			DRILLING, 0.0 - 4.0 Ft. GRAVEL, Gravelly SILT and Borehole advar
		1.0			2			-		SILT FILL (GP, GM-ML, OL). 0.0-0.5 Ft. Gravel, broken basalt
55	2.0	0.2	5-7-8 11							0.5-2.3 Ft. Gravely silt, gray and brown. Radiologically sampled and
s	2.0	1.4	7-12-16				· 	-		Gravel of decomposed and broken [gamma-logged Brunswick sandstone. TMA-Eberline,
			20					5_		(2.5Y4/2).
S	2.0	1.8	8-6-10 10				-	-	μЦ	4.0 - 6.3 Ft. SILT (ML). Light gray
s	2.0	1.3	6-8-10							iron-oxide mottling.
-			10					-		Dark yellowish brown (10YR4/4), very fine-grained, interbedded on scale of 1 cm.
							-			8-10 Ft. Sand, very fine-grained.
										Bottom of borehole at 10.0 Ft.
										Borehole backfilled with spoils, 12/3/87.
						1				
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		ŀ					,			Description and classification of
			:			ľ				solis by visual examination.
= 0	SPLI	I SP(SON;	P = PIT	= SHELI CHER; (BY TUB D = OT	E; SI HER	12		Н	ancock St. (LODI)
									1	-8
									-	-

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	G	EC	DLOG		RIL	LLC)G	PROJE	CT		FUSRAT	 P		JOB NO	. SHE	ET NO.	HOLE NO.
SITE				<u> </u>		· · · · · · · · · · · · · · · · · · ·	COORDIN	ATES				•		44301	ANGLE FR	ON HORIZ	BEARING
EGL	<u>ж</u>	HI IC	MPLETED	St. (LODI LER)			DRII	N	1,705 E 2	2,100	R17E	OVEDBILDDEN	Ver	tical	
9-2	23-8	8 9	-23-8	8	EM	PIRE	SOILS				CME 45B		12"	10.0	KUC	N (117)	10.0
CORE	REC	over 3.4/3	Y (FT./3 88	K) COR	E BOXE	S SAMP	LESEL. TO	PCAS	ING	GR	COUND EL. DE	PTH/E 8.4/	L. GROUN	D WATER	DEPTH	/EL. TOP	OF ROCK
SAMP	LEN	ANNE	R WEIGHT	T/FALL	CAS	SING LI	EFT IN HO	LE: DI	IA./	EN	GTH LOGGED B	/: /:	·····			/	
tet i	30	0 1b	<u>s./ 24</u>	<u>in.</u>			NO	NE	-	T				J. Lo	rd		
SAMP. TYPE AND DIAM.	SAMP. ADU. LEN CORE	SAMPLE REC.	SAMPLE BLOWS "N" X CORE RECOVERY	LOSS LOSS NI A.P.M	RESSU TEST: ON UN UN		ELEV.	DEPTH	GRAPHICS	SAMPLE	DESCRIPT	'ION	and Cl	assific	ATION	NOTES WATER WATER CHARAC DRILLI	ON: LEVELS; RETURN; CTER OF ING, ET(
SS	1.5	1.2	10-10-8				-			Ċ	0.0 - 0.5 Ft. AIRCO dr	ASPE	ALT & C	RAVEL.		Borehol	e advanced
SS	2.0	1.2	3-2-2-5	5							0.5 - 3.0 Ft. (SM-SG). dusky red	Silty Mode (5R3/	travelly S trate brow 4) mixed	AND. wn (5YR3/4 organic flee) to ks,	0-10 Ft o.d. holl augers. Radiolog	. using 12 i low-stem gically
SS	2.0	2.0	11-7-12 17					5_			soft, crumi 3.0 - 6.4 Ft.	bles es Silty	h a sandy sily. No	cohesion. I M). Dark		gamma- TMA-E	l and logged by berline, In
SS	2.0	2.0	8-10 14-20				-				(5B7/1). stiff. Slight	(N6) c Wet, 1 it fine	or light bl oose, adh s compon	uish gray esive, slight ent, slightly	ung 10	84 54	Consideration
	2.0	2.0	⊳-8-9-1					10 .			6.4 - 9.0 Ft. yellowish t sand. Sub silt. Adhe shear stren minerals. (Crumbles e 9.0 - 10.0 Ft. brown (5Y Stiff, well s crumbles e Bottom of bon Borehole back 9/23/88.	Silty 1 prown angul: sive di gth. Comparative casily. Sand R5/6 Biorted asily. rehole filled	SAND (S) (10YR5/ ar, poorly ue to the Mixed fel ct, no th y SILT (. Very sli , slightly Dense. at 10.0 F with clea	M). Modern 4) coarse sil sorted with moisture. I dspar and q read, rubber ML). Light ghtly moist cohesive, bu t. n spoils,	tte ty 20% No uartz ry.	6.4 Ft. undistur	Top of rbed soil.
																Descript classifica soils by examina samples.	ion and ation of visual tion of
S = = (SPLI	T SP	OON; ST P = PI	= SHE TCHER;	LBY TU O = O	BE; S Ther			80	H	lancock S	St.	(LOD	I)		HOLE NO	

BEGL 12- CORE	IN -8-8 REC	Han CO 7 1 OVERI	COCK S MPLETED 2-8-87 (FT./X	DRILL	DI) ER BOXE	E.D.	I. Esel. To	P CAS	DRILI N ING	N 1, MAKE MOB GROUN	991 E 2,172 AND MODEL (LE B-57 D EL. DEPTH/	2 SIZE 6.5" EL. GROU	OVERBURDEN 8.0 IND WATER	Vert ROCI DEPTH	ical (FT.) /EL. TOP	TOTAL S
SAMF	LEH	AMMER	VEIGHT	/FALL	CAS	ING LE	FT IN HO	LE: DI	IA./L	ENGTH	LOGGED BY:			<u>_</u>	/	
<u>۳</u> .	14 14	010	s/ 30 1	n. t	IATER	2	NO	<u>ne</u> T		1	1	aka muti a t	D. Harr	nish		
SAMP. TY	SAMP. ADI	SAMPLE RE CORE REC	SAMPLE BLOUS "N X CORE RECOVERY	LOSS IN G.P.M	PRESS. 15	HINE NIN.	ELEV.	DEPTH	GRAPHICS		DESCRIPTION	and C	LASSIFIC	TION	NOTES WATER WATER CHÀRAC DRILLI	ON: LEVE RETU TER NG,
SS	1.5	1.3	7-14-20							0.	- 2.8 Ft. GRA	VEL and	Silty GRAV	BL	Borehole 0-8 Ft. u	adva
SS	2.0	0.2	20-10								0.0-0.7 Ft. Gri basalt gravel.	vel, asph	alt and broke	en -	auger. Radiolog	ically
55	2.0	1.8	14-22 30-41					5.		 2.	0.7-2.8 Ft. Silt Brunswick sand 5 - 5.1 Ft. Silty FILL (7) (SM. 1	y gravel. stone with <u>SAND at</u> ML-GM	Dusky red th dusky red a nd Gravelly S	ilt. J	TMA-Et 2-4 Ft. from aug	logged berlind Grab ger flig
SS	2.0	1.8	15-15 25-25						-		2.8-4.0 Ft. Silt with greenish ti	y sand. i nt, soft, (Dark gray (5) damp.	¥4/1)	0-0.5 Ft. roadbed.	. No i
-							-		<u> </u>		4.0-4.9 Ft. Gra with round Bru	velly silt nswick st	. Greenish gi indstone grav	ray el.		
											4.9-5.1 Ft. Silt	y sand.	Greenish gray		ENDIER	
										5.	(5YR5/2), olive	(ML). 1 stain on	top.	•]	ENMET ppm at t hole.	reads op of
			•							5.	f - 8.0 Ft. <u>SAN</u> medium-graine subangular grai	D (SP). 1 d, some s ns.	Fine- to ilt, minor gra	vel,		
											5.4-6.0 Ft. We	ak red (2	.5YR4/2).			
											5.0-8.0 Ft. Rec gravel, wet.	Idish bro	wn (5YR4/3)	. Minor		
										B	ottom of boreholo orehole backfilled	e at 8.0 F I with spo	't. pil s, 12/8/87 .			
										•						
	1															
							2	ĺ								
															Descripti classifica soils by v examinat	ion an tion c visual tion.
SS = D =	SPL	IT SF	POON; ST P = PI	= SHEL TCHER;	.BY TU 0 = 0	BE; S	ITE		H	and	ock St. (LODI)		HOLE NO.	25
				<u> </u>	-				7	-10						

	G	EC	DLOG	IC D	RIL		G				FUSR.	AP		14501	-138	10	F 1	2022
ITE	. R 0	H	ncock	St (T	זתח	<u> </u>	COORDINA	TES		N 1 4		2 3 10	 		ANGLE	FROM	HORIZE	BEARING
EGU	IN IN	- ICC	MPLETED	DRILL	ER.	,			DRIL	IN I.	AND HO	2 2,10 DEL	Z SIZE	OVERBURDE	I V N İR	ertic	81 (FT.)	TOTAL D
)-2	2-8	89	-22-88	3	EMI	PIRE	SOILS			CM	E 45 E	3	12"	10.0				10.0
UKĘ	RECI 7	OVER	r (F1./% 77) CORE	BOXE	SISAMPL	ESIEL. TO	P CAS	ING	GROUN	EL.	DEPTH/	'EL. GROU	ND WATER 8	DEI	PTH/E	L. TOP	OF ROCK
MP	LE W	AMHEI	R WEIGHT	/FALL	CAS	ING LE	FT IN HOL	E: D	IA./I	I Ength	LOGGED	<u> ₹ /</u> BY:					/	
. 1	30	<u>0 lb</u>	<u>s./ 24</u>	in.			NOI	NE .						J. L	ord			
뉡	S B B B B B B B B B B B B B B B B B B B			PR	JATEF ESSU	RE		-	2									
	.0	ш <u>.</u>	1000	mΣ			ELEV.	F.	Ŧ	ត្ត ដ	escri	PTION	AND C	LASSIFIC	CATIO	N 3	ATER	DN: LEVELS
밁	튄	I I I I I I I I I I I I I I I I I I I	R LOA	од С Н с	S S S	NN N		Ö	1 A							u S S	ATER HARAC	RETURN
54	<u></u>	di Di Di		- 0	<u>ā</u> d	- 2					- 05 F	ASP	HATTA	PAVEL.			RILLI	NG, ET
S	1.5	1.5	10-15-2:					,	-		AIRCO	Drivew	ау.	<u>GAUNY EIL</u> .		_ ∏°	-10 Ft.	advance
5	2.0	0.0	5-6-6-7						_	0.6	- 4.0 F	t. Sand 5YR3/	y SILT F	LL. Mode y red (5R3)	rate (4).		ollow si ampled	em auge and
											Mixed of sandy s	ilt loam	liecks, brid Dry, sol	ck, gravel w t, crumbles	vith a		amma- y TMA	logged to -Eberlin
s	2.0	2.0	3-6-8-12							4.0	23511Y.	t. Silty	SAND (S	M). Light		¹	BC.	
								Ð.]		loose, an	dhesive,	slightly s	tiff. Slight	** 261			
s	2.0	1.8	10-10 16-12]		6.0-7.7	Ft. We	t to satur	ated; stiffer	with			
18	20	20	10-10				-		₽		depth.	D4		() ()			.0 Ft. (Groundw
	2.0	4.0	10-12				4	7		7.7	- 10.0 I Modera	Ft. <u>Silt</u> te yello	y SAND (wish brow	SM). n (10YR5/	4)	7 1	.7 Ft. Indistur	Fop of bed soil.
-							-	10	1		subangu Adhesiv	ilar, poi	orly sorted	with 20%	silt. Bilt.	Ч		
										\	strength	1. Mixe 1. Com	d feldspar pact, no t	and quart	t bery.			
																-		
										Bo Bo	ttom of rehole b	borehol ackfille	e at 10.0] d with clea	Ft. an spoils,				
											9/25/88	5.						
							ļ											
												•				I)escripti lassifica	on and tion of
									1							3	oils by v xamina	visual tion of
				[ľ		1			、				•	amples.	
 ; =	SPL1	T SP	TZ: NOO	= SHE1	BY TU	BE: SI	ITE		<u> </u>	[]				··	···		DLE NO.	
= 1	DENNI	SON	D = D11		0 - 0		-		00			• ••	() AB			10		000

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SIT								ATEC		FUSRAP 14501-138 1 OF 1 1	222
	8) H	ncock	St. ()	LODI)		AIES		N 1.933 E 2.186 Vertical	ING
BEG	JN _7_4	27 1	OMPLETE	DRIL	LER	T: T			DRIL	MAKE AND MODEL SIZE OVERBURDEN ROCK (FT.) TOTA	AL Ö
CORE	REC	OVER	Y (FT./	X) COR	E BOXE	E.L	LESEL. TI	OP CAS	ING	GROUND EL. DEPTH/EL GROUND WATER DEPTH/EL TOP OF R	10.
	(5.3/	63			5					IULA
BAR	'LE H 14	O IL	к weigh os./ 30	T/FALL	CA	SING L	EFT IN HO NO	NE: DI	IA./I	ENGTH LOGGED BY:	
Ш.	تا اد	0			WATE	R				D. Harnish	
	A SS	R R			TEST	5 1		E	12	NOTES ON:	
ц.	₽ Z			SN T SN T	SH SH	H Z Z Z			Ē	WATER RET	'UR
₩£ E	SA	A D		و ر	E C	E.E		-	8	DRILLING,	2 OI
SS	2.0	1.0	1-1-6-1	1						0.0 - 4.6 Ft. Gravelly SILT. GRAVEL. and SILT FILL (GM-ML, GP, ML). 0-10 Ft using	anc
55	2.0	17	15-14	4						0.0-2.4 Ft. Gravelly silt, dark reddish o.d. hollow-st auger.	tem
			14-15					.		brown (5YR3/3) mixed with dark brown topsoil and Brunswick sandstone gravel; TMA-Eberlin	ed b 1e, I
SS	2.0	2.0	7-2-2-5	5		·		-		giass at base. 1-2 Ft. Grab 2.4-3.0 Ft. Gravel dusky red Brunswick from auger fit	sai ight:
							-	5_	\prod	sandstone.	б епт
ss	2.0	1.6	3-21-20					•		3.0-3.3 Ft. Silt, mixed dark gray, dark reddish brown, brownish yellow, some black	
]			-	1 -	╓╫	SJ-4.6 Ft Gravel dusky and Deux might	
SS	2.0		5-9-11-	1						sandstone; dead plants and grass at base, (pre-fill surface?).	
				-				10		4.6 - 6.9 Ft. SILT (ML).	
										4.6-4.9 Ft. Reddish gray, organic.	
- 1										4.9-5.4 Ft. Sandy, gray (10YR5/1).	
										5.4-6.8 Ft. Very dark gray (7.5YR3/0).	
										6.8-6.9 Ft. Sand, very dark gray.	
										(7.5YR6/4) and dry becoming brown (7.5YR6/4) and damp downward	
					ĺ					Bottom of borehole at 10.0 Ft. Borehole backfilled with spoils, 12/7/87.	
				ľ							
										Description an	d
										soils by visual examination.	•
s = :	SPLI	r spo	XON; ST	= SHELI	BY TUB	E; SI	TE	<u> </u>		HOLE NO.	
* D	ENNIS	SON;	P = PIT	CHER; (0 = OT	HER		8	<u>80</u>	Hancock St. (LODI) 1222F	2
									A .	-12	

STIE COULD CONTRET FUSRAP 14501-138 10 1 2001 BOD Hancock St. (LODI) N 1,800 E 2,194 Vertical		(GF(ח י	BII			PROJE	СТ	_			JOB NC	. SHI	EET NO.	HOLE NO.
B01 Hancock St. (LOD) Partice And Rock N 1,800 E 2,194 Vertical	SIT	E					J & 2 Lo		COOPDIA	ATES			FUSRAP		14501	-138 1	OF 1	2023R
EGUM COMPLETED PAILLER PAILER PROFIL PAILER ADDRECK FILZ MERANDER ROCK (F1.) 107AL DU 14.0 CARE ASS DULLS CME 45B 12" 14.0 14.4 CARE ASS DULLS CME 45B 12" 14.0 14.0 SAUD 157.2 CARE ASS DULLS CME 45B 12" 14.0 14.4 CARE ASS DULLS CARE ASS DULLS CARE ASS DULLS DEPTIAL DEPTIAL DEPTIAL TO F RECK SAUD 157.2 CARE ASS DULLS CARE ASS DULLS DEPTIAL DEPTIAL <td></td> <td>8</td> <td>0 H</td> <td>ancock</td> <td>S</td> <td>t. (L</td> <td>.ODI</td> <td>)</td> <td></td> <td>INTES</td> <td></td> <td>N</td> <td>1900 521</td> <td>04</td> <td></td> <td>ANGLE FI</td> <td>ROM HORIZ</td> <td>BEARING</td>		8	0 H	ancock	S	t. (L	.ODI)		INTES		N	1900 521	04		ANGLE FI	ROM HORIZ	BEARING
9-25-8819-25-88 PE EMPTRE SOILS CME 45B 12" 14.0 19-26-8819-25-88 EMPTRE SOILS CME 45B 12" 14.0 19-26-8919-25-88 EMPTRE SOILS CME 45B 12" 14.0 19-26-8919-25-88 EMPTRE SOILS CME 45B 12" 14.0 19-26-8919-25-88 EMPTRE SOILS CME 45B 12" 14.0 19-26-25-88 EMPTRE SOILS CME 45B 12" 14.0 10-26-25-88 EMPTRE SOILS CME 45B 12" 14.0 10-26-26-26-26 EMPTRE SOILS CME 45B 12" 14.0 10-26-26-26 EMPTRE SOIL	BEG	JN	F	OMPLETE	D	RILL	ER	<u> </u>	······································		DRIL		MAKE AND HODEL	SIZE	OVERBURDEN	ROC	K (FT.)	TOTAL DEPTH
Code REQUENT (F1.75) CODE BOXESIGNEDESIGN. TOP CASING REQUED IN COMPUTED VIEW (L. TOP OF RECC 11.9 (R. 12.7 CALL) CONTRACT (LEFT IN NOLE 10.4 /LINGTH LIGGED NT 300 Ibcs / 24 in. NONE LEU. LEU. So Ibcs / 24 in. NONE LEU. So Ibcs / 24 in. NONE LEU. So Ibcs / 24 in. NONE LEU. So Ibcs / 24 in. NONE LEU. So Ib Ibcs / 24 in. NONE LEU. So Ibs / 25 is in the set of the	9-	25-	B 8 9	-25-8	8		EM	PIRE	SOILS				CME 45B	12"	14.0			14.0
Bit 10 / 200 Discrete Well GH1 / ALL DATE of ALL PARTY ALL DATE OF ALL PLATE INFORCE DIAL LEVEL INCOME DIAL PLATE OF ALL PLATE	COR	E REI		Y (FT./ /00	**>	CORE	BOXE	SISAMP	LESEL. TI	OP CAS	ING	CR	OUND EL. DEPTI	1/EL. GRO	IND WATER	DEPTH	I/EL. TOP	OF ROCK
Solution of the set of the	SAM	LE	KAMME	R WEIGH	T/F	ALL	ICAS	ING L	EFT IN HO		1A /1						/	
Bit Side 12: 1: 1: 1: 1: 1: 1: 1: 1: 1: 1: 1: 1: 1:		30)0 II	os./ 24	in	•			NO	NE		-67			J. Le	rđ		
C C OG B LUM Y LUES TTESTS ELEV. T <td< td=""><td>Ш.</td><td><u>ار د</u></td><td>U.</td><td>Ξ.,</td><td></td><td>1</td><td>JATER</td><td>?</td><td>T</td><td>T</td><td></td><td>Π</td><td></td><td></td><td></td><td></td><td>1</td><td></td></td<>	Ш.	<u>ار د</u>	U.	Ξ.,		1	JATER	?	T	T		Π					1	
SS 1.8 1.0 0-11-13 SS 2.0 2.00-3-6-6- 0-0.5 %: SBFALT & GRAVE. Borchole advance SS 2.0 2.00-3-6-7 Status advance Status advance SS 2.0 1.1 2-1-2-6 Status advance Status advance SS 2.0 1.8 9-10-10 Status advance Sta	SAND DIAN	SAMP. AD	BAMPLE RE	BLOUS "N	LOSS	M.4.0	ESTS ESTS ST. S. T. S. C.	TIME NIN.	ELEV.	DEPTH	GRAPHICS	SAMPLE	DESCRIPTIO	n and c	Lassific +	ATION	NOTES WATER WATER CHARAC DRILLI	ON: LEVELS, RETURN, CTER OF NG, ETC.
SS 2.0 2.0 0.3 4.3 37. Eliber Troit XAT is coupary readers and set in coupary readers and se	SS	1.5	1.0	9-11-1	3				-				0.0 - 0.5 Ft. AS AIRCO Drive	PHALT &	GRAVEL.		Borehole	advanced
13 2.0 1.0 2.0 1.1 2.2-2-2 augent. Split-mode rumbles site. About facts, brick, gravel rumbles site. About for the strong rumbles site. Abou	60	2.0	-	10 0 0									0.5 - 4.3 Ft. Silt	graveliy i	SAND.		0-13 Ft. o.d. holi	using 12" ow-stem
ISS 2.0 1.1 i 2-2-2-6 petroleum add. Borchoet service Sampled and generation SS 2.0 1.8 0-10-10 Image: Comparison of the service of the		4.U	2.0	40-8-0-			·						Moderate bro (5R3/4) mixed with a sandy of crymbles eacil	wn (5YR3) 1 organic f iilt loam. y. No cobe	(4) to dusky lecks, brick, Dry, soft, sion. Strong	red gravel	augers. sampled	Split-spoons to 14.0 Ft.
SS 2.0 1.8 9-10-10 10	SS	2.0	1.1	2-2-2-	6				-	5_			petroleum ode underground	r. Boreho liesel stors	le next to age tank. FI	L. /	Sampled	and
SS 2.0 10-8-11 S. 2 F. Groundw. SS 2.0 2.0 10-8-12 G.S. 13.1 F. Silve SAND (SM) Dark S.2 F. Groundw. SS 2.0 2.0 5-5-8-7 G.S. 13.1 F. Silve SAND (SG) Dark model Sected with 20% silt. Adhesive due to the modeliner. No shear strength. Mixed for nump, then stiff to 12% silt. Adhesive due to the modeliner. No shear strength. Mixed for nump, then stiff to 13.5 F. SAND (SG). Moderate modeling of a class of sill. SAND (SG). Moderate modeling of a class of sill. SAND (SG). Moderate modeling of a class of sill. Sector sill. Sand Science Scie	SS	2.0	1.8	9-10-1 10	ō				-				4.3 - 6.8 Ft. Silty (N6) to light 1 loose, adhesive	SAND (S bluish gray a, slightly (M). Light g (5B7/1). W stiff. Slight	et,	gamma- TMA-El	logged by berline, Inc.
SS 2.0 2.0 5-5-5-7 SS 2.0 2.0 5-5-5-7 SS 2.0 2.0 7-10-11 SS 2.0 2.0 10-10 SS 2.0 2.0	SS	2.0	2.0	10-8-1	1					₽ -			fines compone rubbery.	nt, slightly	elastic or		8.2 Ft. (observed	Groundwater l.
SS 2.0 2.0 7-10-11 SS 2.0 7-1	SS	2.0	2.0	5-5-8-	7					- 10_			6.8 - 13.5 Ft. Sil yellowish oran coarse-grained	ge (10YR6 sand. Su	SM). Dark /6) medium bangular, po	- to orly		
SS 2.0 2.0 7-10-11 9 IS2-13.3 Pt. Staturated to runny, then stiff to 13.5 Pt. 13.2-13.3 Pt. Saturated to runny, then stiff to 13.5 Pt. IS3-14.0 Pt. SAND (SG). Moderate brown (GYR3/4) coarse-grained and with some fines. Saturated, sightly adhesive, low fines. Saturated and sightly adhesive, solution of borehole as 14.0 Pt. Botehole backfilled with clean spoils, 9/25/88. 1-3 Ft. High ENY high readings. Bottom of borehole as 14.0 Pt. Botehole backfilled with clean spoils, 9/25/88. Description and classification of soils by visual examination of samples. S = SPLII SPOON; ST = SHELBY TUBE; SITE as Filled Pt. SITE SO Happengek St. (LODI)										-			moisture. No a feldspar and q	hear stren uarts mine	gth. Mixed trais. Compa	st, no		
I3.2-13.3 Pt. Saturated to runny, then stiff to 3.5 Pt. I3.2-13.4 Pt. Saturated to runny, then stiff to 3.5 Pt. I3.5-14.0 Pt. SAND (SG). Moderate brown (SYR5/4) coarse grained sand with scalings; off scale Scale 1.5 Pt. inter loce. Mixed mineralogy. Bottom of borehole at 14.0 Pt. Borehole backfilled with clean spoils, 9/25/83. Bottom of scale spoils, 9/25/83. Bestim spoils, 9/25/83. <tr< td=""><td>SS</td><td>2.0</td><td>2.0</td><td>7-10-1: 9</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>intead, tubber</td><td>у.</td><td></td><td></td><td></td><td></td></tr<>	SS	2.0	2.0	7-10-1: 9									intead, tubber	у.				
\$\$ = SPLIT SPOON; ST = SHELBY TUBE;; STEE STEE Store St. (1 ODD) NOLE NO. \$\$ = SPLIT SPOON; ST = SHELBY TUBE; STEE Store St. (1 ODD) NOLE NO.									-	.	-		13.2-13.3 Ft. stiff to 13.5 Ft	Saturated	to runny, th	en f		
S = SPLIT SPOON; ST = SHELBY TUBE;; SITE SO Honcock St. (LODI) Hole NO.													13.5 -14.0 Ft. S/ brown (5YR3/ some fines. Sa loose. Mixed 1	<u>ND</u> (SG). 4) coarse- turated, si nineralogy	Moderate grained sand lightly adhes	with ive,	1-3 Ft. readings Seal 1-3 with aug	High ENMET ; off scale. Ft. interval er. No more
S = SPLIT SPOON; ST = SHELBY TUBE; S = SPLIT SPOON; ST = SHELBY TUBE; S = SPLIT SPOON; ST = SHELBY TUBE; SITE SO Hancock St. (LODI) NOLE NO. 2022D													Bottom of boreho Borehole backfille	le at 14.0 i d with cle	Ft. an spoils,	J	high read	lings.
S = SPLIT SPOON; ST = SHELBY TUBE; S = DEHNICIDEN B = SHELBY TUBE; S = DEHNICIDEN B = SHELBY TUBE; S = SPLIT SPOON; ST = SHELBY TUBE; S = SPLIT SPOON; S = ST = SPLIT SPOON; S LIT SPOON; S = SPLIT SPOON; SPLIT SPOON; S = SPLIT SPOON; SPLIT SPOON; SPLIT SPOON; SPLIT SPO													¥/25/88.					
S = SPLIT SPOON; ST = SHELBY TUBE; SITE S = DELINISON: D = OTHER SITE																		
S = SPLIT SPOON; ST = SHELBY TUBE; SITE SITE ROLE NO.																		
S = SPLIT SPOON; ST = SHELBY TUBE; SITE BO Hancock St. (LODI) HOLE NO.																	•	
S = SPLIT SPOON; ST = SHELBY TUBE; SITE SITE NOLE NO. NOLE NO. 2022D																		
S = SPLIT SPOON; ST = SHELBY TUBE; SITE SITE NOLE NO. S = OFWNISOW: D = PUTCHER: 0 = OTHER SITE POLY PUTCHER: 0 = OTHER POLY PUTCHER: 0 = OTHER																		
S = SPLIT SPOON; ST = SHELBY TUBE; S = SPLIT SPOON; ST = SHELBY TUBE; S = SPLIT SPOON; ST = SHELBY TUBE; S = OFWHISOW; B = PITCHER; 0 = OTHER NOLE NO. 20022D																	Descripti	on and
S = SPLIT SPOON; ST = SHELBY TUBE; SITE = DEMNISON; B = PITCHER; 0 = OTHER = DEMNISON; B = PITCHER; 0 = OTHER = 000000000000000000000000000000000000				Ĵ.													soils by v examinat samples.	tion of risual ion of
S = SPLIT SPOON; ST = SHELBY TUBE; SITE = DENNISON; B = BITCHER; 0 = OTHER 2022P	·																	
UTARIOUCK SL. (LODI) 2023R	s = = D	SPLI	T SP SON;	OON; ST P = PI	= TCH	SHELE ER; C	BY TUB) = OT	E; S. Her	ITE	{	BO	Н	ancock St.	(LOD))		HOLE NO.	23R
A-13											A	-1	.3			\ \		

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SITI					*****		JG			FLISPAP		14501.	-138 1	OF 1	17
BEGL							COORDIN	ATES		<u>r vokat</u>		+4501	ANGLE FR	OM HORIZ	BEARI
	80 M	Ha	DCOCK	St. (L	ODI ER)	1		09111	N 1,844 E 2,21	1 S17F	OVERNIPDEN	Veri Isori	tical	TOTA
12	-8-8	7 1	2-8-87	7		E.D.	.I.	ſ	N	IOBILE B-57	6.5"	10.0		~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	1
CORE	REC	OVERY	(FT./%	CORE	BOXE	SISAMPL	ESEL. TO	P CAS	ING	ROUND EL. DEPTH/	EL. GROU	ND WATER	DEPTH	VEL. TOP	OF R
SAMI	LE H	AMMER	WEIGHT	/FALL	CAS	I D	FT IN HO	LE: DI	A./L	NGTH LOGGED BY:	·			/	
	14	<u>0 16</u>	s./ 30	in.			NO	NE			أشتكر ويشترك	D. Har	nish		
SAMP. TYPE AND DIAM.	SAMP. ADU. LEN CORE	AMPLE REC.	SAMPLE BLOWS "N" X CORE RECOVERY	B. M. 4.0			ELEV.	DEPTH	GRAPHICS	DESCRIPTION	and C	LASSIFIC	ATION	NOTES WATER WATER CHARAC DRILLI	ON: LEVI RETI TER
SS	1.5	1.3	6-10-21				1			0.0 - 4.0 Ft. GRA	VEL and	SILT FILL		Borehole 0-10 Ft.	e advi
00	<u> </u>									0.0-0.5 Ft. Gr	vel; brok	en basalt.	-	o.d. holl suger.	ow-st
55	2.0	1.2	11-20 12-12].		0.5-1.2 Ft. Sil	;; very da	rk gray and l	light	Gamma-E	berlin
SS	2.0	0.2	12-3-3				-	.		1.2-4.0 Ft. Gr	vel; dusi	y red Bruns	vick	Road be	d.
			21				1	5		formation.	ale hannin	ailt mith h	s1+		
SS	2.0	1.5	14-24 22-27			ļ	-		IIII	gravel.				1	
			10.05					.		4.0 - 6.1 Ft. <u>SANI</u> fine-grained, di	2 (SP). (Mmp.	Gray (5YR5/)	1),		
22	2.0	1.5	31-33				=	.	Ħ	6.1 - 8.3 Ft. SILT (7.5YR3/4), cr	(ML). B	rown ghtly damp.			
	·						-	10.		massive.				ENMET	' read
										8.3 - 8.7 Ft. Silty brown (7.5YR3	<u>SAND</u> (5 /4).	5M). Strong		deep ho	n, inte le.
										8.7 - 10.0 Ft. SIL SM), Gravish	T and Sil	ty SAND (M)Y5/2), silt b	L, ecomes		
						l				silty sand down fine-grained.	ward, ve	y fine- to			
										Battom of borehol	a at 10.0	 (+	ſ		
										Borehole backfilled	l with spe	bils, 12/8/87.			
			:											ł	
								ĺ							
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														Descript	ion an
														soils by	visua tion.
			;											1	
			:												
SS 7	SPL	LT SP	DON; ST	= SHEL	.BY TL	IBE; S	ITE	1		1			<u> </u>	HOLE NO	
0 *	DENN	I SON ;	P = P1	TCHER;	0 = 0	THER			80	Hancock St.	(LOE	<u>))</u>		12	228

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GEOLOGIC DRI	LL LOG	PROJECT	FICDAD	JOB ND. SHE	ET NO. HOLE NO.
SITE	COORDIN	I IATES	FUSKAP	43UJ-138 I ANGLE FR	OF 1 2021R
80 Hancock St. (LOD)])	N 1,	763 E 2,250	Vert	ical
9-25-88 9-25-88 EN	MPIRE SOILS	CM	IE 45B 12"	10.0	10.0
ORE RECOVERY (FT./%) CORE BO	KES SAMPLESEL. T	OP CASING GROUN	D EL. DEPTH/EL. GROU	ND WATER DEPTH.	EL. TOP OF ROCK
AMPLE HANNER WEIGHT/FALL C	ASING LEFT IN HO	DLE: DIA./LENGTH	LOGGED BY:	<u>l</u>	
300 lbs./ 24 in.	NO	NE		J. Lord	
AND DIANE SAMP. DIANE LEN CORE JAMPLE REC GORE REC CORE REC SAMPLE RECOUERY RECOUERY LEOS CORE REC SAMPLE BRES CORE REC SAMPLE RECOUERY RECOUERY	TS ELEV. UZZ HILL F ELEV.	DEPTH GRAPHICS SAMPLE	DESCRIPTION AND C	LASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
SS 2.0 1.8 5-5-6-1		0.0	AIRCO Driveway.	GRAVEL /	Borehole advanced
SS 2.0 1.0 5-3-4-3		- 0.:	t - 5.0 Ft. <u>Silty gravely</u> (SM-SG). Moderate bro dusky red (5R3/4). Mix brick, gravel with a sand	SAND. wn (5YR3/4) to ed organic flecks, y silt loam. Dry,	0-10 Ft. using 12 in. o.d. hollow-stem augers. Sampled to 8' and gamma-logged to 10
SS 2.0 1.7 2-2-6-11		55.0	soit, crumples easily. No Strong petroleum odor. underground diesel stora) - 6.8 Ft. Silty SAND (S	b cohesion. Borehole next to ge tank. M). Light	by TMA-Eberline, Inc.
SS 2.0 2.0 12-12 11-15			Wet, loose, adhesive, slig Slight fines component, s rubbery.	gray (557/1). htly stiff. lightly elastic or	8.0 ft. Groundwater
			 3-7.6 Ft. Silty SAND (Syellowish brown (10) R5 coarse-grained sand. Wipoorly sorted with 20% s to the moisture. No sher feldspar and quartz mine thread, rubbery. 5-10.0 Ft. SAND (SW). brown (5YR3/4) coarse-some fines. Saturated, si loose. Mixed mineralogy of the more block filled with cle 9/25/88. 	M). Moderate (4) medium- to et, subangular, ilt. Adhesive due ar strength. Mixed grained sand with lightly adhesive, Ft. an spoils,	observed. 6.8 Ft. Top of undisturbed soil.
	TUPE. SITE				Description and classification of soils by visual examination of samples.
= DENNISON; P = PITCHER; O =	OTHER	80 Har	ncock St. (LOC	DI)	2021R

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GEOLOGIC DRILL LOG POSE PLACE POSE PLACE <th colsp<="" th=""><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th>iopo in</th><th>C7</th><th>_</th><th></th><th></th><th></th></th>	<th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>iopo in</th> <th>C7</th> <th>_</th> <th></th> <th></th> <th></th>									iopo in	C7	_			
BITE DODD INATES 14.925 12.914-1.93 10.01 10.11 10.		C	GEC)LOG	IC D	RIL	L LO)G	-XUJE	6 1		HOB NO.	SHEET NO.	HOLE NO.	
N 1,925 E 2,253 Vertical	SITE COORDINATES ANGLE FROM HORIZBEARING														
Description and Description and State Provide and State Provide and State Provide State Reformed and State Provide and State Provide and State Provide State Reformed and State Provide and State Provide and State Provide State Reformed and State Provide and State Provide and State Provide State Reformed and State Provide and State Provide and State Provide State Reformed and State Provide and State Provi	BEGUN COMPLETED DRILLER N 1,925 E 2,253 Vertical														
Edge Records C (T.A) CORE BOXESENDUCESEL: TOP CASING FROME E. DEPTIVIEL. GROUD MATER DEPTIVIEL. GROUD MATER AMPLE MARK REIGN//ALL CASING LEFT IN HOLE: DIA/LENGTH LOGED BY: D. Harnish 10 lbs./ 30 in. NONE D. Harnish 10 lbs./ 30 in. MATER Pressure 10 lbs./ 30 in. NONE D. Harnish 11 lbs./ 30 in. NONE D. Harnish 12 lbs./ 30 in. MATER FLEV. 13 lbs./ 30 in. NONE D. Harnish 14 lbs./ 30 in. MATER FLEV. 15 lbs./ 30 in. MATER 15 lbs./ 30 in. MATER 15 lbs./ 30 in. MATER 16 lbs./ 30 in. MATER 15 lbs./ 12 in. MATER 16 lbs./ 12 in. MATER 17 lbs./ 12 in. MATER 18 lbs./ 12 in. MATER <t< td=""><td>12-</td><td>.8_1</td><td>27 1</td><td>7-8-8</td><td>DRILI 7</td><td>.ER</td><td>FD</td><td>т</td><td></td><td>DRIL</td><td>L ¥</td><td>AKE AND HODEL SIZE OVERBURDEN</td><td>ROCK (FT.)</td><td>TOTAL DEPTH</td></t<>	12-	.8_1	27 1	7-8-8	DRILI 7	.ER	FD	т		DRIL	L ¥	AKE AND HODEL SIZE OVERBURDEN	ROCK (FT.)	TOTAL DEPTH	
Sold State Sold State <td>CORE</td> <td>REC</td> <td>OVER</td> <td>Y (FT./X</td> <td>CORE</td> <td>BOXE</td> <td>S SAMPL</td> <td>ESEL. TO</td> <td>P CAS</td> <td>ING</td> <td></td> <td>UND EL. DEPTH/FL COCUMD WATED</td> <td></td> <td></td>	CORE	REC	OVER	Y (FT./X	CORE	BOXE	S SAMPL	ESEL. TO	P CAS	ING		UND EL. DEPTH/FL COCUMD WATED			
MADEL MARKEN GEGEN FALL LASING LETT IN NOLE DIALACENCTN LIGGED BY: D. Harnish NONE MATER RELIANT NONE D. Harnish NONE MATER RELIANT TESTS ELEU. ELEU. <td></td> <td>(</td> <td>5.5/</td> <td>65</td> <td></td> <td></td> <td>5</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>DEFIN/EL. IV</td> <td>/</td>		(5.5/	65			5						DEFIN/EL. IV	/	
Level DS:/ 30 In. NONE D. Harnish M/A Composition of the second s	SAMP	LE H	IAMME	R WEIGHT	/FALL	CAS	SING LE	FT IN HO	LE: DI	IA./L	EN	GTH LOGGED BY:	MP		
Exc 20 More and the second	ш I	14	0 10	<u>s./ 30</u>	<u>1n.</u>	JATES		NO	NE	1	7 1	D. Harnis	h Yr		
SS 2.0 1.7 7-10-17 28 2.0 1.7 7-10-17 28 2.0 1.4 12-26 28 2.0 1.2 3-5-55 29 0 1.6 12-26 29 0 1.6 12-26 29 0 1.6 12-26 29 0 1.6 12-26 29 0 1.6 12-26 20 0 12-26 20 0 12-26 20 0 12-26 20 0 12-26 20 0 12-26 20 0	SAMP. TYPI	SAMP. ADU.	SAMPLE REC.	SAMPLE BLOWS "N" X CORE RECOVERY	BL M. 4.0	ESSU ESTS OH DO C	TIME MIN. MIN.	ELEV.	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICAT	NOTES ION WATER WATER CHARA DRILL	ON: LEVELS, RETURN, CTER OF ING, ETC.	
SS 20 04 12-0 5-0 SS 20 1.2 3-5-5-5 SS 20 1.6 12-26 SS 20 1.6 12-26 SS 20 1.6 6-16 17-15 10 10 10 10 10 10 10 10 10 10	SS	2.0	1.7	7-10-17								0.0 - 4.6 Ft. Gravelly SILT and SILT FILL	Boreho	le advanced	
35 2.0 1.6 12-26 1.9	SS SS	2.0 2.0	0.4	12-9 5-6 3-5-5-5								 (GM-ML, ML). 0.0-0.7 Ft. Gravelly silt, dark grayish brown (10YR4/2), crushed Brunswick sandstone gravel. 0.7-1.2 Ft. Gravelly silt, dusky red (2.5YR3/2), crushed Brunswick sandston 	0-10 F o.d. hol auger. Gamma TMA-F 2-4 Ft. from au	: using 6.5 in. low-stem berline, Inc. Grab sample ger flights.	
SS 2.0 1.6 6-16 17-15 10 -1.6 6-16 17-15 10 -1.6 6-16 17-15 10 -1.6 -1.6	SS	2.0	1.6	12-26 30-45				-	- - -			1.2-4.0 Ft. Gravelly silt, very dark gray (10YR3/1), abundant plant material,			
10 10 10 10 10 10 10 10 10 10	ss	2.0	1.6	6-16 17-15								4.0-4.6 FL. Silt, weak red (5YR4/2), disturbed (?).			
Contraction and contraction of assisting of the second sec	+							_	10 .			4.6 - 6.5 Ft. SILT (FILL?) (MH). Very dark gray (10YR4/1), organic.			
B.0-8.2 Ft. Clay, same color. 8.2-10.0 Ft. Dark reddish gray, wet. Bottom of borehole at 10.0 ft. Borehole backfilled with spoils, 12/8/87. Description and classification of solita by visual examination.												(0.5 710.0 rt. SH, (ML), weak red (2.5 YR5/2), stiff, crumbly and dry, downward becomes dark reddish gray (5 YR4/2) and wet.			
Bottom of borehole at 10.0 ft. Borehole backfilled with spoils, 12/8/87.												8.0-8.2 Ft. Clay, same color. 8.2-10.0 Ft. Dark reddish gray, wet.			
Description and classification of sola by visual examination.												Bottom of borshole at 10.0 ft. Borshole backfilled with spoils, 12/8/87.			
Description and classification of soils by visual examination.												• • • • • • • • • • • • • • • • • • • •			
Description and classification of soils by visual examination.															
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Description and classification of soils by visual examination.															
													Descript classific soils by examina	tion and ation of visual tion.	
S = SPLIT SPOON; ST = SHELBY TUBE; SITE	 s =	SPL	T SP	OON; ST	= SHEL	BY TU	BE; SI	TE					HOLE NO	•	
= DENNISON; P = PITCHER; O = OTHER 80 Hancock St. (LODI) 1224R	= D	ENNI	SON;	P = PIT	CHER;	0 = 0	THER			<u>80</u>	H	ancock St. (LODI)	1	224R	