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September 7, 1990

JN 0173-1

Gramor Development
4211 200th Street Southwest, Suite 202
Lynnwood, Washington 98036

Attention: Richard Embry

Subject: REPORT: Supplemental Environmental Studies
10-Acre Parcel
SWC West Meeker Street At 64th Avenue South
Kent, Washington.

Dear Mr. Embry:

The Environmental Services Division of Geotech Consultants, Inc. has completed drilling, soil sampling, groundwater sampling, and subsequent laboratory analysis of groundwater samples for a portion of the subject property. The work for this project corresponds with the tasks outlined in our proposal dated July 30, 1990. This report integrates a brief summary of previous work on the subject site, along with the purpose, methods, and results of our latest effort.

PROJECT DESCRIPTION

Surface Conditions

The site is located on the southwest corner of the intersection of West Meeker Street and 64th Avenue South in Kent, Washington. The general location of the property is illustrated in the Site Vicinity Map, Plate 1 appended to this report. The property consists of approximately 10 acres comprised of three adjacent parcels of land. The site is rectangular in shape, with approximately 1,000 feet of frontage on the south side of West Meeker Street. The area of particular interest for this study is located in the northwest corner of this 10-acre parcel.

Currently the property is undeveloped. The site is vegetated with tall grass and some deciduous trees. Land use in the vicinity of the site is characterized largely by a mixture of commercial and multi-family residential developments.

Commercial land use is predominant along West Meeker Street and along Washington Avenue, approximately one-half mile east of the subject property. South and west of the site are the Riverwood multi-family apartments.

Topographically, there is a very slight inclination downward from the north to the south across the property. Relief across the 425 feet of subject land north-south is estimated to be less than 10 feet.

Project Background

Geotech Consultants, Inc. was retained to provide both geotechnical engineering and environmental consulting services on the project.

Geotechnical Study

The scope of work for the geotechnical portion of the study initially included the excavation of a series of backhoe test pits to permit examination of subsurface soil conditions for foundation design purposes. In one of the test pits located in the northwest corner of the property, strong hydrocarbon odors were noted. Following discussions with the client, the geotechnical exploration program was modified to include drilling two test borings. One of these borings (designated B-1 on the attached Plate 2) was located near the test pit in which the petroleum odors were originally discovered. The second boring, designated B-1B was positioned in the northeast corner of the property as shown on Plate 2.

Laboratory analysis of samples of groundwater obtained through the center of the hollow-stem auger used to make Boring 1 confirmed that groundwater was contaminated with petroleum hydrocarbons. As noted in Table A, benzene concentrations in groundwater at B-1 were on the order of 2,100 parts per billion (ppb). No contamination was detected in boring B-1B located in the northeast corner of the property.

Environmental Study

The discovery of petroleum contamination in the northwest corner of the property occurred as the Environmental Services Division of Geotech Consultants, Inc. was completing a preliminary environmental audit of the property. Following evaluation of the information developed during the geotechnical study and following discussions with the client, we proposed

making five additional borings in the northwest corner of the property. The purpose of the additional work as described in this report was to permit general assessment of the areal and vertical extent of the petroleum contamination detected in earlier phases of study.

METHODOLOGY/SCOPE OF WORK

Our scope of work for this phase of the project included:

* Drilling and soil sampling five additional borings at the locations noted on Plate 2.
* Completing four of these borings as monitoring wells, and groundwater sampling.
* Laboratory analysis of groundwater, and archive of soil for possible analysis at a later date.
* Measurement of headspace concentrations of petroleum vapors in soil during sampling.
* Preparation of this summary report.

Field work was conducted on August 15, 1990. The following paragraphs provide a brief description of the methods employed in our work:

Soil Sampling

A truck-mounted, hollow-stem, auger drilling unit was used for the drilling. The sampling technique consisted of advancing the hole with the auger string to the desired depth. Then, the split-spoon sampler and connecting rods were lowered through the hollow-stem augers. The sampler and rods were then driven eighteen (18) inches into native soils beyond the tip of the augers using a 140-pound hammer in general accordance with ASTM procedure D-1586. The sampler was withdrawn and the sample transferred to laboratory-prepared glassware with teflon-sealed lids.

During drilling and sampling, a field log was made by the field engineer for each boring. Information recorded versus corresponding depth on each log included soil type, color,

texture, moisture characteristics, estimated relative density, odors, iridescent sheens, etc.

Samples were stored in an iced chest during field sampling and transferred to refrigerated archive space in this condition to preserve sample integrity by minimizing excessive dissipation of volatile fraction hydrocarbons. Each sample was clearly identified with respect to boring number, sample depth, date, field engineer, etc. The samples were archived in the event that analysis of the soil samples is requested at a later date.

During drilling, field analysis using sensidyne technology, or "headspace" measurements of aromatic petroleum hydrocarbons, was recorded for various soil samples retrieved up the auger string. These measurements are logged on the boring plates as "HC", denoting hydrocarbon concentrations in parts per million (ppm), and they reveal a preliminary indication of soil contamination.

Monitoring Well Installation and Groundwater Sampling

Two-inch-diameter PVC monitoring wells were installed in borings B-2, B-3, B-5 and B-6. The well was positioned so as to span the range of the anticipated seasonal groundwater fluctuation, thus making representative sampling of water/hydrocarbons possible at any time during the year. The general design for construction of each well is presented on Plate 8, Well Installation Design.

Before sampling each well, a sterilized, hand-operated, lift pump was used to purge the well by removing a minimum of three well volumes of water in accordance with current EPA-recommended sampling protocol. This effort was intended to assure that samples obtained from each well were representative of ambient groundwater conditions. Following this purge pumping, a sterilized PVC bailer was used to extract groundwater samples from the well. Samples were poured into preconditioned, labeled glassware furnished by the project laboratory.

Laboratory Analysis

Soils

Field observations and headspace measurements of petroleum vapor concentrations were carefully documented on the field boring logs. The soil samples were archived and not analyzed.

Groundwater

Groundwater samples were obtained from the new monitoring wells installed in borings B-2, B-3, B-5, and B-6. Analysis of groundwater was accomplished by EPA Method 602 for benzene, toluene, ethylbenzene, and xylene (BTEX).

RESULTS OF INVESTIGATION

Subsurface Conditions

Contacts between soil units depicted on the boring logs appended to this report are approximate only, and based on interpretation of the drilling action observed, and upon visual examination of the samples retrieved from each exploration.

Soils encountered by the borings were typical of Kent Valley alluvium, consisting of poorly stratified to non-stratified silty sand and silt.

Petroleum hydrocarbon odors were noted on soil samples that were retrieved from all of the borings except B-4.

Groundwater

Groundwater was encountered during the drilling of each of the test borings. At this point we refer the reader to the Boring Logs appended as Plates 3 - 9 for specific groundwater levels encountered during drilling. In general, groundwater was noted at a depth of approximately 19 to 21 feet.

Laboratory Chemical Analysis

The results of laboratory tests on groundwater associated with this study are presented in Table A.

Analytical results presented in Table A confirm that groundwater samples extracted from the four wells sampled for this study contained dissolved-phase petroleum hydrocarbons. In each of the wells, benzene concentrations exceeded levels currently permitted by the Washington Department of Ecology (WDOE).

CONCLUSIONS

Based upon the site information developed in this report and in previous work by our firm, the following tentative conclusions are offered:

(1) Referring to Table A and using benzene as an index for assessing the areal distribution of the petroleum contamination in groundwater, it is clear that the highest concentration was detected in the northern area covered by our monitoring wells, and that the concentration progressively diminished toward the south. This observation alone suggests that the source lies to the north of the area explored by the monitoring wells.

(2) In terms of vertical distribution of petroleum contamination, headspace measurements of petroleum vapor concentrations in soil samples obtained from the various borings during drilling generally confirm that the contamination lies in the depth zone defined by the range of the seasonal fluctuation of the water table. This relationship appears to link the contamination to an off-site source from where contamination may be transported onto the subject site by groundwater movement.

(3) As previously stated, concentrations of benzene in all groundwater samples exceed the maximum values permitted under existing and future guidelines of the Washington Department of Ecology.

RECOMMENDATIONS

In attempting to formulate meaningful recommendations from the findings of this report, factors including cost, time, liability, and other issues need to be considered. The

following recommendations are offered as potentially valuable first steps in managing the remaining environmental issues at the site:

(1) Coordinate all future action on the subject property in liaison with the WDOE. This approach may minimize the potential for needless duplication of efforts or interference with Agency planning.

(2) Initiate all actions necessary to make the responsible parties and regulatory agencies aware of the presence of petroleum contamination on the property and of your concern regarding potential continuing migration from the source. Evaluation and pursuit of legal remedies may be necessary to clarify your position and interest. Provisions of various statutes, including the Water Pollution Control Act, Chapter 90.48, section 338, provide a cause of action for a landowner to recover costs for cleanup from any other person causing entry of "oil" (including gasoline) into the "waters" of the state (including groundwater).

(3) Periodic sampling and analysis of groundwater from the monitoring wells could provide valuable information regarding potential future changes in contaminant distributions which might occur.

(4) Installation, sampling, and analysis of additional monitoring wells would be beneficial in defining further the areal extent and magnitude of petroleum contamination on the subject property. Such an activity may be an expensive burden, and one that may be appropriately put off until a time when many of the preliminary steps have been implemented.

(5) Survey of the existing water level in each of the wells would be a prudent step at this point as it would be of value in assessing the prevailing hydrologic gradient, which is useful in determining the probable direction of contaminant migration.

With the above "preliminary" steps in mind, it may be premature at this time to pursue a plan of remedial action for the site. In the future, however, it is our opinion that owing to the depth at which the petroleum-contaminated groundwater is

located, a successful approach to remediation of the site will probably hinge on "in-situ" treatment or a combination of treatment schemes which may include:

(a) Pumping and treating groundwater (extraction and stripping)
(b) Biological treatment methods
(c) Soil venting/vapor extraction

The staff of the Environmental Services Division of Geotech Consultants, Inc. includes professional environmental engineers, hydrogeologists, and other specialists with substantial experience in remediation of soil and groundwater. We are prepared to assist you in this area, depending upon your schedule and needs.

LIMITATIONS

This report has been prepared for the exclusive use of Mr. Richard Embry of Gramor Development, and for Bert McNae Realty, Inc., and their representatives for specific application to this site. Our work for this project was conducted in a manner consistent with that level of care and skill normally exercised by members of the environmental science profession currently practicing under similar conditions in the area, and in accordance with the terms and conditions set forth in our proposal dated July 30, 1990. No other warranty is expressed or implied.

If new information is developed in future site work which may include excavations, borings, studies, etc., Geotech Consultants, Inc., should be allowed to reevaluate the conclusions of this report and to provide amendments as required.

We trust that the information presented in this report will be of value in your planning efforts. We appreciate the opportunity to provide environmental consulting services for the project. If there are any questions, or if we can be of further service, please contact us.

The following tables and plates are attached and complete this report:

Table A	Analytical Results - Groundwater
Plate 1	Vicinity Map
Plate 2	Well Location Plan
Plates 3 - 9	Boring Logs
Plate 10	Typical Well Design

Respectfully submitted,

GEOTECH CONSULTANTS, INC.

Sean P. O'Brien
Environmental Engineer

Don W. Spencer, M.Sc.
Vice President
Director, Environmental Services

SPO/DWS:cka

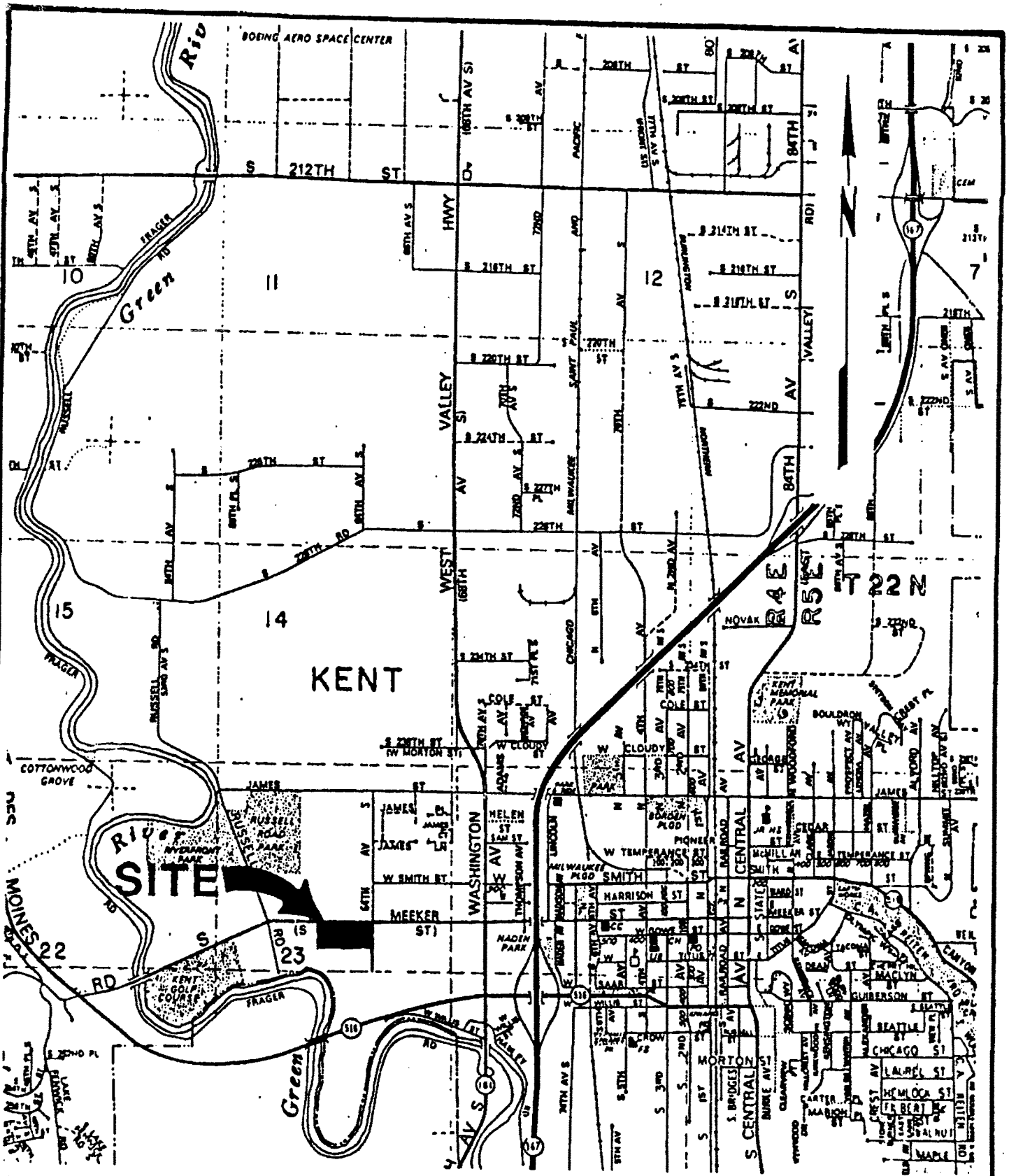
TABLE A

Analytical Results - Groundwater

Sample #	Benzene (ppb)	Toluene (ppb)	Ethylbenzene (ppb)	Xylene (ppb)
B-1	2,100	620	260	1,500
B2-Wa	750	3,100	1,400	7,900
B3-Wa	510	1,300	1,500	6,800
B5-Wb	660	38	200	660
B6-Wb	96	19	140	264
Current WDOE Maximum Permitted	66	14,300	1,400	90,000

ppb: parts per billion

Analytical Methodology: EPA Method 602



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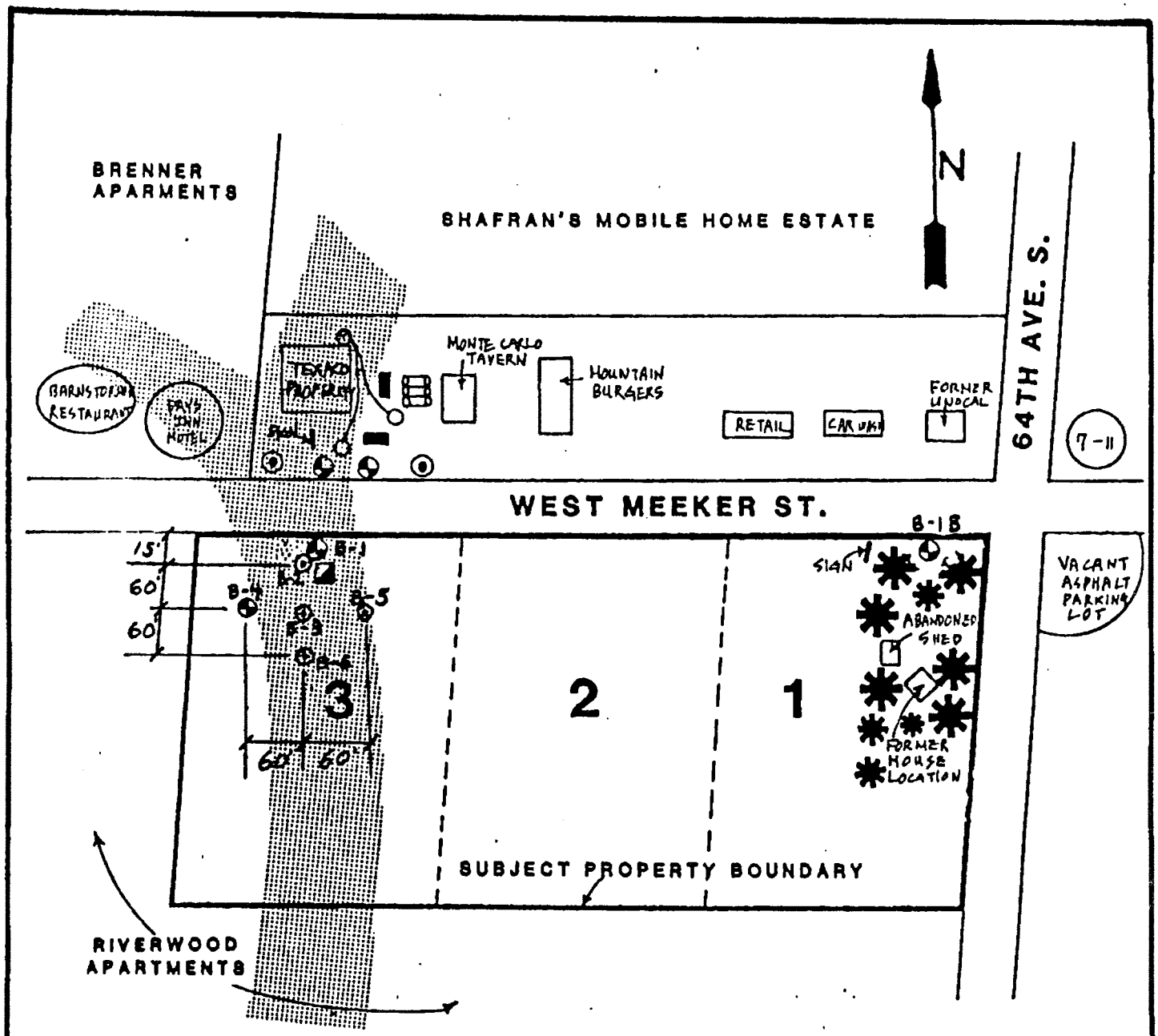
SITE VICINITY MAP
W. MEEKER ST. & 64TH AVE. S.
KENT, WASHINGTON

Job No.:	Date:		Plate:
0173-1	AUG 1990	N.T.S.	1



BORINGS LABELED B-2 THROUGH B-6 ARE SUPPLEMENTAL BORINGS FOR THIS REPORT

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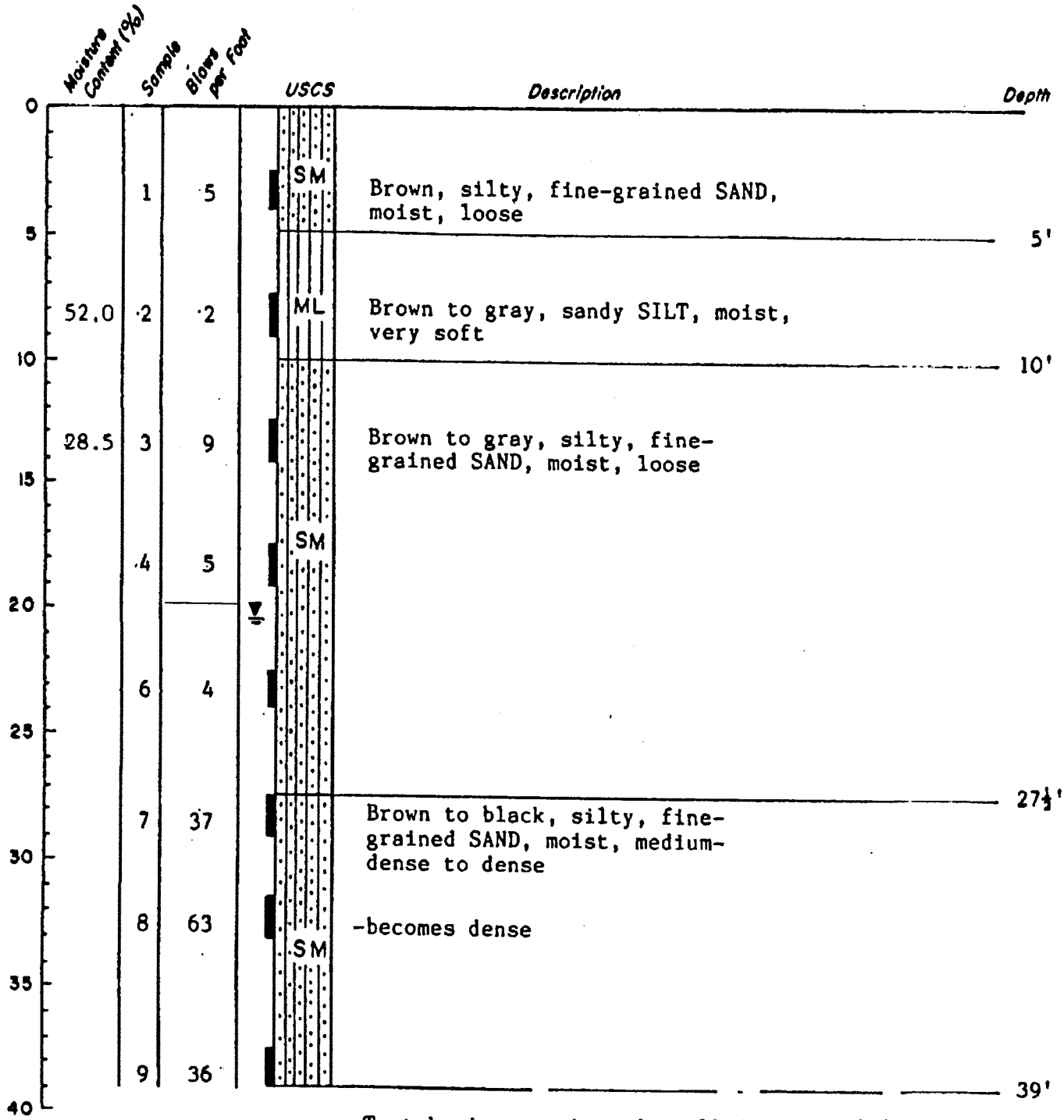
BORING/WELL LOCATION PLAN
W. MEEKER ST. & 64TH AVE. S.
KENT, WASHINGTON

Job No.:	Date:		Plate:
0173-1	AUG 1990	N.T.S.	2

BORING 1



Test boring terminated at 39 feet on 7/3/90.
Groundwater seepage encountered at 20 feet while drilling.

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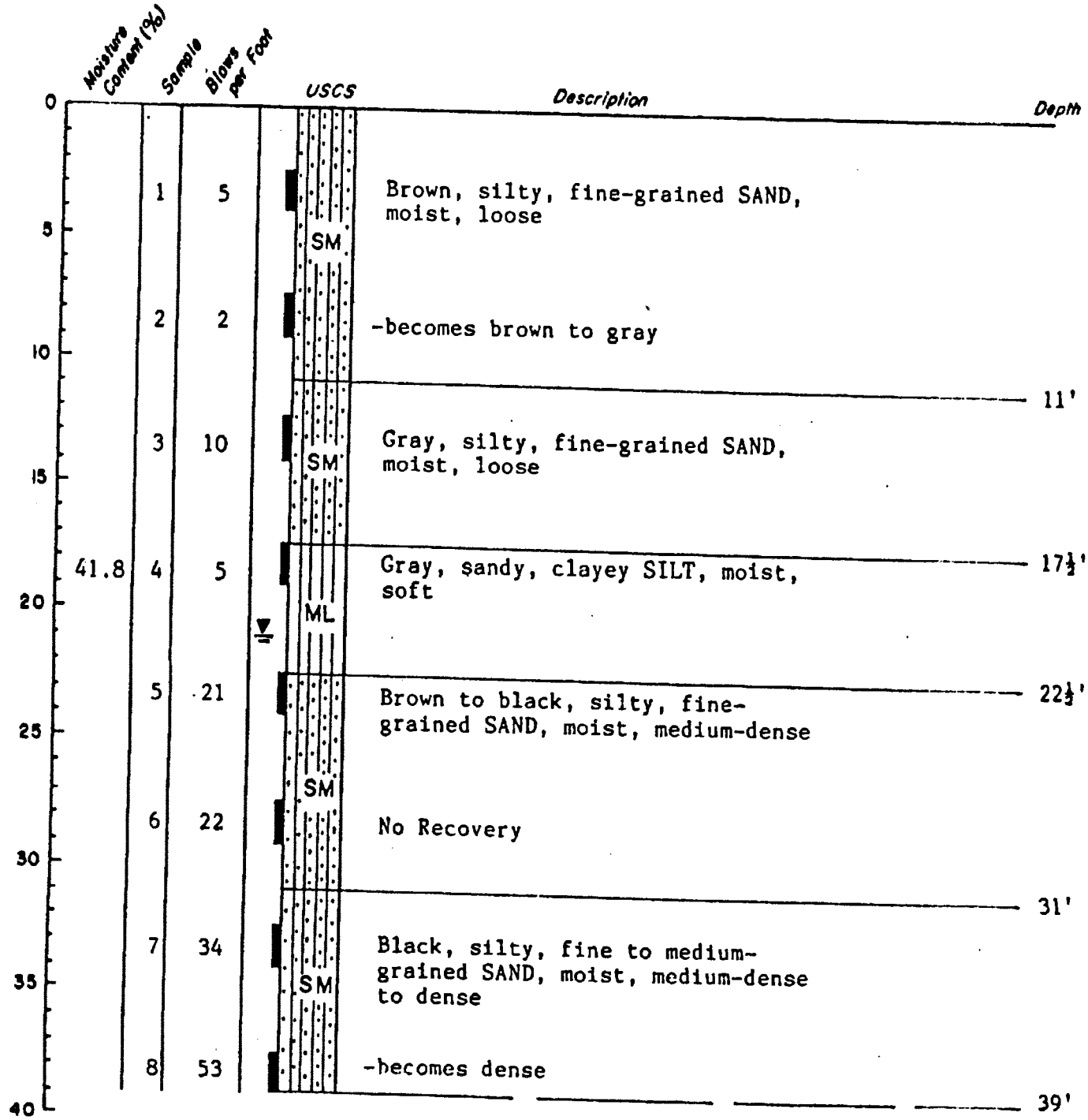
TEST BORING LOG

W. MEEKER STREET & 64TH AVENUE S.
KENT, WASHINGTON

Job No.:	Date:	Logged By:	Plate:
90262	7/2/90	DRW	3

BORING 1B



est boring terminated at 39 feet on 7/3/90.
Groundwater seepage encountered at 21 feet while drilling.

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TEST BORING LOG

W. MEEKER STREET & 64TH AVENUE S.
KENT, WASHINGTON

Job No.:	Date:	Logged By:	Plate:
90262	7/2/90	DRW	4

BORING 2

Elevation: _____

Moisture Content (%)	Sample	Blows per Foot	USCS	Description	Head Space Analysis (ppm)
	1	2	SM	Tan, mottled, silty SAND, moist, very loose	
				4'	
	2	2	ML/SM	Mottled brown, slightly sandy SILT, moist, very loose	
				9'	
			SM	Gray SAND, moist, very loose	
	3	5	ML	Gray, slightly sandy SILT, moist, loose	HC = 550 ppm
				12½'	
				14'	
	4	11	SM	Gray, silty SAND, moist, medium-dense	HC = none detected
				25'	

Test boring terminated at 25 feet on 8/15/90. Groundwater observed in Piezometer at 20 feet. Well screen section spans 15 feet to 25 feet.

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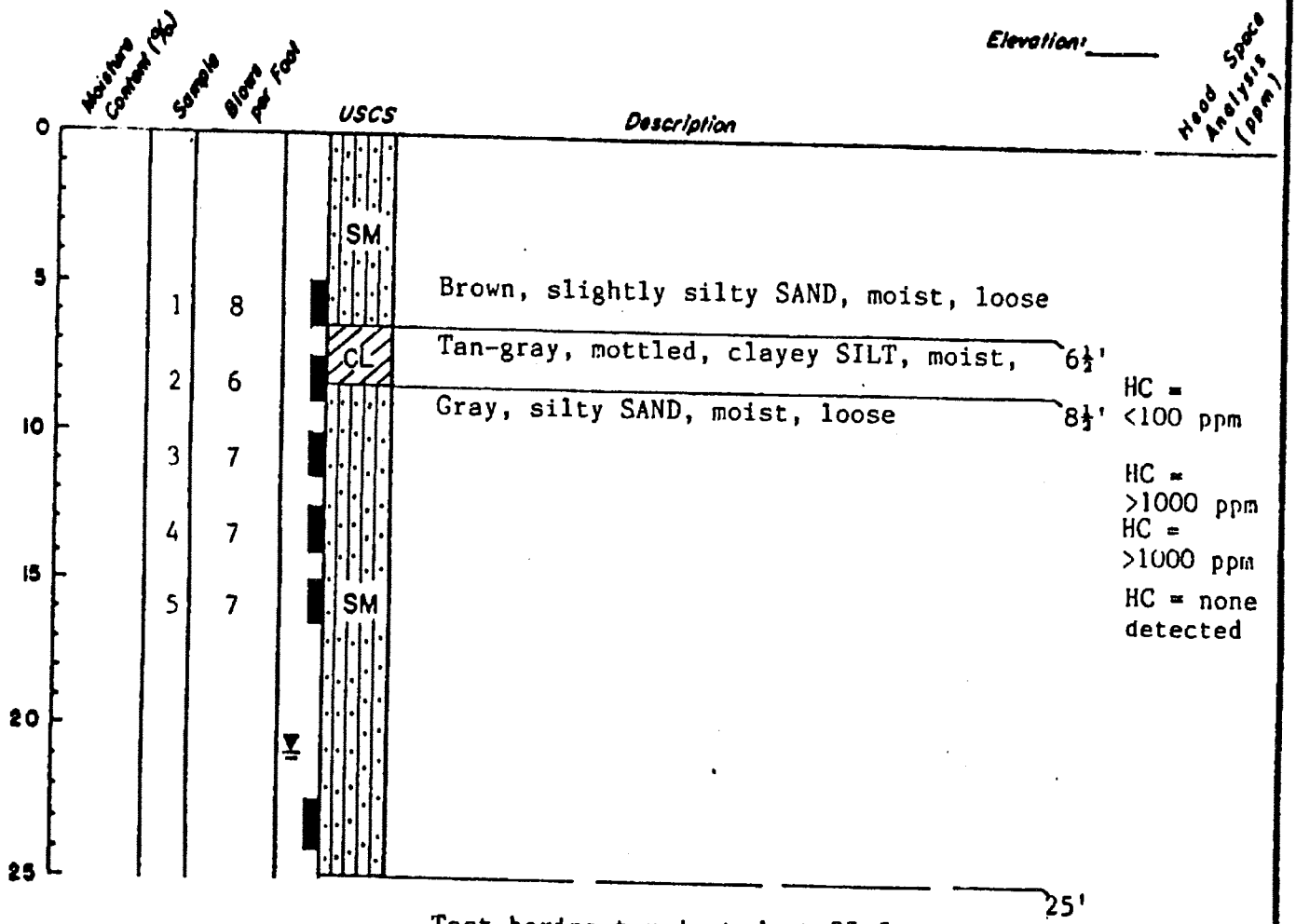
TEST BORING LOG

SWC WEST MEEKER @ 64TH AVENUE SOUTH
KENT, WASHINGTON

Job No.:	Date:	Logged By:	Plate:
JN 0173-1	8/15/90	SPO	5

BORING 3



Test boring terminated at 25 feet on 8/15/90. Groundwater observed at 21 feet during drilling.

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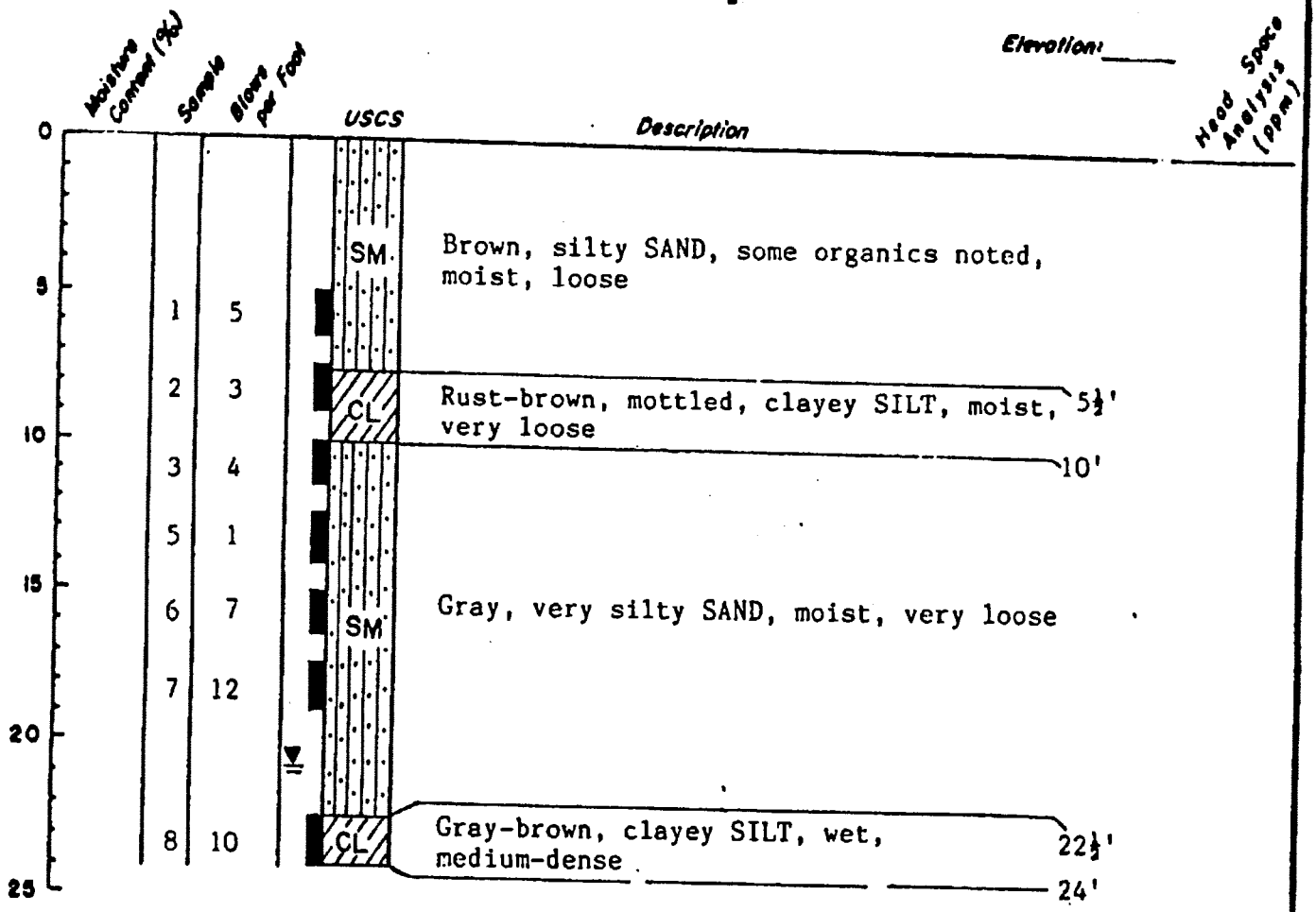
TEST BORING LOG

SWC WEST MEEKER @ 64TH AVENUE SOUTH
KENT, WASHINGTON

Job No.:	Date:	Logged By:	Plate:
JN 0173-1	8/15/90	SPO	6

BORING 4



Test boring terminated at 24 feet on 8/15/90. Groundwater observed at 21 feet during drilling.

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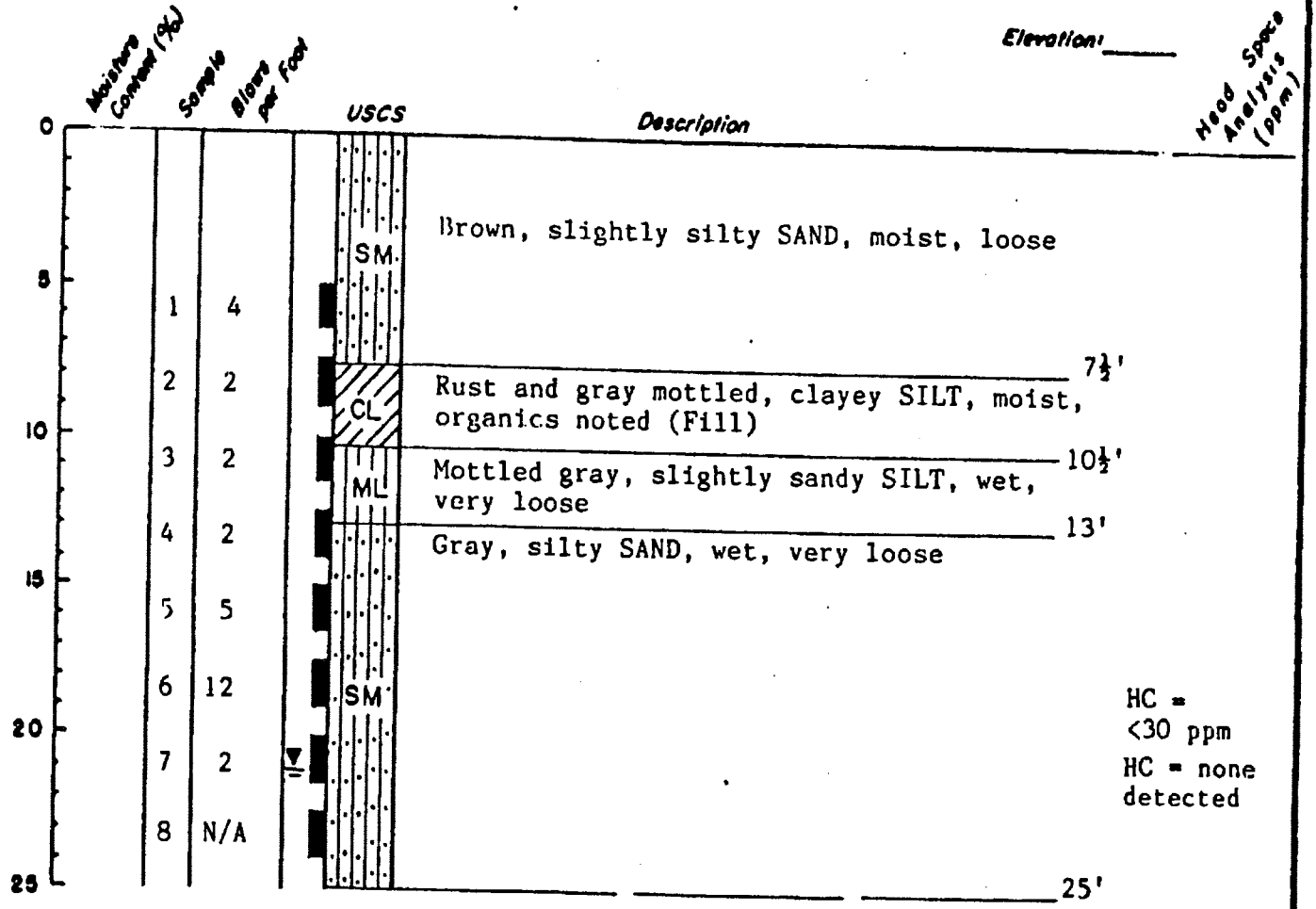
TEST BORING LOG

SWC WEST MEEKER @ 64TH AVENUE SOUTH
KENT, WASHINGTON

Job No.:	Date:	Logged By:	Plate:
JN 0173-1	8/15/90	SPO	7

BORING 5



Test boring terminated at 25 feet on 8/15/90. Groundwater observed at 21 feet during drilling.

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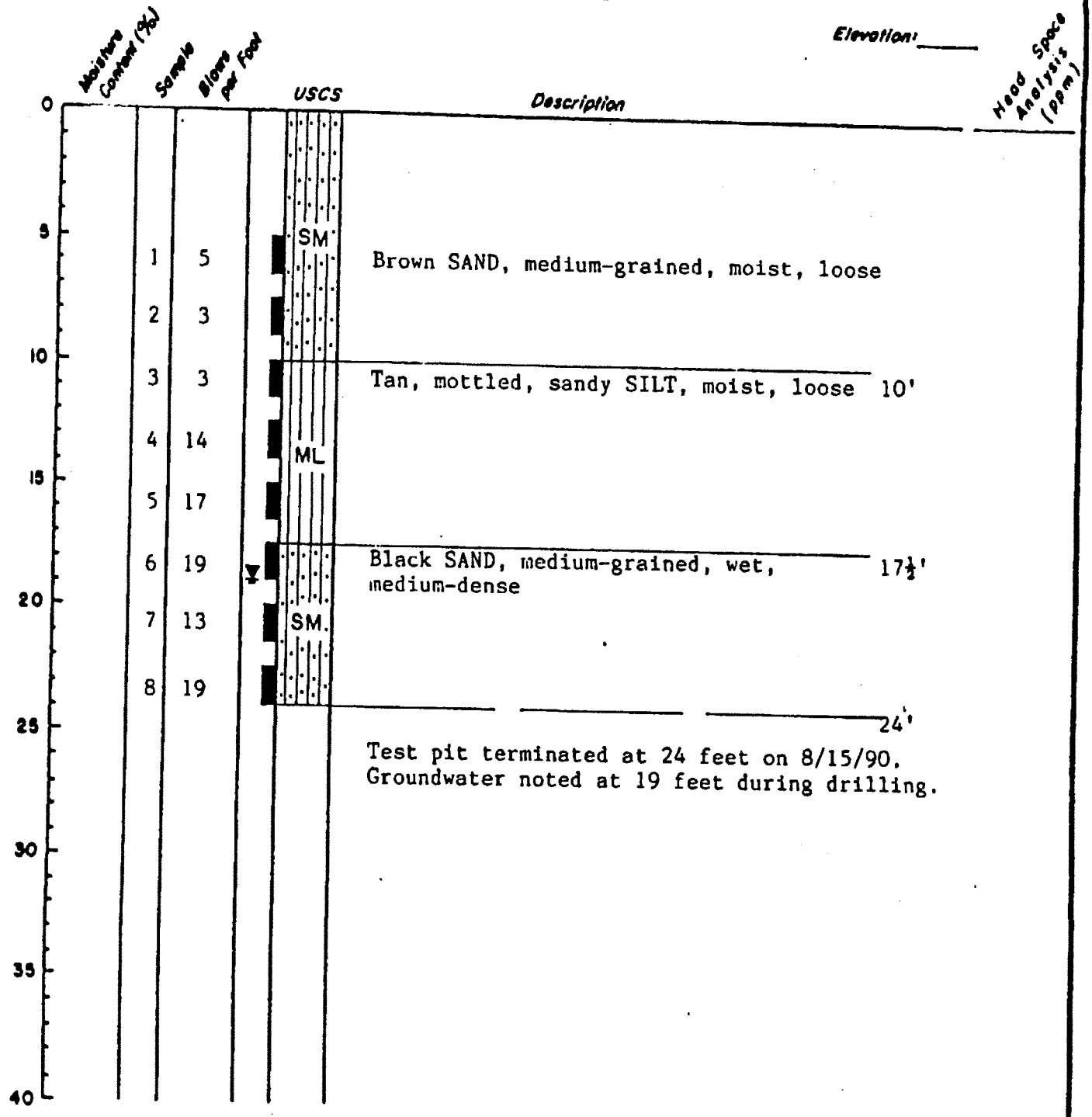
TEST BORING LOG

SWC WEST MEEKER @ 64TH AVENUE SOUTH
KENT, WASHINGTON

Job No.:	Date:	Logged By:	Plate:
JN 0173-1	8/15/90	SPO	8

BORING 6



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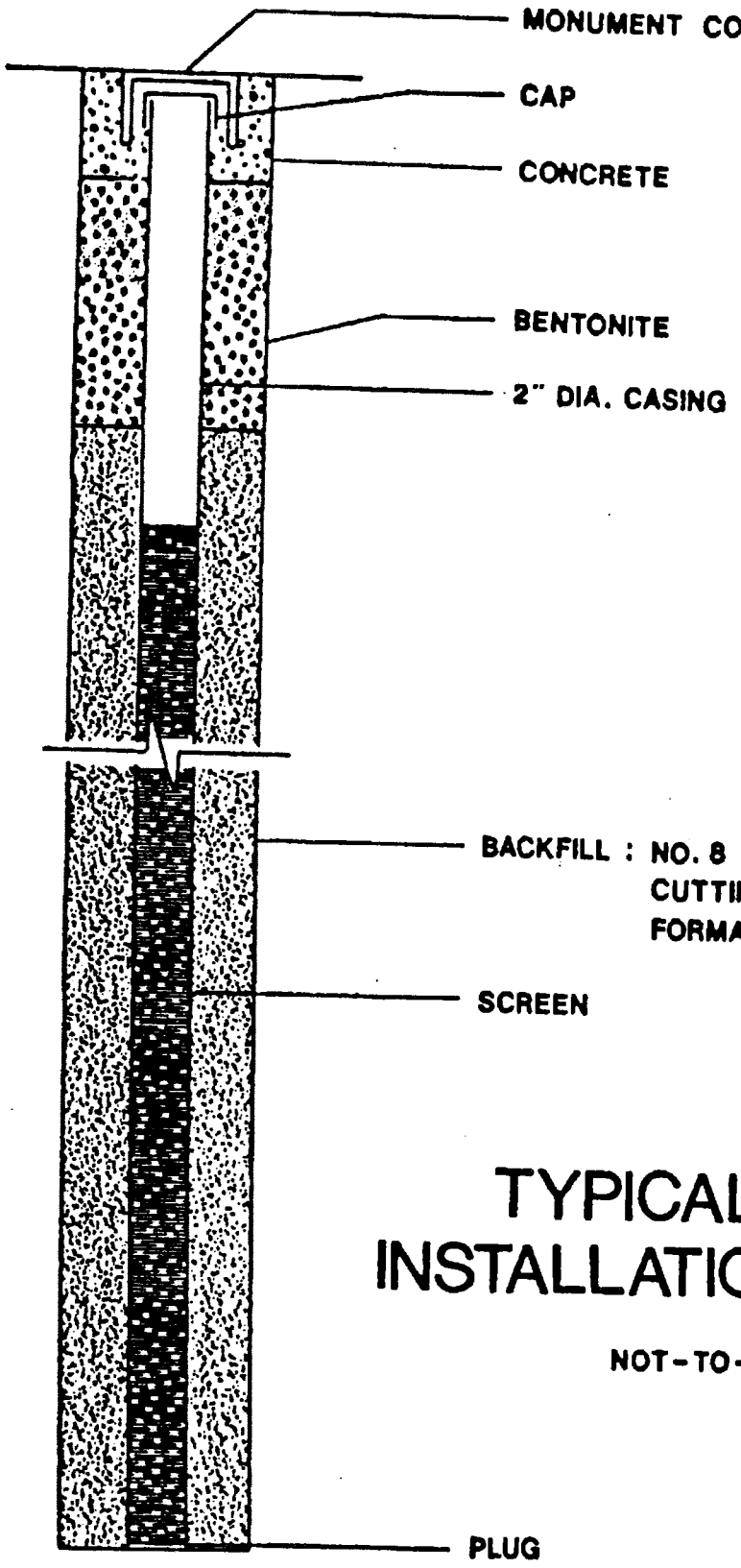
TEST BORING LOG

SWC WEST MEEKER @ 64TH AVENUE SOUTH
KENT, WASHINGTON

Job No.:	Date:	Logged By:	Page:
JN 0173-1	8/15/90	SPO	9



TYPICAL WELL INSTALLATION DESIGN

NOT-TO-SCALE

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SWC WEST MEEKER @ 64TH AVENUE SOUTH
KENT, WASHINGTON

Job No.:	Date:		Plate:
0173-1	AUG 1990		10