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HYDROGEOLOGIC INVESTIGATION OF WASTE DISPOSAL SITES AT THE NAVAL WEAPONS SUPPORT CENTER, CRANE, INDIANA

by

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Summary

The Naval Weapons Support Center (NWSC) identified areas on its installation where contaminated materials have been buried and determined that a groundwater monitoring network at each area was required to identify any subsurface contamination which might have resulted from these disposal areas. The NWSC requested the Waterways Experiment Station (WES) to install a groundwater monitoring system around each identified disposal site. A total of 13 groundwater monitoring networks; 83 monitoring wells; were installed in 11 sites throughout the NWSC. Each site contained from 5 to 15 monitoring wells with the number of wells dependent on the area of each site, the number of groundwater flow patterns encountered, or the number of disposal areas per site.

The WES conducted a soil sampling and drilling program to define the hydrogeologic characteristics and to locate and install the monitoring wells at each site. The sampling and drilling program identified two sites where the water table was encountered in the unconsolidated overburden and in the remaining sites, the water table was encountered in fractures in sedimentary rocks at depths of less than 10 ft to a maximum depth of 121 ft. The direction of groundwater flow varied, but generally conformed with the surface flow at each site. Overburden thickness at the sites ranges from less than 1 ft to more than 40 ft with soil types of predominantly clay, silt, and sand. The rock underlying the overburden consists of sandstone, shale, limestone, and interbedded coal seams of Pennsylvanian and Mississippian age.

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PREFACE

This study was performed by personnel of the Geotechnical Laboratory (GL) of the U. S. Army Engineer Waterways Experiment Station. Funding for this study was authorized by Military Interdepartmental Purchase Request (MIPR) Number N00164-IMP-04575 dated 6 June 1981 and amended 22 October 1981.

The field work was conducted during the period 17 August 1981 to 1 December 1981. Soil testing and data reduction were performed from January 1982 to April 1982 and report preparation was accomplished during this same period. The drilling was performed by the Exploration Group (EG), Engineering Geology and Rock Mechanics Division (EGRMD), GL, under the supervision of Mr. Joseph B. Dunbar, Engineering Geology Applications Group (EGAG) of the EGRMD. The physical soil tests were performed by the Soil Testing Facility, GL. Messrs. Jerald D. Broughton and Dale L. Barefoot, EGAG, assisted in data compilation and analysis. Mr. Dunbar prepared the report.

The study was conducted under the direct supervision of Mr. John H. Shamburger, Chief, EGAG, and Mr. Mark A. Vispi, Chief, EG, and under the general supervision of Dr. Don C. Banks, Chief, EGRMD, and Drs. William F. Marcuson III and Paul F. Hadala, Chief and Assistant Chief, GL, respectively.

Special acknowledgment is extended to Mrs. Cathy Andrews and Mr. Eric Foster of the Naval Weapons Support Center for their assistance during the study.

Commander and Director of WES during the conduct of the study was COL Tilford C. Creel, CE. The Technical Director was Mr. F. R. Brown.

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PART I: INTRODUCTION

Background

The Naval Weapons Support Center (NWSC) has located areas on its premises that might contain buried hazardous waste. These hazardous waste areas resulted from landfill dumping operations and the production and disposal of military ordnance. The NWSC determined these waste sites required a groundwater monitoring network to help ascertain any subsurface contamination problems which might result from these areas.

Purpose and Scope

The purpose of this investigation was to define the hydrogeological characteristics of each buried waste site and design and install groundwater monitoring networks around these buried waste sites which would conform with state and Federal requirements.

This study was performed at 11 predesignated areas on the NWSC where subsurface contaminations were suspected. Activities during the study included field exploration, soil sampling, well installation, and physical soil testing. Chemical analysis of soil and water samples was conducted by the NWSC and are not presented in this report.

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PART II: ENVIRONMENTAL SETTING

Geographic Location

The NWSC is located in southwestern Indiana in the northern half of Martin County and extends into portions of Greene, Daviess, and Lawrence Counties. It is situated approximately 75 miles southwest of Indianapolis and approximately 45 miles southwest of Bloomington, the nearest metropolitan area. The NWSC covers more than 60,000 acres or an area roughly ten miles by ten miles. Figure 1 shows the NWSC and surrounding area which is predominantly rural.

Climate

The NWSC is located in a warm temperate climate zone. In general, summers are warm and humid while winters are mild with cold periods of short duration. Temperature ranges from an average maximum July temperature of 89°F to an average minimum January temperature of 26°F. Precipitation is nearly evenly distributed throughout the year with maximum precipitation occurring during spring and early summer. The NWSC averages 44 inches of precipitation yearly with 42 inches of rain and 15 inches of snow. Average humidity ranges from 40 to 90 percent in summer and 60 to 90 percent in winter.

Topography

Surface relief at the NWSC consists of gently rolling hills and steep sided ridges which are dissected by numerous well-defined drainageways. Elevations at the NWSC are higher in the east and decline towards the west. The highest elevation occurs in the extreme eastern portion with an elevation of 860 feet (ft) mean sea level (MSL) while the lowest elevation of 491 ft MSL occurs in the southwestern portion of the installation.

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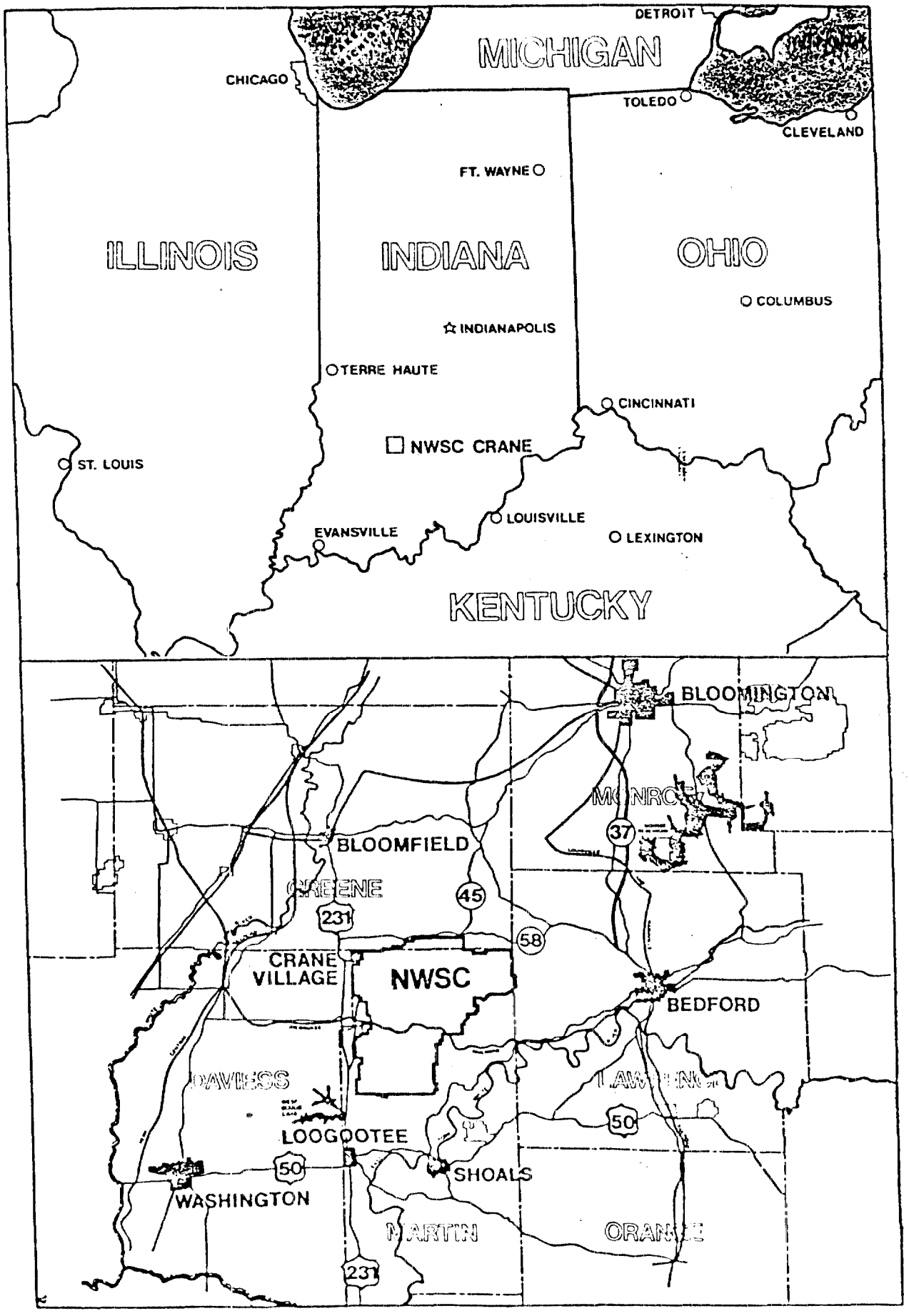

(From Naval Facilities Engineering Command)

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Figure 1. Naval Weapons Support Center and Vicinity

Soils

The United States Department of Agriculture identifies three-fourths of Martin County which contains the major portion of the NWSC as belonging to the Zanesville and Muskingum soil series. These series are identified as a dark brown organic silt loam at the surface, underlain by 48 inches of mottled tan, grey, and yellow clay with varying percentages of sand and silt. Occasionally, a clay hardpan occurs between 25 and 32 inches below surface. WES borings encountered soil thickness at the NWSC from less than 1 ft to an excess of 40 ft. These borings identified a surficial organic layer underlain by clay, silt, or sand.

Geology

The NWSC lies in a region of Indiana which was not covered by Pleistocene glacial deposits. The surface deposits are divided into two types; unconsolidated deposits of Recent and Pleistocene age and residual soils formed from the underlying rock. Recent and Pleistocene deposits occur in the many small floodplains throughout the NWSC and are composed of alluvial, colluvial, and paludal silt, sand, and gravel; and lacustrine clay, silt, and sand. Residual soils at the NWSC were derived from the underlying sedimentary rocks of the lower Pennsylvanian Raccoon Creek Group and the upper Mississippian Stephensport and the West Baden Groups. These soils are clay, silt, and sand. Lower Pennsylvanian rock at the NWSC consists of shale, sandstone, and coal beds while upper Mississippian rock consists of limestone, shale, and sandstone. Since the NWSC lies on the eastern edge of the Illinois Structural Basin, the Pennsylvanian and Mississippian sedimentary rocks dip west-southwest between 30 and 35 ft per mile into the basin. Table 1 presents the stratigraphic column of units underlying the NWSC and Figure 2 shows the distribution of these units on the installation.

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COLUMNAR SECTION SHOWING BEDROCK UNITS

TIME UNIT		MAP UNIT	THICKNESS (FEET)	LITHOLOGY	ROCK UNIT *			
PERIOD	EPOCH				SIGNIFICANT MEMBER	FORMATION		GROUP
PENNSYLVANIAN	CONEMAUGHIAN	P_5	175+		MEROM Ss.	MATTOON Fm.	MATTOON Fm. (FORMATIONS MAPPED IN ILLINOIS)	MCLEANSBORO
		P_4	150 to 200		LIVINGSTON Ls. / SHOAL CREEK Ls.	BOND Fm.	BOND Fm.	
		P_3 WF	200 to 350		WEST FRANKLIN Ls.	*PATOKA Fm.*	MODESTO Fm.	
						SHELBURN Fm.		
	ALLEGHENIAN	P_2	300 to 400		DANVILLE COAL (VII)	DUGGER Fm.		CARBONDALE
					SPRINGFIELD COAL (V)	PETERSBURG Fm.		
					SURVANT COAL (IV)	LINTON Fm.		
		B	250 to 500		SEELYVILLE COAL (III)	STAUNTON Fm.		*RACCOON CREEK*
	POTTSVILLIAN	P_1			BUFFALOVILLE COAL / LOWER BLOCK COAL	BRAZIL Fm.		
						MANSFIELD Fm.		

* ROCK-UNIT NAMES FOR PENNYSLVANIAN ROCKS IN INDIANA FOLLOW THE USAGE PROPOSED BY WIER (IN PREPARATION), STRATIGRAPHY OF MIDDLE AND UPPER PENNSYLVANIAN ROCKS IN SOUTHWESTERN INDIANA. NEW NAMES ARE SHOWN IN ITALICS AND ARE TENTATIVE UNTIL FORMAL PRESENTATION.
(After Grey, Wayne, and Wier)

Table 1. Stratigraphy of Naval Weapons Support Center
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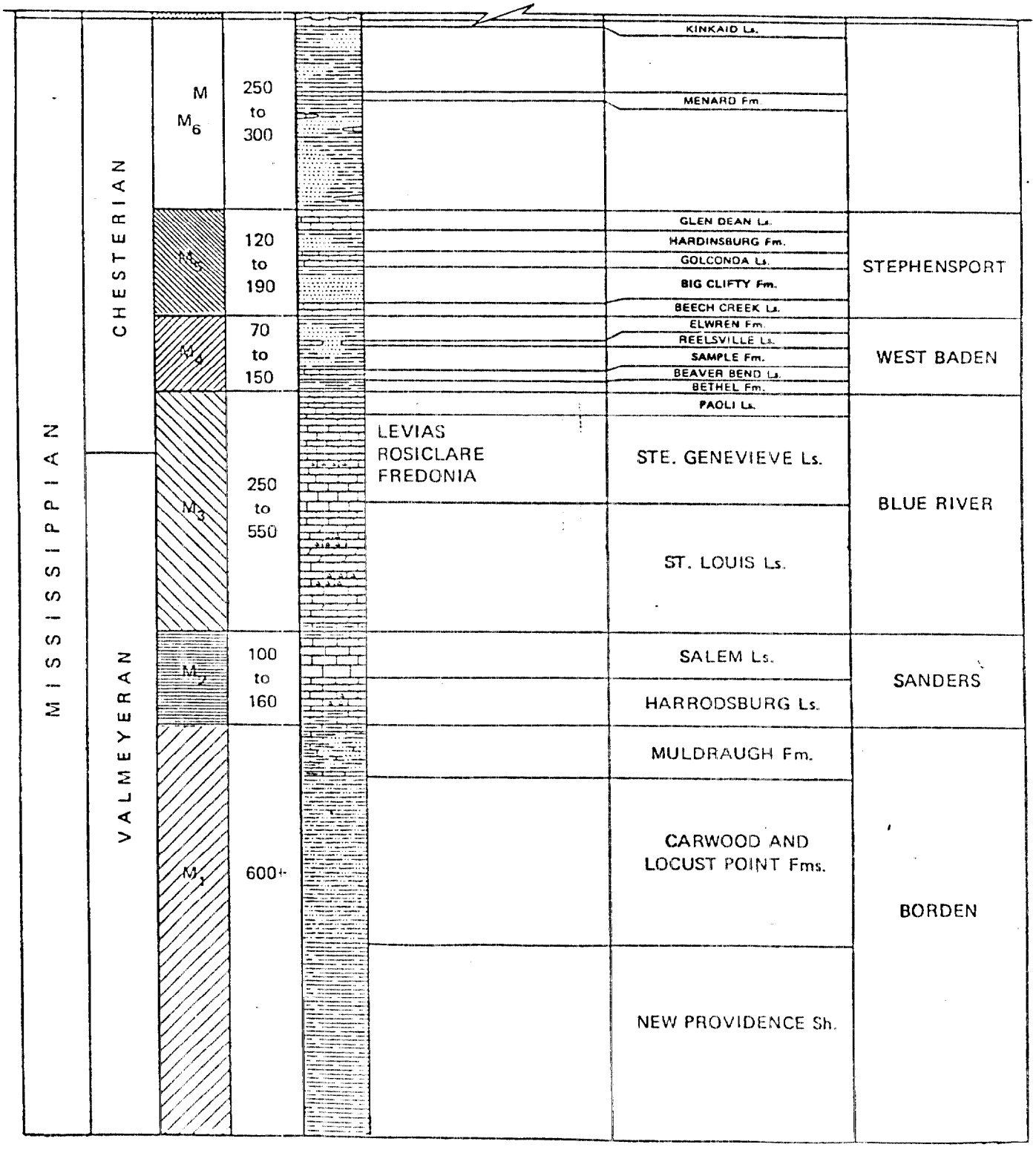
COLUMNAR SECTION SHOWING BEDROCK UNITS (CONT.)



* ROCK-UNIT NAMES FOR PENNSYLVANIAN ROCKS IN INDIANA FOLLOW THE USAGE PROPOSED BY WIER (IN PREPARATION), STRATIGRAPHY OF MIDDLE AND UPPER PENNSYLVANIAN ROCKS IN SOUTHWESTERN INDIANA. NEW NAMES ARE SHOWN IN ITALICS AND ARE TENTATIVE UNTIL FORMAL PRESENTATION.

Table 1 (concluded)

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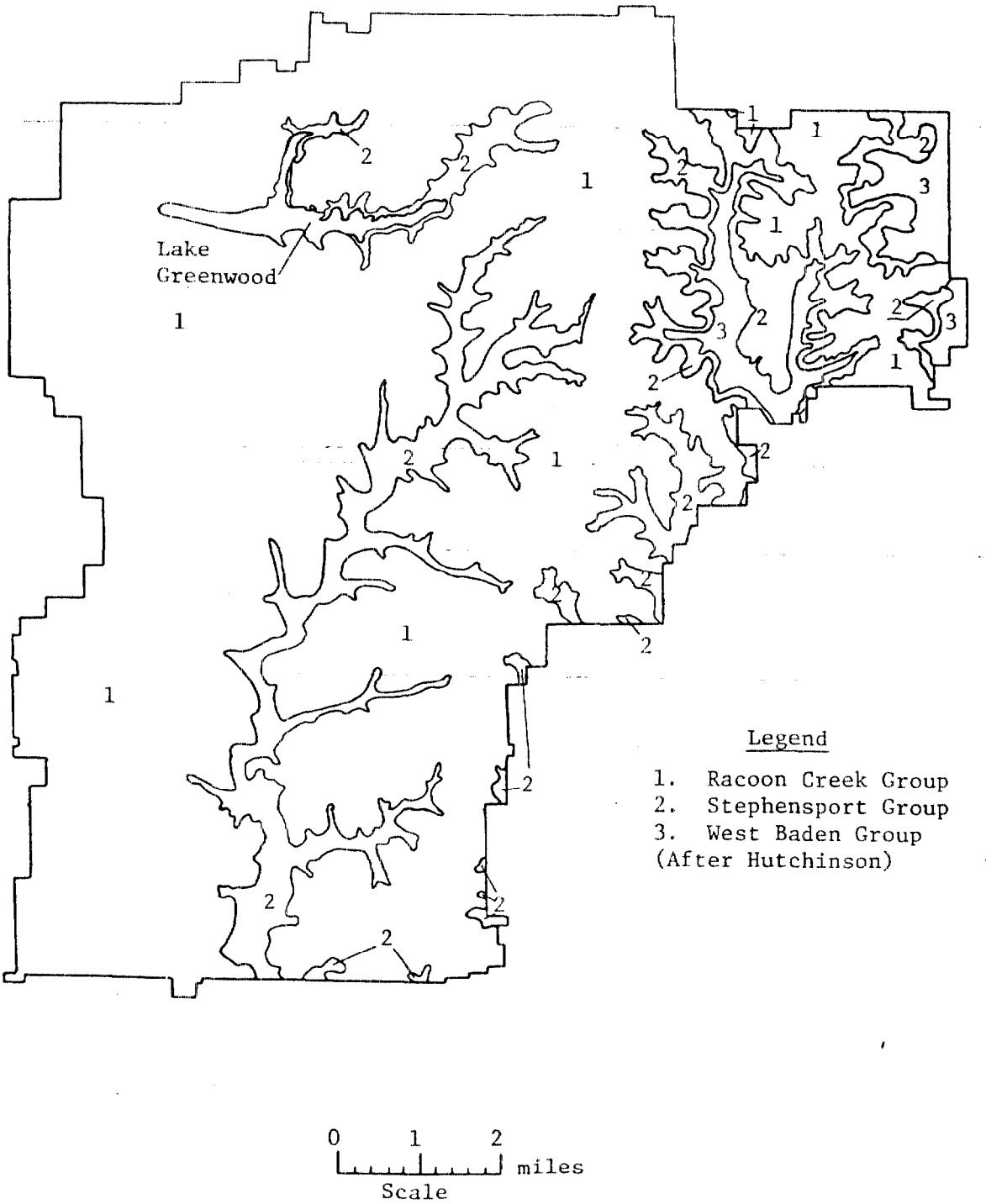

Figure 2. Distribution of Geological Groups at the NWSC.

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Surface Water

The surface drainage at the NWSC has formed a dense dendritic pattern throughout the installation that flows in a general southerly or southwesterly direction. Seven creeks in five drainage basins carry surface water off the installation where it eventually drains into the East Fork of the White River. Figure 3 shows the basins and drainages of the NWSC. Drainage Basin IV consists of Boggs and Turkey Creeks which are the primary drainageways for the installation and drain the majority of the area. The north and northwest section (Basin I) is drained by Furst Creek, the eastern portion (Basin III) is drained by the Sulphur Creek Complex, the extreme eastern portion (Basin II) is drained by Indiana Creek, and the southwestern section (Basin V) is drained by Seed Tick Creek. Also located within the installation are several small ponds and Lake Greenwood, an 800 acre spring-fed lake in the northwestern portion of the installation.

Groundwater

Detailed groundwater information at the NWSC is lacking since potable water is derived primarily from Lake Greenwood. Regionally, groundwater flow is expected to conform with the westward dipping bedrock with a gradient approaching the dip while locally, groundwater flow is likely to parallel the surface drainage on the installation. Wells installed by WES for the groundwater monitoring network generally showed groundwater flow agreed with local drainage. Seasonal fluctuations in the water table are expected to be slight since precipitation is well distributed throughout the year.

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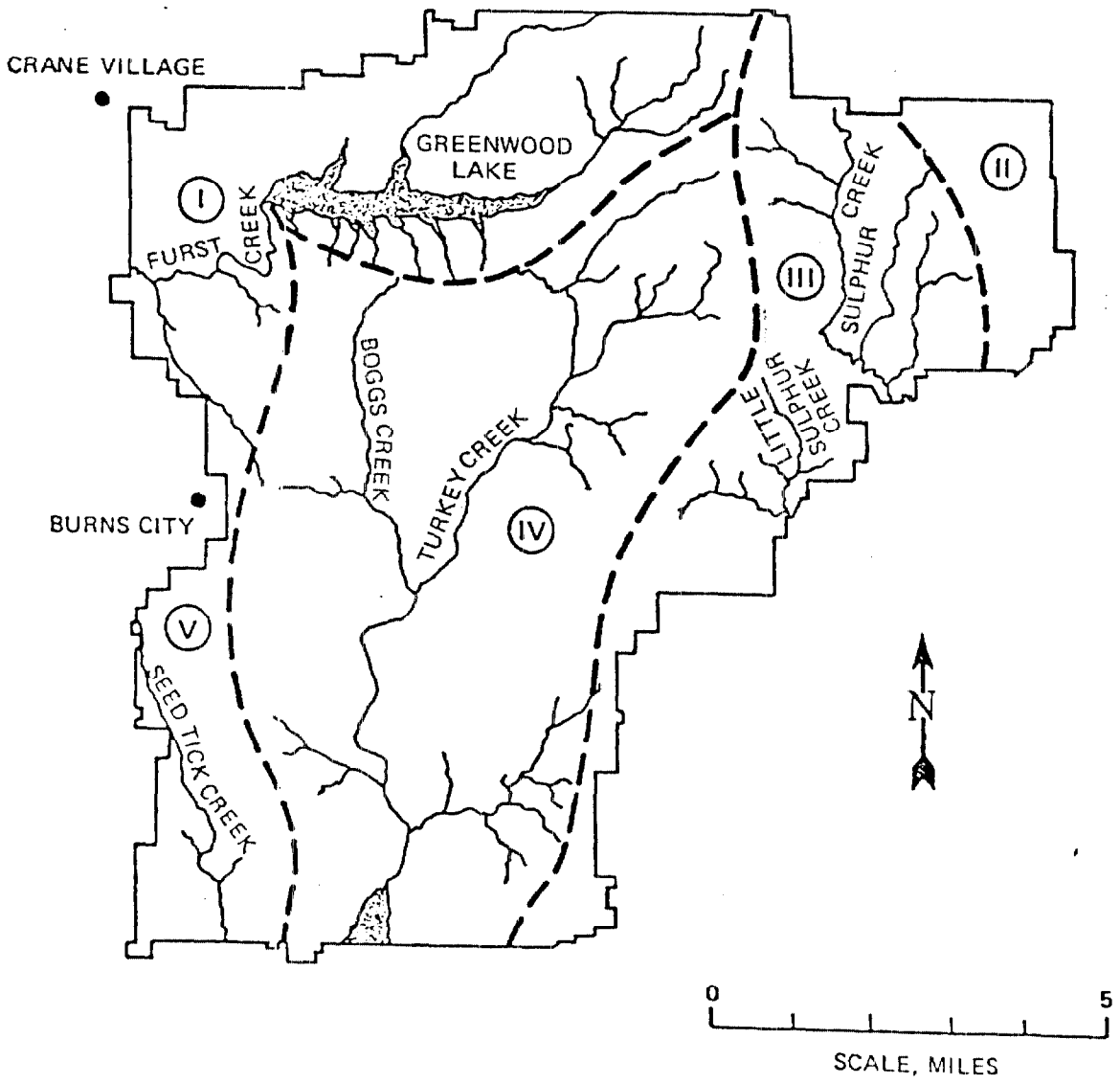

Figure 3. Surface Drainage at the NWSC.

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PART III: DATA COLLECTION

Field Exploration

The WES began installation of a groundwater monitoring system around each buried waste site in August 1981 and concluded work in December 1981. Thirteen groundwater monitoring networks (containing a total of 83 monitoring wells) were installed at 11 sites on the NWSC. Figure 4 identifies and locates the disposal sites on the NWSC. The installation of each network involved a soil sampling and drilling program to help define the hydrogeological characteristics at each site. The NWSC was responsible for the sampling and chemical analysis of water samples from each monitoring site, with the WES assisting the NWSC in obtaining water samples from the Demolition Area, the Old Rifle Range, the Ammunition Burning Grounds, and the Dye Burial Grounds. The NWSC initiated, prepared, and monitored all safety aspects of the drilling and sampling operations. Necessary support equipment, facilities, and personnel were also provided by the NWSC.

Field procedure

The installation of a monitoring network around each site was conducted in two phases. Phase one was concerned with determining depth to groundwater and the direction of groundwater flow by installing three monitoring wells around each disposal area. Well locations were based on the site topography and estimated water table gradient, and wells were located 25 to 75 ft from the site perimeter. When installed, the wells formed an approximate equilateral triangle around each area with one well up gradient and the remaining two wells down gradient of each disposal site. Water level measurements were recorded daily for seven days and weekly thereafter following each well installation (water levels were measured with an M-scope, a device similar to a volt-ohm meter). The NWSC surveyed all well locations and riser pipe elevations prior to implementation of the second phase. Groundwater elevations from the three initial wells were used to determine the direction of flow and the plane of the water table for each disposal site.

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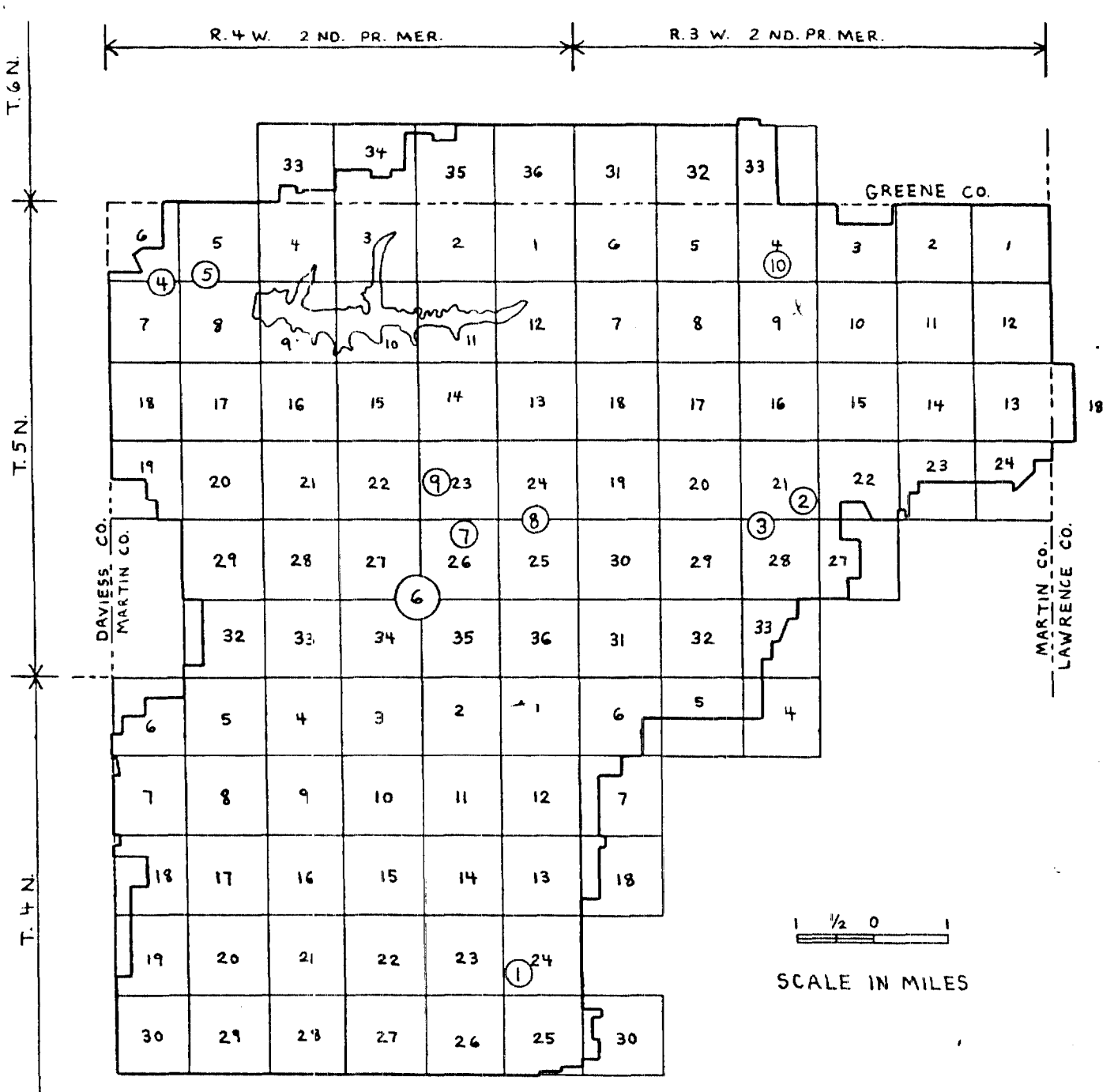

Site Number	Site Name
1	Mustard Gas Burial Grounds
2	Dye Burial Grounds
3	Ammunition Burning Grounds
4	McComish Gorge
5	Old Burning Pit
6	Demolition Area and Old Rifle Range (included under Site 6 but separate area)
7	Highway 58 Dump Site A
8	Highway 58 Dump Site B
9	Pest Control Area
10	Rockeye Site

Figure 4. Location of Groundwater Monitoring Systems

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Phase two consisted of installing a sufficient number of wells to obtain a minimum of three monitoring wells along the down gradient perimeter of each disposal site. These wells were located 25 to 75 ft from the site perimeter and equally spaced along the down gradient length to insure optimum subsurface coverage. Additional monitoring wells were installed where more than one direction of flow was encountered or where the down gradient perimeter was large. Prior to drilling the down gradient wells, a surveyed ground elevation was obtained where possible, if not, an estimate of the ground elevation was made to predict the depth where groundwater would be encountered. If the water table was as predicted, the remaining down gradient wells were installed. If the water table was not at the predicted depth, the completed well was given time to stabilize and the new three point problems solved with the next well located accordingly.

Soil sampling procedure

Undisturbed and disturbed soil samples were obtained using two truck-mounted Failing 1500 drilling rigs. An undisturbed soil sample is defined as a sample of minimal disturbance suitable for laboratory testing. The primary method used in obtaining undisturbed soil samples was with a 3-inch (in.) -diameter (diam), fixed piston sampler or Hvorslev sampler (Figure 5). A 3-in. Shelby tube, mounted to the sampler head, was pushed with hydraulic pressure into the stratum being sampled. The sampler was retrieved from its position and the tube removed from the sampler head. Approximately 3 inches of the soil sample was removed from the bottom of the tube for field classification and then sealed into a jar and labeled. Field classification consisted of identifying soil type, color, consistency, water content, and any other visible physical characteristics. Packers were inserted in each end of the sample tube and the sample tube labeled for storage at the NWSC for later shipment to WES for physical testing.

Additional undisturbed sampling methods were employed using a Pitcher sampler (Figure 6) or Dennison barrel. Both sample techniques use an inner sample tube and outer barrel with bit which is drilled into the sample interval. These methods were primarily used with hard soils or weathered rock and very coarse soils where the Hvorslev sampler was not effective.

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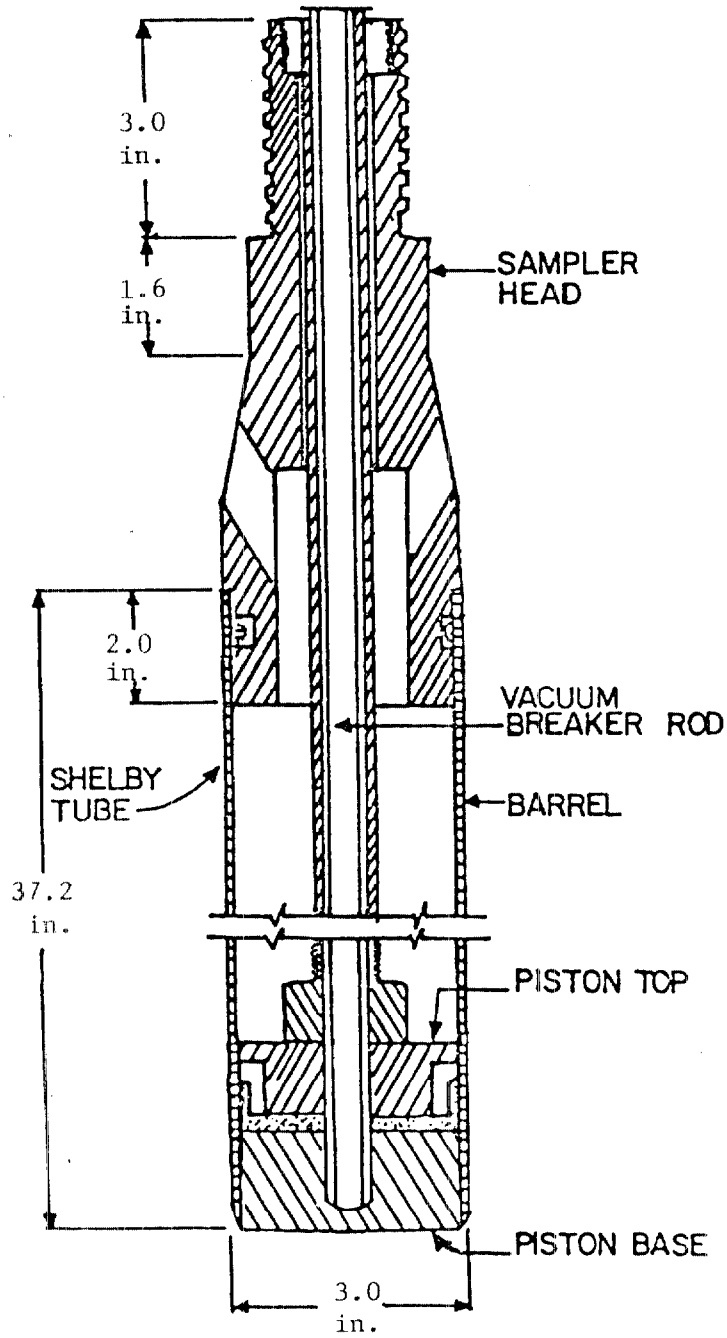

Figure 5. Sketch of Hvorslev Sampler or 3-in. Fixed Piston Sampler

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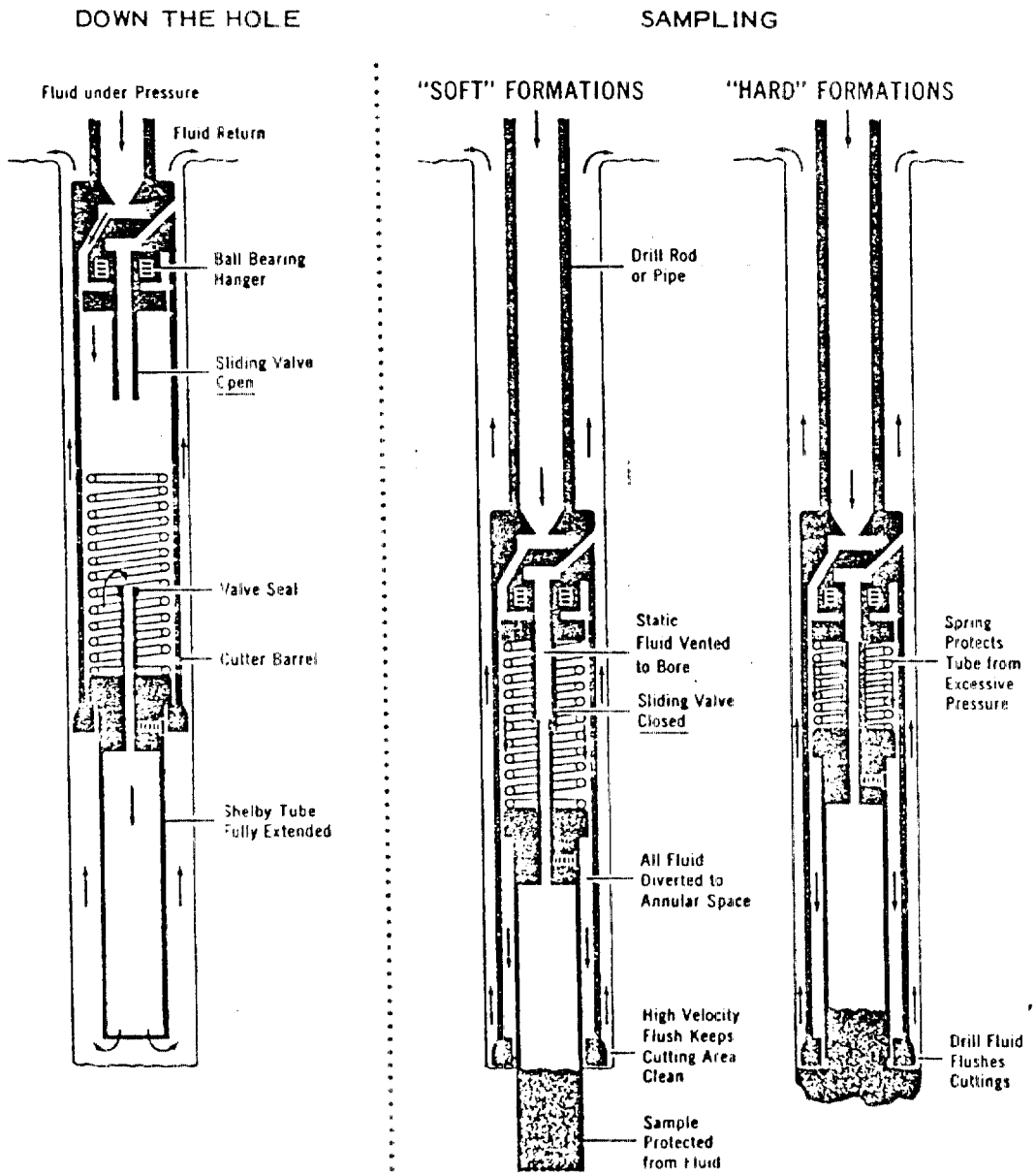

Figure 6. Sketch and Operation of Pitcher Sampler.

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Disturbed soil samples were obtained with a split-spoon sampler (Figure 7). A disturbed soil sample contains all the constituents of a particular stratum, but the original structure has been altered. The split-spoon sampler was pushed with hydraulic pressure into the same interval where the Hvorslev sampler failed to obtain a sample. This sample loss generally occurred in very moist or wet sands. The split-spoon sampler was retrieved from its position, disassembled, and the sample removed from the barrel portion where it was classified, sealed into a jar, and labeled for later shipment to WES for laboratory testing.

Additional disturbed soil samples were requested by the NWSC from the Dye Burial Grounds and an ash pile at the Ammunition Burning Grounds. These soil samples were obtained with a folding auger and composite jar samples were made for every 5 ft of material sampled. The NWSC required these samples to conduct chemical analysis on the soil and ash from these areas.

Sampling frequency

The sampling program called for 3-in. fixed piston undisturbed soil samples to be taken at 5-ft intervals - 0, 5, 10 ... ft - until either the water table or rock was encountered. If water was encountered in the overburden, two additional soil samples were taken at 5-ft and 10-ft below the depth where water was first encountered. If bedrock was encountered, boring advance was changed to rock drilling.

Boring advance between sample intervals was made with either a hollow stem auger or folding-solid auger. The hollow stem auger is a combination casing and auger which is used in soils where the boring will collapse when not supported. The folding or solid auger was used primarily in boring advance where soil borings tended to remain open. The hollow stem auger was used only at McComish Gorge and the Old Burning Pit where soils were predominantly coarser-grained.

Drilling

Drilling was initiated where rock was encountered. Rock drilling at the NWSC was done either with a 5-5/8-in. rock bit or 4-in. inside diameter (I.D.) x 5½-in. outside diameter (O.D.) core barrel with diamond bit (Figure 8). At least one boring per site was drilled with the core barrel

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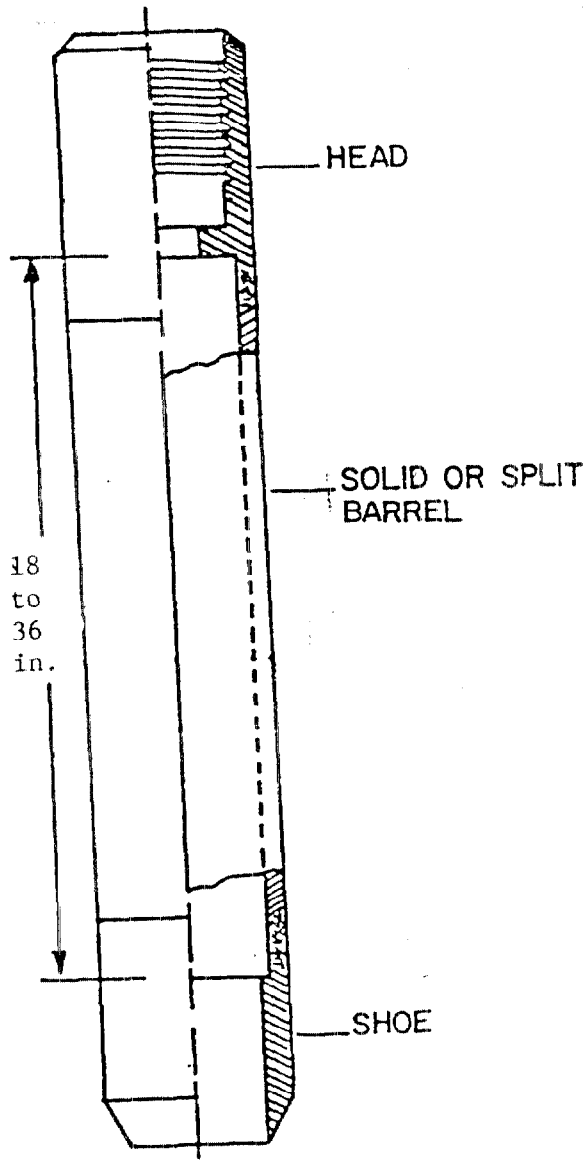

O.D. 2 in., 2.5 in., 3 in., 3.5 in.
I.D. 1.5 in., 2 in., 2.5 in., 3 in.

Figure 7. Sketch of Split-Spoon Sampler.

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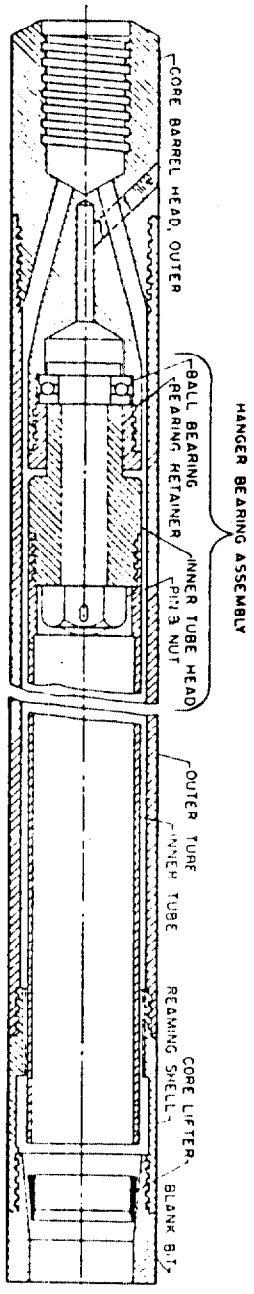

Figure 8. Sketch of 4-in. I.D. x 5-1/2-in. O.D. Core Barrel.

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to provide detailed lithologic information and the remaining borings were drilled with a rock bit. Boring advance was ended when the boring was 10 ft below the water table.

Air was used as a medium during rock drilling. A 650 cubic feet per minute air compressor furnished the necessary pressure to remove cuttings from the boring and lubricate the rock bit. During the coring operation it was occasionally necessary for water to be used as a drilling medium instead of air. This occurred when the boring was too deep for cuttings to be efficiently removed by air or the water table prevented the cuttings from reaching the surface. The preferred medium was air because water could mask the water table.

Samples from core borings were not saved, but detailed lithological logs and photographs were made from rock samples. Lithological classification from rock bit borings was made on drill cuttings which identified type, color, grain-size, water content, and drilling resistance of the material. Appendix A contains the field boring logs and Appendix B graphically summarizes the information from the field boring logs.

Well installation

Well installation for each boring was dependent on the site geology. If the water table was encountered in the overburden, one of three situations could occur which was easily determined during the soil sampling operation by pushing two undisturbed soil samples below the depth where water was encountered. Where the saturated zone was found to equal or exceed 12.5 ft, well installation would correspond to Figure 9 and where the saturated zone was less than 12.5 ft, well installation would correspond to Figure 10. The third type of overburden well installation is illustrated in Figure 11 and occurs where the saturated zone is less than 12.5 ft and overlies rock. Figure 12 illustrates installation where the water table is in rock which represents the majority of wells installed at the NWSC.

A well string was made from 2-in. schedule 40 PVC pipe after the depth of the monitoring well was determined. All well strings consisted of a bottom capped silt trap, a slotted section of PVC screen (preconstructed 10-ft

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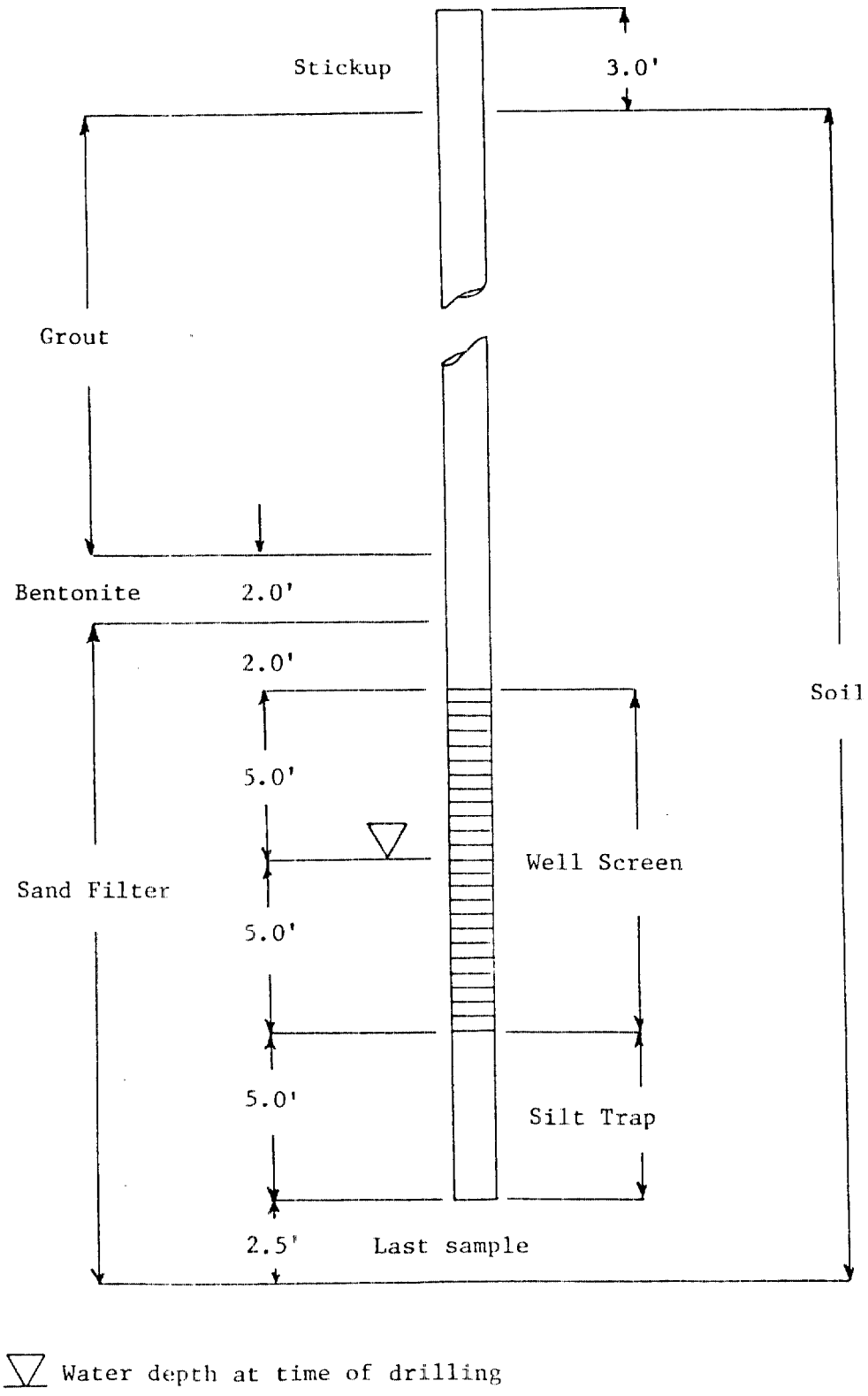

Figure 9. Monitoring Well When Saturated Zone Equals or Exceeds 12.5 ft.

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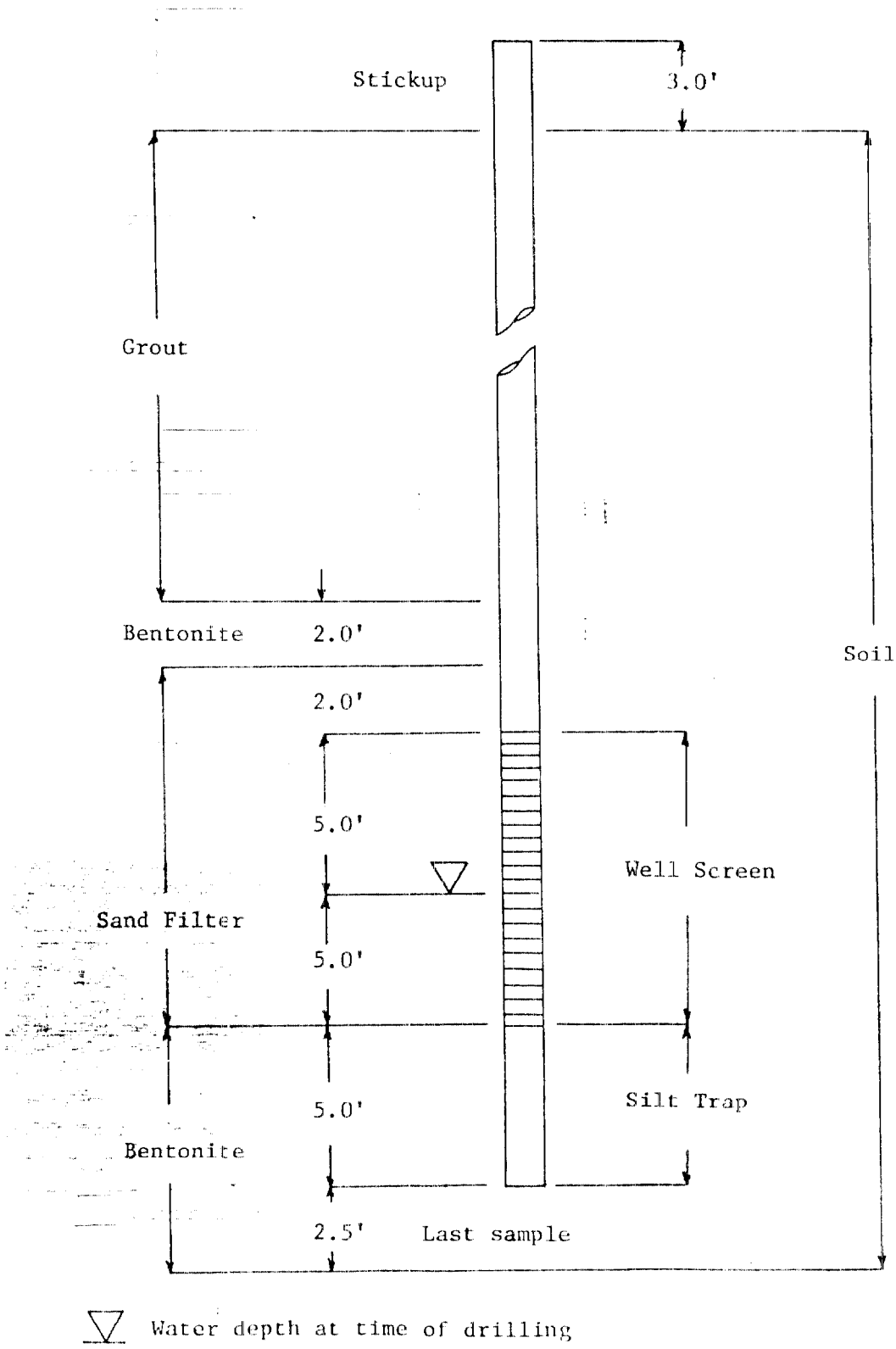

Figure 10. Monitoring Well When Saturated Zone is Less Than 12.5 ft Thick and Overlies Dry Soil.

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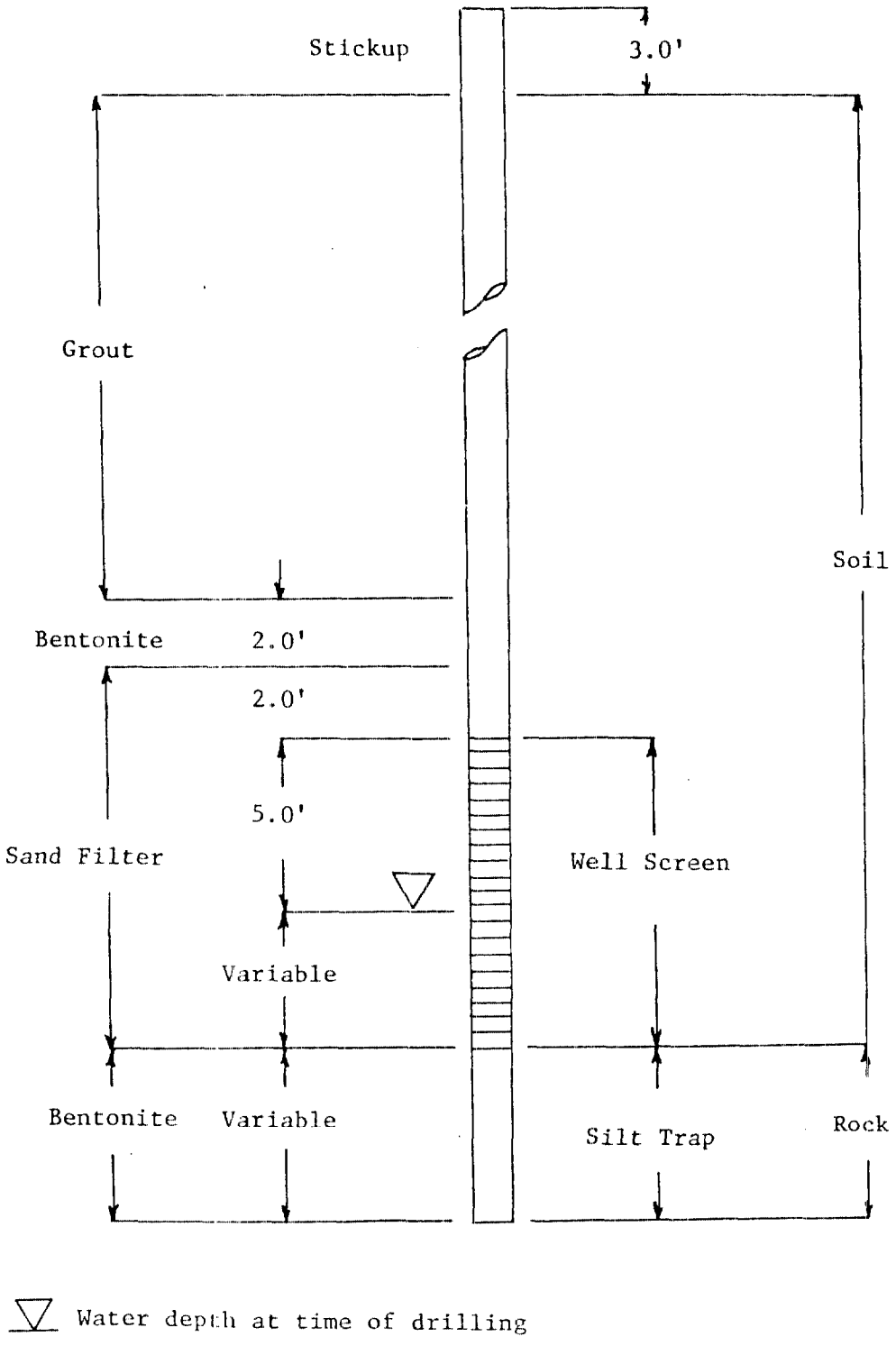

Figure 11. Monitoring Well When Saturated Zone is Less Than 12.5 ft Thick and Overlies Rock.

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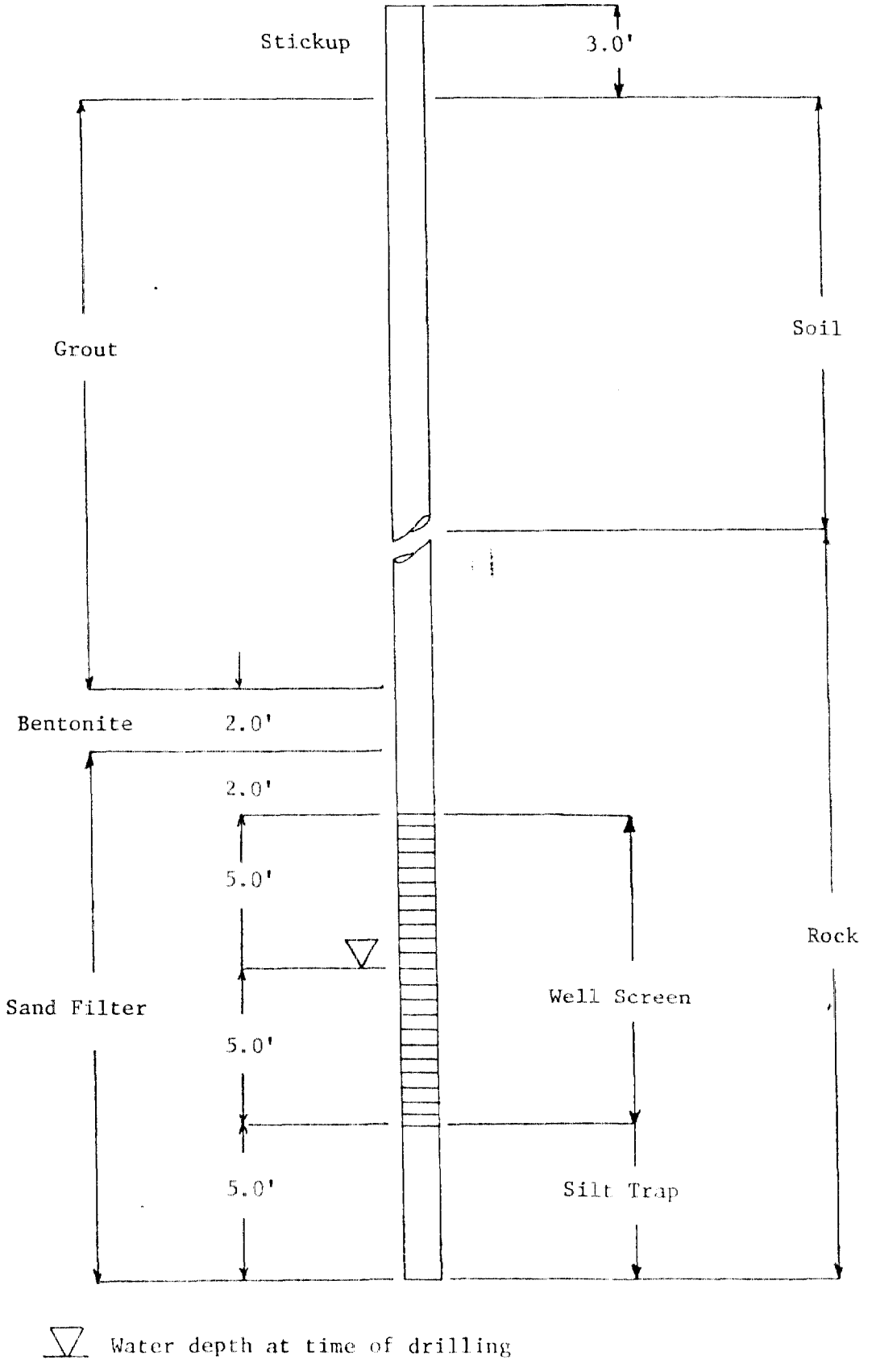


Figure 12. Monitoring Well with Water Table in Rock.

WORKING DRAFT

sections with slot width opening of 0.020 in.) and a solid riser pipe extending 3 ft above ground surface. All joints were sealed with PVC cement to prevent leakage and a small vent was sawed into the riser pipe cap to allow equalization of pressure. In shallow borings the well string was lowered as a complete unit while in deeper borings it was necessary to glue the well string in sections when lowering to the desired depth. If the hollow stem auger was used in boring advance (McComish Gorge and Old Burning Pit), the well string was lowered through the hollow stem auger and the hollow stem auger removed.

Well completion was dependent on the applicable geological condition in Figures 9 through 12. If the saturated zone was less than 12.5 ft and was underlain by soil (Figure 10) or bedrock (Figure 11), a bentonite seal was placed around the silt trap to prevent possible contamination of the underlying material from the water table. If the saturated zone was greater than 12.5 ft (Figure 9) or the water table was found in bedrock (Figure 12), a washed filter sand was placed around the silt trap. In all constructions, the annulus between the well screen and boring wall was filled with a washed filter sand (laboratory test results on the filter sand are contained in Appendix E) to a level approximately 2 ft above the top of the screen, followed by approximately 2 ft of bentonite. The remaining annulus was grouted using a water, cement, and bentonite mixture. The bentonite was added to the grout to prevent shrinking and cracking during the curing process. Surface depressions caused by settling of the grout mixtures were later filled with a similar mixture.

In certain locations additional protection to the well was supplied by a 3-in.-diam, steel pipe with screw cap. All wells in the Demolition Area and the Old Rifle Range were fitted with protector pipes. Those locations where the possibility of damage might result from snow removal or high vehicle trafficked areas were also fitted with protector pipes. These protector pipes were cemented 2 ft below ground surface, vented in the cap, and contained a drain hole at the base. The drain hole prevented trapped water from freezing during the colder months and possible damage to the inner PVC riser pipe. Each monitoring well was labeled and Appendix C contains diagrams of all wells installed. Appendix D contains the water level measurements on all monitoring wells installed.

WORKING DRAFT

Physical Test and Cation Exchange Capacity

Physical test

Standard soil test procedures as specified by Engineering Manual 1110-2-1906 "Laboratory Soil Testing" were followed during testing. Classification tests (Atterberg limits and grain size distribution of soils), water content, and density tests were performed on all tube samples. Classification tests and water content were performed on all jar samples where no tube samples existed. Permeability tests were performed on selected samples from each site. Detailed testing procedures are presented in Appendix E with laboratory soil test data.

Classification of soils was made according to the Unified Soil Classification System (USCS) which depends on the grain size distribution and Atterberg limits. Grain size distribution was determined with standard sieves and the Atterberg limits (liquid and plastic limits) were determined with standard devices. The liquid and plastic limits are the water contents at the boundaries between the semiliquid and plastic state and the plastic and semisolid state, respectively. Figure 13 shows the USCS with which the NWSC soil samples were described.

Water content and soil density are important engineering relationships and are useful correlations among samples for which a full suite of test data are not available. Water content is the amount of free water in a soil and soil density is the dry weight per soil volume.

Permeability tests were performed on one to three representative samples from each site to evaluate the hydrogeological conditions at each disposal site. The samples above bedrock and the water table furnished an approximate measure of possible migration of contaminants.

Cation exchange capacity

Cation Exchange Capacity (CEC) test procedures as specified by Technical Report EPA/CE 81-1 "Procedures for Handling and Chemical Analysis of Sediment and Water Samples" were followed during testing. The CEC of a soil is a measure of the cations (positive charged ions) reversibility capacity from the surface of the crystalline matrix of a mineral. These cations may be released into the water table under appropriate conditions. CEC tests were generally performed on the jar sample from the first sample tube in each boring. Detailed chemical test procedures and results are included in Appendix E.

UNIFIED SOIL CLASSIFICATION
(Including Identification and Description)

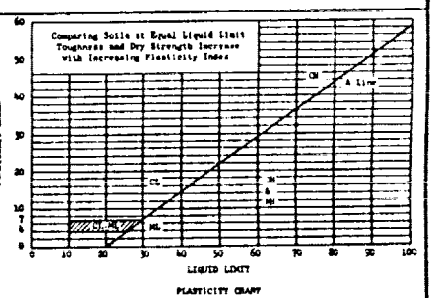
Major Divisions (1)	(2)		Group Symbols (3)	Typical Names (4)	Field Identification Procedures (Excluding particles larger than 3 in. and basing fractions on estimated weights) (5)	Information Required for Describing Soils (6)	Laboratory Classification Criteria (7)
Coarse-grained Soils. More than half of material is larger than No. 200 sieve size.	Gravels. More than half of coarse fraction is larger than No. 4 sieve size (For visual classification, the 1/4-in. size may be used as equivalent to the No. 4 sieve size)	Clean Gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.	For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions, and drainage characteristics.	
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.		
		Gravels with Fines (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below).	Give typical name; indicate approximate percentages of sand and gravel; maximum size; angularity; surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbol in parentheses.	
			GC	Clayey gravels, gravel-sand-clay mixtures.	Plastic fines (for identification procedures see CL below).		
	Sands. More than half of coarse fraction is smaller than No. 4 sieve size.	Clean Sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines.	Wide range in grain size and substantial amounts of all intermediate particle sizes.	Example: Silty sand, gravelly; about 20% hard, angular gravel particles 1/2-in. maximum size; rounded and subangular sand grains, coarse to fine; about 15% nonplastic fines with low dry strength; well compacted and moist in place; alluvial sand; (SM).	
			SP	Poorly graded sands or gravelly sands, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.		
		Sands with Fines (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below).		
			SC	Clayey sands, sand-clay mixtures.	Plastic fines (for identification procedures see CL below).		
					Identification Procedures on Fraction Smaller than No. 40 Sieve Size: Dry Strength (Crushing characteristics) / Dilatancy (Reaction to shaking) / Toughness (Consistency near PL)		
Fine-grained Soils. More than half of material is smaller than No. 200 sieve size. (For the No. 200 sieve size is about the smallest particle visible to the naked eye)	Silts and Clays. Liquid limit is less than 50		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.	None to slight / Quick to slow / None	For undisturbed soils add information on structure, stratification, consistency in undisturbed and remolded states, moisture and drainage conditions.	
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.	Medium to high / None to very slow / Medium		
			OL	Organic silts and organic silty clays of low plasticity.	Slight to medium / Slow / Slight		
	Silts and Clays. Liquid limit is greater than 50.		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	Slight to medium / Slow to none / Slight to medium	Give typical name; indicate degree and character of plasticity; amount and maximum size of coarse grains; color in wet condition; odor, if any; local or geologic name and other pertinent descriptive information; and symbol in parentheses.	
			CH	Inorganic clays of high plasticity, fat clays.	High to very high / None / High		
			OH	Organic clays of medium to high plasticity, organic silts.	Medium to high / None to very slow / Slight to medium	Example: Clayey silt, brown; slightly plastic; small percentage of fine sand; numerous vertical root holes; firm and dry in place; loess; (ML).	
Highly Organic Soils			Pt	Peat and other highly organic soils.	Readily identified by color, odor, spongy feel and frequently by fibrous texture.		

Use grain-size curve in identifying the fractions as given under field identification.

Determine percentages of gravel and sand from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5% — GW, GP, SW, SP
More than 12% — GM, GC, SM, SC
5% to 12% — Borderline cases requiring use of dual symbols.

$C_u = \frac{D_{60}}{D_{10}}$ Greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
Not meeting all gradation requirements for GW	
Atterberg limits below "A" line or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols.
Atterberg limits above "A" line with PI greater than 7	
$C_u = \frac{D_{60}}{D_{10}}$ Greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
Not meeting all gradation requirements for SW	
Atterberg limits below "A" line or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols.
Atterberg limits above "A" line with PI greater than 7	



For laboratory classification of fine-grained soils

(1) Boundary classifications: Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW-GC, well-graded gravel-sand mixture with clay binder. (2) All sieve sizes on this chart are U. S. standard

FIELD IDENTIFICATION PROCEDURES FOR FINE-GRAINED SOILS OR FRACTIONS

These procedures are to be performed on the sieve No. 40 sieve size particles, approximately 1/64 in. For field classification purposes, screening is not intended, simply remove by hand the coarse particles that interfere with the tests.

Dilatancy (reaction to shaking)

After removing particles larger than No. 40 sieve size, prepare a pat of moist soil with a volume of about one-half cubic inch. Add enough water if necessary to make the soil stiff but not sticky.

Place the pat in the open palm of one hand and shake horizontally, striking vigorously against the other hand several times. A positive reaction consists of the appearance of water on the surface of the pat which changes to a livery consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the pat stiffens, and finally it cracks or crumbles. The rapidity of appearance of water during shaking and of its disappearance during squeezing assist in identifying the character of the fines in a soil.

Very fine clean sands give the quickest and most distinct reaction whereas a plastic clay has no reaction. Inorganic silts, such as a typical rock flour, show a moderately quick reaction.

Dry Strength (crushing characteristics)

After removing particles larger than No. 40 sieve size, mold a pat of soil to the consistency of putty, adding water if necessary. Allow the pat to dry completely by oven, sun, or air-drying, and then test its strength by breaking and crumbling between the fingers. This strength is a measure of the character and quantity of the colloidal fraction contained in the soil. The dry strength increases with increasing plasticity.

High dry strength is characteristic for clays of the CH group. A typical inorganic silt possesses only very slight dry strength. Silty fine sands and silts have about the same slight dry strength, but can be distinguished by the feel when powdering the dried specimen. Fine sand feels gritty whereas a typical silt has the smooth feel of flour.

Toughness (consistency near plastic limit)

After particles larger than the No. 40 sieve size are removed, a specimen of soil about one-half inch cube in size, is molded to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture by evaporation. Then the specimen is rolled out by hand on a smooth surface or between the palms into a thread about one-eighth inch in diameter. The thread is then folded and rerolled repeatedly. During this manipulation the moisture content is gradually reduced and the specimen stiffens, finally loses its plasticity, and crumbles when the plastic limit is reached.

After the thread crumbles, the pieces should be lumped together and a slight kneading action continued until the lump crumbles.

The tougher the thread near the plastic limit and the stiffer the lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil. Weakness of the thread at the plastic limit and quick loss of coherency of the lump below the plastic limit indicate either inorganic clay of low plasticity, or material such as kaolin-type clays and organic clays which occur below the A-line.

Highly organic clays have a very weak and spongy feel at the plastic limit.

Figure 13. Unified Soil Classification System (USCS)

PART IV: DISPOSAL SITES

Mustard Gas Burial Grounds

Location

The Mustard Gas Burial Grounds are located in the SE¼ NW¼ SW¼, Sec. 24, T4N, R4W (Figure 4). The area is enclosed by a fence and lies on a slight northwesterly slope. Five monitoring wells were installed around the Mustard Gas Burial Grounds and their locations are shown in Figure 14.

Geology

Overburden at this site ranges in thickness from 1 to 10 ft. The underlying rock consists of sandstone and shale from the Mansfield Formation of the Raccoon Creek Group (Table 1). Boring WES-1-2-81 was drilled to a depth of 22.8 ft and, underlying the overburden, encountered 14.5 ft of a light brown, uniform, fine-grained, quartz sandstone which changes to a very fine-grained, grey sandstone with shale lenses at a depth of about 16 ft. This material gradually grades into a dark grey to black, soft, sandy shale with sandstone lenses at a depth of 19 ft. Cross section A-A' (Figure 15) shows boring and groundwater data from three borings. The boring logs are presented in Appendixes A and B.

Groundwater

Groundwater at the Mustard Gas Burial Grounds was encountered in fractures in the sandstone. Between the up gradient and down gradient monitoring wells, groundwater elevations range from 658 to 652 ft MSL, a difference of 6 ft. A groundwater contour map constructed from water measurements of 29 November 1981, shows flow to be in a northerly direction (see Figure 16). Groundwater data are presented in Appendix D.

Physical and chemical test

Laboratory classification of soil samples ranged from clayey sand (SC) to clay (CL). These soils are brown to reddish brown. Soil permeability for a clay soil (sample 1, boring 5) was calculated to be 1.72×10^{-4} cm/sec and this soil composes 86 percent of the soil samples obtained from this site. Appendix E presents the physical and chemical tests results.

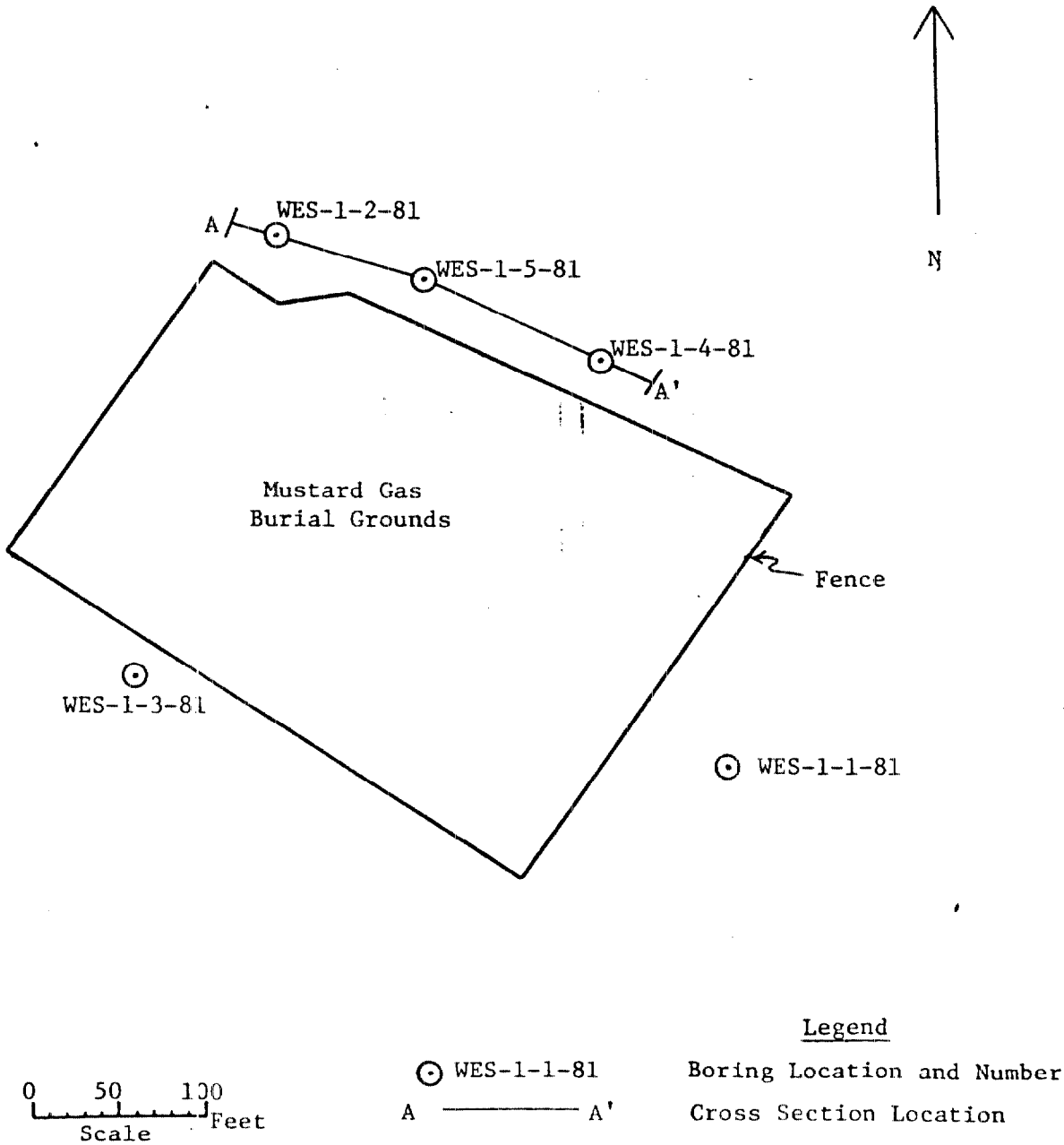


Figure 14. Well Locations and Cross Section Location of Mustard Gas Burial Grounds.

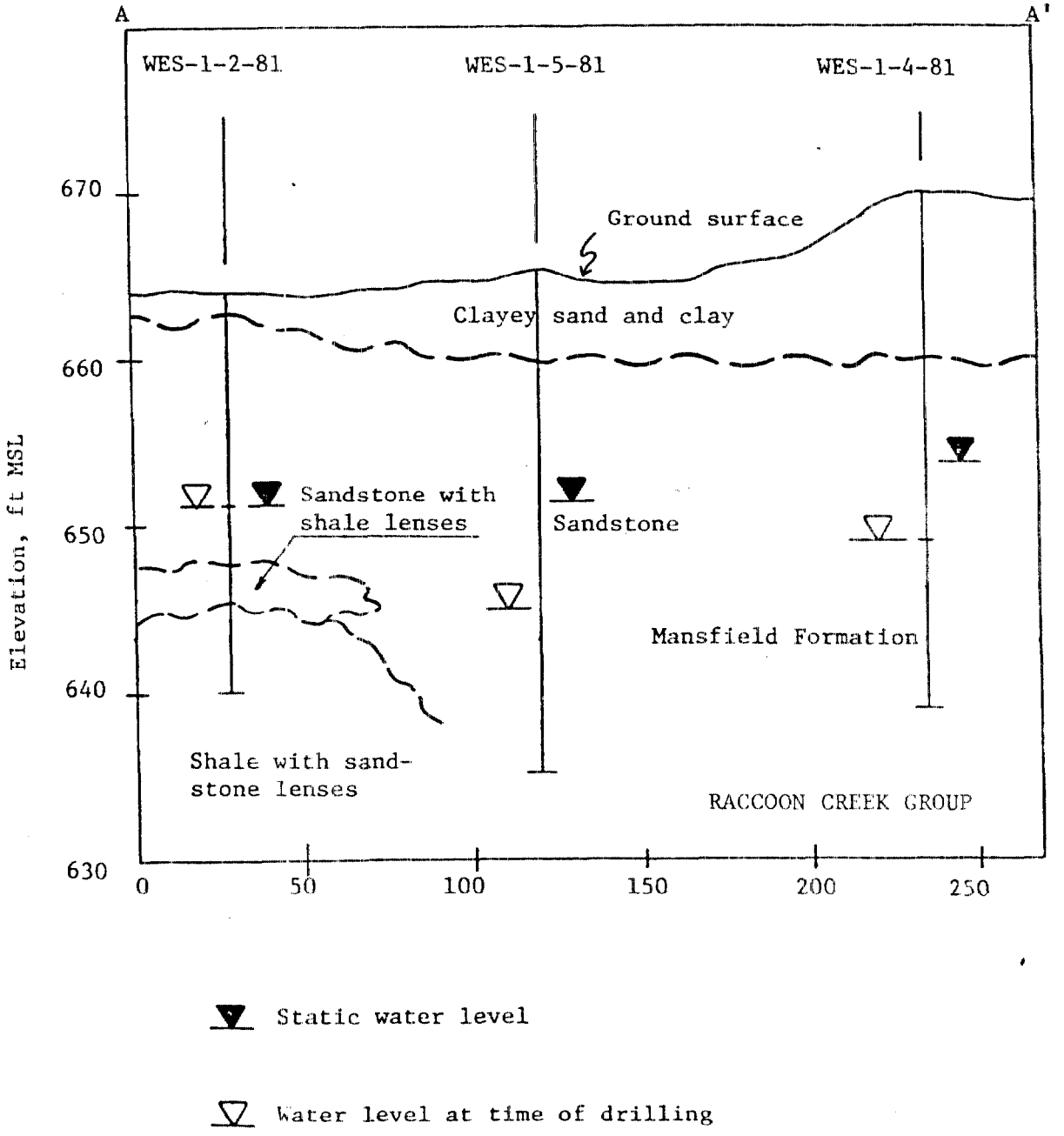


Figure 15. Geological Cross Section A-A' of Mustard Gas Burial Grounds.

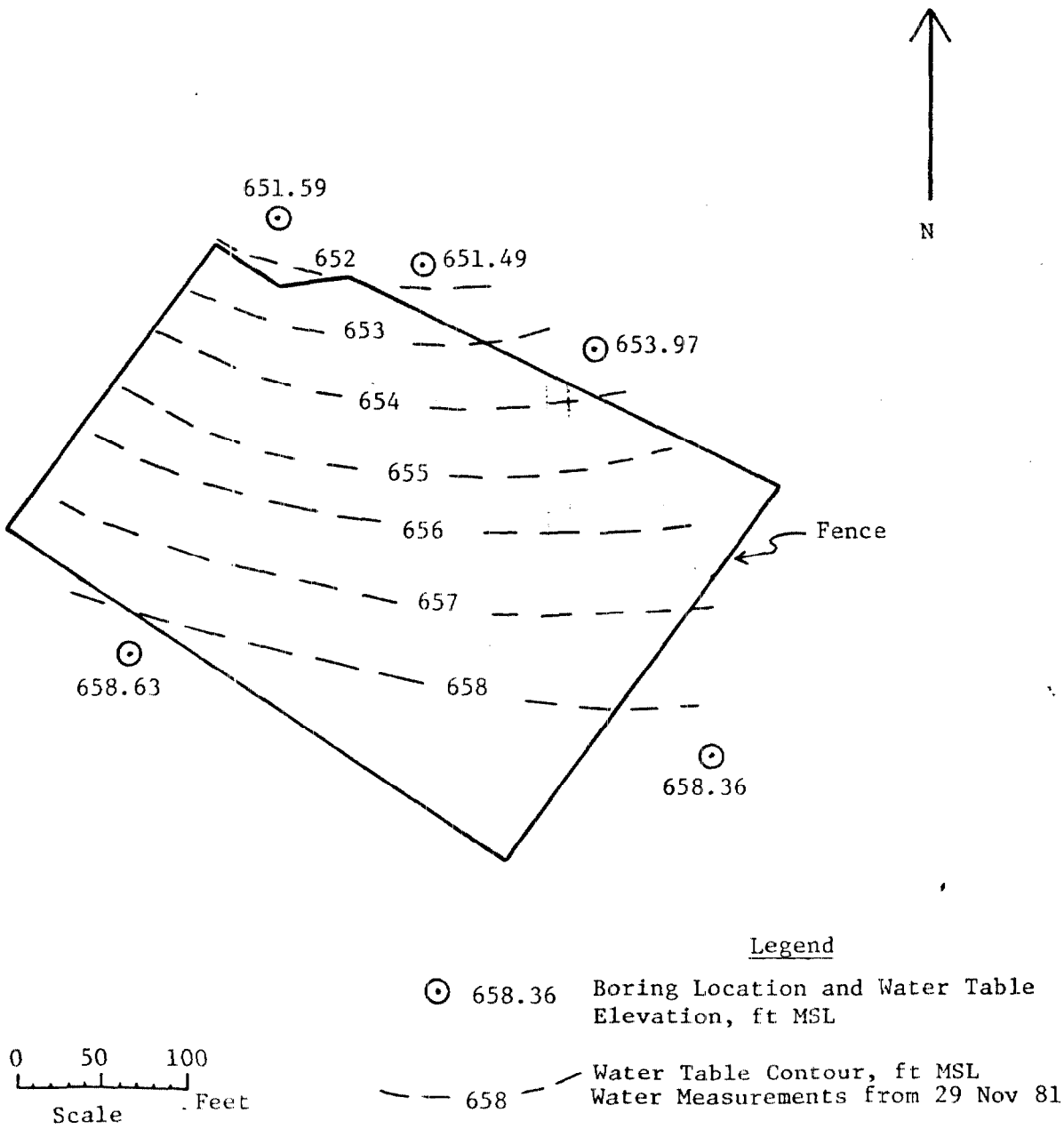


Figure 16. Water Table Contour Map of Mustard Gas Burial Grounds.

Dye Burial Grounds

Location

The Dye Burial Grounds are located in the SW¼ SE¼, Sec. 21, T5N, R3W (Figure 4). They are located on a ridgetop southwest of Magazine 1518 where eight monitoring wells were installed around the perimeter of the disposal site. Well locations and the approximate limits of the burial site are shown in Figure 17.

Geology

Overburden at the Dye Burial Grounds ranges in thickness from 2 to 10 ft. The underlying rock consists of interbedded shale and sandstone from the Mansfield Formation of the Raccoon Creek Group and the Glen Dean Limestone of the Stephensport Group (Table 1). Boring WES-2-2-81 was drilled to a depth of 54.5 ft and, underlying the overburden, encountered approximately 42 ft of sandstone ranging from brown, orange, and red to various shades of grey. This sandstone unit was composed of a very fine to fine-grained quartz sand thinly bedded with seams and lenses of dark grey, soft shale and minor amounts of clay and lignite. The shale content gradually increases with depth beginning around 35 ft and grades into a green, uniform, soft, brittle shale at a depth of around 51 ft. Boring WES-2-3-81 drilled through this shale unit which was 12 ft thick and encountered 8 ft of red to purple, fine-grained sandstone underlain by the Glen Dean Limestone. This limestone was very hard and grey. Cross section A-A' (Figure 18) shows boring and groundwater data from six borings. The boring logs are presented in Appendixes A and B.

Groundwater

Groundwater at the Dye Burial Grounds was encountered in fractures in the upper sandstone unit in all borings except boring WES-2-3-81. Groundwater in this boring was encountered near the shale and lower sandstone contact. Boring WES-2-1-81 encountered a perched water table in the upper sandstone unit. This perched water table resulted from either a localized lithological change or from little to no fracturing in the underlying rock. Between the up gradient and down gradient monitoring wells, groundwater elevations range from 684 to 678 ft MSL, a difference of 6 ft. A groundwater contour map constructed from water measurements of 11 November 1981, shows flow to be in a westerly direction (see Figure 19). Monitoring well WES-2-1-81 was not used in constructing the water table map. Groundwater data are presented in Appendix D.

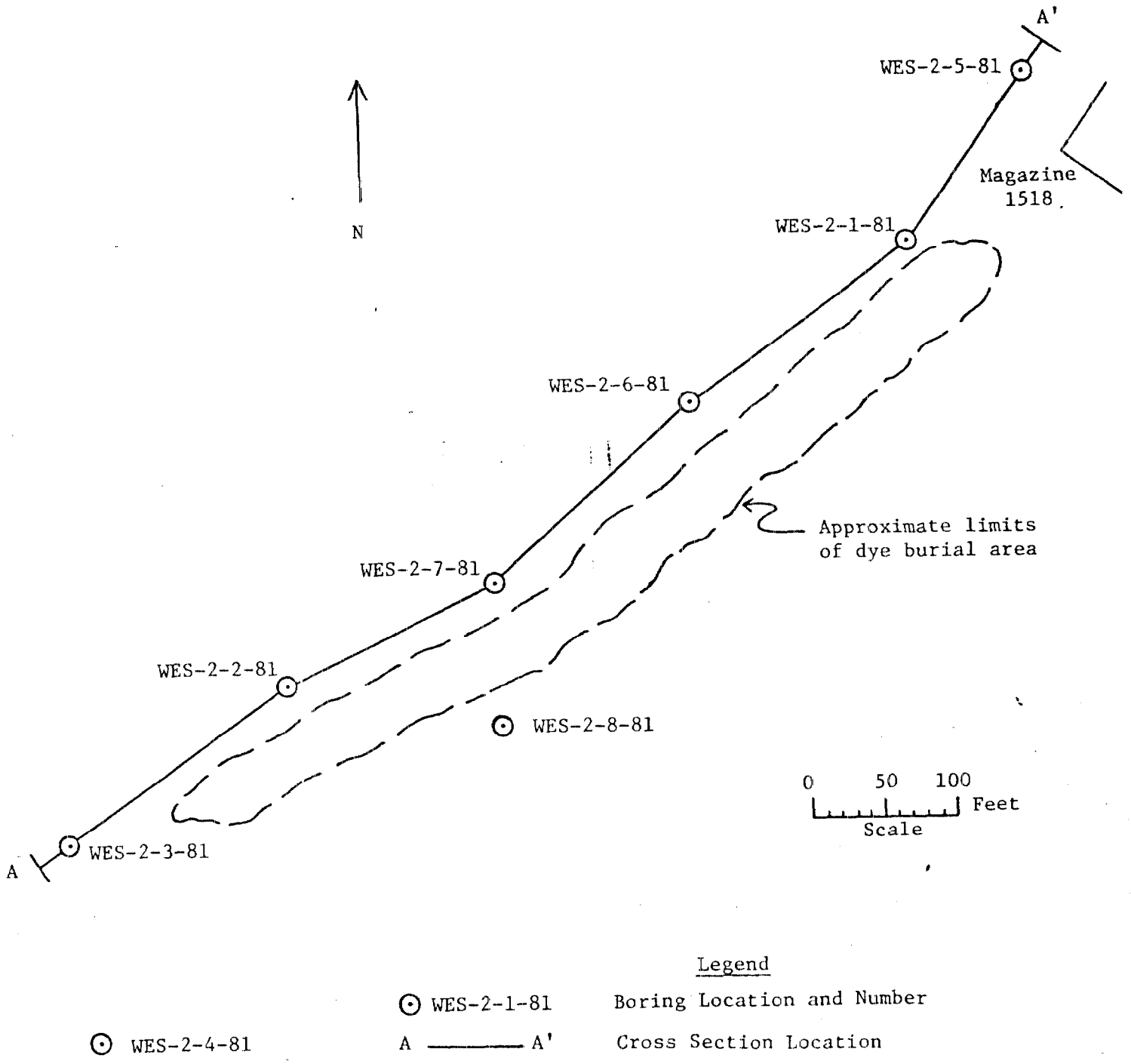


Figure 17. Well Locations and Cross Section Location of Dye Burial Area.

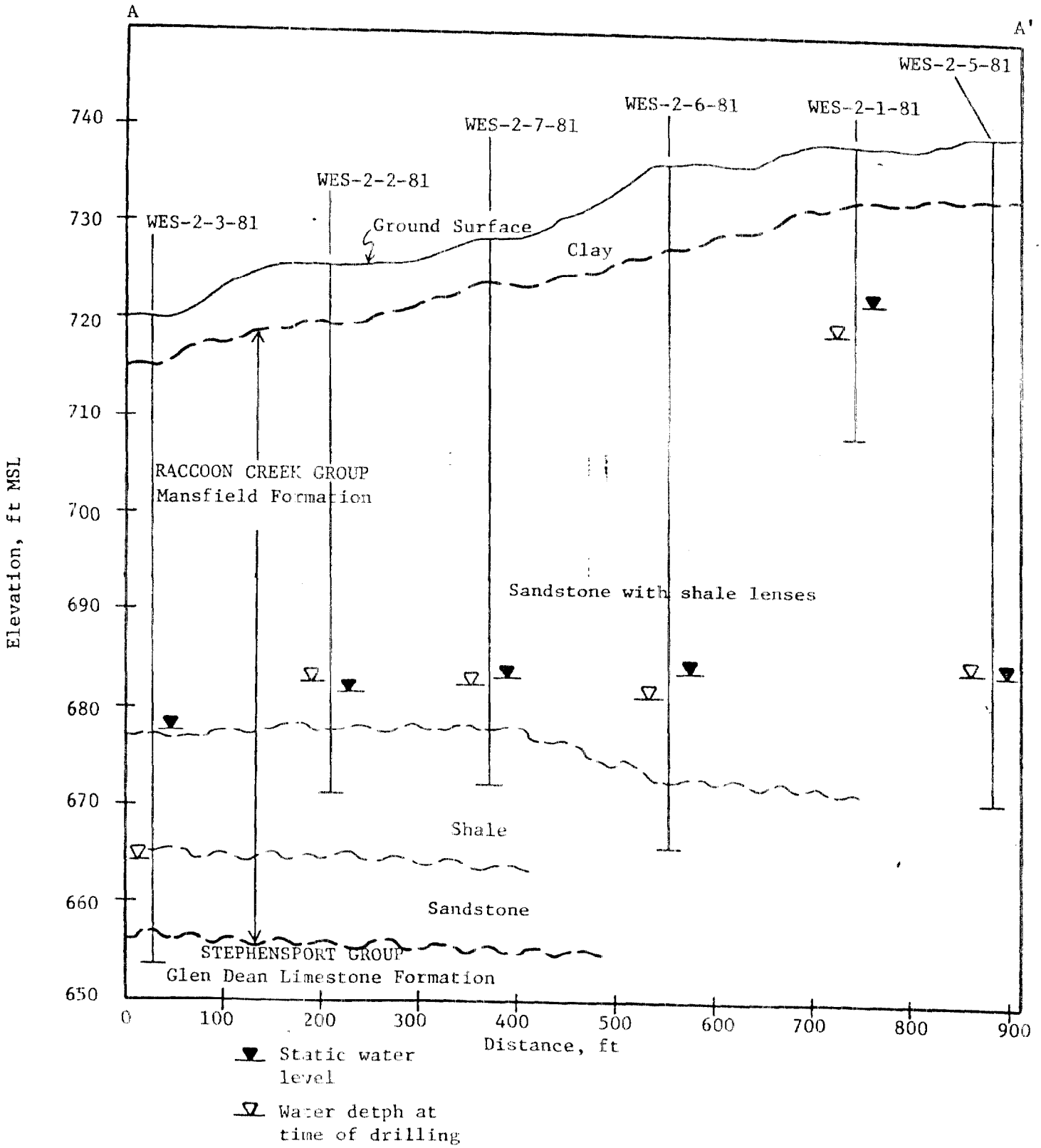


Figure 18. Geological Cross Section A-A' of Dye Burial Grounds

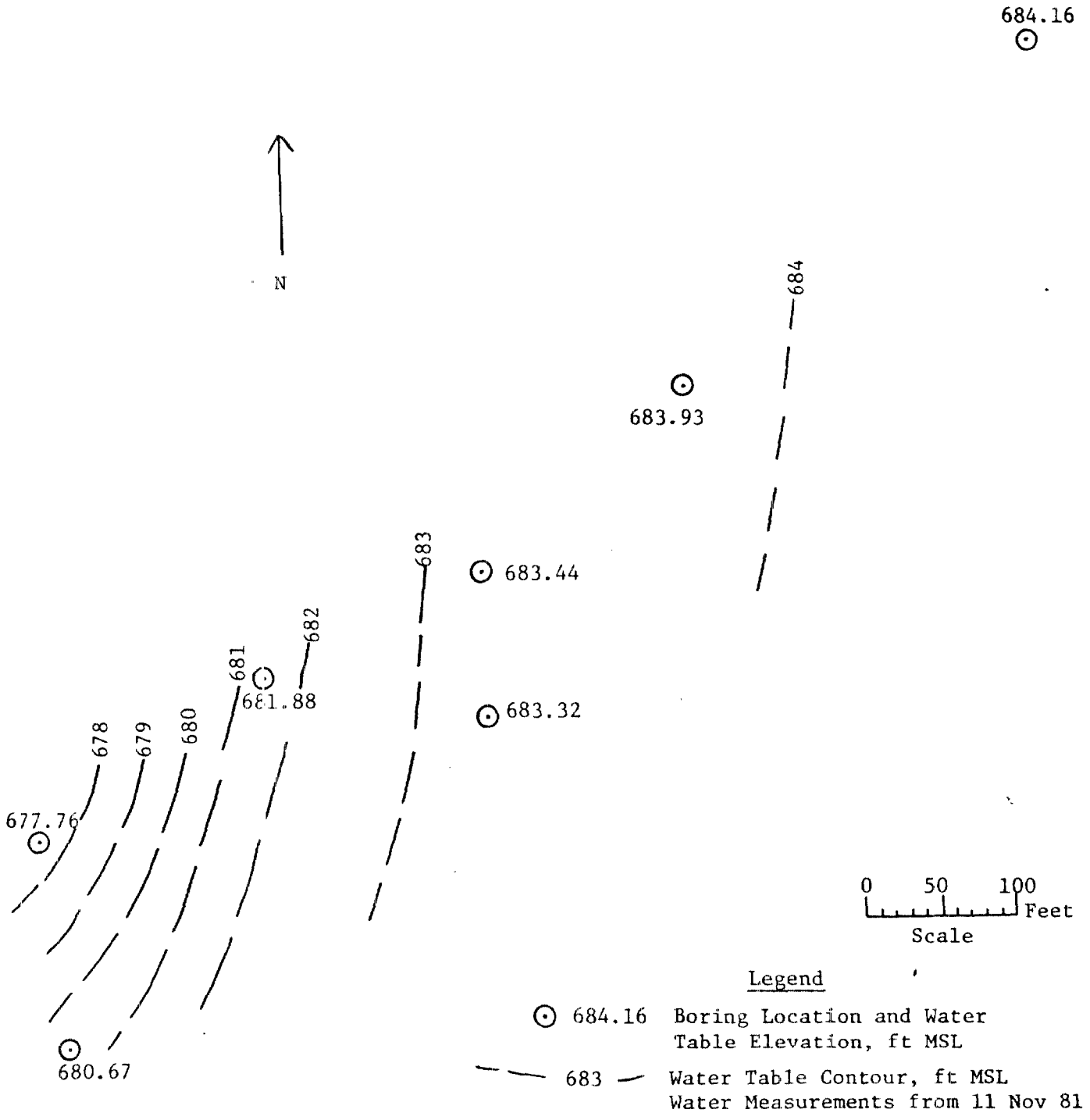


Figure 19. Water Table Contour Map of Dye Burial Grounds.

Physical and chemical test

Laboratory classification of soil samples yielded a clay (CL) soil type for the entire disposal site. This soil ranges from shades of brown to tan. Permeability tests on samples 1, 2, and 2 from borings 2, 6, and 8, respectively, yielded a permeability value ranging from 3.86×10^{-5} to 5.98×10^{-8} cm/sec. Appendix E presents the physical and chemical test results.

Ammunition Burning Grounds

Location

The Ammunition Burning Grounds are located in the N½ NW¼ NW¼, Sec. 28, T5N, R3W (Figure 4). Eight monitoring wells were installed within the Ammunition Burning Grounds Valley (Figure 20) and monitoring well WES-3-7-81 was installed approximately ½ mile southeast of Building 2908 (Ammunition Burning Grounds Field Office) along Jeep Trail 25 (Figure 21). Monitoring well WES-3-7-81 is located in an area reported to have been used for disposal operations and lies adjacent to a small stream draining into the Little Sulphur Creek further south.

Geology

Overburden at the Ammunition Burning Grounds ranges in thickness from 3 to around 11 ft. The underlying rock consists of sandstone, limestone, and shale from the Hardinsburg, Golconda Limestone, Big Clifty, and Beech Creek Limestone Formations of the Stephensport Group; and shale and sand lenses from the Elwren Formation of the West Baden Group (Table 1). Boring WES-3-3-81 was drilled to a depth of 100.6 ft and underlying the overburden encountered approximately 30 ft of weathered sandstone (Hardinsburg Formation). This sandstone is brown to grey and composed of fine-grained quartz sand containing very small iron nodules and lenses of clay. No core was recovered from a depth of 27 to 35 ft. Material from this interval was either a loose sand or a very weathered sandstone. At a depth of 35 ft, the core changes to a hard, grey, dense, fine-grained, fossiliferous limestone (Golconda Limestone Formation) which grades into a green to dark grey, soft shale (Big Clifty Formation) at a depth of 46 ft. This shale unit at a depth of 60 ft changes to a grey, hard, dense limestone (Beech Creek Limestone Formation) which is thinly bedded

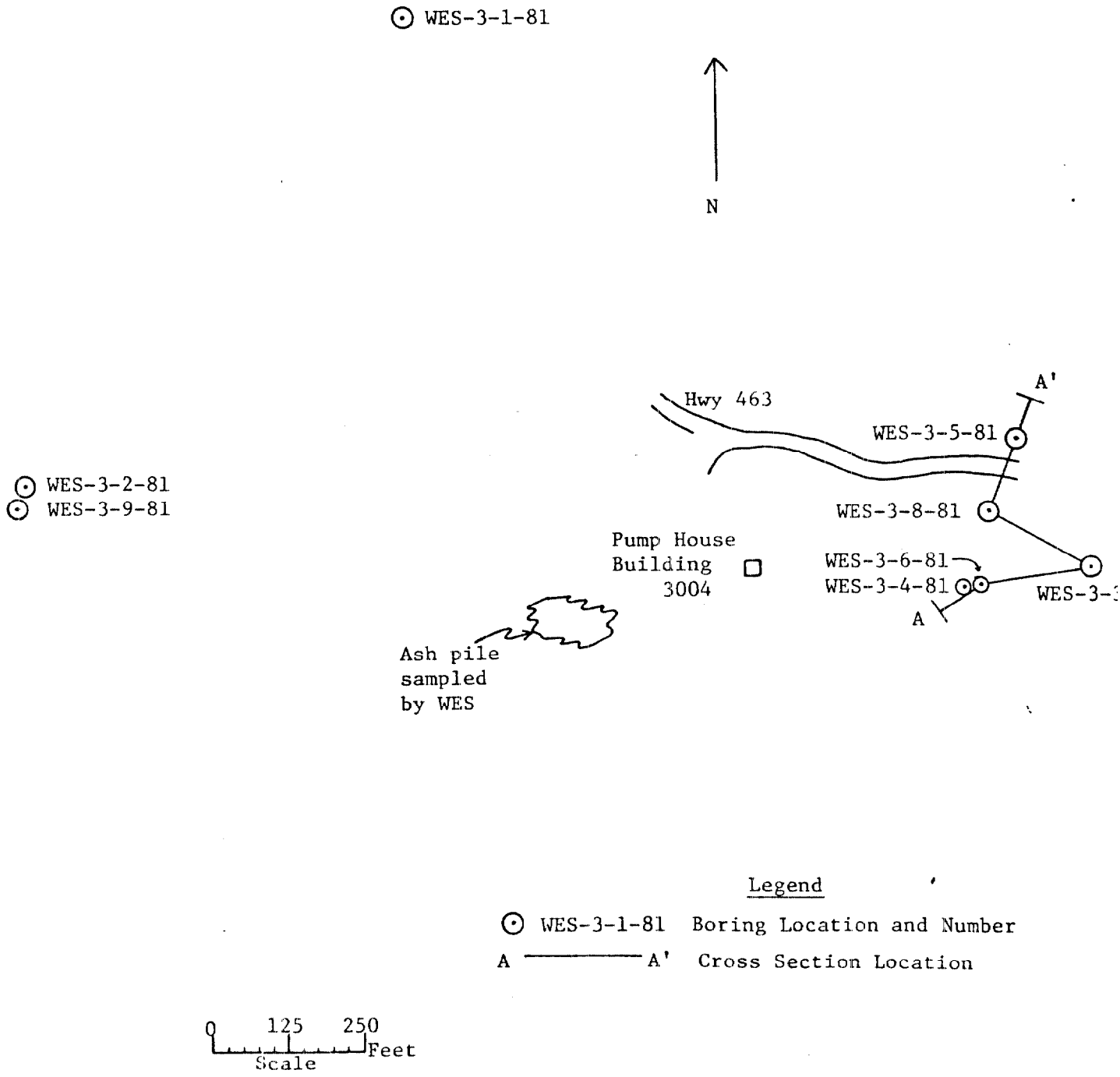


Figure 20. Well Locations and Cross Section Location of Ammunition Burning Grounds

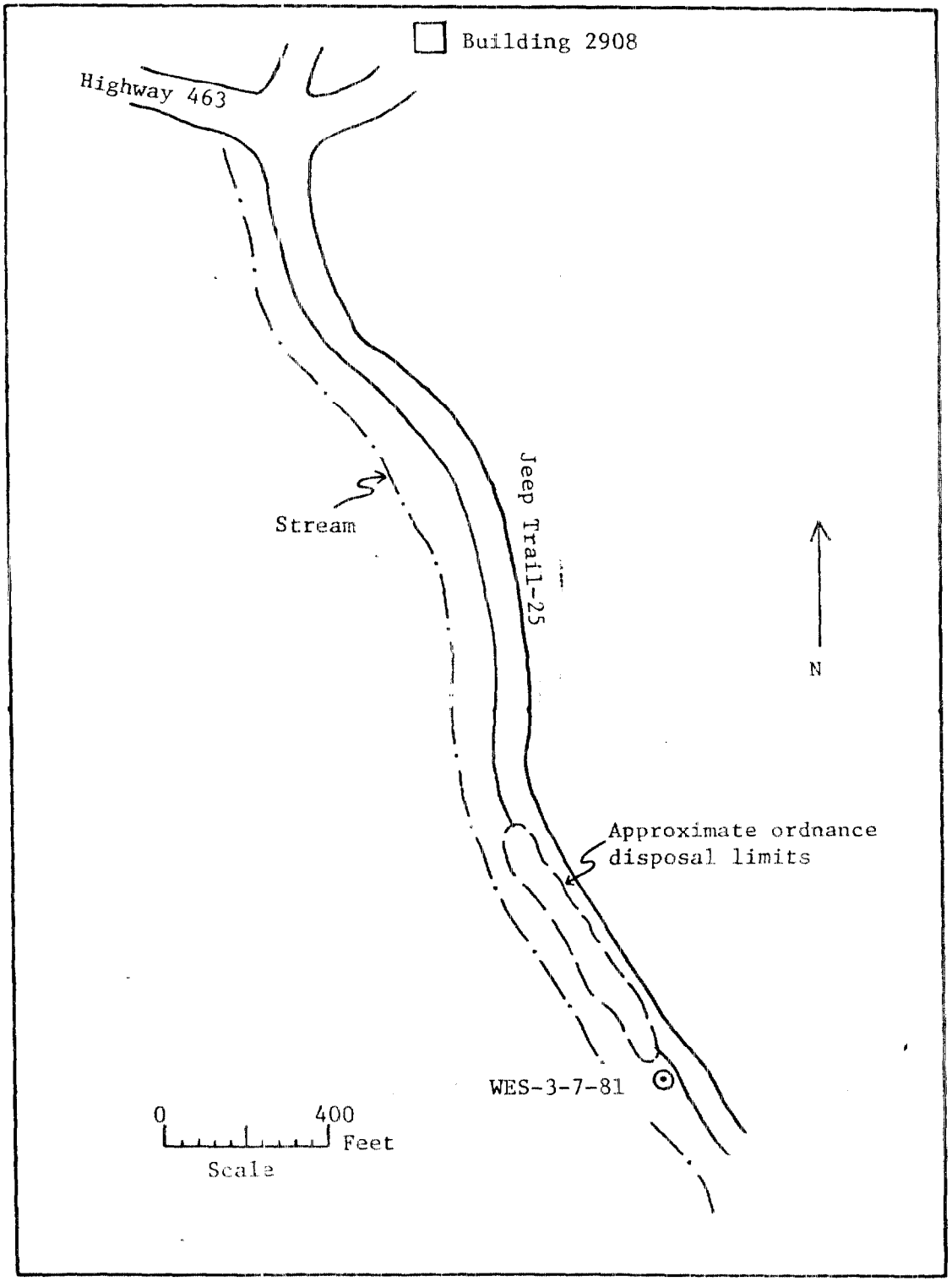


Figure 21. Ordnance Disposal Well Location Map for Boring WES-3-7-81

with soft, grey to green shale. At a depth of 71 ft, the core changes to a soft, uniform, dark grey to green shale which is interbedded with fine to medium-grained sand lenses beginning at a depth of 89 ft. Cross section A-A' (Figure 22) shows boring and groundwater data from four borings. The boring logs are presented in Appendixes A and B.

Groundwater

Groundwater at the Ammunition Burning Grounds was encountered in fractures near the contact of the Hardinsburg and Golconda Limestone Formations in all borings except WES-3-2-81 and WES-3-3-81. Boring WES-3-2-81 encountered water near the overburden-rock contact. Boring WES-3-9-81, located next to WES-3-2-81, was drilled through this perched water table and into the next saturated zone. Groundwater elevations between the up gradient and down gradient monitoring wells ranges from 559 to 546 ft MSL, a difference of 13 ft. A groundwater contour map constructed from water measurements of 29 November 1981, shows flow to be in a southeasterly direction (see Figure 23). Monitoring well WES-3-2-81 and WES-3-3-81 were not used in map construction because they were either above or below the primary saturated zone. Monitoring well WES-3-4-81 experienced problems during installation and was omitted from the groundwater contour map (see Appendix A and Appendix D for details). Groundwater data are presented in Appendix D.

Physical and chemical test

Laboratory classification of soil samples yielded the following soil types: clay sand-gravel (GC), clayey sand (SC) and clay (CL). These soils are brown to tan. Permeability tests were conducted on a clayey sand-gravel (sample 1, boring 5) and a clayey sand (sample 1, boring 4) and yielded permeability values ranging from 5.04×10^{-5} to 4.69×10^{-6} cm/sec for these respective soil types. Appendix E presents the physical and chemical tests results.

McComish Gorge

Location

McComish Gorge is located a short distance from the Crane Gate at the northwest corner of the installation in NE¼ NE¼ NE¼, Sec. 7, T5N, R4W (Figure 4). Six monitoring wells were located along the perimeter of the disposal site and are shown in Figure 24.

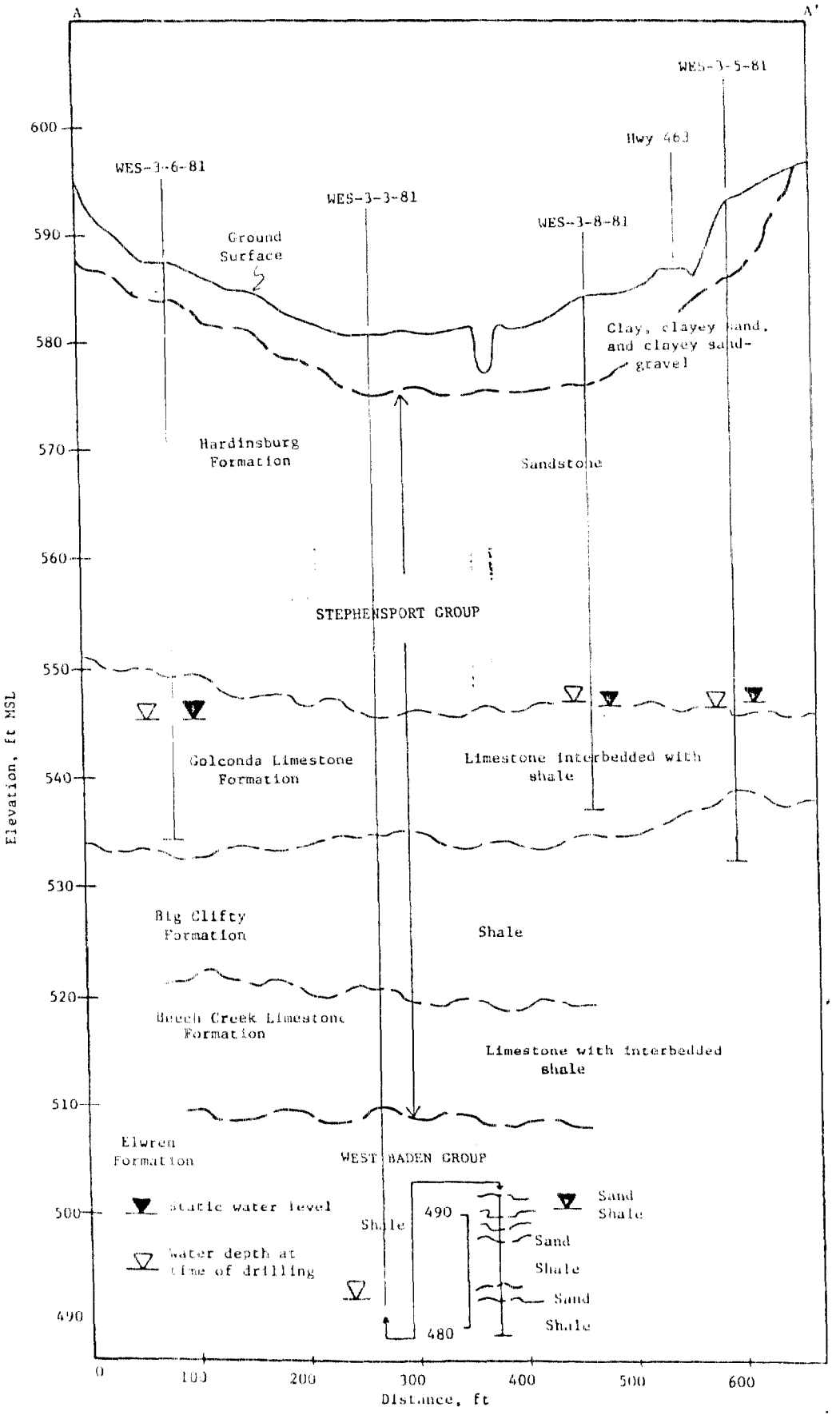
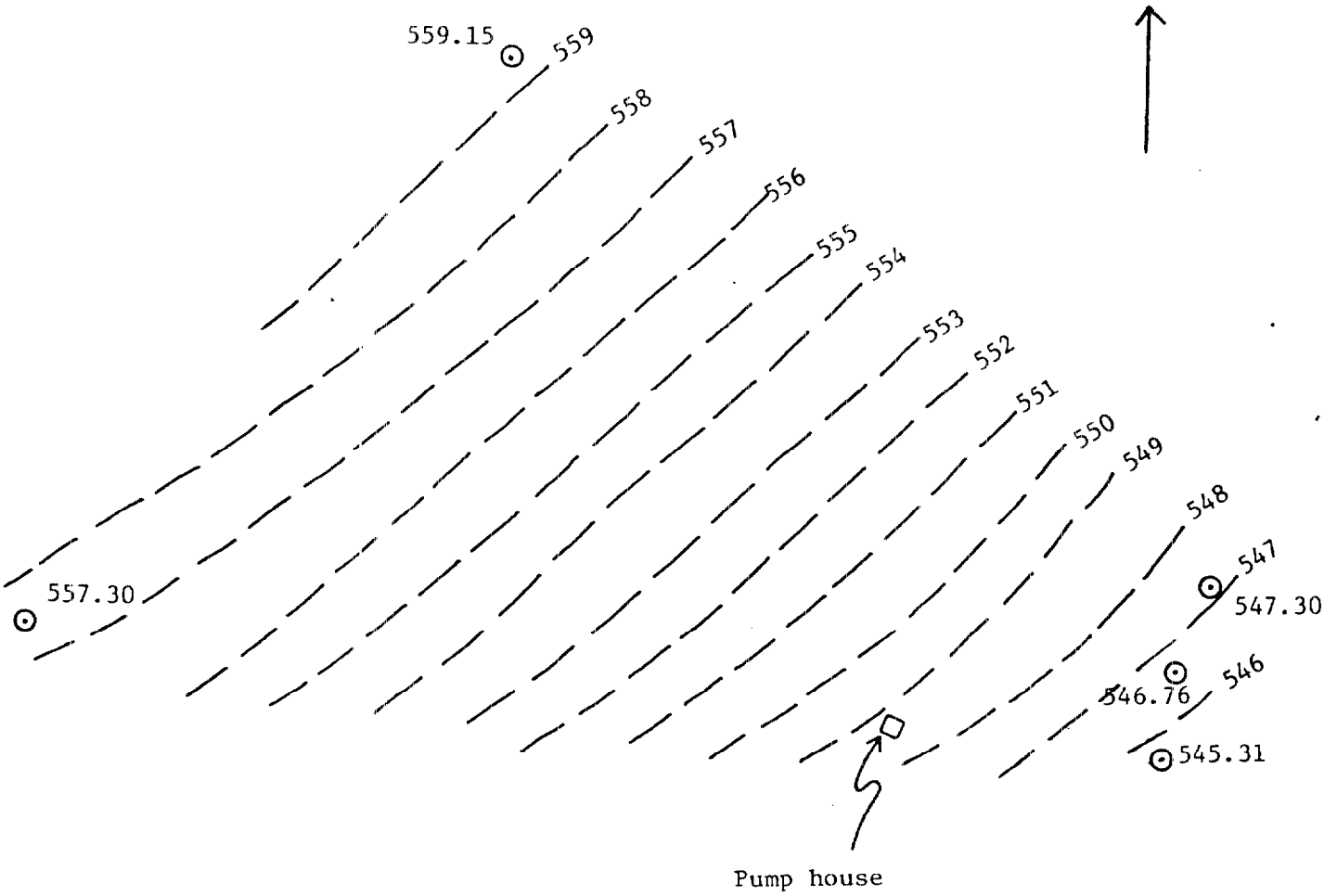


Figure 22. Geological Cross Section A-A' of Ammunition Burning Grounds



0 125 250 Feet
Scale

Legend

559.15 Boring Location and Water Table Elevation, ft MSL

551 Water Table Contour, ft MSL
Water Measurements from 29 Nov 81

Figure 23. Water Table Contour Map of Ammunition Burning Grounds

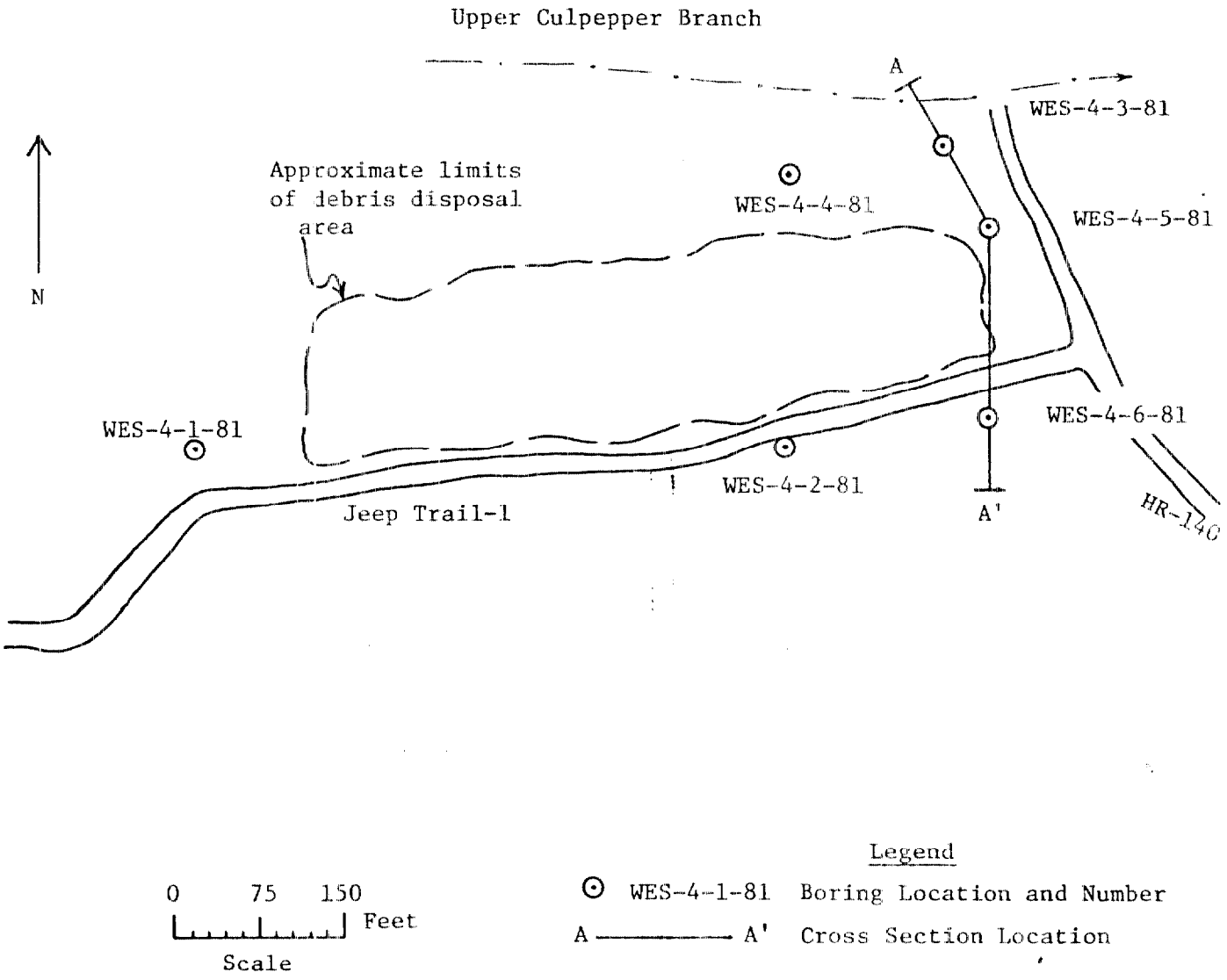


Figure 24. Well Locations and Cross Section Location of McComish Gorge

Geology

McComish Gorge is composed of unconsolidated lacustrine deposits of clay, silt, and sand which are included in the Atherton Formation of the Illinoian and Wisconsinan Stage of the Pleistocene Series (Grey, Wayne, Wier, 1970). Cross section A-A' (Figure 25) shows boring and groundwater data from three borings. The boring logs are presented in Appendixes A and B.

Groundwater

Groundwater at McComish Gorge was encountered in the overburden at relatively shallow depths. Between the up gradient and down gradient monitoring wells, groundwater elevations range from 573 to 563 ft MSL, a difference of 10 ft. A groundwater contour map constructed from water measurements of 29 November 1981, shows flow to be towards the northeast and east (see Figure 26). Groundwater data are presented in Appendix D.

Physical and chemical test

Laboratory classification of 39 soil samples from McComish Gorge resulted in the following distribution: 23.1 percent clay (CL), 12.8 percent silt (ML), 20.5 percent clayey sand (SC), 28.2 percent silty sand (SM), 10.3 percent silty sand-sand (SP-SM), 2.6 percent sand-clayey sand (SP-SC), and 2.6 percent sand (SP). These soils are brown to reddish brown. Soil permeability for a silty sand (sample 7, boring 4) was calculated to be 3.99×10^{-5} cm/sec. Appendix E presents the physical and chemical tests results.

Old Burning Pit

Location

The Old Burning Pit is located just north of the NWSC truck weigh station on Highway 5 and lies along the section line between Sec. 5 and 8, T5N, R4W (Figure 4). Eight monitoring wells were installed along the perimeter of the Old Burning Pit and the disposal area to the north as shown in Figure 27.

Geology

The Old Burning Pit and adjacent dumping grounds are also included in the tongue of lacustrine deposits which comprise McComish Gorge (Grey, Wayne, Wier, 1970). These Pleistocene deposits consist of clay, silt, and sand. Boring and groundwater data are shown in cross section A-A' (Figure 28) from six borings. Boring information is presented in Appendixes A and B.

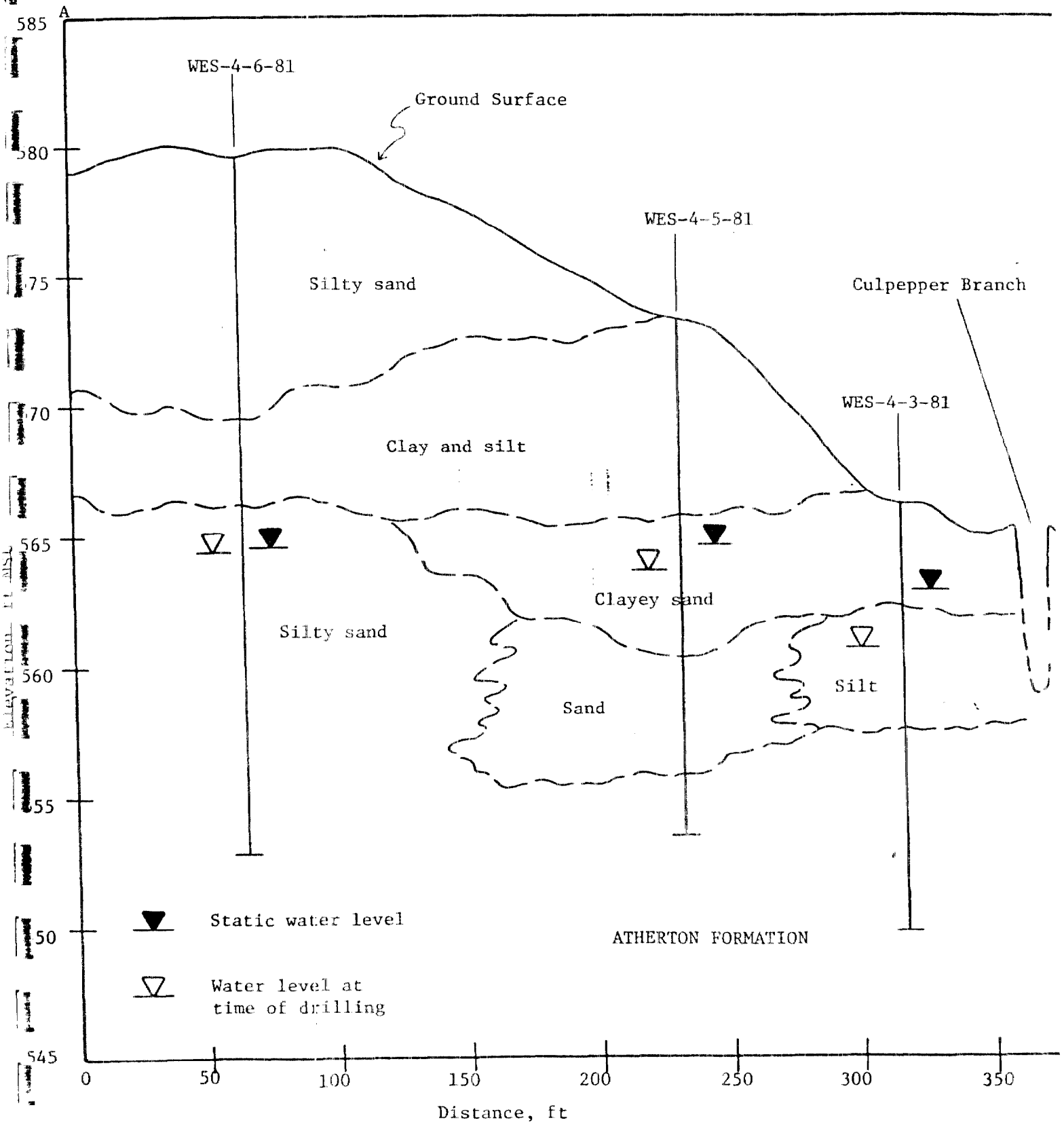


Figure 25. Geological Cross Section A-A' of McComish Gorge

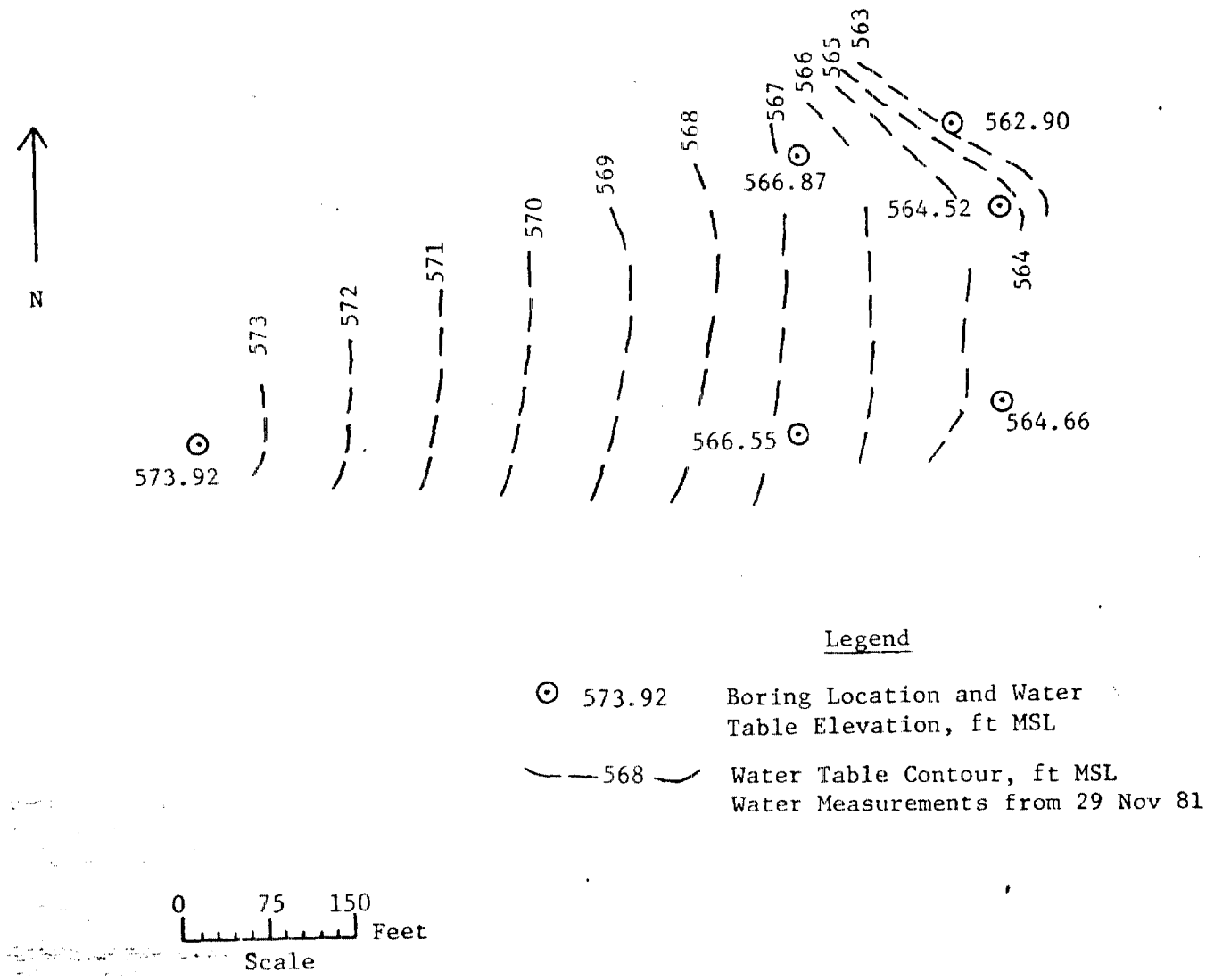


Figure 26. Water Table Contour Map of McComish Gorge

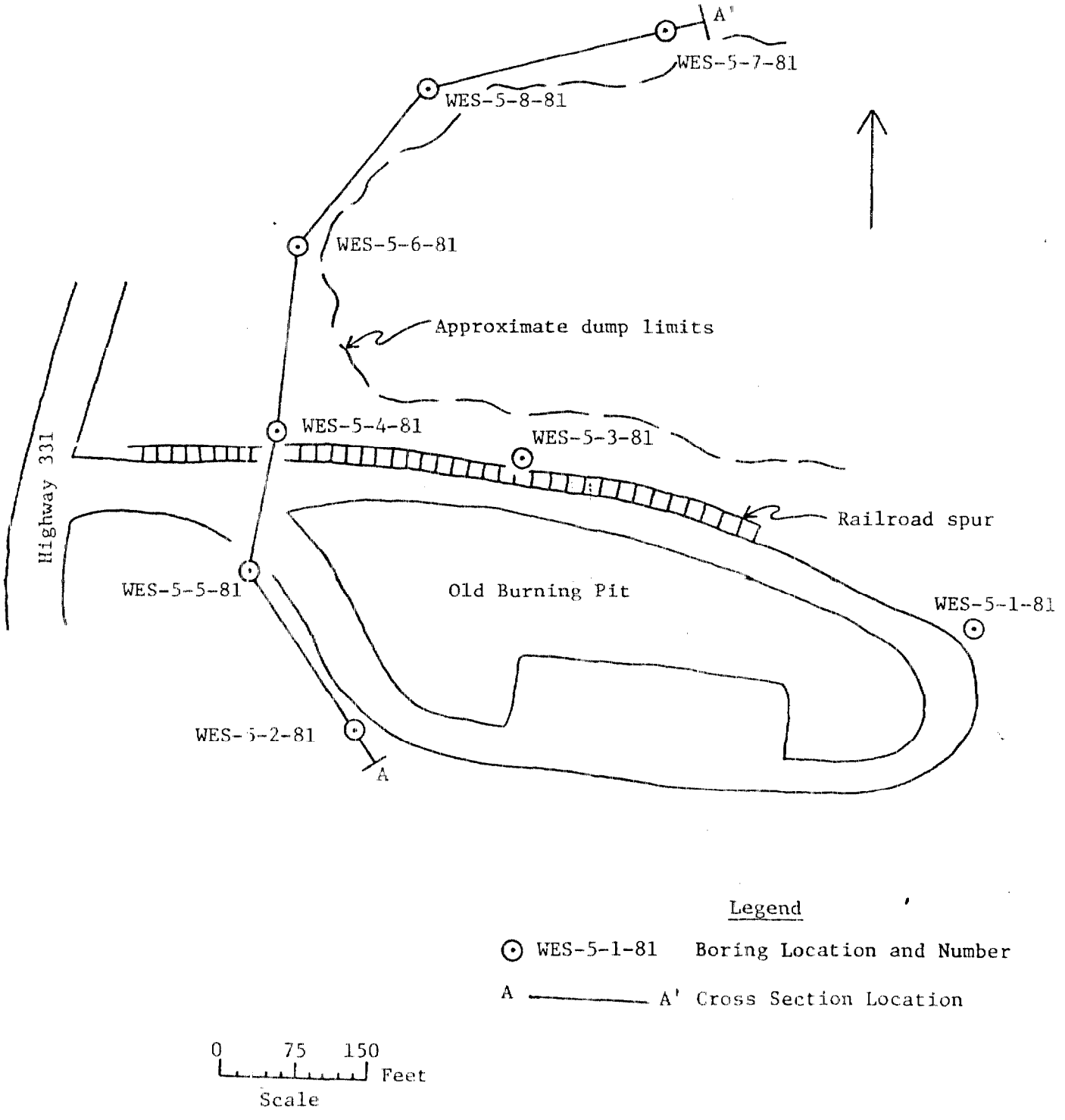


Figure 27. Well Locations and Cross Section Location of Old Burning Pit

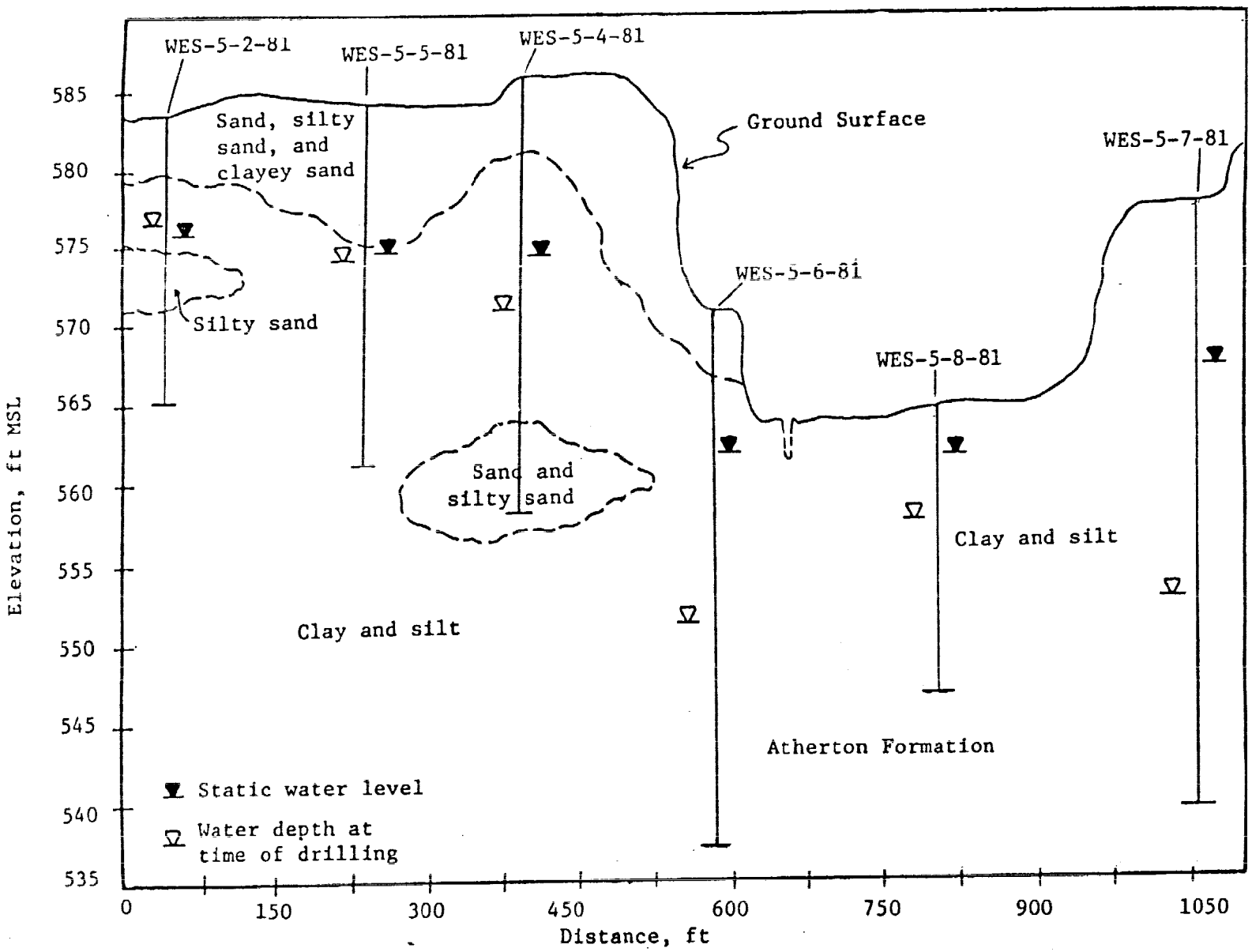


Figure 28. Geological Cross Section A-A' of Old Burning Pit

Groundwater

Groundwater at the Old Burning Pit and adjacent dumping grounds was encountered at shallow depths. Between the up gradient and down gradient monitoring wells, groundwater elevations range from 591 to 561 ft MSL, a difference of 30 ft. A groundwater contour map constructed from water measurements of 29 November 1981, shows flow to be in a northwesterly direction (see Figure 29). Groundwater data are presented in Appendix D.

Physical and chemical test

Laboratory classification of 40 soil samples resulted in the following soil distribution: 35 percent clay (CL), 22.5 percent clay-silt (CL-ML), 12.5 percent silt (ML), 12.5 percent clayey sand (SC), 5 percent silty sand (SM), 7.5 percent silty sand-sand (SP-SM) and 2.5 percent clayey sand-sand (SP-SC). These soils are brown to reddish brown. Soil permeability was calculated from samples 3, 6, and 3 of borings 3, 7, and 8, respectively, and ranged from 2.35×10^{-5} to 8.05×10^{-6} cm/sec. Appendix E presents the physical and chemical tests results.

Demolition Area

Location

The Demolition Area lies on two steep-sided ridgetops in SW¼, Sec. 26; SE¼, Sec. 27; NE¼, Sec. 34; and NW¼, Sec. 35; T5N, R4W (Figure 4). A total of 15 monitoring wells were installed at the Demolition Area with 7 monitoring wells along the south ridge, 5 monitoring wells along the east ridge, and 3 monitoring wells at the intersection of the two ridges as shown in Figure 30. The south ridge is used for disposal of military ordnance and contaminated insulation from production facilities was reported to have been buried along the east ridge.

Geology

Overburden at the Demolition Area ranges in thickness from 2 to 13 ft. The underlying rock on both the south and east ridges consists of interfingered and interbedded sandstone, shale, and coal seams from the Mansfield Formation of the Raccoon Creek Group (Table 1). Core boring WES-6-2-81 along the south ridge was drilled to a depth of 39 ft and, underlying the overburden, encountered 3 ft of a weathered, brown, friable, fine-grained sandstone of which

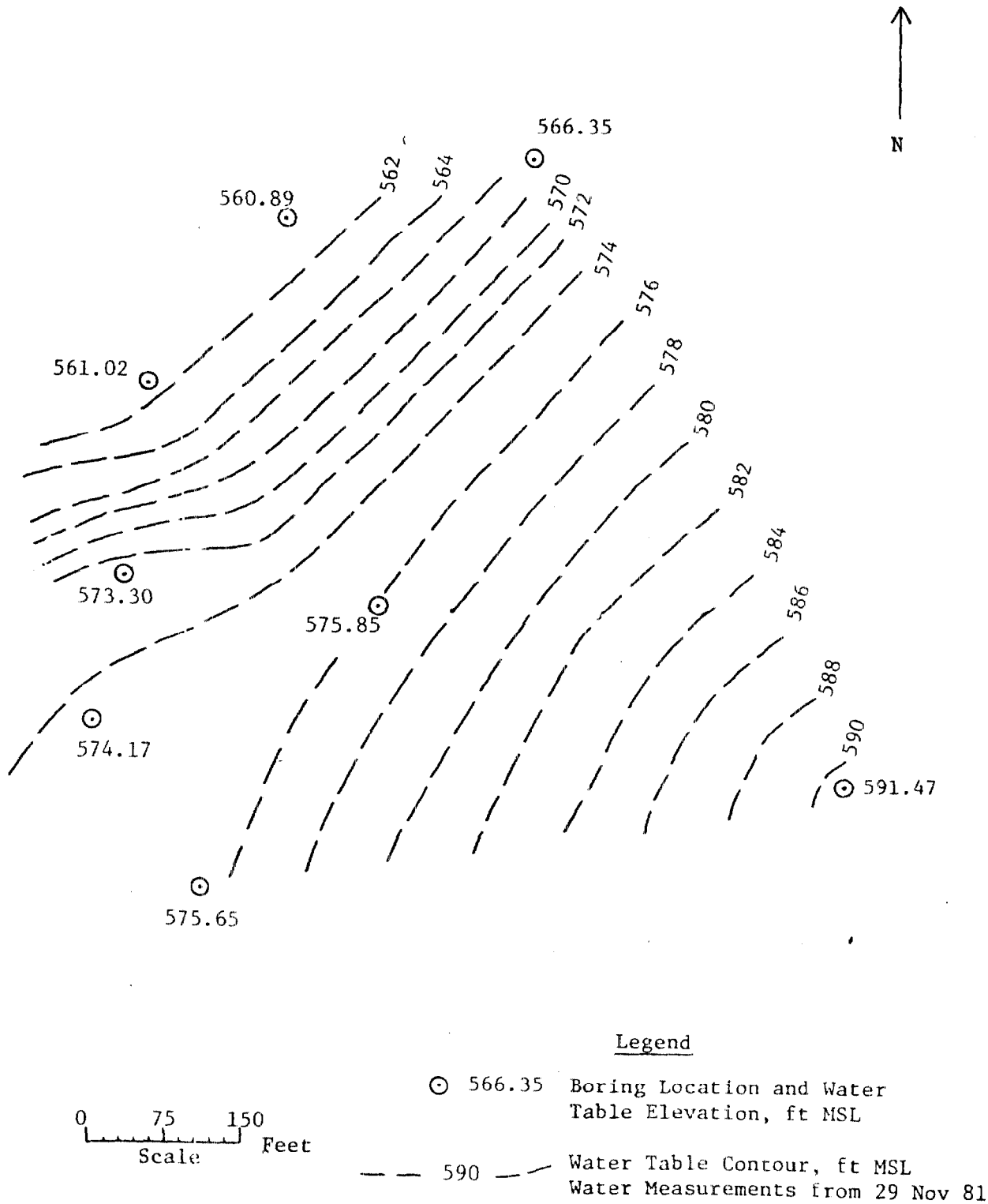


Figure 29. Water Table Contour Map of Old Burning Pit

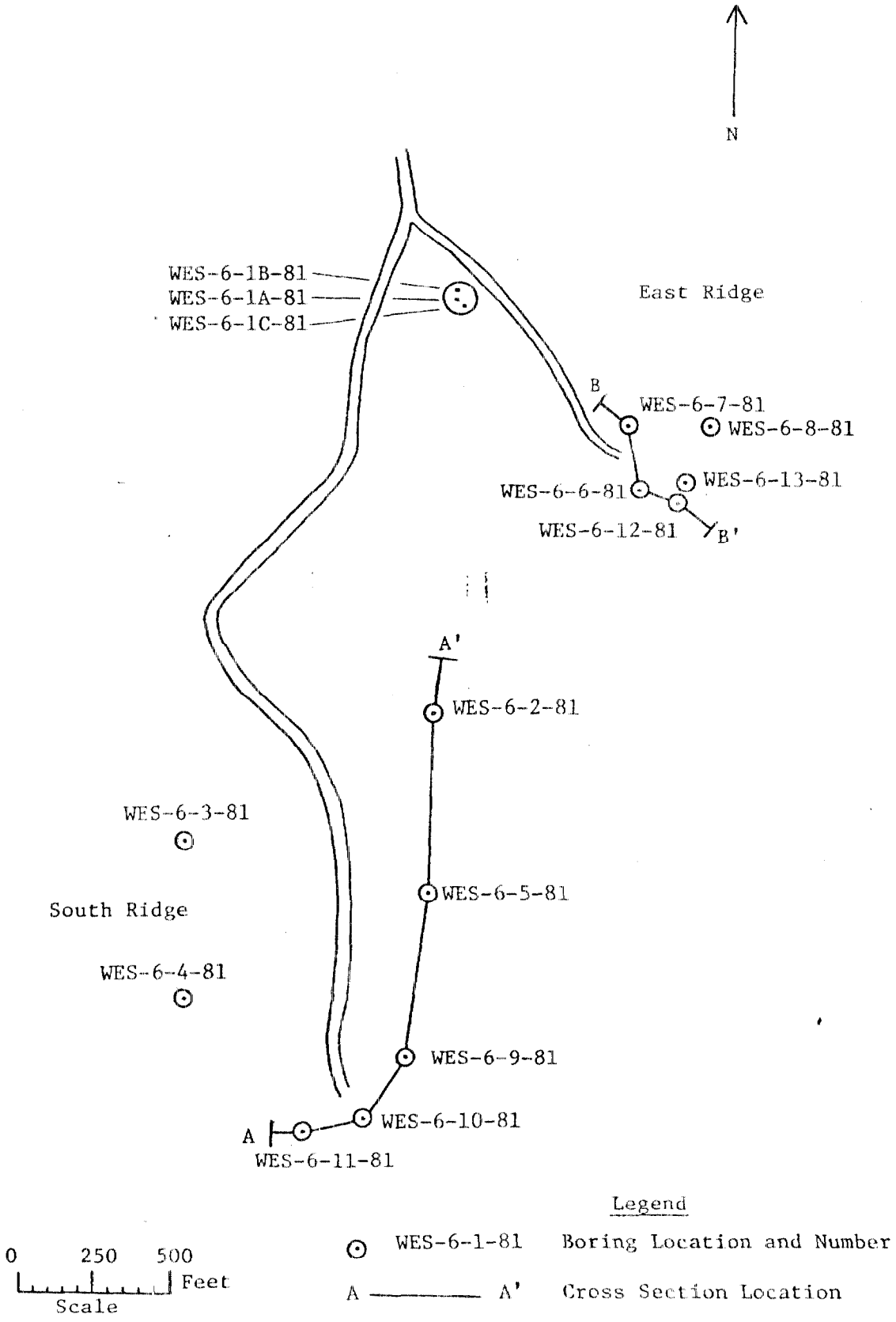


Figure 30. Well Locations and Cross Section Locations of Demolition Area

only partial sample recovery was made. This sandstone unit was underlain by about 2 ft of soft, grey to dark grey, partially organic shale which overlies 2.5 ft of brown, fine-grained, weathered, moderately friable sandstone containing approximately 20 percent thinly bedded shale seams. At a depth of 14 ft, the core grades into a 1-ft-thick bed of dark grey, soft, weathered, organic shale which is underlain by 18 ft of brown to grey, fine-grained, moderately hard sandstone containing 10 to 20 percent soft, black shale seams. At a depth of 34 ft, shale and sandstone are thinly interbedded in equal proportions. Core boring WES-6-7-81 along the east ridge was drilled to a depth of 29 ft and encountered a similar sequence of sedimentary materials. Beneath the overburden, 2 ft of brown to orange brown, weathered, friable, fine-grained quartz sandstone was encountered. This sandstone unit at a depth of 12 ft was underlain by 5 ft of soft, uniform, black shale which is underlain by approximately 1.5 ft of a black, soft, jointed coal. This coal seam was underlain by 10 ft of light to dark grey, very fine-grained shaley sandstone containing approximately 20 to 40 percent interbedded shale seams and lenses. Boring and groundwater data for the south ridge are shown in cross section A-A' (Figure 31) and for the east ridge, boring and groundwater data are shown in cross section B-B' (Figure 32). The boring logs are presented in Appendixes A and B.

Groundwater

Groundwater at the Demolition Area is flowing through fractures in a variety of rock types (see Figures 31 and 32). Groundwater elevations along the south ridge range from 648 to 595 ft MSL, a difference of 53 ft, while along the east ridge, groundwater elevations range from 645 to 630 ft MSL, a difference of 15 ft. Groundwater contour maps constructed from water measurements of 27 November 1981, shows flow on the south ridge to be in opposite directions off the ridge (Figure 33), while on the east ridge, flow is towards the southeast (Figure 34). Monitoring wells WES-6-1A, 1B, and 1C-81 were not used in contouring because all three wells are dry. The groundwater dropped below the screens in monitoring wells WES-6-1A and 1C-81 after several weeks after installation. Monitoring well WES-6-1B-81 never produced water even though water was present at time of drilling. The above three wells represent a nearly continuous screened interval from a depth of 4 ft to a depth of 39 ft. Groundwater data are presented in Appendix D.

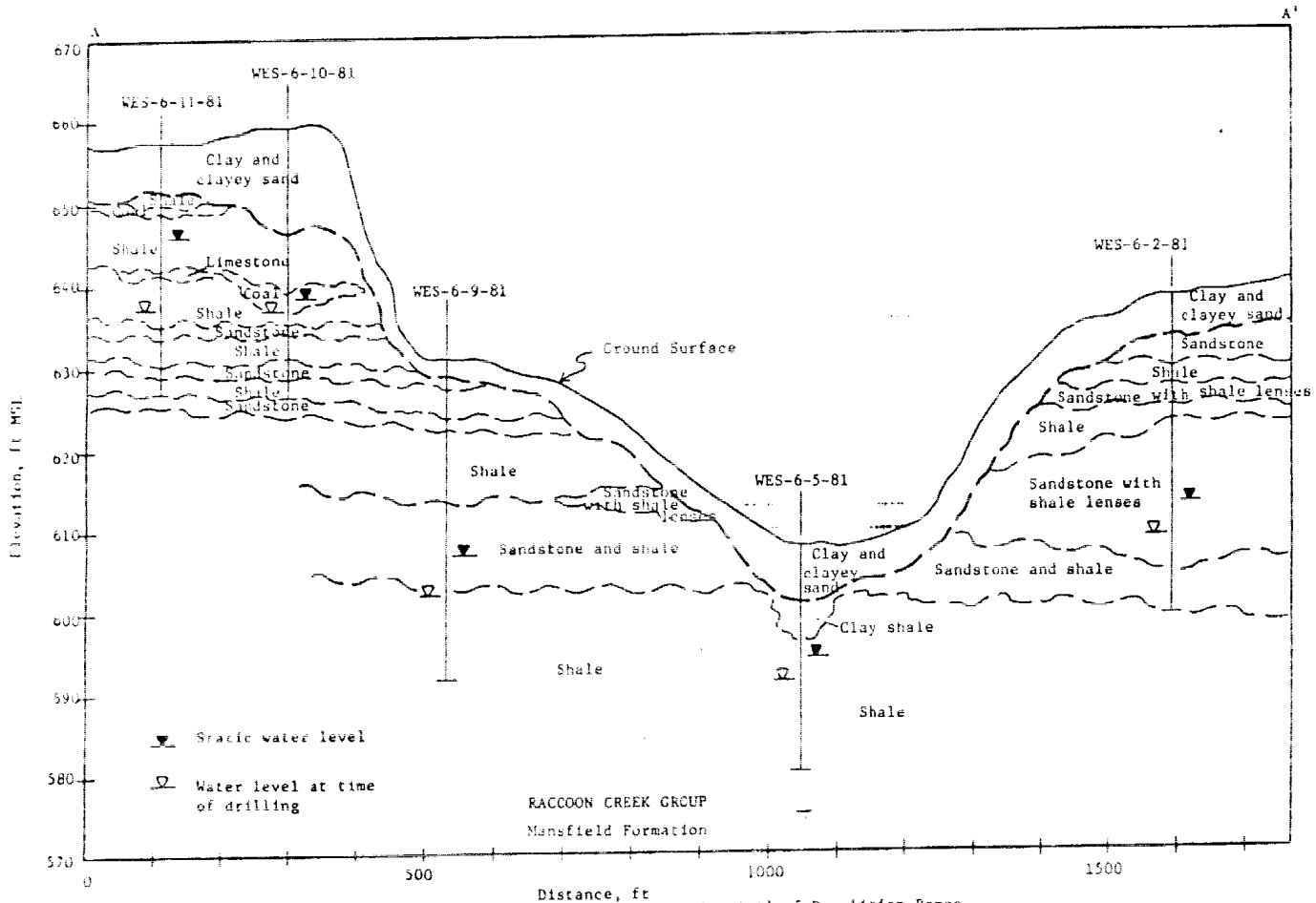


Figure 31. Geological Cross Section A-A' of Demolition Range.

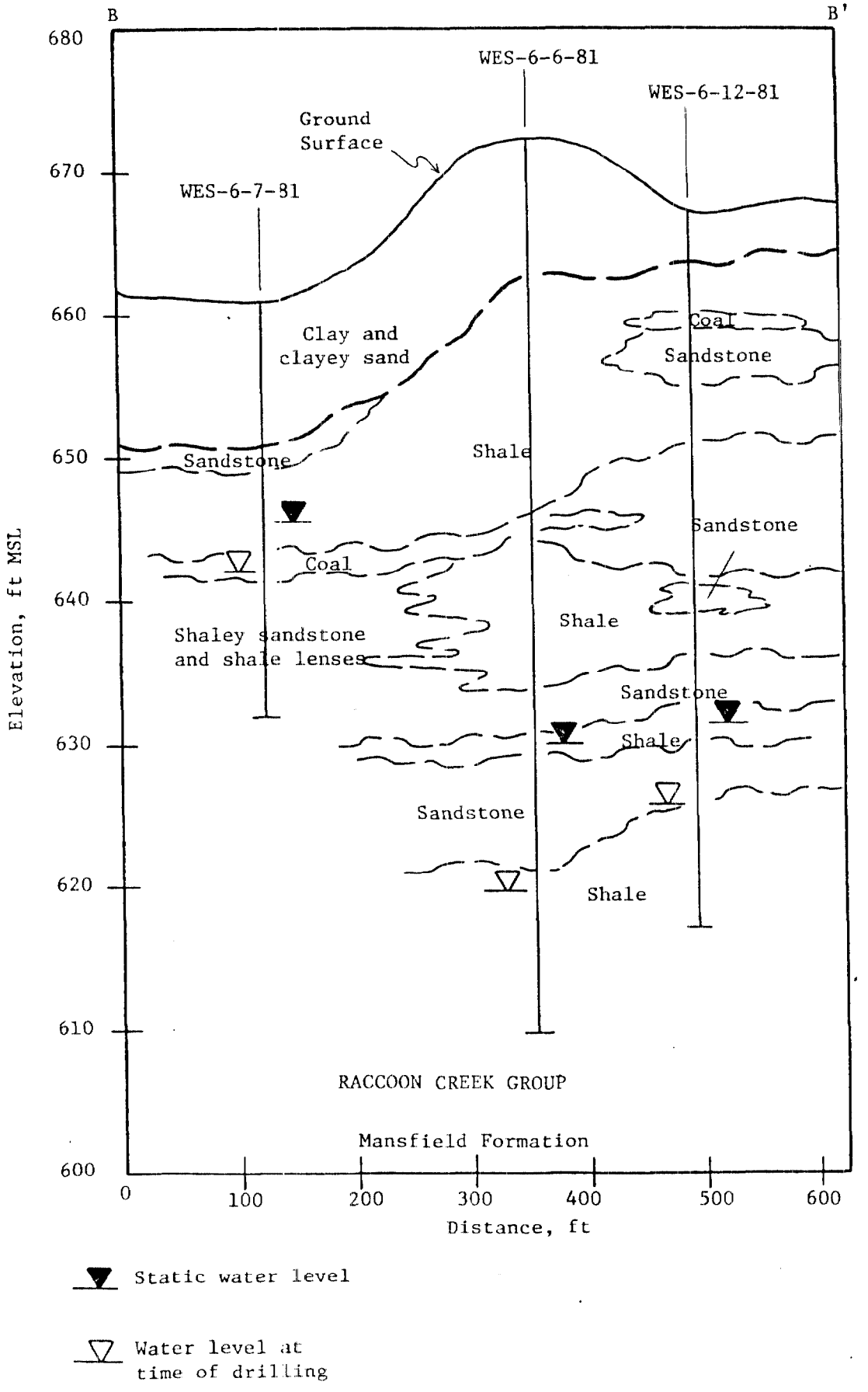


Figure 32. Geological Cross Section B-B' of Demolition Area

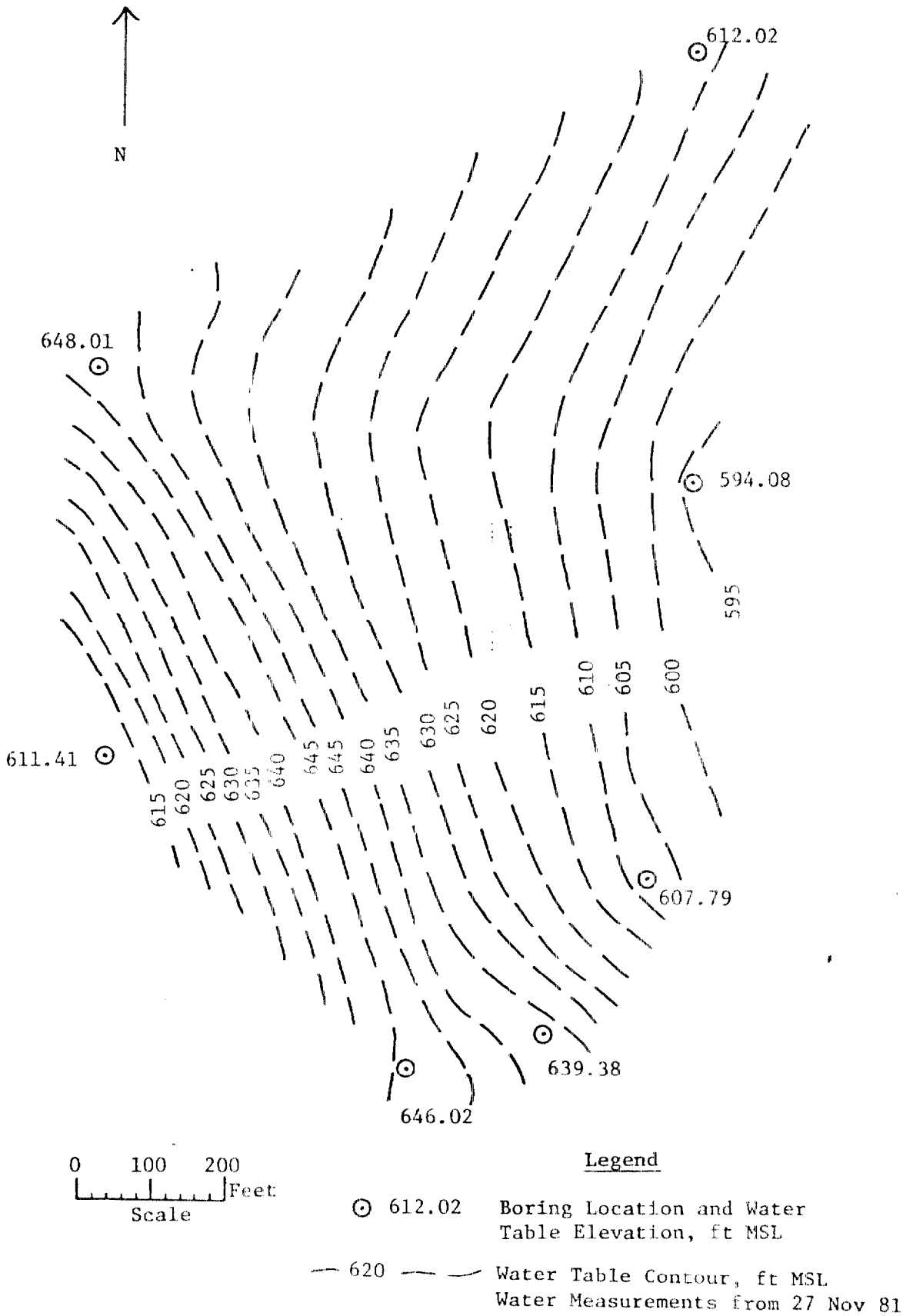


Figure 33. Water Table Contour Map of South Ridge of Demolition Area

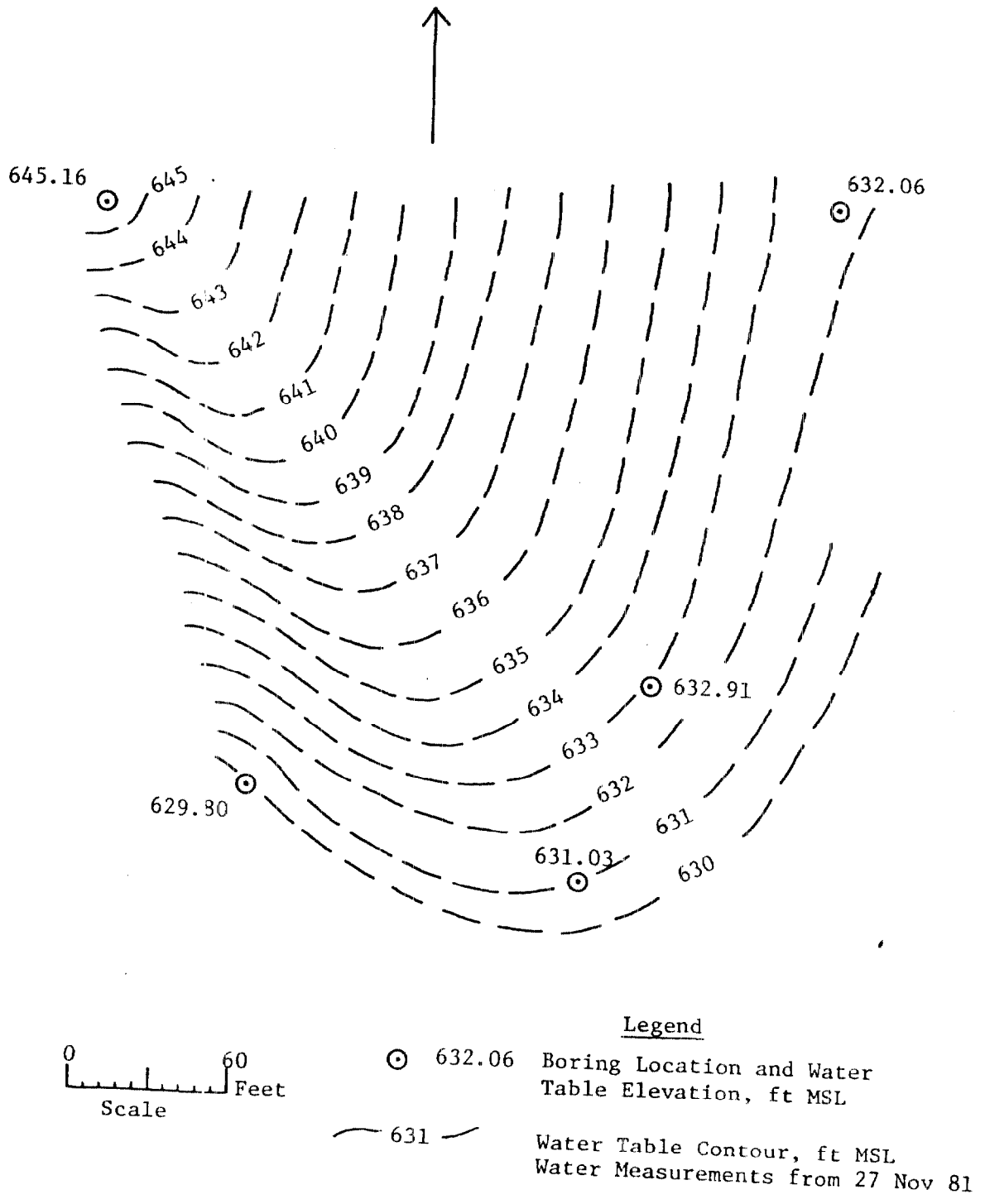


Figure 34. Water Table Contour Map of East Ridge of Demolition Area

Physical and chemical test

Laboratory classification of soil samples ranged from clay (CL and CH) to clayey sand (SC). These soils are light brown to greyish brown. Soil permeability ranges from 0.0 to 3.01 x 10^{-8} cm/sec for a clay (CL) soil (sample 2, boring 10, and sample 1, boring 6) and this soil composes 79 percent of the soil samples from this site. Appendix E presents the physical and the chemical tests results.

Old Rifle Range

Location

The Old Rifle Range is located within the confines of the Demolition Area in the N½, NW¼, Sec. 35, T5N, R4W (Figure 4). Seven monitoring wells were installed along either side of the gravel road as shown in Figure 35. Disposal operations involving military ordnance were reported to have been conducted several feet deep along either side of this north-south trending gravel road.

Geology

Overburden at the Old Rifle Range varies in thickness from less than 2 ft at the northern end to more than 20 ft at the southern end. The thick fine-grained deposits at the southern end are probably a former alluvial channel during Recent and Pleistocene times. The underlying rock in borings WES-6-15-81 and WES-6-17-81 consists of a fine-grained, uniform, well cemented, brown to reddish brown sandstone from the Hardinsburg Formation of the Stephensport Group (Table 1). Boring and groundwater data from 5 borings are shown in cross section A-A' (Figure 36). Boring logs are presented in Appendixes A and B.

Groundwater

Groundwater was encountered in fractures in the sandstone at the northern end and in the overburden at the southern end. Groundwater elevations between the up gradient and down gradient wells range from 504 to 498 ft MSL, a difference of 6 ft. A groundwater contour map constructed from water measurements of 29-30 November 1981, shows that flow is from the northwest and southwest with the direction of flow towards the east (see Figure 37). Monitoring well

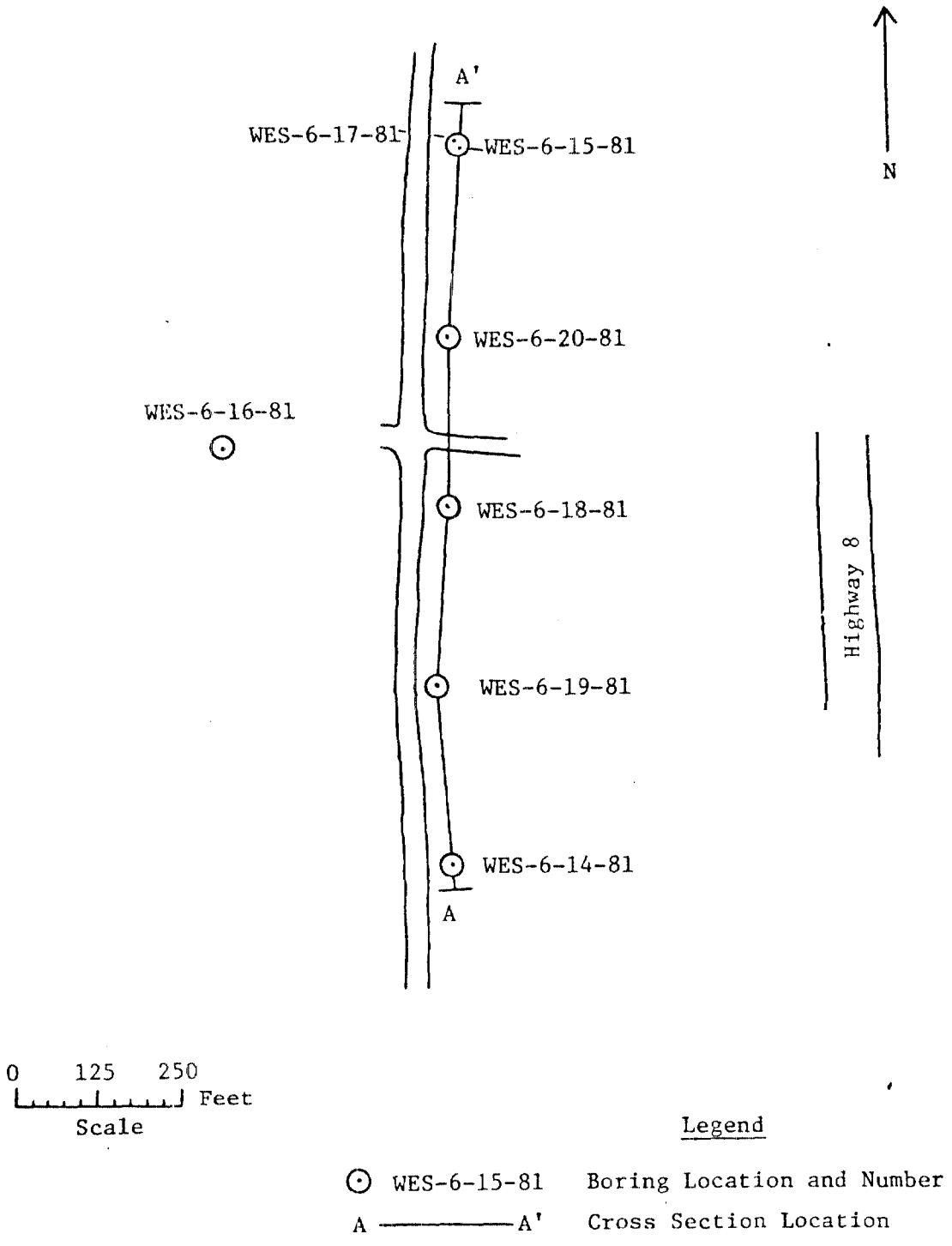


Figure 35. Well Locations and Cross Section Locations of Old Rifle Range

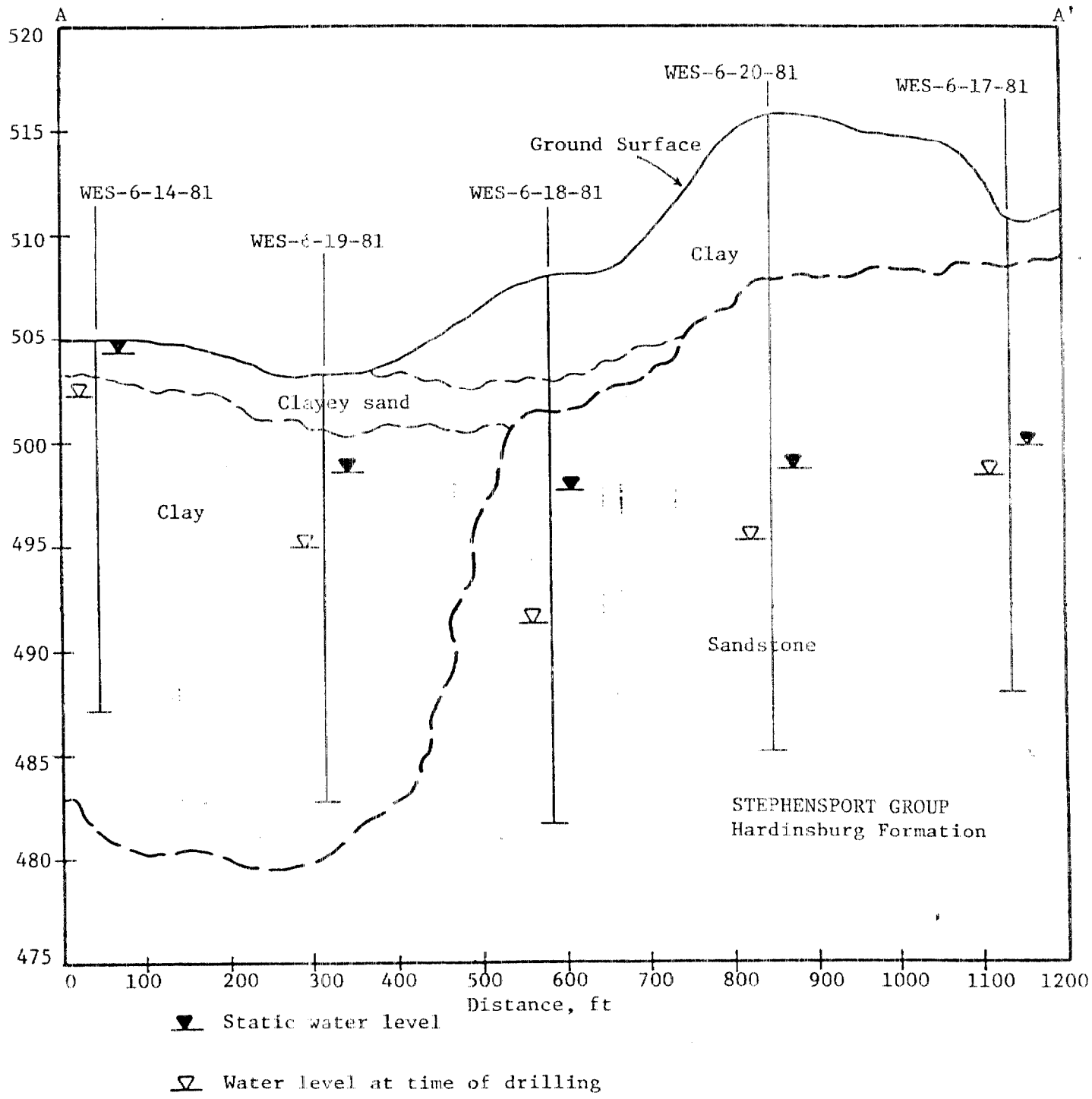


Figure 36. Geological Cross Section A-A' of Old Rifle Range.

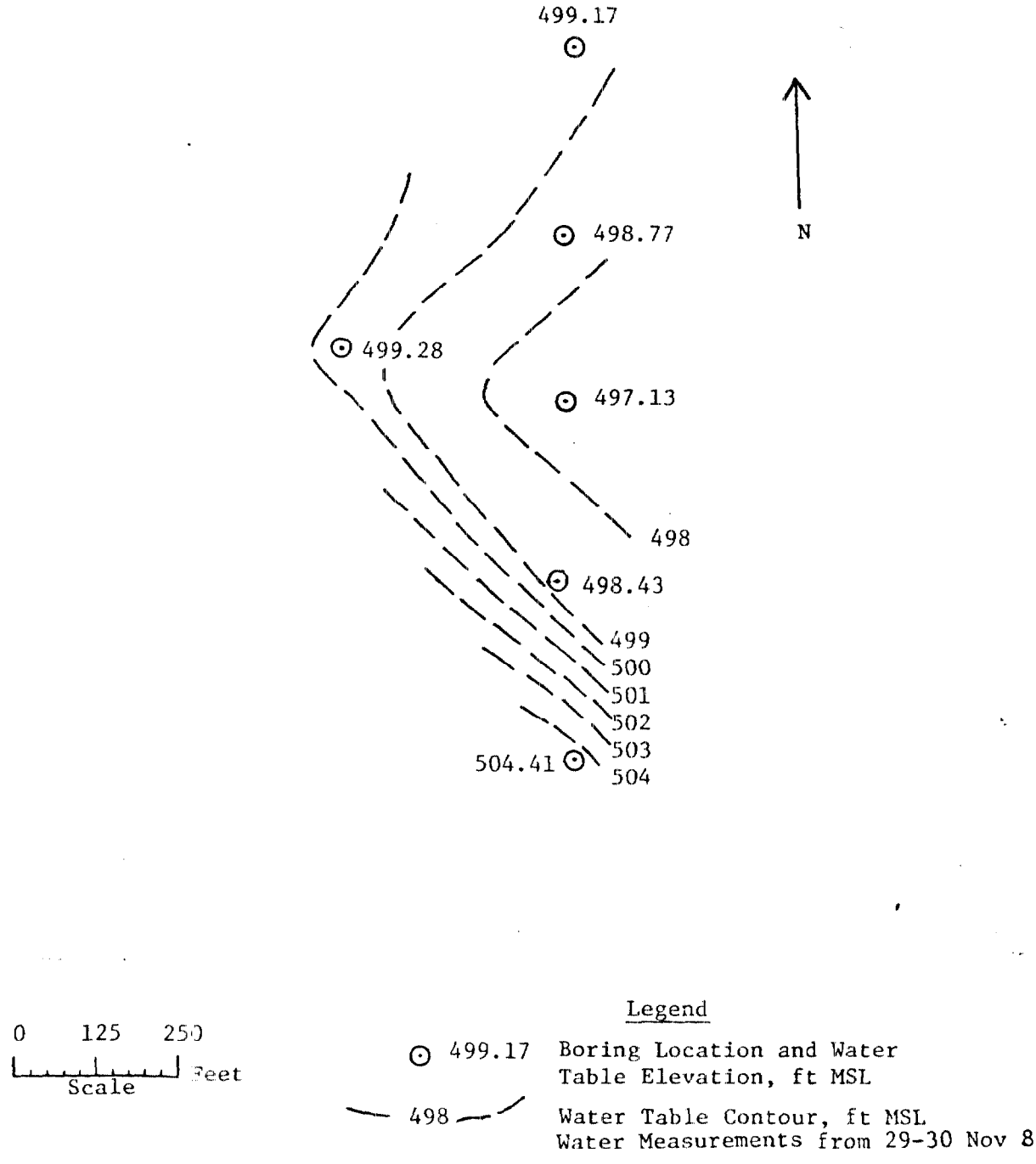


Figure 37. Water Table Contour Map of Old Rifle Range.

WES-6-15-81 was not used in contour construction since the water level fell below the screened portion shortly after installation. Groundwater data for this site are presented in Appendix D.

Physical and chemical test

Laboratory classification of soil samples ranged from clayey sand (SC) to clay (CL and CH). These soils are brown to tan. Soil permeability for a clay (CL) soil (sample 2, boring 14) was calculated to be 2.77×10^{-6} cm/sec and this soil composes 79 percent of the samples from this site. Appendix E presents the physical and chemical tests results.

Highway 58 Dump Site A

Location

The Highway 58 Dump Site A is located slightly north of the center of Sec. 26, T5N, R4W (Figure 4) and lies between Highway 45 and the NWSC Salvage Yard on Highway 58. Five monitoring wells were installed around the dump perimeter as shown in Figure 38.

Geology

Overburden at the Highway 58 Dump Site A ranges in thickness from less than 2 ft to 18.5 ft. Limestone, sandstone, and shale from the Mansfield Formation of the Raccoon Creek Group (Table 1) underlie the overburden. Boring WES-7-2-81 was drilled to a depth of 35 ft and beneath the overburden encountered 12 ft of a reddish brown, very stiff, dense, weathered gravelly clay shale. This clay shale at a depth of 15.5 ft grades into a soft, weathered, brown to dark grey, occasionally limonitic shale. From a depth of 20 ft, sandstone and shale are thinly interbedded in nearly equal proportions and at the end of the boring, the shale content declines to around 10 percent. The sandstone is light grey to dark grey, fine-grained, and moderately hard while the shale is dark grey to black and soft. Cross section A-A' (Figure 39) presents boring and groundwater data from 4 borings. Boring logs are presented in Appendixes A and B.

Groundwater

Groundwater at the Highway 58 Dump Site A was encountered in fractures in the sandstone. Groundwater elevations between the up gradient and the down gradient monitoring wells range from 606 to 570 ft MSL, a difference of 36 ft.

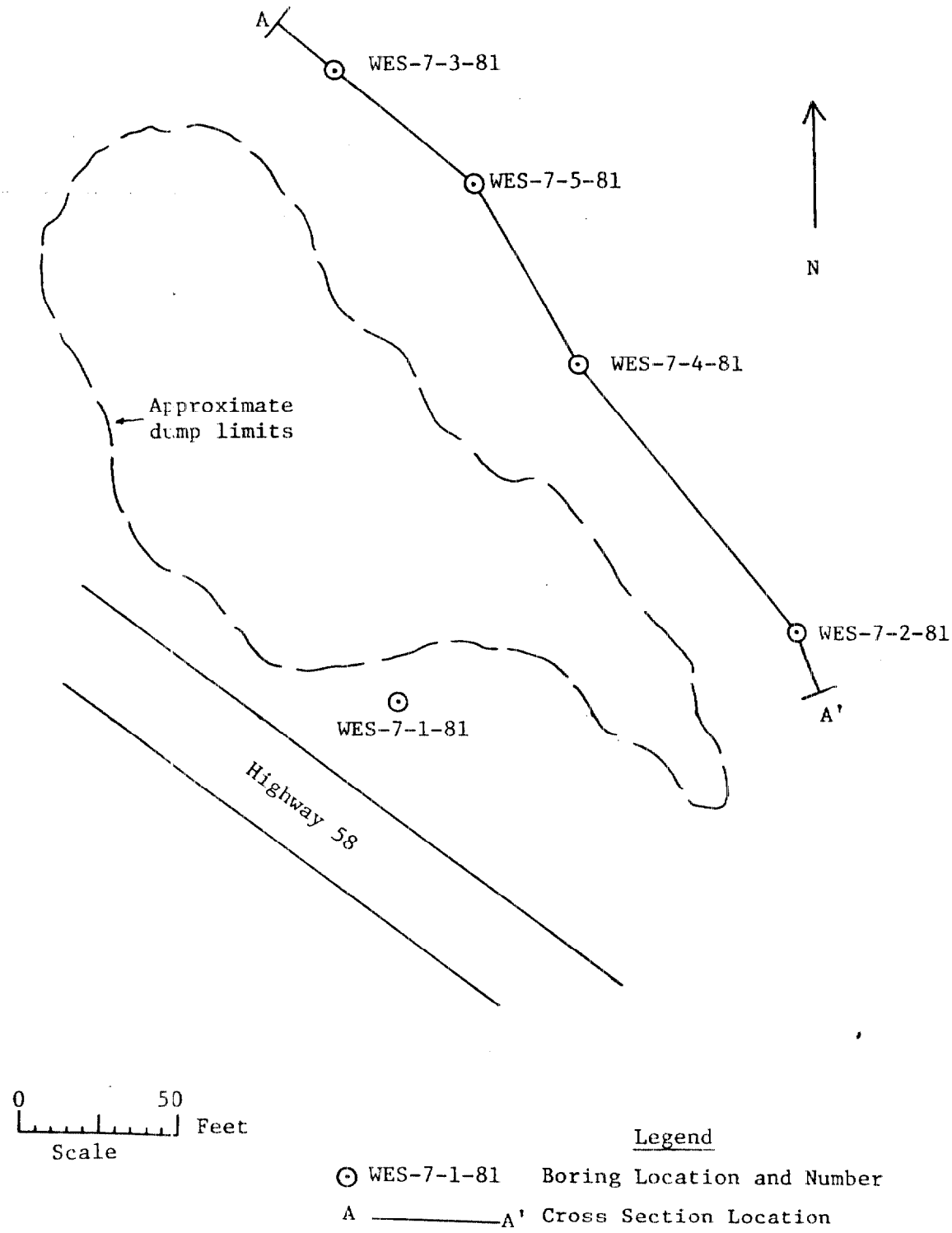


Figure 38. Well Locations and Cross Section Locations of Highway 58 Dump Site A

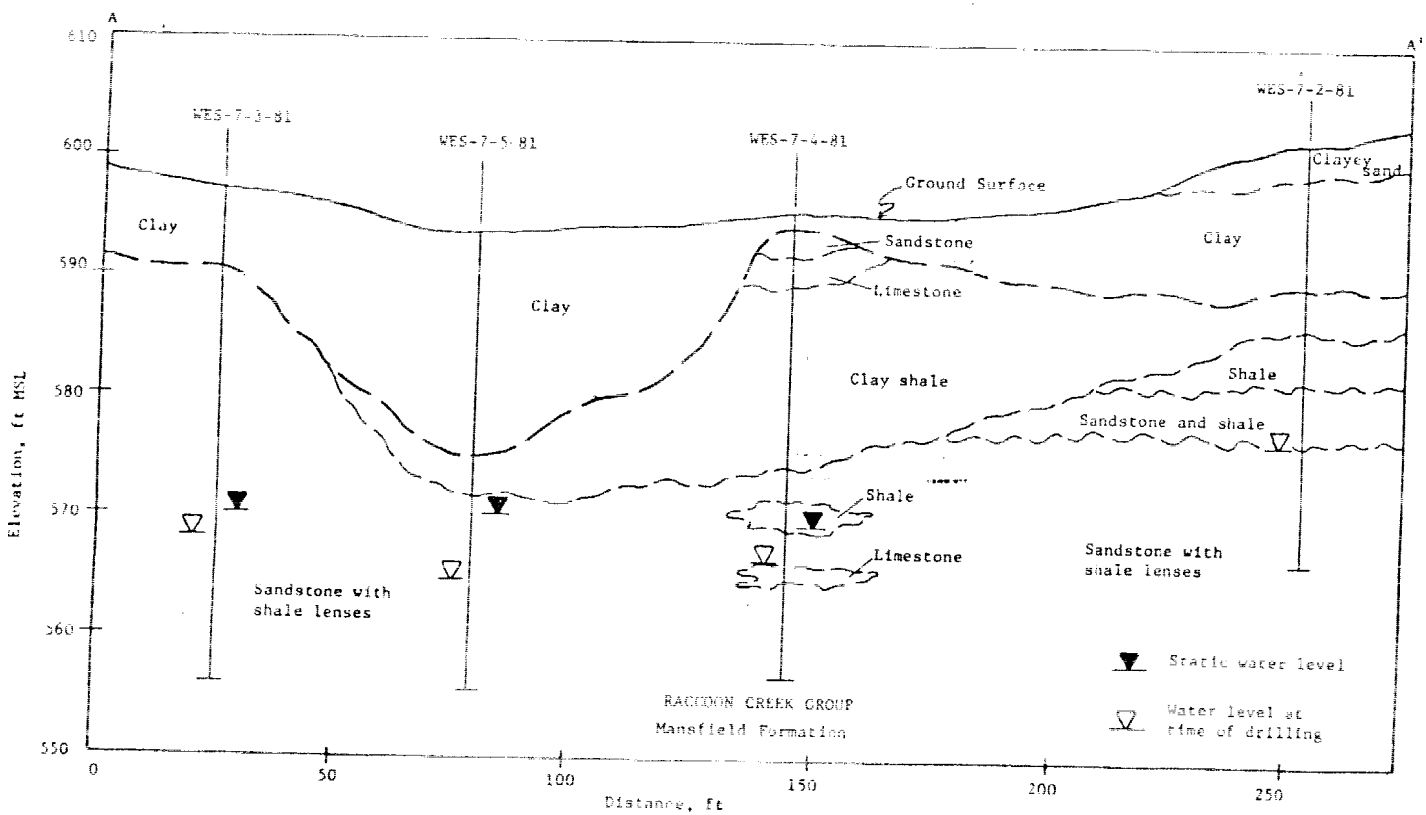


Figure 39. Geological Cross Section A-A' of Highway 58 Dump Site A

A groundwater contour map constructed from water levels of 29 November 1981, shows the flow to be in a northeasterly direction (see Figure 40). Monitoring well WES-7-2-81 was not used in map construction because the water level fell below the bottom of the well screen several weeks after installation. Groundwater data are presented in Appendix D.

Physical and chemical test

Laboratory classification of soil samples ranged from clayey sand-gravel (GC) to clay (CL). Soil permeability for a clay (sample 2, boring 1), was calculated to be 0.0 cm/sec and this soil composes 83 percent of the samples from this site. Appendix E presents the chemical and physical tests results.

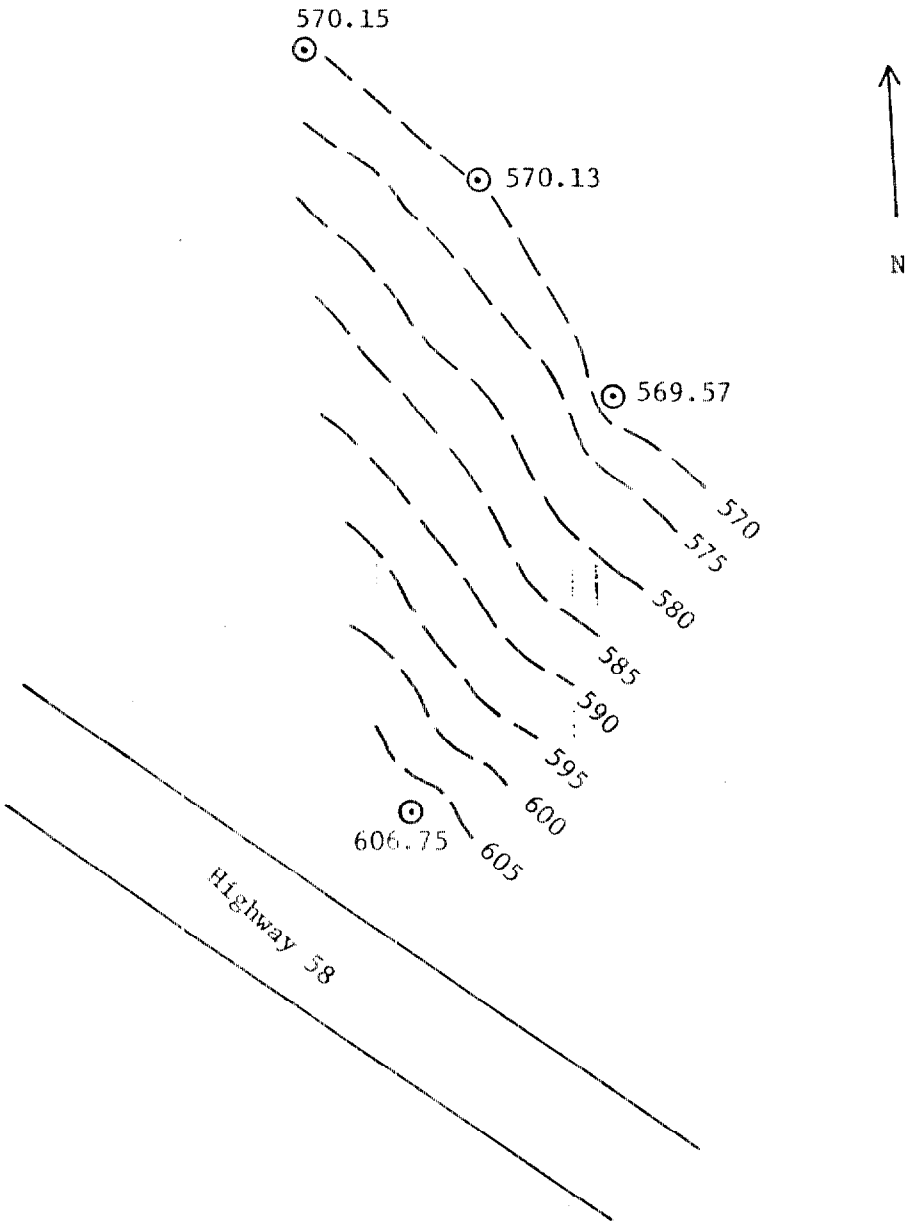
Highway 58 Dump Site B

Location

The Highway 58 Dump Site B is located in the NW¼ NE¼ NW¼, Sec. 25, T5N, R4W (Figure 4). This site is located midway on a ridge overlooking Highway 58 and Turkey Creek and is approximately ¼ mile south of Magazine 871. Nine monitoring wells were installed at this site (see Figure 41).

Geology

Overburden at the Highway 58 Dump Site B ranges in thickness from less than 1 ft to 13 ft. Underlying the overburden is shale, sandstone, and limestone from the Hardinsburg and Golconda Limestones Formations of the Stephensport Group (Table 1). Two core borings were drilled below the dump site. Boring WES-8-2-81 was drilled to a depth of 26.4 ft and boring WES-8-5-81 continued from this depth to a final depth of 70.8 ft. Only partial sample recovery was made of a highly weathered, yellowish brown clay shale from the base of the overburden to a depth of 13 ft. This clay shale grades into a weathered, soft, brittle shale which ranges from brown to dark grey and contains approximately 30 to 40 percent thinly bedded, brown sandstone beginning at a depth of 30 ft. From about 32 ft to 66 ft, a brown, well cemented, fine-grained quartz sandstone was encountered and was underlain by a light grey, moderately hard, fine-grained, fossiliferous limestone. Boring and groundwater data from 5 borings are shown in cross section A-A' (Figure 42). The boring logs are presented in Appendixes A and B.



0 25 50 Feet
Scale

Legend

570.15 Boring Location and Water Table Elevation, ft MSL

605 Water Table Contour, ft MSL
Water Measurements from 29 Nov 81

Figure 40. Water Table Contour Map of Highway 58 Dump Site A

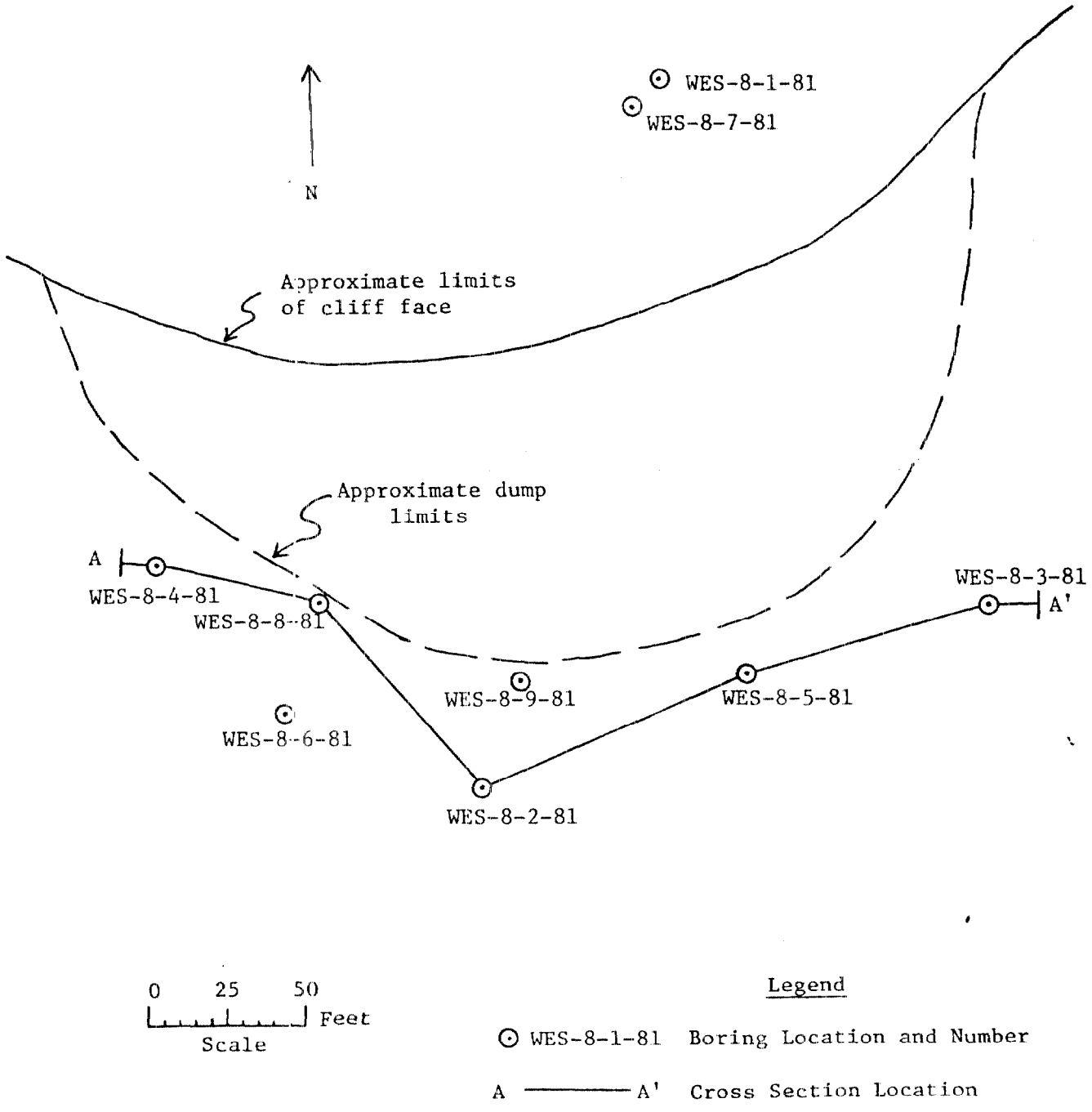


Figure 41. Well Locations and Cross Section Location of Highway 58 Dump Site B.

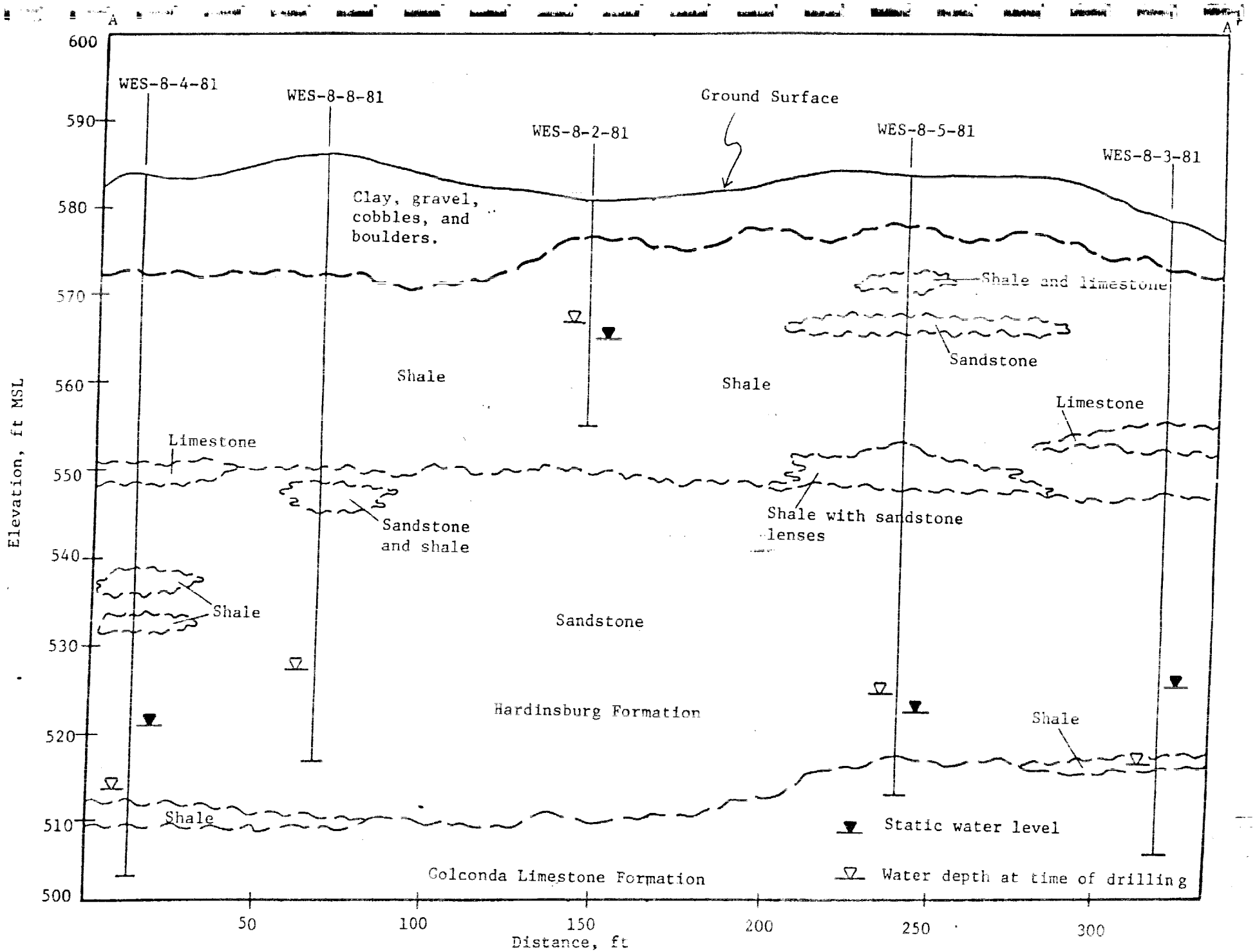


Figure 42. Geological Cross Section A-A' Highway 58 Dump Site B

Groundwater

Groundwater at the Highway 58 Dump Site B was encountered in fractures near the base of the sandstone unit. Borings WES-8-1-81, WES-8-2-81, and WES-8-6-81 encountered a perched water table in the fractured shale near surface. Between the up gradient and down gradient monitoring wells, groundwater elevations range from 525 to 521 ft MSL, a difference of 4 ft. A contour map constructed from water measurements of 29 November 1981, shows flow to be in a westerly direction (Figure 43). Monitoring well WES-8-8-81 is not shown in the water table contour map since it is a dry well. Croundwater data are presented in Appendix D.

Physical and chemical test

Laboratory classification of 3 soil samples ranged from clay (CL) to clayey sand-gravel (GC). Sampling methods at this site were not effective since the overburden consists of clay with sandstone and limestone gravel, cobbles, and boulders. Soil permeability for a clay (CL) soil was calculated to be 2.07×10^{-8} cm/sec. Appendix E presents the chemical and physical tests results.

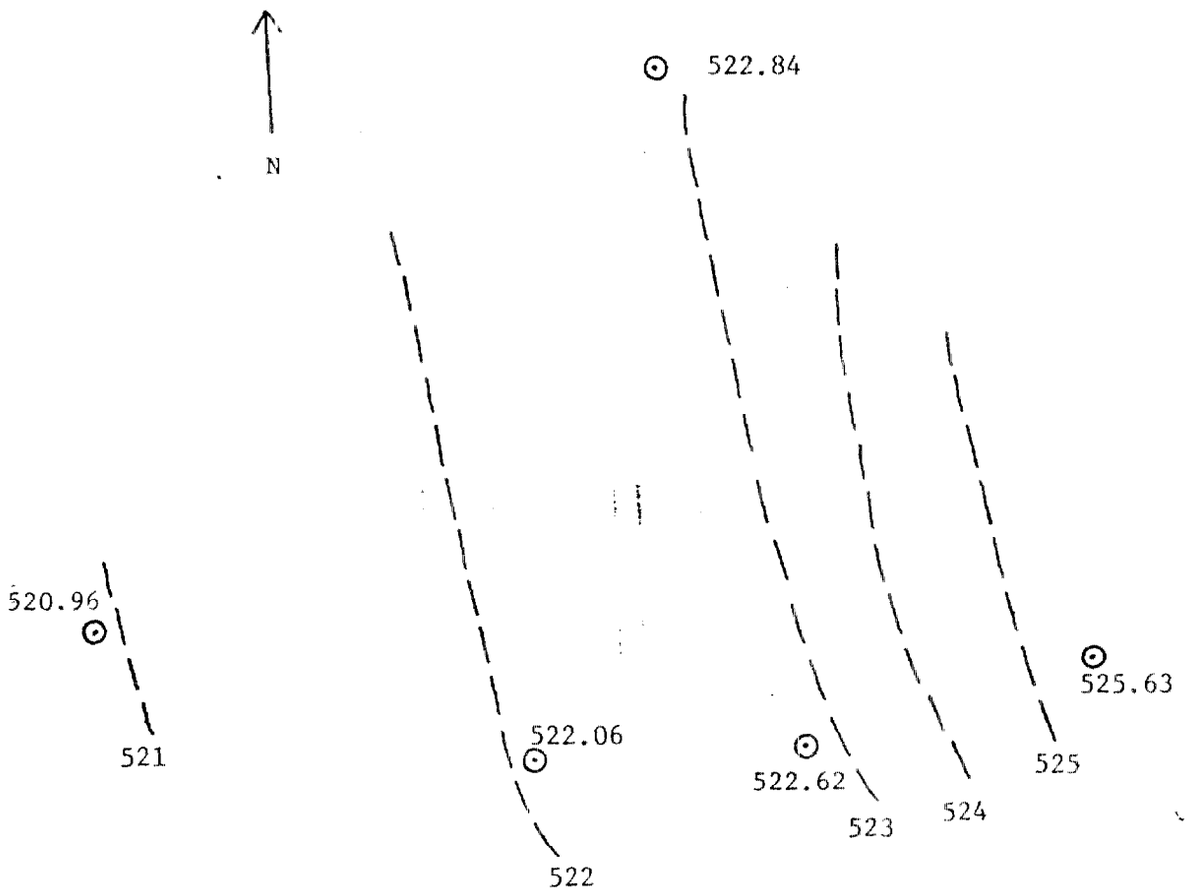
Pest Control Area

Location

The Pest Control Area is located in the E½ NW¼ SW¼, Sec. 23, T5N, R4W (Figure 4). This site consists of a waste storage tank buried in a gravel parking lot north of Highway 349 and an area west-northwest of Building 2189 (Pest Control) where materials were reported to have been dumped and buried. Two groundwater monitoring networks consisting of nine wells were installed and are shown in Figure 44.

Geology

Overburden at the Pest Control Area ranges in thickness from 2 to 10 ft and is underlain by interfingered and interbedded sandstone, shale, limestone, and coal from the Mansfield Formation of the Raccoon Creek Group (Table 1). Boring WES-9-8-81 was drilled to a depth of 25.1 ft and under the overburden was 11.5 ft of brown, weathered, fine-grained quartz sandstone interbedded with approximately 30 percent soft, brown clay seams and lenses. At a depth



Legend

0 25 50 Feet
Scale

522.84 Boring Location and Water Table Elevation, ft MSL

522 Water Table Contour, ft MSL
Water Measurements from 29 Nov 81

Figure 43. Water Table Contour Map of Highway 58 Dump Site B.

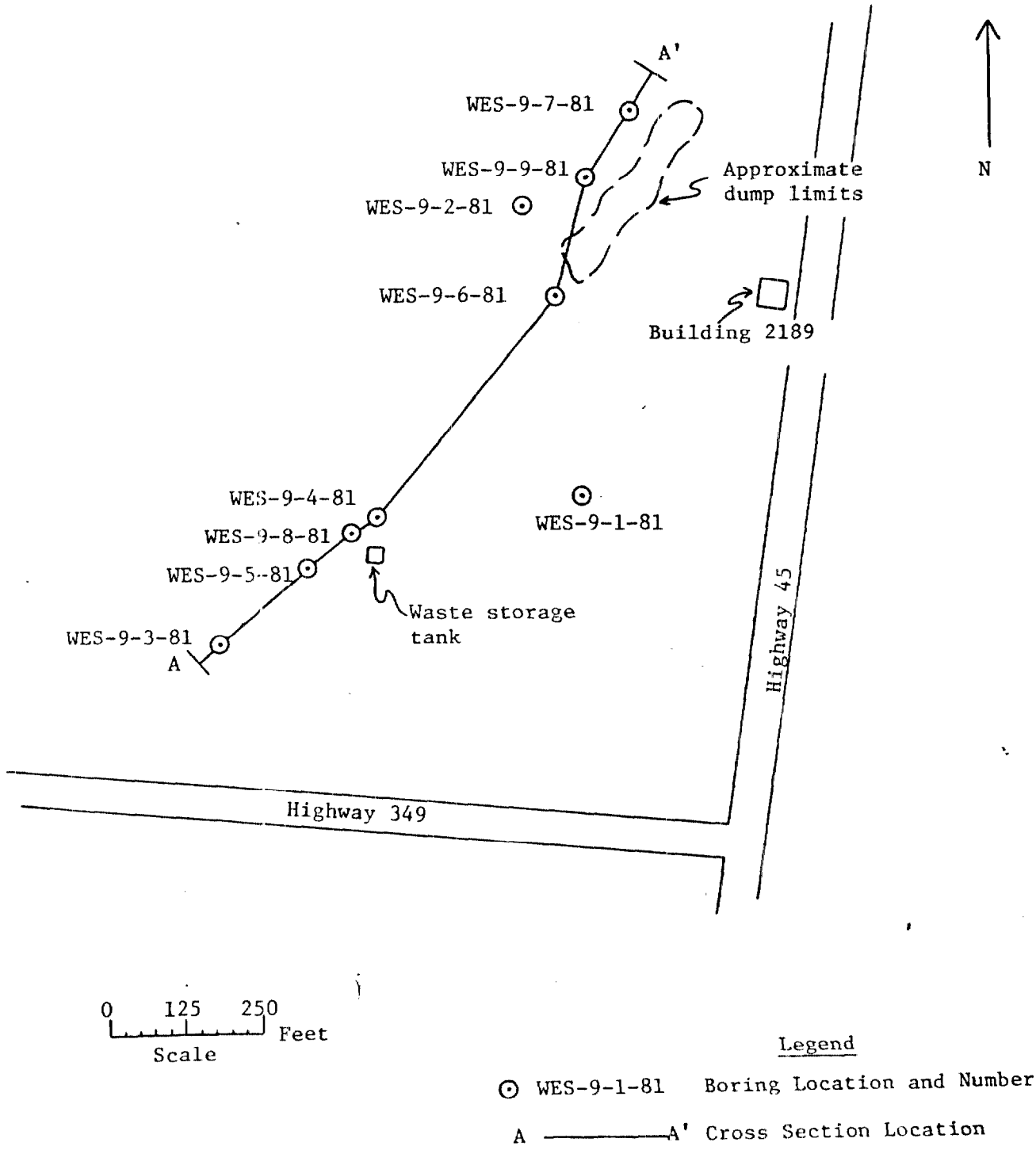


Figure 44. Well Locations and Cross Section Location of Pest Control Area.

of 18.5 ft, the sandstone is interbedded with a grey to dark grey shale with the shale content increasing with depth. At 23.5 ft, core changes to a black, soft, uniform shale. Cross section A-A' (Figure 45) shows boring and groundwater data from 7 borings. Boring logs are presented in Appendixes A and B.

Groundwater

Groundwater at the Pest Control Area was encountered in the overburden and in fractures in the underlying sandstone. Between the up gradient and down gradient monitoring wells, groundwater elevations range from 719 to 705 ft MSL, a difference of 14 ft. A contour map constructed from water measurements of 13 December 1981, shows groundwater flow to be towards the west behind Building 2189 and towards the west-northwest at the buried waste storage tank (see Figure 46). The groundwater data are presented in Appendix D.

Physical and chemical test

Laboratory classification of the soil samples ranged from clay (CL) to clayey sand (SC). These soils are tan, brown, and reddish brown. Soil permeability for a clay (CL) soil (sample 1, boring 3) was calculated to be 3.52×10^{-7} cm/sec and this soil composes 68 percent of the samples from this site. Appendix E presents the physical and chemical tests results.

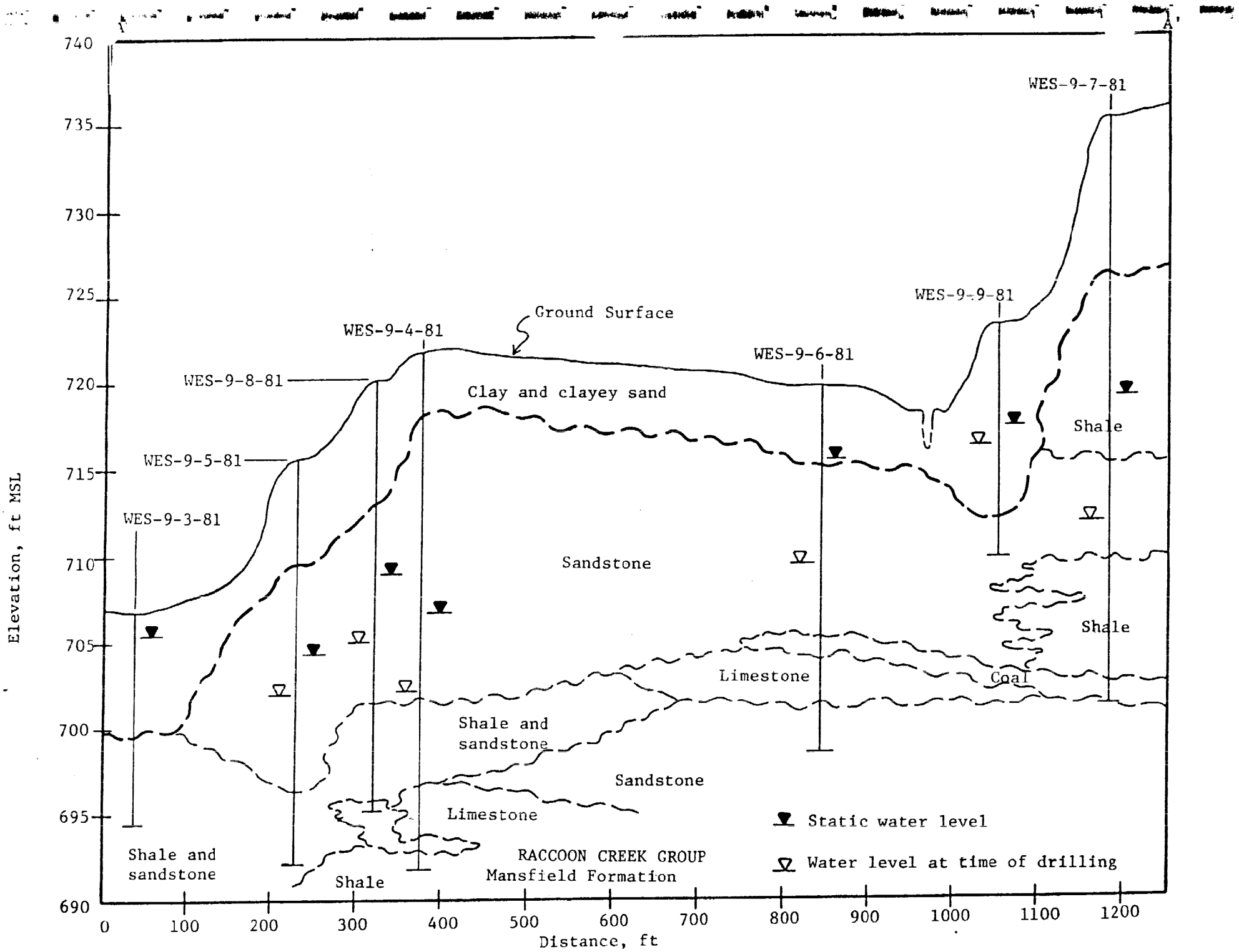
Rockeye Site

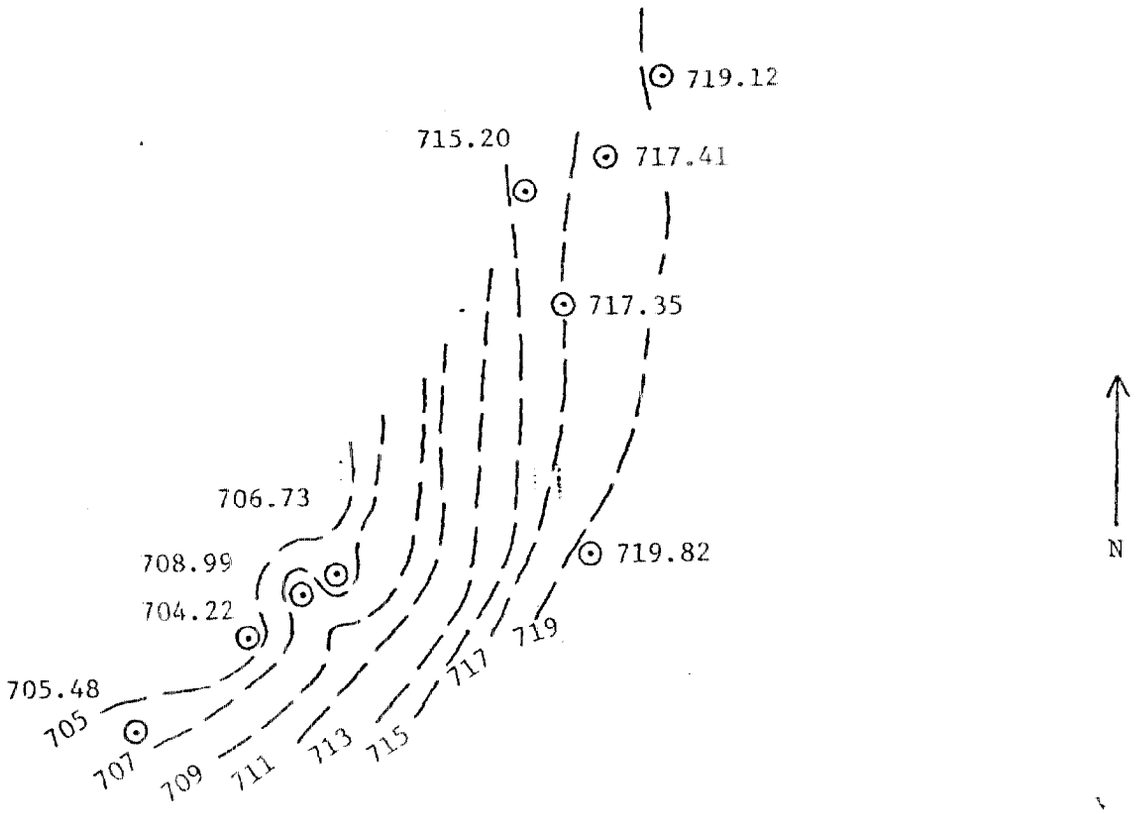
Location

The Rockeye Site is located in the SW¼ NW¼ SE¼, Sec. 4, T5N, R3W (Figure 4). It consists of two wells located along each bank of the stream approximately 200 to 250 ft from Magazine 1569 along Highway 165. Figure 47 shows well locations and the approximate stream course. The NWSC requested two wells to monitor surface discharge from the Rockeye Facility which was reported seeping into the stream bed at this location.

Geology

Overburden along each bank of the stream was around 7 ft thick and was underlain by a brown, fine-grained, quartz sandstone from the Mansfield Formation of the Raccoon Creek Group and a grey, moderately hard limestone from the


A
A'
740
735
730
725
720
715
710
705
700
695
690
Elevation, ft MSL
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
Distance, ft
WES-9-3-81
WES-9-5-81
WES-9-8-81
WES-9-4-81
WES-9-6-81
WES-9-9-81
WES-9-7-81
Ground Surface
Clay and clayey sand
Sandstone
Shale
Shale
Coal
Limestone
Shale and sandstone
Sandstone
Limestone
Shale and sandstone
Shale
RACCOON CREEK GROUP
Mansfield Formation
Static water level
Water level at time of drilling



Legend

0 125 250 Feet
Scale

719.2 Boring Location and Water Table Elevation, ft MSL

719 Water Table Contour, ft MSL
Water Measurements from 13 Dec 81

Figure 46. Water Table Contour Map of Pest Control Area.

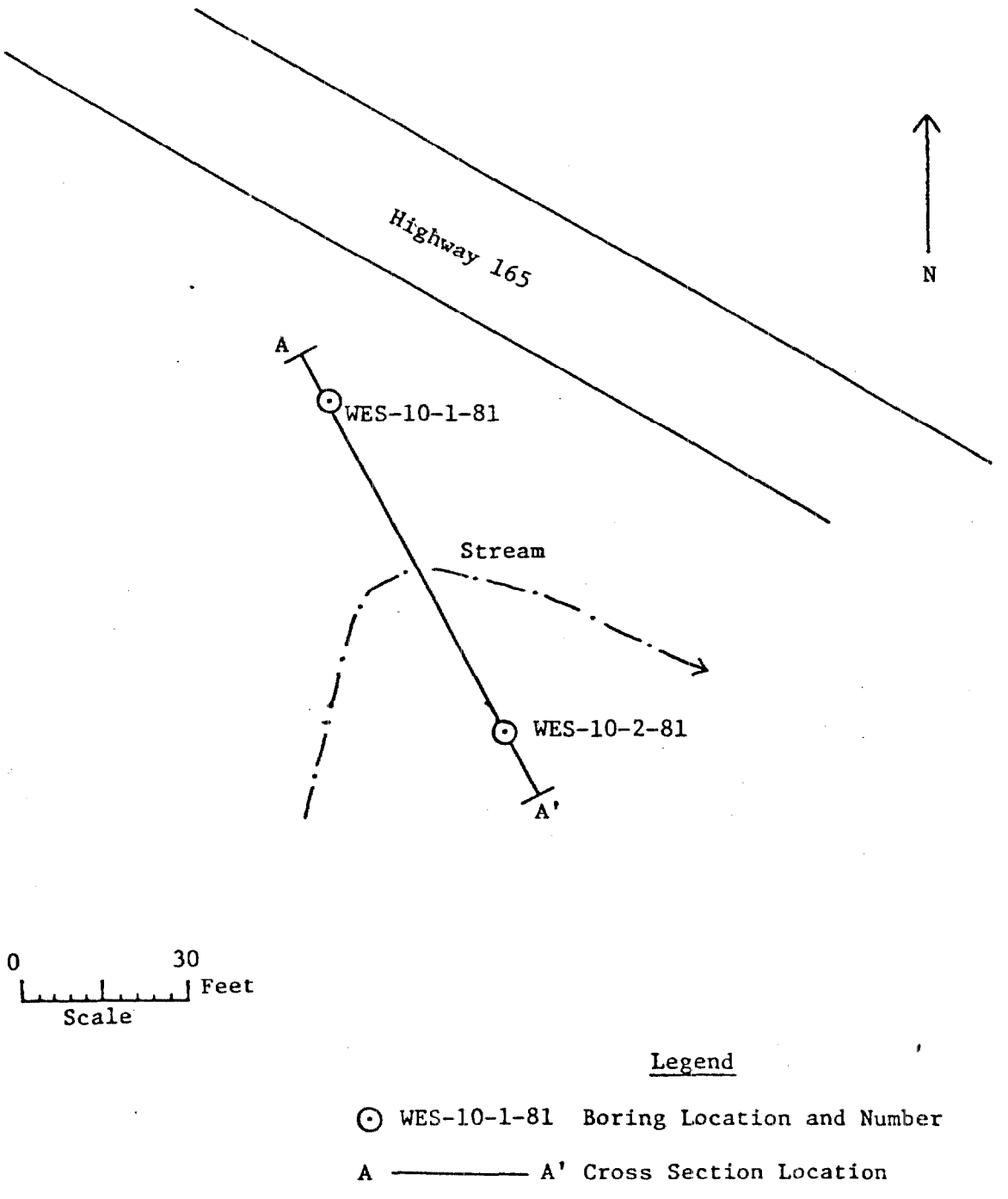


Figure 47. Well Locations and Cross Section Location of Rockeye Site.

Glen Dean Limestone Formation of the Stephensport Group (Table 1). Cross section A-A' (Figure 48) shows boring and groundwater data. Boring logs are presented in Appendixes A and B.

Groundwater

Groundwater at this location was encountered in fractures in the sandstone. Since only two wells were installed, the direction of groundwater flow cannot be determined, but in all probability conforms with the surface drainage.

Physical and chemical test

Laboratory classification of three soil samples were silty sand (SM), clayey sand-gravel (GC), and clay (CL). These soils are brown. Soil permeability for a clay soil (sample 1, boring 1), was calculated to be 5.20×10^{-6} cm/sec. Appendix E shows the chemical and the physical tests results.

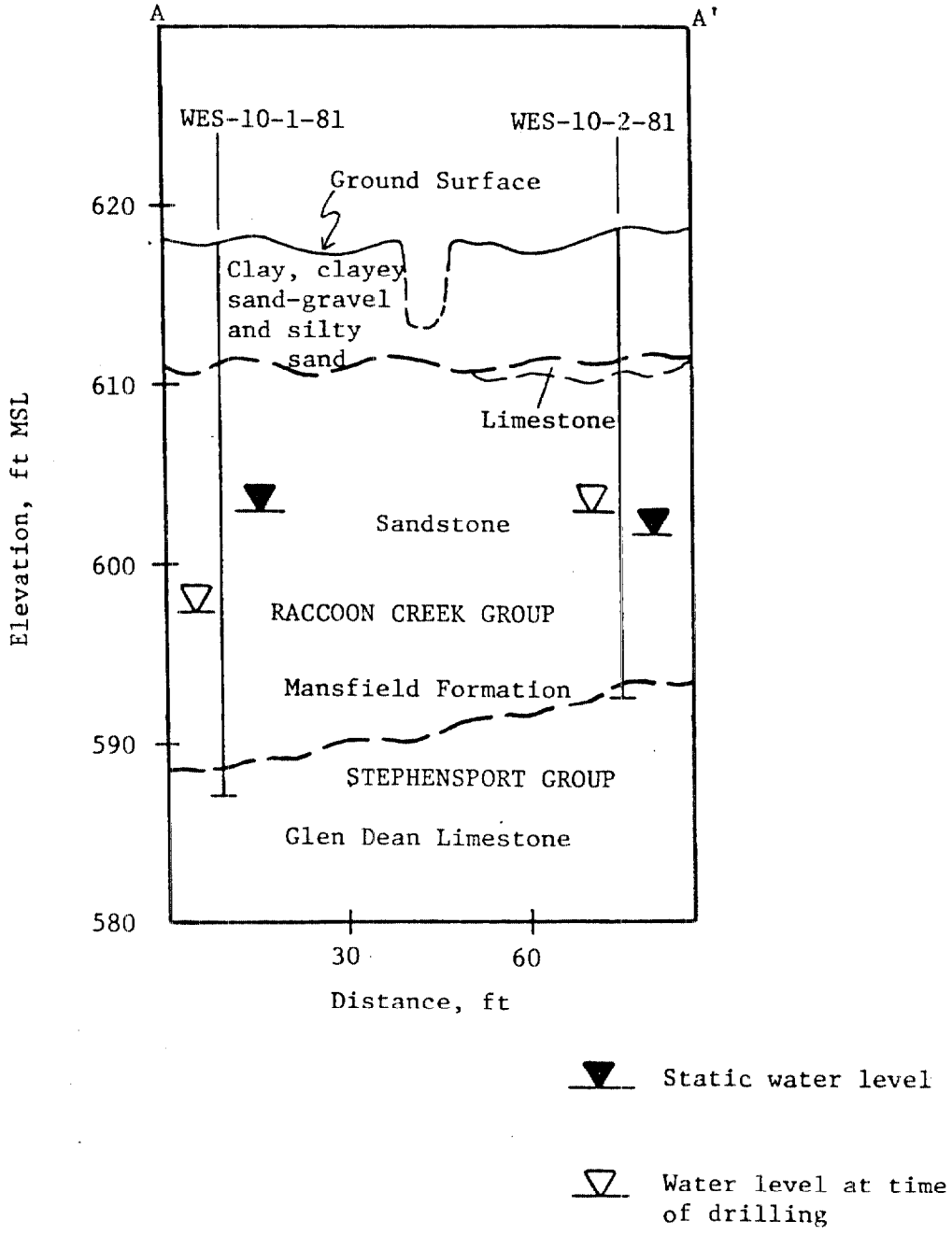


Figure 48. Geological Cross Section A-A' of Rockeye Site.

PART V: CONCLUSIONS

The installation of groundwater monitoring networks around identified buried waste sites has been completed. A total of 13 groundwater monitoring networks (containing a total of 83 monitoring wells) were installed in 11 locations throughout the NWSC (Figure 4). With the exception of the Rockeye site, each groundwater monitoring network consists of three down gradient monitoring wells. Additional down gradient monitoring wells were installed in areas where groundwater flow was in more than one direction or where the down gradient disposal site perimeter was a large area. Overburden at the various disposal sites ranges in thickness from less than 1 ft to more than 40 ft with soils of clay, silt, and sand. Rock underlying the overburden consists of sandstone, shale, limestone, and coal seams of Pennsylvanian and Mississippian age. The water table was encountered in the unconsolidated overburden at two sites and in the remaining sites, the water table was encountered in the sedimentary rock at an average depth of 29.2 ft. The average groundwater gradient among the 11 sites was 0.06. The direction of groundwater flow varied, but generally conformed with the surface flow at each site.

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Admin Records
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HYDROGEOLOGIC INVESTIGATION OF WASTE DISPOSAL SITES AT THE NAVAL WEAPONS SUPPORT CENTER, CRANE, INDIANA

APPENDIXES A AND B

by

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Prepared for
Naval Weapons Support Center
Crane, Indiana

April 1982

APPENDIX A: FIELD BORING LOGS

APPENDIX B: GRAPHIC FIELD LOGS

WORKING DRAFT

APPENDIX A

FIELD BORING LOGS

WORKING DRAFT

BORING LOG
FIELD DATA

Project N W S C Groundwater Study Site Crane, Indiana Date 20 August 1981
Location Mustard Gas Burial Grounds Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 683.14 ft Boring No. WES-1-1-81

SAMPLE NUMBER	DATE TAKEN	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
1	20 Aug	0.0		0.0	0.5	0.0	1.85	3"ShelbyTube	0	S.T.	Clay(CL): light brown to grey in
1A				0.5	1.0	1.85	2.15		160	Jar	color, soft to slightly stiff, low
				1.0	1.5				280		plasticity.
				1.5	2.0				360		Sample length: 2.15'
				2.0	2.5				420		
				0.0	5.0			7"Folding Auger			Cleanout
2	20 Aug		5.0	5.0	5.5	5.0	6.37	*3"Fixed Piston Sampler	0	S.T.	Sand (SP): light brown to grey in
2A		5.0		5.5	6.0	6.37	6.67		20	Jar	color, v. fine-grained, uniform,
				6.0	6.5	6.37	6.67		300		with thin zones of moderately hard
			7.05	6.5	7.05				750		cemented sand.
											Sample length: 1.67'
	20 Aug	7.05		7.05	14.5			5-5/8" Rock	Bit		Cleanout
											Sandstone: brown to darkbrown in

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*3" Fixed Piston Sampler = 3" F.P.S.

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES 1-1-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
											color and fine-grained.
3A	21 Aug			14.5	14.75	14.5	14.75	3"F.P.S.	750	Jar	Sandstone: same as above.
	21 Aug		48.0	14.5	48.0			5-5/8" Rock	Bit		Sandstone
											Water encountered at 38 ft.
											Blew hole of cuttings and fall-in
											with air. Installed well.

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Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, Indiana Date 20 August 1981
Location Mustard Gas Burial Grounds Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 664.04 ft Boring No. WES-1-2-81

SAMPLE NUMBER	DATE TAKEN	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press.	Cont.	CLASSIFICATION AND REMARKS
1A	22 Aug	0.0		0.0	0.5	0.0	0.65	3"ShelbyTube	180	Jar	Sandy silt(SM): lt. brown in color,
			1.2	0.5	0.65				700		dry, very fine-grained, with frag-
											ments of weathered sandstone.
				0.0	2.2	----	----	5-5/8 " Rock Bit		----	Cleanout for core barrel.
											Continued on Eng Form 1836, page 2.

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Hole No. WES-1-2-81

DRILLING LOG	DIVISION U.S. Navy	INSTALLATION N.W.S.C., Crane, Indiana	SHEET 2 OF 4 SHEETS

1. PROJECT .N.W.S.C. Groundwater Study	10. SIZE AND TYPE OF BIT 4"x5-1/2"
2. LOCATION (Coordinates or Station) Mustard Gas Burial Grounds	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) M.S.L.
3. DRILLING AGENCY C.E.W.E.S.	12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
4. HOLE NO. (As shown on drawing title and file number) WES-1-2-81	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED zero; UNDISTURBED one
5. NAME OF DRILLER C. Drake	14. TOTAL NUMBER CORE BOXES zero
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 22 August 1981; COMPLETED 22 August 81
7. THICKNESS OF OVERBURDEN 1.2	17. ELEVATION TOP OF HOLE 664.04
8. DEPTH DRILLED INTO ROCK 21.6	18. TOTAL CORE RECOVERY FOR BORING 63% %
9. TOTAL DEPTH OF HOLE 22.8	19. SIGNATURE OF INSPECTOR Joseph B. Dimber

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
664.04	0.0		Overburden - See page one for soil information.			
663.04	1.0					
662.04	2.0		No recovery			
661.04	3.0		Sandstone: light brown, very fine-grained with 85% uniform quartz sand and 15% misc. materials. Sandstone is dry, weathered, very friable to moderately friable, and bedding is distinct with zones of oxidation.			Run 1 Begun 1:30 Rec 1.9' End 1:50 Loss 3.1' Time 20min. Gain__ Drl time 20min. Hyd press 200 psi Water press - RPM 100± Drl Action Smooth Cuttings Red Brown
660.04	4.0		Fractured			
559.04	5.0					Used carbide bit.
558.04	6.0		No recovery			
557.04	7.0		Run 1	38%	-	
556.04	8.0		No recovery			Run 2 Begun 2:15 Rec 1.5' End 2:45 Loss 3.5' Time 30min Gain - Drl time 30min Hyd press 150-200psi Water press - RPM 100± Drl Action Smooth Cuttings Brown Remarks
555.04	9.0		Sandstone: same - Core loss appears to occur in areas of unconsolidated sands or very weathered sandstone.			
			Fractured			
554.04	10.0		No recovery			

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PROJECT | HOLE NO.

Hole No. WES-1-2-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 3 OF 4 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED: — UNDISTURBED:
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	16. DATE HOLE — STARTED: — COMPLETED:
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
554.04	10.0					
553.04	11.0		No recovery			
552.04	12.0		Run 2	30%	–	
			No recovery			
			Water at 12.8 ft.			
551.04	13.0					Wl– Run 3 Began 3:00 Rec 4.33' End 3:30 Loss 0.4' Time 30min Gain – Drl time 30min Hyd press 100psi Water press– RPM 75± Drl Action Smooth Water Ret Brown
550.04	14.0		Sandstone: same			
549.04	15.0					Remarks Switched from carbide to to diamond bit.
			Water at 15.7 ft.			
548.04	16.0		Highly oxidized			
			Run 3	91%	–	
			Contact from brown to grey colored sandstone.			
547.04	17.0		Shale seam – 3/4"			Wl– Run 4 Began 4:00 Rec 3.37' End 4:30 Loss – Time 30min Gain – Drl time 30min Hyd press 100psi Water press – RPM 75± Drl Action Smooth Water Ret Grey
546.04	18.0		Sandstone and interbedded shale: sandstone is grey, uniform, fine-grained quartz sands with numerous dark grey shale lamina interbedded.			
545.04	19.0		Shale ranges in thickness from 1/16" to 1/2" and controls rock breaks. Shale is fairly soft and sandstone is moderately friable.			Bit blocked off.
			Shale seam – 1/2"			
544.04	20.0		Run 4	100%	–	

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PROJECT | HOLE NO.

Hole No. WES-1-2-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 4 OF 4 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN	16. DATE HOLE — STARTED — COMPLETED
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE	18. TOTAL CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
544.04	20.0		19.9' contact between sandstone and shale 0.2' black shale(pure) 0.05' black shale(pure)			
543.04	21.0		Sandy shale: recovered core indicates 60% soft, black sandy shale interbedded with a fine-grained, grey sandstone. Individual lamina range in thickness from 1/16" to 2".			Run 5 Began 4:30 Rec 1.0' End 4:50 Loss 1.95' Time 20min Gain Drl time 20min Hyd press 100psi. Water press - RPM 75 Drl Action smooth ~~Water~~ ret -
542.04	22.0		No recovery - Left in hole			
541.04	23.0		Run 5	34%	-	Remarks
			Went back in with 5-5/8" rock bit to remove fall-in and core left in hole. Slight "oily" oder was smelled when pulling core barrel on last run. Had test run for mustard gas and negative results on test.			

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PROJECT | HOLE NO.

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, Indiana Date 25 August 1981
Location Mustard Gas Burial Grounds Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 667.43 ft Boring No. WES-1-3-81

SAMPLE NUMBER	DATE TAKEN	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press.	Cont.	CLASSIFICATION AND REMARKS
1	25 Aug	0.0		0.0	0.5	0.0	2.3	3"ShelbyTube	0	S.T.	Silt(ML): brown in color, soft
1A				0.5	1.0	2.3	2.5		20	Jar	organic matter, low plasticity.
				1.0	1.5				95		
				1.5	2.0				180		
			4.0	2.0	2.5				220		Sample length: 2.5 ft
				0.0	5.0	------	------	7" Folding	Auger	---	Cleanout: assumed change at 4.0 ft
2	25 Aug	4.0		5.0	5.5	5.0	6.02	3" FixedPis-	0	S.T.	Clayey sand(SC) with fragments of
2A				5.5	6.0	6.02	6.27	ton Sampler	40	Jar	weathered sandstone: reddish brown
			6.45	6.0	6.45				280		in color, dry, and uniform fine-
											grained sand.
											Sample length: 1.27 ft
	25 Aug			5.0	6.5	------	------	7" Folding	Auger	----	Cleanout

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BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-1-3-81

SAMPLE NUMBER	DATE TAKEN	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
	25 Aug	6.45		6.5	6.7	------	------	3"Pitcher Sampler	200-300		Sandstone: lt. brown to reddish brown in color, very fine to fine-grained, weathered, moderate to very friable.
	25 Aug			6.7	8.6	------	------	4x5-1/2" core bbl.	---		Sandstone: lt. grey to reddish brown in color, weathered, moderate to slightly friable, bedding is distinct with three breaks in run. Recovered to 6.25 ft. Water at 8.6 ft.
	25 Aug		--	8.6	18.6	------	------	5-5/8" rock bit.	---		Cleanout ~~Sandstone: same as above.~~ Blew hole clean of cuttings and fall-in. Installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, Indiana Date 22 Sep 81
Location Mustard Gas Burial Grounds Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 669.95 ft Boring No. WES-1-4-81

SAMPLE NUMBER	DATE TAKEN	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press.	Cont.	CLASSIFICATION AND REMARKS
1	22 Sep	0.0		0.0	0.5	0.0	2.43	3" Shelby Tube	40	S.T.	Sandy silt (SM): brown to grey in
1A				0.5	1.0	2.43	2.6		60		color, moderate cohesion, dry,
				1.0	1.5				80		with approx. 20-30% fine-grained
				1.5	2.0				120		sand.
			3.80	2.0	2.6				200		Sample length: 2.6 ft
	22 Sep			0.0	5.0	----------		7" Solid Auger	----------		Cleanout
2	22 Sep	3.80		5.0	5.5	5.0	6.35	3" Fixed Piston Sampler	100	S.T.	Sandy silt (SM): brown to lt.
2A				5.5	6.0	6.35	6.55		140	Jar	grey in color (mostly grey), v.
				6.0	6.5				200		stiff, layered, dry, with approx.
				6.5	7.0				260		20-30% fine sand.
				7.0	7.5				300		Sample length: 1.55 ft
	22 Sep			5.0	10.0	----------		7" Solid Auger	----------		Cleanout

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-1-4-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER	Hyd. Press.	Cont.	CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
3A	22 Sep		10.3	10.0	10.3	10.0	10.3	3" Fixed Piston Sampler	800	Jar	Sandy silt (SM) and weathered sandstone: grey to brown in color, dry, with sandstone reddish brown in color, fine-grained, and friable.
	22 Sep	10.3	31.0	10.0	31.0	------	------	5-5/8" Rock Bit	------	------	Water at 21 ft. Drilled to 31.0 ft. Water on 23 Sep 81 at 21 ft. Blew hole and installed well.
											Sandstone: reddish brown in color, fine-grained and weathered.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, Indiana Date 23 Sep 81
Location Mustard Gas Burial Grounds Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 665.69 ft Boring No. WES-1-5-81

SAMPLE NUMBER	DATE TAKEN	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press.	Cont.	CLASSIFICATION AND REMARKS
1	23 Sep	0.0		0.0	0.5	0.0	2.28	3" Shelby Tube	60	S.T.	Clay (CL): brown in color, dry,
1A				0.5	1.0	2.28	2.48		80	Jar	little cohesion, uniform. Approx-
				1.0	1.5				100		imately 5% sand and gravel.
				1.5	2.0				120		
				2.0	2.5				120		Sample length: 2.48 ft
				0.0	5.0	------	------	7" Solid Auger	----	----	Cleanout
2A	23 Sep		5.2	5.0	5.5	5.0	5.5	3" Fixed Piston Sampler	800	Jar	Sandstone: brown in color, layered,
											v. fine-grained, dry, weathered,
											friable.
	23 Sep	5.2	30.63	5.5	18.0	------	------	5-5/8" Rock Bit	----	----	At 18.0 ft, monitored hole for
				18.0	30.63	------	------	5-5/8" Rock Bit	----	----	water, negative results. Water at
											20.5 ft. Sandstone: brown in
											color with interbedded grey shale.
											Installed well on 24 Sep 81.

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Sheet 1 of 1 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 26 Aug 81
Location Dye Burial Grounds Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 738.66 Boring No. WES-2-1-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press.	Cont.	CLASSIFICATION AND REMARKS
1A	26 Aug	0.0		0.0	0.5	0.0	0.92	3" Shelby Tube	0	Jar	Clay (CL): Brown in color, soft,
1				0.5	1.0	0.92	1.87		0	S.T.	low plasticity, & slight organic
				1.0	1.5				10		matter.
				1.5	2.0				30		Sample length: 1.97 ft
			6.0	2.0	2.5				100		
				0.0	5.0	-------		7" Folding Auger	------		Cleanout
2A	26 Aug	6.0	7.17	5.0	5.5	5.0	6.0	3" Fixed Piston Sampler	0	Jar	Sandy silt (SM) & sandstone frag-
2				5.5	6.0	6.0	6.95		20	S.T.	ments: brown in color, slightly
				6.0	6.5				380		sticky, & contains 25% weathered
				6.5	7.0				700		sandstone. Sandstone is light
				7.0	7.17				800		brown to grey in color, uniform,
											fine-grained, dry, & friable.
											Sample length: 1.95 ft

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Sheet 1 of 2 Sheets

NOTE: Extra jar sample made for NWSC

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-2-1-81

SAMPLE NUMBER	DATE TAKEN	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
	26 Aug	7.17	11.5	5.0	7.17	-------	-------	7" Folding Auger	-------	-------	Cleanout: weathered sandstone starts at 7.17 ft
	26 Aug	11.5	30.0	7.17	30.0	-------	-------	5-5/8" Rock Bit	-------	-------	Hard sandstone at 11.5 ft. Water at approximately 20 ft. Cleanout to 10 ft below water, blew hole dry of water & cuttings. Installed well screen.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 26 Aug 81
Location Dye Burial Grounds Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 725.46 Boring No. WES-2-2-81

SAMPLE NUMBER	DATE TAKEN	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press.	Cont.	CLASSIFICATION AND REMARKS
1	26 Aug	0.0		0.0	0.5	0.0	1.65	3" Shelby Tube	40	S.T.	Silt (ML): brown in color, soft,
1A				0.5	1.0	1.65	2.5		75	Jar	slightly sticky, dry, & contains
				1.0	1.5				140		organic matter.
				1.5	2.0				180		Sample length: 2.5 ft
			5.0	2.0	2.5				230		
				0.0	5.0	----	----	7" Folding Auger	----	----	Cleanout
2A	26 Aug	5.0		5.0	5.5	5.0	6.05	3" Fixed Piston Sampler	40	Jar	Silt (ML) & weathered sandstone:
				5.5	6.0				700		brown to brownish white in color
			6.05	6.0	6.05				800		& dry. Sandstone is fine-grained,
											uniform, & friable. Slight dry
											green film found on soil sample.
											Sample length: —
	26 Aug	6.05		5.0	6.1	----	----	5-5/8" Rock Bit	----	----	Cleanout

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 1 of 8 Sheets

NOTE: Extra jar sample made for NWSC

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-2-2-81

SAMPLE NUMBER	DATE TAKEN	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
	26 Aug	6.05		6.1	6.7	------	------	3" Pitcher Sam.	200	--	Fragments of weathered sandstone
											Continued on Eng Form 1836, page 3.
											Will use 4x5-1/2 in. core barrel.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 8 Sheets

Hole No. WES-2-2-81

DRILLING LOG	DIVISION U.S. Navy	INSTALLATION NWSC, Crane, Indiana	SHEET 3 OF 8 SHEETS

1. PROJECT NWSC Groundwater Study	10. SIZE AND TYPE OF BIT 4x5-1/2 in. diamond
2. LOCATION (Coordinates or Station) Dye burial Grounds	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL
3. DRILLING AGENCY CEWES	12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
4. HOLE NO. (As shown on drawing title and file number) WES-2-2-81	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED zero; UNDISTURBED two
5. NAME OF DRILLER C. Drake	14. TOTAL NUMBER CORE BOXES zero
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN 6.1 ft	16. DATE HOLE: STARTED 26 August 81; COMPLETED 2 September 81
8. DEPTH DRILLED INTO ROCK 48.4 ft	17. ELEVATION TOP OF HOLE 725.46 ft
9. TOTAL DEPTH OF HOLE 54.5 ft	18. TOTAL CORE RECOVERY FOR BORING 37.8%
	19. SIGNATURE OF INSPECTOR [illegible]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
725.46	0.0		See page one for overburden information.			
724.46	1.0					
723.46	2.0					
722.46	3.0					
721.46	4.0					
720.46	5.0					
719.46	6.0					26 August 1981
718.46	7.0		No recovery - highly weathered sandstone			Run 1 Rec 4.3' Loss 0.8' Gain- Time 50 min Feed press 100 psi Water press - 70± Drill Action Smooth Return Wtr Brown Remarks
717.46	8.0		½" clay seam-soft			
716.46	9.0		½" clay seam-soft Sandstone	81.4%	--	
715.46	10.0					

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PROJECT | HOLE NO.

Hole No. WES -2-2-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 4 OF 8 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	16. DATE HOLE — STARTED — COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
715.46	10.0		Sandstone: see below			
714.46	11.0					
			Run 1			27 August 1981
713.46	12.0					WL - Run 2 Began 9:15 Rec 3.65' End 10:20 Loss - Time 65 min Gain - Drl time 40 min Drl press 100-120 psi Water press - RPM 75± Drl Action Smooth Water Rot Brown
			closed break			
712.46	13.0		Sandstone interbedded with seams of clay, siltstone, limonite, lignite, and peat. Core ranges in color from shades of brown, orange, and red to various shades of grey. Grain size is uniform and ranges from very fine to fine with quartz grains predominating. Material is dry, friable, and weathered. Bedding is distinct with thickness ranging from ¼ in. to 8 in. maximum.			
711.46	14.0					Bit blocked off.
710.46	15.0			100%	--	
			Run 2			
			fractured			
709.46	16.0					- Run 3 10:40 Rec 4.15' 11:10 Loss - 30 min Gain - Drl time 30 min Drl press 100-200 psi Water press - RPM 75± Drl Action Smooth Water Rot Brown Remarks -
708.46	17.0		Sandstone: same	100%	--	
707.46	18.0		closed break			
706.46	19.0					
			Run 3			
705.46	20.0		No recovery			

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PROJECT HOLE NO.

Hole No. WES-2-2-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 5 OF 8 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN	16. DATE HOLE — STARTED — COMPLETED
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE	18. TOTAL CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
705.46	20.0		Run 4			WL - Run 4 Began 12:05 Rec 0.0' End 12:30 Loss 0.6' Time 25 min Gain - Drl time 25 min Hyd press 100-120 psi Water press - RPM 50 ± Drl Action Smooth Water ret -
704.46	21.0		No recovery			
703.46	22.0			62.0%	--	Remarks Bit blocked off.
			-fractured siltsone Siltstone: brown, dry, and breaks very easily.			
702.46	23.0					WL - Run 5 Began 12:50 Rec 3.1' End 1:45 Loss 1.9' Time 55 min Gain - Drl time 50 min Hyd press 100-200 psi Water press- RPM 50-75 ± Drl Action Semi-rough Water ret - Remarks -
701.46	24.0		Sandstone with lignite: same			
700.46	25.0		Run 5			
			-fractured Run 6	100.0%	--	WL - Run 6 Began 2:05 Rec ≈0.6' End 2:30 Loss - Time 25 min Gain - Drl time 20 min Hyd press 200 psi Water press- RPM 50 ± Drl Action Rough Water ret - Remarks -
699.46	26.0		Limonite with pyrite and chalcopyrite: red, blue, black in color, very hard, and has high specific gravity.			
			No recovery	0.0%	--	
698.46	27.0		Run 7			
			fractured sandstone and clay			
697.46	28.0			69.0	--	WL- Run 7 Began 2:50 Rec 0.0' End 3:15 Loss 1.6' Time 25 min Gain - Drl time 15 min Hyd press 200 psi Water press- RPM 50 ± Drl Action Rough Water ret -
696.46	29.0		Sandstone: same			
695.46	30.0		Run 8			Remarks Bit blocked off

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT HOLE NO.

Hole No. WES-2-2-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 6 OF 8 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	16. DATE HOLE — STARTED — COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
695.46	30.0		fractured			WL - Run 8 Began 3:30 Rec 2.0' End 4:15 Loss 0.9' Time 45min Gain - Drl time 40 min Hyd press 150 psi Water press - RPM 50± Drl Action Very rough Water ret -
694.46	31.0		Sandstone: same except very hard.	83.0%	--	
			clay/silt: grey and soft Run 9			
693.46	32.0		From 32.0 to 32.25 - grey sandstone			Remarks Bit blocked off.
692.46	33.0		Sandstone interbedded with seams of grey shale(1/32 to 1/2 in.). Sandstone is grey to orange brown in color, hard, and fine-grained.			WL - Run 9 Began 4:20 Rec 1.7' End 4:40 Loss 0.35' Time 20 min Gain - Drl time 20 min Hyd press 200 psi Water press - RPM 50-100 ± Drl Action Smooth Water ret -
691.46	34.0		Sandstone from 34.0 to 35.0 is dark grey in color.			
690.46	35.0		Sandstone from 35.0 to 37.8 is light brown to orange brown and contains no shale seams.			Remarks Bit blocked off. 28 August 1981
689.46	36.0			100.0%	--	WL - Run 10 Began 9:26 Rec 4.85' End 11:06 Loss Time 100 min Gain - Drl time 90 min Hyd press 80-100 Water press - RPM 35 ± Drl Action Smooth Water ret -
			Run 10			
688.46	37.0		fractured			WL - Run 11 Began 11:20 Rec 4.2' End 1:30 Loss - Time 130 min Gain - Drl time 120 min Hyd press 100-150 psi Water press - RPM 35 ± Drl Action Smooth Water ret -
687.46	38.0			100.0%	--	
686.46	39.0		1/16 in. lignite			
			Sandstone and shale: orange brown sandstone from 1/16 to 3 in. and grey shale from 1/16 to 1 in. thickness.			
685.46	40.0		fractured			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT) PROJECT HOLE NO

Hole No. WES-2-2-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 7 OF 8 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN	16. DATE HOLE — STARTED — COMPLETED
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE	18. TOTAL CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
685.46	40.0					Switched over to water coring due to long drill times. Lost water at 27 ft - sandstone is too fractured for drilling mud to prevent water loss. Will drop casing into hole after reaming hole out with 6-3/4 in. rock bit for 6-1/2 in. casing. Bottom of casing is at 39.0 ft.
			3/4 in. shale seam	100.0%	--	
684.46	41.0		Run 11			
683.46	42.0		fractured			
			Sandstone with interbedded shale seams. Sandstone is various shades of brown, uniform, fine-grained, and quartz grains predominating.			
682.46	43.0					29 August 1981
681.46	44.0		Run 12			WL - Began 11:30 End 12:15 Time 45 min Drl time 45 min Hyd press 150 psi Water press - RPM 50± Drl Action Smooth Water ret Brown Remarks - Run 12 Rec 2.95' Loss - Gain -
680.46	45.0		Sandstone: same			
			From 45.5 to 48.2 alternating grey sandstone and shale with brown sandstone. Bedding thickness averages between 1/16 to 1/2 in. Sandstone is fine-grained and moderately friable and core breaks occur in shale seams.			
679.46	46.0					
678.46	47.0			100.0%	--	[illegible] 12:45 [illegible] 1:35 [illegible] 50 min [illegible] 50 min [illegible] 150 psi [illegible] 50± [illegible] Action Smooth Water ret Brown Remarks - Run 13 Rec 4.2' Loss - Gain -
677.46	48.0		Run 13			
			- machine/mechanical fracture Brown sandstone			
676.46	49.0					
			From 49.0 to 51.1 ft grey to dark grey shale(70%) interbedded with fine-grained, grey sandstone(30%).			
675.46	50.0					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT) PROJECT HOLE NO.

Hole No. WES-2-2-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 8 OF 8 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	16. DATE HOLE — STARTED — COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
675.46	50.0		Shale(70%) with interbedded sandstone(30%)			Run 14 Begun 2:00 Rec 4.5' End 3:40 Loss 1.0' Time 90 min Gain - Drl time 90 min Hyd press 300 psi Water press - RPM 70 Drl Action Smooth Water retBrown Remarks-
674.46	51.0		0.15 ft dark grey shale			
			Shale: green in color, uniform, brittle, and soft.			
				81.8%	--	
673.46	52.0					
			Highly fractured - possibly mechanical/ machine fractured.			
672.46	53.0					
			Run 14			
			Recovered core to approximately 53.5 ft.			
671.46	54.0					
			End depth is 54.5 ft			
670.46	55.0		Blew hole dry of all water. Ran air for approximately one hour to remove water. Will monitor in morning to see if water is coming in. Water level rose to 43.0 ft overnight. Blew hole and installed well screen.			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT | HOLE NO.

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 3 Sep 81
Location Dye Burial Grounds Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 720.02 Boring No. WES-2-3-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press.	Cont.	CLASSIFICATION AND REMARKS
1	3 Sep	0.0		0.0	0.5	0.0	1.15	3" Shelby Tube	0	S.T.	Clay (CL): Brown in color, dry,
1A				0.5	1.0	1.15	1.45		20	Jar	crumbles easily, & contains frag-
				1.0	1.5				150		ments of weathered sandstone.
				1.5	2.0				300		Sample length: 1.45 ft
			2.5	2.0	2.5				350		Tube damaged in push.
				0.0	5.0	----------		7" Folding Auger	----	----	Cleanout: assumed change at 2.5'
2A	3 Sep	2.5	5.65	50.	5.65	5.0	5.65	3" Pitcher Sampler	700	Jar	Clayey sand (SC) & fragments of
											sandstone: brown in color, dry,
											friable, uniform, & very fine-grained.
	3 Sep			5.0	66.2	----------		5-5/8" Rock Bit	----	----	Cleanout: possible moisture at
											19.4 ft. Drilling indicates 0.2
											to 0.4 ft cavity at this depth.
											Checked hole for water and negative
											results. Removed small root from rock bit.

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Sheet 1 of 2 Sheets

NOTE: Extra jar sample made for NWSC

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-2-3-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
		5.65	43.7								Sandstone: brown, fine-grained
		43.7	54.7								Shale: grey/green color
		54.7	64.2								Sandstone: red/purple, fine-grained
											Limestone: grey, very hard
		64.2	66.2								
											Water level overnight rose to
											55.8 ft. Suspect water coming in
											at 54.7 ft. Blew hole dry and in-
											stalled well screen.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 4 Sep 81
Location Dye Burial Grounds Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 716.66 Boring No. WES-2-4-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press.	Cont.	CLASSIFICATION AND REMARKS
1	4 Sep	0.0		0.0	0.5	0.0	2.2	3" Shelby Tube	20	S.T.	Silt (ML): brown to grey, no
1A				0.5	1.0	2.2	2.5		20	Jar	cohesion, dry, very uniform in
				1.0	1.5				70		grain size, texture, & composition
				1.5	2.0				150		Sample length: 2.5 ft
			3.75	2.0	2.5				300		
				0.0	5.0	----	----	7" Folding Auger	----	----	Cleanout
2A	4 Sep	3.75		5.0	5.5	5.0	5.65	3" Fixed Piston Samp.	150	Jar	Silt (ML) & fragments of sand-
			5.65	5.5	5.65				700		stone: silt is same as above.
											Sandstone is friable, fine-
											grained, light brown in color.
	4 Sep	5.65	41.5	5.0	31.0	----	----	5-5/8" Rock Bit	----	----	Sandstone: brown & fine-grained
	5 Sep	41.5	43.0	31.0	50.5	----	----	5-5/8" Rock Bit	----	----	Shale: green, soft & weathered
		43.0	50.5								Shale: green & hard

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 1 of 2 Sheets

NOTE: Extra jar sample made for NWSC

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Job No. _____
Boring No. WES-2-4-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
											Encountered water at 40.5 ft.
											Drilled 10.0 ft below water.
											Blew cuttings & water from hole.
											Installed well screen.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 5 Sep 81
Location Dye Burial Grounds Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 739.24 Boring No. WES-2-5-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press.	Cont.	CLASSIFICATION AND REMARKS
1	5 Sep	0.0		0.0	0.5	0.0	1.55	3" Shelby Tube	20	S.T.	Clay (CL): brown in color, soft,
1A				0.5	1.0	1.55	1.90		20	Jar	dry, moderately cohesive, & con-
				1.0	1.5				50		tains organic matter.
				1.5	2.0				150		Sample length: 1.9 ft
				2.0	2.5				300		
				0.0	5.0	----------		7" Folding Auger	----------		Cleanout
2	5 Sep			5.0	5.5	5.0	6.1	3" Fixed Piston Sam.	100	S.T.	Clay (CL) & sandstone: clay same
2A				5.5	6.0	6.1	6.45		350	Jar	as above. Sandstone is red in
			6.45	6.0	6.45				750		color, very friable, & fine-grained.
											Sample length: 1.45 ft
	5 Sep	6.45	28.0	5.0	68.8	----------		5-5/8" Rock Bit	----------		Sandstone: red to brown, fine-
		28.0	68.8								grained. Alternating small seams
											of sandstone, shale, & limestone.
											Slightly moist at 30 ft but no water.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 1 of 2 Sheets

NOTE: Extra jar sample was made for NWSC

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-2-5-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
											Water level rose overnight to
											55.8 ft. Blew hole of water &
											cuttings. Installed well screen.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 23 Sep 81
Location Dye Burial Grounds Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 736.58 Boring No. WES-2-6-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press.	Cont.	CLASSIFICATION AND REMARKS
1	23 Sep	0.0		0.0	0.5	0.0	2.2	3" Shelby Tube	0	S.T.	Clay (CL) - brown to grey in color,
1A				0.5	1.0	2.2	2.45		0	Jar	dry, little cohesion, material
				1.0	1.5				10		disturbed by dozer.
				1.5	2.0				100		Sample length: 2.45 ft
				2.0	2.5				140		
1B	23 Sep			0.0	5.0	0.0	5.0	7" Folding Auger	--	Jar	Cleanout: Sample for NWSC -
											material same as above
2	23 Sep			5.0	5.5	5.0	6.33	3" Fixed Piston Sam.	0	S.T.	Clay (CL): same as above.
2A				5.5	6.0	6.33	6.55		20	Jar	Sample length: 1.55 ft
				6.0	6.55				550		
2B	23 Sep		9.0	5.0	9.0	5.0	9.0	7" Folding Auger		Jar	Cleanout: Sample for NWSC -
											material same as above

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-2-6-81

SAMPLE NUMBER	DATE TAKEN	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
	23 Sep	9.0	64.0	9.0	50.0	----	----	5-5/8" Rock Bit	----	----	Sandstone & interbedded shale:
											weathered, brown & dark grey in
											color, soft spot at 37 ft.
											Monitored hole for water at 50 ft
											for 40 min. & negative results.
	23 Sep	64.0	70.63	50.0	70.63	----	----	5-5/8" Rock Bit	----	----	Continued drilling & between 55
											& 60 ft encountered water.
											Shale: dark grey

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 24 Sep 81
Location Dye Burial Grounds Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 728.73 Boring No. WES-2-7-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press.	Cont	CLASSIFICATION AND REMARKS
1	24 Sep	0.0		0.0	0.5	0.0	2.0	3" Shelby Tube	0	S.T.	Sandy silt (SM): brown, dry, hard,
1A				0.5	1.0	2.0	2.15		0	Jar	& contains 5% very fine gravel.
				1.0	1.5				0		Possible dozer fill.
				1.5	2.0				20		Sample length: 2.15 ft
			4.0	2.0	2.5				100		
1B	24 Sep			0.0	5.0	0.0	5.0	7" Folding Auger		Jar	Cleanout: Material same as above.
											Sample for NWSC.
	24 Sep	4.0	9.0	5.0	40.0	------	------	5-5/8" Rock Bit	------	------	Sandstone: brown, weathered
		9.0	51.2								Sandstone & interbedded dark grey
											shale. Sandstone is brown, tan,
											grey & white, hardness varies from
											soft to very hard.
											Slight damp area at 31.3 ft. Drilled
											to 40 ft and monitored hole for
											60 min. with negative results.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-2-7-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
	24 Sep	51.2	57.3	40.0	57.3	----------		5-5/8" Rock Bit	-------		Water at approximately 46 ft.
											Material changes to dark grey
											shale with interbedded sandstone
											at 51.2 ft.
											Blew hole of water & cuttings.
											Installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 25 Sep 81
Location Dye Burial Grounds Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 730.22 Boring No. WES-2-8-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press.	Cont.	CLASSIFICATION AND REMARKS
1	25 Sep	0.0		0.0	0.5	0.0	2.25	3" Shelby Tube	0	S.T.	Silty clay (CL): light brown-brown
1A				0.5	1.0	2.25	2.45		0	Jar	in color, dry, moderate cohesion,
				1.0	1.5				0		uniform, slightly stiff.
				1.5	2.0				40		Sample length: 2.45 ft
				2.0	2.5				60		
1B	25 Sep			0.0	5.0	0.0	5.0	7" Folding Auger		Jar	Cleanout: Sample for NWSC -
											material same as above.
2	25 Sep			5.0	5.5	5.0	6.69	3" Fixed Piston Sam.	0	S.T.	Silty clay (CL): lt. brown to
2A				5.5	6.0	6.69	6.84		10	Jar	brown, dry, stiff, moderate co-
				6.0	6.5				180		hesion, uniform.
				6.5	6.84				800		Sample length: 1.84 ft
1B	25 Sep		6.84	5.0	6.84	5.0	6.84	7" Folding Auger		Jar	Cleanout: sample for NWSC -
											material same as above

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-2-8-81

SAMPLE NUMBER	DATE TAKEN	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
	25 Sep	6.84	58.0	6.84	40.0	----	----	5-5/8" Rock Bit	----	----	Sandstone & interbedded dark grey
											shale: sandstone varies from
											white, grey, brown to reddish
											brown.
											From 30 to 35.7 ft soft and slightly
											damp. Monitored for water at
											40 ft for 40 min. & negative
											results.
	25 Sep	58.0	60.1	40.0	60.1	----	----	5-5/8" Rock Bit	----	----	Shale: dark grey

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 4 Sept, 1982
Location Ammunition Burning Grounds Job No. 441-G150,11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 602.45 Boring No. WES-3-1-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
1	4 Sept	0.0		0.0	0.5	0.0	1.35	3" Shelby Tube	40	ST	Sandy clay (SC): brown in color,
1A				0.5	1.0	1.35	1.60		60	Jar	dry, moderately cohesive with
				1.0	1.5				100		approximately 30 to 40% sand
				1.5	2.0				120		which ranges from fine to very
				2.0	2.5				160		coarse.
											Sample length: 1.6 ft
			4.5	0.0	5.0	—	—	7" Solid Auger	—	—	Cleanout
2	4 Sept	4.5		5.0	5.5	5.0	5.79	3"Fixed Piston Sampler	100	ST	Clay (CL): dark grey to black in
2A				5.5	6.0	5.79	6.04		300	Jar	color, uniform composition, brittle,
				6.0	—				400		and very cohesive. Sample is
											disturbed.
											Sample length: 1.04 ft
			8.02	5.0	10.0	—	—	7" Solid Auger	—	—	Cleanout

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-3.1.81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
3	4 Sept	8.02		10.0	10.5	10.0	10.85	3"Fixed Piston Sampler	300	ST	Clay shale: dark grey-black in
3A			11.5	10.5	11.0	10.85	11.0		500	Jar	color, soft (crumbles easily),
											uniform in composition
											Slight moisture at 10.5 ft
	4 Sept	11.5	13.0	11.0	21.5			5-5/8" Rock Bit			Limestone: grey, fossiliferous,
											and fine-grained
		13.0									Sandstone: fine-grained, uniform
											composition (quartz grains), and
											friable.
											Stopped drilling at 21.5 ft to see
											if water came in overnight from
											damp spot at 10.5 ft-negative
											results on water from above inter-
											val.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-3-1-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
	5 Sept		56.2	21.5	56.2			5-5/8" Rock	Bit		Sandstone: Same
											Encountered water at 46 ft
											and drilled 10 ft below this
											depth. Blew hole of water &
											cuttings. Installed well screen.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 3 of 3 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 7 Sept. 1981
Location Ammunition Burning Grounds Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 620.68 Boring No. WES-3-2-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
1	7 Sept	0.0		0.0	1.8	0.0	1.5	3" Shelby Tube		ST	Sandy silt (SM); brown in color,
1A						1.5	1.8			Jar	dry, no cohesion with 20 to 50%
											sand and sandstone fragments.
											Sandstone is brown to red in color
			Hydrallic gauge is broken.								and friable.
											Sample length: 1.8 ft
			5.0	0.0	5.0'			7" Solid Auger			Cleanout:
2	7 Sept	5.0		5.0	7.5	5.0	7.4	5 x 6- 1/4" Dennison Barrel		ST	Sandy clay (SC) and sandstone
2A			8.25			7.4	7.5			Jar	fragments: Sandstone is brown
											to red in color, fine-grained,
											friable, and fragments range in
											size from 1/2" to 2-1/2".
											Encountered water at 7.5 ft

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-3-2-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		8.25		5.0	9.0			7" Solid Auger			Cleanout: Water from 7.5 to 9.2 ft
				9.0				3"Fixed Piston Sampler			Would not push
3A	7 Sept		9.2	9.0	9.2	9.0	9.2	7" Solid Auger		Jar	Weathered brown and grey sandstone with sandy clay (SC).
4A	7 Sept	9.2	14.0	9.2	16.0	9.2	9.8	5-5/8" Rock	Bit		Limestone: grey, very hard, fine-grained.
		14.0	16.0								Sandstone/Limestone: drill change at 14 ft, unable to determine.
											Blew hole dry of water & cuttings. Installed well screen.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 8 Sept. 1981
Location Ammunition Burning Grounds Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 580.78 Boring No. WES-3-3-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
1	8 Sept	0.0		0.0	0.5	0.0	1.23	3" Shelby Tube	120	ST	Gravelly clay (CL): dark brown
1A				0.5	1.0	1.23	1.43		120	Jar	in color, moderate cohesion,
				1.0	1.5				80		soft, and contains 10% gravel
				1.5	2.0				60		ranging from 1/6-3/4 in.
				2.0	2.5				60		Sample length: 1.43 ft
				0.0	5.0			7" Solid Auger			Cleanout
2A	8 Sept		5.5	5.0	5.5	5.0	5.5	3"Fixed Piston Sampler	-500	Jar	Clay (CL): and weathered sandstone;
											clay is same as above. Sandstone
											is brown in color, friable, and
											very fine-grained.
											See Engineer Form 1836 for core
											log- page 2

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Hole No. WES-3-3-81

DRILLING LOG	DIVISION U.S. Navy	INSTALLATION Crane, IN	SHEET 2 OF 11 SHEETS

1. PROJECT NWSC Groundwater Study	10. SIZE AND TYPE OF BIT 4 x 5-1/2 in. Diamond bit
2. LOCATION (Coordinates or Station) Ammunition Burning Grounds	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL
3. DRILLING AGENCY CEWES	12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
4. HOLE NO. (As shown on drawing title and file number) WES-3-3-81	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED zero; UNDISTURBED two
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES zero
	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	16. DATE HOLE: STARTED 8 Sept. 81; COMPLETED 17 Sept. 81
7. THICKNESS OF OVERBURDEN 5.5 ft	17. ELEVATION TOP OF HOLE 580.78 ft
8. DEPTH DRILLED INTO ROCK 95.0 ft	18. TOTAL CORE RECOVERY FOR BORING 77.3% %
9. TOTAL DEPTH OF HOLE 100.5 ft	19. SIGNATURE OF INSPECTOR Joseph B. Rinaldo

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
575.78	5.0		Overburden information on page 1			
574.78	6.0		orange brown clay			8 September 81 WL - Began 3:30 End 4:15 Time 45 min Drl time 48 min Hyd press 150-200psi Water press - RPM 50-75 Drl Action Smooth Water rot - Run 1 Rec 4.6' Loss - Gain -
573.78	7.0		orange brown in color			
572.78	8.0		Sandstone: brown in color, very uniform, fine-grained, predominately quartz grains, and moderately friable.			Remarks Cored with water.
571.78	9.0					
570.78	10.0		Run 1			
569.78	11.0					WL - Began 4:20 End 5:10 Time 40 min Drl time 40 min Hyd press 150-200psi Water press - RPM 50-75 Drl Action Smooth Water rot Run 2 Rec 5.05' Loss - Gain -
			From 11.9 to 21.85 ft, reddish brown color-iron staining.			
568.78	12.0		fractured	100%	-	
567.78	13.0		Sandstone: same as above.			Remarks Blew hole dry and monitored for water-negative results.
566.78	14.0					
565.78	15.0					

Hole No. WES-3-3-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 3 OF 11 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	16. DATE HOLE — STARTED — COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
565.78	15.0		Run 2			
			fractured and clay filled			
564.78	16.0		fractured and clay filled			9 Sept, 81
563.78	17.0		At 16.3 to 16.4 ft, interbedded organic matter. Sandstone: grey in color (begins at 16.34 ft), uniform, fine-grained quartz sand, and slightly friable.			WL - Run 3 Began 8:35 Rec 5.0' End 9:10 Loss - Time 35 min Gain - Drl time 35 min Hyd press 100psi Water press - RPM 50-75 Drl Action Smooth Water ret Brown Remarks -
562.78	18.0					
			closed break with clay			
561.78	19.0			100%	-	
560.78	20.0		Run 3			
559.78	21.0					
558.78	22.0		Sandstone; grey in color, very uniform, clean, fine-grained quartz sand, and slightly friable	100%	-	WL - Run 4 Began 9:20 Rec 4.85' End 10:00 Loss - Time 40 min Gain - Drl time 35 min Hyd press 100psi Water press - RPM 50-75 Drl Action Smooth Water ret Brown Remarks -
557.78	23.0					
556.78	24.0					
			closed break			
555.78	25.0		Run 4			

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PROJECT | HOLE NO.

Hole No. WFS-1-3-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 4 OF 11 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE — STARTED — COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
555.78	25.0		closed break			
554.78	26.0		Grey sandstone			ML - Run 5 Began 11:05 Rec 2.5' End 11:20 Loss 2.5' Time 15 min Gain - Drl time 15 min Hyd press 150psi Water press - RPM 50-70 Drl Action Smooth Water ret - Remarks Lost water at approximately 26 ft.
553.78	27.0		From 26.0 to 27.3 ft, iron nodules from 1/16 to 1/8 in. diameter.			
552.78	28.0		no recovery-possible unconsolidated sand or very weathered sandstone.			
551.78	29.0		Run 5			
550.78	30.0					
549.78	31.0			0%	-	ML- Run 6 Began 11:30 Rec 0.0 End 11:35 Loss 5.0' Time 5 min Gain - Drl time 5 min Hyd press 100psi Water press - RPM 50-70 Drl Action Smooth Water ret - Remarks Lost water-very quick drill time
548.78	32.0		no recovery- possible unconsolidated sand or very weathered sandstone.			
547.78	33.0					
546.78	34.0					
			Run 6			
545.78	35.0		fractured			

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PROJECT | HOLE NO.

Hole No. WES-3-3-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 5 OF 11 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN	16. DATE HOLE — STARTED — COMPLETED
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE	18. TOTAL CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
545.78	35.0		fractured sandstone			
544.78	36.0					Wt. - Run 7 Begun 12:30 Rec 4.6' End 1:25 Loss - Time 55 min Gain - Drl time 55 min Hyd press 100psi water press - RPM 70 Drl Action Smooth Water ret -
543.78	37.0		Limestone: grey brown in color, hard, dense, fine-grained, fossiliferous, and uniform texture			
542.78	38.0			100%	-	Remarks Refilled water tank
541.78	39.0		Run 7			
540.78	40.0					
539.78	41.0		grey clay/shale	100%	-	Wt. - Run 8 Begun 3:30 Rec 5.1' End 4:20 Loss - Time 50 min Gain - Drl time 50 min Hyd press 400psi water press - RPM 70+ Drl Action Smooth Water ret -
538.78	42.0		Limestone and interbedded grey shale: very hard, and possibly an argillaceous or shaley limestone.			Remarks -
537.78	43.0					
536.78	44.0		Run 8			
535.78	45.0					

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PROJECT | HOLE NO.

Hole No. WES-3-3-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 6 OF 11 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE — STARTED — COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
535.78	45.0					
			Limestone	100%	-	
534.78	46.0		Run 9			
			- fractured			
533.78	47.0					10 Sept. 81
			fractured			NL - Run 9 Began 9:00 Rec 1.7' End 9:30 Loss - Time 30 min Gain -
532.78	48.0					Drl time 25 min Hyd press 400psi Water press - RPM 50-70 Drl Action Smooth Water ret -
			Shale: greylsh green color (change occurs at 46.2 ft), soft, uniform, and dry.			
531.78	49.0					Remarks Bit blocked off.
530.78	50.0			100%	-	
			fractured			
529.78	51.0		Run 10			
			Green color from 51.5 to 51.6 ft			
528.78	52.0					NL - Run 10 Began 10:00 Rec 5.0' End 10:50 Loss -
			Shale: brownish grey color (change occurs at 50.25 ft), soft, uniform, and dry.			Time 50 min Gain - Drl time 50 min Hyd press 350-400psi Water press -
527.78	53.0					RPM 50 Drl Action Rough Water ret -
526.78	54.0			48.6%	-	Remarks Kept blocking off.
			no recovery			Jetted hole dry and monitored for 1 hr-no water.
525.78	55.0					

Hole No. WES-3-3-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 7 OF 11 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	16. DATE HOLE — STARTED — COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
525.78	55.0					
524.78	56.0		no recovery Run 11	48.6%	-	WL - Began 1:15 End 2:20 Time 65 min Drl time 65 min Hyd press 200-360psi Water press - RPM 70 Drl Action Rough Water ret -
523.78	57.0					
522.78	58.0		Shale: green in color, soft, dry, uniform, texture, and uniform composition.			Remarks Bit kept blocking off. Load of water.
			- fractured			11 Sept. 81
521.78	59.0			100%	-	WL - Began 8:40 End 9:50 Time 65 min Drl time 65 min Hyd press 400psi Water press - RPM 75 - 100 Drl Action Rough Water ret -
520.78	60.0		Alternating lamina of green shale and grey limestone. Individual thickness is from 1/64 in to 1/8 in.			Remarks -
519.78	61.0		Run 12			
518.78	62.0		From 61.3 to 61.7 ft, greenish grey shale and brownish grey limestone.			
517.78	63.0		Limestone: grey, hard, dense, fine-grained, and sugary texture. Microcrystals of calcite visible			WL - Began 10:30 End 11:20 Time 70 min Drl time 45 min Hyd press 400psi Water press - RPM 75-100 Drl Action Rough Water ret -
516.78	64.0		Grey brown limestone and inter-bedded green shale with thickness of 1/64 to 1/4 in.			Remarks -
515.78	65.0		Grey limestone: 2 vertical cracks show weathering	100%	-	

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PROJECT HOLE NO.

Hole No. WES-3-3-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 8 OF 11 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN	16. DATE HOLE — STARTED — COMPLETED
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE	18. TOTAL CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
515.78	65.0		Run 13			
514.78	66.0		fractured-stuck in core barrel-hammered out.			WL - Run 14 Began 11:35 Rec 4.8' End 12:10 Loss - Time 35 min Gain - Drl time 35 min Hyd press 400psi Water press - RPM 75-100 Drl Action Rough ~~Water~~ ret - Remarks -
513.78	67.0					
512.78	68.0		Shale and limestone: Complete run is fine-lamina of green shale and grey limestone. Material is moderately hard, dense, and dry.	100%	-	
511.78	69.0					WL - Run 15 Began 1:00 Rec 3.2' End 1:35 Loss - Time 35 min Gain - Drl time 35 min Hyd press 350-400psi Water press - RPM 75-100 Drl Action Rough ~~Water~~ ret -
510.78	70.0		Run 14			Remarks Blocked off- Jetted hole dry and monitored for water-no water.
509.78	71.0			100%	-	
508.78	72.0		Shale: green, soft, dry, uniform texture, and uniform composition.			WL - Run 16 Began 3:05 Rec 1.5' End 3:35 Loss 0.6' Time 30 min Gain - Drl time 30 min Hyd press 400psi Water press - RPM 50-75 Drl Action Rough ~~Water~~ ret -
507.78	73.0		Run 15			
506.78	74.0		Shale: same as above			Remarks Blocked off- Went for another load of water.
505.78	75.0		fractured	71.4%	-	

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PROJECT | HOLE NO.

Hole No. WES-3-3-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 9 OF 11 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	16. DATE HOLE — STARTED — COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
505.78	75.0		fractured Run 16			12 Sept 81 Ml. - Begun 9:30 Run 17 End 10:05 Rec 10' Time 35 min Loss - Drl time 35 min Gain - Hyd press 280-440psi Water press - RPM 50-75 Drl Action Rough Water ret -
504.78	76.0		Shale: same as above Run 17	100%	-	
503.78	77.0		Shale: same as above			Remarks Blocked off-used carba-loid bit
502.78	78.0		fractured			Ml. - Begun 10:35 Run 18 End 12:05 Rec 2.0' Time 90 min Loss 3.0' Drl time 80 min Gain - Hyd press 350-400psi Water press - RPM 50-75 Drl Action Rough Water ret -
501.78	79.0			100%	-	
500.78	80.0		no recovery			Remarks Went back with diamond bit
499.78	81.0		Run 18			Ml. - Begun 1:00 Run 19 End 2:00 Rec 1.0' Time 60 min Loss 1.7' Drl time 40 min Gain - Hyd press 300-400psi Water press - RPM 70 Drl Action Rough Water ret -
498.78	82.0		fractured Shale: same as above			Remarks Broke drill stem. Recovered with fishing tool.
497.78	83.0		no recovery	37.0%	-	Ml. - Begun 3:00 Run 19 End 3:25 Rec 1.7' Time 25 min Loss - Drl time 20 min Gain - Hyd press 300-400psi Water press - RPM 50-75 Drl Action Smooth Water ret -
496.78	84.0		Run 19			
495.78	85.0		Shale: dark grey in color.	100%	-	Remarks Used 3 in. Pitcher Sampler

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT) PROJECT HOLE NO.

Hole No. WES-3-3-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 10 OF 11 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE — STARTED — COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
495.78	85.0		Shale: dark grey in color, soft, uniform, and dry. Run 20			Hl. - Run 21 Begun 3:40 Rec 1.3' End 3:50 Loss - Time 10 min Gain - Drl time 8 min Hyd press 300-400psi Water press - RPM 50-75 Drl Action Smooth Water ret -
494.78	86.0		Shale: same	100%		
493.78	87.0		Run 21 Hole fell in, cleanout with rock bit.			Remarks Hard rock at 86.9 ft. Used Pitcher Sampler.
						14 Sept. 81
492.78	88.0		no recovery	0.0%	-	Hl. - Run 22 Begun 12:25 Rec 0.0' End 1:50 Loss 1.8' Time 105 min Gain - Drl time 80 min Hyd press 300-450psi Water press - RPM 50 Drl Action Smooth Water ret -
491.78	89.0		Run 22			
490.78	90.0		Run 23	70%	-	Remarks Blocked off. Pitcher Sampler.
489.78	91.0		From 89.35 to 91.0, sand: brown, fine-grained, uniform unconsolidated, with approximately 70 % quartz and 30% miscellaneous grains Shale: grey, uniform, dry	100%	-	Hl. - Run 23 Begun 2:45 Rec 0.7' End 3:30 Loss 0.3' Time 45 min Gain - Drl time 30 min Hyd press 400psi Water press - RPM 50-75 Drl Action Smooth Water ret -
488.78	92.0		Run 24			Remarks Pitcher Sampler
487.78	93.0		From 92.0 to 92.5, sand: brown, fine-grained, and unconsolidated. From 92.5 to 92.9, sand: grey, coarse-grained, and unconsolidated. Shale: grey, uniform, and dry			Hl. - Run 24 Begun 4:15 Rec 2.0' End 4:50 Loss - Time 30 min Gain - Drl time 30 min Hyd press 400psi Water press - RPM 50-75 Drl Action Smooth Water ret -
486.78	94.0		Run 25			
485.78	95.0		no recovery			Remarks Pitcher Sampler

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PROJECT HOLE NO.

Hole No. WES-3-3-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 11 OF 11 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE — STARTED — COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
485.78	95.0		fractured			15 Sept, 81 WL - Began 8:50 Run 25 End 9:20 Rec 1.8' Time 30 min Loss 0.5' Drl time 20 min Gain - Hyd press 400psi Water press - RPM 75 Drl Action Smooth Water ret - Remarks Pitcher Sampler
			Grey shale			
484.78	96.0		Run 26			
483.78	97.0		no recovery	52.0%	-	
			Sand: grey to brown, fine to medium grained, and unconsolidated			WL - Began 9:35 Run 26 End 10:00 Rec 1.3' Time 25 min Loss 0.7' Drl time 25 min Gain - Hyd press 400psi Water press - RPM 70 Drl Action Smooth Water ret - Remarks Pitcher Sampler
482.78	98.0		Grey shale			
			Run 27			
481.78	99.0		no recovery: drill action indicated shale:	16.6%	-	
480.78	100		Grey shale Run 28			WL - Began 10:20 Run 27 End 10:50 Rec 1.3' Time 30 min Loss 1.2' Drl time 28 min Gain - Hyd press 400psi Water press - RPM 70 Drl Action Smooth Water ret - Remarks Pitcher Sampler
			Ran rock bit to bottom and cleaned out hole. Jetted hole dry after making repairs to jet. Installed well screen.			WL - Began 11:15 Run 28 End 11:45 Rec 0.3' Time 30 min Loss 1.5' Drl time 20 min Gain - Hyd press 400psi Water press - RPM 50-70 Drl Action Smooth Water ret - Remarks Pitcher Sampler

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT | HOLE NO.

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 24 Sept. 1981
Location Ammunition Burning Grounds Job No 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 592.12 Boring No. WES-3-4-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
1	24 Sept	0.0		0.0	0.5	0.0	1.3	3" Shelby Tube	240	ST	Sandy silt (SM) and gravel: brown
1A				0.5	1.0	1.3	1.5		320	Jar	in color, dry, with hard fragments
				1.0	1.5				460		of sandstone and silt. Composition
											is varied.
											Sample length: 1.5 ft
			5.0	0.0	5.0			7" Solid Auger			Cleanout: Hardness increasing
											with depth.
	24 Sept	5.0	11.0	5.0	20.5			5-5/8" Rock Bit			Gravel, sand, and weathered sand-
											stone
		11.0	21.0								Sandstone
		21.0	23.5								Limestone: white in color and
											hard
	25 Sept	23.5	34.2	20.5	70.0			5-5/8" Rock Bit			Sandstone: Reddish brown and
											weathered
		34.2	49.5								Sandstone: Hard

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BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-3-4-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
											Slightly softer from 40.5 to 42 ft
		49.5	59.0								Limestone: very hard cutting
		59.0	70.0								Sandstone or shale; Material is
											soft-easy drilling.
	26Sept										Water in hole to depth of 45.55 ft
	26Sept		No indication of moisture or water was noted during								drilling. Blew hole dry and
			attempted to determine the depth at which water is								entering boring. Was unable to
			see where water is coming from. Packed boring with								sand to depth of 60 ft and
			bentonite to depth of 57 ft. Sealed lower portion								of boring to determine if water is
			coming in above 57 ft. On 28 September 81, no water was noted. Drilled sand and								
			bentonite plug from boring and installed well on bottom of hole.								

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 29 Sept. 1981
Location Ammunition Burning Grounds Job No 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 593.25 Boring No. WES-3-5-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
1	29Sept	0.0		0.0	0.5	0.0	1.25	3" Shelby Tube	120	ST	Sandy silt(SM): brown in color,
1A				0.5	1.0	1.25	1.50		240	Jar	dry, slight cohesion and 30% fine
			7.0	1.0	1.5				400		to coarse sand.
	29Sept			0.0	47.0	—	—	5-5/8" Rock	Bit	—	
		7.0	12.0								Sandstone: soft & brown
		12.0	16.5								Sandstone: Moderately hard & brown
		16.5	20.0								Sandstone: reddish brown & soft
		20.0	32.0								Sandstone & Shale: medium hard &
											brown to grey
		32.0	34.0								Sandstone & Shale: very hard
	30Sept			47.0	60.0	—	—	5-5/8" Rock	Bit	—	Water rose overnight to depth of
											46.5 ft.
		34.0	47.0								Sandstone & Shale: med. hard
		47.0	55.0								Sandstone/Limestone: very hard
		55.0	60.0								Shale: grey to green color & soft
											Monitored hole for 2 hours and

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BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-3-5-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
											water came up 0.7 ft. Water was
											visible in bottom of boring and
											bubbling.
											Installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 6 Oct. 1981
Location Ammunition Burning Grounds Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 587.60 Boring No. WES-3-6-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	6 Oct	0.0		0.0	0.5	0.0	1.75	3" Shelby Tube	60	ST	Sandy clay(CL); brown in color,
1A				0.5	1.0	1.73	1.98		60	Jar	stiff, dry, and 1-10% fine gravel
				1.0	1.5				100		and 30-40% sand.
				1.5	2.0				180		Sample length: 1.98
				2.0	2.5				280		
	6 Oct		3.4	0.0	3.4	—	—	7" Solid Auger	—	—	Cleanout: Hard rock at indicated
											depth.
	7 Oct	3.4	8.5	3.4	52.7	—	—	5-5/8" Rock	Bit	—	Sandstone: soft, brown
		8.5	9.5								Sandstone: soft, red
		9.5	13.2								Sandstone: soft, brown
		13.2	14.5								Sandstone: soft, red
		14.5	22.5								Sandstone: soft, brown
		22.5	24.0								Sandstone: soft, red
		24.0	37.5								Sandstone: soft, brown
		37.5	52.7								Limestone: Hard & possibly fractured
											from 39.0'. Water encountered

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____

Location Job No

Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES3-6-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
											around 42 ft. Installed well
											screen.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 8 Oct, 1981
Location Ammunition Burning Grounds Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 554.65 Boring No. WES-3-7-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
1	8 Oct	0.0		0.0	0.5	0.0	0.72	3" Shelby Tube	100	ST	Sandy clay (CL): dark brown in
1A				0.5	1.0	0.72	0.90		140	Jar	color, low plasticity, soft, and
				1.0	1.5				180		with 20 to 30% fine to coarse sand
				1.5	2.0				220		& fine gravel.
				2.0	2.5				300		Sample length: 0.90 ft
								7" Solid Auger			Cleanout:
				0.0	5.0						
2	8 Oct			5.0	5.5	5.0	6.24*	3"Fixed Piston Sampler	50	ST	Sandy clay (CL): same as above.
2A				5.5	6.0	6.24	6.44		50	Jar	
				6.0	6.5				100		
				6.5	7.0				140		Sample length: 1.44 ft
				7.0	7.5				200		
								7" Solid Auger			Cleanout:
				5.0	10.0						

Sheet 1 of 3 Sheets

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

*3" Fixed Piston Sampler = 3" F.P.S.

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-3-7-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
3	8 Oct			10.0	10.5	10.0	11.57	3" F.P.S.	25	ST	Sandy clay (CL): same except sand
3A				10.5	11.0	11.57	11.77		50	Jar	& gravel content increased to
				11.0	11.5				75		approx. 40 to 50%.
				11.5	12.0				140		Sample length: 1.77 ft
			13.0	12.0	12.5				180		
		13.0		10.0	15.0	—	—	7" Solid Auger	—	—	Cleanout; stratum change assumed
4	8 Oct			15.0	15.5	15.0	16.33	3" F.P.S.	50	ST	Sandy gravel (GC): brown in color
4A				15.5	16.0	16.33	16.59		120	Jar	with 50% fine to coarse sandstone
				16.0	16.5				260		fragments and 50% sand and clay.
			17.0	16.5	17.0				300-500		
											Sample length: 1.59 ft
	8 Oct			15.0	28.0	—	—	5-5/8" Rock	Bit	—	Water at 17.5-18.0 ft
		17.0	22.2								Sandstone: weathered, brown, & soft
		22.2	24.0								Limestone: grey, hard, & fine-
											grained

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 3 Sheets

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-3-7-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
		24.0	28.0								Shale: dark grey & moderately
											soft
	9 Oct										Installed well after blowing hole
											of water & fall in.

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Sheet 3 of 3 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 9 Oct. 1981
Location Ammunition Burning Grounds Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 584.26 Boring No. WES-3 8-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
1	9 Oct	0.0		0.0	0.5	0.0	1.86	3" Shelby Tube	50	ST	Clay (CL): grey brown in color,
1A				0.5	1.0	1.86	2.06		100	Jar	soft, low plasticity, uniform,
				1.0	1.5				120		organic matter, and dry.
				1.5	2.0				140		Sample length: 2.06 ft
			3.0	2.0	2.5				180		
		3.0									
				0.0	5.0	—	—	7" Solid Auger	—	—	Cleanout
2	9 Oct			5.0	5.5	5.0	6.01	3" Fixed Piston Samp	100	ST	Gravelly sand (SW): brown in color
2A				5.5	6.0	6.01	6.21		180	Jar	with fine to coarse grained sand
			6.5	6.0	6.5				300-540		and sandstone fragments & dry.
											Sample length: 1.21 ft
	9 Oct	6.5	14.3	5.0	48.0	—	—	5-5/5" Rock	Bit	—	Weathered brown sandstone inter-
											bedded with shale.
		14.3	17.0								Sandstone: brown, soft

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location Job No.
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-3-8-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
		17.0	24.3								Sandstone: hard, brown
		24.3	36.0								Sandstone: light tan, moderately
											hard
		36.0	48.0								Limestone: hard, grey
											Encountered water between 37 & 38
											ft. Blew hole dry & installed
											well.
											Note: Water in this hole is very
											slow. Not similar to well no.
											6 & 5 where boring made water
											at faster rate.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 28 Oct. 1981
Location Ammunition Burning Grounds Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 625.25 Boring No. WES-3-9-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
1	28 Oct	0.0		0.0	0.5	0.0	0.89	3" Shelby Tube	50	ST	Sandy clay (CL) and sandstone
1A				0.5	1.0	0.89	1.14		120	Jar	fragments: brown in color, dry,
				1.0	1.5				160		and low plasticity. Sand ranges
				1.5	2.0				160		from fine to coarse-grained.
				2.0	2.5				180		Sample length: 1.14 ft
				0.0	5.0			7" Solid Auger			Cleanout
2A	28 Oct		5.8	5.0	5.5	5.0	5.8	3"Fixed Piston Sampler	200	Jar	Sandy clay (CL) and sandstone.
				5.5	5.8				700		
	28 Oct	5.8	8.5	0.0	18.7			6 3/4" Rock Bit			Sandstone: brown, soft, weathered.
	29 Oct	8.5	11.0	0.0	18.7			8 3/4" Rock Bit			Sandstone: brown, rough drilling-
				Cemented 8" schedule 40 PVC Pipe to							contains boulders, clay, and water.
		11.0	11.8	depth of 11.9 ft. Telescoped 6" thin-							Sandstone: brown and hard.
		11.8	16.8	wall casing to 18.7 ft and cemented in							Limestone: light grey and hard.
		16.8	17.5	place. Casing, will seal off water							Shale: grey and soft.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-3-9-81

SAMPLE NUMBER	DATE TAKEN	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
				found in overburden.							
		17.5	20.0								Limestone: light grey and hard
	31 Oct			18.7	59.5			5-5/8" Rock Bit			Drilled through grout in 6 and 8"
											Casing.
		20.0	39.8								Shale: grey and medium hard
		39.8	45.3								Sandstone: light grey and hard
		45.3	47.7								Limestone: light grey and hard
		47.7	48.0								Sandstone: light brown
		48.0	49.2				48.5	ft slight moisture-			Shale: dark grey and medium hard
		49.2	51.3				no water after 90 min				Sandstone: light grey
		51.3	52.0								Shale: dark grey
		52.0	63.7								Sandstone: brown and hard
		63.7	65.0								Limestone: grey and hard
		65.0	70.0								Sandstone: light grey and hard
		70.0	73.5				70.5	ft encountered water			Sandstone: light grey and soft
		73.5	80.5								Sandstone: light grey and hard
											Installed well screen.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

Pump House (Bld. 3004) - Ammunition Burning Grounds

1. Driller: W. W. Mardis
2. Date Drilled: Jan. 9, 1942
3. Depth of Well: 141 ft
4. Casing Depth: 102 ft Diameter: 8 in
5. Elevation of Casing Plate: 594.79 ft
6. Water Depth: 120 ft
7. Remarks:

   8-in. hole to 100 ft - reduced to 7-in.

   Water height in well - 20 ft
8. Well Log:

   0 to 90 ft - No information

   90 to 141 ft - Sandstone

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 9 Sept. 1981
Location McComish Gorge Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 603.49 Boring No. WES-4-1-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	9 Sept	0.0		0.0	0.5	0.0	2.08	3" Shelby Tube	0	ST	Silt (ML): brown in color, slightly
1A				0.5	1.0	2.08	2.23		0	Jar	moist, little cohesion, slight
				1.0	1.5				0		gritty feal, and contains organic
				1.5	2.0				20		matter.
				2.0	2.5				120		Sample length: 2.23 ft
			5.0	0.0	5.0			7" Folding Auger			Cleanout
2	9 Sept	5.0		5.0	5.5	5.0	6.55	*3"Fixed Piston Sampler	0	ST	Silty sand (SM): reddish brown in
2A				5.5	6.0	6.55	6.75		0	Jar	color, very uniform, fine-grained,
				6.0	6.5				0		little cohesion, and dry.
				6.5	7.0				20		
				7.0	7.4				80		Sample length: 1.75 ft
				5.0	70.0			*7" Hollow-stem Auger			Cleanout

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

*3" Fixed Piston Sampler = 3" F.P.S.
*7" Hollow Stem Auger = 7" H.S. Auger

Sheet 1 of 5 Sheets

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-4-1-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
3	9 Sept			10.0	10.5	10.0	10.3	3" F.P.S.	0	ST	Silty sand (SM): reddish brown in
3A				10.5	11.0	10.3	10.6		20	Jar	color, uniform, fine-grained (pre-
				11.0	11.5				40		dominately quartz), little cohesion,
				11.5	12.0				50		and dry.
				12.0	12.5				700		Sample length: 0.6 ft- Sample fell
											back into hole.
			14.0	70.0	15.0	—	—	7" H.S. Auger		—	Cleanout: assumed stratum change.
4	9 Sept	14.0		15.0	15.5	15.0	16.97	3" F.P.S.	0	ST	Gravelly sand (SP): reddish brown
4A				15.5	16.0	16.97	17.20		20	Jar	in color, fine to coarse-grained
				16.0	16.5				80		sand, very fine gravel, slightly
				16.5	17.0				120		moist, and no cohesion.
				17.0	17.5				140		Sample length: 2.2 ft
			19.0	15.0	20.0	—	—	7" H.S. Auger		—	Cleanout: assumed stratum change.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-4-1-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
5	9 Sept	19.0		20.0	20.5	20.0	22.05	3" F.P.S	0	ST	Sand (SP): brown in color, fine
5A				20.5	21.0	22.05	22.3		10	Jar	to medium grained, slight moisture,
				21.0	21.5				30		very little cohesion, and 80-90%
				21.5	22.0				60		quartz sand.
				22.0	22.5				90		Sample length: 2.3 ft
			24.0	20.0	25.0	—	—	7" H.S. Auger		—	Cleanout: assumed stratum change
6	9 Sept	24.0		25.0	25.5	25.0	27.08	3" F.P.S.	0	ST	Silty sand (SM): brown in color,
				25.5	26.0	27.08	27.3		50	Jar	fine-grained, slight moisture, little
				26.0	26.5				100		cohesion, and contains 30% silt.
				26.5	27.0				160		
				27.0	27.5				180		Sample length: 2.3 ft
			30.0	25.0	30.0	—	—	7" H.S. Auger		—	Cleanout: assumed stratum change

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-4-1-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
7A	9 Sept	30.0		30.0	30.5	30.0	30.3	3" F.P.S.	0	Jar	Recovered 0.3 ft of very moist
				30.5	31.0				10		sand/silt: brown in color, very
				31.0	31.5				20		fine-grained, and slight cohesion.
				31.5	32.0				50		Will attempt again at 32.5 ft.
				32.0	32.5				80		
				30.0	32.5			7" H.S. Auger			Cleanout
8	9 Sept			32.5	33.0	32.5	33.3	3" F.P.S.	0	ST	Silt (ML): very moist, brown in
8A				33.0	33.5	33.3	33.6'		20	Jar	color, moderately cohesive, and
				33.5	34.0				30		contains 1-2% very fine gravel.
				34.0	34.5				40		Sample length: 1.1 ft
				34.5	35.0				80		Lost 1.4 ft
			37.5	32.5	37.5			7" H.S. Auger			Cleanout

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-4-1-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
9	9 Sept	37.5		37.5	38.0	37.5	39.55	3" F.P.S.	0		Clay silt: grey in color, moist
9A				38.0	38.5	39.55	39.8		40		and moderately cohesive.
				38.5	39.0				190		
				39.0	39.5				230		Sample length: 2.3 ft
				39.5	39.85				300		
				37.5	40.0			7" H.S. Auger			Cleanout
10	10Sept			40.3	40.8	40.3	42.48	3" F.P.S.	0	ST	Clay silt: same moist
10A				40.8	41.3	42.48	42.63		0	Jar	
				41.3	41.8				0		
				41.8	42.3				10		Sample length: 2.33 ft
			42.7	42.3	42.7				20		
	10Sept										Pulled auger and installed well
											screen.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 5 of 5 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 10 Sept. 1981
Location McComish Gorge Job No. 441-G150,11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 585.69 Boring No. WES-4-2-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	10Sept	0.0		0.0	0.5	0.0	1.27	3"Shelby Tube	280	ST	Gravelly sand (SP): brown in
1A				0.5	1.0	1.27	1.47		240	Jar	color, dry, fine to coarse
				1.0	1.5				300		grained with 20% fine to medium
				1.5	2.0				330		gravel, and no cohesion.
				2.0	2.5				350		Sample length: 1.47 ft
				0.0	5.0			7" Folding Auger			Cleanout
2	10Sept			5.0	5.5	5.0	5.9	*3"Fixed Piston Sampler	0	ST	Gravelly sand (SP): brown in
2A				5.5	6.0	5.9	6.1		20	Jar	color, dry, fine to medium
				6.0	6.5				40		grained with 10% fine gravel and
				6.5	7.0				60		little cohesion.
											Sample length: 1.1 ft- suspect
											loss
			8.0	5.0	10.0			*7"Hollow Stem Auger			Cleanout

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

*3" Fixed Piston Sampler = 3" F.P.S.
*7" Hollow Stem Auger = 7" H.S. Auger

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-4-2-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
3	10Sept	8.0		10.0	10.5	10.0	11.97	3" F.P.S.	12	ST	Silty sand (SM): brown in color,
3A				10.5	11.0	11.97	12.23		20	Jar	slight moisture, and slight
				11.0	11.5				30		cohesion.
				11.5	12.0				90		Last foot is fine-grained.
				12.0	12.5				150		Sample length: 2.23 ft
				70.0	15.0			7" H.S. Auger			Cleanout
4	11Sept		15.0	15.0	15.5	15.0	16.60	3" F.P.S.	0	ST	Clay silt (ML): brown in color,
4A		15.0		15.5	16.0	16.60	16.85		20	Jar	moderately cohesive, and slight
				16.0	16.5				40		moisture. Lost last 0.4 ft
				16.5	17.0				100		Sample length: 1.85 ft
				17.0	17.5				180		
				15.0	20.0			7" H.S. Auger			Cleanout

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-4-2-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
	11Sept			20.0	20.5	See below		3" F.P.S.	20		Lost sample.
				20.5	21.0				20		
				21.0	21.5				50		
				21.5	22.0				70		
				22.0	22.5				130		
5A	11Sept			20.0	21.5	20.0	21.5	Standard Splitspoon	—	Jar	Pushed splitspoon-clay silt (ML)
											brown in color, moderately
											cohesive, and moist. Water was
											visible in bottom of hole.
			22.0	20.0	25.0	—	—	7" H.S. Auger		—	Cleanout: stratum change assumed
6	11Sept	22.0		20.0	25.5	25.0	27.05	3" F.P.S.	0	ST	Silty sand (SM): grey in color,
6A				25.5	26.0	27.05	27.35		10	Jar	very fine-grained sand, uniform,
				26.0	26.5				50		moderately cohesive, and moist.
				26.5	27.0				100		Sample length: 2.35 ft

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-4-2-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
				27.0	27.4				160		
				25.0	30.0			7" H.S. Auger			Cleanout
7	11Sept			30.0	30.5	30.0	32.05	3" F.P.S.	10	ST	Silty sand (SM): brown in color,
7A				30.5	31.0	32.05	32.35		20	Jar	very fine-grained, moderate
				31.0	31.5				80		cohesion, and moist.
				31.5	32.0				120		Sample length: 2.35 ft
			32.4	32.0	32.4				170		
											Left hole open overnight to
											monitor water level. Water on
											12 Sept. 81, was at 19.9 ft.
											Installed well through auger.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 4 of 4 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 12 Sept, 1981
Location McComish Gorge Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 566.22 Boring No. WES-4-3-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press Wt. Kelly	Cont	CLASSIFICATION AND REMARKS
1	12Sept	0.0		0.0	0.5	0.0	2.08	3" Shelby Tube		ST	Silty sand (SM): brown in color,
1A				0.5	1.0	2.08	2.28		0	Jar	damp, fine-grained, and moderate
				1.0	1.5				20		cohesion. Sand equals 60 to 70%
				1.5	2.0				60		and silt equals 30 to 40%.
				2.0	2.5				120		Sample length: 2.28 ft
			4.5	0.0	5.0			7" Folding Auger			Cleanout
2	12Sept	4.5		5.0	5.5	5.0	7.13	*3"Fixed Piston Sampler	0	ST	Silty sand (SM): grey in color,
2A				5.5	6.0	7.13	7.38		10	Jar	damp to moist, fine-grained, and
				6.0	6.5				20		moderate cohesion. Sand equals
				6.5	7.0				20		60%-70% and silt equals 30%-40%.
				7.0	7.5				20		Believe water starts at 5.5 ft.
											Sample length: 2.38 ft
				5.0	10.0			*7" Hollow Stem Auger			Cleanout

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

*3" Fixed Piston Sampler = 3" F.P.S.
*7" Hollow Stem Auger = 7" H.S. Auger

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-4-3-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
3	12Sept			10.0	10.5	10.0	12.3	3" F.P.S	0	ST	Silty sand (SM): same as in no.2
3				10.5	11.0	11.83	12.13		10	Jar	except for more moisture.
				11.0	11.5				50		
				11.5	12.0				120		Sample length: 2.28 ft
				12.0	12.4				160		
			15.0	10.0	15.0	—	—	7" H.S. Auger		—	Cleanout
											When pulling weight out of hollow
											stem auger, acted as piston and
											sucked sand in behind. Cleaned
											out several times with same result.
											Used splitspoon to get sample of
											material and confirm if sample
											was wet.
4A	12Sept	15.00	17.0	15.0	17.0	15.0	17.0	*Splitspoon			Silty sand (SM): grey in color,
											saturated, and fine-grained.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

*Splitspoon = 1-7/8" I.D. x 2 1/2" O.D.

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-4-3-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
											Installed well through auger.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 3 of 3 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 28 Sept. 1981
Location McComish Gorge Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 593.14 Boring No. WES-4-4-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
1	28Sept	0.0		0.0	0.5	0.0	2.26	3" Shelby Tube	0	ST	Clay (CL): brown in color, dry,
1A				0.5	1.0	2.26	2.45		0	Jar	uniform, slightly stiff, with
				1.0	1.5				0		slight to moderate cohesion.
				1.5	2.0				0		Sample length: 2.45 ft
				2.0	2.5				10		
				0.0	5.0			7"Folding Auger			Cleanout
2	28Sept			5.0	5.5	5.0	6.64	*3"Fixed Piston Sampler	0	ST	Clay (CL): same as above.
				5.5	6.0	6.64	6.82		20	Jar	
				6.0	6.5				90		Sample length: 1.82 ft
				6.5	7.0				130		
				7.0	7.35				200		
			10.0	5.0	10.00			*7"Hollow Stem Auger			Cleanout: stratum change assumed

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

*3" Fixed Piston Sampler = 3" F.P.S.
*7" Hollow Stem Auger = 7" H.S. Auger

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-4-4-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
3	28Sept	10.0		10.0	10.5	10.0	12.19	3" F.P.S	0	ST	Silt (ML): brown, uniform, dry,
3A				10.5	11.0	12.19	12.36		0	Jar	and slight cohesion.
				11.0	11.5				140		Sample length: 2.36 ft
				11.5	12.0				160		
				12.0	12.38				210		
			13.5	10.0	15.0			7" H.S. Auger			Cleanout
4	28Sept	13.5		15.0	15.5	15.0	16.7	3" F.P.S.	0	ST	Sand (SP): reddish brown in
				15.5	16.0	16.7	17.0		10	Jar	color, dry, fine-grained, and
				16.0	16.5				20		no cohesion.
				16.5	17.0				60		Sample length: 2.00 ft
				17.0	17.5				90		
				15.0	20.0			7" H.S. Auger			Cleanout

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-4-4-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
5	28Sept			20.0	20.5	20.0	22.08	3" F.P.S.	0	ST	Sand (SP): brown in color, fine-
5A				20.5	21.0	22.08	22.4		0	Jar	grained, dry, and very uniform
				21.0	20.5				0		quartz sand.
				20.5	22.0				10		Sample length: 2.35 ft
				22.0	22.4				120		
				20.0	25.0			7" H.S. Auger			Cleanout
6				25.0	25.5	25.0	26.50	3" F.P.S.	0	ST	Sand (SP): brown in color, very
6A	28Sept			25.5	26.0	26.50	26.80		0	Jar	fine-grained, wet, and uniform.
				26.0	26.5				10		Water in hollow stem auger at
				26.5	27.0				30		26.89 ft.
				27.0	27.41				70		Sample length: 1.8 ft
				25.0	30.0			7" H.S. Auger			Cleanout: when pulling plug
											from auger, sand came in.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-4-4-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
7	28Sept			27.8	28.3	27.8	29.90	3" F.P.S.	0	ST	Sand (SP): brown, fine-grained,
				28.3	28.8	29.90	30.40		0	Jar	and wet.
				28.8	29.3				0		Sample length: 2.40 ft
				29.3	29.8				0		
				29.8	30.3				40		
				30.0	35.0			7" H.S. Auger			Cleanout
8	28Sept		36.25	35.0	35.5	35.0	37.05	3" F.P.S.	30	ST	Clay (CL): grey in color, soft,
8A		36.25		35.5	36.0	37.05	37.30		70	Jar	very uniform in texture, and
				36.0	36.5				100		uniform consistency.
				36.5	37.0				120		Sample length: 2.30 ft
			37.4	37.0	37.4				120		
											Installed well through auger.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 4 of 4 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 30 Sept. 1981
Location McComish Gorge Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 573.39 Boring No. WES-4-5-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd, Press	Cont	CLASSIFICATION AND REMARKS
1	30Sept	0.0		0.0	0.5	0.0	1.8	3" Shelby Tube	0	ST	Sandy clay (CL): brown in color,
1A				0.5	1.0	1.8	1.95		0	Jar	moderate cohesion, soft, and
				1.0	1.5				0		contains 20-30% fine-grained sand.
				1.5	2.0				10		Sample length: 1.95 ft
				2.0	2.55				10		
				0.0	5.0			7" Folding Auger			Cleanout
2	30Sept			5.0	5.5	5.0	6.36	*3"Fixed Piston Sampler	0	ST	Sandy clay (CL): brown in color,
				5.5	6.0	6.36	6.56		0	Jar	moderate cohesion, soft, and con-
				6.0	6.5				0		tains 40% fine to coarse-grained
				6.5	7.0				0		sand.
				7.0	7.41				10		Sample length: 1.56 ft
			7.5	5.0	70.0			*7" Hollow Stem Auger			Cleanout

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

*3" Fixed Piston Sampler = 3" F.P.S.
*7" Hollow Stem Auger = 7" H.S. Auger

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-4-5-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
3	30Sept	7.5		10.0	10.5	10.0	11.10	3" F.P.S.	0	ST	Silty sand (SM): dark grey to
3A				10.5	11.0	11.10	11.70		0	Jar	black in color, wet, slight cohesion,
				11.0	11.5				0		and trace of odor (organic/oily).
				11.5	12.0				10		Sample length: 2.21 ft
				12.0	12.42				10		Water at 9.5 ft after 30 min
			13.5	10.0	15.0			7" H.S. Auger			Cleanout: material came in when
											pulling plug from auger.
		13.5		14.3	14.8	14.3	16.0	3" F.P.S.	80	ST	Sandy gravel (GW): grey in color,
				14.8	15.3	16.0	16.35		110	Jar	wet, coarse sand (30%) and fine
				15.3	15.8				115		to medium angular to rounded,
				15.8	16.3				130		unsorted gravel.
			15.0	16.3	16.71				130		Sample length: 2.35 ft
				15.0	20.0			7" H.S. Auger			Cleanout: material came in when
											pulling plug from auger.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-4-5-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER	Hyd, Press	Cont	CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
5	30Sept	15.0		18.6	19.1	18.6	20.05	3" F.P.S.	70	ST	Silty sand (SM): grey in color,
5A				19.1	19.6	20.05	20.35		210	Jar	wet, no cohesion, and uniform.
				19.6	20.1				220		Sample length: 1.75 ft
				20.1	20.6				380		
			20.91	20.6	20.91				450		
											Installed well through auger.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 3 of 3 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 8 Oct. 1981
Location McComish Gorge Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 579.54 Boring No. WES-4-6-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	8 Oct	0.0		0.0	0.5	0.0	2.14	3" Shelby Tube	0	ST	Sand (SP): reddish brown in color,
1A				0.5	1.0	2.14	2.36		0	Jar	slight cohesion, dry, uniform, and
				1.0	1.5				0		fine-grained.
				1.5	2.0				50		Sample length: 2.36 ft
				2.0	2.5				140		
				0.0	5.0	—	—	7" Folding Auger		—	Cleanout
2	8 Oct			5.0	5.5	5.0	7.08	*3"Fixed Piston Sampler	0	ST	Sand (SP): brown in color, slight
2A				5.5	6.0	7.08	7.34		0	Jar	cohesion, dry, uniform, and fine
				6.0	6.5				0		to medium (10-15%) grained.
				6.5	7.0				0		Sample length: 2.34 ft
			10.0	7.0	7.4				0		
				5.0	10.0	—	—	*7" Hollow Stem Auger		—	Cleanout

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

*3" Fixed Piston Sampler = 3" F.P.S.
*7" Hollow Stem Auger = 7" H.S. Auger

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-4-6-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
3	8 Oct	10.0		10.0	10.5	10.0	11.71	3" F.P.S.	0	ST	Silty sand (SM): brown in color,
3A				10.5	11.0	11.71	12.31		0	Jar	very fine-grained, uniform, slightly
				11.0	11.5				0		damp, and little cohesion.
				11.5	12.0				0		Sample length: 2.31 ft
				12.0	12.4				0		
				10.0	15.0			7" H.S. Auger			Cleanout
4	8 Oct			15.0	15.5	15.0	17.17	3" F.P.S.	0	ST	Silty sand (SM): brown in color,
4A				15.5	16.0	17.17	17.38		0	Jar	very fine-grained, moist, uniform,
				16.0	16.5		Water	at 17.35	0		and slight cohesion,
				16.5	17.0				0		Sample length: 2.38 ft
				17.0	17.38				0		
				15.0	20.0			7" H.S. Auger			Cleanout: material came in when
											pulling plug from auger.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-4-6-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
5	8 Oct			19.5	20.0	19.5	20.35	3" F.P.S.	0	ST	Silty sand (SM): same as in pre-
5A				20.0	20.5	20.35	20.6		0	Jar	vious sample-moist.
				20.5	21.0				0		Sample length: 1.1 ft
				21.0	21.5				0		
				21.5	21.9				0		
				20.0	25.0			7" H.S. Auger			Cleanout: material came in when
											pulling plug from auger.
6	8 Oct			24.2	24.7	24.2	26.36	3" F.P.S.	0	ST	Silty sand (SM): brown to grey in
6A				24.7	25.2	26.36	26.56		20	Jar	color, fine-grained, slight cohesion,
				25.2	25.7				50		uniform, and damp.
				25.7	26.2				100		Sample length: 2.36 ft
			26.59	26.2	26.59				130		
											Installed well through auger.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 3 of 3 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 14 Sept. 1981
Location Old Burning Pit Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 596.52 Boring No. WES-5-1-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	14Sept	0.0		0.0	0.5	0.0	1.55	3" Shelby Tube	0	ST	Silty sand (SM): brown in color,
1A				0.5	1.0	1.55	1.85		0	Jar	slightly damp, fine-grained, and
											slight cohesion.
				1.0	1.5				0		Sample length: 1.85 ft
				1.5	2.0				10		
				2.0	2.5				20		
				0.0	5.0			7" Folding Auger			Cleanout
2	14Sept			5.0	5.5	5.0	6.59	*3"Fixed Piston Sampler	0	ST	Silty sand (SM): brown in color,
2A				5.5	6.0	6.59	6.89		0	Jar	damp, fine-grained, slight cohesion,
				6.0	6.5				10		and contains 5% very fine gravel.
				6.5	7.0				20		Sample length: 1.89 ft
				7.0	7.4				30		
				5.0	10.0			*7" Hollow stem Auger			Cleanout

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

*3" Fixed Piston Sampler = 3" F.P.S.
*7" Hollow Stem Auger = 7" H.S. Auger

Sheet 1 of 3 Sheets

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-5-1-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
3	14Sept			10.0	10.5	10.0	11.81	3" F.P.S.	10	ST	Silty sand (SM): brown in color,
3A				10.5	11.0	11.81	12.01		20	Jar	moderate cohesion, and dry.
				11.0	11.5				50		
				11.5	12.0				130		Sample length: 2.01 ft
			12.0	12.0	12.35				400		
		12.0		10.0	15.0			7" H.S. Auger			Cleanout
4	14Sept			15.0	15.5	15.0	15.65	3" F.P.S.	0	ST	Silt (ML): brown to grey in color,
4A				15.5	15.9	15.65	15.90		800	Jar	hard, cohesive, and dry.
			16.0	15.0	17.5			7" H.S. Auger			Cleanout
5A	14Sept	16.0	17.80	17.5	18.0	17.5	17.80	3" F.P.S.	850	Jar	Shale: grey to black in color,
											uniform, and dry.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 3 Sheets

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-5-1-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
											Water in hole on 15 September,
											at 10.5 ft.
											Set well through auger.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 3 of 3 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 15 Sept. 1981
Location Old Burning Pit Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 585.43 Boring No. WES-5-2-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	15Sept	0.0		0.0	0.5	0.0	1.75	3" Shelby	0	ST	Sand (SP): reddish brown in color,
1A				0.5	1.0	1.75	2.0		0	Jar	dry, slight cohesion, fine to
				1.0	1.5				50		medium grained, and contains ash
				1.5	2.0				280		and other burned materials.
				2.0	2.5				460		Sample length: 2.0 ft
			4.5	0.0	5.0			7" Folding Auger			Cleanout
2	15Sept	4.5		5.0	5.5	5.0	7.15	*3"Fixed Pis-	0	ST	Sandy silt (SM): brown in color,
2A				5.5	6.0	7.15	7.35	ton Sampler	20	Jar	damp, slight cohesion, and contains
				6.0	6.5				30		20% fine-grained sand.
				6.5	7.0				40		Sample length: 2.35 ft
				7.0	7.4				50		
			8.68	5.0	10.0			7" Folding Auger			Cleanout: assumed stratum change

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED *3" Fixed Piston Sampler = 3" F.P.S. Sheet 1 of 3 Sheets

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-5-2-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
3	15Sept	8.68		10.0	10.5	10.0	11.46	3" F.P.S.	0	ST	Silt (ML): brown in color, slight
3A				10.5	11.0	11.46	12.0		0	Jar	cohesion, and wet.
				11.0	11.5				20		
				11.5	12.0				20		Sample length: 2.16 ft
				12.0	12.5				20		
				10.0	15.0			7" Hollow stem			Cleanout: water at 7.4 ft
								Auger			
	15Sept			15.0	15.5			3" F.P.S.	0		No sample
				15.5	16.0				0		
				16.0	16.5				20		
				16.5	17.0				20		
				17.0	17.5				40		
4A	15Sept		18.2	15.0	18.2	15.0	18.2	*Splitspoon		Jar	Weight of rods carried splitspoon
											to 17.0 ft. Pushed to 18.2 ft.
											Silt (ML): same as above

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED *Splitspoon = 1 7/8" I.D. x 2 1/2" O.D. Sheet 2 of 3 Sheets

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-5-2-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
	16Sept										Installed well through auger.
											Water overnight to 7.1 ft.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 3 of 3 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 16 Sept. 1981
Location Old Burning Pit Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 589.78 Boring No. WES-5-3-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	16Sept	0.0		0.0	0.5	0.0	1.75	3" Shelby Tube	0	ST	Sand (SW): brown in color, fine
1A				0.5	1.0	1.75	2.0		20	Jar	to very coarse grained with majority
				1.0	1.5				20		of sand being medium, dry, and
				1.5	2.0				200		no cohesion.
				2.0	2.5				360		Sample length: 2.0 ft
			3.0	0.0	5.0			7" Folding Auger			Cleanout
2	16Sept	3.0		5.0	5.5	5.0	6.76	*3"Fixed Piston Sampler	0	ST	Sand (SP): brown in color, uniform,
2A				5.5	6.0	6.76	7.41		10	Jar	fine-grained, slightly moist, and
				6.0	6.5				10		no cohesion.
				6.5	7.0				20		
				7.0	7.41				20		Sample length: 2.41 ft
			10.0	5.0	10.0			7" Folding Auger			Cleanout

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

*3" Fixed Piston Sampler = 3" F.P.S.

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-5-3-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
3	16Sept	10.0		10.0	10.5	10.0	11.95	3" F.P.S.	0	ST	Sand silt (ML): brown in color,
3A				10.5	11.0	11.95	12.25		0	Jar	slight cohesion, wet, and uniform.
				11.0	11.5				0		
				11.5	12.0				10		Sample length: 2.25 ft
				12.0	12.4				10		
			13.73	10.0	15.0	—	—	7" Folding Auger	—		Cleanout: assumed stratum change
4	16Sept	13.73		15.0	15.5	15.0	17.15	3" F.P.S.	0	ST	Silt (ML): brown in color, moderate
4A				15.5	16.0	17.15	17.35		0	Jar	to highly cohesive, wet, and uniform.
				16.0	16.5				10		
				16.5	17.0				10		Sample length: 2.35 ft
				17.0	17.4				10		
				15.0	20.0	—	—	7" Folding Auger	—		Cleanout

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-5-3-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
5	16Sept			20.0	20.5	20.0	21.38	3" F.P.S.	0	ST	Silt (ML): wet, same as previous
5A				20.5	21.0	21.38	21.68		0	Jar	sample.
				21.0	21.5				10		
				21.5	22.0				10		Sample length: 2.03 ft
			22.4	22.0	22.4				10		
											Water came in overnight to 11.35 ft.
											Set well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 3 of 3 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 1 Oct. 1981
Location Old Burning Pit Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 585.33 Boring No. WES-5-4-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	1 Oct	0.0		0.0	0.5	0.0	2.04	3" Shelby	0	ST	Sand (SP): brown in color, uniform,
1A				0.5	1.0	2.04	2.34		0	Jar	very fine-grained quartz sand, and
				1.0	1.5				20		no cohesion.
				1.5	2.0				150		
				2.0	2.5				290		Sample length: 2.34 ft
				0.0	5.0			7" Folding Auger			Cleanout
2	1 Oct			5.0	5.5	5.0	6.78	*3"Fixed Pis-	0	ST	Sand (SP): brown in color, uniform,
2A				5.5	6.0	6.0	6.98	ton Sampler	0	Jar	very fine-grained quartz sand,
				6.0	6.5				10		slight cohesion, and slightly damp.
				6.5	7.0				15		
				7.0	7.38				20		Sample length: 1.98 ft
			6.0	5.0	10.0			*7" Hollow			Cleanout
								stem Auger			

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

*3" Fixed Piston Sampler = 3"F.P.S.
*7" Hollow Stem Auger = 7" H.S. Auger

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-5-4-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
		6.0		10.0	10.5			3" F.P.S.	0		No sample; used splitspoon to get
				10.5	11.0				0		sample-see below.
				11.0	11.5				0		
				11.5	12.0				10		
				12.0	12.4				20		
3A	1 Oct			10.0	12.0	10.0	12.0	*Splitspoon		Jar	Silt/sand (SP-SM); brown in color,
											very fine-grained, moist, and
											little cohesion. Monitored hole
											for 30 min and no water.
				10.0	15.0			7" H.S. Auger			Cleanout
	1 Oct			15.0	15.5			3" F.P.S.	0		No sample; used splitspoon to get
				15.5	16.0				0		sample-see below.
				16.0	16.5				10		
				16.5	17.0				20		Water in hole at 15.0 ft

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED *Splitspoon = 1 7/8" I.D. x 2 1/2" O.D. Sheet 2 of 4 Sheets

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-5-4-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
				17.0	17.41				80		
4A	1 Oct			15.0	17.0	15.0	17.0	Splitspoon		Jar	Silt/sand (SP-SM): same as in
											previous sample.
				15.0	20.0	—	—	7" H.S. Auger		—	Cleanout
				20.0	20.5			3" F.P.S.	0		No sample: used splitspoon to get
				20.5	21.0				0		sample-see below.
				21.0	21.5				20		
				21.5	22.0				20		
				22.0	22.42				60		
5A	1 Oct		22.5	20.0	23.0	22.0	22.5	Splitspoon		Jar	Silt/sand (SP-SM): same as previous
5B		22.5				22.5	23.0			Jar	sample.
											Clay (CL): light grey to brown in
											color, soft, low plasticity, and

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 3 of 4 Sheets

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-5-4-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
											slightly moist.
				20.0	25.0			7" H.S. Auger			
6	1 Oct			25.0	25.5	25.0	27.18	3" F.P.S.	0	ST	Clay (CL): grey in color, uniform,
6A				25.5	26.0	27.18	27.38		0	Jar	low plasticity, soft, and moist.
				26.0	26.5				0		
				26.5	27.0				0		Sample length: 2.38 ft
			27.42	27.0	27.42				15		
											Installed well through hollow stem
											auger.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 4 of 4 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 2 Oct. 1981
Location Old Burning Pit Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 583.78 Boring No. WES-5-5-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	2 Oct	0.0		0.0	0.5	0.0	2.12	3" Shelby Tube	10	ST	Sand (SP): brown in color, uniform,
1A				0.5	1.0	2.12	2.42		10	Jar	fine-grained quartz sand, dry, and
				1.0	1.5				20		no cohesion.
				1.5	2.0				80		
				2.0	2.5				160		Sample length: 2.42 ft
				0.0	5.0			7" Folding Auger			Cleanout
2	2 Oct			5.0	5.5	5.0	6.81	*3"Fixed Pis-	0	ST	Sand (SP): same as above.
2A				5.5	6.0	6.81	7.25	ton Sampler	0	Jar	
				6.0	6.5				0		
				6.5	7.0				0		Sample length: 2.25 ft
				7.0	7.39				0		
			9.0	5.0	10.0			*7"Hollow stem Auger			Cleanout: when pulling plug, auger
											fell to 10.5 ft. Assumed stratum
											change.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

*3" Fixed Piston = 3"F.P.S.
*7" Hollow Stem Auger = 7" H.S. Auger

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-5-5-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
3	2 Oct	9.0		10.5	11.0	10.5	12.02	3" F.P.S.	0	ST	Silt/sand (SP-SM): brown in
3A				11.0	11.5	12.02	12.36		0	Jar	color, very fine-grained, soft,
				11.5	12.0				0		wet, uniform, and slight cohesion.
				12.0	12.5				0		Water in hole at 10.1 ft.
				12.5	12.9				0		Sample length: 2.36 ft
				10.5	15.0			7" H.S. Auger			Cleanout
4	2 Oct			15.0	15.5	15.0	16.85	3" F.P.S.	0	ST	Silt/sand (SP-SM): same as in
4A				15.5	16.0	16.85	17.20		0	Jar	previous sample
				16.0	16.5				0		
				16.5	17.0				0		Sample length: 2.20 ft
				17.0	17.4				0		
				15.0	20.0			7" H.S. Auger			Cleanout: auger fell to 20.4 ft
											when pulling plug.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-5-5-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
5	2 Oct			20.4	20.9	20.4	22.15	3" F.P.S.	0	ST	Silt/sand (SP-SM): same
5A				20.9	21.4	22.15	22.45		0	Jar	
				21.4	21.9				0		
				21.9	22.4				0		Sample length: 2.36 ft
			22.78	22.4	22.78				0		
	3 Oct										Set well through hollow stem auger.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 3 of 3 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 10 Oct. 1981
Location Old Burning Pit Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 570.27 Boring No. WES-5-6-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	10 Oct	0.0		0.0	0.5	0.0	2.03	3" Shelby Tube	0	ST	Sandy silt (ML): reddish brown in
1A				0.5	1.0	2.03	2.23		10	Jar	color, dry, uniform, low plasticity,
				1.0	1.5				20		and organic matter.
				1.5	2.0				60		
				2.0	2.5				120		Sample length: 2.23 ft
			3.62	0.0	5.0	—	—	7" Folding Auger	—		Cleanout: assumed stratum change
2	10 Oct	3.62		5.0	5.5	5.0	7.17	3"Fixed Piston Sampler	0	ST	Silt (ML): light brown in color,
2A				5.5	6.0	7.17	7.37		0	Jar	soft, low plasticity, uniform, and
				6.0	6.5				10		dry.
				6.5	7.0				40		
				7.0	7.38				110		Sample length: 2.37 ft
				5.0	10.0	—	—	7" Hollow Stem Auger		—	Cleanout

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

*3" Fixed Piston Sampler = 3" F.P.S.
*7" Hollow Stem Auger = 7" H.S. Auger

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-5-6-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
3	10 Oct			10.0	10.5	10.0	12.09	3" F.P.S.	10	ST	Silt (ML): brown in color, soft,
3A				10.5	11.0	12.09	12.32		10	Jar	low plasticity, dry, and contains
				11.0	11.5				10		trace of clay.
				11.5	12.0				20		
				12.0	12.4				30		Sample length: 2.32 ft
			13.5	10.0	15.0			7" H.S. Auger			Cleanout: assumed stratum change
4	10 Oct	13.5		15.0	15.5	15.0	17.15	3" F.P.S.	0	ST	Silt (ML): grey in color, soft,
4A				15.5	16.0	17.15	17.57		0	Jar	low plasticity, and slightly damp.
				16.0	16.5				0		
				16.5	17.0				0		Sample length: 2.37 ft
				17.0	17.41				10		
				15.0	20.0			7" H.S. Auger			Cleanout: water at 19.5 ft

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-5-6-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
5	10 Oct			20.0	20.5	20.0	21.19	3" F.P.S.	0	ST	Silt (ML): dark grey in color,
5A				20.5	21.0	21.19	21.50		0	Jar	sticky, wet, soft, and low plasti-
				21.0	21.5				0		city. Lost some sample when pulling.
				21.5	22.0				0		
				22.0	22.41				0		Sample length: 1.19 ft
				20.0	25.0	—	—	7" H.S. Auger		—	Cleanout
	10 Oct			25.0	25.5	—	—	3" F.P.S.	0	—	No sample-see below
				25.5	26.0				0	—	
				26.0	26.5				0		
				26.5	27.0				0		
				27.0	27.39				0		
6A	10 Oct			25.0	27.5			Splitspoon	—	Jar	Silt (ML): dark grey in color,
											sticky, wet, soft, and low plasti-
											city.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No WES-5-6-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
				25.0	30.0	—	—	7"H.S. Auger	—	—	Cleanout
	10 Oct			30.0	30.5	—	—	3" F.P.S.	0	—	No sample-see below
				30.5	31.0				0		
				31.0	31.5				0		
				31.5	32.0				0		
				32.0	32.41				0		
7A	10 Oct		33.5	30.0	33.5	30.0	33.5	Splitspoon	—	Jar	Silt (ML): dark grey in color,
											very soupy, soft, and low plasticity.
					Installed well screen through hollow stem auger. When pulling auger from						
					hole, natural material, silt, caved-in to depth of 13 ft. There is a good						
					possibility that well screen would plug without sand filter. Will redrill						
					with water to prevent cave-in, and backfill well screen with sand to						
					prevent plugging off.						

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 4 of 4 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 20 Oct. 1981
Location Old Burning Pit Job No 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 576.70 Boring No. WES-5-7-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	20 Oct	0.0		0.0	0.5	0.0	1.89	3" Shelby Tube	0	ST	Silt (ML): brown in color, dry,
1A				0.5	1.0	1.89	2.04		10	Jar	uniform, and low plasticity.
				1.0	1.5				10		
				1.5	2.0				250		
				2.0	2.5				350		Sample length: 2.04 ft
				0.0	5.0			7" Folding Auger			Cleanout
2	20 Oct			5.0	5.5	5.0	6.99	*3"Fixed Piston Sampler	0	ST	Silt (ML): same as above.
2A				5.5	6.0	6.99	7.37		0	Jar	
				6.0	6.5				0		
				6.5	7.0				20		
			7.3	7.0	7.38				30		Sample length: 2.37 ft
				5.0	10.0			7" Folding Auger			Cleanout

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED *3" Fixed Piston Sampler = 3"F.P.S. Sheet 1 of 5 Sheets

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-5-7-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
3	20 Oct	7.3		10.0	10.5	10.0	11.91	3"F.P.S.	0	ST	Silt (ML): grey in color, moist,
3A				10.5	11.0	11.91	12.16		0	Jar	uniform, and low plasticity.
				11.0	11.5				20		
				11.5	12.0				100		
				12.0	12.4				140		Sample length: 2.16 ft
				10.0	15.0			7" Folding Auger			Cleanout
4	20 Oct			15.0	15.5	15.0	16.36	3" F.P.S.	0	ST	Silt (ML): same as above
				15.5	16.0	16.36	16.66		0	Jar	
				16.0	16.5				0		
				16.5	17.0				0		Sample length: 1.66 ft
				17.0	17.4				0		
				15.0	20.0			7" Folding Auger			Cleanout

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-5-7-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
	20 Oct			20.0	20.5			3" F.P.S.	0		No sample- see below
				20.5	21.0				0		
				21.0	21.5				0		
				21.5	22.0				0		
				22.0	22.41				10		
5A	20 Oct			20.0	22.5	20.0	22.5	*Splitspoon		Jar	Silt (ML): grey in color, moist,
											uniform, and low plasticity.
				20.0	25.0			7" Folding Auger			Cleanout: water at bottom of hole
6	20 Oct			25.0	25.5	25.0	27.05	3" F.P.S.	0	ST	Silt (ML): grey in color, wet,
6A				25.5	26.0	27.05	27.35		0	Jar	uniform, and low plasticity,
				26.0	26.5				0		
				26.5	27.0				0		Sample length: 2.35 ft
				27.0	27.40				0		

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED *Splitspoon = 1 7/8" I.D. x 2 1/2" O.D. Sheet 3 of 5 Sheets

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-5-7-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
	21 Oct								Water came to 12.4 ft overnight. Jetted		
									water from hole and continued advance with		
									folding auger. Hole started to fall-in and		
									went to 5 1/2 in. fishtail bit and water.		
					30.0			5 1/2" Baffled Fish-			Cleanout
								tail			
7	21 Oct			30.0	30.5	30.0	32.07	3" F.P.S.	0	ST	Silt (ML): same as above
7A				30.5	31.0	32.07	32.35		0	Jar	
				31.0	31.5				0		
				31.5	32.0				20		Sample length: 2.35 ft
				32.0	32.39				40		
				30.0	35.0			5 1/2"Baffled Fish-			Cleanout
								tail			

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 4 of 5 Sheets

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-5-7-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
8	21 Oct			35.0	35.5	35.0	37.08	3" F.P.S.	0	ST	Silt (ML): same as above
8A				35.5	36.0	37.08	37.35		0	Jar	
				36.0	36.5				20		
				36.5	37.0				150		Sample length: 2.35 ft
				37.0	37.38				200		
											Pumped hole untill water return was
											fairly clear, then installed well
											screen. Blew well dry on 22 Oct,

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 5 of 5 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 4 Nov. 1981
Location Old Burning Pit Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 563.78 Boring No. WES-5-8-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
1	4 Nov	0.0		0.0	0.5	0.0	0.8	3" Shelby Tube	0	ST	Sandy clay (CL): brown in color,
1A				0.5	1.0	0.8	1.1		0	Jar	slightly moist, soft, and organic
				1.0	1.5				0		matter. Material is possibly
				1.5	2.0				0		dozer fill.
				2.0	2.5				10		Sample length: 1.1 ft
			4.0	0.0	5.0			7" Folding Auger			Cleanout
2	4 Nov	4.0		5.0	5.5	5.0	7.08	*3"Fixed Piston Sampler	0	ST	Silt (ML): brownish grey in
2A				5.5	6.0	7.08	7.33		0	Jar	color, moist, and uniform.
				6.0	6.5				0		Water at end of push. Water
				6.5	7.0				0		came up to 4.1 ft after a few
				7.0	7.4				0		minutes.
											Sample length: 2.33 ft
				5.0	10.0			7" Folding Auger			Cleanout

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

*3" Fixed Piston Sampler = 3"F.P.S.

Sheet 1 of 2 Sheets

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____

Location _____ Job No. _____

Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-5-8-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
3	4 Nov			10.0	10.5	10.0	12.15	3" F.P.S.	0	ST	Silt (ML): grey in color, wet,
3A				10.5	11.0	12.15	12.40		0	Jar	and uniform.
				11.0	11.5				0		
				11.5	12.0				0		
				12.0	12.41				0		Sample length: 2.40 ft
				10.0	15.0			7" Folding	Auger		Cleanout
4	4 Nov			15.0	15.5	15.0	17.1	3" F.P.S.	0	ST	Silt (ML): same as above
4A				15.5	16.0	17.1	17.40		0	Jar	
				16.0	16.5				0		
				16.5	17.0				0		Sample length: 2.40 ft
				17.0	17.4				10		
				15.0	17.5			7" Folding	Auger		Cleanout: bailed water out of
											hole with bailer.
											Installed well

Sheet 2 of 2 Sheets

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 17 Sept, 1981
Location Demolition Area Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 682.63 Boring No. WES-6-1A-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	17Sept	0.0		0.0	0.5	0.0	2.17	3" Shelby Tube	0	ST	Clay (CL): brown to grey in color,
1A				0.5	1.0	2.17	2.32		0	Jar	dry, moderate, cohesion, and uniform
				1.0	1.5				80		organic matter first foot.
				1.5	2.0				250		
				2.0	2.5				480		Sample length: 2.32 ft
				0.0	5.0			7" Folding Auger			Cleanout
2	17Sept			5.0	5.5	5.0	6.21	3"Fixed Piston Sampler		ST	Clay (CL): orange brown in color,
2A				5.5	6.0	6.21	6.36			Jar	dry, stiff, hard, and contains
				6.0	6.5						5-10% very fine, angular to rounded
				6.5	7.0						gravel.
				7.0	7.5						Sample length: 1.36 ft
			8.3	5.0	8.30			7"Hollow Stem Auger			Cleanout: bedrock at 8.3 ft,
		8.3	19.0	8.30	19.0			5 5/8" Rock Bit			Sandstone: reddish color and fine-
											grained. Water around 9 ft.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 1 of 1 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 6 Nov. 1981
Location Demolition Area Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 683.27 Boring No. WES-6-1B-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	6 Nov	0.0		0.0	2.5	0.0	1.14	3" Shelby Tube		ST	Clay (CL): brown in color, very
1A						1.14	1.27			Jar	stiff, dry, and low plasticity.
											Sample length: 1.27 ft
				0.0	5.0	—	—	7" Solid Auger		—	Cleanout
2			7.0	5.0	7.0	5.0	6.14	3"Fixed Piston Sampler		ST	Sandy clay (CL): brown in color,
2A						6.14	6.29			Jar	very stiff, dry, and low plasticity.
											Sample length: 1.27 ft
	6 Nov	7.0	8.6	5.0	29.0	—	—	5 5/8" Rock Bit		—	Clay/shale: reddish brown
		8.6	12.6								Sandstone: light grey and hard
		12.6	13.2								Shale: brown
		13.2	14.0								Shale: grey
		14.0	15.2								Sandstone: reddish brown
		15.2	15.6								Shale: light grey
		15.6	16.3								Sandstone: light grey

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-6-1B-81

SAMPLE NUMBER	DATE TAKEN	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		16.3	20.5								Shale: grey and hard
		20.5	24.5								Sandstone: light grey, very hard,
											and fine-grained.
		24.5	28.0								Sandstone: light grey and extremely
											hard.
		28.0	31.0								Shale: dark grey
	6 Nov			29.7	29.0	—	—	5 5/8" Rock	Bit	—	No water untill 29.3 ft (very slow).
											Drilled to 39.0 and will leave
											open overnight.
	7 Nov										Water at 8:05 a.m. 34.65 ft,
				39.0	44.7	—	—	5 5/8" Rock	Bit	—	Drilled 10 ft below water,
		31.0	44.7								Sandstone: brown and fine-grained.
											Installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 11 Nov. 1981
Location Demolition Area Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 682.60 Boring No. WES-6-1C-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	11 Nov	0.0		0.0	0.5	0.0	1.34	3" Shelby Tube	0	ST	Sandy clay (CL): brown in color,
1A				0.5	1.0	1.34	1.51		40	Jar	dry, soft, and slight cohesion.
				1.0	1.5				140		
				1.5	2 0				280		Sample length: 1.51 ft
				2.0	2.5				320		
			4.0	0.0	5.0			7" Folding Auger			Cleanout: assumed stratum change
2	11 Nov	4.0		5.0	5.5	5.0	6.25	3"Fixed Piston Sampler	0	ST	Clay (CH): brown in color, dry,
2A				5.5	6.0	6.25	6.40		0	Jar	very stiff, hard, and high plasti-
				6.0	6.5				20		city.
				6.5	7.0				180		Sample length: 1.40 ft
			7.5	7.0	7.31				320		
		7.5	8.2	5.0	8.3			7" Folding Auger			Sand and weathered sandstone;
											brown and fine-grained
		8.2	8.3								Sand and weathered sandstone;

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-6-1C-81

SAMPLE NUMBER	DATE TAKEN	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
											light grey and fine-grained.
	11 Nov	8.3	10.0	8.3	38.0	—	—	5 5/8" Rock	Bit	—	Sandstone: brown and fine-grained.
		10.0	12.3								Sandstone: grey with grey shale
											lenses
		12.3	12.5								Sandstone: dark brown
		12.5	15.1								Sandstone: brown
		15.1	17.2								Sandstone: brown with grey shale
											lenses
		17.2	23.7								Sandstone: soft, brown, and weathered
		23.7	27.8								Sandstone: hard and brown
		27.8	31.4								Shale and sandstone lenses
		31.4	35.7								Sandstone: brown and soft
		35.7	38.1								Sandstone: hard
	12 Nov										Water overnight at 9:20 a.m. at
											36.52 ft, water at 2:10 p.m. at
											36.20 ft. Blew wells 6-1A and

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-6-1C-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
	18 Nov			0.0	38.1			1 3/4" Rock	Bit		6-1B with air to see if there was
											any communication between these borings
											and 6-1C. No communications was
											noticeable. Allowed hole to set
											untill 19 Nov. 1981, Jetted well
											several times and each time its
											making water.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 3 of 3 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 18 Sept. 1981
Location Demolition Area Job No 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 637.53 Boring No. WES-6-2-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
1	18Sept	0.0		0.0	0.5	0.0	1.58	3" Shelby Tube	0	ST	Clay (CL): brown in color, soft,
1A				0.5	1.0	1.58	1.78		0	Jar	little cohesion, uniform, slightly
				1.0	1.5				0		damp, and organic matter.
				1.5	2.0				0		Sample length: 1.78 ft
				2.0	2.5				20		
				0.0	5.0	—	—	7" Solid Auger		—	Cleanout
2A	18Sept		5.38	5.0	5.38			3"Fixed Piston Sampler	800	Jar	Clay (CL) and sandstone fragments:
											same as above
	19Sept			5.4	—			4 x 5-1/2"Core Barrel			See page two for log of core.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Hole No. WES-6-2-81

DRILLING LOG	DIVISION U.S Navy	INSTALLATION Crane, IN	SHEET 2 OF 5 SHEETS

1. PROJECT NWSC Groundwater Study	10. SIZE AND TYPE OF BIT 4 x 5-1/2' Diamond bit
2. LOCATION (Coordinates or Station) Demolition Area	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL
3. DRILLING AGENCY CEWES	12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
4. HOLE NO. (As shown on drawing title and file number) WES-6-2-81	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED zero; UNDISTURBED two
5. NAME OF DRILLER C. Drake	14. TOTAL NUMBER CORE BOXES zero
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 18 Sept. 81; COMPLETED 21 Sept. 81
7. THICKNESS OF OVERBURDEN 5.38 ft	17. ELEVATION TOP OF HOLE 657.53
8. DEPTH DRILLED INTO ROCK 33.62 ft	18. TOTAL CORE RECOVERY FOR BORING 93.4 %
9. TOTAL DEPTH OF HOLE 39.0 ft	19. SIGNATURE OF INSPECTOR Joseph B. Dunbar

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
632.53	5.0		See page one for overburden information.			
631.53	6.0		No recovery			
630.53	7.0					19 Sept.81 WL - Run 1 Began 8:10 Rec 2.8' End 9:05 Loss 2 2' Time 55 min Gain - Drl time 53 min Hyd press 150psi Water press - RPM 75 Drl Action Smooth Water ret -
629.53	8.0		Sandstone; brown, fine-grained, weathered, and friable. fractured			
628.53	9.0		Clay shale; grey and soft. closed			Remarks Used air
627.53	10.0		Shale: dark grey to brown, soft, and dry. Run 1	56%	-	
626.53	11.0		Shale: dark grey to black and highly organic			
625.53	12.0		Sandstone and interbedded Shale: sandstone is brown in color, fine-grained, moderately friable, and weathered. Shale averages around 20% of interval and thickness 1/16-1/4 in. with frequency increasing with depth.			WL - Run 2 Began 9:20 Rec 4.65' End 10:45 Loss - Time 25 min Gain - Drl time 25 min Hyd press 100-150psi Water press - RPM - Drl Action Smooth Water ret -
624.53	13.0		closed			Remarks -
623.53	14.0		Shale: dark grey in color, soft, organic, slightly moist, and weathered.			
622.53	15.0			100%	-	

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PROJECT | HOLE NO.

Hole No. WES-6-2-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 3 OF 6 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN	16. DATE HOLE — STARTED — COMPLETED
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE	18. TOTAL CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
622.53	15.0		Run 2			
			Sandstone and interbedded shale: sandstone is grey to brown and moderately hard. Shale runs at 15% and is grey to dark grey in color.			
621.53	16.0					AL - Run 3 Began 11:05 Rec 4.8 End 11:50 Loss - Time 45 min Gain - Drl time 45 min Hyd press 150psi Water press - RPM 50-75 Drl Action Smooth Water ret - Remarks -
620.53	17.0		Shale: black and soft			
			← closed			
619.53	18.0					
			Sandstone: light grey to brown, fine-grained, and moderately hard.			
618.53	19.0		recemented breaks-iron			
			Run 3	100%	-	
617.53	20.0					
616.53	21.0		← 1/4 in. black shale			
			← 1/4 in. black shale			AL - Run 4 Began 12:40 Rec 4.7 End 1:30 Loss - Time 50 min Gain - Drl time 50 min Hyd press 100-150psi Water press - RPM 50-75 Drl Action Smooth Water ret - Remarks -
			Sandstone: grey to brown, fine-grained, and moderately hard to hard. Run contains 1-5% shale. Oxidized from 21.5-22.0 and 23.5-24.1 ft.			
615.53	22.0					
614.53	23.0		← 1/4 in. black shale			
			Shale seams in fractured sandstone			
613.53	24.0					
			Run 4	100%	-	
612.52	25.0					

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PROJECT HOLE NO.

Hole No. WES-6-2-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 4 OF 5 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE — STARTED — COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
612.53	25.0					
611.53	26.0		1/2 in. black shale 3/4 in. black shale			NL - Run 5 Began 1:50 Rec 4.8 End - 2:25 Loss - Time 35 min Gain - Drl time 35 min Hyd press 150psi Water press - RPM 50-75 Drl Action Smooth Water ret -
610.53	27.0		closed			
609.53	28.0		Sandstone; grey in color, fine-grained, moderately hard, and inter-bedded with 10-20% black shale ranging in thickness from 1/8-3/4 in.			Remarks Water in hole at 29 ft
608.53	29.0		Run 5	100%	-	
607.53	30.0					
606.53	31.0		Sandstone: same-oxidized from 29.3-30.5 ft 1/4 in. shale			NL - Run 6 Began 2.50 Rec 5.1 End 3:24 Loss - Time 34 min Gain - Drl time 34 min Hyd press 150psi Water press - RPM 50-75 Drl Action Smooth Water ret - Remarks -
605.53	32.0		1/4 in. shale			
604.53	33.0		ripple marks			
603.53	34.0		Run 6	100%	-	
602.53	35.0		Sandstone and shale; closed			

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PROJECT HOLE NO.

Hole No. WES-6-2-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 5 OF 5 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	16. DATE HOLE — STARTED — COMPLETED
	17. ELEVATION TOP OF HOLE
7. THICKNESS OF OVERBURDEN	18. TOTAL CORE RECOVERY FOR BORING %
8. DEPTH DRILLED INTO ROCK	19. SIGNATURE OF INSPECTOR
9. TOTAL DEPTH OF HOLE	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
602.53	35.0					
601.53	36.0		Sandstone (50%) and shale (50%); sandstone is fine-grained, grey to dark grey and hard; shale is black and contains sand. Thickness ranges from 1/8 to 1-1/2 in. and averages runs 1-in.			MC - Run 7 Began 3:50 Rec 4.6 End 4:50 Loss - Time 60 min Gain - Drl time 55 min Hyd press 150 Water press - RPM 50-75 Drl Action Smooth Water ret - Remarks -
600.53	37.0					
	38.0					
			Shale: black, soft, uniform and slakes on drying.			
	39.0		Run 7	100%	-	
			Installed well on 21 Sept. 81			

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PROJECT | HOLE NO.

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 21 Sept. 1981
Location Demolition Area Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 659.77 Boring No. WES-6-3-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	21Sept	0.0		0.0	0.5	0.0	1.74	3" Shelby Tube	0	ST	Clay (CL): dark brown in color,
1A				0.5	1.0	1.74	1.94		10	Jar	uniform, slight cohesion, organic
				1.0	1.5				50		matter, and very slight moisture.
				1.5	2.0				120		Sample length: 1.94 ft
			4.0	2.0	2.5				150		
				0.0	5.0	—	—	7" Folding Auger		—	Cleanout
2	21Sept	4.0	5.3	5.0	5.3	5.0	5.3	3"Fixed Piston Sampler	800	Jar	Sandy clay (CL): light brown in
											color, very stiff, dry, and contains
											10-20% sand.
	21Sept	5.3	8.0	5.3	20.3	—	—	5 5/8" Rock Bit		—	Cleanout: at 8.0 ft rock is harder,
											less weathered. Moisture between
											10-11 ft
		8.0	18.0								Sandstone
		18.0	20.3								Shale

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-6-3-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
	21Sept										Water at 10.6 ft at 9:01 a.m.
											Blew hole and installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 1 Oct. 1981
Location Demolition Area Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 632.89 Boring No. WES-6-4-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
1	1 Oct	0.0		0.0	0.5	0.0	1.46	3" Shelby Tube	40	ST	Gravelly clay (CL): brown in color,
1A				0.5	1.0	1.46	1.66		40	Jar	soft to slightly stiff, and dry.
				1.0	1.5				60		Gravel is fine-grained, friable
				1.5	2.0				80		sandstone.
				2.0	2.5				100		Sample length: 1.66 ft
			4.8	0.0	4.8	—	—	7" Solid Auger		—	Cleanout: bedrock at 4.8 ft
	2 Oct	4.8	6.5	4.8	30.0	—	—	5 5/8" Rock Bit		—	Weathered sandstone and clay: brown
		6.5	23.0								Sandstone and shale: light grey
											to green in color, and moderately
											hard
		23.0	26.0								Sandstone: greenish grey and hard
		26.0	27.8								Shale: hard and green
		27.8	30.0								Sandstone: hard and light grey
											Water at 19.5 ft

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 2 Oct. 1981
Location Demolition Area Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 607.89 Boring No. WES-6-5-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	2 Oct	0.0		0.0	0.5	0.0	1.8	3" Shelby Tube	100	ST	Clay (CL): brown to reddish brown
1A				0.5	1.0	1.8	2.0		100	Jar	in color, soft to moderately stiff,
				1.0	1.5				160		dry, and contains 20-25% fine gravel.
				1.5	2.0				220		
				2.0	2.5				220		Sample length: 2.00 ft
			6.5	0.0	5.0			7" Solid Auger			Cleanout: assumed stratum change
2	3 Oct	6.5		5.0	5.5	5.0	6.85	3"Fixed Piston Sampler	160	ST	Clay shale: brown to grey, soft,
2A				5.5	6.0	6.85	7.05		220	Jar	and dry.
				6.0	6.5				240		
				6.5	7.0				260		Sample length: 2.05 ft
				7.0	7.5				300		
			11.5	7.5	27.0			5 5/8" Rock Bit			Clay shale: see above
		11.5	13.0								Shale: red in color
		13.0	27.0								Shale: grey in color and harder

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Job No. _____
Boring No. WES-6-5-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
											at 26 ft.
											Hole making water at fairly good
											rate between 16.5 and 17.0 ft.
											Blew hole and installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 13 Oct. 1981
Location Demolition Area Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 672.06 Boring No. WES-6-6-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	13Oct	0.0		0.0	0.5	0.0	1.41	3" Shelby Tube	200	ST	Clay (CL): brown in color, very
1A				0.5	1.0	1.41	1.58		160	Jar	stiff, dry, variable composition,
				1.0	1.5				240		and thinly bedded.
				1.5	2.0				300		
				2.0	2.5				460		Sample length: 1.58 ft
				0.0	5.0	—	—	7" Solid Auger		—	Cleanout
2	13Oct			5.0	5.5	5.0	6.27	*3"Fixed Pis-	160	ST	Clay (CL): same as above except
2A				5.5	6.0	6.27	6.45	ton Sampler	240	Jar	not as stiff.
				6.0	6.5				300		
				6.5	7.0				400		
				7.0	7.5				500		Sample length: 1.45 ft
			9.0	5.0	10.0	—	—	7" Solid Auger		—	Cleanout: assumed stratum change

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

*3" Fixed Piston Sampler = 3" F.P.S

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-6-6-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
3	13Oct	9.0		10.0	10.5	10.0	11.30	3" F.P.S.	200	ST	Shale: brown and dark grey, dry,
3A				10.5	11.0	11.30	11.45		340	Jar	stiff, varied composition, and
			11.8	11.0	11.5				500		varied texture.
											Sample length: 1.45 ft
	13Oct	11.8	14.0	11.8	60.0			5 5/8" Rock	Bit		Shale: grey and medium hard
		14.0	15.2								Shale: brown and medium hard
		15.2	16.8								Shale: reddish brown and medium hard
		16.8	26.6								Shale: greyish brown and medium hard
		26.6	27.3								Coal: black and medium to hard
		27.3	36.0								Shale: grey and soft
		36.0	37.2								Shale: brown
		37.2	38.0								Shale: grey
		38.0	41.0								Sandstone: grey and hard
		41.0	42.2								Shale: grey and medium hard
		42.2	46.3								Sandstone: brown and medium hard

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-6-6-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
		46.3	48.7								Sandstone: grey and hard
		48.7	51.0								Sandstone: light grey-grey and
											medium hard
		51.0	62.3								Shale: grey
	14Oct			60.0	62.3			5 5/8" Rock	Bit	—	Water level rose to 50.5 ft over-
											night. M-scope wouldn't give
											reading, water level measured on
											drill rods and estimate 2 ft
											displacement. Set well after
											blowing hole.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 3 of 3 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 14 Oct. 1981
Location Demolition Area Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator A. McNamara Surface El 660.92 Boring No. WES-6-7-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	14Oct	0.0		0.0	0.5	0.0	2.22	3" Shelby Tube	20	ST	Clay (CL): brown in color, soft
1A				0.5	1.0	2.22	2.40		100	Jar	to slightly stiff, dry, and low
				1.0	1.5				250		plasticity- fill material
				1.5	2.0				300		Sample length: 2.40 ft
			4.5	2.0	2.5				300		
				0.0	5.0	—	—	7" Folding Auger	—		Cleanout
2	14Oct	4.5		5.0	5.5	5.0	6.45	*3"Fixed Piston Sampler	0	ST	Sandy clay (CL): orange brown in
2A				5.5	6.0	6.45	6.65		80	Jar	color, dry, variable composition,
				6.0	6.5				500		and contains 10-20% fine-grained
				6.5	7.0				550		sand. Possible black powder
			7.5	7.0	7.38				—		intermixed in sample.
											Sample length: 1.65 ft- chucks
											slipped
		7.5	10.0	5.0	10.0	—	—	7" Folding Auger	—		Cleanout: clay and weathered sandstone.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED *3" Fixed Piston Sampler = 3"F.P.S. Sheet 1 of 4 Sheets

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____

Location _____ Job No

Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-6-7-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
3A	14Oct	10.0		10.0	10.5	10.0	10.5	3"F.P.S.	700	Jar	Sandstone: grey brown in color,
											dry, weathered, and very fine-
											grained.
				10.7	———			4 x 5-1/2"Core Barrel			See page 3 (Engineer Form 1836)
											for log of core.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 4 Sheets

Hole No. WES-6-7-81

DRILLING LOG	DIVISION U.S. Navy	INSTALLATION Crane, IN	SHEET 3 OF 4 SHEETS

1. PROJECT NWSC Groundwater Study	10. SIZE AND TYPE OF BIT 4 x 5 1/2' Diamond bit
2. LOCATION (Coordinates or Station) Demolition Area	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL
3. DRILLING AGENCY CEWES	12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
4. HOLE NO. (As shown on drawing title and file number) WES-6-7-81	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED three; UNDISTURBED two
5. NAME OF DRILLER A. McNamara	14. TOTAL NUMBER CORE BOXES zero
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 14 Oct. 81; COMPLETED 15 Oct. 81
7. THICKNESS OF OVERBURDEN 10.0 ft	17. ELEVATION TOP OF HOLE 660.92
8. DEPTH DRILLED INTO ROCK 19.15 ft	18. TOTAL CORE RECOVERY FOR BORING 100% %
9. TOTAL DEPTH OF HOLE 29.15 ft	19. SIGNATURE OF INSPECTOR [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
650.92	10.0		See pages 1 and 2 for			
649.92	11.0		Sandstone: brown to orange brown in color, fine-grained quartz and miscellaneous sand, weathered, dry, thinly bedded, and friable.			14 Oct. 81 WL - Began 2:05 End 3:00 Time 55 min Drl time 55 min Hyd press 100psi Water press - RPM 50+ Drl Action Smooth ~~Water~~ rot Reddish brown and grey Remarks Cored with air
648.92	12.0		fractured			Run 1 Rec 4.15' Loss - Gain -
647.92	13.0		Shale: black, dry, soft, and uniform, except for small, irregular seams and lenses of yellow, dry, and earthy oxidation product or precipitate.			
			fractured			
646.92	14.0					
			Run 1	100%	-	
645.92	15.0		Shale: same as above			
644.92	16.0		closed			WL - Began 3:45 End 4:50 Time 65 min Drl time 65 min Hyd press - Water press RPM 50-60+ Drl Action Smooth ~~Water~~ rot Dark black/dark grey Remarks Cored with air. Water began bubbling in at bottom of run. Checked water level 15 Oct. 81, at 8:00 and read 15.56 ft.
643.92	17.0			100%	-	Run 2 Rec 4.75 Loss - Gain -
642.92	18.0		Coal: black in color, brilliant luster, brittle, soft, and jointed with irregular pattern. From 17.9-18.1 ft, slight, earthy, orange brown crust. From 18.6-19.0 ft, material is more shale like in nature and softer.			
641.92	19.0					
			Run 2			
640.92	20.0		Shaley sandstone		-	

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT | HOLE NO.

Hole No. WES-6-7-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 4 OF 4 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	16. DATE HOLE — STARTED — COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
640.92	20.0		From 20-20.5 ft, soft, black shale.			15 Oct. 81
639.92	21.0		Shaley sandstone: light to dark grey in color, moderately hard, very fine-grained, and contains 30-40% interbedded dark grey shale. Sandstone and shale is interbedded in irregular seams, lenses, and thin beds.			WL - Run 3 Began 9:30 Rec 0.0' End 9:45 Loss 0.8' Time 15 min Gain - Drl time 15 min Hyd press 100psi Water press - RPM 50 Drl Action Smooth ~~Water~~ ret Black Remarks Blocked off
638.92	22.0					
637.92	23.0					
636.92	24.0		Run 4	118%	-	WL - Run 4 Began 10:08 Rec 4.55' End 11:33 Loss - Time 85 min Gain 0.8 Drl time 85 min Hyd press 100psi Water press - RPM 50-70 Drl Action Smooth ~~Water~~ ret Black-dark grey Remarks -
635.92	25.0					
634.92	26.0		coal (1/4-1/2 in.)			
			shale (1/2 in.)			
633.92	27.0					
632.92	28.0		Shaley sandstone and interbedded shale: 20-30% shale 70-80% sandstone			WL - Run 5 Began 12:18 Rec 5.05 End 2:00 Loss - Time 102 min Gain - Drl time 102 min Hyd press 100psi Water press - RPM 50 Drl Action Smooth ~~Water~~ ret Black Remarks -
631.92	29.0		Run 5	100%	-	
			Cleaned mud and cuttings from hole with water. Jetted hole of water and installed well screen.			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT) PROJECT HOLE NO.

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 14 Oct. 1981
Location Demolition Area Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 638.72 Boring No. WES-6-8-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	14Oct	0.0		0.0	0.5	0.0	1.55	3" Shelby Tube	80	ST	Clay (CL): brown in color, soft,
1A				0.5	1.0	1.55	1.75		100	Jar	low plasticity, and uniform.
				1.0	1.5				120		Material is fill from dozer.
				1.5	2.0				120		Sample length: 1.75 ft
			4.2	2.0	2.5				140		
				0.0	5.0	—	—	7" Solid Auger		—	Cleanout
2	14Oct	4.2		5.0	5.5	5.0	5.99	3"Fixed Piston Sampler	700	ST	Sandstone: brown in color, weathered,
2A				5.5	6.0	5.99	6.19		400	Jar	very fine-grained, crumbles easily,
											and dry.
			6.3	6.0	—				700		Sample length: 1.19 ft
	14Oct	6.3	8.4	6.3	20.0	—	—	5 5/8" Rock Bit		—	Sandstone: weathered and brown
		8.4	9.2								Shale: reddish grey and soft
		9.2	11.4								Sandstone: grey
		11.4	17.3								Shale: grey and hard

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-6-8-81

SAMPLE NUMBER	DATE TAKEN	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
	15Oct	17.3	27.5	20.0	27.5	—	—	5 5/8" Rock	Bit	—	Shale: dark grey and hard
											Encountered water around 17.5 ft.
											Drilled to 27.5 ft. Water came up
											overnight to depth of 8 ft (reading
											taken on 15 Oct. 81 at 8:10 a.m.
											Blew hole and installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 16 Oct. 1981
Location Demolition Area Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 631.04 Boring No. WES-6-9-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1A		0.0		0.0	0.5	0.0	1.7	3" Shelby Tube	260	Jar	Sand (SP) and sandstone fragments:
				0.5	1.0				500		brown in color, dry, fine-grained
				1.0	1.5				700		quartz sand, and uniform. Tube
			1.7	1.5	1.7				700		was damaged in push.
		1.7	3.2	0.0	39.7	—	—	5 5/8" Rock	Bit	—	Sandstone: brown and weathered
		3.2	6.6								Clay shale: brown
		6.6	7.5								Shale: grey
		7.5	8.6								Sandstone
		8.6	17.9								Shale: changing often from brown,
											to red, and to grey.
		17.9	19.7								Sandstone: rust colored
		19.7	23.2								Shale: grey
		23.2	24.2								Sandstone: brown
		24.2	25.0								Shale: grey
		25.0	27.5								Sandstone: brown

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-6-9-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
		27.5	39.7								Shale: grey
											Water at 29 ft. Installed well
											after blowing hole.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 17 Oct. 1981
Location Demolition Area Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator A. McNamara Surface El 659.10 Boring No. WES-6-10-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	17Oct	0.0		0.0	0.5	0.0	2.08	3" Shelby Tube	0	ST	Clay (CL): brown in color, dry,
1A				0.5	1.0	2 08	2.28		0	Jar	no cohesion, and organic matter.
				1.0	1.5				0		Material is fill from dozer.
				1.5	2.0				20		Sample length: 2.28 ft
			4.0	2.0	2.5				40		
				0.0	5.0	—	—	7" Folding Auger	—		Cleanout: fill ends at 4.0 ft
2	17Oct	4.0		5.0	5.5	5.0	6.99	3"Fixed Piston Sampler	40	ST	Clay (C): grey brown in color,
2A				5.5	6.0	6.99	7.14		100	Jar	uniform, stiff, dry, and high plas-
				6.0	6.5				150		ticity.
				6.5	7.0				250		Sample length: 2.14 ft
				7.0	7.35				400		
				5.0	10.0	—	—	7" Folding Auger	—		Cleanout

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED 3" Fixed Piston Sampler = 3" F.P.S. Sheet 1 of 2 Sheets

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-6-10-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
3	17 Oct			10.0	10.5	10.0	11.49	3" F.P.S.	0	ST	Clay (CH): dark grey brown in color,
3A				10.5	11.0	11.49	11.68		20	Jar	dry, stiff, uniform, and high plas-
				11.0	11.5				50		ticity.
				11.5	12.0				400		Sample length: 1.68 ft
				12.0	12.40				500		
			13.34	10.0	15.0			7" Folding Auger			Cleanout: assumed stratum change
4A	17 Oct	13.34	15.5	15.0	15.5	15.0	15.5	3" F.P.S.	700	Jar	Sandy shale: brownish dark grey
											in color, dry, and stiff to hard.
	17 Oct	15.5	20.0	15.0	32.7			5 5/8" Rock Bit			Shale: brown to dark grey
		20.0	22.0								Coal: black- water at 22 ft
		22.0	32.7								Shale and interbedded sandstone
											Blew hole dry and installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 17 Oct. 1981
Location Demolition Area Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 657.43 Boring No. WES-6-11-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	17Oct	0.0		0.0	0.5	0.0	2.39	3" Shelby Tube	50	ST	Sandy silt (SM): brown in color,
1A				0.5	1.0	2.39	2.62		75	Jar	dry, no cohesion, and contains 5-10%
				1.0	1.5				120		sandstone and limonite gravel.
				1.5	2.0				140		
			3.5	2.0	2.62				160		Sample length: 2.62 ft
				0.0	5.0			7" Solid Auger			Cleanout
2	17Oct	3.5	6.0	5.0	5.5	5.0	5.71	3"Fixed Pis-	100	ST	Clay (CL) and shale: brown in color,
2A				5.5	5.9	5.71	5.90	ton Sampler	500	Jar	low plasticity, dry, and contains
											30% hard shale fragments.
	17Oct	6.0	7.8	5.0	30.5			5 5/8" Rock	Bit		Shale: grey
		7.8	8.5								Coal: black
		8.5	10.5								Shale: brown and grey mixed
		10.5	15.3								Shale: light brown

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-6-11-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
		15.3	16.0								Limestone: light grey
		16.0	17.0								Shale: grey
		17.0	22.2								Shale: dark grey with water between
											20-20.5 ft
		22.2	23.0								Sandstone: brown and hard
		23.0	27.0								Shale: hard and grey
		27.0	27.8								Sandstone: hard
		27.8	30.5								Shale: grey
											Blew hole dry and installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 3 Nov. 1981
Location Demolition Area Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 667.28 Boring No. WES-6-12-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
		0.0		0.0	1.1						Disturbed when setting up rig.
			1.5								Clay (CH): brown, soft, and slight
											moisture
1	3 Nov	1.5	2.8	1.1	3.6	1.10	2.20	3"Shelby Tube		ST	Clay (CH): brick red in color, dry,
1A						2.20	2.35			Jar	uniform, stiff, and high plasticity.
		2.8	3.1			Pressure gauge is broken					Sandy clay (CL): brown in color,
											dry, stiff, and brittle.
											Sample length: 1.25 ft
				0.0	5.0			7" Solid Auger			Cleanout
2	3 Nov	3.1	7.6	5.0	6.7	5.0	6.01	3"Fixed Piston Sampler		ST	Clay shale: brown to grey brown in
						6.01	6.15			Jar	color, dry, and stiff.
											Sample length: 1.15 ft

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-6-12-81

SAMPLE NUMBER	DATE TAKEN	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
	3 Nov	7.6	8.3	5.0	45.4			5 5/8" Rock	Bit		Coal: black
		8.3	12.0								Sandstone: light grey and medium
											hard
		12.0	16.3								Shale: dark grey
		16.3	26.0								Sandstone: light brown
		26.0	27.3								Shale: dark grey and hard
		27.3	28.5								Sandstone: brown
		28.5	31.8								Shale: dark grey
		31.8	34.5								Sandstone: grey and hard
		34.5	37.0								Shale: light grey
		37.0	41.8			Slight moisture at 37 ft					Sandstone: light grey
		41.8	51.7								Shale: grey
	4 Nov			45.4	51.7			5 5/8" Rock	Bit		Water came up to depth of 41.5 ft
											overnight. Drilled to 51.7 ft and
											set well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 5 Nov. 1981
Location Demolition Area Job No. 441-G150,11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 660.41 Boring No. WES-6-13-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	5 Nov	0.0	3.7	0.0	2.5	0.0	1.29	3"Shelby Tube		ST	Clay (CL): reddish brown in color,
1A						1.29	1.44			Jar	slightly moist, stiff, and low
											plasticity.
											Sample length: 1.44 ft
2	5 Nov	3.7	5.7	0.0	5.0	3.7	5.0	7" Solid Auger		Jar	Clay shale: dark black in color,
											soft, dry, and highly organic.
		5.7	8.0	5.0	52.0	—	—	5 5/8" Rock Bit		—	Shale: mixture of grey and brown
		8.0	13.3								Shale: grey and soft
		13.3	14.4								Shale: brown and soft
		14.4	16.1								Sandstone: grey and hard
		16.1	18.2								Sandstone: brown
		18.2	23.7								Shale: grey and hard
		23.7	24.8								Sandstone: light grey
		24.8	27.7								Shale: grey and hard
		27.7	31.8								Sandstone: grey and hard

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-6-13-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
		31.8	32.3								Sandstone: brown
		32.3	35.7								Sandstone: grey and hard
		35.7	50.2								Shale: dark grey and hard
		50.2	52.0								Sandstone: light grey and hard
											Water at 40.5 ft coming in very
											slow. Installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 27 Oct. 1981
Location Old Rifle Range Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 505.06 Boring No. WES-6-14-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	27Oct	0.0		0.0	0.5	0.0	1.61	3" Shelby Tube	0	ST	Sandy clay (CL) and sandstone gravel:
1A				0.5	1.0	1.61	1.89		0	Jar	brown in color, moist, and low
				1.0	1.5				0		plasticity.
				1.5	2.0				0		
				2.0	2.5						Sample length: 1.89 ft
			3.44	0.0	5.0	—	—	7" Folding Auger	—		Cleanout: assumed stratum change
2	27Oct	3.44		5.0	5.5	5.0	7.06	3"Fixed Piston Sampler	0	ST	Sandy clay (CL): grey to brown in
2A				5.5	6.0	7.06	7.30		0	Jar	color, moist, and low plasticity.
				6.0	6.5				0		Water level at 4.0 ft, ten minutes
				6.5	7.0				0		later, water level at 3.4 ft.
				7.0	7.4				10		Sample length: 2.30 ft
				5.0	10.0	—	—	7" Folding Auger	—		Cleanout

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED 3" Fixed Piston Sampler = 3" F.P.S. Sheet 1 of 2 Sheets

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-6-14-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
3	27 Oct	11.8		10.0	10.5	10.0	11.67	3" F.P.S.	0	ST	Clay (CH): dark grey in color,
3A				10.5	11.0	11.67	11.89		0	Jar	uniform, soft, and high plasticity.
				11.0	11.5				10		
				11.5	12.0				30		
				12.0	12.4				70		Sample length: 1.89 ft
				10.0	15.0			7"Folding Auger			Cleanout
4	27 Oct			15.0	15.5	15.0	17.07	3" F.P.S.	0	ST	Clay (CH): same as above- water
4A				15.5	16.0	17.07	17.32		0	Jar	level rose to 2.6 ft after lunch.
				16.0	16.5				0		
				16.5	17.0				0		
				17.0	17.39				0		Sample length: 2.32 ft
			17.5	15.0	17.5			7" Folding Auger			Cleanout: installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 30 Oct. 1981
Location Old Rifle Range Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 510.42 Boring No. WES-6-15-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	30 Oct	0.0		0.0	0.5	0.0	1.35	3" Shelby Tube	0	ST	Sand (SP) and sandstone fragments.
1A				0.5	1.0	1.35	1.55		0	Jar	brown to orange brown in color, very
				1.0	1.5				50		fine to fine-grained, and dry.
				1.5	2.0				120		
			2.4	2.0	2.5				700		Sample length: 1.55 ft
				0.0	2.75			7" Folding Auger			Cleanout; bedrock starts at 2.4 ft
				0.0	2.8			5 5/8" Rock Bit			Cleanout
	31 Oct			2.8				4 x 5 1/2" Core Barrel			See page two for core log.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Hole No. WES-6-15-81

DRILLING LOG	DIVISION U.S. Navy	INSTALLATION Crane, IN	SHEET 2 OF 2 SHEETS

1. PROJECT NWSC Groundwater Study	10. SIZE AND TYPE OF BIT 4 x 5 1/2 in. Diamond bit
2. LOCATION (Coordinates or Station) Old Rifle Range	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL
3. DRILLING AGENCY CEWES	12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
4. HOLE NO. (As shown on drawing title and file number) WES-6-15-81	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED zero; UNDISTURBED two
5. NAME OF DRILLER C. Drake	14. TOTAL NUMBER CORE BOXES zero
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 30 Oct. 81; COMPLETED 31 Oct. 81
7. THICKNESS OF OVERBURDEN 2.75 ft	17. ELEVATION TOP OF HOLE 510.42
8. DEPTH DRILLED INTO ROCK 14.50 ft	18. TOTAL CORE RECOVERY FOR BORING 95.2% %
9. TOTAL DEPTH OF HOLE 17.25 ft	19. SIGNATURE OF INSPECTOR Joseph B. Wheeler

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
510.42	0.0		See page one for over-burden information.			
509.42	1.0					
508.42	2.0					30 Oct. 81 WL - Run 1 Began 2:35 Rec 4.55' End 2:55 Loss - Time 20 min Gain - Drl time 20 min Hyd press 100psi Water press - RPM 50-75 Drl Action Smooth ~~Water~~ ret Brown Remarks Cored with air. Stuck core bbl-drilled 6" Cs around to break out.
507.42	3.0		Sandstone: brown to rusty brown in color, uniform, fine-grained quartz sand, moderately hard, and oxidized. Bedding ranges from thinly bedded to around one foot maximum thickness and horizontal to sub-horizontal in attitude.			
506.43	4.0					
505.42	5.0					
504.42	6.0		Solution cavity.			
503.42	7.0		Water at end of run. Run 1	100%	-	31 Oct. 81 WL - Run 2 Began 9:42 Rec 3.85 End 10:15 Loss - Time 33 min Gain - Drl time 33 min Hyd press 100psi Water press - RPM 50-75 Drl Action Smooth Water ret Slight return-brown Remarks Stuck core bbl-Drilled 6" Cs around to break out.
502.42	8.0		Sandstone: same			
501.42	9.0					
500.42	10.0					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT) PROJECT HOLE NO.

Hole No. WES-6-15-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 3 OF 3 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	16. DATE HOLE — STARTED — COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
500.42	10.0					
499.42	11.0		Run 2			
498.42	12.0					AL - Run 3 Logan 1:09 Rec 4.1' End 1:39 Loss - Time 30 min Gain - Drl time 30 min Hyd press 100psi Water press - RPM 50 Drl Action Smooth Water ret Slight-brown Remarks Water more pronounced after second run.
497.42	13.0		Sandstone: same	100%	-	
			small cavity-1/2 x 1/2 x 1 in.			
496.42	14.0					
495.42	15.0		Run 3			
494.42	16.0		Sandstone: same	64.1%	-	AL - Run 4 Logan 2:00 Rec 1.25 End 2:30 Loss 0.70 Time 30 min Gain - Drl time 30 min Hyd press 100+ Water press - RPM 50 Drl Action Smooth ~~Water~~ ret Slight-brown Remarks -
			Recovered to 16.55 ft			
493.42	17.0		Hole rodded at 17.25 ft Run 4			
			Blew hole dry and installed well.			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT | HOLE NO.

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 2 Nov, 1981
Location Old Rifle Range Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 527.88 Boring No. WES-6-16-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	2 Nov	0.0		0.0	0.5	0.0	1.37	3" Shelby Tube	0	ST	Silt (ML): brown in color, uniform,
1A				0.5	1.0	1.37	1.52		0	Jar	dry, and stiff.
				1.0	1.5				200		
				1.5	2.0				480		
				2.0	2.5				620		Sample length: 1.52 ft
				0.0	3.0			7" Folding Auger			Cleanout: very hard
			4.5	3.0	5.0			5 5/8" Rock Bit			Cleanout: softer at 4.5 ft
2A	2 Nov	4.5	10.0	5.0	5.4	5.0	5.4	3"Fixed Piston Sampler	700	Jar	Sandy silt (ML): brown in color,
											dry, low plasticity, and contains
											5-10% fine to medium sand.
		10.0	27.0	5.0	45.15			5 5/8" Rock Bit			Clay shale: brown in color, very
											stiff to hard, weathered, and
											slightly moist in regions,

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-6-16-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
		27.0	45.15								Sandstone: brown in color, medium
											hard, and fine-grained.
											Encountered water between 35 and 37ft.
											Meausred water level after 49
											minutes and it rose to 31.97 ft.
											Drilled to 45.15 ft and blew water
											from hole. Rinsed hole three times
											with clean water to remove mud,
											Installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 10 Nov. 1981
Location Old Rifle Range Job No. 441-G150,11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 510.73 Boring No. WES-6-17-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	10 Nov	0.0		0.0	0.5	0.0	1.39	3" Shelby Tube	0	ST	Clay (CL): brown in color, soft,
1A				0.5	1.0	1.39	1.57		0	Jar	slightly moist, and low plasticity.
				1.0	1.5				30		Sample length: 1.57 ft
			2.0	1.5	2.0				700		
	10 Nov	2.0		0.0	17.5			6 3/4" Rock	Bit		Sandstone: brown, fine-grained,
											and medium hard. Checked hole for
											water at 6.8 ft, 10.0 ft, and
											12.4 ft. Moisture at 12.4 ft.
											Water visible from 12.4 to 17.5 ft
											coming in from sidewalls.
	10 Nov		22.5	17.5	22.55			4 x 5 1/2" Core Barrel			Sandstone: see page two for log
											of core.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Hole No. WES-6-17-81

DRILLING LOG	DIVISION U.S. Navy	INSTALLATION Crane, IN	SHEET 2 OF 2 SHEETS

1. PROJECT NWSC Groundwater Study	10. SIZE AND TYPE OF BIT 4 x 5 1/2 in Diamond
2. LOCATION (Coordinates or Station) Old Rifle Range	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL
3. DRILLING AGENCY CEWES	12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
4. HOLE NO. (As shown on drawing title and file number) WES-6-17-81	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED zero; UNDISTURBED one
5. NAME OF DRILLER C. Drake	14. TOTAL NUMBER CORE BOXES zero
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 10 Nov. 81; COMPLETED 10 Nov. 81
7. THICKNESS OF OVERBURDEN 2.0 ft	17. ELEVATION TOP OF HOLE 510.73
8. DEPTH DRILLED INTO ROCK 20.55 ft	18. TOTAL CORE RECOVERY FOR BORING 24.6% %
9. TOTAL DEPTH OF HOLE 22.55 ft	19. SIGNATURE OF INSPECTOR Joseph B. Wenham

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
493.73	17.0					
492.73	18.0		From 17.5 to 18.0 ft, 1/4-3/4 in. alternating layers of rusty brown to dark brown sandstone.			10 Nov. 81 NL - Run 1 Began 1:13 Rec 5:05 End 1:56 Loss - Time 43 min Gain - Drl time 43 min Hyd press 100psi Water press - RPM 50-75 Drl Action Smooth Water ret Brown -
491.73	19.0		Sandstone: brown in color, uniform, fine-grained quartz sand, and medium hard. Pyrite crystals with oxidation rims from 21.65-21.9 ft and at 22.35 ft.			
490.73	20.0					
489.73	21.0					
488.73	22.0					
			Run 1	100%	-	
487.73	23.0		Reamed hole out with 6-3/4 in rock bit and rinsed hole with clean water. Water level came up overnight to 12.7 ft. Blew dry and installed well.			

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PROJECT | HOLE NO.

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 13 Nov. 1981
Location Old Rifle Range Job No 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 508.03 Boring No. WES-6-18-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	13 Nov	0.0		0.0	0.5	0.0	1.63	3" Shelby Tube	0	ST	Silty sand (SM): brown to rusty
1A				0.5	1.0	1.63	1,78		0	Jar	brown in color, fine-grained, and
				1.0	1.5				20		little cohesion.
				1.5	2.0				280		
			5.0	2.0	2.5				380		Sample length: 1.78 ft
				0.0	5.0			7" Folding Auger			Cleanout
2	13 Nov	5.0		5.0	5,5	5.0	6.58	3"Fixed Piston Sampler	0	ST	Sand (SP): brown in color, uniform,
2A				5.5	6.0	6,58	6.78		20	Jar	fine-grained quartz sand, and
				6.0	6.5				320		slightly damp.
			6.5	6.5	6.75				720		Sample length: 1.78 ft
		6.5	10.0	5.0	26.6			5 5/8" Rock Bit			Sandstone: brown, weathered, and
											fine-grained
		10.0	11.5								Sandstone with clay/shale lenses.
		11.5	14.4								Sandstone: brown, fine-grained,

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-6-18-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
											and soft.
		14.4	26.6								Sandstone: brown, fine-grained,
											and hard.
											Water at 16.6 ft.
											Jetted hole twice to clear water
											and installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 23 Nov, 1981
Location Old Rifle Range Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 503.42 Boring No. WES-6-19-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
		0.0		0.0	5.0			7" Folding Auger			Cleanout: 0.0 to 5.0 ft is disturbed
											from setting up. Had to dump load
			3.0								of gravel to firm up area.
1	23 Nov	3.0		5.0	5.5	5.0	6.88	*3"Fixed Piston Sampler	0	ST	Clay (CH): grey with streaks of
1A				5.5	6.0	6.88	7.13		0	Jar	brown, soft, and high plasticity.
				6.0	6.5				0		Water in hole after cleanout- 8 ft.
				6.5	7.0				0		Sample length: 2.13 ft
				7.0	7.5				10		
			11.75	5.0	10.0			7" Folding Auger			Cleanout: assumed stratum change
2	23 Nov	11.75		10.0	10.5	10.0	11.66	3" F.P.S.	0	ST	Sandy clay (CL): dark grey in color,
2A				10.5	11.0	11.66	11.96		0	Jar	soft, low to medium plasticity, and
				11.0	11.5				0		contains 20% very fine-grained sand.
				11.5	12.0				0		
				12.0	12.39				0		Sample length: 1.96 ft

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

* 3" Fixed Piston Sampler = 3"F.P.S.

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-6-19-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
			16.75	10.0	15.0			7" Folding Auger			Cleanout: assumed stratum change
3	23 Nov	16.75		15.0	15.5	15.0	17.06	3" F.P.S.	0	ST	Gravelly clay (CL): brown to grey
3A				15.5	16.0	17.06	17.36		0	Jar	with traces of red and green, fine
				16.0	16.5				0		to medium sized gravel, soft, and
				16.5	17.0				0		low plasticity.
				17.0	17.40				0		Sample length: 2.36 ft
			20.0	15.0	20.0			7" Folding Auger			Went additional few ft to provide
											better seal at surface.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 24 Nov. 1981
Location Old Rifle Range Job No. 441-G150.11CR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 515.68 Boring No. WES-6-20-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	24 Nov	0.0		0.0	0.5	0.0	1.78	3" Shelby Tube	0	ST	Silt (ML), brown in color, soft,
				0.5	1.0	1.78	1.95		0	Jar	low plasticity, and dry.
				1.0	1.5				25		
				1.5	2.0				75		Sample length: 1.95 ft
				2.0	2.5				380		
				0.0	5.0			7" Folding Auger			Cleanout
2	24 Nov			5.0	5.5	5.0	6.75	3"Fixed Piston Sampler	0	ST	Silt (ML): brown in color with
2A				5.5	6.0	6.75	6.95		0	Jar	traces of grey, soft, and low
				6.0	6.5				10		plasticity.
				6.5	7.0				230		Sample length: 1.95 ft- chucks slipped
				7.0	7.5				380		
	25 Nov		8.0	5.0	8.0			7" Folding Auger			Cleanout

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-6-20-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
	25 Nov	8.0	30.5	8.0	30.5			5 5/8" Rock	Bit		Sandstone: brown in color, fine-grained, and weathered. Water encountered around 20.5 ft. Installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 3 Oct. 1981
Location Highway 58 Dump Site A Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 629.54 Boring No. WES-7-1-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	3 Oct	0.0		0.0	0.5	0.0	1.05	3" Shelby	40	ST	Gravelly clay (CL): brown in color,
1A				0.5	1.0	1.05	1.25	Tube	40	Jar	soft to moderately stiff, dry, and
				1.0	1.5				100		contains 20% gravel fragments.
				1.5	2.0				160		
			4.0	2.0	2.5				300		Sample length: 1.25 ft
				0.0	5.0	—	—	7" Solid Auger		—	Cleanout
2	3 Oct	4.0		5.0	5.5	5.0	6.79	3"Fixed Pis-	40	ST	Clay (CL): brown to grey, stiff,
2A				5.5	6.0	6.79	6.97		60	Jar	and fairly uniform.
				6.0	6.5				120		
				6.5	7.0				180		Sample length: 1.97 ft
			8.0	7.0	7.5				240		
				5.0	10.0	—	—	7" Solid Auger		—	Cleanout

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

*3" Fixed Piston Sampler = 3"F.P.S.

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-7-1-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
3	5 Oct	8.0		10.0	10.5	10.0	11.44	3" F.P.S.	160	ST	Clay shale: grey in color, dry,
3A				10.5	11.0	11.44	11.59		240	Jar	very stiff, and uniform.
				11.0	11.5				380		
				11.5	12.0				420		Sample length: 1.59 ft
				12.0	12.5				520		
			13.0	10.0	13.0	—	—	7" Solid Auger		—	Cleanout: auger required 600 psi,
											will go to rock bit
	5 Oct	13.0	17.5	13.0	41.5	—	—	5 5/8" Rock Bit		—	Shale: brownish red
		17.5	31.0								Shale: grey
											Encountered water between 30-31 ft
		31.0	32.2								Coal: black
		32.2	41.5								Shale: grey and becoming harder
											at 39 ft
											Installed well after blowing hole clear.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 3 Oct, 1981
Location Highway 58 Dump Site A Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 601.89 Boring No. WES-7-2-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	3 Oct	0.0		0.0	0.5	0.0	1.55	3" Shelby Tube	0	ST	Gravelly clay (CL): brown in color,
1A				0.5	1.0	1.55	1.80		10		dry, stiff, and contains 10-15%
				1.0	1.5				150		sandstone gravel.
				1.5	2.0				250		
				2.0	2.5				360		Sample length: 1.7 ft
				0.0	5.0			7"Folding Auger			Cleanout
2	3 Oct			5.0	5.5	5.0	7.06	3"Fixed Piston Sampler	0	ST	Gravelly clay (CL): brownish grey
2A				5.5	6.0	7.06	7.21		0	Jar	in color, very stiff, dry, and con-
				6.0	6.5				40		tains 10-15%, fine to medium sand-
				6.5	7.0				220		stone gravel.
				7.0	7.4				400		Sample length: 2.21 ft
				5.0	10.0			7" Folding Auger			Cleanout

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-7-2-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
3A	3 Oct			10.0	10.5	10.5	11.5	3" F.P.S.	0	Jar	Gravelly clay (CL): same as in
				10.5	11.0				400		previous sample except 25-30% gravel.
			11.8	11.0	11.5				800		Tube bent on rock.
		11.8		10.0	11.8			7" Folding Auger			Cleanout: 800 psi on auger.
											For core log page 3.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 5 Sheets

Hole No. WES-7-2-81

DRILLING LOG	DIVISION U.S. Navy	INSTALLATION Crane, IN	SHEET 3 OF 5 SHEETS

1. PROJECT NWSC Groundwater Study	10. SIZE AND TYPE OF BIT 4 x 5-1/2 in. Diamond bit
2. LOCATION (Coordinates or Station) Highway 58 Dump Site A	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL
3. DRILLING AGENCY CEWES	12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
4. HOLE NO. (As shown on drawing title and file number) WES-7-2-81	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED zero; UNDISTURBED three
5. NAME OF DRILLER C. Drake	14. TOTAL NUMBER CORE BOXES zero
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 3 Oct. 1981; COMPLETED 5 Oct. 1981
7. THICKNESS OF OVERBURDEN 11.8 ft	17. ELEVATION TOP OF HOLE 601.89
8. DEPTH DRILLED INTO ROCK 23.2 ft	18. TOTAL CORE RECOVERY FOR BORING 98.5% %
9. TOTAL DEPTH OF HOLE 35.0 ft	19. SIGNATURE OF INSPECTOR Joseph E. Dunbar

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
590.89	11.0		For overburden see page one and two.			
589.89	12.0					3 Oct. 1981 WL - Run 1 Began 3:18 Rec 3.70' End 3:44 Loss - Time 26 min Gain - Drl time 26 min Hyd press 100psi Water press - RPM 50-75 Drl Action Smooth ~~Water~~ rot Brownish red Remarks Cored with air
588.89	13.0					
			Gravelly clay shale; reddish brown in color, dry, very stiff, dense, weathered, and contains 20-30% fine to medium sized gravel.			
587.89	14.0					
586.89	15.0					5 Oct. 1981 WL - Run 2 Began 8:59 Rec 4.0' End 9:17 Loss 0.45' Time 18 min Gain - Drl time 18 min Hyd press 100psi Water press - RPM 50-75 Drl Action Smooth ~~Water~~ rot Dark grey Remarks -
			Run 1	100%	-	
			Fractured black shale			
585.89	16.0		Fine-grained shaley sandstone from 16.0 to 16.5 ft			
584.89	17.0		Shale: brown to orange brown, weathered, soft, dry, and contains interbedded limonite lenses.			
583.89	18.0		Shale: dark grey and soft Limonite: orange brown, earthly texture, and crumbles easily.			WL - Run 3 Began 10:03 Rec 0.35' End 10:08 Loss - Time 5 min Gain - Drl time 5 min Hyd press 100psi Water press - RPM 50+ Drl Action Smooth ~~Water~~ rot Dark grey Remarks Blocked off
582.89	19.0		Shale: dark grey and soft Shaley sandstone: dark grey and fine-grained			
			Fractured black, soft shale.			
581.89	20.0		Run 2	89.8%	-	
			Run 3 Black shale	100%	-	
580.89	21.0					

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PROJECT | HOLE NO.

Hole No. WES-7-2-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 4 OF 5 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	16. DATE HOLE — STARTED — COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
580.89	21.0					
579.89	22.0		Shale (50%) and sandstone (50%): light grey to dark grey in color, very soft to soft, and very irregular bedding. Sandstone and shale in irregular seams and lenses which are random in orientation and attitude.			AL - Run 4 Began 10:37 Rec 4.65' End 10:59 Loss - Time 22 min Gain - Drl time 22 min Hyd press 100psi Water press - RPM 50-75 Drl Action Smooth ~~Water~~ ret -
578.89	23.0					
577.89	24.0					Remarks Encountered water at 25 ft-lost cuttings.
576.89	25.0		Run 4	100%	-	
575.89	26.0		Sandstone (80%) and shale (20%): light grey to dark grey, fine-grained sandstone, moderately hard, traces of organic matter, and thickness of black shale is between 1/16-1/4 in.			AL - Run 5 Began 11:30 Rec 3.45' End 11:56 Loss - Time 26 min Gain - Drl time 26 min Hyd press 100psi Water press - RPM 50-75 Drl Action Smooth ~~Water~~ ret -
574.89	27.0					Remarks -
573.89	28.0		Run 5	100%	-	
572.89	29.0		Sandstone (85-90%) and shale (10-15%): same as above, breaks in shale seams, and 1-3% black coal between 1/16-1/8-in. thickness.			AL - Run 6 Began 12:42 Rec 3.85' End 12:55 Loss - Time 13 min Gain - Drl time 13 min Hyd press 100psi Water press - RPM 50-75 Drl Action Smooth ~~Water~~ ret -
571.89	30.0					Remarks -
570.89	31.0		closed break			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT HOLE NO.

Hole No. WES-7-2-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 5 OF 5 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	16. DATE HOLE — STARTED — COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	31.0		closed break			
	32.0		Run 6			
			Sandstone (90-95%) Shale (5-10%)			AL - Began 1:15 End 1:40 Time 25 min Drl time 25 min Hyd press 100psi Water press - RPM 50-75 Drl Action Smooth Water ret - Remarks -
	33.0		1/2 in coal lens			Run 7 Rec 2.7' Loss - Gain -
	34.0		1/2 in coal lens			
	35.0		Run 7	100%	-	
			Rinsed boring with water to remove mud and cuttings untill water cleared up. Jetted water from boring prior to installing well on 6 Oct. 81.			

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PROJECT | HOLE NO.

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 6 Oct. 1981
Location Highway 58 Dump Site A Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 597.02 Boring No. WES-7-3-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	1 Oct	0.0		0.0	0.5	0.0	1.77	3" Shelby Tube	0	ST	Gravelly clay (CL): brown in color,
1A				0.5	1.0	1.77	1.97		0	Jar	very stiff, dry, and contains fine
				1.0	1.5				0		to medium sandstone gravel.
				1.5	2.0				150		Sample length: 1.97 ft
				2.0	2.5				280		
				0.0	5.0			7" Folding Auger			Cleanout
2				5.0	5.5	5.0	6.14	3"Fixed Piston Sampler	20	ST	Gravelly clay (CL): same as above.
2A	6 Oct			5.5	6.0	6.14	6.39		340	Jar	
				6.0	6.5				440		
				6.5	7.0				480		Sample length: 1.39 ft
			6.39	7.0	7.5				750		
	6 Oct	6.39	40.1	5.0	40.1			5 5/8" Rock Bit			Water encountered between 28-30 ft.
											Material drilled was shale and
											sandstone. Lost cuttings at 30 ft.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 1 of 1 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 12 Oct. 1981
Location Highway 58 Dump Site A Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 595.80 Boring No WES-7-4-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
	12 Oct	0.0	1.5	0.0	0.3	—	—	3" Shelby	500	—	Clay, coal, and fragments of bed-
											rock, material is fill.
	12 Oct	1.5	3.7	0.0	36.5	—	—	5 5/8" Rock	Bit	—	Sandstone: brown and soft
		3.7	6.3								Limestone: grey, fine-grained,
											and fossiliferous.
		6.3	11.7								Clay shale: reddish brown and soft
		11.7	21.5								Clay shale: dark brownish grey
											and soft
		21.5	23.7								Sandstone and interbedded shale:
											grey to brown and moderately hard.
		23.7	25.0								Shale: grey and soft
		25.0	29.3								Sandstone and shale: grey and
											moderately hard. Slight moisture
											at 29 ft.
		29.3	30.8								Limestone:
		30.8	39.5								Sandstone and shale

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-7-4-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
	12 Oct			36.5	39.5			5 5/8" Rock	Bit		Stopped st 36.5 ft and allowed
											water level to stabalize. Measured
											after 60 min and depth was 31.75 ft.
											Will drill to 39.0 ft, which should
											put boring 10 ft below where water
											starts.
											Installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 5 Nov. 1981
Location Highway 58 Dump Site A Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 593.73 Boring No. WES-7-5-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	5 Nov	0.0		0.0	0.5	0.0	0.95	3" Shelby Tube	0	ST	Clay (CL): dark brownish grey in
1A				0.5	1.0	0.95	1.18		0	Jar	color, slightly damp, soft, and low
				1.0	1.5				0		plasticity.
				1.5	2.0				0		Sample length: 1.18 ft
				2.0	2.5				0		
				0.0	5.0			7" Folding Auger			Cleanout
2	5 Nov			5.0	5.5	5.0	7.07	*3"Fixed Piston Sampler	0	ST	Clay (CL): brown in color, dry,
2A				5.5	6.0	7.07	7.37		0	Jar	very stiff, brittle, and low
				6.0	6.5				0		plasticity.
				6.5	7.0				0		Sample length: 2.37 ft
				7.0	7.39				30		
				5.0	10.0			7" Folding Auger			Cleanout: material is lighter in
											color from 9 ft.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED *3" Fixed Piston Sampler = 3" F.P.S. Sheet 1 of 3 Sheets

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-7-5-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
3	5 Nov			10.0	10.5	10.0	11.39	3" F.P.S.	0	ST	Clay (CL): brown in color, dry,
3A				10.5	11.0	11.39	11.57		0	Jar	stiff, brittle, and low plasticity
				11.0	11.5				0		
				11.5	12.0				30		
				12.0	—				500		Sample length: 1.57 ft
			13.28	10.0	15.0	—	—	7" Folding Auger	—		Cleanout: assumed stratum change
4	5 Nov	13.28		15.0	15.5	15.0	16.39	3" F.P.S.	0	ST	Sandy clay (CL): brown in color,
4A				15.5	16.0	16.39	16.59		0	Jar	slightly damp, moderately stiff,
				16.0	16.5				0		low plasticity, and contains 5-10%
				16.5	17.0				90		fine to medium grained sand.
			17.0	17.0	17.38				200		Sample length: 1.59 ft
		17.0	18.3	15.0	18.3	—	—	7" Folding Auger	—		Cleanout: from 17 to 18.3 ft,
											gravelly clay (CL)- brown and stiff.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-7-5-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
	5 Nov			18.3	22.0	—	—	5 5/8" Rock	Bit	—	Clay shale; brown and medium hard
				22.0	39.0						Sandstone: grey
											Water at 28.7 ft- drilled to 39 ft.
											Installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 3 of 3 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 24 Oct, 1981
Location Highway 58 Dump Site B Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 641.26 Boring No. WES-8-1-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1A	24Oct	0.0	1.5	0.0	0.5	0.0	0.7	3" Shelby Tube	50	Jar	Sandy clay (CL): brown in color,
				0.5	1.0				500		dry, and contains fine to coarse
				1.0	1.5				700		grained sand.
	24Oct	1.5	18.3	0.0	35.0	—	—	5 5/8" Rock	Bit	—	Sandstone: horizontal cracks at
											3.3, 7.5, and 8.3 ft. Sandstone
											is brown, soft, and weathered to
											8.3 ft, moderately hard after 8.3 ft.
		18.3	19.2								Clay shale: soft and grey
		19.2	23.3								Limestone: very hard and light grey
		23.3	24.7								Shale: brown and soft
		24.7	31.6								Sandstone: brown to 27.3 ft and
											light grey to 31.6 ft
		31.6	32.0								Shale: dark grey and soft
		32.0	34.3								Limestone: light grey and hard
		34.3	35.0								Shale: brown
	26Oct	35.0	37.7	35.0	68.0	—	—	5 5/8" Rock	Bit	—	Limestone: light grey and hard

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____

Location _____ Job No. _____

Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-8-1-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		37.7	38.3								Shale: brown
		38.3	44.2								Limestone: light grey and hard
		44.2	45.0								Sandstone: grey, soft, and clayey
		45.0	54.3								Limestone: grey and hard
		54.3	56.3								Shale: dark grey and soft
		56.3	57.5								Sandstone: grey and medium hard
		57.5	59.3								Clay: brown, soft, and damp
		59.3	65.5								Shale: hard and grey
		65.5	67.3								Sandstone: brown
		67.3	71.6								Limestone
	27Oct	71.6	74.0	6.8	74.0			5 5/8" Rock	Bit		Shale
											Water level at 9:14 on 27 Oct, 1981
											was at 63.95 ft. Drilled 10 ft
											below and installed well.

Sheet 2 of 2 Sheets

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 20 Oct. 1981
Location Highway 58 Dump Site B Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 580.99 Boring No. WES-8-2-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
	20 Oct	0.0		0.0	0.5	—	—	3" Shelby Tube	—	—	No sample: clay (CL), boulders,
				0.5	1.0						and cobbles. Hydrallic guage is
				1.0	1.5						broken.
				1.5	1.7						
				0.0	3.2	—	—	7" Solid Auger		—	Clay with sandstone cobbles and
											boulders.
	20 Oct			3.2	4.8	—	—	5 5/8" Rock Bit		—	Made room for 4-5-1/2 in. core
											barrel.
	20 Oct		4.2	4.8	9.8	—	—	4 x 5 1/2" Core Barrel			No sample-clay shale: yellow
		4.2									brown in color and highly weathered.
	20 Oct			9.8	11.4	—	—	4 x 5 1/2" Core Barrel			No sample-clay shale: same-cored
											with low hyd. and low air press.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-8-2-81

SAMPLE NUMBER	DATE TAKEN	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press		CLASSIFICATION AND REMARKS
	20Oct	13.4	15.5	13.4	15.9	13.4	15.9	5" Dennison	Barrel		Shale: highly weathered, brittle,
											soft, and light brown to brown
											in color-partial recovery
		15.5									Shale: brittle, soft, weathered,
											and dark grey to brownish grey.
	20Oct			15.9	17.0	15.9	17.0	5" Dennison	Barrel		Shale: dark grey and oxidized.
											Water at 16 ft.
	21Oct			17.0	17.5	17.0	18.7	3"Fixed Pis- Sampler	240		Shale: dark grey, brittle, soft,
				17.5	18.0				300		weathered, and oxidized. Water
				18.0	18.5				420		marks visible from iron staining
				18.5	18.7				500		on core.
	21Oct			18.7	2.12	18.7	21.2	5" Dennison	Barrel		Shale: dark black and no oxidation.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-8-2-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
	21Oct			21.2	23.7	21.2	23.7	Dennison Barrel			Shale: dark greenish grey, soft,
											uniform and brittle.
	21Oct			23.7	26.2	23.7	26.2	Dennison Barrel			Shale: same
											oxidized from 24.2 to 24.5 ft and
											25.0 to 25.2 ft.
											Blew hole dry and installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 3 of 5 Sheets

Hole No. WES-8-2-81

DRILLING LOG	DIVISION U.S. Navy	INSTALLATION Crane, IN	SHEET 4 OF 5 SHEETS

1. PROJECT NWSC Groundwater Study	10. SIZE AND TYPE OF BIT –
2. LOCATION (Coordinates or Station) Highway 58 Dump Site B	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL
3. DRILLING AGENCY CEWES	12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
4. HOLE NO. (As shown on drawing title and file number) WES-8-2-81	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED zero; UNDISTURBED seven
5. NAME OF DRILLER D. Taylor	14. TOTAL NUMBER CORE BOXES zero
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 20 Oct. 1981; COMPLETED 21 Oct. 1981
7. THICKNESS OF OVERBURDEN 0.0	17. ELEVATION TOP OF HOLE 58099
8. DEPTH DRILLED INTO ROCK 26.2 ft	18. TOTAL CORE RECOVERY FOR BORING – %
9. TOTAL DEPTH OF HOLE 26.2 ft	19. SIGNATURE OF INSPECTOR [signature]

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
567.99	13.0		Partial recovery of shale; very weathered, brittle, and fractured			
566.99	14.0		fractured			Dennison Barrel
565.99	15.0		Shale: light brown to brown in color, highly weathered, brittle, and soft			
			Shale: dark grey to brownish grey, oxidized, brittle, and soft.			
564.99	16.0		fractured			Dennison Barrel Encountered water at 16 ft
			Shale: dark grey and oxidized			21 Oct. 81 Water overnight to 15 ft
563.99	17.0		Shale: dark grey, brittle, soft, and oxidized. Water marks visible from iron staining on core.			Fixed Piston Sampler
562.99	81.0					
561.99	18.0		fractured			Dennison Barrel
560.99	20.0		Shale: dark grey to black, soft, and very brittle.			
559.99	21.0					
558.99	22.0		Shale: dark greenish grey, soft, uniform, and brittle.			Dennison Barrel
557.99	23.0					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT) PROJECT HOLE NO.

Hole No. WES-8-2-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 5 OF 5 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN	16. DATE HOLE — STARTED — COMPLETED
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE	18. TOTAL CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
557.99	23.0					
556.99	24.0		oxidized			Dennison Barrel
555.99	25.0		oxidized			
554.99	26.0		Shale: dark greenish grey, soft, uniform, and brittle.			
			Machine breaks to 23.7 ft. Natural break from 23.7			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT | HOLE NO.

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 22 Oct. 1981
Location Highway 58 Dump Site B Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 578.90 Boring No. WES 8-3-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
	22 Oct	0.0		0.0	2.5			3" Shelby Tube			No sample-push bent tube-clay (CL), cobbles, and boulders.
			5.3	0.0	5.5			7" Solid Auger			Cleanout: clay, cobbles, and boulders.
		5.3	8.0	5.5	35.0			5 5/8" Rock Bit			Shale: brown, weathered, and soft
		8.0	14.3								Shale: dark grey and medium hard
		14.3	23.0								Shale: light grey and medium hard
		23.0	26.3								Limestone: grey and hard
		26.3	27.5								Shale: light grey and medium hard
		27.5	31.3								Shale: brown
		31.3	35.0								Sandstone: brown and medium hard.
											Let hole sit overnight-no water
											on 23 Oct. 1981.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-8-3-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
	23Oct	35.0	61.0	35.0	73.0	—	—	5 5/8" Rock	Bit	—	Sandstone: brown and medium hard.
		61.0	62.1								Shale: dark grey and water
		62.1	73.0								Limestone: grey and hard.
											Blew hole and installed well.
											Water coming in very slowly.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 10 Nov. 1981
Location Highway 58 Dump Site B Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 583.66 Boring No. WES-8-4-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1A	10Nov	0.0		0.0	2.5	0.0	0.8	3" Shelby Tube		Jar	Gravelly clay (CL): brown, soft,
1A											low plasticity, and contains 25-30%
											limestone and sandstone fragments.
											Tube damaged in push.
				0.0	4.0	—	—	7" Solid Auger		—	Cleanout
	10Nov		9.0	4.0	39.0	—	—	5 5/8" Rock Bit		—	Overburden: clay, gravel, cobbles,
											and boulders. Rock portion is
											primarily limestone.
		9.0	11.6								Sandy clay shale: soft and red
		11.6	15.8								Sandy clay shale: soft and brown
		15.8	33.2								Shale: grey-soft and sandy between
											29-30 ft
		33.2	35.5								Limestone: grey and hard
	11Nov			39.0	70.0	—	—	5 5/8" Rock Bit		—	No water in hole overnight.
		35.5	45.2								Sandstone: brown and hard

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____

Location _____ Job No. _____

Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-8-4-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		45.2	48.1								Shale: grey
		48.1	50.0								Sandstone: hard and brown
		50.0	52.3								Shale: grey and hard
		52.3	71.6								Sandstone: brown and hard
				70.0	80.0			5 5/8" Rock	Bit		Water at 70 ft, waited 60 min and
											water rose 1.5 ft
		71.6	73.8								Shale: grey and hard
		73.8	80.0								Limestone: grey and hard
											Installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 11 Nov. 1981
Location Highway 58 Dump Site B Job No. 441-G150,11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 583.84 Boring No. WES-8-5-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	11Nov	0.0		0.0	2.5	0.0	0.94	3" Shelby Tube		ST	Clay (CH): brown to dark brown in
1A						0.94	1.29			Jar	color, soft, and high plasticity,
											Sample length: 1.29 ft-Tube bent
											in push
				0.0	3.3	—	—	7" Solid Auger	—		Cleanout: clay, cobbles, and boulders
	11Nov		5.1	3.3	26.0	—	—	6 3/4" Rock Bit	—		Clay, cobbles, and boulders
		5.1	10.5								Shale: brown and soft
		10.5	11.3								Shale: grey and soft
		11.3	12.3								Limestone: grey and hard
		12.3	15.8								Shale: grey and medium
		15.8	17.0								Sandstone: brown and soft
		17.0	30.1								Shale: dark grey and soft
	12Nov			26.0	28.2	—	—	Dennison Barrel			For core log see page 3.
				28.2	30.4	—	—	Dennison Barrel			Core information above 26 ft is

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-8-5-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
				30.4	35.2			4 x 5 1/2" Core Barrel			found on boring WES-8-2-81.
				35.2	36.0			Dennison Barrel			
				36.0	37.8			4 x 5 1/2" Core Barrel			
				37.8	38.3			Dennison Barrel			
				38.3	43.1			4 x 5 1/2" Core Barrel			
				43.1	47.8			4 x 5 1/2" Core Barrel			
	13Nov			47.8	52.5			4 x 5 1/2" Core Barrel			
				52.5	57.2			4 x 5 1/2" Core Barrel			
				57.2	61.9			4 x 5 1/2" Core Barrel			
				61.9	65.75			4 x 5 1/2" Core Barrel			
				65.75	70.75			4 x 5 1/2" Core Barrel			

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Hole No. WES-8-5-81

DRILLING LOG	DIVISION U.S. Navy	INSTALLATION Crane, IN	SHEET 3 OF 7 SHEETS

1. PROJECT NWSC Groundwater Study	10. SIZE AND TYPE OF BIT 4 x 5-1/2 in Diamond
2. LOCATION (Coordinates or Station) Highway 58 Dump Site B	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL
3. DRILLING AGENCY CEWES	12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
4. HOLE NO. (As shown on drawing title and file number) WES-8-5-81	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED zero; UNDISTURBED one
5. NAME OF DRILLER C. Drake	14. TOTAL NUMBER CORE BOXES zero
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 11 Nov. 1981; COMPLETED 13 Nov. 1981
7. THICKNESS OF OVERBURDEN 5.1 ft	17. ELEVATION TOP OF HOLE 583.84
8. DEPTH DRILLED INTO ROCK 65.65 ft	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE 70.75 ft	19. SIGNATURE OF INSPECTOR Joseph B. Drake

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
558.84	25.0					
557.84	26.0					
			Shale; dark greenish grey, soft, brittle, and uniform			
556.84	27.0		fractured			
			Breaks occured when drilling and pushing sample			
555.84	28.0		Run 1	100%	-	Dennison Barrel
554.84	29.0					
			Shale; same			
			Breaks ocurred when drilling and pushing sample.			
553.84	30.0		Run 2	100%	-	Dennison Barrel
			fractured			
552.84	31.0					
			Shale (60-70%) and sandstone lenses (30-40%): highly weathered, orange brown in color, brittle, and very soft.			AL - Run 3 Began - Rec 4.6' End - Loss 0 2' Time - Gain - Drl time - Hyd press 100psi Water press - RPM 50-75 Drl Action Smooth Water Tot Brown Remarks Partial recovery
551.84	32.0					
550.84	33.0					
549.84	34.0					
				80%	-	
548.84	35.0		Recovered to about 35 ft			

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PROJECT | HOLE NO.

Hole No. WES-8-5-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 4 OF 7 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE — STARTED — COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
548.84	35.0		Run 3			
			Sandstone: brown, fine-grained, and friable-recovered several fragments.			Run 5 Rec 0.0 Loss 1.8 Gain -
547.84	36.0		Run 4			
			Sandstone: no recovery	0%	-	Drl time - Hyd press 100psi Water press RPM 50-75 Drl Action Smooth Water-ret Brown Remarks Used Dennsion Barrel
546.84	37.0		Run 5 Dennison Barrel			
545.84	38.0		Sandstone			
			Run 6 Dennison Barrel			
544.84	39.0					Run 7 Rec 4.9 Loss - Gain - Drl time - Hyd press 50-100psi Water press RPM 100 Drl Action Smooth Water ret Brown Remarks -
543.84	40.0					
			Sandstone: brown in color, fine-grained quartz sand, friable to moderately hard, very uniform in composition, and massive to thinly bedded.			
542.84	41.0					
541.84	42.0					Run 8 Rec 4.7 Loss - Gain - Drl time - Hyd press 100-240 Water press - RPM 100 Drl Action Smooth Water ret Brown Remarks Slight moisture at 43 ft, but no water.
540.84	43.0		Run 7	100%	-	
539.84	44.0		Sandstone: same	100%	-	
538.84	45.0					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT | HOLE NO.

Hole No. WES-8-5-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 5 OF 7 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	16. DATE HOLE — STARTED — COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
538.84	45.0					
537.84	46.0					
536.84	47.0		Sandstone	100%	-	WL - Run 9 Began - Rec 4.7 End - Loss - Time - Gain - Drl time - Hyd press 100-200 Water press - RPM 100 Drl Action Smooth Water ret Brown Sligth moisture causing barrel to block
535.84	48.0		machine fracture			
534.84	49.0					
533.84	50.0		Sandstone	100%	-	WL - Run 10 Began - Rec 4.7 End - Loss - Time - Gain - Drl time - Hyd press 100-200psi Water press - RPM 70 Drl Action Smooth Water ret Brown
532.84	51.0		oxidized and friable			
531.84	52.0		Run 9			
530.84	53.0					
529.84	54.0		Sandstone: orange brown to brown, fine-grained quartz sand, hard, and very uniform.			
528.84	55.0					

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PROJECT HOLE NO.

Hole No. WES-8-5-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 6 OF 7 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE — STARTED — COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
528.84	55.0					
527.84	56.0		Sandstone: same	100%	-	
526.84	57.0		Run 10			
525.84	58.0					WL - Run 11 Began - Rec 4.7 End - Loss - Time - Gain - Drl time - Hyd press 100-200psi Water press - RPM 70-100psi Drl Action Smooth ~~Water~~ ret Slight-brown Remarks
524.84	59.0		Sandstone: same black discoloration			More difficult to drill, slight moisture water at 59 ft.
523.84	60.0					
522.84	61.0			100%	-	WL - Run 12 Began - Rec 3.85 End - Loss - Time - Gain - Drl time - Hyd press 100-200psi Water press - RPM 50-100 Drl Action Smooth Water ret Slight-brown Remarks -
521.84	62.0		Run 11			
520.84	63.0		Sandstone: brown, uniform, very fine-grained, hard and slight reaction with HCL.	100%	-	
519.84	64.0					
518.84	65.0					

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PROJECT | HOLE NO.

Hole No. WES-B-5-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 7 OF 7 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED: ; UNDISTURBED:
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE — STARTED: ; COMPLETED:
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
518.84	65.0		Sandstone Run 12			
517.84	66.0					
516.84	67.0		black discoloration			ML - Run 13 Began - Rec 5.0 End - Loss - Time - Gain - Drl time - Hyd press 100-200psi Water press - RPM 700-100 Drl Action Smooth Water Ret -
515.84	68.0		Limestone: light grey to pinkish grey in color, fine-grained, moderately hard, and massive to thinly bedded.	100%		
514.84	69.0					
513.84	70.0					
			Run 13			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT | HOLE NO.

BORING LOG
FIELD DATA

Project: NWSC Groundwater Study
Site: Crane, IN
Date: 19 Nov. 1981
Location: Highway 58 Dump Site B
Job No.: 441-G150.11GR21/22
Drill Rig: Failing
Inspector: J. Dunbar
Operator: D. Taylor
Surface El: 582.70
Boring No.: WES-8-6-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
	17 Nov	0.0	6.0	0.0	30.0			5 5/8" Rock	Bit		Clay, gravel, cobbles, and boulders
		6.0	11.0								Clay shale: reddish brown and soft
		11.0	14.0								Clay shale: same, moisture-water
		14.0	30.0								Clay shale: soft to 22 ft and medium hard to 30 ft
											Hole to remain open for several days to monitor water-moisture. Water level steady around 18 ft.
											Blew hole and installed well on 26 Nov. 1981.

Sheet 1 of 1 Sheets

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BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 20 Nov. 1981
Location Highway 58 Dump Site B Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 640.75 Boring No. WES-8.7-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
	20Nov	0.0	4.7	0.0	52.2	—	—	5 5/8" Rock	Bit	—	Sandstone: brown, hard, and fine-
											grained
		4.7	5 8								Shale: grey and medium
		5.8	17.6								Sandstone: brown and medium
		17.6	18.4								Clay shale: red
		18.4	23.1								Limestone: light grey and hard
		23.1	33.2								Sandstone: hard and brown
		33.2	37.4								Limestone: light grey and hard
		37.4	40.6								Sandstone: hard
		40.6	52.2								Limestone: light grey and medium
											hard
	21Nov	52.2	54.3	52.2	120.0						Sandstone: hard
		54.3	55.6								Shale: grey and medium hard
		55.6	57.4								Limestone: very hard and light grey
		57.4	66.3								Shale and sandstone
		66.3	70.2			Water	between	66.3 and	70.2		Limestone: grey and hard
		70.2	90.0								Shale: grey and medium hard

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-8-7-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		90.0	91.7								Limestone, light grey and hard
		91.7	92.3								Shale: grey
		92.3	93.2								Limestone: light grey and hard
		93.2	94.2								Shale: grey
		94.2	96.3								Sandstone: brown, hard and fine-
											grained
		96.3	125.7								Sandstone: brown, soft and fine-
											grained
		125.7	131.2								Limestone: hard and light grey
											Water sticking rock bit- grouted
											hole to 70.0 ft
	22Nov			0.0	45.0	—	—	8 3/4" Rock	Bit	—	Cleanout for 6" casing to seal off
											water from 66.3-70.2 ft.
	23Nov			45.0	78.0	—	—	8 3/4" Rock	Bit	—	Cleanout: continued

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-8-7-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
	24Nov										Grouted 6" casing into hole.
											Bottom at 78 ft with 2 ft stickup.
	25Nov			62.0	131.2			5 5/8" Rock	Bit		Drilled grout from 62 to 120 ft.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 3 of 3 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 26 Nov. 1981
Location Highway 58 Dump Site B Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 586.31 Boring No. WES-8-8-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER		Cont.	CLASSIFICATION AND REMARKS
1	26Nov	0.0	1.25	0.0	1.05	0.0	9.0	3" Shelby Tube	—	ST	Sandy clay (CL): brown in color,
1A						9.0	1.05			Jar	soft, slightly moist, and low
											plasticity.
	26Nov	1.25	14.0	0.0	14.0	—	—	5 5/8" Rock	Bit	—	Clay, gravel, cobbles, and boulders
	27Nov			14.0	69.87	—	—	5 5/8" Rock	Bit	—	Limestone to 9 ft, sandstone to 14 ft
		14.0	27.0								Clay shale: grey, soft, and slightly
											damp
		27.0	36.0								Shale: grey and soft
		36.0	37.5								Sandstone: brown and fine-grained
		37.5	41.0								Sandstone and shale
		41.0	44.5								Sandstone: brown and hard
		44.5	53.5								Sandstone: brown and soft
		53.5	58.0								Sandstone: brown and very soft
		58.0	66.8								Sandstone: brown, very soft, and
											damp
		66.8	69.87								Sandstone: brown, hard, and dry.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No WES-8-8-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
											Installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 26 Nov. 1981
Location Highway 58 Dump Site B Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 586.33 Boring No. WES-8-9-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
1	26Nov	0.0		0.0	0.8	0.0	0.65	3" Shelby Tube		ST	Gravelly clay (CL): brown in color,
1A						0.65	0.80			Jar	soft, slightly moist, and contains
											5% fine to medium gravel,
											Sample length: 0.80 ft
	27Nov		4 8	0.0	80.0			5 5/8" Rock	Bit		Clay (CL), gravel, cobbles, and boulders
		4.8	9.6								Shale, grey with cobbles and boulders
		9.6	11.3								Limestone: grey and hard.
		11.3	12.1								Shale: grey
		12.1	13.5								Limestone: light grey and hard.
		13.5	15.0								Shale: brown
		15.0	32.0								Shale: grey and medium hard.
		32.0	34.5								Sandstone: brown and fine-grained
		34.5	35.3								Limestone: light grey and hard.
		35.3	53.6								Sandstone: brown, hard and fine-grained.
		53.6	69.3								Sandstone: brown, medium and fine-grained.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____

Location _____ Job No. _____

Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-8-9-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
		69.3	72.7								Sandstone: brownish grey, hard,
											and fine-grained.
		72.7	80.0								Limestone: light grey and hard
											Installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 22 Oct. 1981
Location Pest Control Area Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 734.32 Boring No. WES-9-1-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	22Oct	0.0		0.0	0.5	0.0	1.75	3" Shelby Tube	0	ST	Clay (CL): brown, soft, dry, and
1A				0.5	1.0	1.75	1.90		0	Jar	contains organic matter.
				1.0	1.5				5		
				1.5	2.0				150		Sample length: 1.90 ft
			4.5	2.0	2.5				480		
				0.0	5.0	—	—	7"Folding Auger	—		Cleanout
2	22Oct	4.5		5.0	5.5	5.0	7.09	*3"Fixed Piston Sampler	0	ST	Silty sand (SM): brown in color,
2A				5.5	6.0	7.09	7.26		30	Jar	fine-grained sand, dry, and slight
				6.0	6.5				210		cohesion.
				6.5	7.0				320		Sample length: 2.26 ft
				7.0	7.38				410		
			8.63	5.0	10.0	—	—	7"Folding Auger	—		Cleanout: assumed stratum change

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

3" Fixed Piston Sampler = 3" F.P.S.

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-9-1-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
3	22Oct	8.63		10.0	10.5	10.0	11.33	3"F.P.S.	0		Sand (SM) and sandstone fragments:
3A				10.5	11.0	11.33	11.51		10		brown to reddish brown, fine grained,
				11.0	11.55				340		friable, and weathered.
			11.0	11.55	12.0				700		
											Sample length: 1.51 ft
		11.0	23.6	0.0	11.49	—	—	5 5/8" Rock	Bit	—	Sandstone with interbedded shale
	23Oct	23.6	24.6	11.49	33.8	—	—	5 5/8" Rock	Bit	—	Coal: black, soft, and water
		24.6	29.5								Shale: grey and medium hard
		29.5	33.8								Limestone: hard and grey
											Installed well 24 Oct. 1981.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 23 Oct. 1981
Location Pest Control Area Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 723.80 Boring No. WES-9-2-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press		CLASSIFICATION AND REMARKS
1	23Oct	0.0		0.0	0.5	0.0	2.28	3" Shelby Tube	0	ST	Sand (SW), brown in color, dry,
1A				0.5	1.0	2.28	2.45		0	Jar	and fine to coarse grained.
				1.0	1.5				0		
				1.5	2.0				70		
			4.5	2.0	2.5				180		Sample length: 2.45 ft
				0.0	5.0	—	—	7"Folding Auger	—		Cleanout:
2	23Oct	4.5		5.0	5.5	5.0	6.16	*3"Fixed Piston Sampler	0	ST	Sandy clay (CL): brown in color,
2A				5.5	6.0	6.16	6.36		0	Jar	slight cohesion, and contains 20%
				6.0	6.5				0		fine to medium-grained sand.
				6.5	7.0				0		
				7.0	7.38				10		Sample length: 1.36 ft
			8.0	5.0	10.0	—	—	7"Folding Auger	—		Cleanout

*3" Fixed Piston Sampler = 3" F.P.S.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 1 of 2 Sheets

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-9-2-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
3	23Oct			10.0	11.5	10.0	12.08	3" F.P.S.	0	ST	Sandy clay (CL): grey to dark grey
3A				11.5	11.0	12.08	12.33		0	Jar	in color, and wet-water in hole
				11.0	11.5				0		at 10 ft.
				11.5	12.0				0		
				12.0	12.4				0		Sample length: 2.33 ft
			14.0	10.0	14.0	—	—	7"Folding Auger	—		Bedrock starts at 14 ft-sandstone.
		14.0	19.0	14.0	19.0	—	—	5 5/8" Rock Bit	—		Drilled 5 ft into bedrock to make
											room for silt trap.
											Installed well screen and filled
											hole with bentonite to depth of
											14 ft (around silt trap).
											Strong odor was noticed with water
											when drilling.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 24 Oct. 1981
Location Pest Control Area Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 706.78 Boring No. WES-9-3-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	24Oct	0.0		0.0	0.5	0.0	2.29	3" Shelby Tube	0	ST	Sandy clay (CL): brown in color,
1A				0.5	1.0	2.29	2.44		0	Jar	dry, low plasticity, and contains
				1.0	1.5				20		fine to coarse-grained sand.
				1.5	2.0				180		
				2.0	2.5				400		Sample length: 2.44 ft
			3.72	0.0	5.0			7"Folding Auger			Cleanout: assumed stratum change
2	24Oct	3 72		5.0	5.5	6.0	6.40	3"Fixed Piston Sampler	0	ST	Sand (SP) and sandstone: brown to
2A				5.5	6.0	6.40	6.62		0	Jar	white in color, fine-grained, and
				6.0	6.5				30		weathered.
				6.5	7.0				500		
			7.19	7.0	7.19				700		Sample length: 1.62 ft
	25Oct			7.19	12.1			4 x 5 1/2"Core Barrel			See ENGR FORM 1836 (page 2)
											for log of core.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Hole No. WES-9-3-81

DRILLING LOG	DIVISION U.S. Navy	INSTALLATION Crane, IN	SHEET 2 OF 2 SHEETS

1. PROJECT NWSC Groundwater Study	10. SIZE AND TYPE OF BIT 4 x 5 1/2" in Diamonel
2. LOCATION (Coordinates or Station) Pest Control Area	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL
3. DRILLING AGENCY CEWES	12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
4. HOLE NO. (As shown on drawing title and file number) WES-9-3-81	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED zero; UNDISTURBED two
5. NAME OF DRILLER C. Drake	14. TOTAL NUMBER CORE BOXES zero
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 24 Oct. 1981; COMPLETED 25 Oct. 1981
7. THICKNESS OF OVERBURDEN 7.19 ft	17. ELEVATION TOP OF HOLE 706.78
8. DEPTH DRILLED INTO ROCK 4.91 ft	18. TOTAL CORE RECOVERY FOR BORING 100% %
9. TOTAL DEPTH OF HOLE 12.1 ft	19. SIGNATURE OF INSPECTOR Joseph B. Dunham

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
699.78	7.0					
698.78	8.0		fractured and black discoloration			
697.78	9.0		Sandstone: white to orange brown in color, very fine-grained, thinly bedded, and contains clay lenses.			WL - Run 1 Began 10.11 Rec 4.91' End 10.41 Loss - Time 30 min Gain - Drl time 30 min Hyd press loopsi Water press - RPM 50 Drl Action Smooth ~~Water~~ ref Brown to black Cored with air-air bubbled up 25 ft around rig in all directions.
696.78	10.0		fractured closed break Sandstone (70%) and interbedded Shale (30%): orange brown, light grey, and dark grey	100%	-	
695.78	11.0		Sandstone (50%) and shale (50%) thickness ranges from 1/64-1/4 in, light grey to dark grey, and fine-grained sandstone			
694.78	12.0		Run 1 Installed well screen on 25 Oct. 1981. Did not go deeper because of the possibility of encountering deeper zone of water.			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT | HOLE NO.

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 6 Nov. 1981
Location Pest Control Area Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 721.93 Boring No. WES-9-4-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	6 Nov	0.0		0.0	0.5	0.0	2.15	3"Shelby	20	ST	Sandy clay (CL): brown in color,
1A				0.5	1.0	2 15	2.30		40	Jar	very stiff, dry, and low plasticity.
				1.0	1.5				250		
				1.5	2.0				380		
			3.5	2.0	2.5				500		Sample length: 2.30 ft
				0.0	5.0			7"Folding Auger			Cleanout
2	6 Nov	3.5		5.0	5.5	5.0	6.43	3"Fixed Piston Sampler	0	ST	Clay shale and interbedded sandstone:
2A				5.5	6.0	6.43	6.63		20	Jar	grey, brown, reddish brown in color,
				6.0	6.5				490		very stiff, hard, and dry.
			6.63	6.5	----				700		Sample length: 1.63 ft
	6 Nov	6.63	15.5	5.0	20.15			5 5/8" Rock Bit			Sandstone: brown, fine-grained, weathered
		15.5	20.15								Sandstone: light grey, very fine-
											grained, and hard.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-9-4-81

SAMPLE NUMBER	DATE TAKEN	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
	7 Nov			20.15	30.15			5 5/8" Rock	Bit		Water overnight at depth of 19.6 ft
		20.15	25.0								Shale: dark grey in color.
		25.0	28.0								Limestone: light grey and hard.
		28.0	28.7								Shale: grey
		28.7	30.15								Limestone: light grey
											Installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 7 Nov. 1981
Location Pest Control Area Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 715.52 Boring No. WES-9-5-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	7 Nov	0.0		0.0	0.5	0.0	1.54	3" Shelby Tube	0	ST	Clayey sand (SC): brown in color,
1A				0.5	1.0	1.54	1.69		0	Jar	dry, fine-grained, and moderate
				1.0	1.5				40		cohesion.
				1.5	2.0				480		
				2.0	2.5				640		Sample length: 1.69 ft
				0.0	5.0			7"Folding Auger			Cleanout
2	7 Nov			5.0	5.5	5.0	6.17	3"Fixed Piston Sampler	0	ST	Clayey sand (SC) and weathered sandstone:
2A				5.5	6.0	6.17	6.32		20	Jar	brown, fine-grained, brittle, and
			6.33	6.0	6.5				730		friable.
											Sample length: 1.32 ft
	7 Nov	6.33	9.0	6.33	23.5			5 5/8" Rock Bit			Sandstone: brown, fine-grained,
											and weathered.
		9.0	12.0								Sandstone: light brown
		12.0	13.5		Water	in bottom of	hole				Sandstone, light grey to dark brown

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 1 of 2 Sheets

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No.
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-9-5-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
		13.5	17.5								Sandstone: light brown and fine-
											grained.
		17.5	18.5								Sandstone: light grey
		18.5	23.5								Sandstone: darker in color, shale
											content increases.
											Installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 7 Nov. 1981
Location Pest Control Area Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 719.65 Boring No. WES-9-6-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	7 Nov	0.0		0.0	2.57	0.0	2.37	3" Shelby Tube		ST	Sandy silt (ML), brown, soft, and
1A						2.37	2.57			Jar	little cohesion.
											Sample length: 2 57 ft
			4.5	0.0	4.5			7" Solid Auger			Cleanout
	7 Nov	4.5	14.3	4.5	11.0			5 5/8" Rock Bit			Sandstone: brown with slight moisture
											at 10.2 ft
	7 Nov	14.3	15.4	11.0	21.0			5 5/8" Rock Bit			Coal: black, soft, and wet
		15.4	18.1								Limestone: light grey and moderately
											hard.
		18.1	21.0								Sandstone: brown and medium hard
											Installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 1 of 1 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 18 Nov. 1981
Location Pest Control Area Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator D. Taylor Surface El 735.32 Boring No. WES-9-7-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	18Nov	0.0		0.0	2.5	0.0	1.58	3"Shelby Tube		ST	Clay (CL): brown in color, dry,
1A						1.58	1.78			Jar	moderately stiff, and low plasticity.
											Sample length: 1.78 ft
			4.3	0.0	5.0			7" Solid Auger			Cleanout
2	18Nov	4.3	7.5	5.0	7.5	5.0	7.10	3"Fixed Piston Sampler		ST	Silty sand (SM): brown in color,
2A						7.10	7.35			Jar	dry, moderate cohesion, and fine-
											grained.
											Sample length: 2.35 ft
	18Nov	7.5	9.0	5.0	34.2			5 5/8" Rock Bit			Clay and sandstone gravel
		9.0	13.5								Shale: soft and brown
		13.5	19.9								Shale. soft and grey
		19.9	23.2								Sandstone: brown, fine-grained,

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-9-7-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
											and water beginning at 23.2 ft
		23.2	25.5								Sandstone: brown, fine-grained,
											and medium hard.
		25.5	33.2								Shale, grey and hard
		33.2	34.2								Coal: black and soft
											Blew water from hole and installed
											well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 18 Nov. 1981
Location Pest Control Area Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 720.19 Boring No. WES-9-8-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
1	18Nov	0.0		0.0	0.5	0.0	1.39	3" Shelby Tube	0	ST	Clay (CL): brown in color, organic
1A				0.5	1.0	1.39	1.59		10	Jar	matter, very stiff, dry, and low
				1.0	1.5				30		plasticity.
				1.5	2.0				200		
				2.0	2.5				420		Sample length: 1.59 ft
				0.0	5.0	—	—	7"Folding Auger		—	Cleanout
2	18Nov		7.0	5.0	5.5	5.0	6.38	3"Fixed Pis	0	ST	Sandstone: brown to reddish brown,
2A				5.5	6.0	6.38	6.53	ton Sampler	10	Jar	weathered, fine-grained, slightly
				6.0	6.5				220		friable, and dry.
				6.5	7.0				640		
				7.0	7.5				730		Sample length: 1.53 ft
		7.0	18.6	5.0	10.0	—	—	7"Folding Auger		—	Sandstone: brown, fine-grained,
											weathered, and contains clay lenses.
		18.6	23.5	10.0	25.0	—	—	4 x 5-1/2"Core Barrel			Shale and sandstone: shale increases

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-9-8-81

SAMPLE NUMBER	DATE TAKEN	STRATUM		DRIVE		SAMPLE		TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		FROM	TO	FROM	TO	FROM	TO				
	18Nov			0.0	25.1	—	—	6-3/4" Rock	Bit		with depth.
		23.5	25.1								Shale: black, soft, and uniform.
											For core log see page three.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Hole No. WES-9-8-81

DRILLING LOG	DIVISION U.S. Navy	INSTALLATION Crane, IN	SHEET 3 OF 4 SHEETS

1. PROJECT NWSC Groundwater Study	10. SIZE AND TYPE OF BIT 4 x 5 1/2" Diamond Bit
2. LOCATION (Coordinates or Station) Pest Control Area	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL
3. DRILLING AGENCY CEWES	12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
4. HOLE NO. (As shown on drawing title and file number) WES-9-81	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED zero; UNDISTURBED two
5. NAME OF DRILLER C. Drake	14. TOTAL NUMBER CORE BOXES zero
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 18 Nov. 1981; COMPLETED 18 Nov. 1981
7. THICKNESS OF OVERBURDEN 7.0 ft	17. ELEVATION TOP OF HOLE 720.19
8. DEPTH DRILLED INTO ROCK 18.1 ft	18. TOTAL CORE RECOVERY FOR BORING 100% %
9. TOTAL DEPTH OF HOLE 25.1 ft	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
710.19	10.0		Sandstone: brown in color with interbedded clay lenses.			
709.19	11.0					
708.19	12.0		Sandstone (70%) and clay lenses (30%); light brown to brown, fine-grained quartz sand, and very weathered. Clay is brown, soft, and in lenses which are irregular in shape. Lenses are nearly horizontal in attitude and range in shape from angular to rounded with average thickness of 1 in.			WL - Run 1 Began 10:54 Rec 5.0' End 11:13 Loss - Time 19 min Gain - Drl time 19 min Hyd press 100psi Water press - RPM 70-100 Drl Action Smooth Water Jet Brown Remarks Reamed hole with 6-3/4 in bit.
707.19	13.0					
706.19	14.0					Water at 14.89 ft
			Sandstone: brown and clean			
705.19	15.0		Clay shale: brown	100%	-	
704.19	16.0		Run 1 fractured sandstone and clay shale lenses.			
703.19	17.0		80% light grey and orange brown sandstone and 20% brown clay shale lenses closed breaks			WL - Run 2 Began 12:09 Rec 5.0' End 12:15 Loss - Time 6 min Gain - Drl time 6 min Hyd press 100psi Water press - RPM 50-100 Drl Action Smooth Water Jet Brown-dark grey Remarks Reamed hole with 6-3/4 in bit.
702.19	18.0		dark brown shale from 8.3 to 18.6 ft			
701.19	19.0		50% Sandstone: brown-dark grey 50% Shale: grey to dark grey alternating lamina and thin beds-1/16 to 1/4 in.			
700.19	20.0					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT) PROJECT HOLE NO.

Hole No. WES-9-8-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 4 OF 4 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	16. DATE HOLE — STARTED — COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
700.19	20.0					
699.19	21.0		fractured			
			85% Dark grey shale			
698.19	22.0		15% Grey sandstone			ML - Run 3 Began 1:06 Rec 5.1' End 1:22 Loss - Time 16 min Gain - Drl time 16 min Hyd press 100psi Water press - RPM 100 Drl Action Smooth Water rot Black-dark grey Reamed hole with 6-3/4 in bit.
697.19	23.0		closed			
696.19	24.0		closed breaks			
			Shale; black, soft, and uniform			
695.19	25.0		Run 3	100%	-	

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT HOLE NO.

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 25 Nov. 1981
Location Pest Control Area Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 723.21 Boring No. WES-9-9-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	25Nov	0.0		0.0	0.5	0.0	1.75	3"Shelby Tube	0	ST	Sandy clay (CL): brown in color,
1A				0.5	1.0	1.75	1.90		0	Jar	soft, low plasticity, dry, and
				1.0	1.5				0		contains fragments of brown sandstone.
				1.5	2.0				0		
				2.0	2 5				175		Sample length: 1.90 ft
				0.0	5.0			7"Folding Auger			Cleanout
2	25Nov		6.8	5.0	5.5	5.0	6.28	3"Fixed Piston Sampler	0	ST	Clay (CL): dark brown to black,
2A		6.8		5.5	6.0	6.28	6.48		0	Jar	moist, soft, and low plasticity.
				6.0	6.5				0		
				6.5	7.0				0		Sample length: 1.48 ft
				7.0	7.39				0		
				5.0	10.0			7"Folding Auger			Cleanout: water at 7 ft and more
											water at 9 ft.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____ Site _____ Date _____
Location _____ Job No. _____
Drill Rig _____ Inspector _____ Operator _____ Surface El _____ Boring No. WES-9-9-81

SAMPLE NUMBER	DATE TAKEN	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
				10.0	10.5	10.0	10.65	3"Fixed Pis-	10	ST	Sandstone: brown to light grey
			11.0	10.5	11.0	10.65	10.8	ton Sampler	700	Jar	in color, weathered, friable, and
											very fine-grained.
											Sample length: 0.8 ft
				10.0	11.0			7"Folding Auger			Cleanout
		11.0	13.5	11.0	13.5			5 5/8" Rock	Bit		Sandstone: brown, fine-grained,
											soft, and weathered.
											Installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 20 Nov. 1981
Location Rockeye Site Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 617.80 Boring No. WES-10-1-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont.	CLASSIFICATION AND REMARKS
1	20Nov	0.0		0.0	0.5	0.0	1.84	3" Shelby Tube	0	ST	Gravelly sand (SN): brown in color,
1A				0.5	1.0	1.84	2.0		10	Jar	dry, fine to coarse sand, and fine
				1.0	1.5				10		to coarse, angular to rounded gravel.
				1.5	2.0				30		
			4.1	2.0	2.5				50		Sample length: 2.00 ft
				0.0	5.0	—	—	7"Folding Auger	—		Cleanout
2	20Nov	4.1		5.0	5.5	5.0	6.16	3"Fixed Piston Sampler	20	ST	Sand (SP): orange brown in color,
2A				5.5	6.0	6.16	6.41		20	Jar	fine-grained, moderate to little
				6.0	6.5				30		cohesion, and dry.
				6.5	7.0				200		
			7.19	7.0	7.19				460		Sample length: 1.41 ft
	20Nov	7.19	17.3	5.0	30.5	—	—	5 5/8" Rock Bit	—		Sandstone: reddish brown-brown and
											soft.
		17.3	19.0								Sandstone: brown and medium hard

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

BORING LOG
FIELD DATA

Project _____
Location _____ Site _____ Date _____
Drill Rig _____ Inspector _____ Operator _____ Job No. _____
Surface El _____ Boring No. WES-10-1-81

SAMPLE NUMBER	DATE TAKEN	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER			CLASSIFICATION AND REMARKS
		19.0	20.5								Sandstone: brown and soft
		20.5	26.3								Sandstone: brown and soft to medium
		26.3	28.8								Sandstone: brown and hard
		28.8	29.5								Sandstone: red colored water.
		29.5	30.5								Limestone: grey colored water and hard drilling.
											Bailed and washed hole to remove mud and cuttings. Water began at 20.5 ft and was red in color to indicated depth. Lost cuttings at 28.8 ft with slight water return. Installed well.

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Sheet 2 of 2 Sheets

BORING LOG
FIELD DATA

Project NWSC Groundwater Study Site Crane, IN Date 22 Nov. 1981
Location Rockeye Site Job No. 441-G150.11GR21/22
Drill Rig Failing Inspector J. Dunbar Operator C. Drake Surface El 618.51 Boring No. WES-10-2-81

SAMPLE NUMBER	DATE TAKEN 1981	STRATUM FROM	STRATUM TO	DRIVE FROM	DRIVE TO	SAMPLE FROM	SAMPLE TO	TYPE OF SAMPLER	Hyd. Press	Cont	CLASSIFICATION AND REMARKS
1	22Nov	0.0		0.0	0.5	0.0	1.29	3" Shelby Tube	0	ST	Silty sand (SM); dark brown in
1A				0.5	1.0	1.29	1.46		0	Jar	color, dry, soft, very fine-grained,
				1.0	1.5				0		and slight cohesion.
				1.5	2.0				0		Sample length: 1.46 ft
			4.4	2.0	2.5				0		
				0.0	4.4			7"Folding Auger			Cleanout
		4.4	7.1	4.4	9.6			4 x 5 1/2"Core Barrel			For core log see page 2.
		7.1	25.0	4.4	9.6			6 3/4" Rock Bit			
		25.0	25.8	9.6	15.8			4 x 5 1/2"Core Barrel			
				9.6	15.8			6 3/4" Rock Bit			
				15.8	20.8			4 x 5 1/2"Core Barrel			
				15.8	20.8			6 3/4" Rock Bit			
				20.8	25.8			4 x 5 1/2"Core Barrel			
				20.8	25.8			6 3/4" Rock Bit			

WES FORM JAN 74 819 EDITION OF NOV 1971 MAY BE USED

Hole No. WES-10-2-81

DRILLING LOG	DIVISION U.S. Navy	INSTALLATION Crane, IN	SHEET 2 OF 4 SHEETS

1. PROJECT NWSC Groundwater Study	10. SIZE AND TYPE OF BIT 4 x 5-1/2 in. Diamond Bit
2. LOCATION (Coordinates or Station) Rockeye Site	11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL
3. DRILLING AGENCY CEWES	12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500
4. HOLE NO. (As shown on drawing title and file number) WES-10-2-81	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED zero; UNDISTURBED one
5. NAME OF DRILLER C. Drake	14. TOTAL NUMBER CORE BOXES zero
6. DIRECTION OF HOLE [X] VERTICAL [ ] INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE: STARTED 22 Nov. 1981; COMPLETED 22 Nov. 1981
7. THICKNESS OF OVERBURDEN 4.4 ft	17. ELEVATION TOP OF HOLE 618.51
8. DEPTH DRILLED INTO ROCK 21.4 ft	18. TOTAL CORE RECOVERY FOR BORING 47.7 %
9. TOTAL DEPTH OF HOLE 25.8 ft	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
614.51	4.0					
613.51	5.0		Loose sandstone gravel: fine to coarse fragments, brown, and fine-grained.			WL - Run 1 Began 9:40 Rec 5.2' End 9:53 Loss - Time 13 min Gain - Drl time 13 min Hyd press 100psi Water press - RPM 70 ± Drl Action Smooth Water ret Brown Remarks Cored with air
612.51	6.0		Gravelly clay: 60% brown, stiff clay and 40% fine to coarse, rounded gravel Loose sandstone gravel.			
611.51	7.0		Sandstone: brown, very weathered, fine-grained, and friable.			
			Limestone: grey with clay seam			
610.51	8.0					
609.51	9.0		Sandstone: brown, very weathered, uniform, fine-grained quartz sand, and friable.			
			fractured	100%	-	
608.51	10.0		Run 1			
607.51	11.0		closed break			Run 2 Began 10:07 Rec 3.4' End 10:20 Loss 2.8' Time 13 min Gain - Drl time 13 min Hyd press 100psi Water press - 50-100 Action - Water ret Brown
606.51	12.0		fractured	54.8%	-	
605.51	13.0		Sandstone: same			Water at end of run-15.8 ft
604.51	14.0		No recovery			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT) PROJECT HOLE NO.

Hole No. WES-10-2-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 3 OF 4 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN	16. DATE HOLE — STARTED — COMPLETED
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE	18. TOTAL CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
604.51	14.0					
603.51	15.0		Run 2			
602.51	16.0					Run 3 Began 11:22 Rec 0.8' End 11:25 Loss 3.7' Time 3 min Gain - Drl time 3 min Hyd press 100psi Water press - RPM 100+ Drl Action Smooth Water ret Brown Remarks -
601.51	17.0		Sandstone	17.8%	-	
600.51	18.0		No recovery except for approximately 0.8 ft of weathered, brown, fine-grained quartz sandstone.			
599.15	19.0					
598.51	20.0		Run 3			
597.51	21.0		Sandstone			Run 4 Began 11:57 Rec 0.8' End 12:05 Loss 4.7' Time 8 min Gain - Drl time 8 min Hyd press 100psi Water press - RPM 100 Drl Action Smooth Water ret Brown Remarks -
596.51	22.0		No recovery	14.5%	-	
595.51	23.0					
594.51	24.0					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT | HOLE NO.

Hole No. WES-10-2-81

DRILLING LOG	DIVISION	INSTALLATION	SHEET 4 OF 4 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	16. DATE HOLE — STARTED — COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
594.51	24.0		No recovery			
593.51	25.0		Limestone: light grey, moderately hard, and fine-grained.			
			Bailed water from hole and set well. Boring fell in 0.9 ft.			

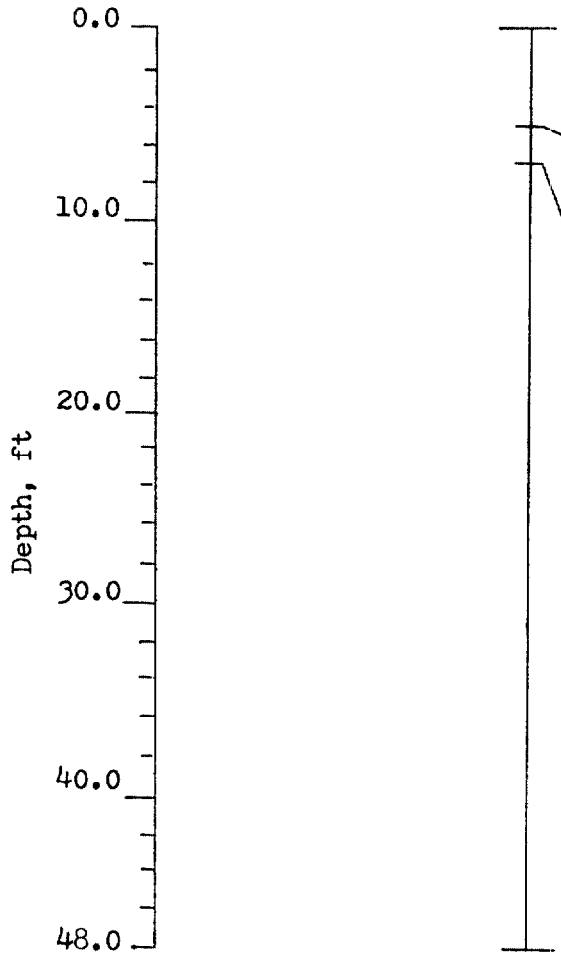
ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT | HOLE NO.

APPENDIX B

GRAPHIC FIELD LOGS

WORKING DRAFT



686.14' MSL

Clay (CL): light brown to grey in color, soft to slightly stiff, and low plasticity.

Sand (SP): light brown to grey in color, very fine-grained, uniform, and contains thin zones of moderately hard cemented sand.

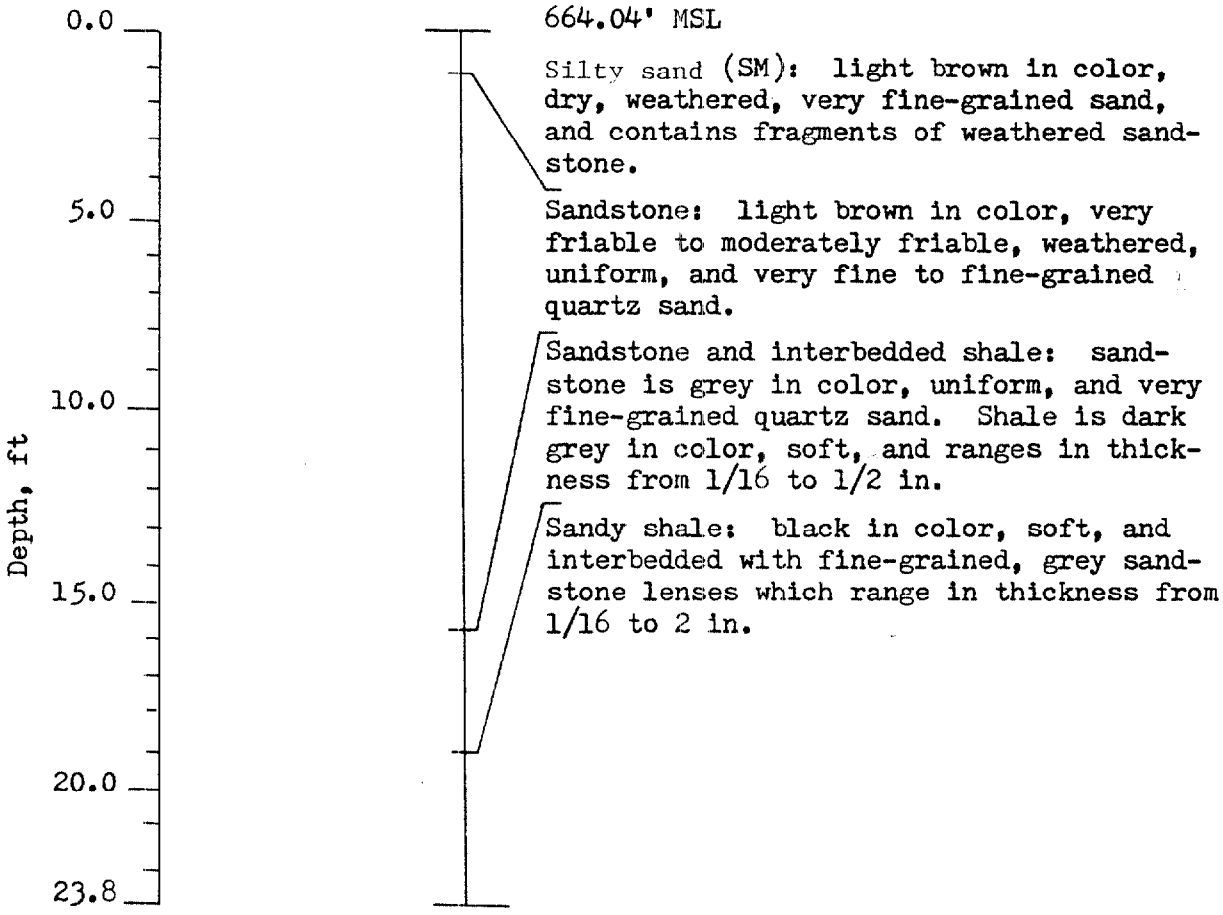
Sandstone: brown to dark brown in color and very fine-grained.

NWSC, Crane, Indiana

Mustard Gas Burial Grounds

Lithology

Boring Number: WES-1-1-81

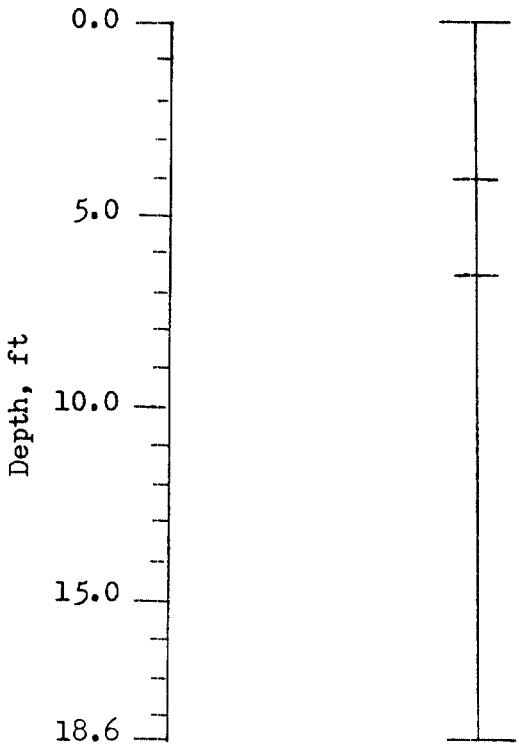


NWSC, Crane, Indiana

Mustard Gas Burial Grounds

Lithology

Boring Number: WES-1-2-81



667.43' MSL

Silt(ML): brown in color, soft, organic matter, and low plasticity.

Clayey sand(SC): reddish brown in color, dry, uniform, and fine-grained sand and sandstone fragments.

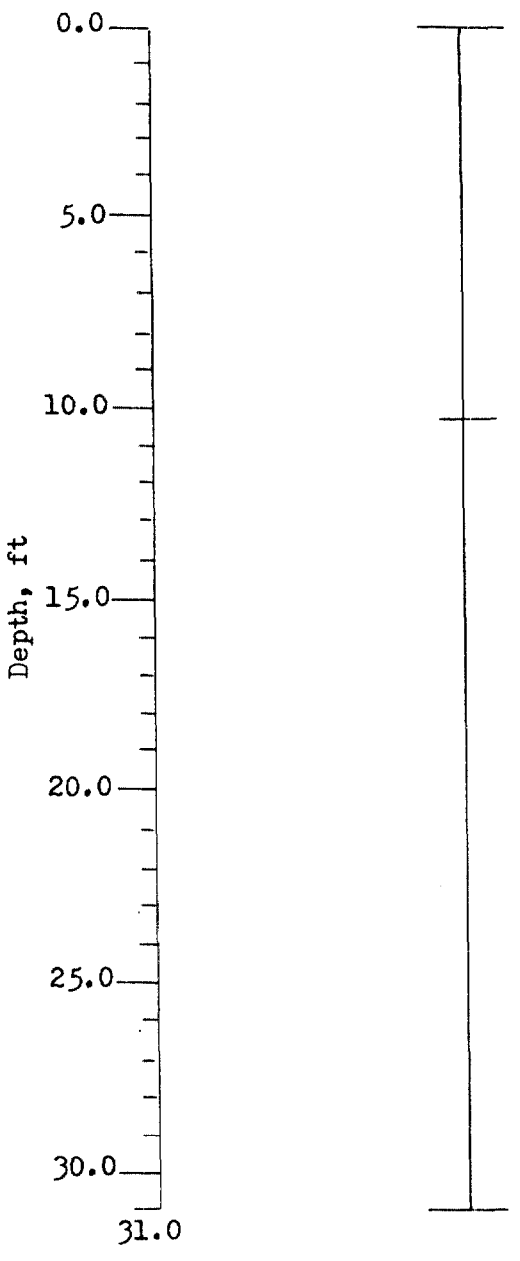
Sandstone: light brown to reddish brown and light grey in color, very friable to slightly friable, weathered, and very fine to fine-grained.

NWSC, Crane, Indiana

Mustard Gas Burial Grounds

Lithology

Boring Number: WES-1-3-81



669.95' MSL

Sandy silt(ML): brown to grey in color, moderate cohesion, dry, stiff, and contains 20 to 30% fine-grained sand.

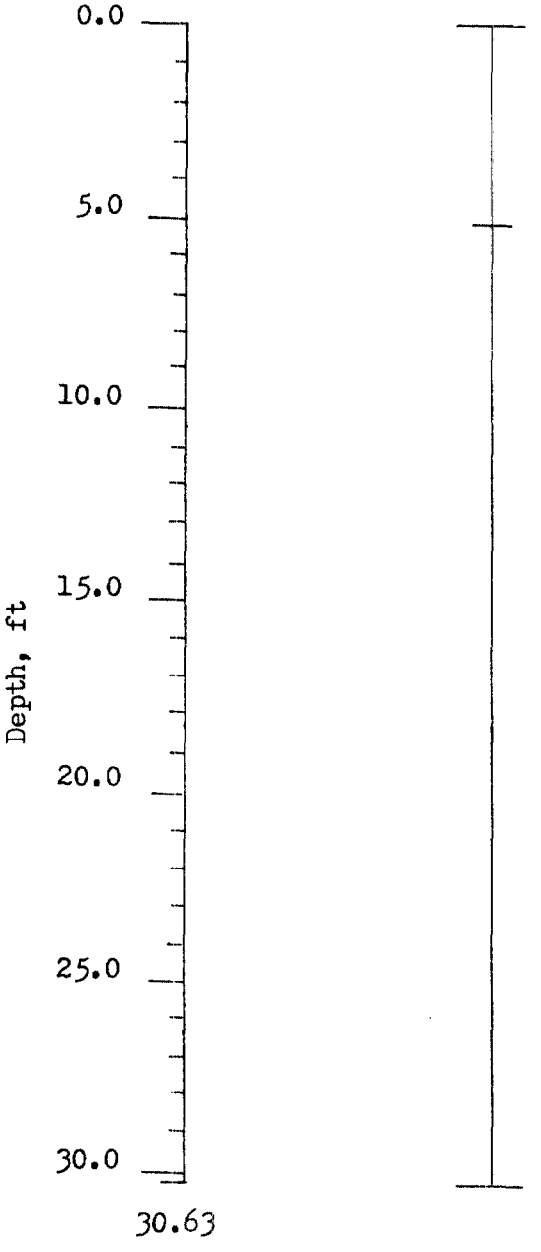
Sandstone: reddish brown in color, fine-grained, and weathered.

NWSC, Crane, Indiana

Mustard Gas Burial Grounds

Lithology

Boring Number: WES-1-4-81



665.69' MSL

Clay (CL): brown in color, dry, little cohesion, uniform, and contains 5% sand and gravel.

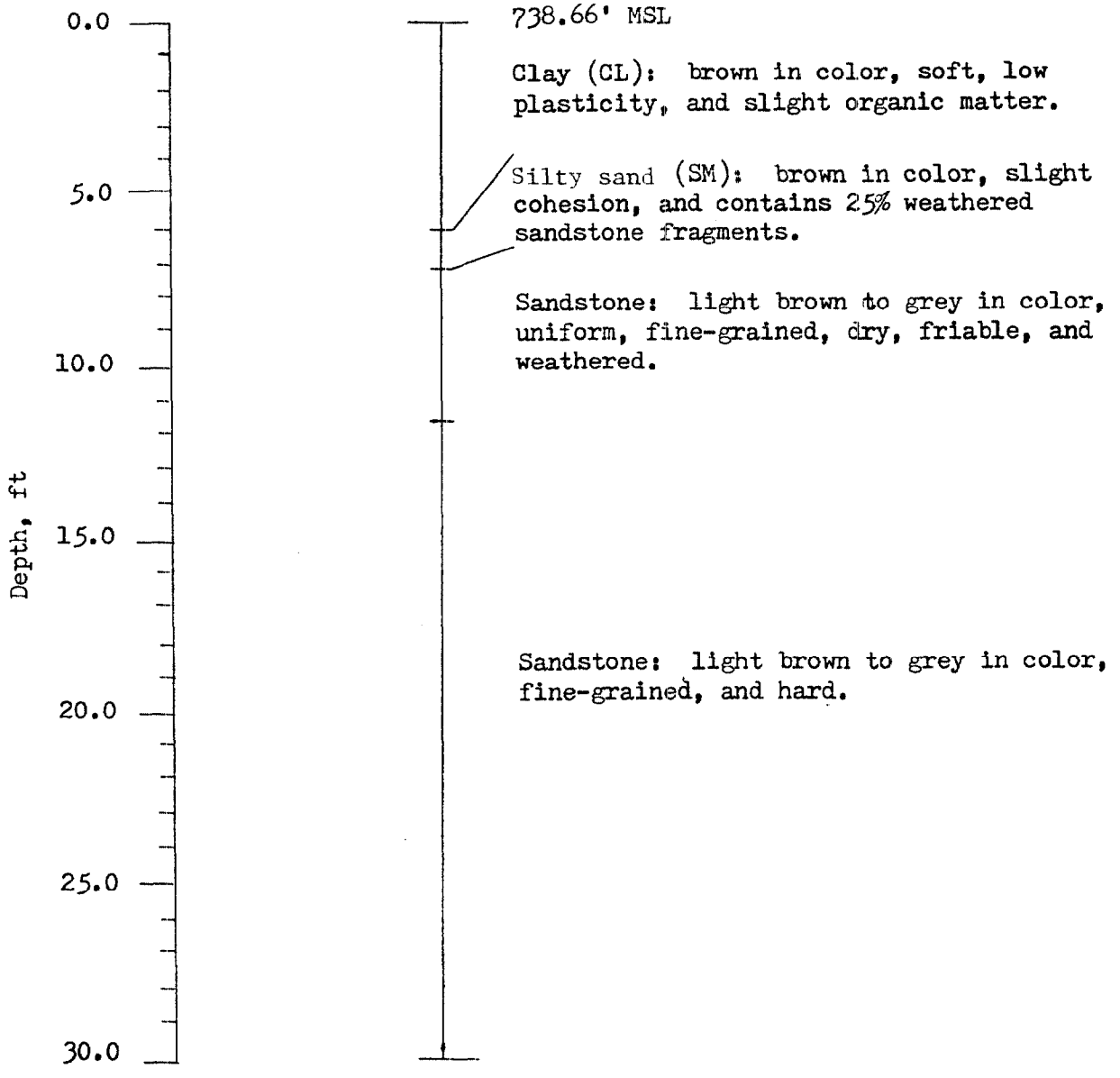
Brown sandstone and interbedded grey shale

NWSC, Crane, Indiana

Mustard Gas Burial Grounds

Lithology

Boring Number: WES-1-5-81

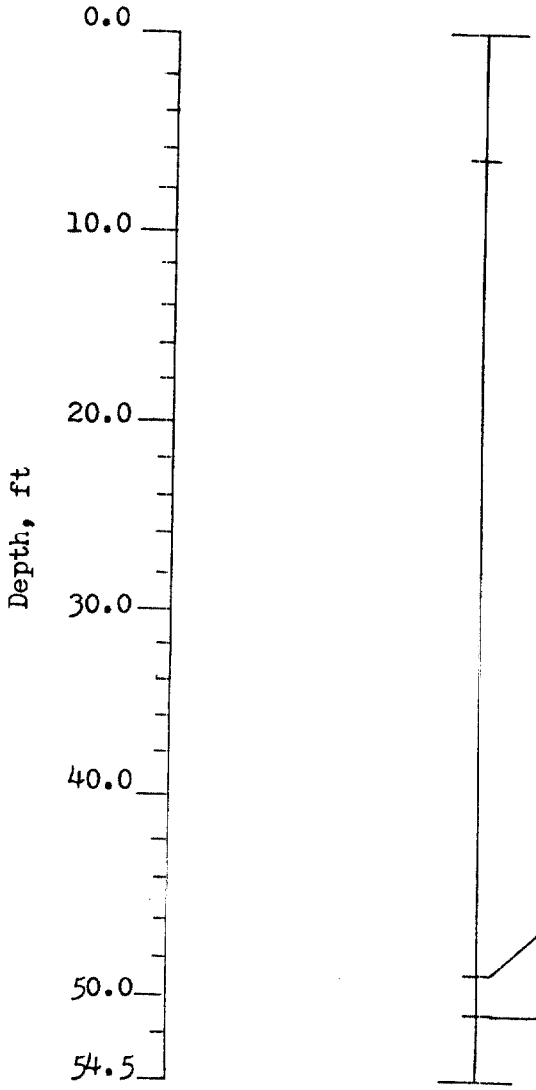


NWSC, Crane, Indiana

Dye Burial Grounds

Lithology

Boring Number: WES-2-1-81



725.46' MSL

Silt (ML): brown in color, soft, dry, and contains slight organic matter. Sandstone fragments begin at 5 ft.

Sandstone: color ranges from shades of brown, orange, and red to various shades of grey, uniform, very fine to fine-grained quartz sand, dry, friable, weathered, and interbedded with numerous small seams of clay, shale, siltstone, peat, and lignite. Shale is dark grey to grey in color, soft, and frequency increases with depth beginning around 35 ft.

Shale(70%) interbedded with sandstone(30%): grey to dark grey in color, soft, and thinly bedded.

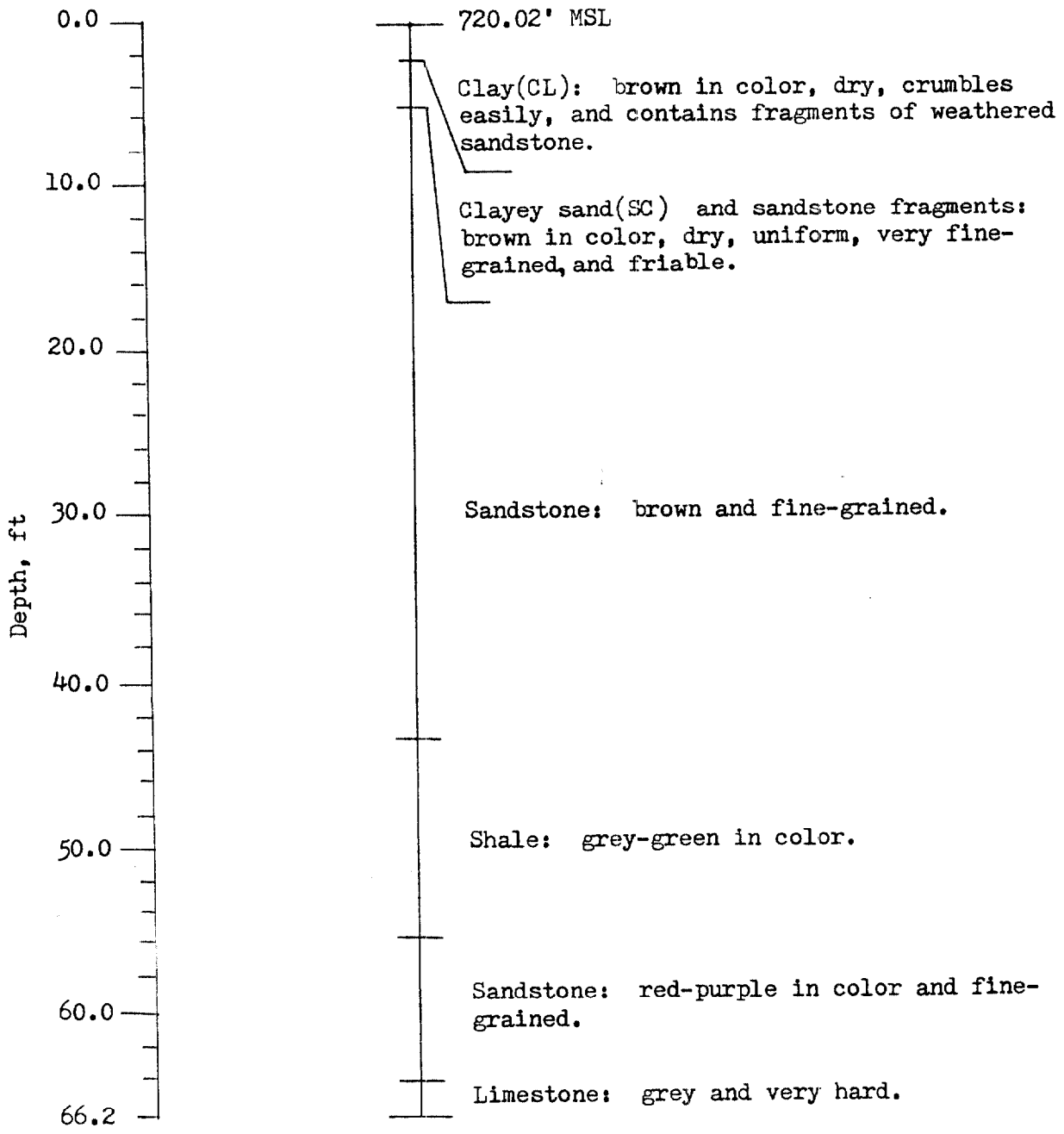
Shale: green, uniform, soft, and brittle.

NWSC, Crane, Indiana

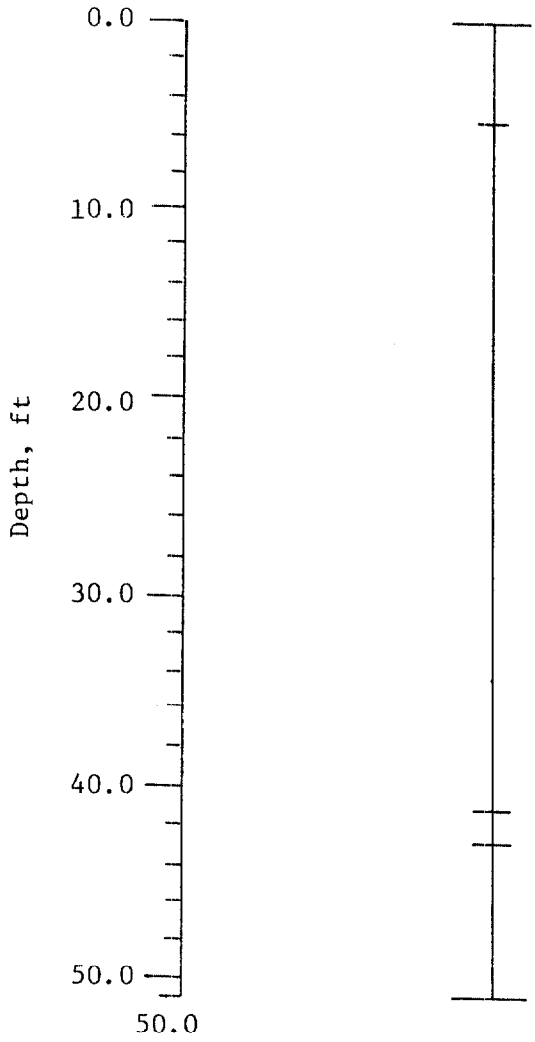
Dye Burial Grounds

Lithology

Boring Number: WES-2-2-81



NWSC, Crane, Indiana
Dye Burial Grounds
Lithology
Boring Number: WES-2-3-81



716.66' MSL

Silt (ML): brown to grey in color, no cohesion, dry, very uniform in grain size, texture, and composition. Sandstone fragments begin at 3.75 ft.

Sandstone: brown in color and fine-grained.

Shale: green and soft.

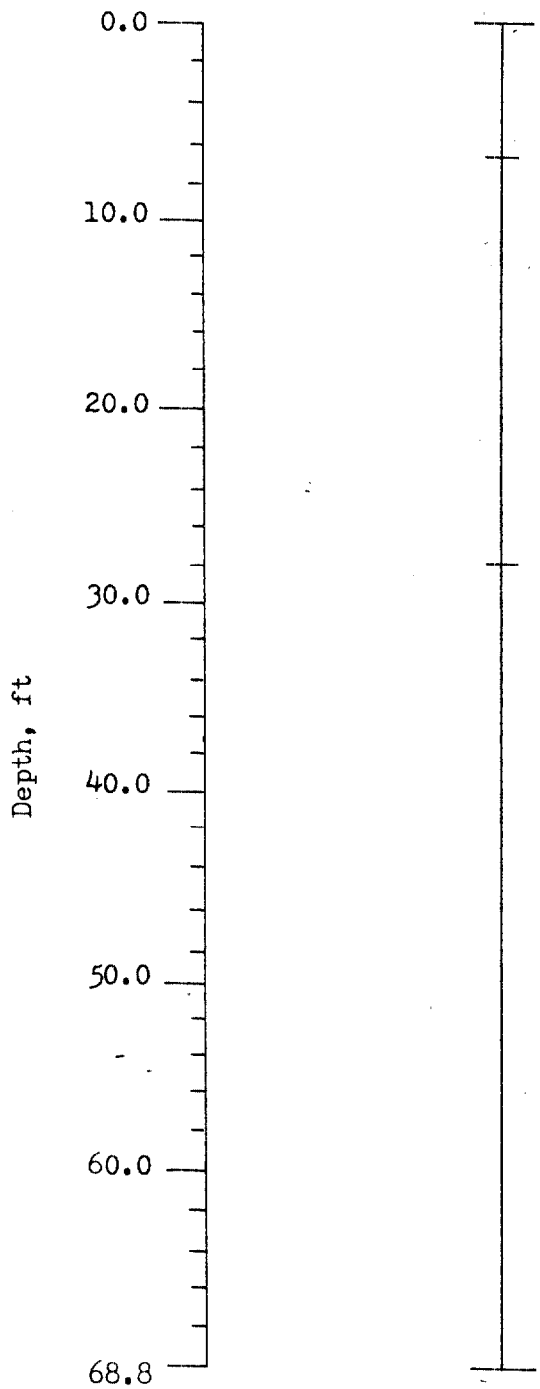
Shale: green and hard.

NWSC, Crane, Indiana

Dye Burial Grounds

Lithology

Boring Number: WES-2-4-81



739.24' MSL

Clay (CL): brown in color, soft, dry, moderately cohesive, and slight organic matter. Sandstone fragments begin at 5 ft.

Sandstone: red to brown in color and fine-grained.

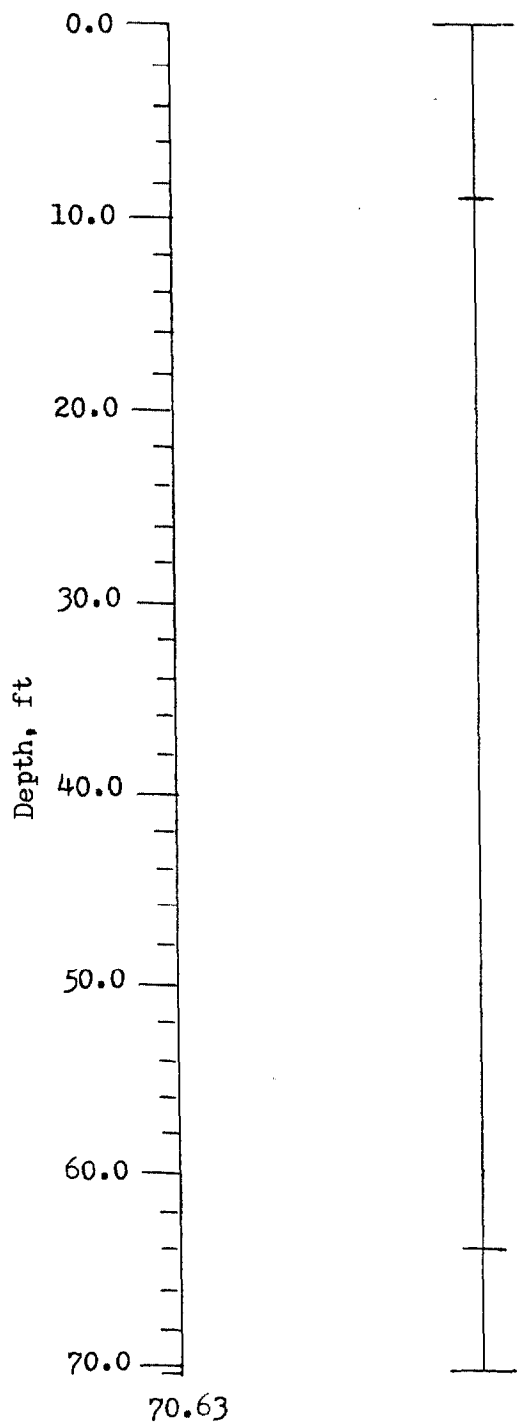
Interbedded sandstone, shale, and limestone.

NWSC, Crane, Indiana

Dye Burial Grounds

Lithology

Boring Number: WES-2-5-81



736.58' MSL

Clay(CL): brown to grey in color, dry, and little cohesion.

Sandstone and interbedded shale: brown to dark grey in color.

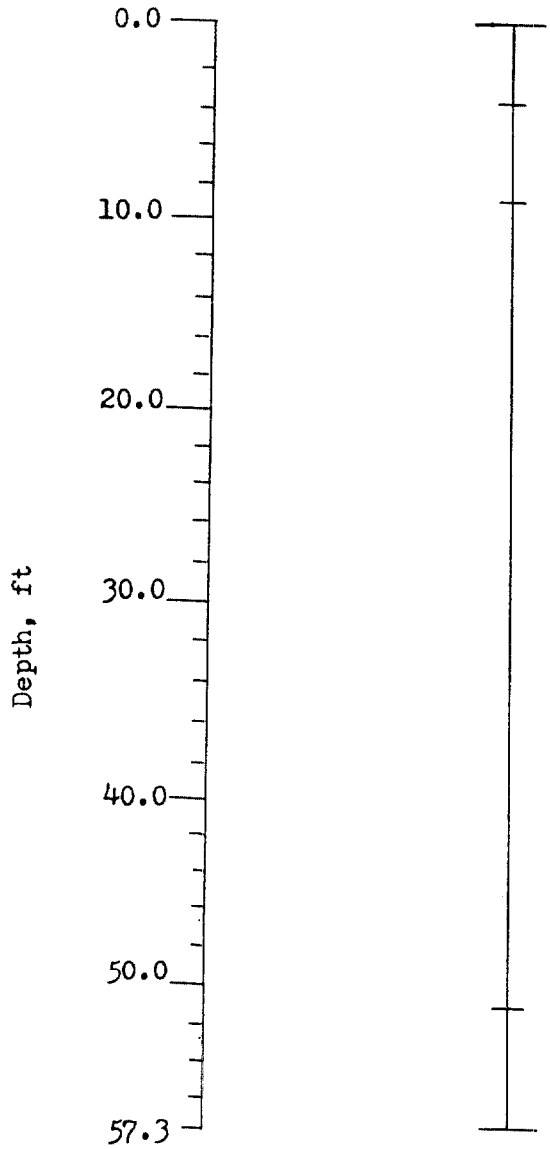
Shale: dark grey in color.

NWSC, Crane, Indiana

Dye Burial Grounds

Lithology

Boring Number: WES-2-6-81



728.73' MSL

Silty sand (SM): brown, dry, hard, and contains 5% very fine gravel.

Sandstone: brown in color and weathered.

Sandstone and interbedded dark grey shale: brown, tan, grey, and white in color, soft to very hard.

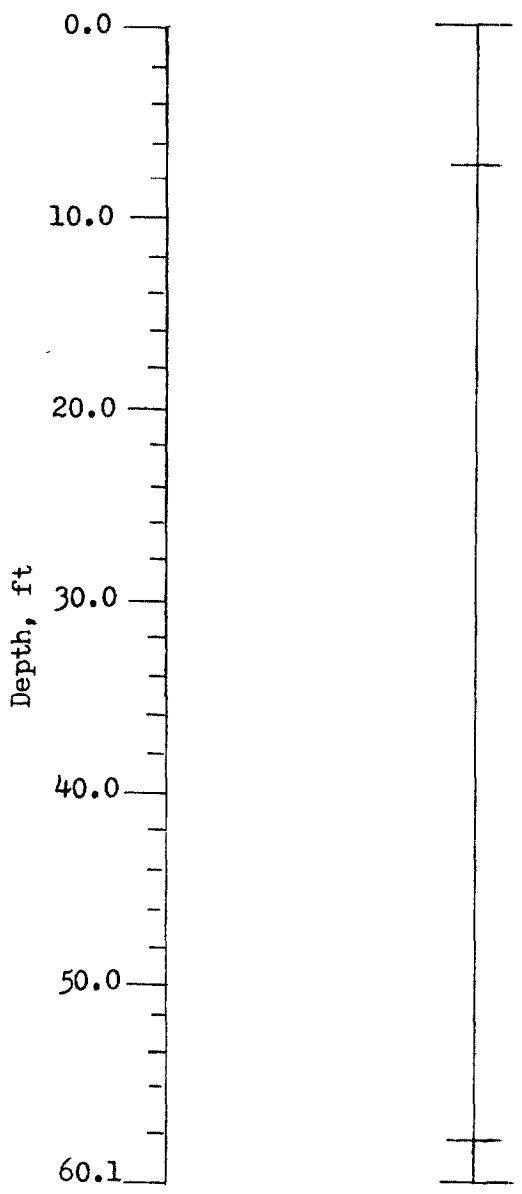
Shale and interbedded sandstone: dark grey in color.

NWSC, Crane, Indiana

Dye Burial Grounds

Lithology

Boring Number: WES-2-7-81



730.29' MSL

Silty clay(CL): light brown to brown, dry, moderate cohesion, uniform, and slightly stiff.

Sandstone and interbedded dark grey shale: color ranges from white, grey, brown, and reddish brown.

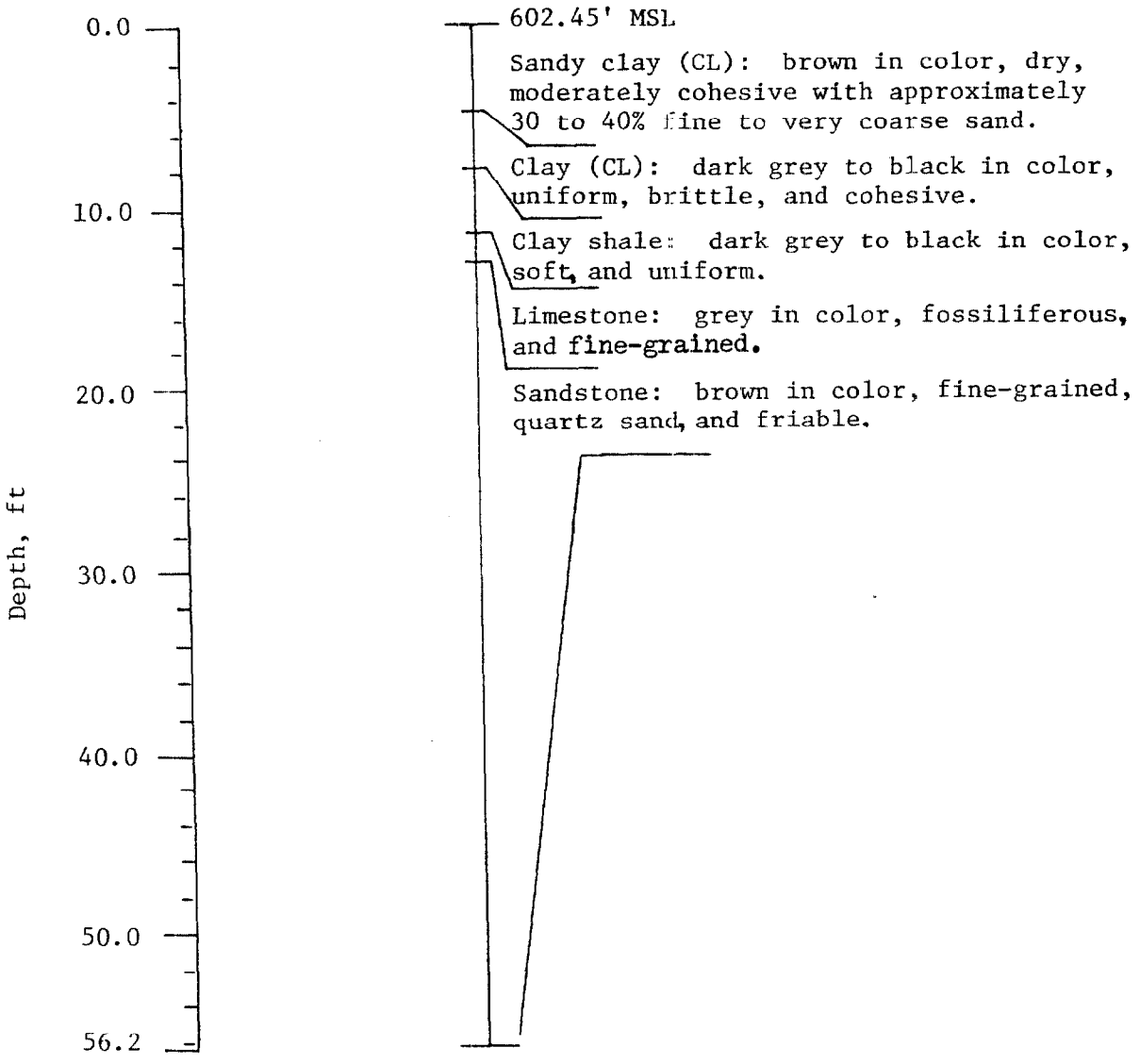
Shale: dark grey in color.

NWSC, Crane, Indiana

Dye Burial Grounds

Lithology

Boring Number: WES-2-8-81

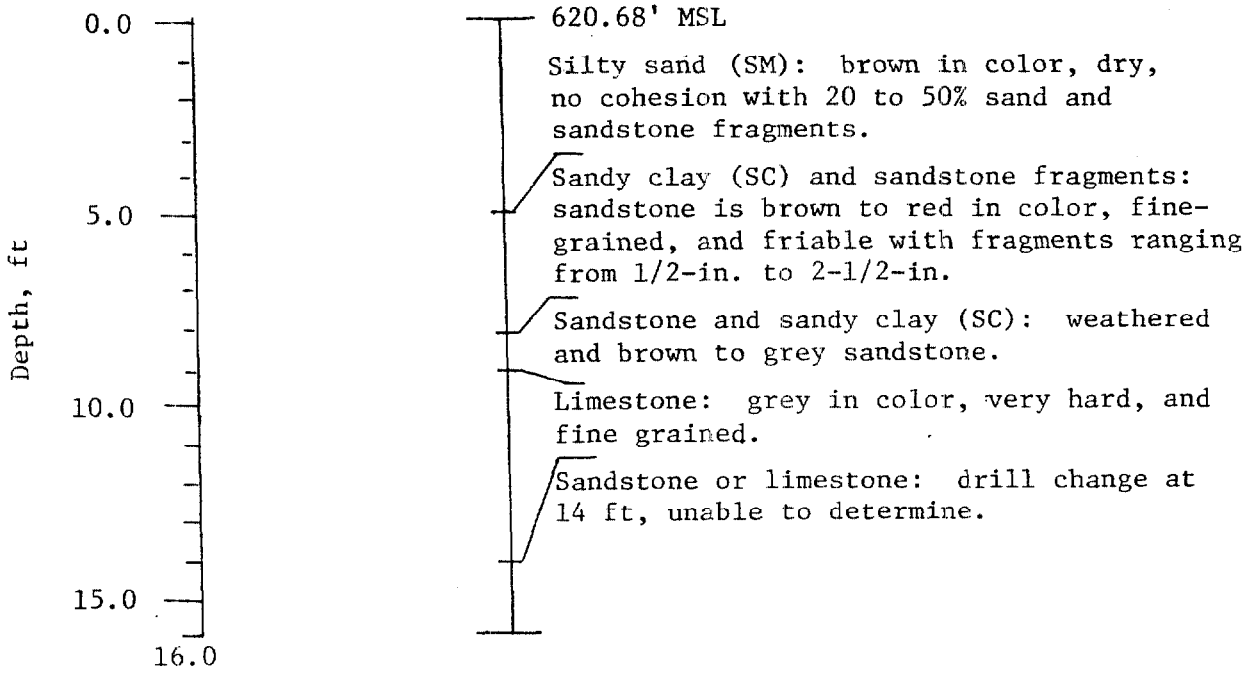


NWSC, Crane, Indiana

Ammunition Burning Grounds

Lithology

Boring Number: WES-3-1-81

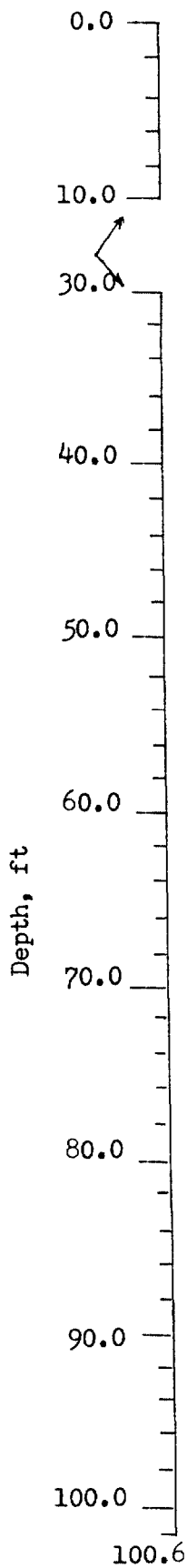


NWSC, Crane, Indiana

Ammunition Burning Grounds

Lithology

Boring Number: WES-3-2-81



580.87' MSL

Gravelly clay (CL): dark brown in color, moderately cohesive, soft, and contains 10% gravel from 1/16 to 3/4-in.

Sandstone: brown (to 16.35 ft) and grey in color, uniform, fine-grained quartz sand, and contains iron nodules and fine seams of lignite. Sandstone is very friable near surface, weathered in areas, and predominantly thinly bedded.

Limestone: grey brown in color, hard, dense, fine-grained, fossiliferous, and thinly bedded with grey shale.

Shale: brownish grey to greenish grey, soft, and uniform.

Limestone with interbedded shale: grey brown to grey, hard, dense, and contains soft, greenish grey shale.

Shale: green to dark grey in color, soft, and fairly uniform.

Sand (SP): brown, fine-grained, uniform, unconsolidated, and approximately 70% quartz grains.

Shale: grey and uniform.

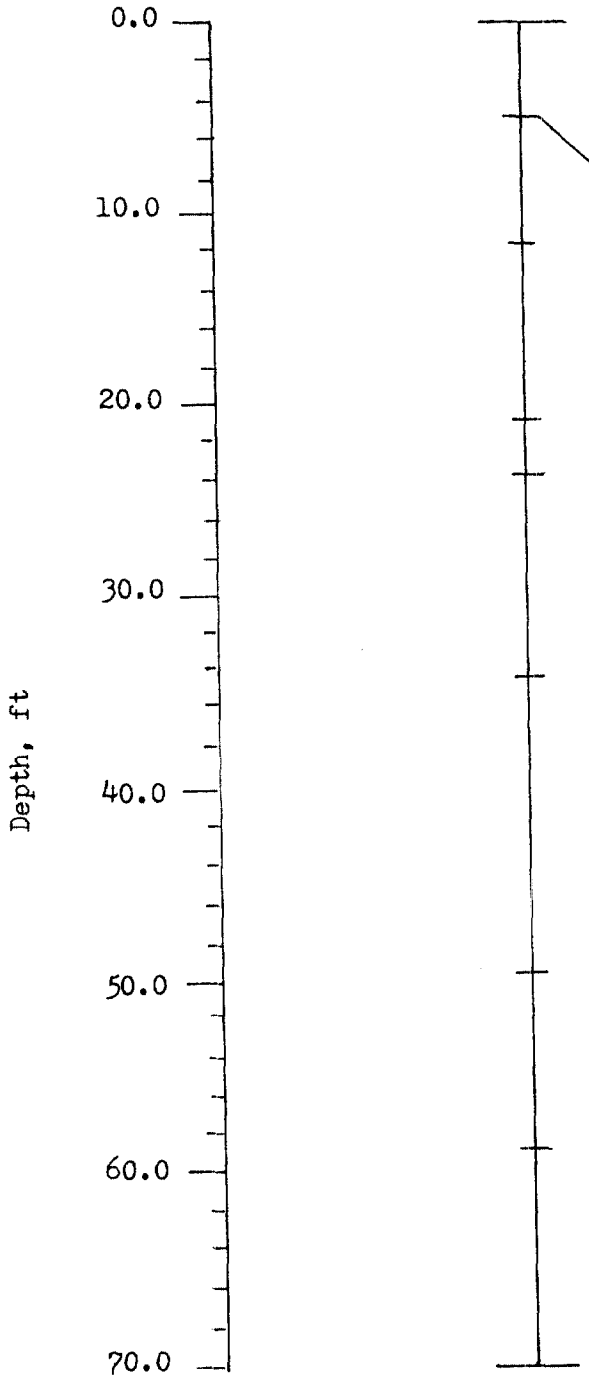
Sand (SP): brown to grey, fine-coarse, and unconsolidated.

Shale: same as above.

Sand (SP): same as above.

Shale: same as above.

NWSC, Crane, Indiana
Ammunition Burning Grounds
Lithology
Boring Number: WES-3-3-81



592.12' MSL

Silty sand (SM): brown in color, dry, and contains hard fragments of sandstone and silt.

Gravel, sand, and weathered sandstone.

Sandstone

Limestone: white in color and hard.

Sandstone: reddish brown in color and weathered.

Sandstone: hard.

Limestone: very hard.

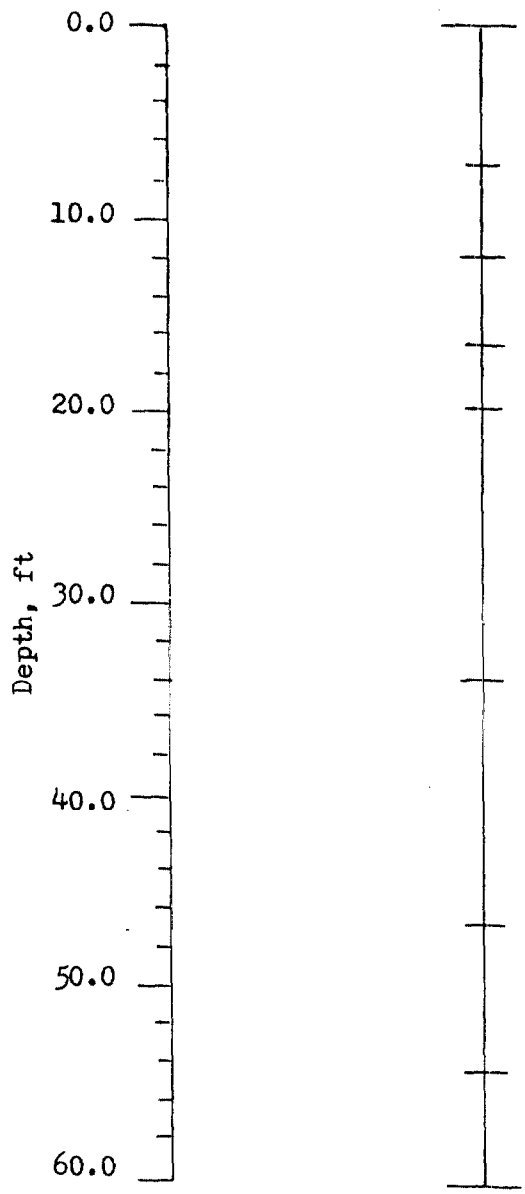
Sandstone or shale

NWSC, Crane, Indiana

Ammunition Burning Grounds

Lithology

Boring Number: WES-3-4-81



593.25' MSL

Silty sand (SM): brown in color, dry, slight cohesion, and 30% fine to coarse sand.

Sandstone: brown in color and soft.

Sandstone: brown in color and moderately hard.

Sandstone: reddish brown in color and soft.

Sandstone and shale: brown to grey in color and medium hard. Very hard spot from 32 to 34 ft.

Sandstone and shale: brown to grey in color and medium hard.

Sandstone or limestone: very hard.

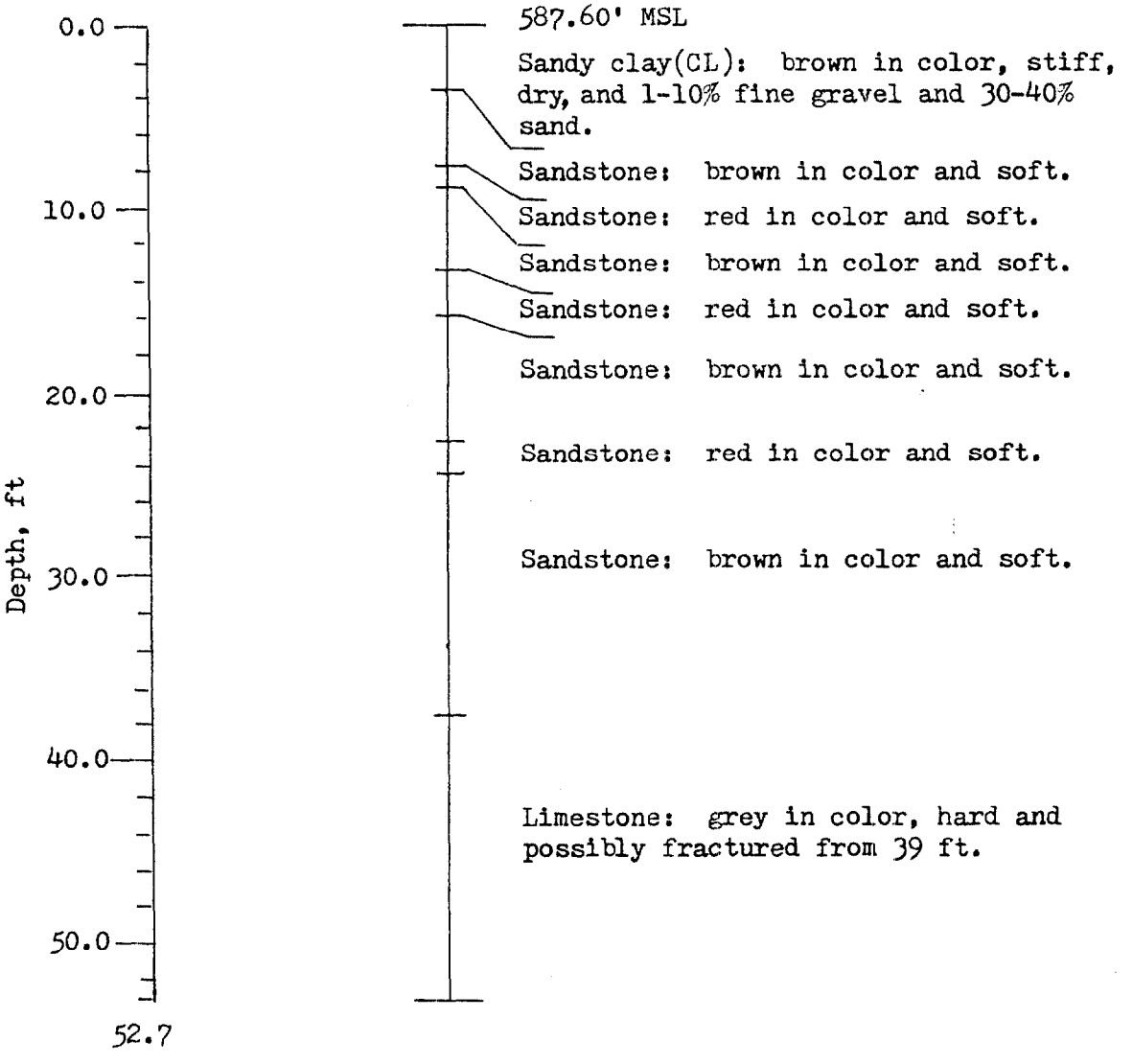
Shale: grey to green in color and soft.

NWSC, Crane, Indiana

Ammunition Burning Grounds

Lithology

Boring Number: WES-3-5-81

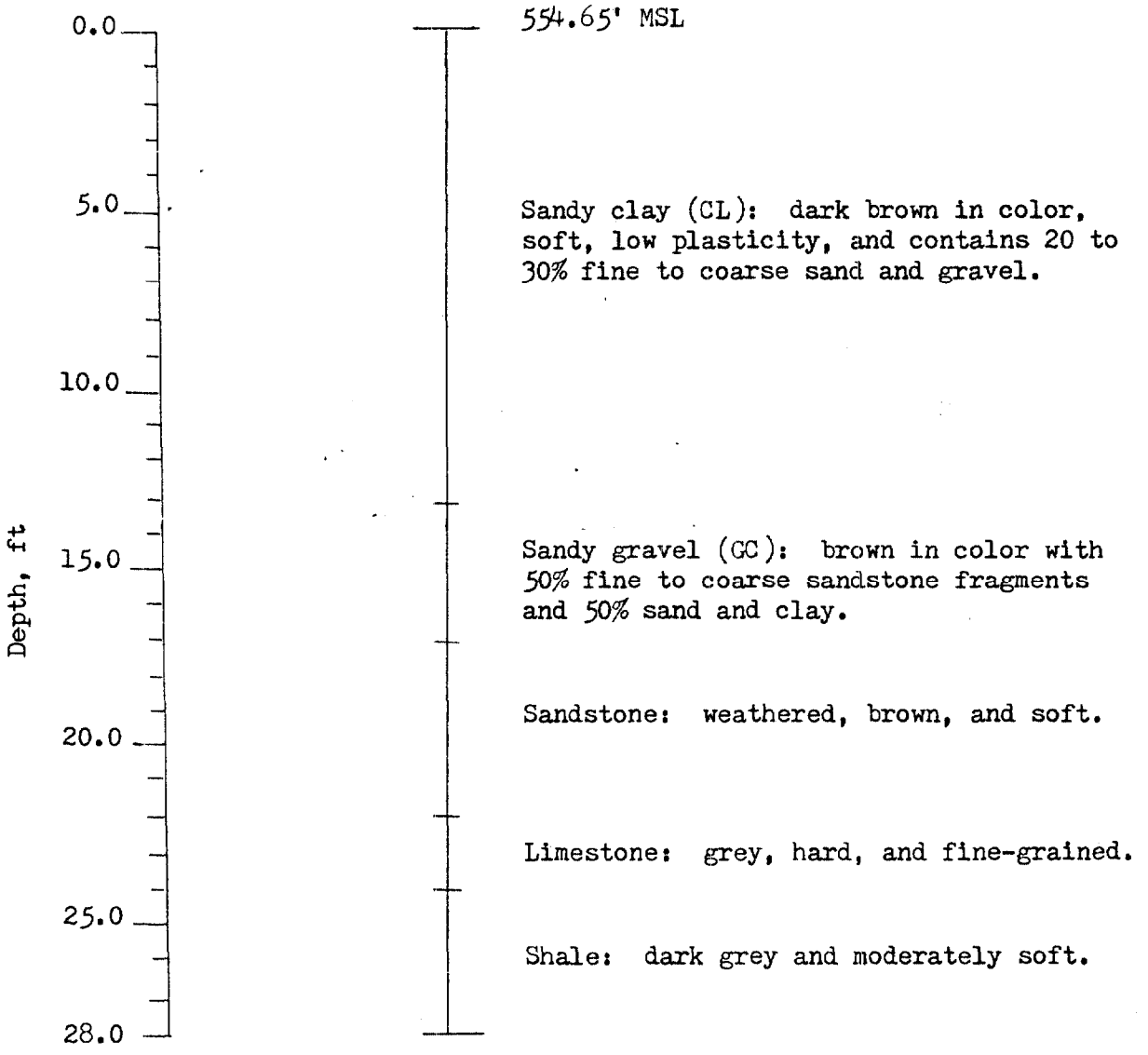


NWSC, Crane, Indiana

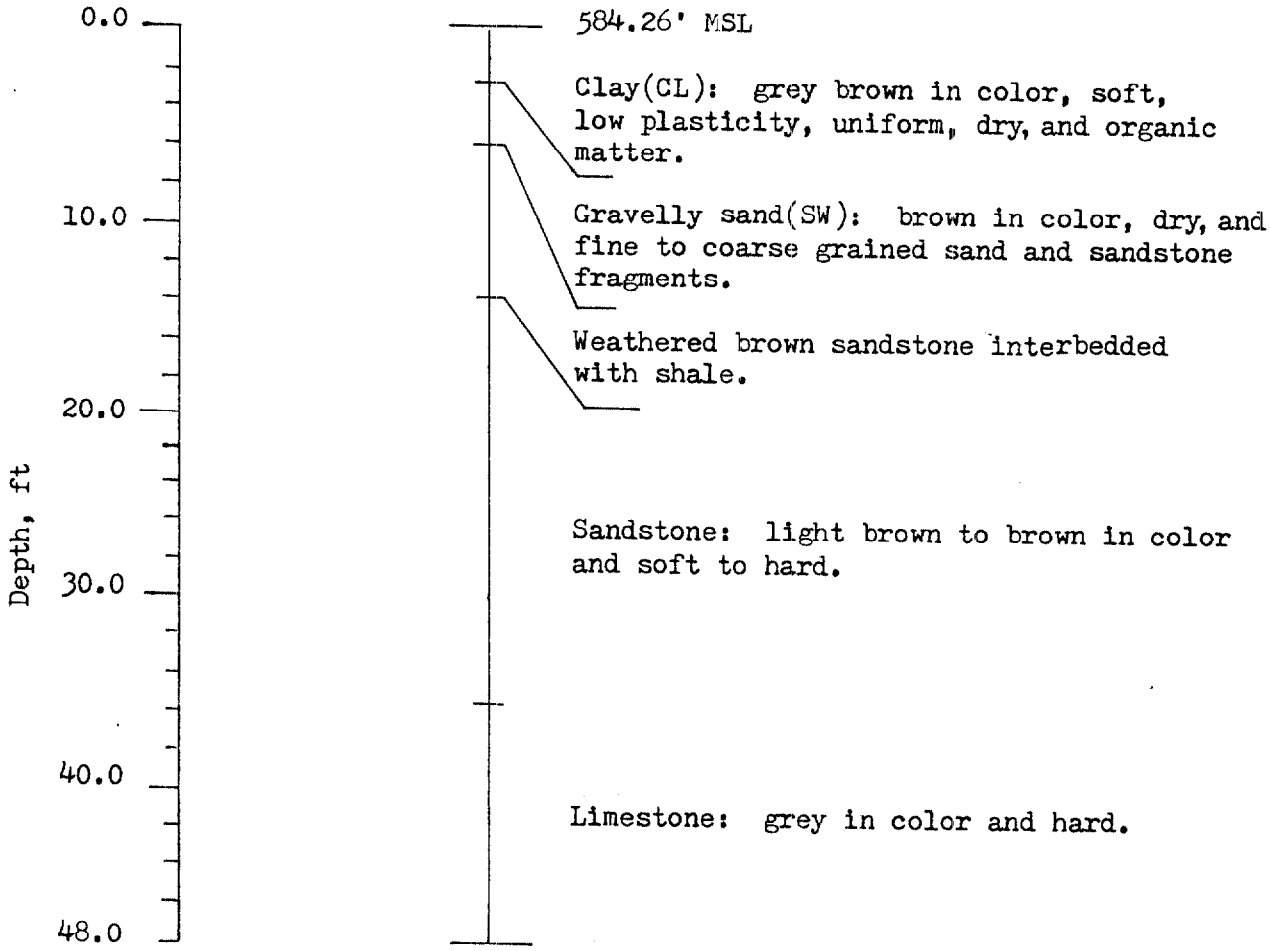
Ammunition Burning Grounds

Lithology

Boring Number: WES-3-6-81



NWSC, Crane, Indiana
Ammunition Burning Grounds
Lithology
Boring Number: WES-3-7-81

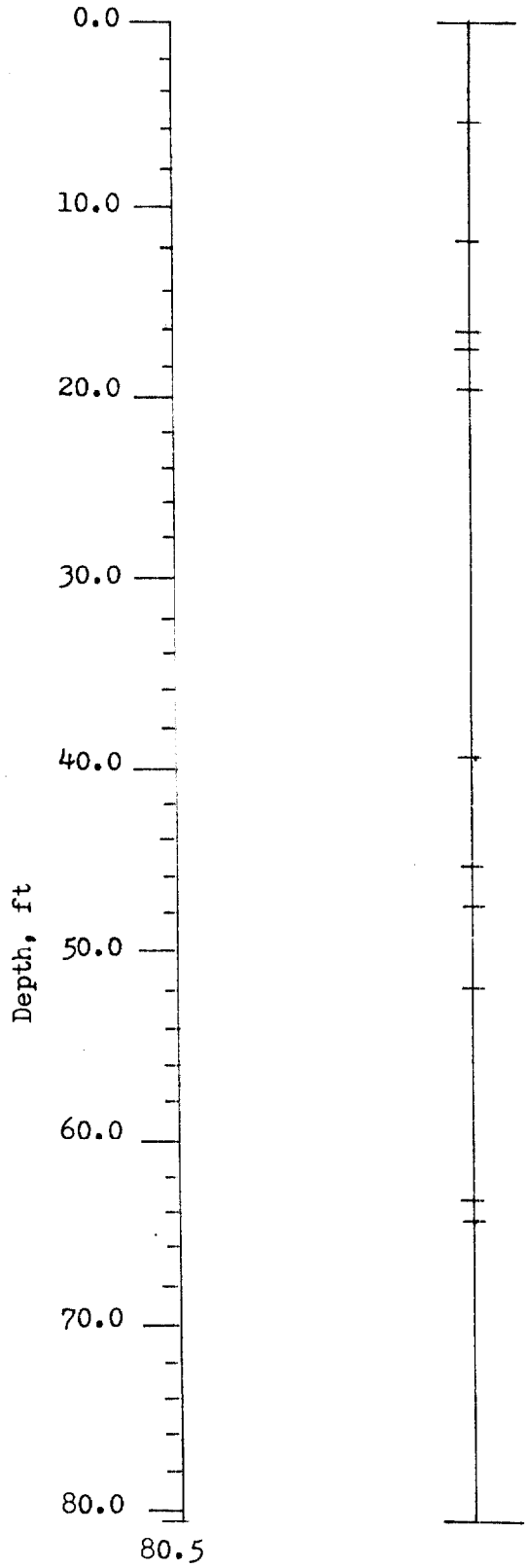


NWSC, Crane, Indiana

Ammunition Burning Grounds

Lithology

Boring Number: WES-3-8-81



625.25' MSL

Sandy clay (CL): brown in color, dry, low plasticity, and contains fine to coarse-grained sand and sandstone fragments.

Sandstone: brown in color, soft, highly weathered, and wet.

Limestone: light grey in color and hard.

Shale: grey in color and soft.
Limestone: light grey in color and hard.

Shale: grey in color and medium hard.

Sandstone: light grey in color and hard.

Limestone: light grey in color and hard.

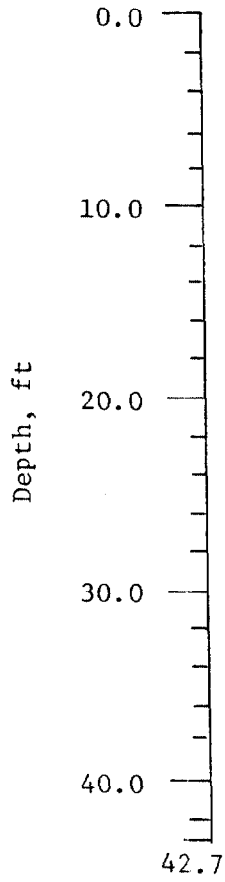
Shale, sandstone, and limestone

Sandstone: brown in color and hard.

Limestone: grey in color and hard.

Sandstone: light grey in color and hard.
Soft spot from 70.0 to 73.5 ft.

NWSC, Crane, Indiana
Ammunition Burning Grounds
Lithology
Boring Number: WES-3-9-81



603.49' MSL

Silt (ML): brown in color, slightly moist, little cohesion, slightly gritty, and contains organic matter.

Silty sand (SM): reddish brown in color, very uniform, fine-grained, little cohesion, and dry.

Gravelly sand (SP): reddish brown in color, fine to coarse-grained sand, very fine gravel, slightly moist, and no cohesion.

Sand (SP): brown in color, fine to medium quartz sand, slight moisture, and very little cohesion.

Silty sand (SM): brown in color, fine-grained quartz sand, slight moisture, little cohesion, and 30% silt.

Silt (ML): brown in color, very moist, moderately cohesive, and contains 1-2% very fine gravel.

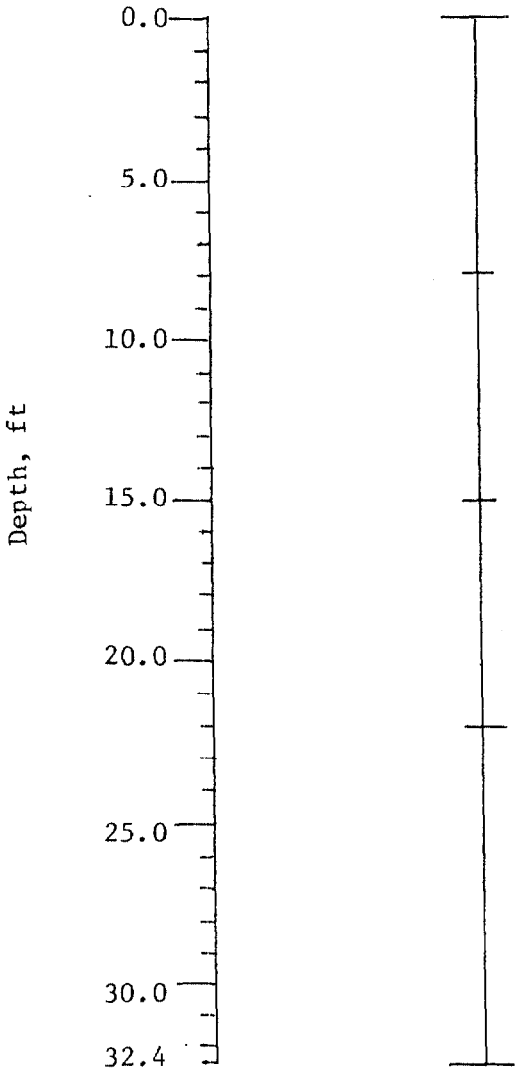
Clay silt (ML): grey in color, moist, and moderately cohesive.

NWSC, Crane, Indiana

McComish Gorge

Lithology

Boring Number: WES-4-1-81



585.69' MSL

Gravelly sand (SP): brown in color, dry, no cohesion, and fine to coarse-grained sand with 10-20% fine to medium gravel.

Silty sand (SM): brown in color, slight moisture, and slight cohesion.

Clay silt (ML): brown in color, moderately cohesive, and slight moisture. Material is very moist around 20 ft.

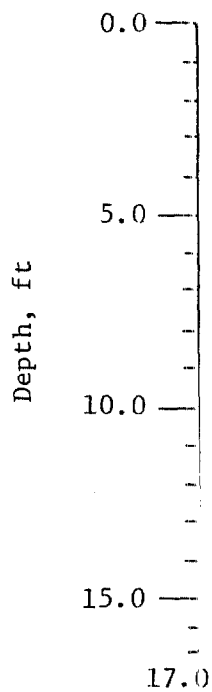
Silty sand (SM): grey in color, very fine-grained sand, uniform, moderately cohesive, and moist.

NWSC, Crane, Indiana

McComish Gorge

Lithology

Boring Number: WES-4-2-81



566.22' MSL

Silty sand (SM): brown in color, damp, fine-grained, moderate cohesion, and contains 30 to 40% silt.

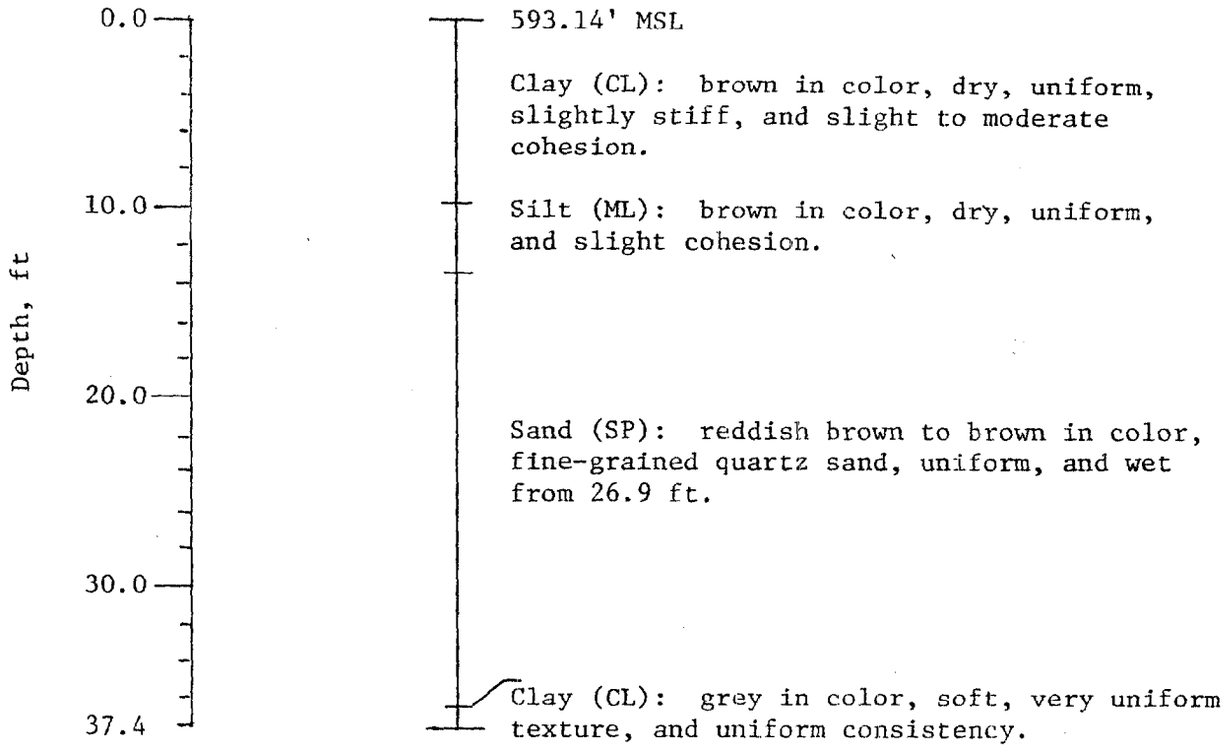
Silty sand (SM): grey in color, fine-grained, wet, moderate cohesion, and contains 30 to 40% silt.

NWSC, Crane, Indiana

McComish Gorge

Lithology

Boring Number: WES-4-3-81

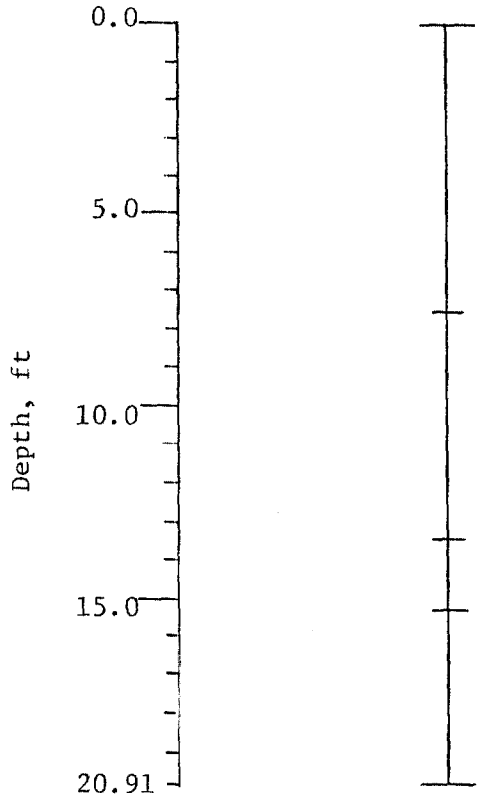


NWSC, Crane, Indiana

McComish Gorge

Lithology

Boring Number: WES-4-4-81



573.39' MSL

Sandy clay (CL): brown in color, moderate cohesion, soft, and contains 20-30% fine-grained sand.

Silty sand (SM): dark grey to black in color, wet, slight cohesion, and slight organic-oily odor.

Sandy gravel (GW): grey in color, wet, coarse sand (30%), and fine to medium, angular to rounded, unsorted gravel.

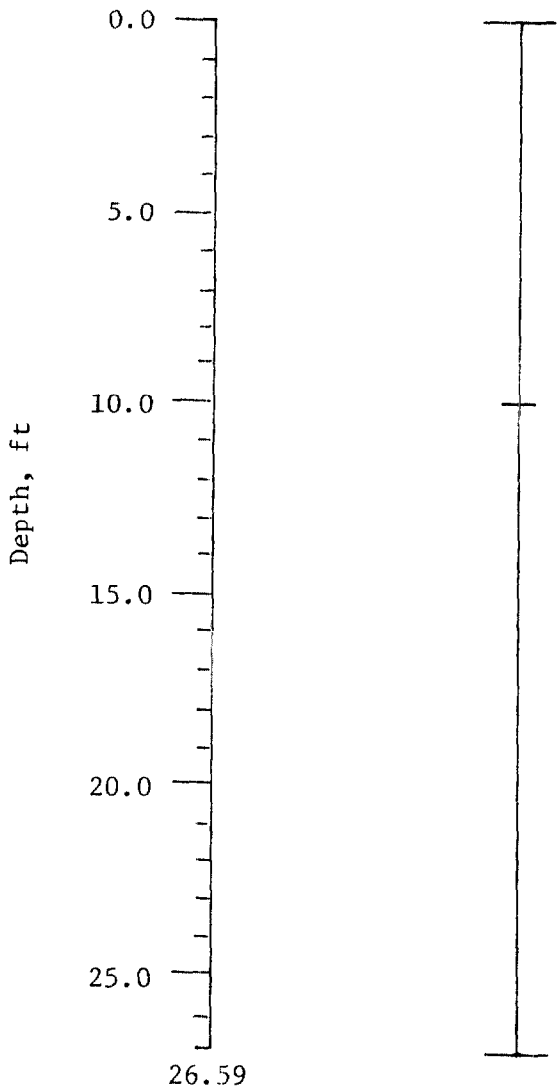
Silty sand (SM): grey in color, wet, no cohesion, and uniform.

NWSC, Crane, Indiana

McComish Gorge

Lithology

Boring Number: WES-4-5-81



579.54' MSL

Sand (SP): reddish brown to brown in color, dry, uniform, slight cohesion, and fine to medium grained.

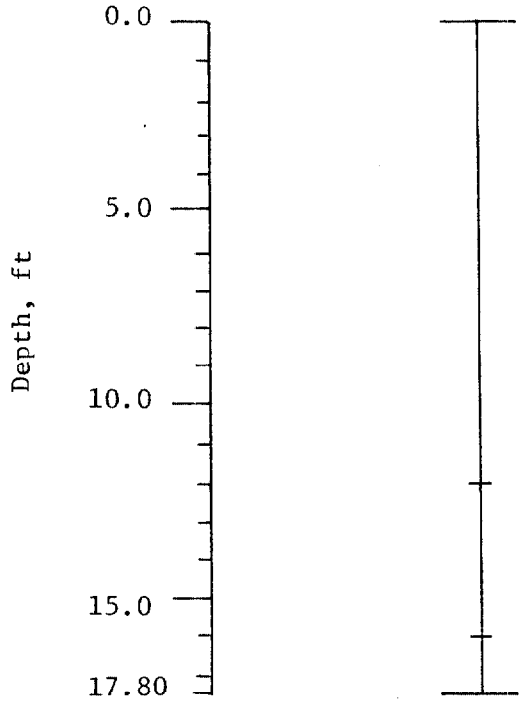
Silty sand (SM): brown in color, uniform, very fine-grained, slight cohesion, and wet from 17.35 ft. Material changes to grey color at 24.2 ft.

NWSC, Crane, Indiana

McComish Gorge

Lithology

Boring Number: WES-4-6-81



596.52' MSL

Silty sand (SM): brown in color, fine-grained, slight cohesion, and contains 5% very fine gravel. Material is moist from about 5 to 10 ft.

Silt (ML): brown to grey in color, hard, cohesive, and dry.

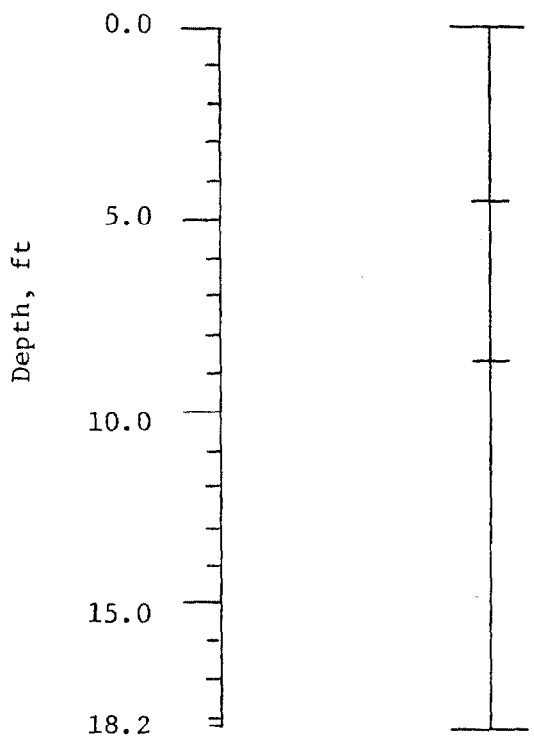
Shale: grey to black in color, uniform, and dry.

NWSC, Crane, Indiana

Old Burning Pit

Lithology

Boring Number: WES-5-1-81



583.43' MSL

Sand (SP): reddish brown in color, dry, slight cohesion, fine to medium grained, and contains ash and other burned materials.

Sandy silt (ML): brown in color, damp, slight cohesion, and contains 20% fine-grained sand.

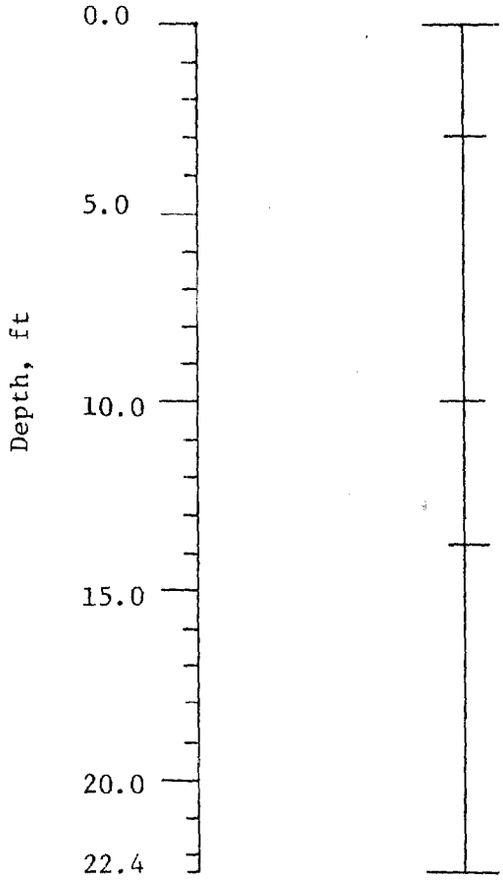
Silt (ML): brown in color, wet, and slight cohesion.

NWSC, Crane, Indiana

Old Burning Pit

Lithology

Boring Number: WES-5-2-81



589.78' MSL

Sand (SW): brown in color, fine to very coarse grained with majority of sand being medium, dry, and no cohesion.

Sand (SP): brown in color, uniform, fine-grained, slightly moist, and no cohesion.

Sandy silt (ML): brown in color, uniform, wet, and slight cohesion.

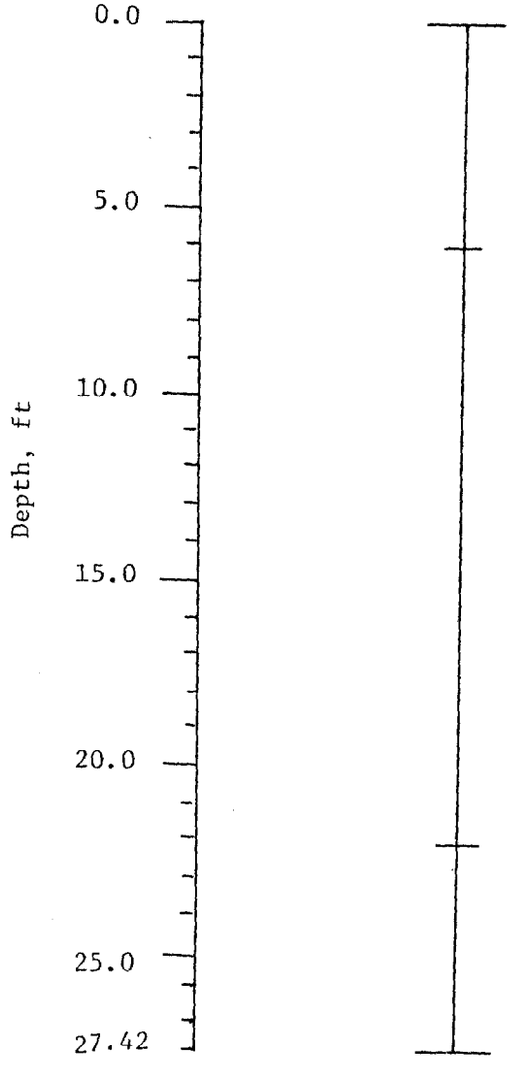
Silt (ML): brown in color, uniform, wet, moderate to highly cohesive.

NWSC, Crane, Indiana

Old Burning Pit

Lithology

Boring Number: WES-5-3-81



585.33' MSL

Sand (SP): brown in color, uniform, very fine-grained quartz sand, slightly damp, and slight cohesion.

Silt/Sand (SP-SM): brown in color, very fine-grained, moist to wet, and little cohesion.

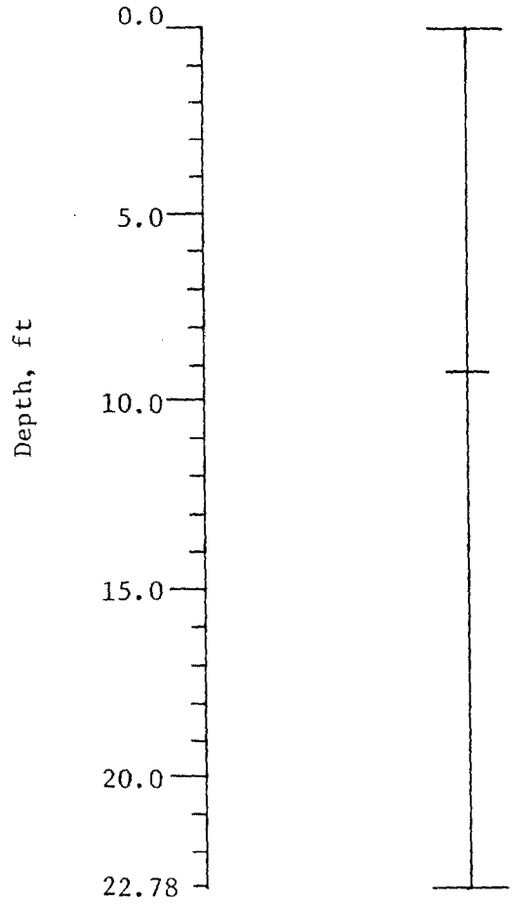
Clay (CL): brown to grey in color, soft, low plasticity, and moist.

NWSC, Crane, Indiana

Old Burning Pit

Lithology

Boring Number: WES-5-4-81



583.78' MSL

Sand (SP): brown in color, fine-grained quartz sand, dry, and no cohesion.

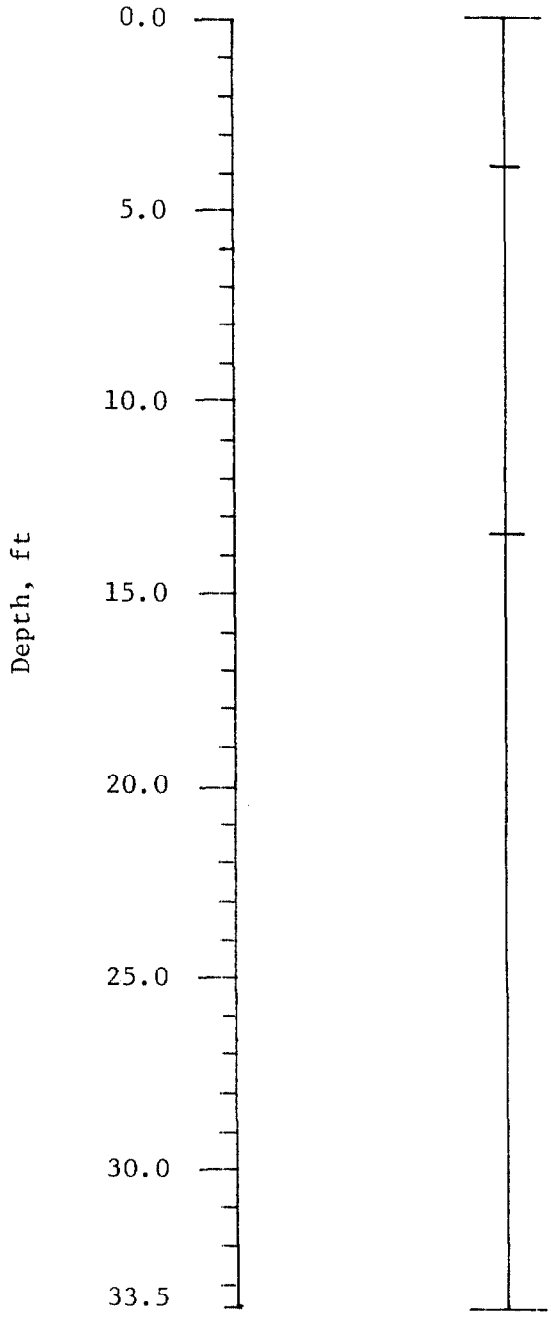
Silt/Sand (SP-SM): brown in color, very fine-grained, soft, wet, uniform, and slight cohesion.

NWSC, Crane, Indiana

Old Burning Pit

Lithology

Boring Number: WES-5-5-81



570.27' MSL

Sandy silt (ML): reddish brown in color, dry, uniform, low plasticity, and organic matter.

Silt (ML): light brown in color, soft, low plasticity, uniform, and dry.

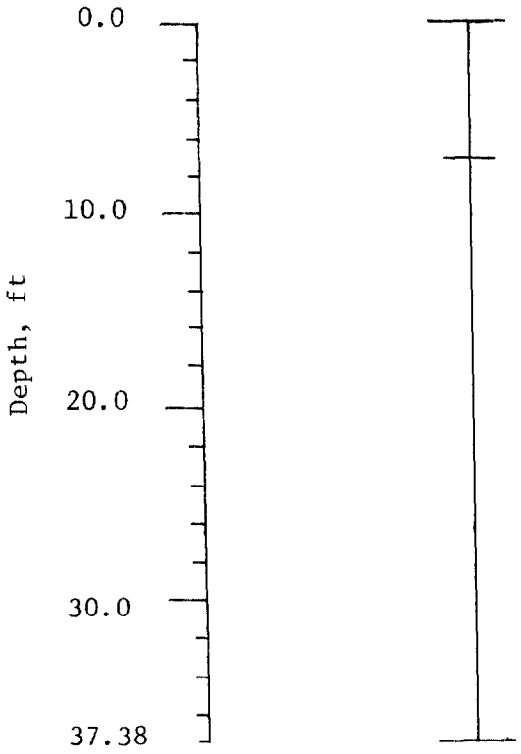
Silt (ML): grey to dark grey in color, soft, and low plasticity. Material is wet from 19.5 ft.

NWSC, Crane, Indiana

Old Burning Pit

Lithology

Boring Number: WES-5-6-81



576.70' MSL

Silt (ML): brown in color, dry, uniform and low plasticity.

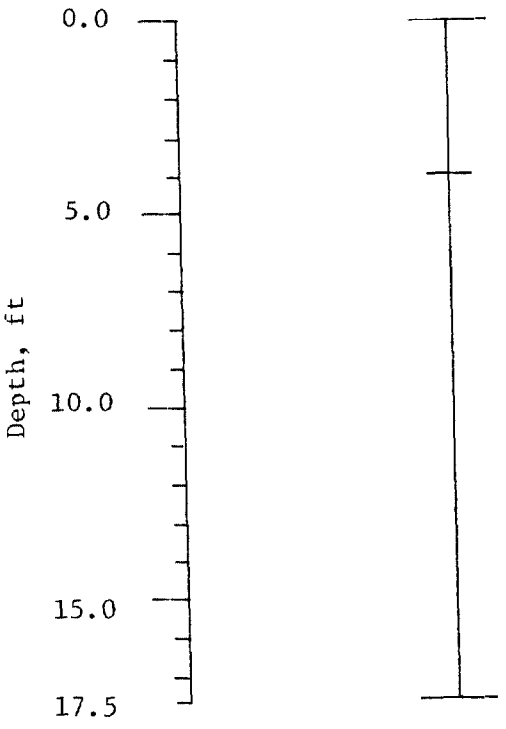
Silt (ML): grey in color, moist to very wet, uniform, soft, and low plasticity.

NWSC, Crane, Indiana

Old Burning Pit

Lithology

Boring Number: WES-5-7-81



563.78' MSL

Sandy clay (CL): brown in color, slightly moist, soft, and organic matter. Material is possibly dozer fill.

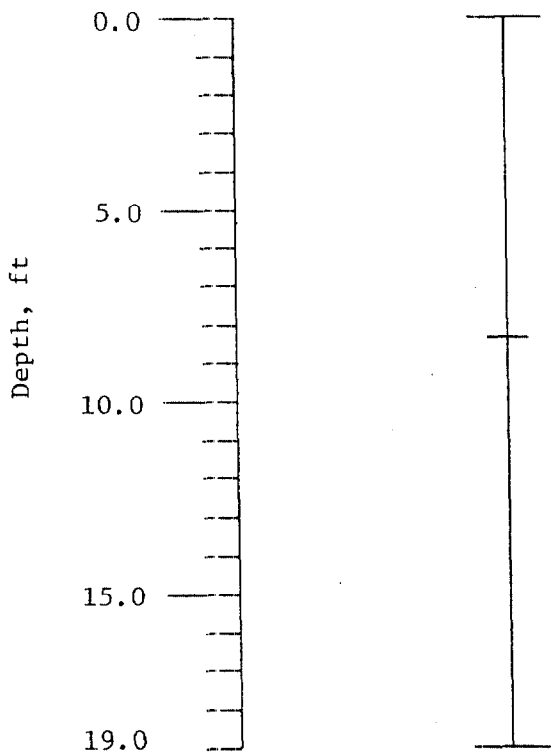
Silt (ML): brownish grey to grey in color, moist to wet, and uniform.

NWSC, Crane, Indiana

Old Burning Pit

Lithology

Boring Number: WES-5-8-81



682.63' MSL

Clay (CL): brown to grey in color, dry, moderate cohesion, organic matter, and contains 5-10% very fine, angular to rounded gravel from 5 ft.

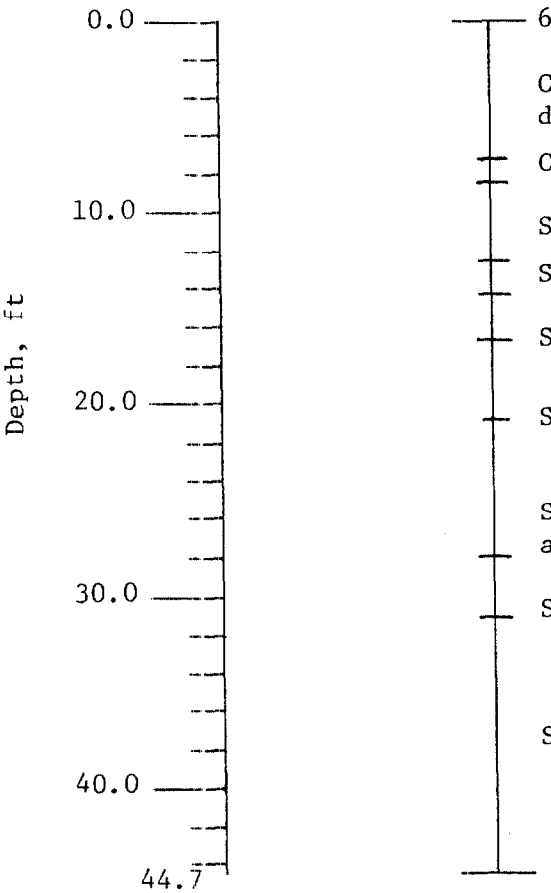
Sandstone: reddish brown in color and fine-grained.

NWSC, Crane, Indiana

Demolition Area

Lithology

Boring Number: WES-6-1A-81



683.27' MSL

Clay (CL): brown in color, very stiff, dry, and low plasticity.

Clay shale: reddish brown.

Sandstone: light grey and hard.

Shale: brown and grey.

Sandstone and shale: light grey.

Shale: grey and hard.

Sandstone: light grey, fine-grained, and very hard.

Shale: dark grey.

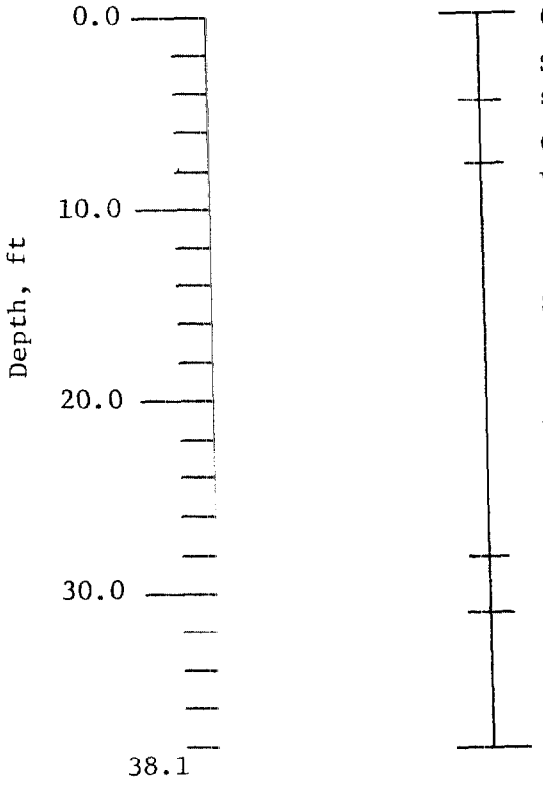
Sandstone: brown and fine-grained.

NWSC, Crane, Indiana

Demolition Area

Lithology

Boring Number: WES-6-1B-81



682.60' MSL

Sandy clay (CL): brown in color, dry, soft, and slight cohesion.

Clay (CH): brown in color, dry, hard, very stiff, and high plasticity.

Sandstone: ranges in color from brown to dark brown and light grey to grey, fine-grained, weathered, contains shale lenses, and alternates between soft and hard.

Shale with sandstone lenses.

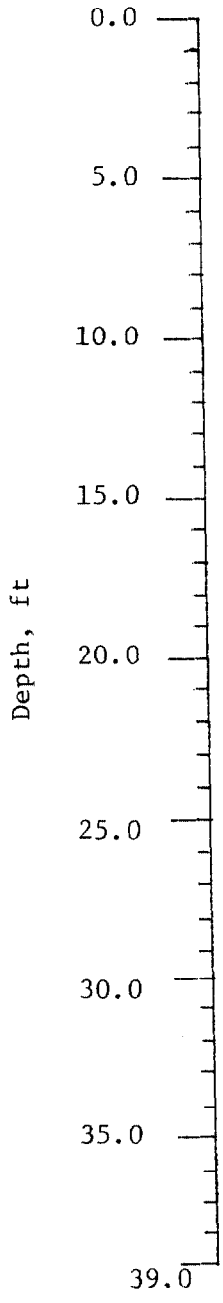
Sandstone: brown and soft, becoming harder at 35.7 ft.

NWSC, Crane, Indiana

Demolition Area

Lithology

Boring Number: WES-6-1C-81



637.53' MSL

Clay (CL): brown in color, soft, little cohesion, uniform, slightly damp, and organic matter. Sandstone fragments start around 5 ft.

Sandstone: brown fine-grained, weathered, and friable.

Shale: brown, grey to dark grey, dry, and very soft to soft.

Sandstone and interbedded shale: sandstone is brown in color, fine-grained, moderately friable, and weathered. Shale averages around 20% of interval with thickness ranging from 1/16-1/4 in. and frequency increasing with depth.

Shale: dark grey in color, soft, organic matter, slightly moist, and weathered.

Sandstone and interbedded shale: sandstone ranges from brown to grey, to light grey, fine-grained, and moderately hard to hard. Shale is grey to dark grey in color, soft, and content is about 10-20% of interval.

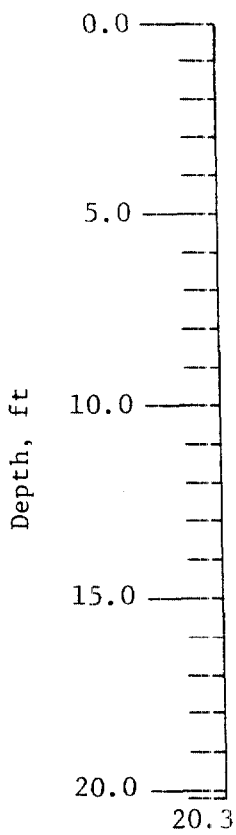
Sandstone (50%) and shale (50%): sandstone is fine-grained, grey to dark grey, and hard. Shale is black and contains sand. Bedding ranges from 1/8 to 1-1/2 in. with average at around 1 in.

NWSC, Crane, Indiana

Demolition Area

Lithology

Boring Number: WES-6-2-81



659.77' MSL

Clay (CL): dark brown in color, uniform, slight cohesion, organic matter, and slightly moist.

Sandy clay (CL): light brown in color, very stiff, dry, and contains 10-20% sand.

Sandstone: soft and weathered to 8 ft.

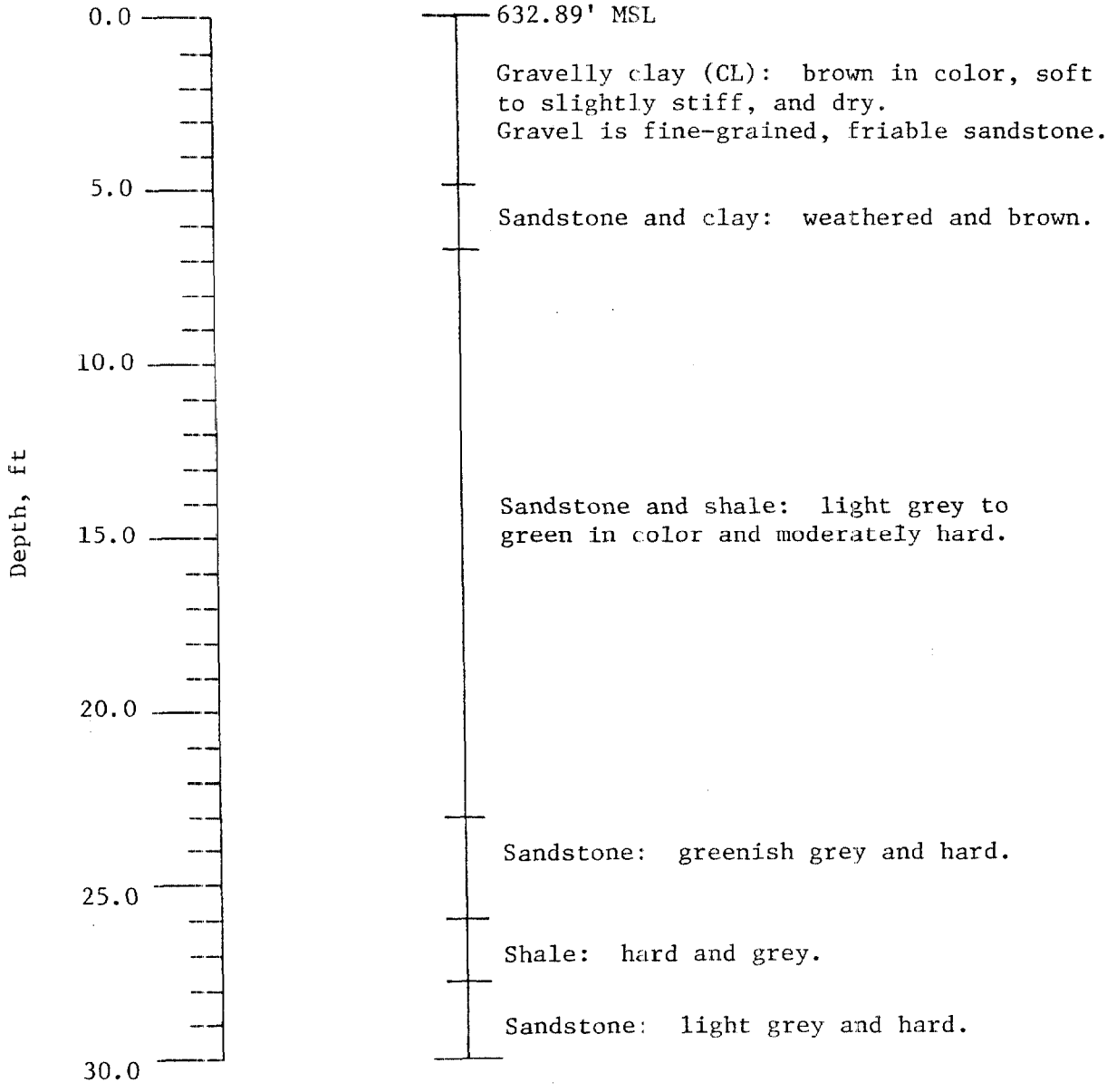
Shale

NWSC, Crane, Indiana

Demolition Area

Lithology

Boring Number: WES-6-3-81

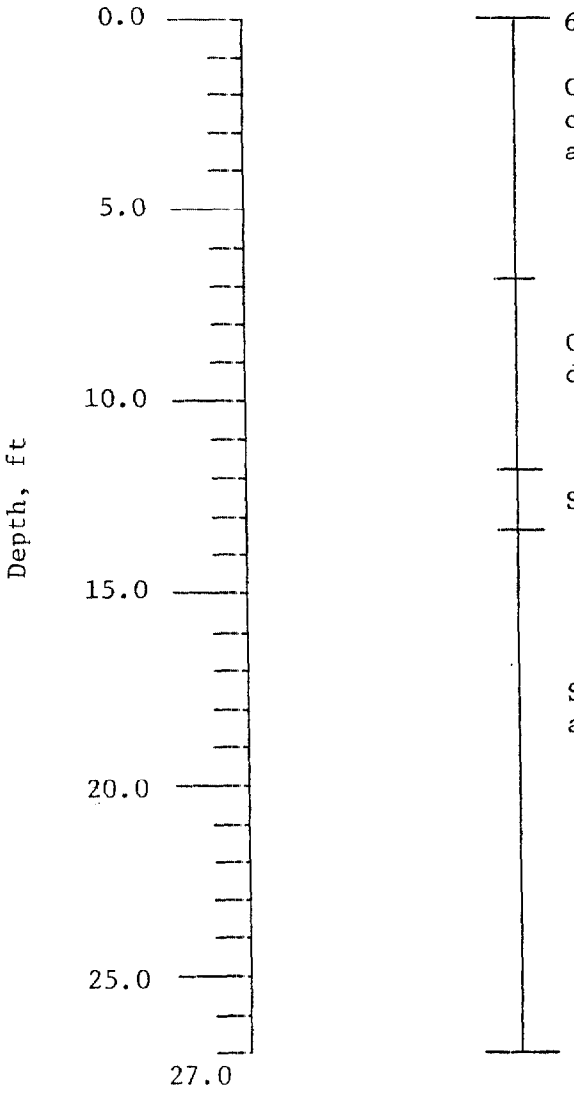


NWSC, Crane, Indiana

Demolition Area

Lithology

Boring Number: WES-6-4-81



607.89' MSL

Clay (CL): brown to reddish brown in color, soft to moderately stiff, dry, and contains 20-25% fine gravel.

Clay shale: brown to grey, soft, and dry.

Shale: red.

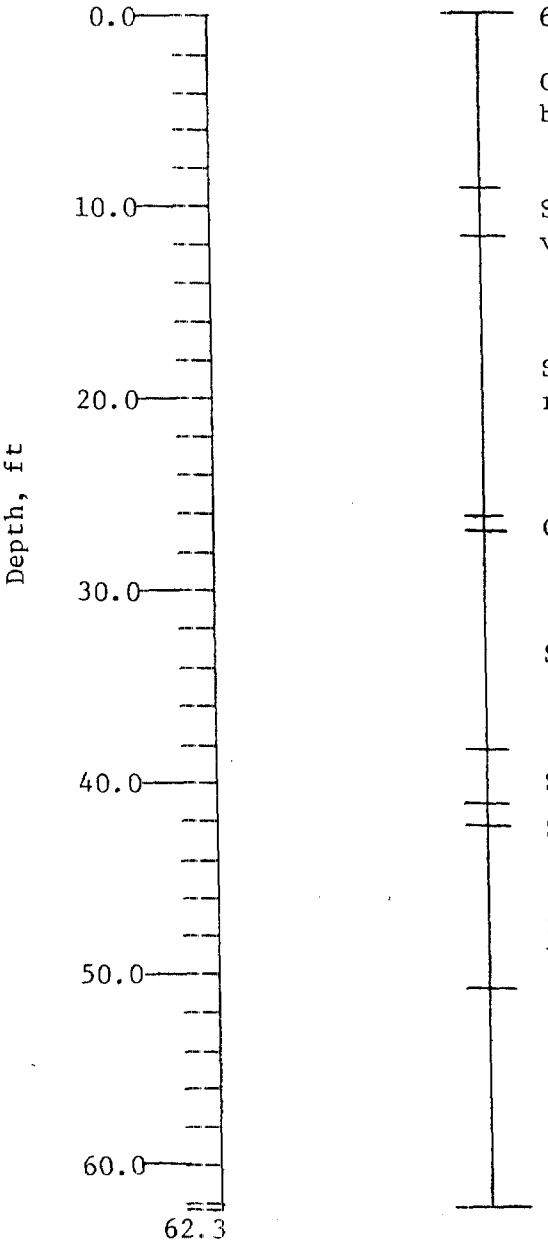
Shale: grey in color and becoming harder at 26 ft.

NWSC, Crane, Indiana

Demolition Area

Lithology

Boring Number: WES-6-5-81



672.06' MSL

Clay (CL): brown in color, stiff, thinly bedded, and dry.

Shale: brown and dark grey, dry, stiff, varied texture, and varied composition.

Shale: medium hard, grey, brown, and reddish brown in color.

Coal: black and medium hard.

Shale: grey to brown and soft.

Sandstone: grey and hard.

Shale: grey and medium hard.

Sandstone: brown to grey and medium hard to hard.

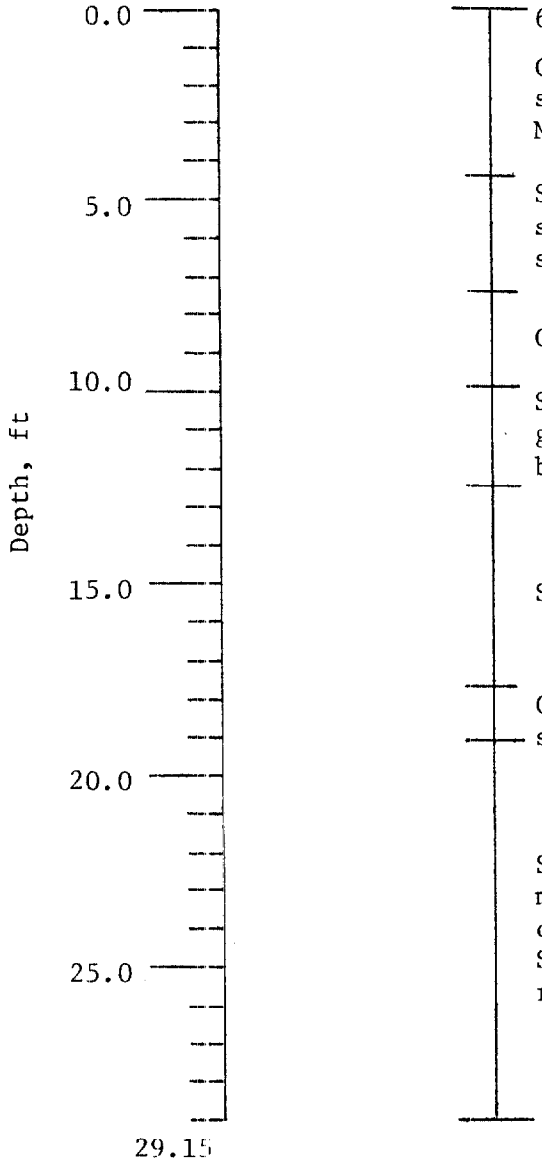
Shale: grey.

NWSC, Crane, Indiana

Demolition Area

Lithology

Boring Number: WES-6-6-81



660.92' MSL

Clay (CL): brown in color, soft to slightly stiff, dry, and low plasticity. Material is dozer fill.

Sandy clay (CL): orange brown in color, soft, dry, and contains 10-20% fine-grained sand.

Clay and weathered sandstone.

Sandstone: brown to orange brown, fine-grained quartz sand, weathered, dry, thinly bedded, and friable.

Shale: black, dry, soft, and uniform.

Coal: black, brilliant luster, brittle, soft, and jointed.

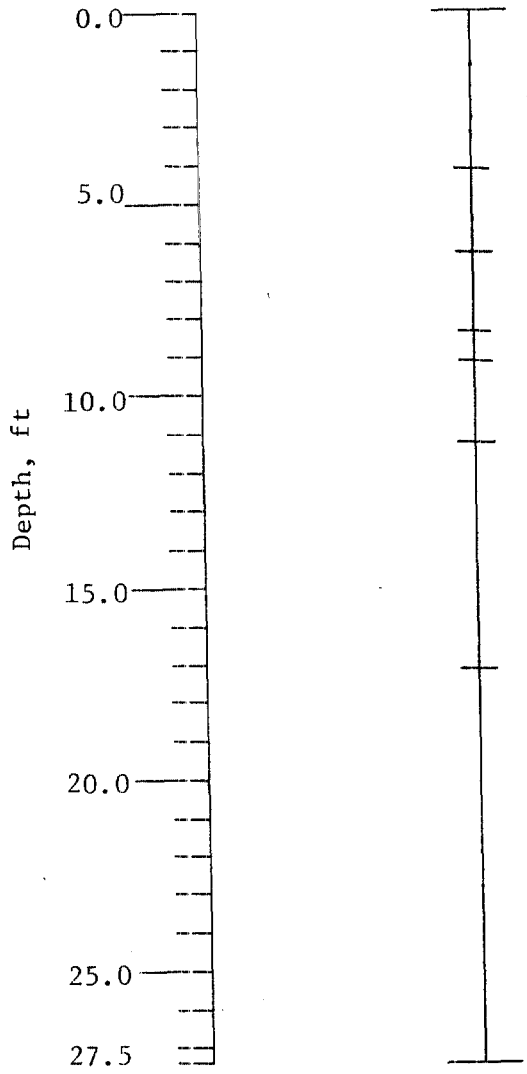
Shaley sandstone: light to dark grey, moderately hard, very fine-grained, and contains 30-40% interbedded dark grey shale. Sandstone and shale are interbedded in irregular seams, lenses, and thin beds.

NWSC, Crane, Indiana

Demolition Area

Lithology

Boring Number: WES-6-7-81



638.72' MSL

Clay (CL): brown in color, soft, low plasticity, and uniform. Material is dozer fill.

Sandstone: brown in color, weathered, very fine-grained, crumbles easily, and dry.

Sandstone: weathered and brown.

Shale: reddish grey and soft.

Sandstone: grey.

Shale: grey and hard.

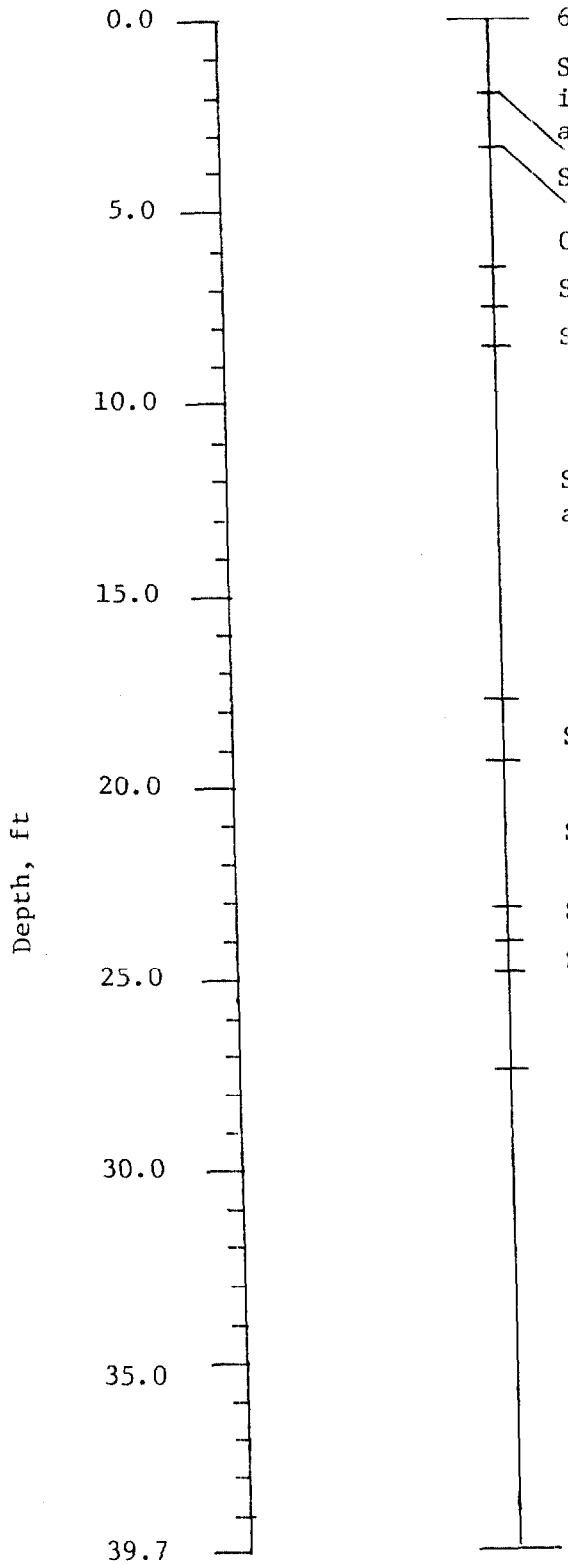
Shale: dark grey and hard.

NWSC, Crane, Indiana

Demolition Area

Lithology

Boring Number: WES-6-8-81



631.04' MSL

Sand (SP) and sandstone fragments: brown in color, dry, fine-grained quartz sand, and uniform.

Sandstone: brown and weathered.

Clay shale: brown.

Shale: grey.

Sandstone

Shale: changing often from brown, to red, and to grey.

Sandstone: rust colored.

Shale: grey.

Sandstone: brown.

Shale: grey.

Sandstone: brown.

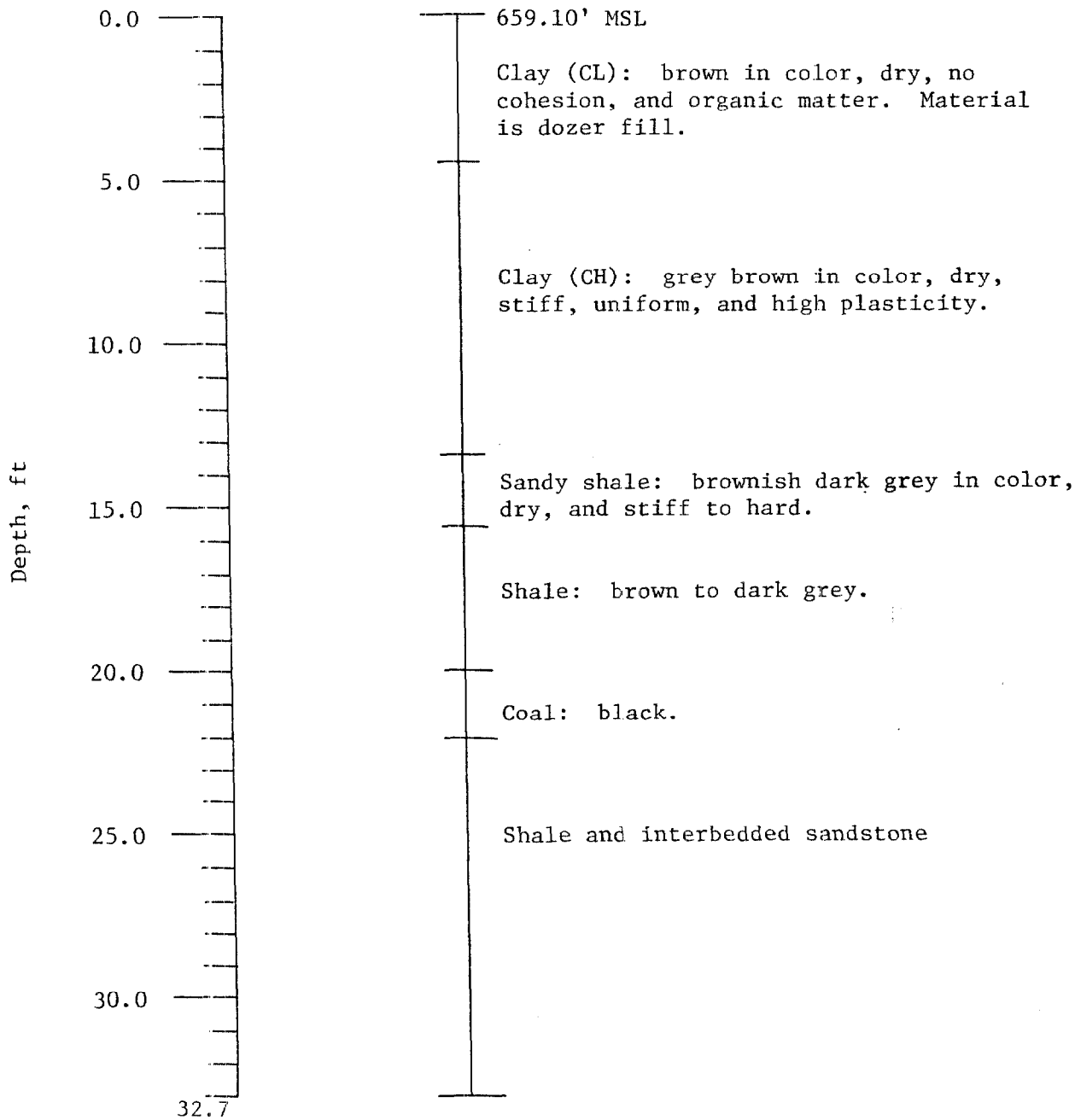
Shale: grey.

NWSC, Crane, Indiana

Demolition Area

Lithology

Boring Number: WES-6-9-81

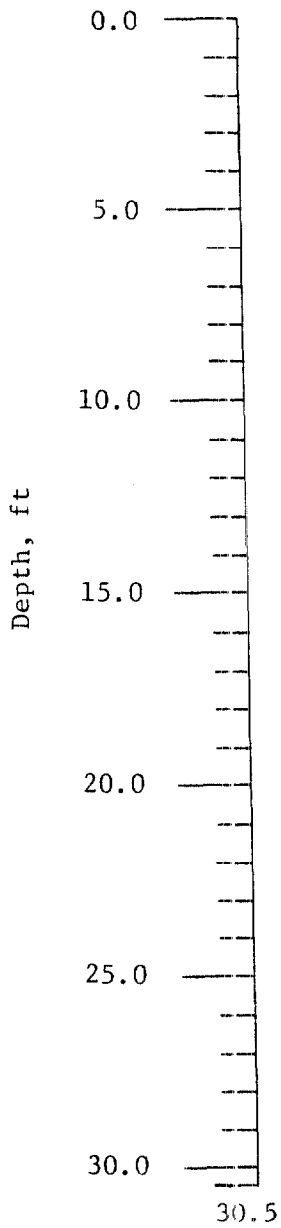


NWSC, Crane, Indiana

Demolition Area

Lithology

Boring Number: WES-6-10-81



657.43' MSL

Silty sand (SM): brown in color, dry, no cohesion, and contains 5-10% sandstone gravel.

Clay (CL) and shale: brown in color, low plasticity, dry, and contains 30% hard shale fragments.

Shale: grey.

Coal: black.

Shale: brown and grey mixed.

Shale: light brown.

Limestone: light grey.

Shale: grey.

Shale: dark grey.

Sandstone: brown and hard.

Shale: grey and hard.

Sandstone: hard.

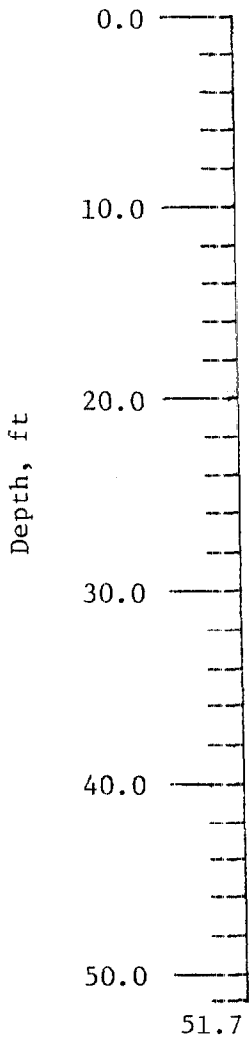
Shale: grey.

NWSC, Crane, Indiana

Demolition Area

Lithology

Boring Number: WES-6-11-81



667.28' MSL

Clay (CH): brown to red in color, slightly moist to dry, soft to stiff, and high plasticity.

Clay shale: brown to grey brown in color, dry, and stiff.

Coal: black.

Sandstone: light grey and medium hard.

Shale: dark grey.

Sandstone: light brown.

Shale: dark grey and hard.

Sandstone: brown.

Shale: dark grey.

Sandstone: grey and hard.

Shale: light grey.

Sandstone: light grey.

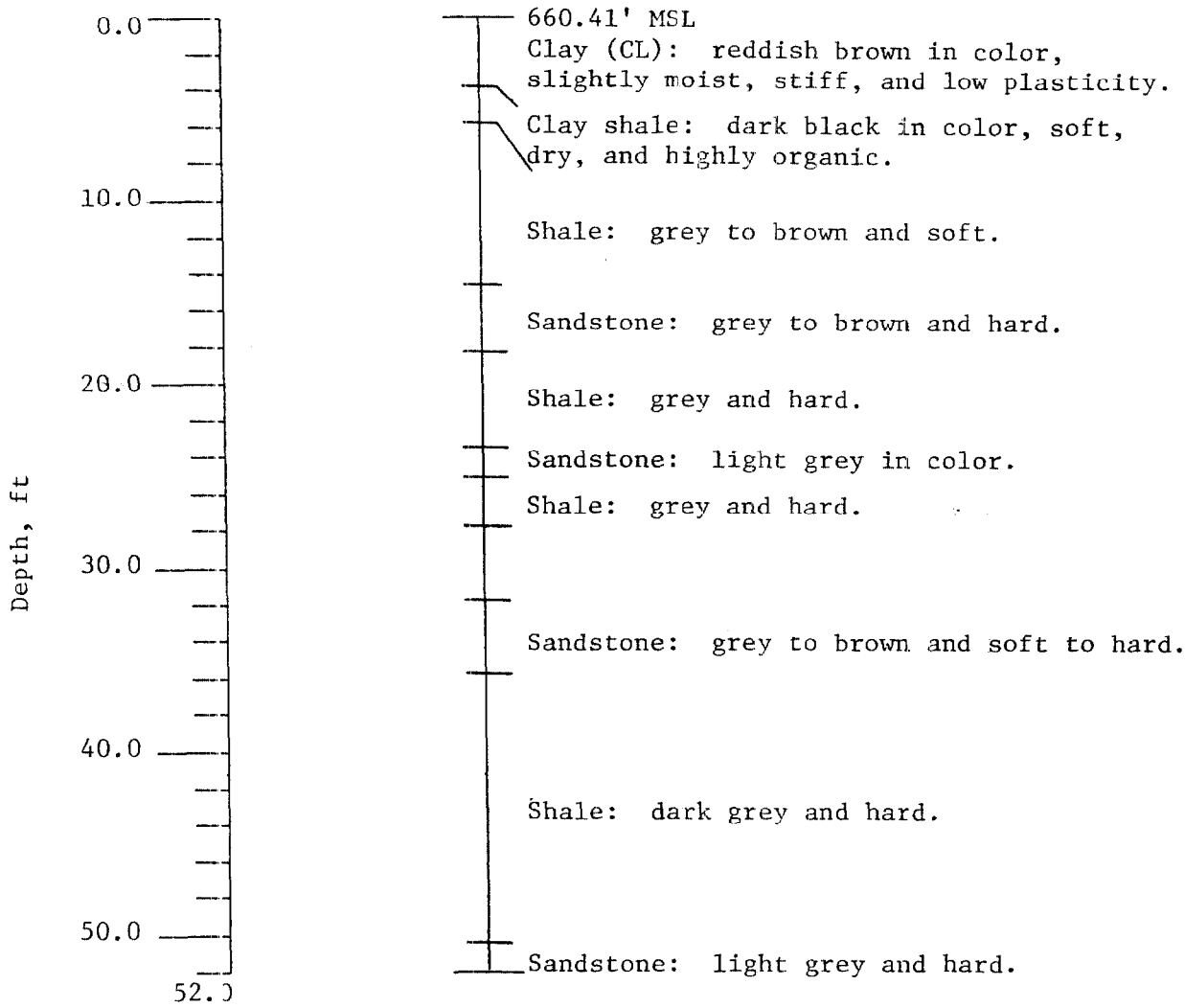
Shale: grey.

NWSC, Crane, Indiana

Demolition Area

Lithology

Boring Number: WES-6-12-81

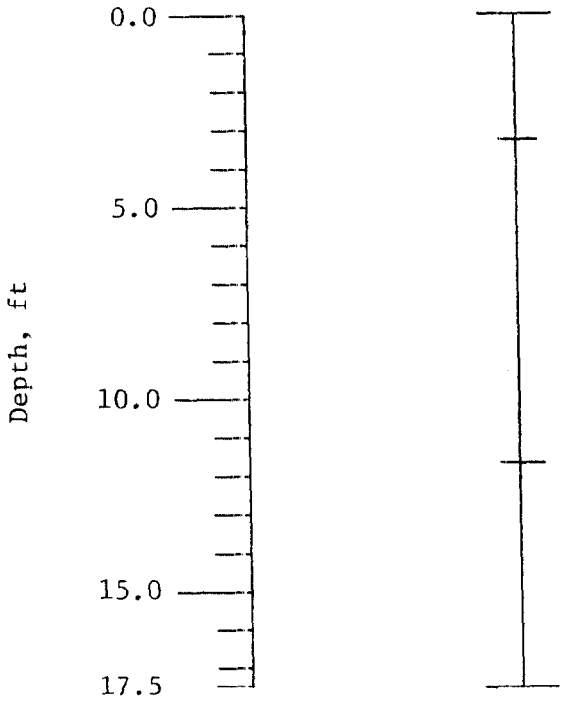


NWSC, Crane, Indiana

Demolition Area

Lithology

Boring Number: WES-6-13-81



505.06' MSL

Sandy clay (CL) and sandstone gravel: brown in color, moist, and low plasticity.

Sandy clay (CL): grey to brown in color, moist, and low plasticity.

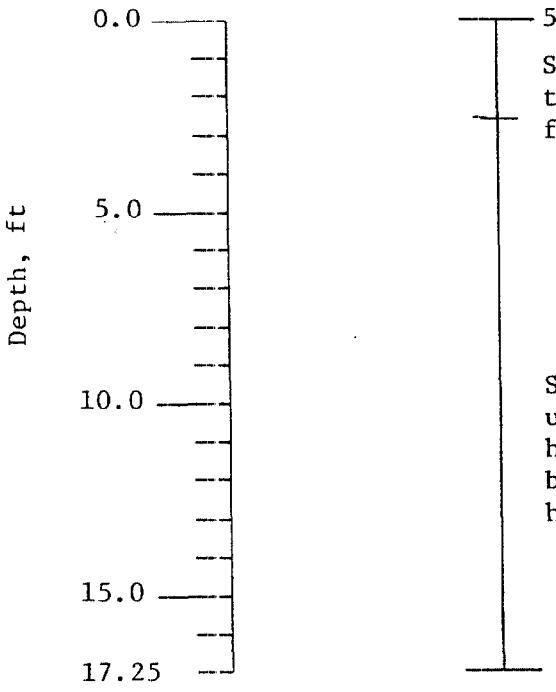
Clay (CH): dark grey in color, uniform, soft, and high plasticity.

NWSC, Crane, Indiana

Old Rifle Range

Lithology

Boring Number: WES-6-14-81



510.42' MSL

Sand (SP) and sandstone fragments: brown to orange brown in color, very fine to fine-grained, and dry.

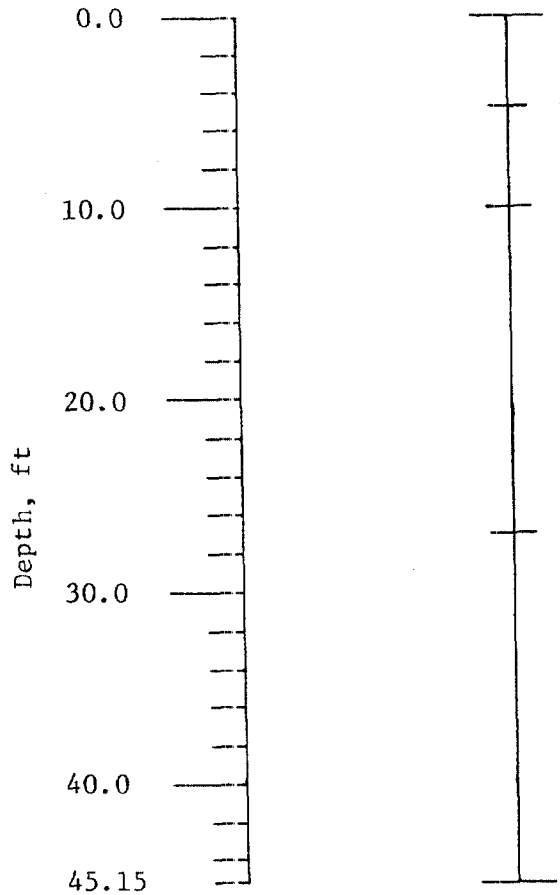
Sandstone: brown to rusty brown in color, uniform, fine-grained quartz sand, moderately hard and oxidized. Bedding ranges from thinly bedded to around one foot maximum and nearly horizontal in attitude.

NWSC, Crane, Indiana

Old Rifle Range

Lithology

Boring Number: WES-6-15-81



527.88' MSL

Silt (ML): brown in color, uniform, dry, and stiff.

Sandy silt (ML): brown in color, dry, and contains 5-10% fine to medium-grained sand.

Clay shale: brown in color, very stiff to hard, weathered, and slightly moist in regions.

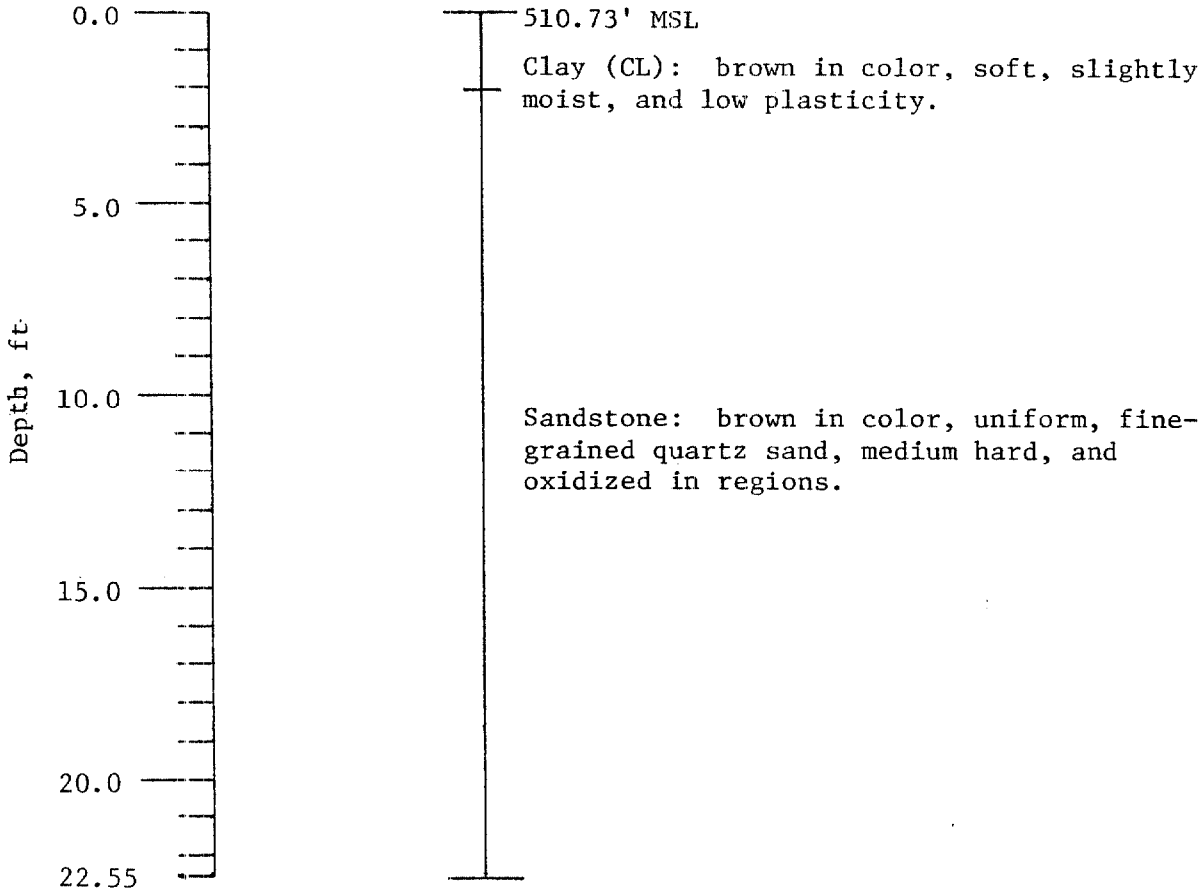
Sandstone: brown in color, medium hard, and fine-grained.

NWSC, Crane, Indiana

Old Rifle Range

Lithology

Boring Number: WES-6-16-81

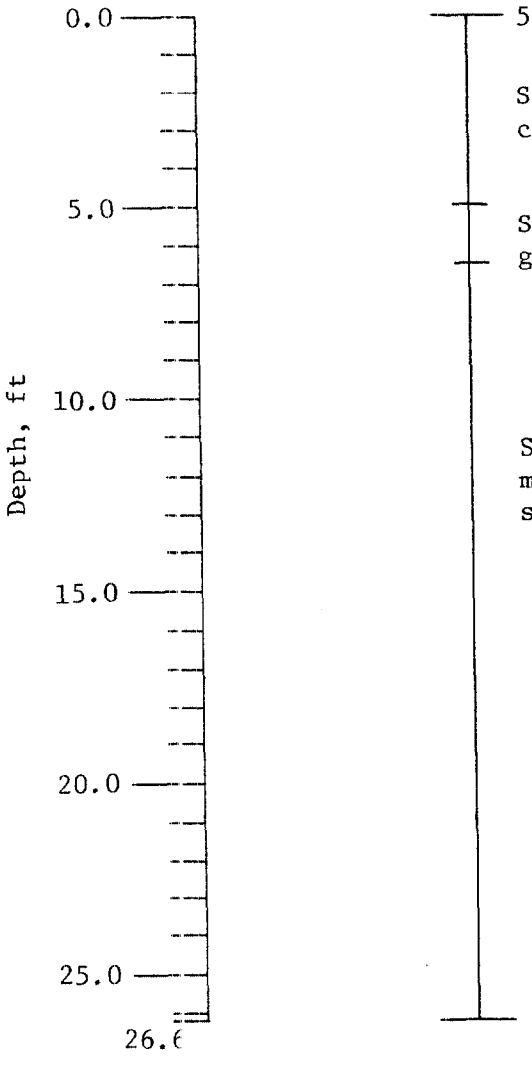


NWSC, Crane, Indiana

Old Burning Grounds

Lithology

Boring Number: WES-6-17-81



508.03' MSL

Silty sand (SM): brown to rusty brown in color, fine-grained, and little cohesion.

Sand (SP): brown in color, uniform, fine-grained quartz sand, and slightly moist.

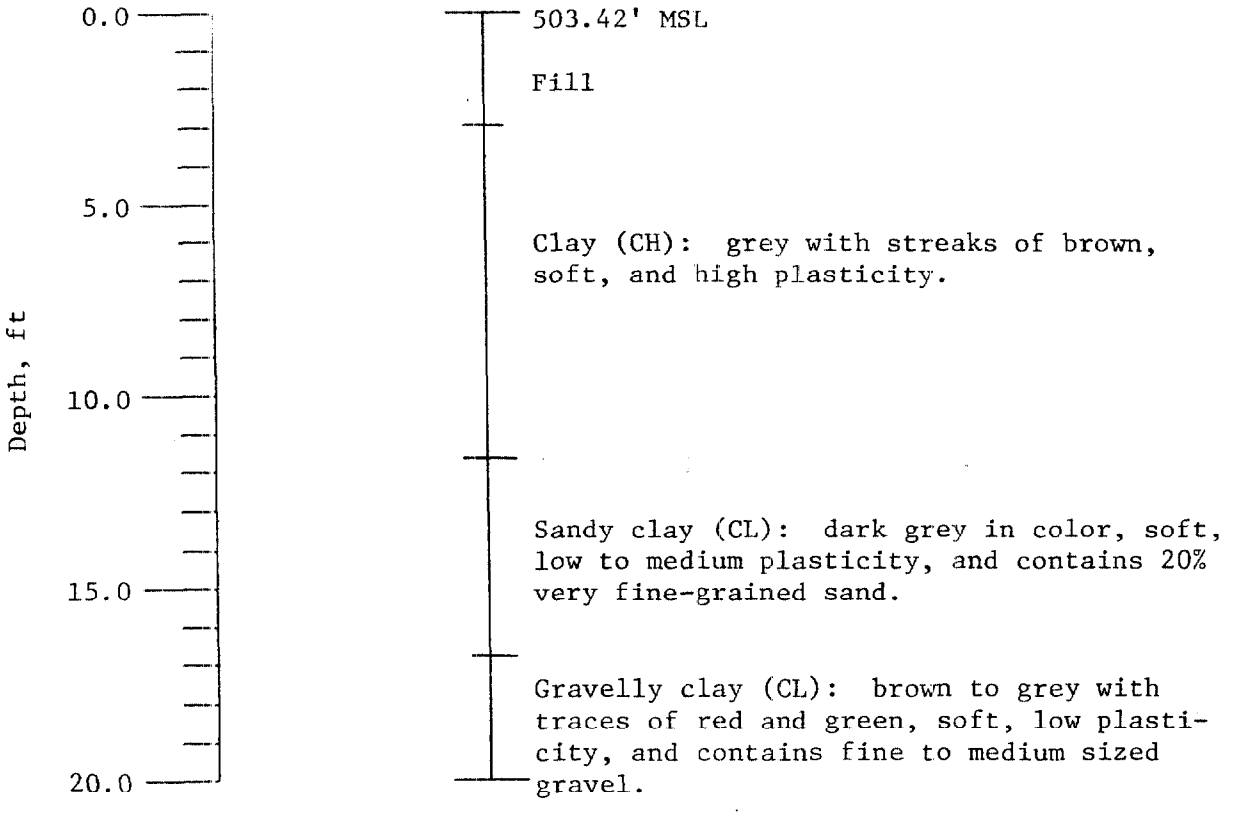
Sandstone: brown, weathered, fine-grained, medium hard to hard, and contains clay or shale lenses from 10 to 11.5 ft .

NWSC, Crane, Indiana

Old Rifle Range

Lithology

Boring Number: WES-6-18-81

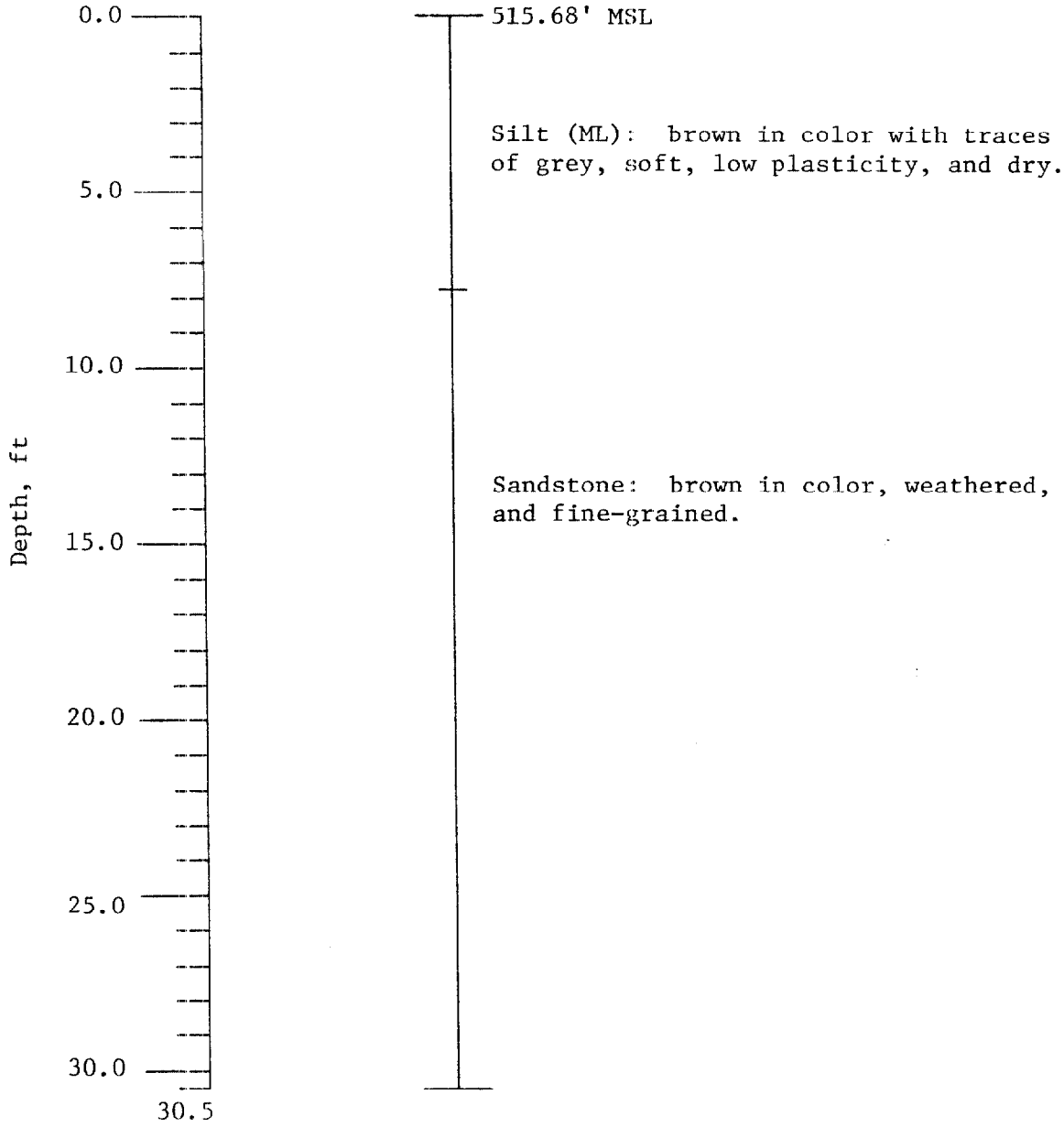


NWSC, Crane, Indiana

Old Burning Grounds

Lithology

Boring Number: WES-6-19-81

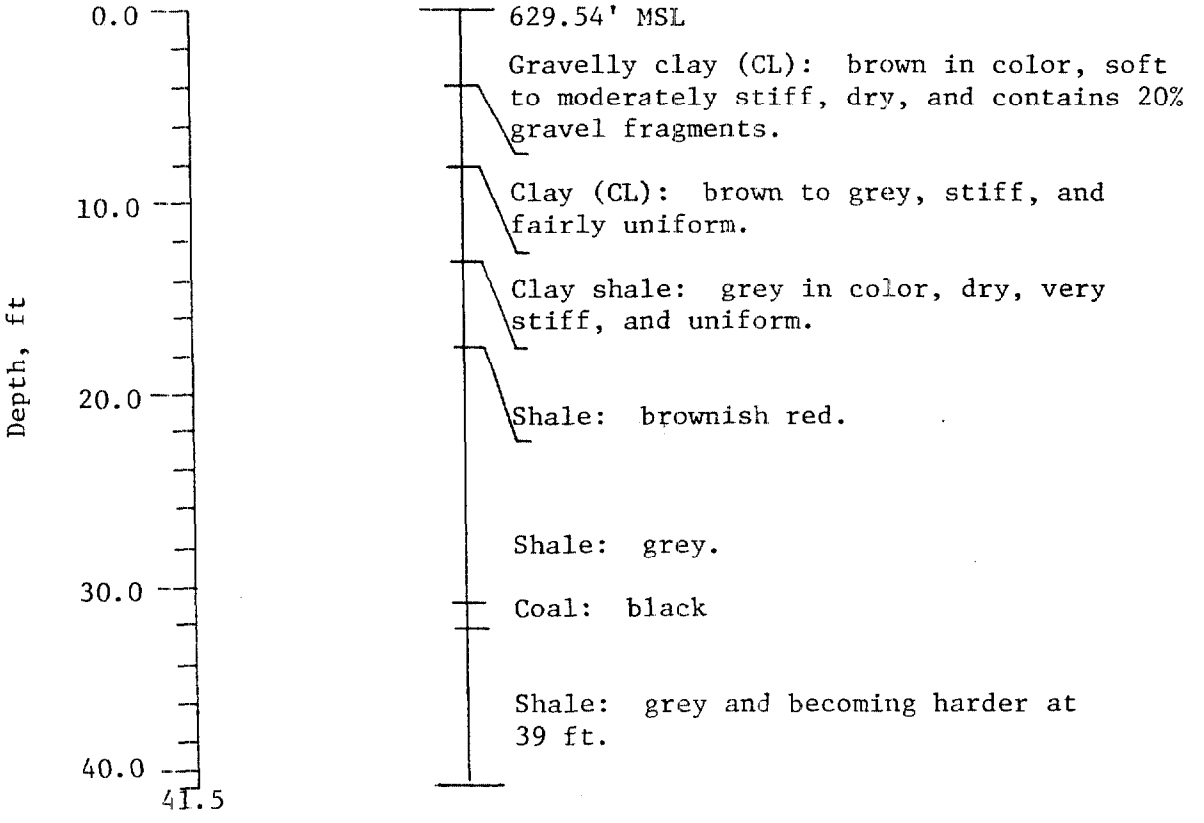


NWSC, Crane, Indiana

Old Rifle Range

Lithology

Boring Number: WES-6-20-81

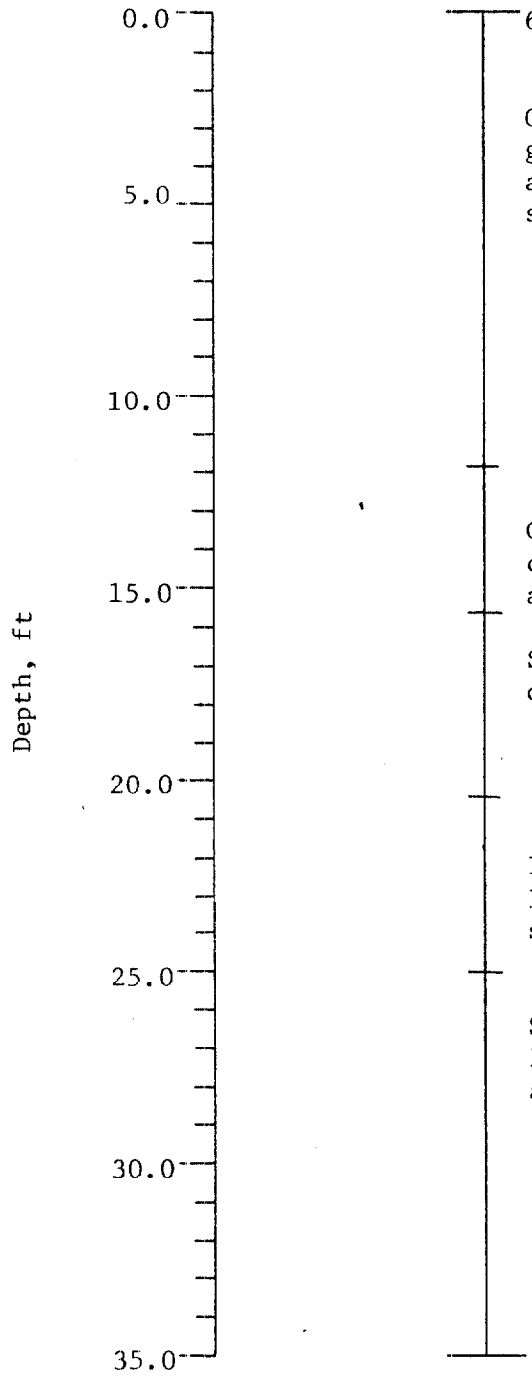


NWSC, Crane, Indiana

Highway 58 Dump Site A

Lithology

Boring Number: WES-7-1-81



601.89' MSL

Gravelly clay (CL): brown to brownish grey in color, dry, stiff to very stiff, and contains 10-15% fine to medium sandstone gravel.

Gravelly clay shale: reddish brown in color, dry, very stiff, dense, weathered, and contains 20-30% fine to medium gravel.

Shale: brown to orange brown with zones of dark grey, soft, dry, and weathered.

Interbedded sandstone (50%) and shale (50%): light grey to dark grey and very soft to soft.

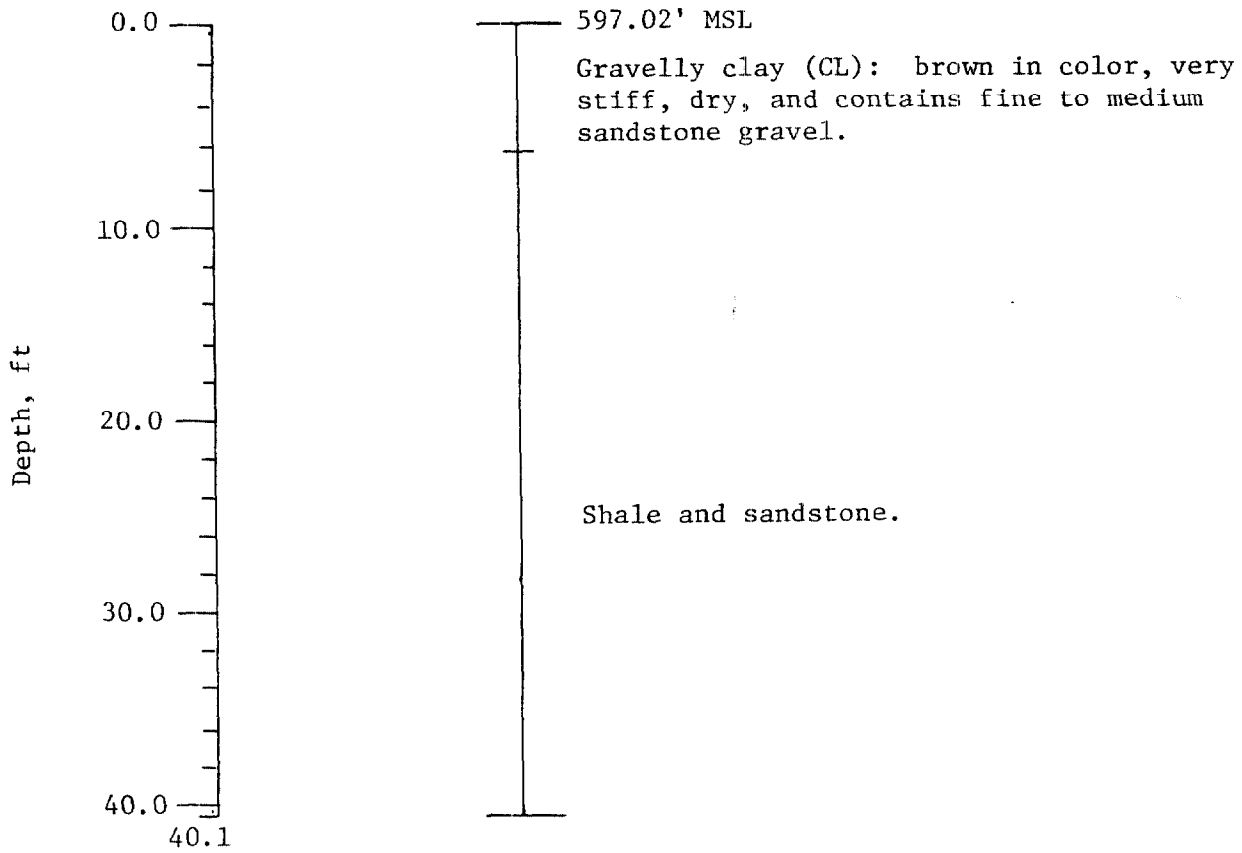
Sandstone (80%) and interbedded shale (20%): light grey to dark grey, soft to very soft, and contains 1-3% coal lenses.

NWSC, Crane, Indiana

Highway 58 Dump Site A

Lithology

Boring Number: WES-7-2-81

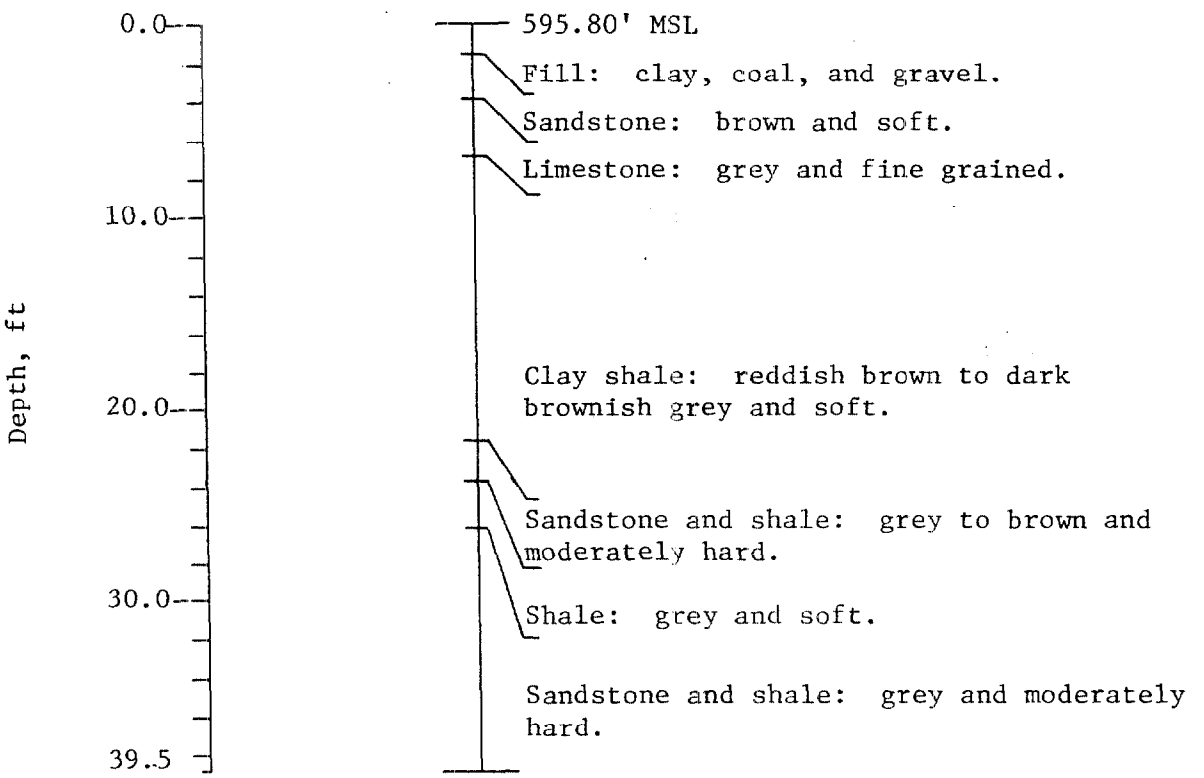


NWSC, Crane, Indiana

Highway 58 Dump Site A

Lithology

Boring Number: WES-7-3-81

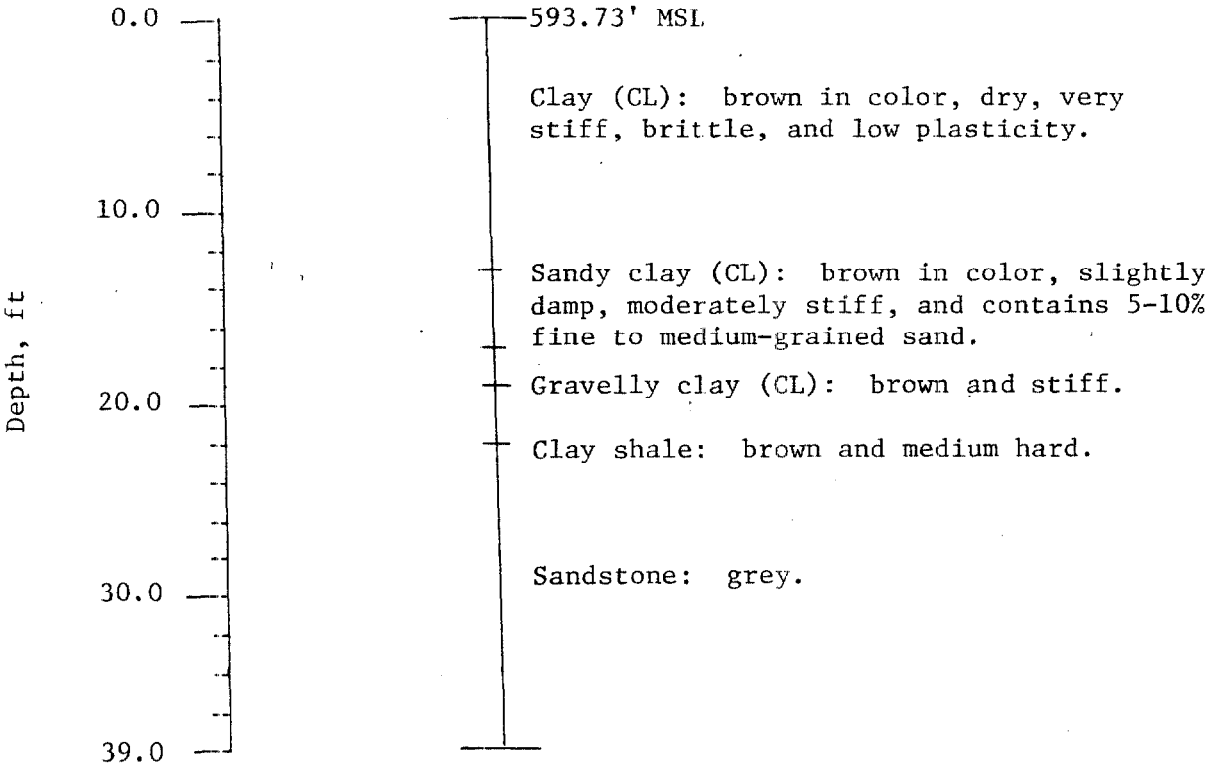


NWSC, Crane, Indiana

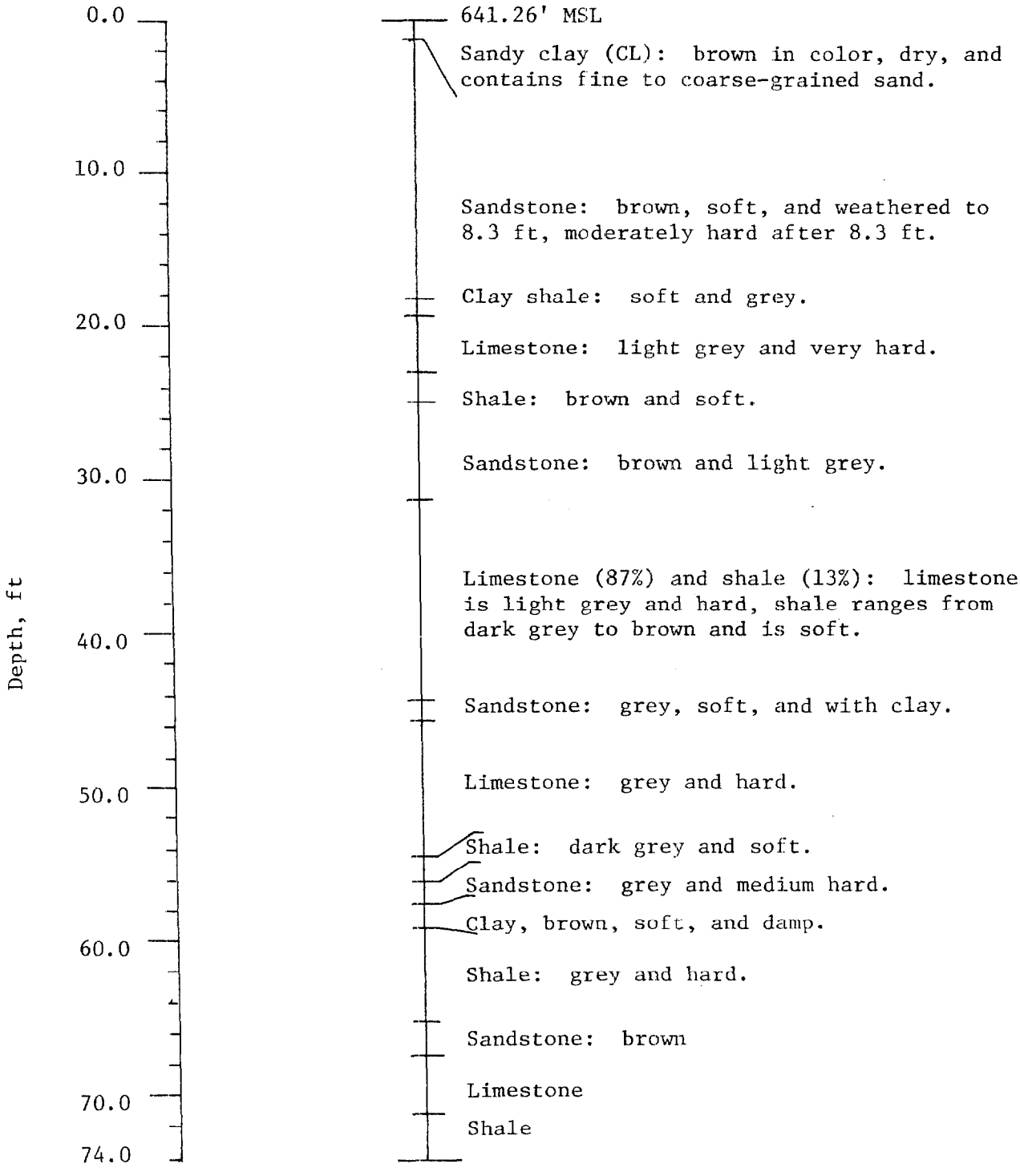
Highway 58 Dump Site A

Lithology

Boring Number: WES-7-4-81



NWSC, Crane, Indiana
Highway 58 Dump Site A
Lithology
Boring Number: WES-7-5-81

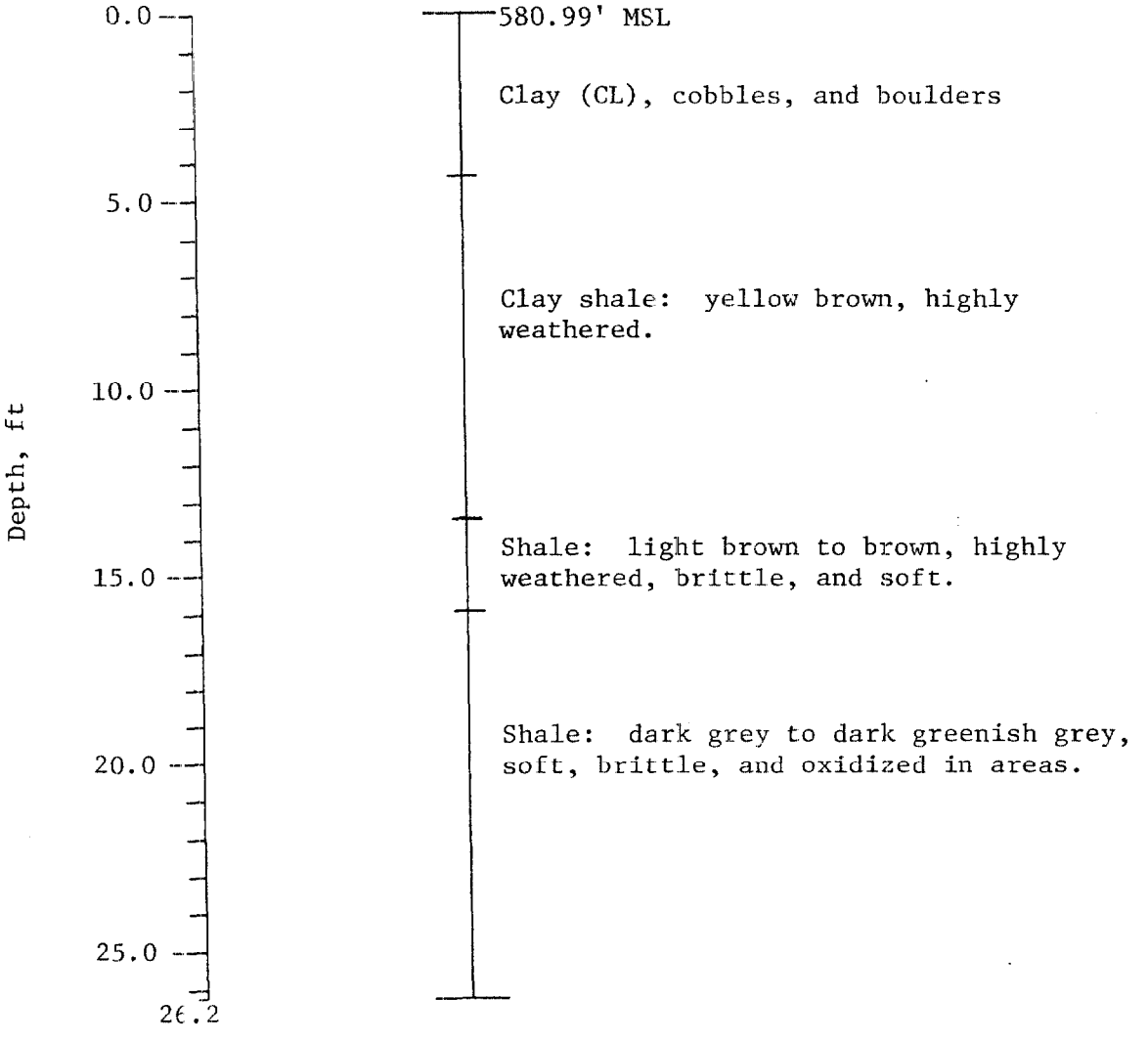


NWSC, Crane, Indiana

Highway 58 Dump Site B

Lithology

Boring Number: WES-8-1-81

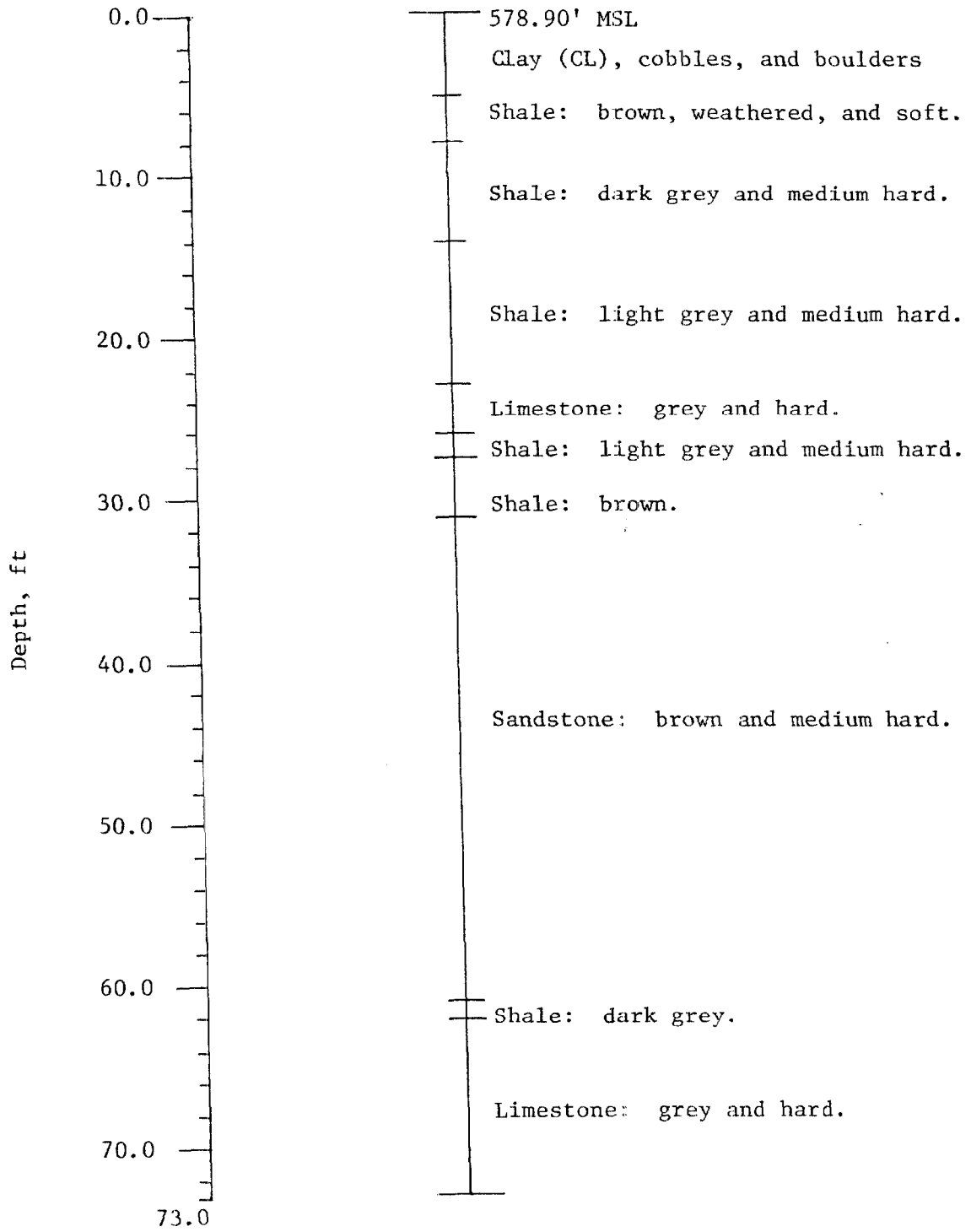


NWSC, Crane, Indiana

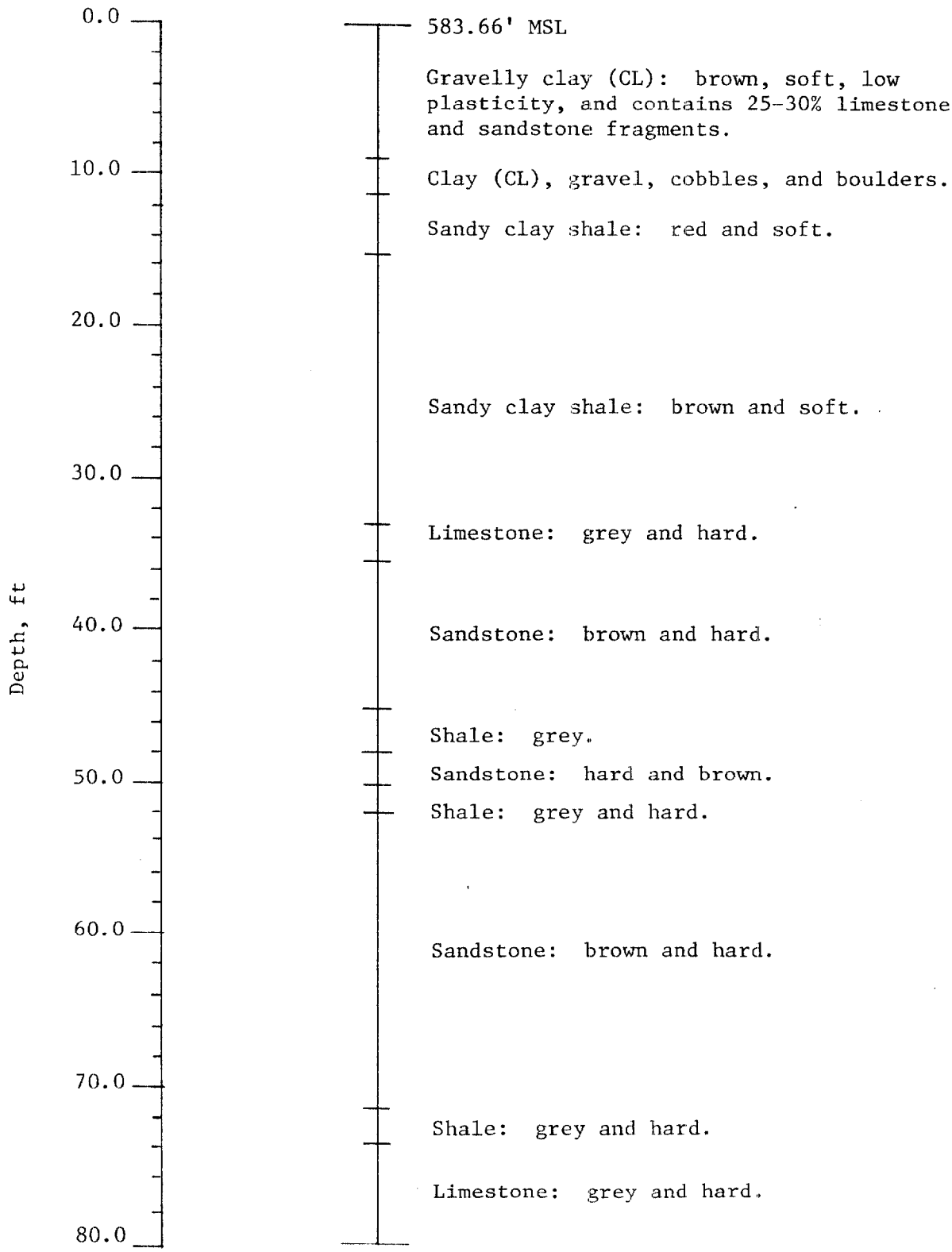
Highway 58 Dump Site B

Lithology

Boring Number: WES-8-2-81



NWSC, Crane, Indiana
Highway 58 Dump Site B
Lithology
Boring Number: WES-8-3-81

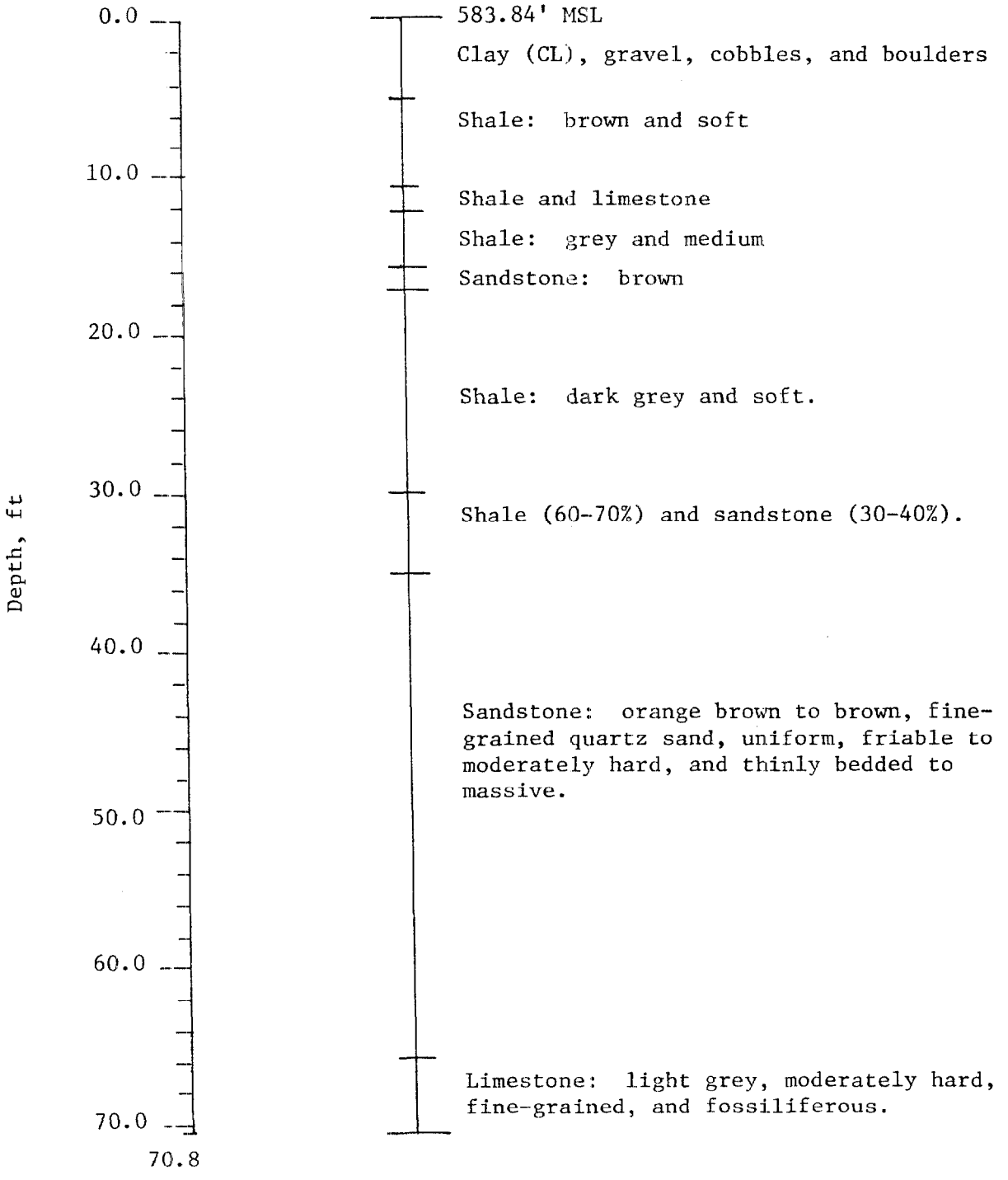


NWSC, Crane, Indiana

Highway 58 Dump Site B

Lithology

Boring Number: WES-8-4-81

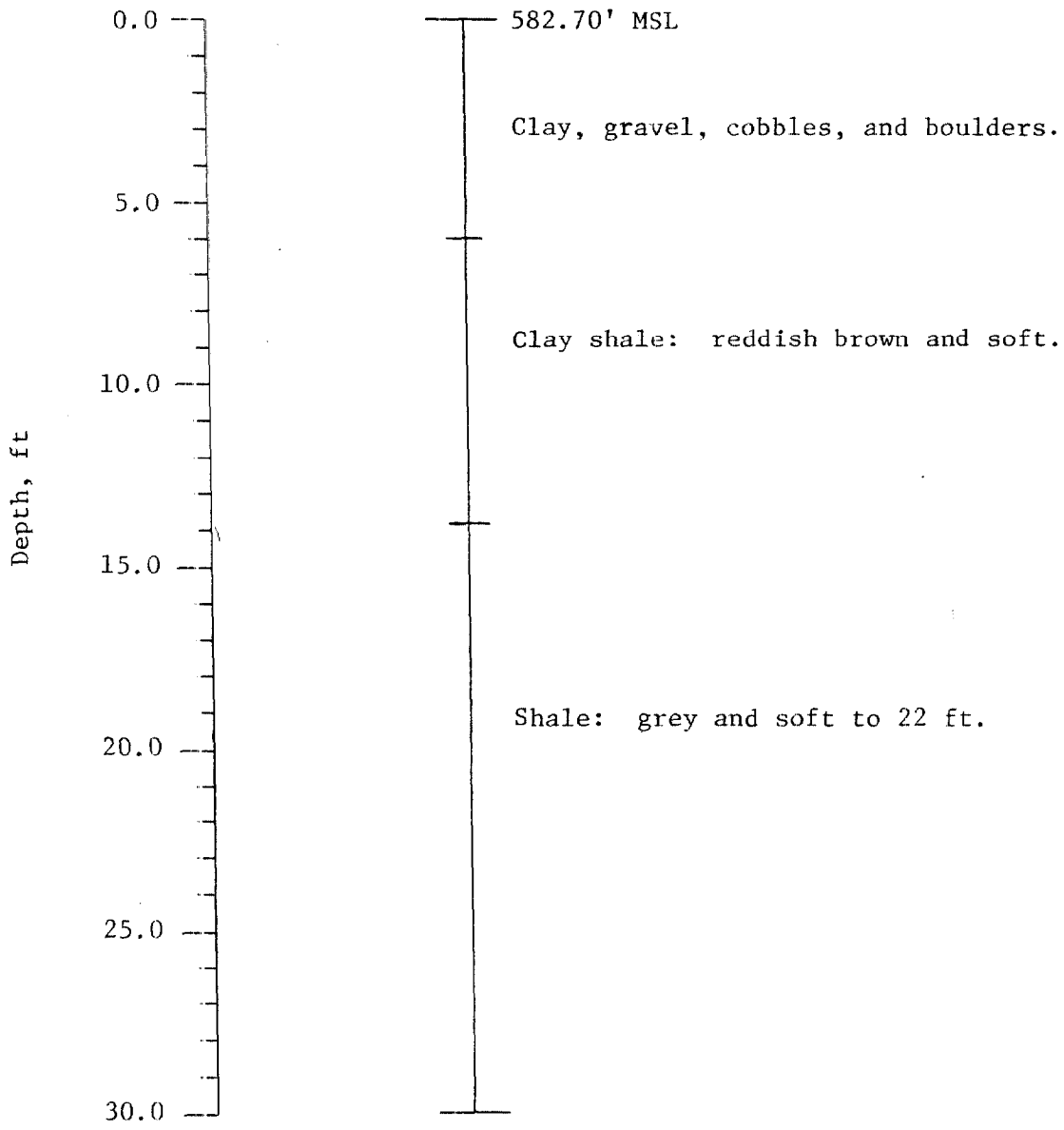


NWSC, Crane, Indiana

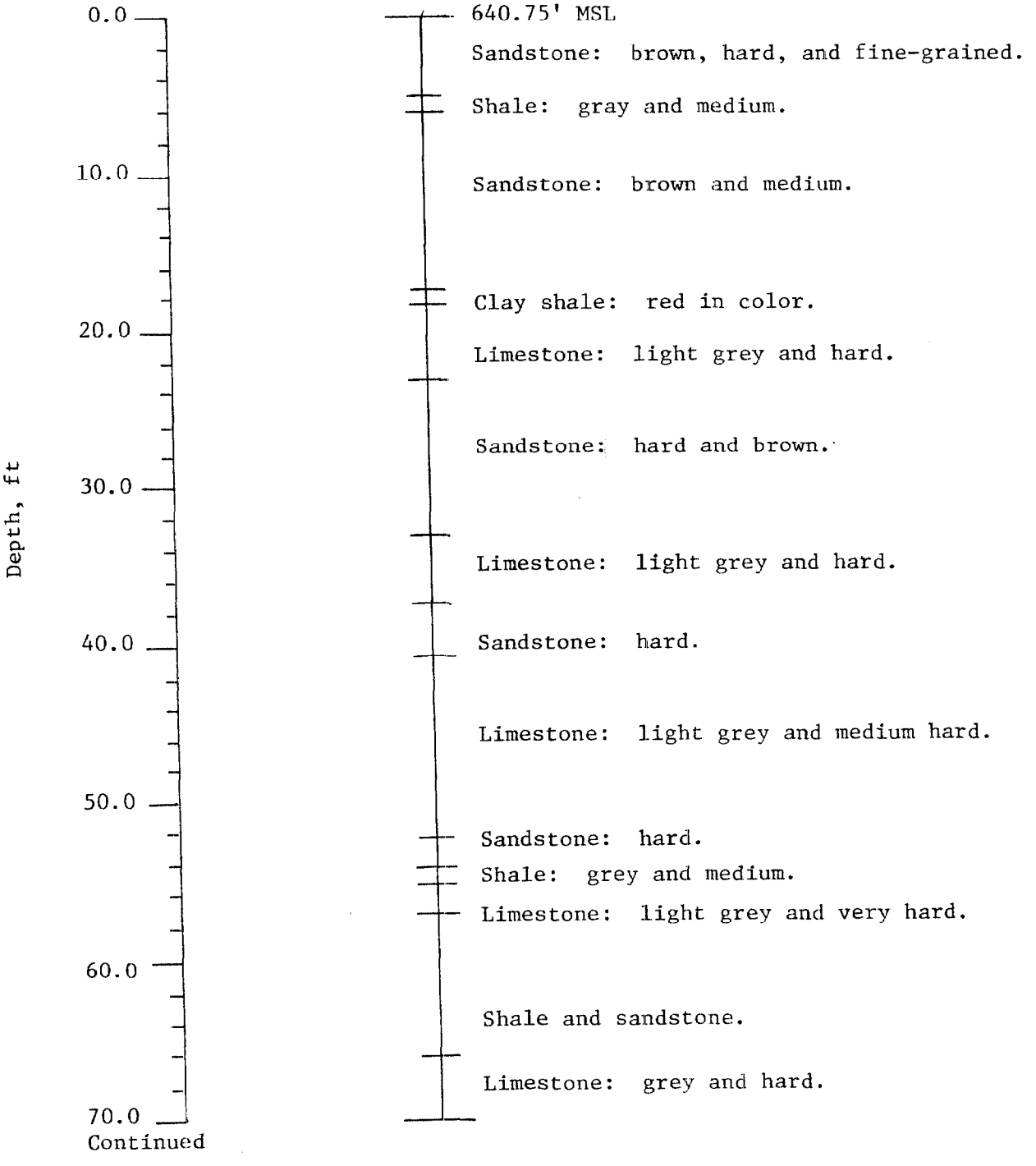
Highway 58 Dump Site B

Lithology

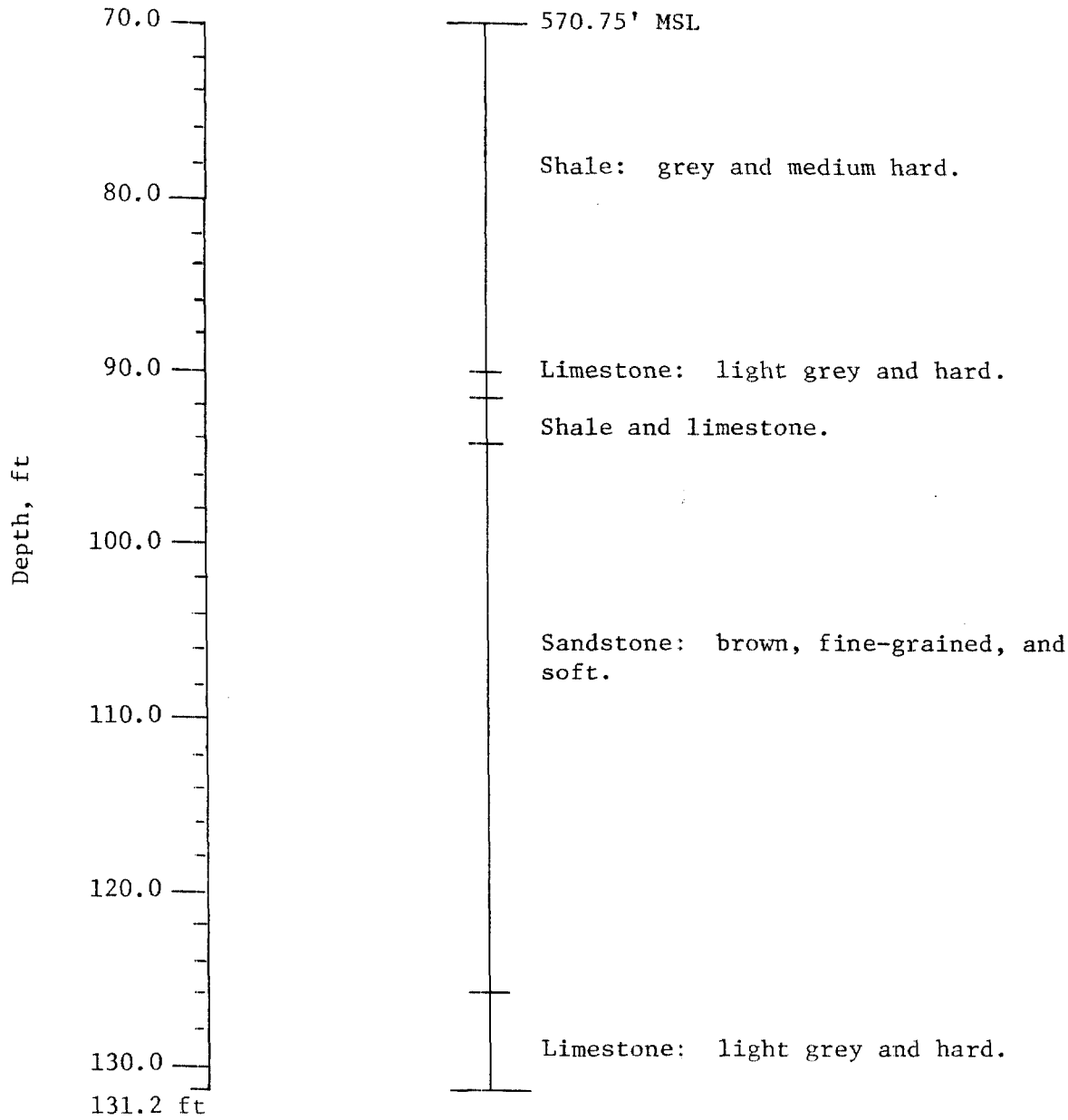
Boring Number: WES-8-5-81



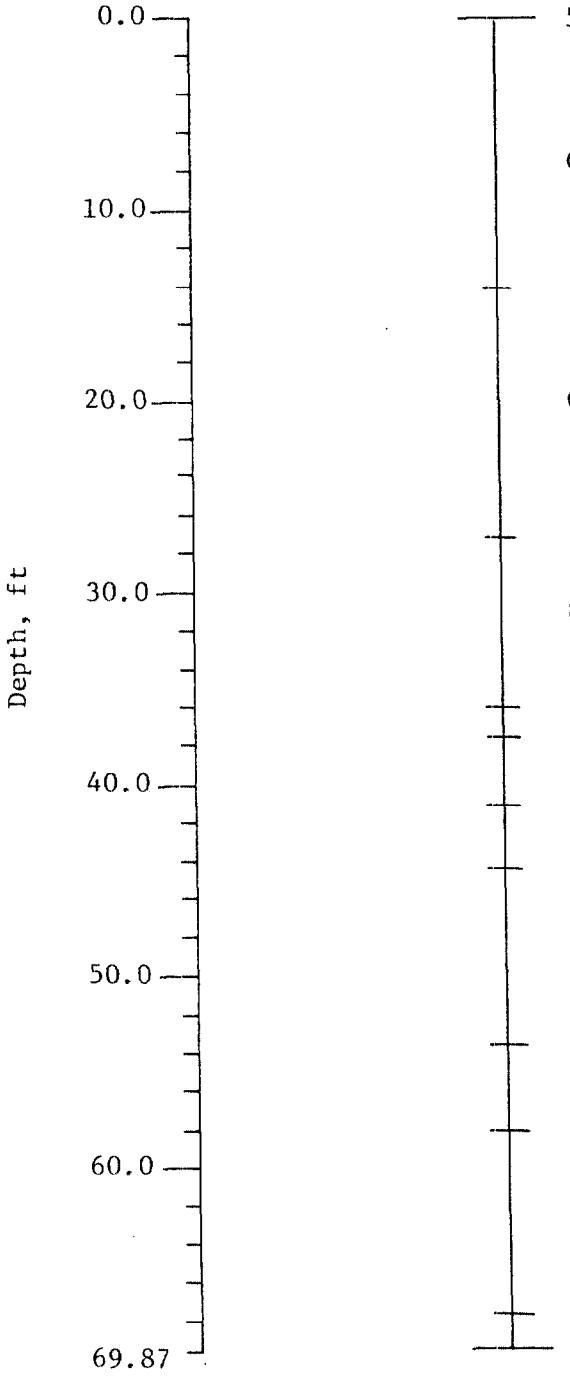
NWSC, Crane, Indiana
Highway 58 Dump Site B
Lithology
Boring Number: WES-8-6-81



NWSC, Crane, Indiana
Highway 58 Dump Site B
Lithology
Boring Number: WES-8-7-81



NWSC, Crane, Indiana
Highway 58 Dump Site B
Lithology
Boring Number: WES-8-7-81



586.31' MSL

Clay (CL), gravel, cobbles, and boulders

Clay shale: grey, soft, and slightly damp.

Shale: grey and soft.

Sandstone: brown and fine-grained.

Sandstone and shale.

Sandstone: brown and hard.

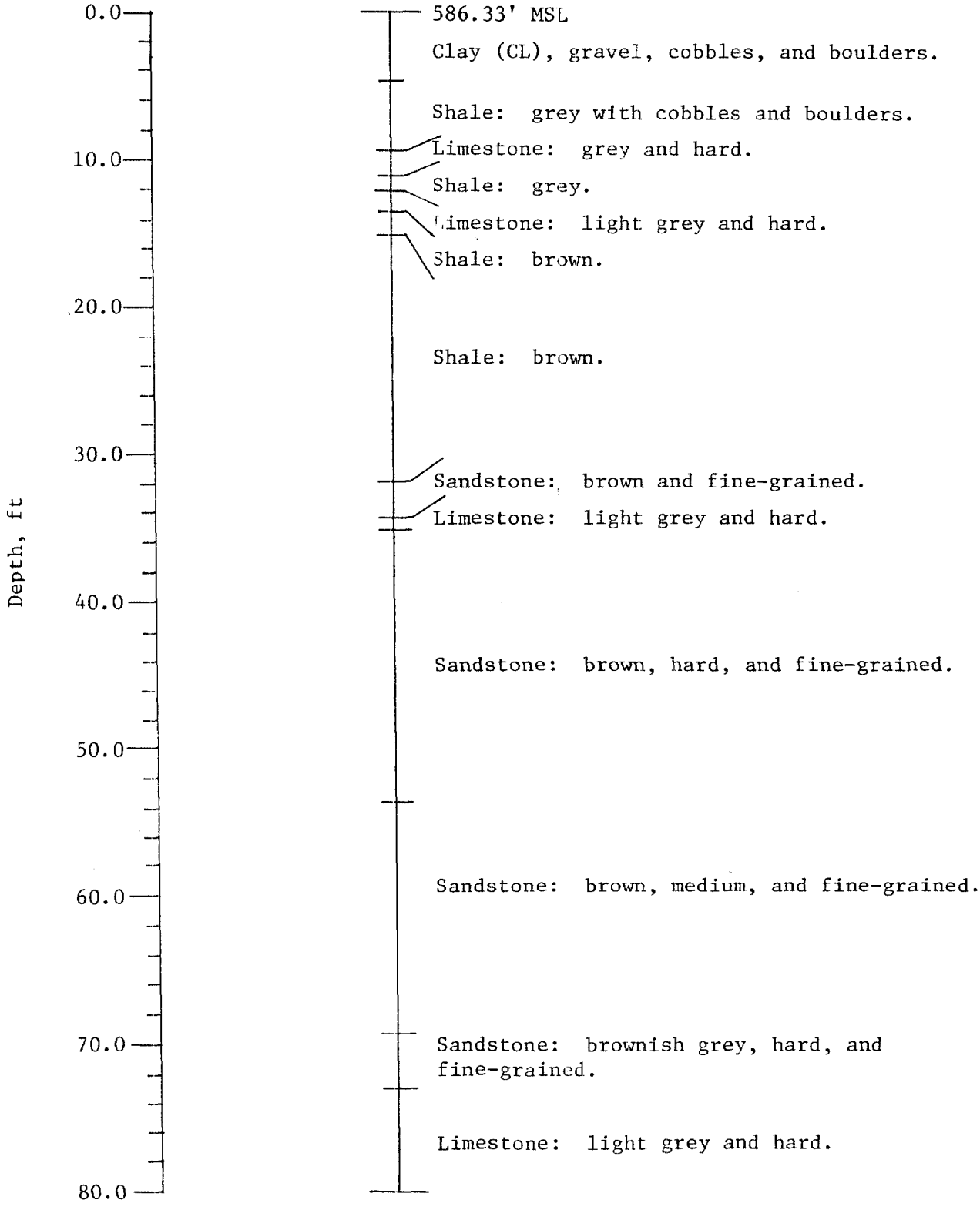
Sandstone: brown and soft.

Sandstone: brown and very soft.

Sandstone: brown, very soft, and damp.

Sandstone: brown and hard.

NWSC, Crane, Indiana
Highway 58 Dump Site B
Lithology
Boring Number: WES-8-8-81

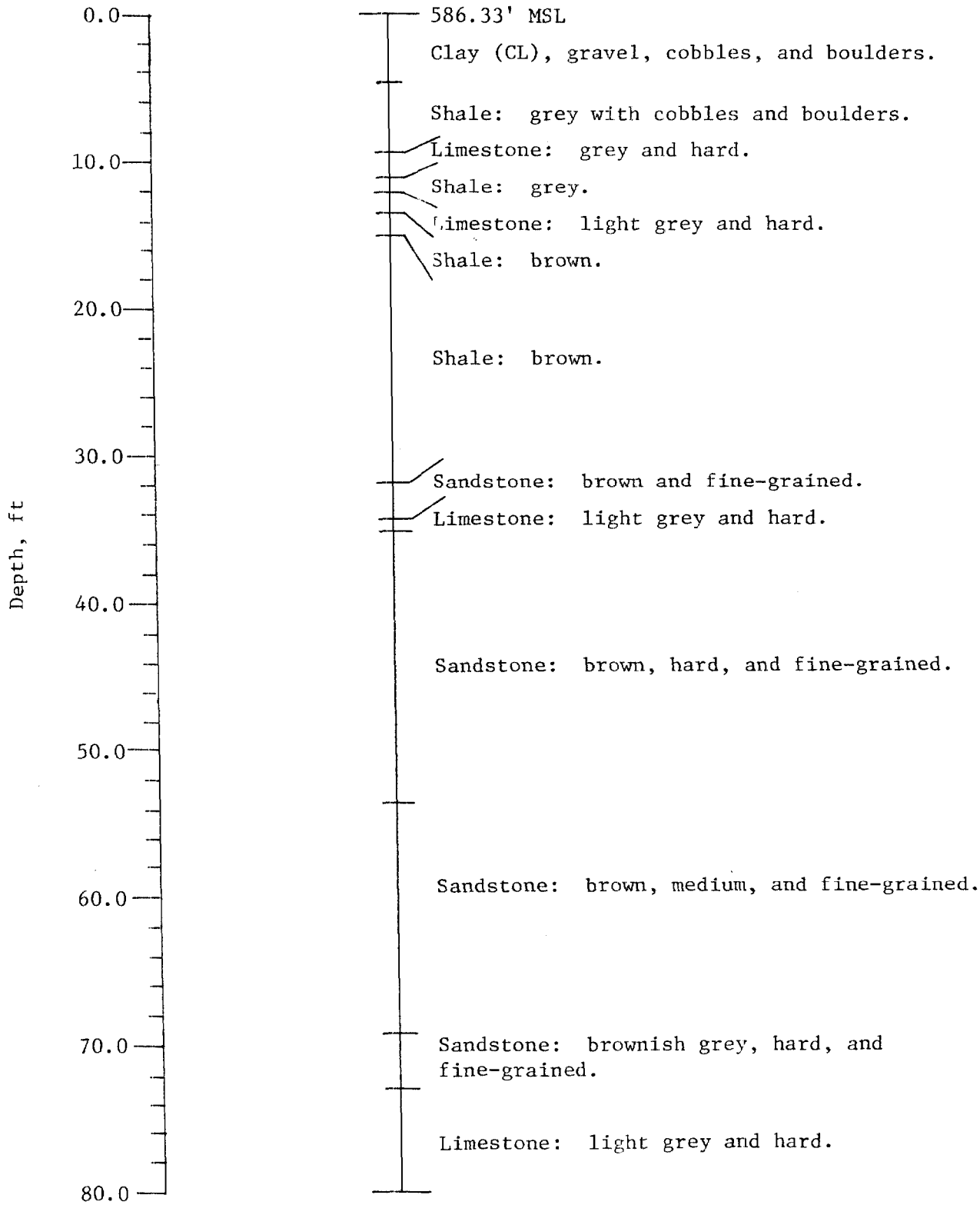


NWSC, Crane, Indiana

Highway 58 Dump Site B

Lithology

Boring Number: WES-8-9-81

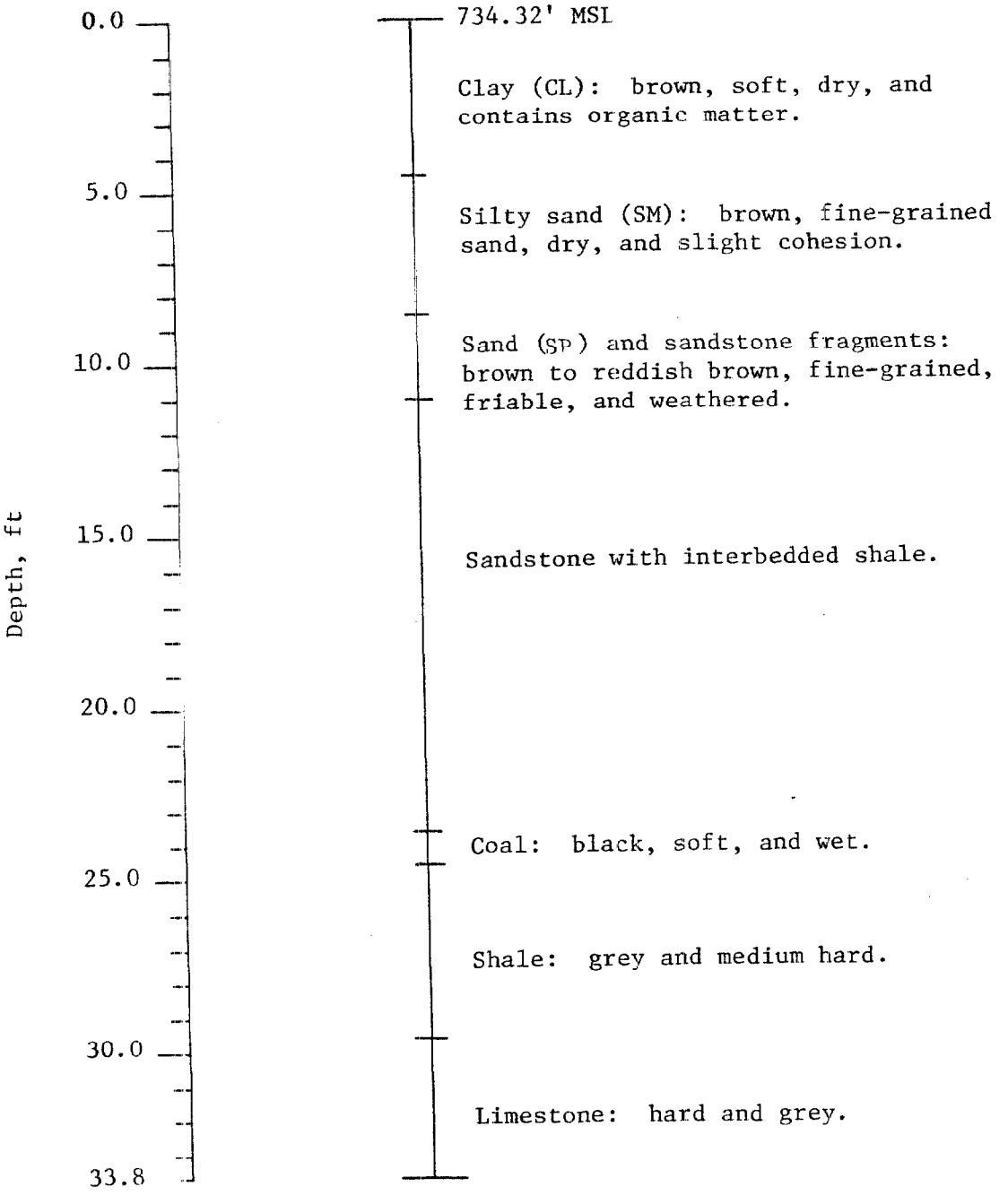


NWSC, Crane, Indiana

Highway 58 Dump Site B

Lithology

Boring Number: WES-8-9-81

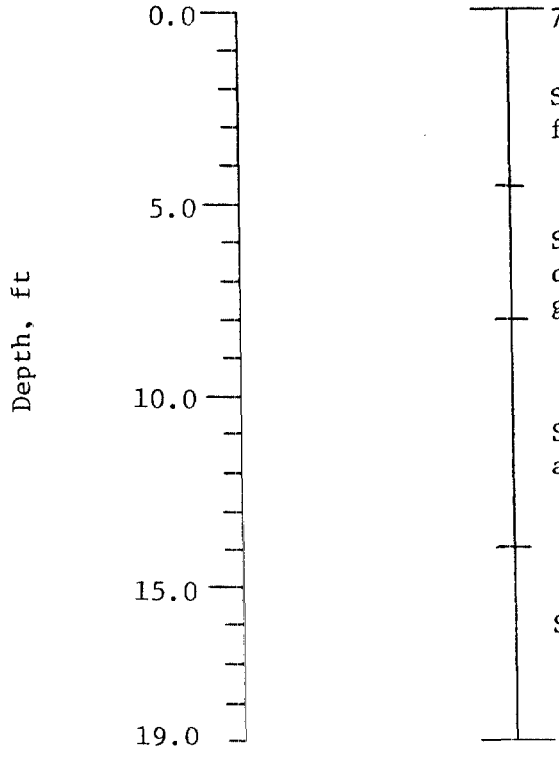


NWSC, Crane, Indiana

Pest Control Area

Lithology

Boring Number: WES-9-1-81



723.80' MSL

Sand (SW): brown in color, dry, and fine to coarse grained.

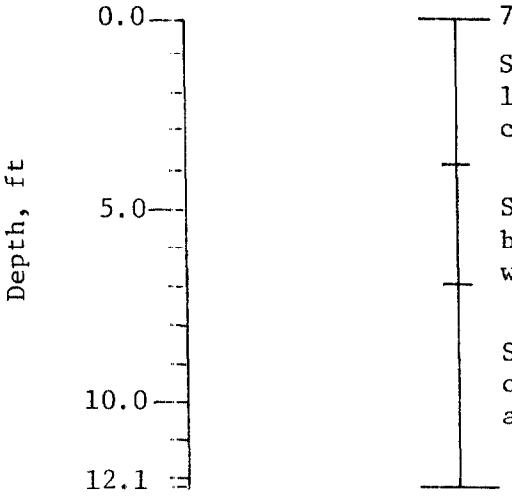
Sandy clay (CL): brown in color, slight cohesion, and contains 20% fine to medium grained sand.

Sandy clay: grey to dark grey in color and wet.

Sandstone.

NWSC, Crane, Indiana

Pest Control Area
Lithology
Boring Number: WES-9-2-81



706.78' MSL

Sandy clay (CL): brown in color, dry, low plasticity, and contains fine to coarse-grained sand.

Sand (SP) and sandstone fragments: brown to white, fine-grained, and weathered.

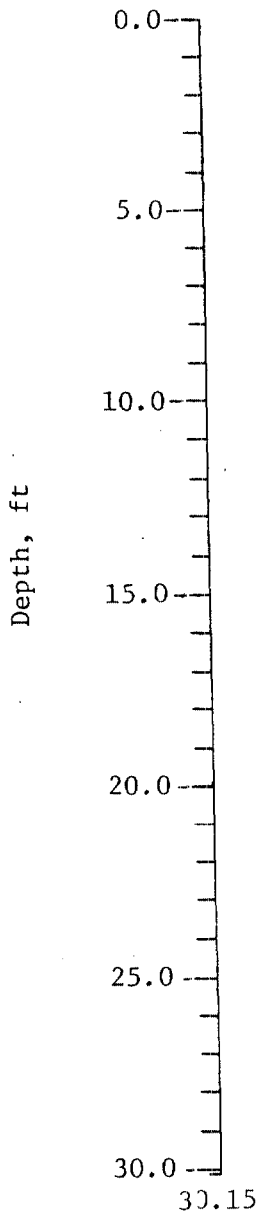
Sandstone (50-70%) and shale (30-50%): orange brown to dark grey, fine-grained, and thinly bedded.

NWSC, Crane, Indiana

Pest Control Area

Lithology

Boring Number: WES-9-3-81



721.93' MSL

Sandy clay (CL): brown in color, very stiff, dry, and low plasticity.

Clay shale and interbedded sandstone: grey, brown, reddish brown in color, very stiff, hard, and dry.

Sandstone: brown, fine-grained, and weathered.

Sandstone: light grey, very fine-grained, and hard.

Shale: dark grey.

Limestone: light grey and hard.

Shale: grey.

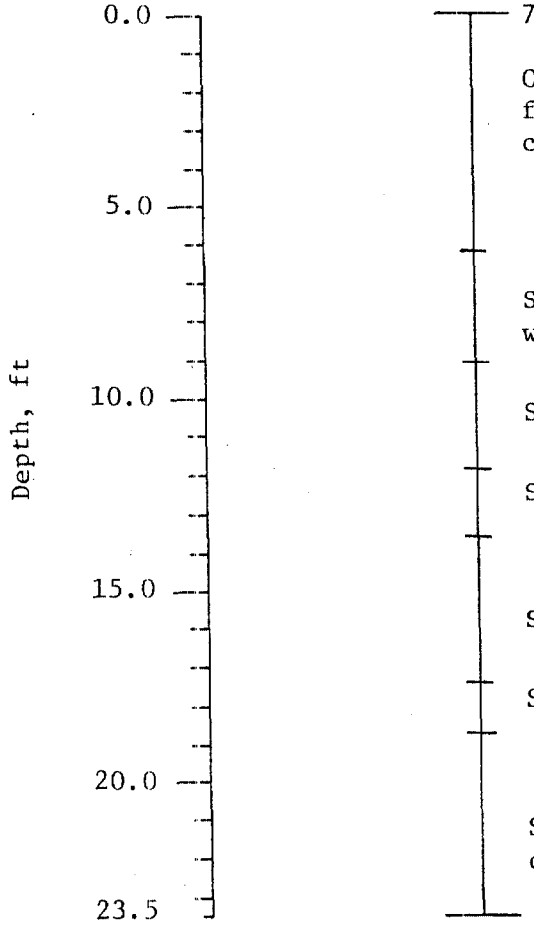
Limestone: light grey.

NWSC, Crane, Indiana

Pest Control Area

Lithology

Boring Number: WES-9-4-81



715.52' MSL

Clayey sand (SC): brown in color, dry, fine-grained, moderate cohesion, and contains sandstone fragments from 5 ft.

Sandstone: brown, fine-grained, and weathered.

Sandstone: light brown.

Sandstone: light grey to dark brown.

Sandstone: light brown and fine-grained.

Sandstone: light grey.

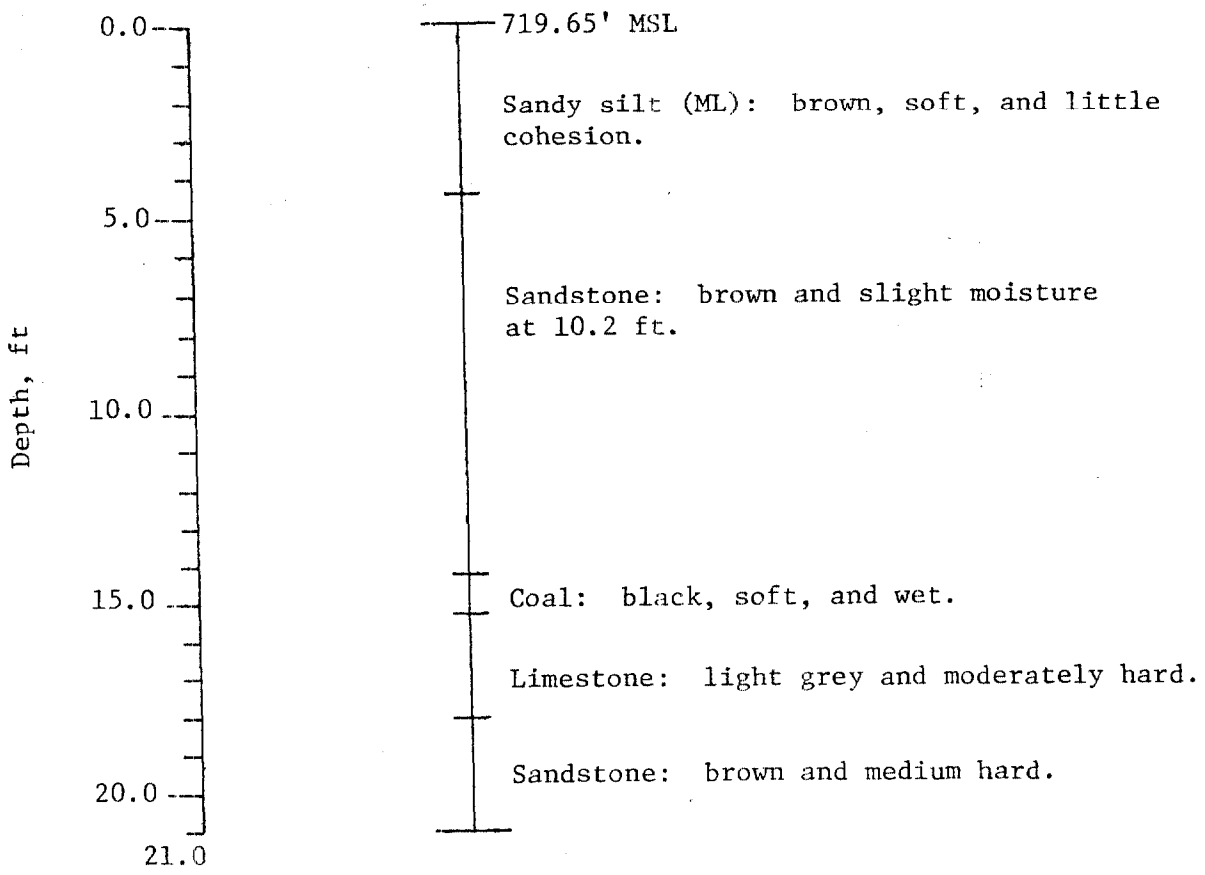
Sandstone: darker in color as shale content increases.

NWSC, Crane, Indiana

Pest Control Area

Lithology

Boring Number: WES-9-5-81

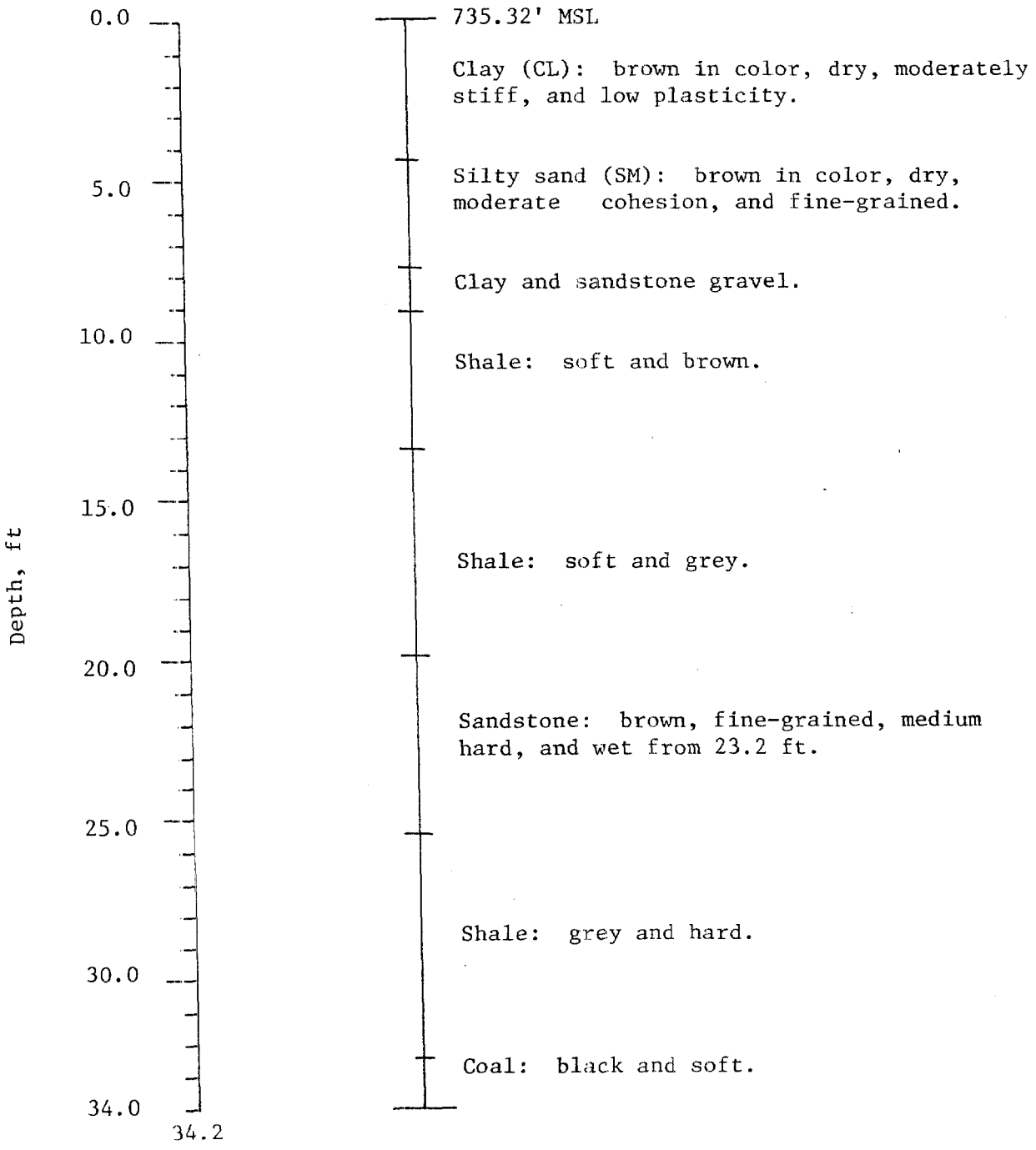


NWSC, Crane, Indiana

Pest Control Area

Lithology

Boring Number: WES-9-6-81

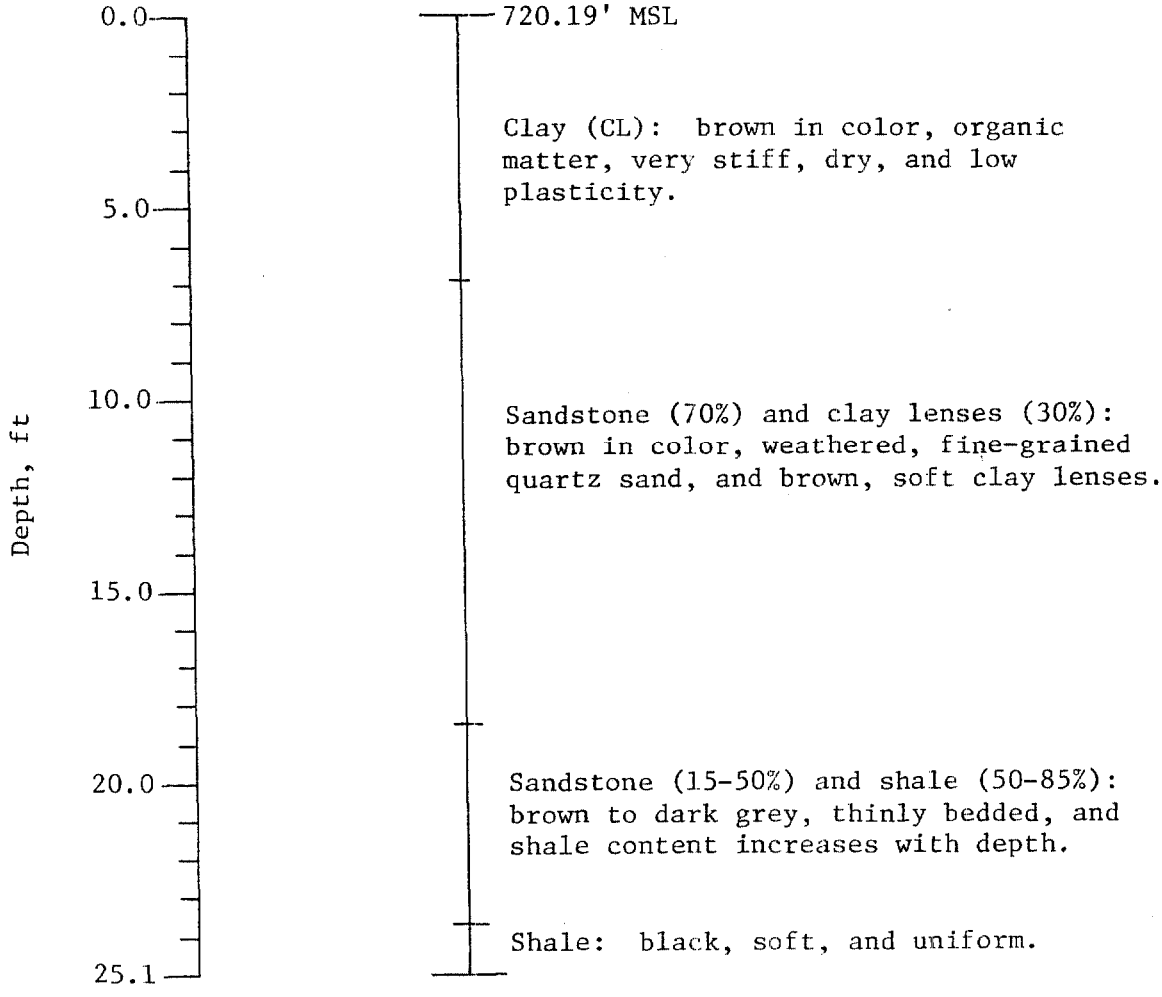


NWSC, Crane, Indiana

Pest Control Area

Lithology

Boring Number: WES-9-7-81

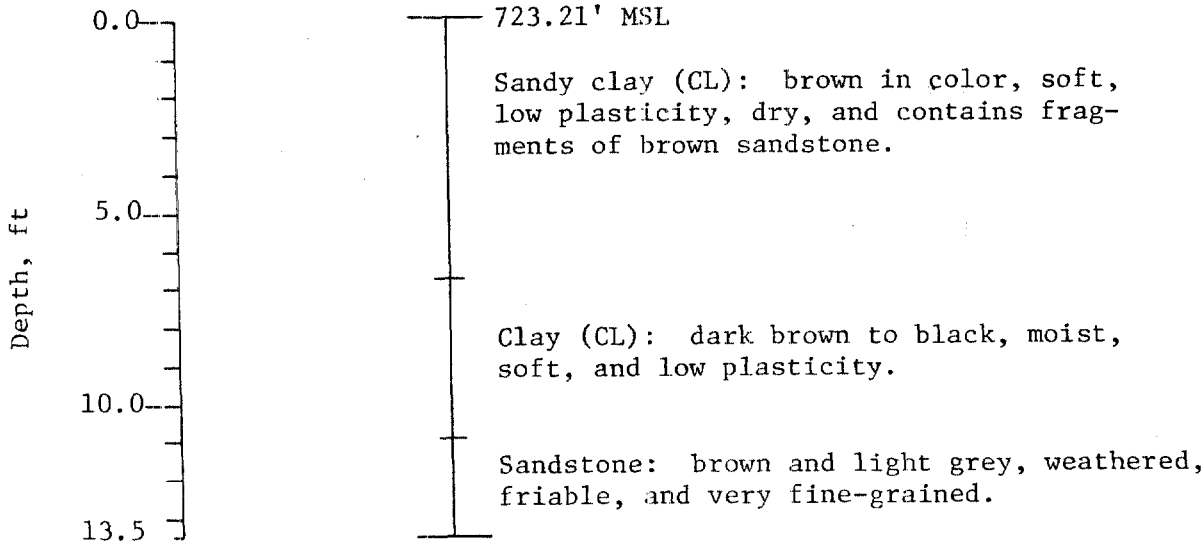


NWSC, Crane, Indiana

Pest Control Area

Lithology

Boring Number: WES-9-8-81

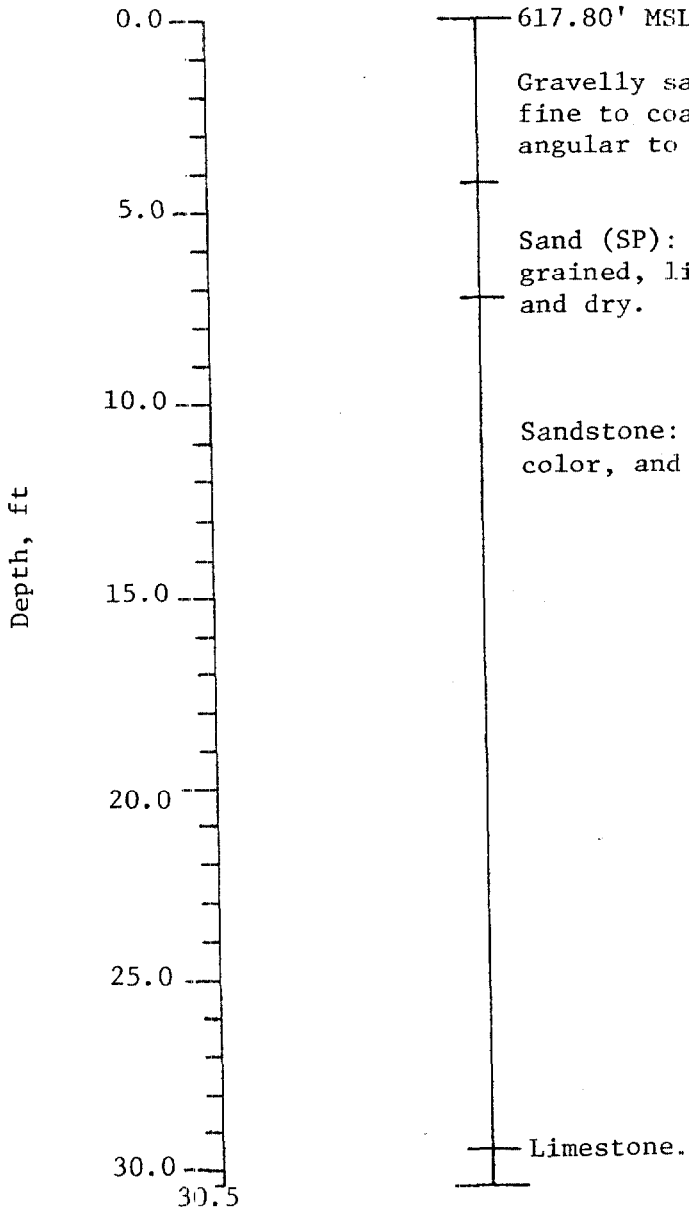


NWSC, Crane, Indiana

Pest Control Area

Lithology

Boring Number: WES-9-9-81

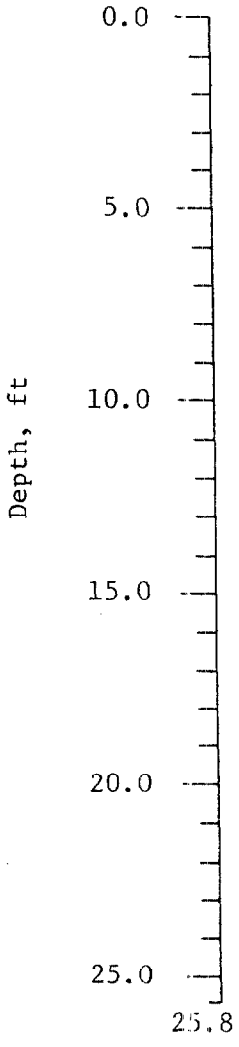


NWSC, Crane, Indiana

Rockeye Site

Lithology

Boring Number: WES-10-1-81



618.51' MSL

Silty sand (SM): dark brown in color, dry, soft, very fine-grained and slight cohesion.

Sandstone gravel: brown, fine to coarse fragments, and fine-grained sandstone.

Limestone: grey.

Sandstone: brown, fine-grained quartz sand, very weathered, and friable.

Limestone: light grey, moderately hard, fine-grained, and fossiliferous.

NWSC, Crane, Indiana

Rockeye Site

Lithology

Boring Number: WES-10-2-81

10

Admin Records 095 10

HYDROGEOLOGIC INVESTIGATION OF WASTE DISPOSAL SITES AT THE NAVAL WEAPONS SUPPORT CENTER, CRANE, INDIANA

APPENDIXES C AND D

+ E

by

Joseph B. Dunbar

Geotechnical Laboratory
USAE Waterways Experiment Station
PO Box 631, Vicksburg, MS 39180

Prepared for
Naval Weapons Support Center
Crane, Indiana

April 1982

APPENDIX C: WELL COMPLETION DIAGRAMS

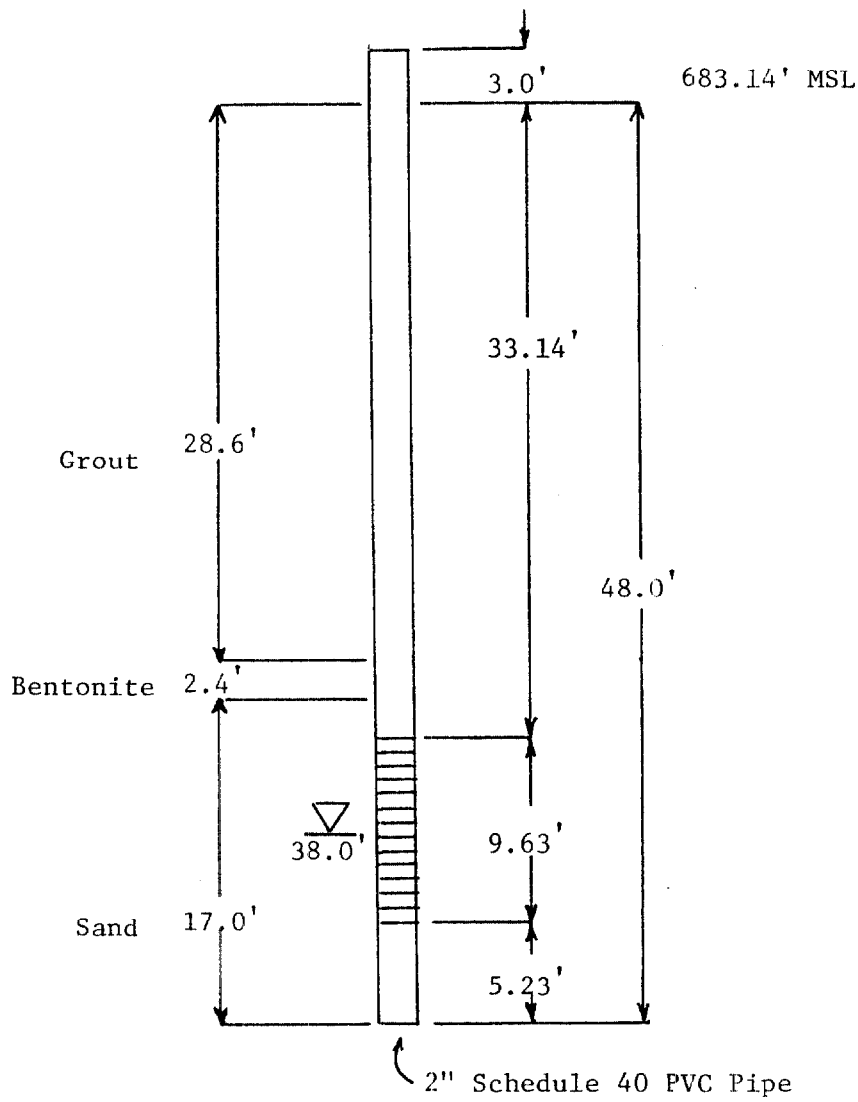
APPENDIX D: GROUNDWATER ELEVATIONS

WORKING DRAFT

APPENDIX C

WELL COMPLETION DIAGRAMS

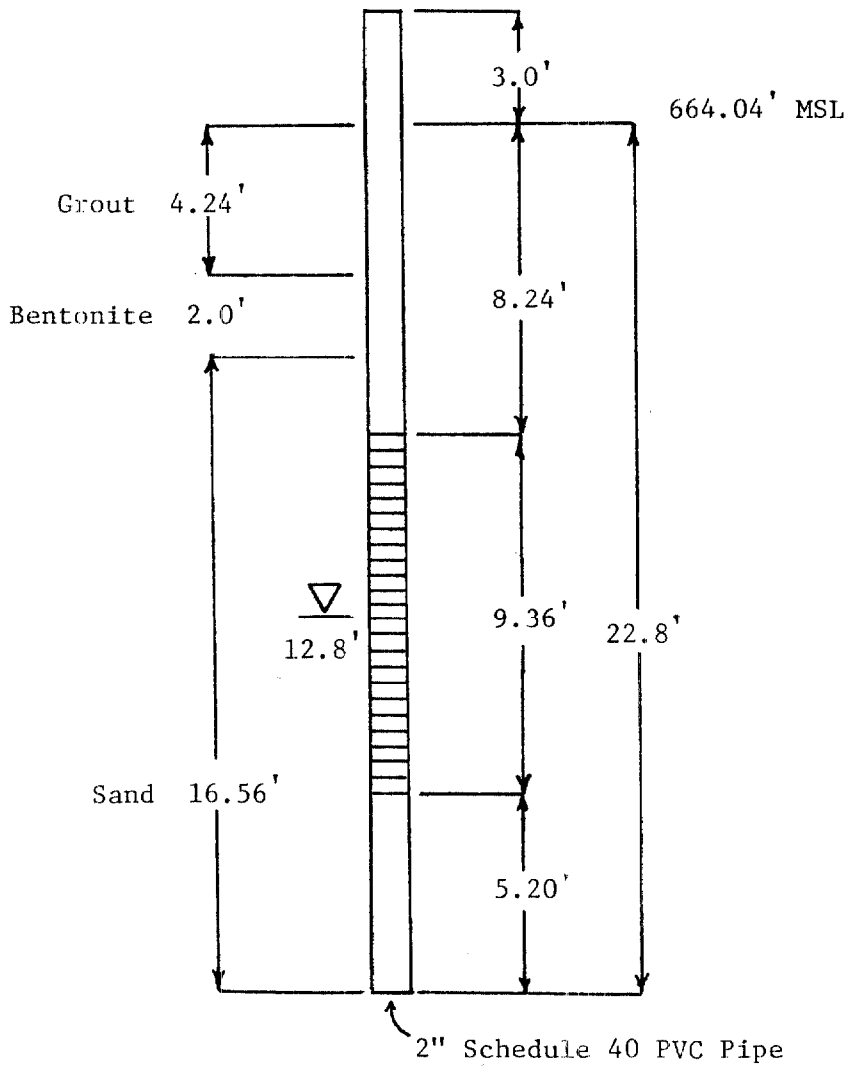
WORKING DRAFT



Water depth at time of drilling

Well screen

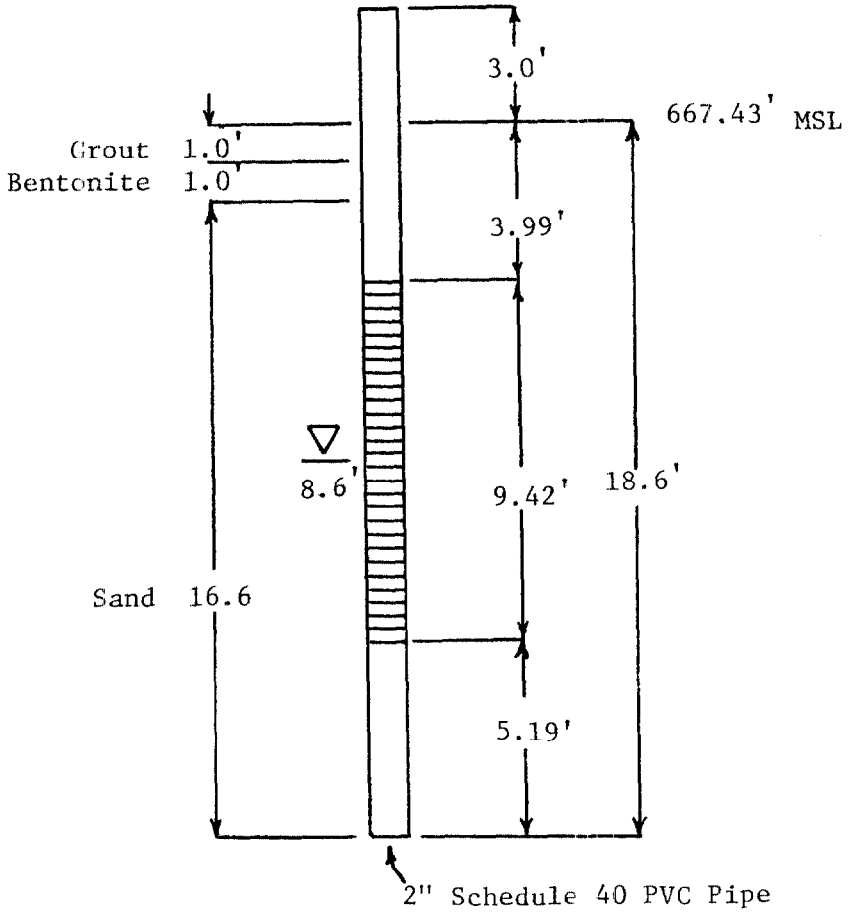
NWSC, Crane, Indiana
Mustard Gas Burial Grounds
Well Completion
Boring Number: WES-1-1-81



Water depth at time of drilling

Well screen

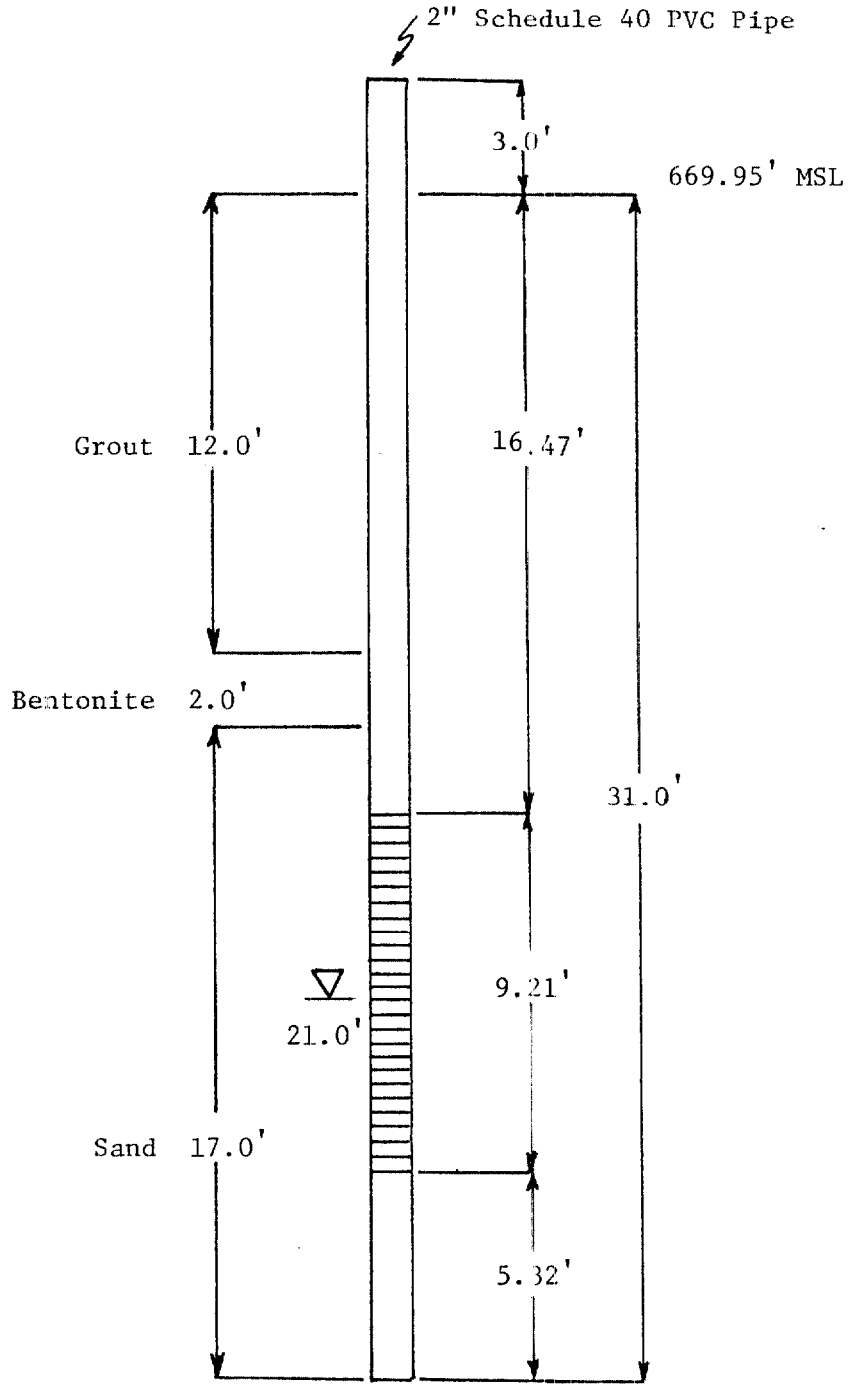
NWSC, Crane, Indiana
Mustard Gas Burial Grounds
Well Completion
Boring Number: WES-1-2-81



Water depth at time of drilling

Well screen

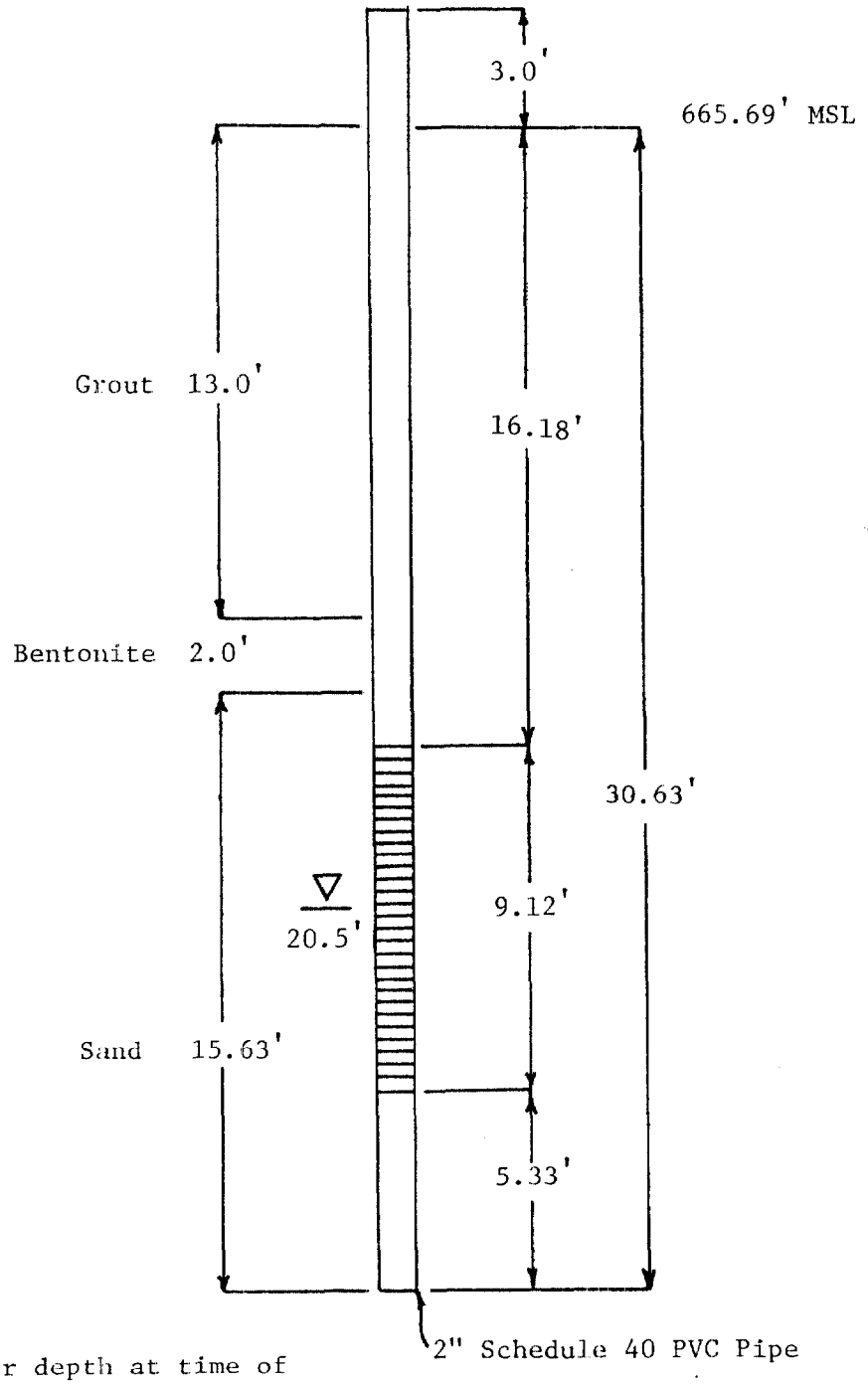
NUSC, Crane, Indiana
Mustard Gas Burial Grounds
Well Completion
Boring Number: WES-1-3-81



Water depth at time of drilling

Well screen

NWSC , Crane, Indiana
Mustard Gas Burial Grounds
Well Completion
Boring Number: WES-1-4-81



▽ Water depth at time of drilling

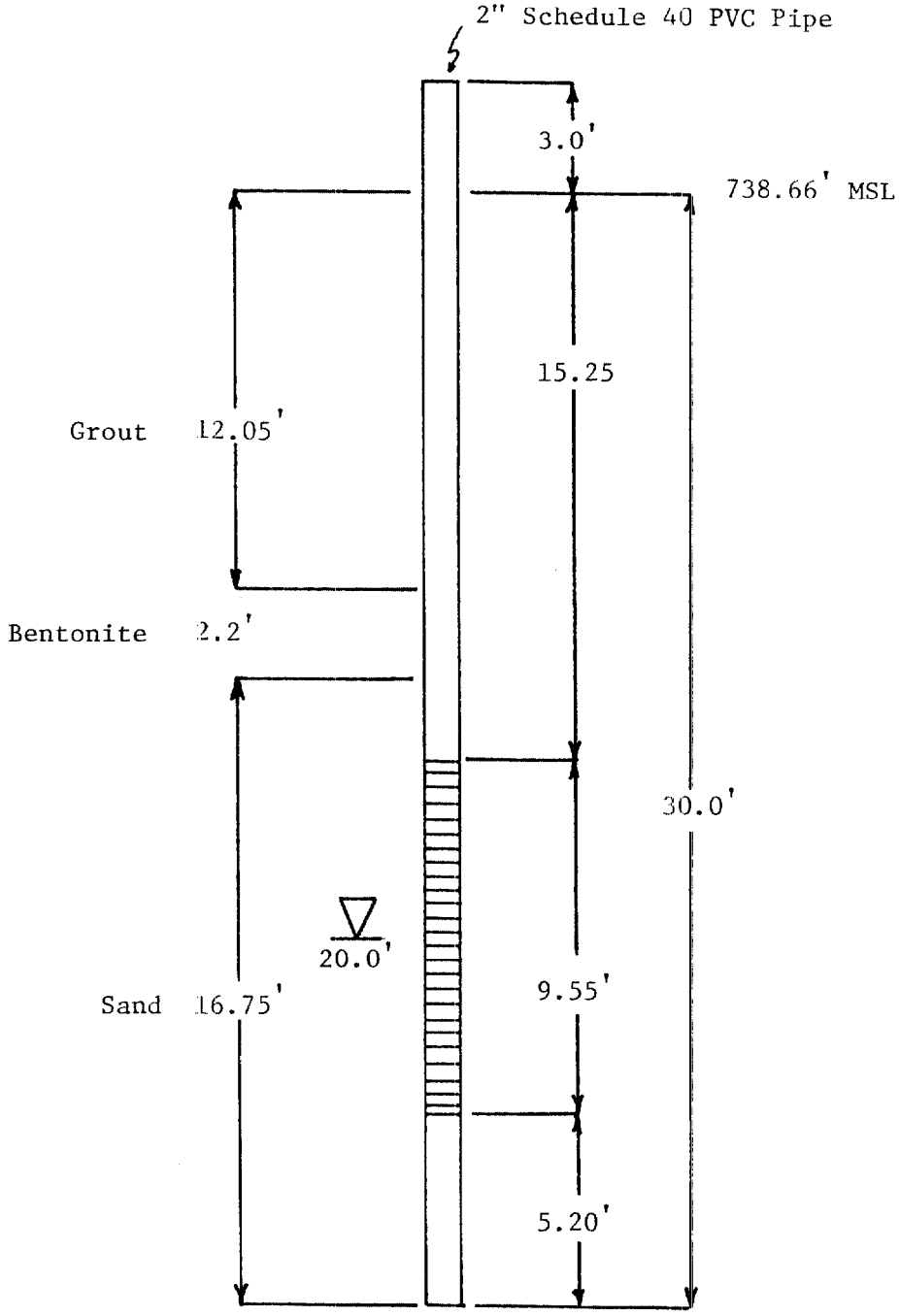
Well screen

NWSC, Crane, Indiana

Mustard Gas Burial Grounds

Well Completion

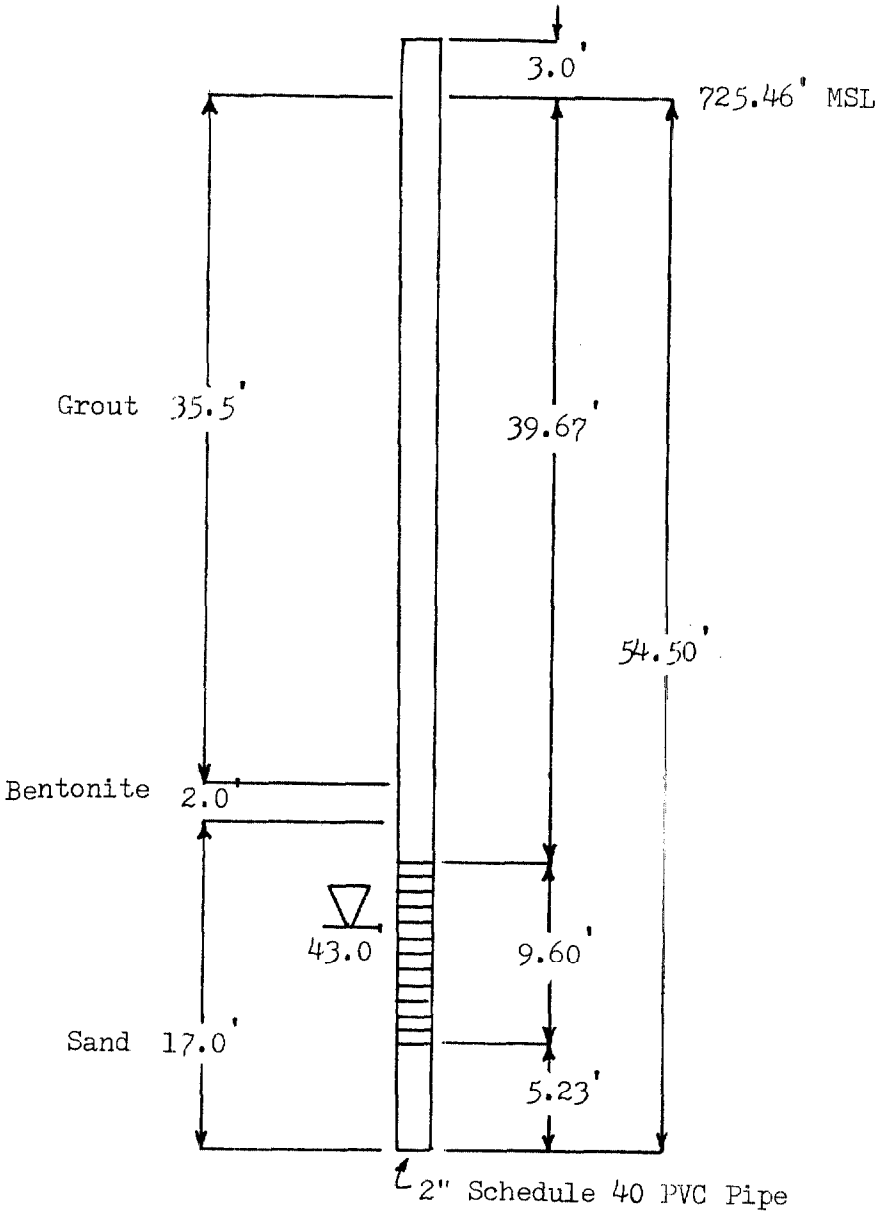
Boring Number: WES-1-5-81



Water depth at time of drilling

Well screen

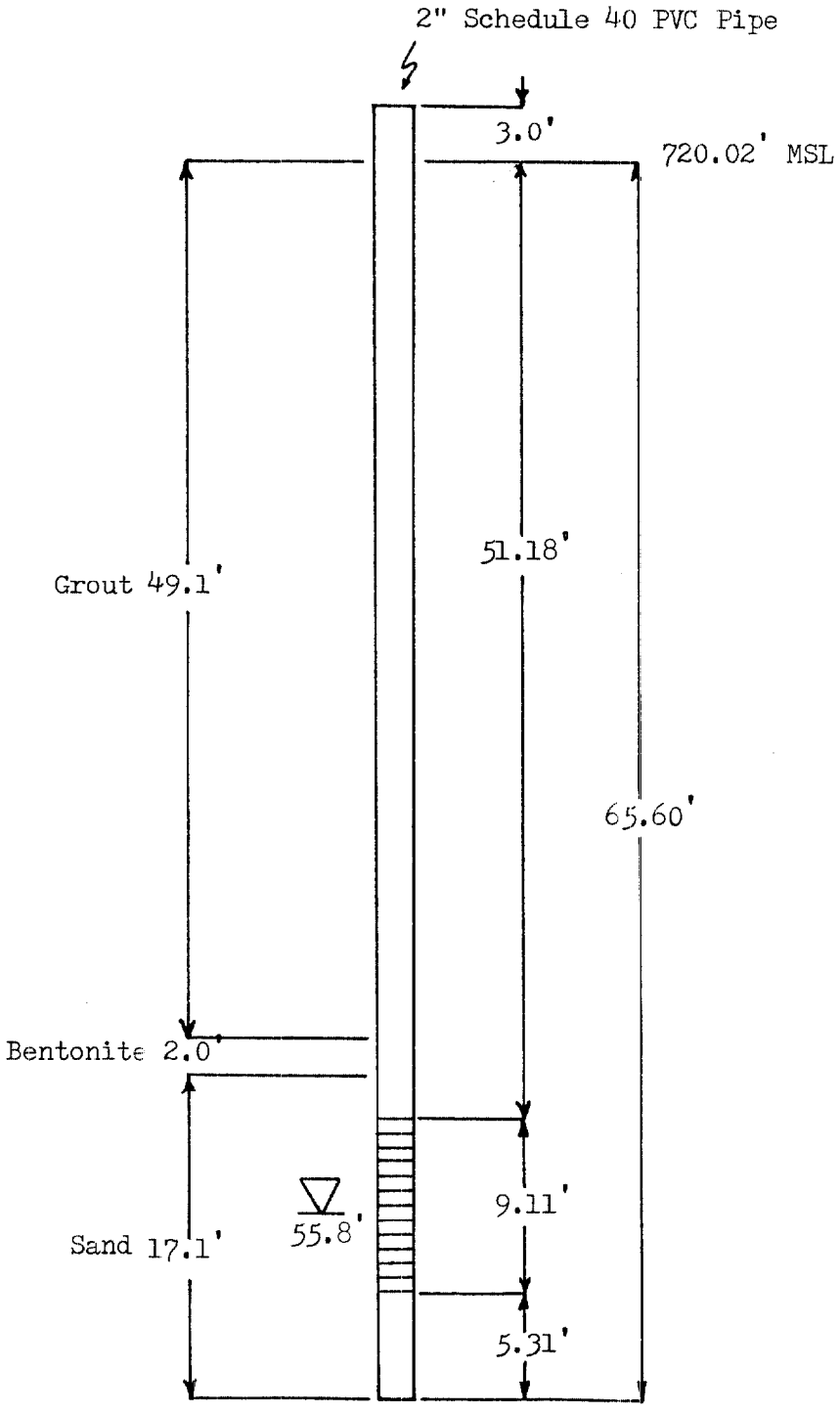
NWSC, Crane, Indiana
Dye Burial Grounds
Well Completion
Boring Number: WES-2-1-81



Water depth at time of drilling

Well screen

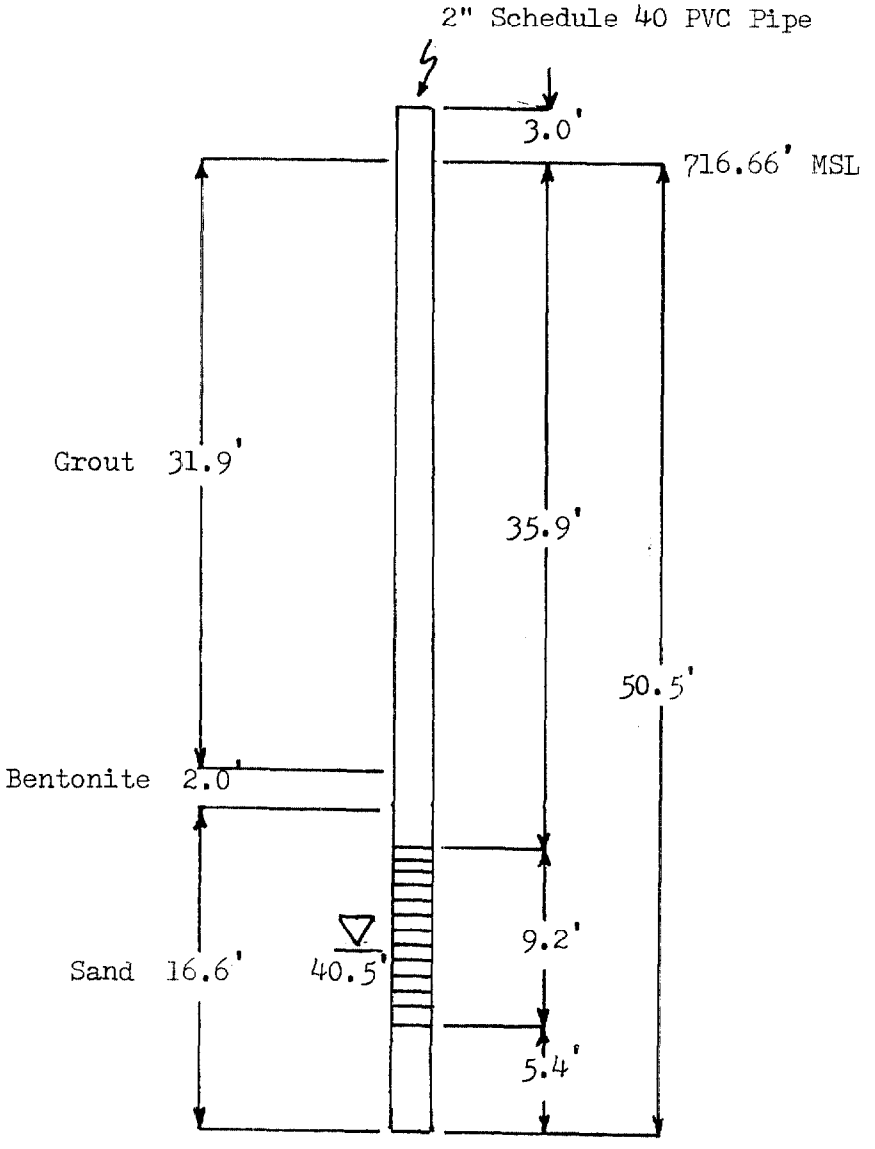
NWSC, Crane, Indiana
Dye Burial Grounds
Well Completion
Boring Number: WES-2-2-81



Water depth at time of drilling

Well screen

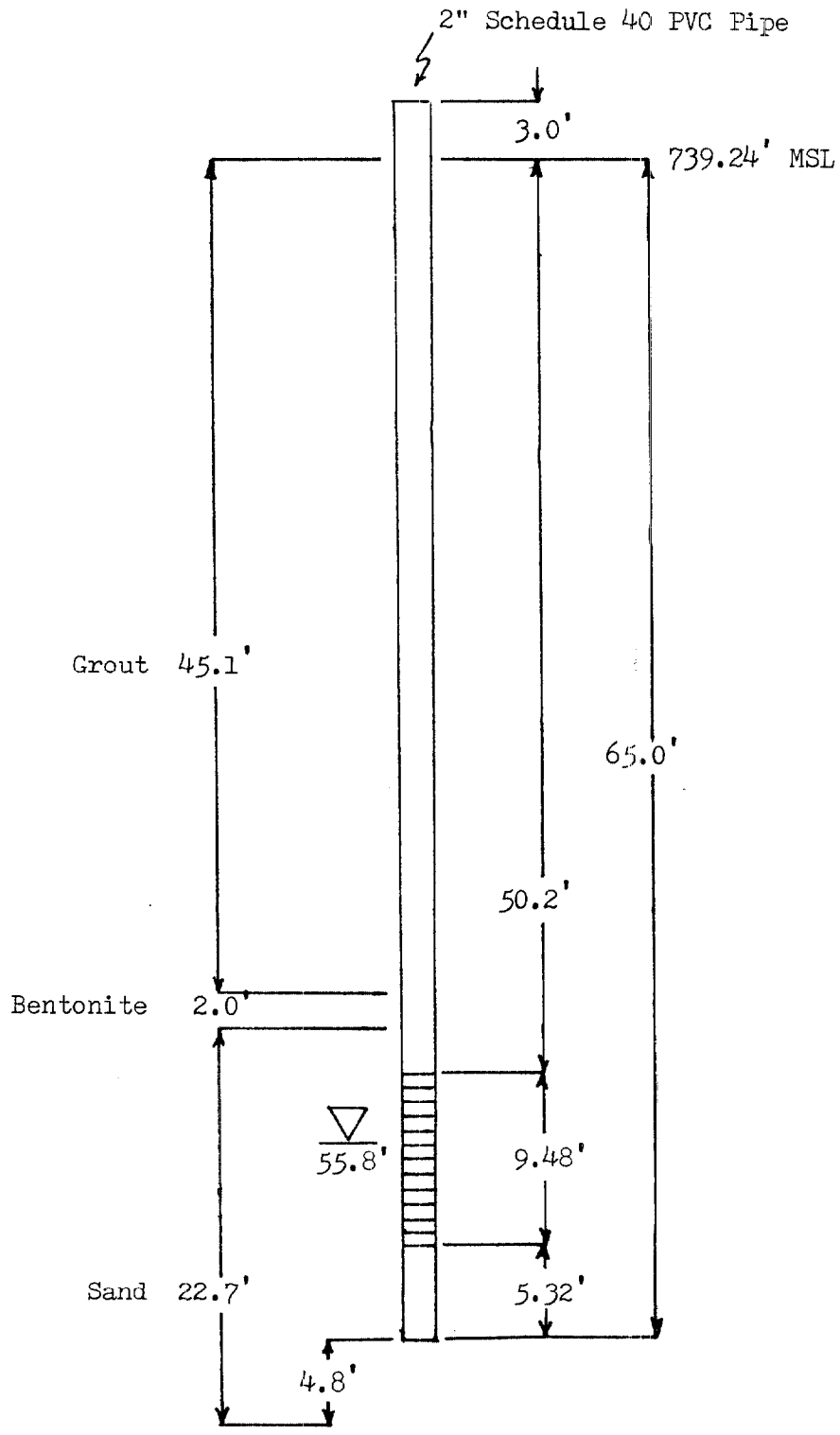
NWSC, Crane, Indiana
Dye Burial Grounds
Well Completion
Boring Number: WES-2-3-81



Water depth at time of drilling

Well screen

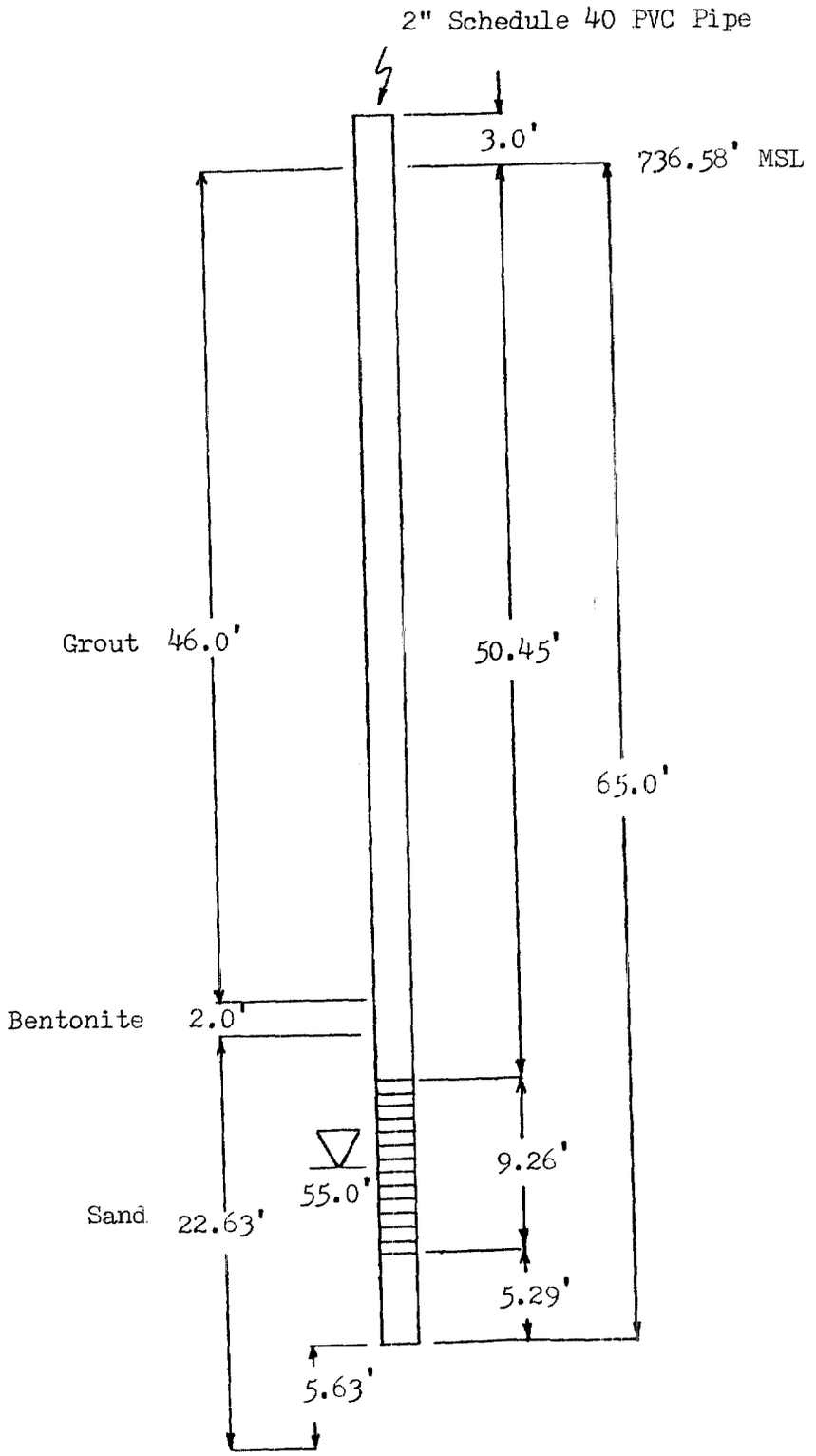
NWSC, Crane, Indiana
Dye Burial Grounds
Well Completion
Boring Number: WES-2-4-81



Water depth at time of drilling

Well screen

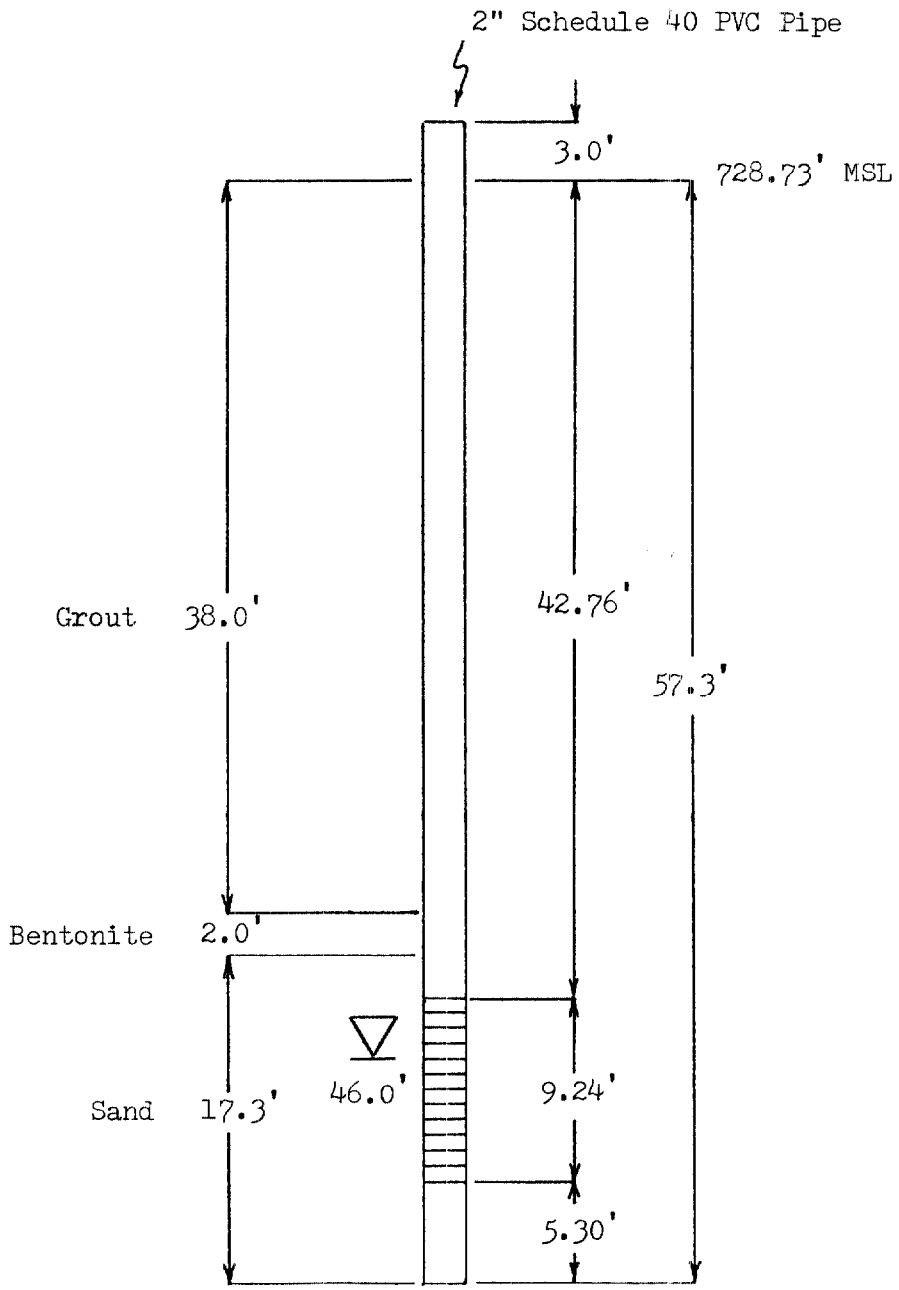
NWSC, Crane, Indiana
Dye Burial Grounds
Well Completion
Boring Number: WES-2-5-81



Water depth at time of drilling

Well screen

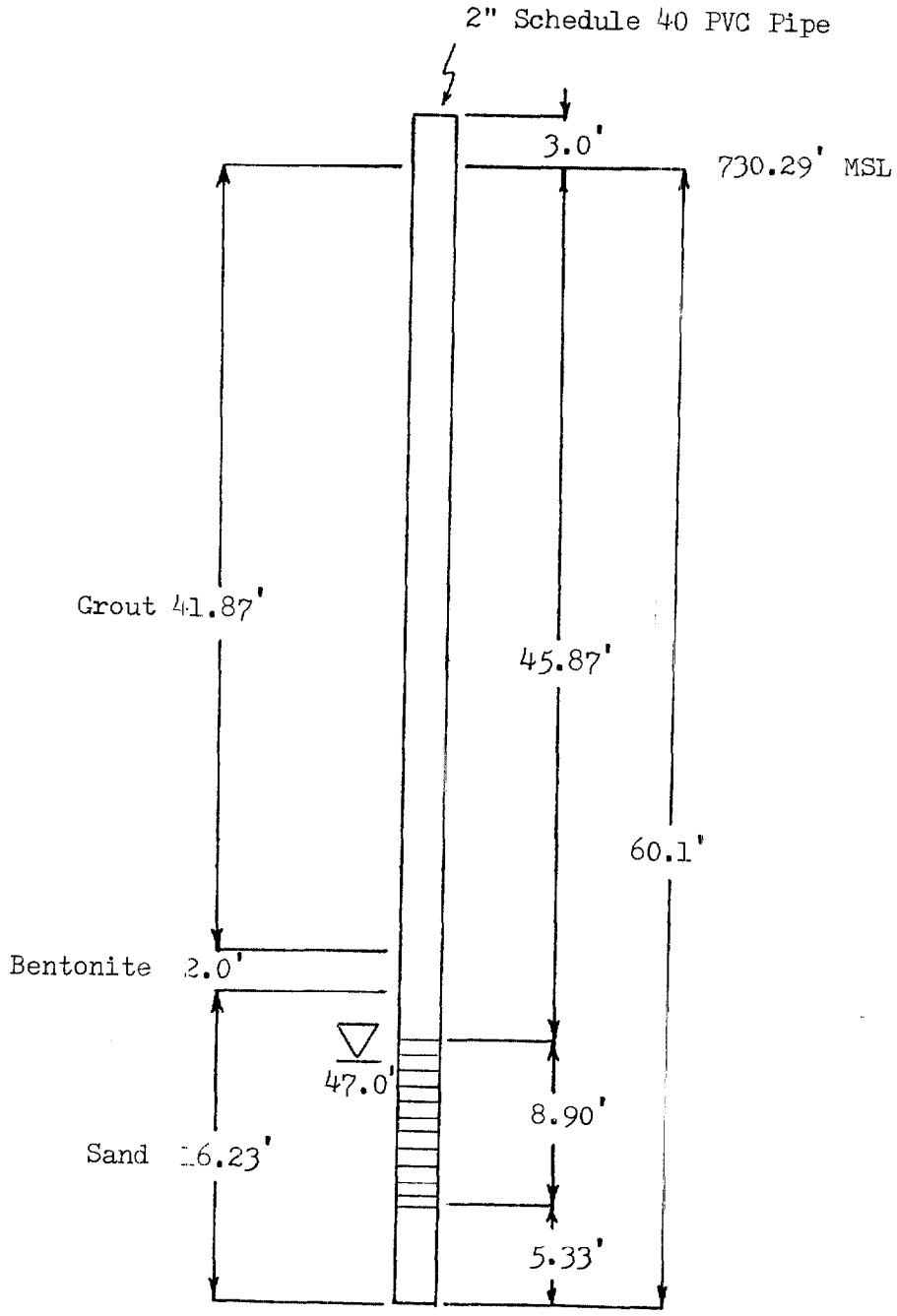
NWSC, Crane, Indiana
Dye Burial Grounds
Well Completion
Boring Number: WES-2-6-81



Water depth at time of drilling

Well screen

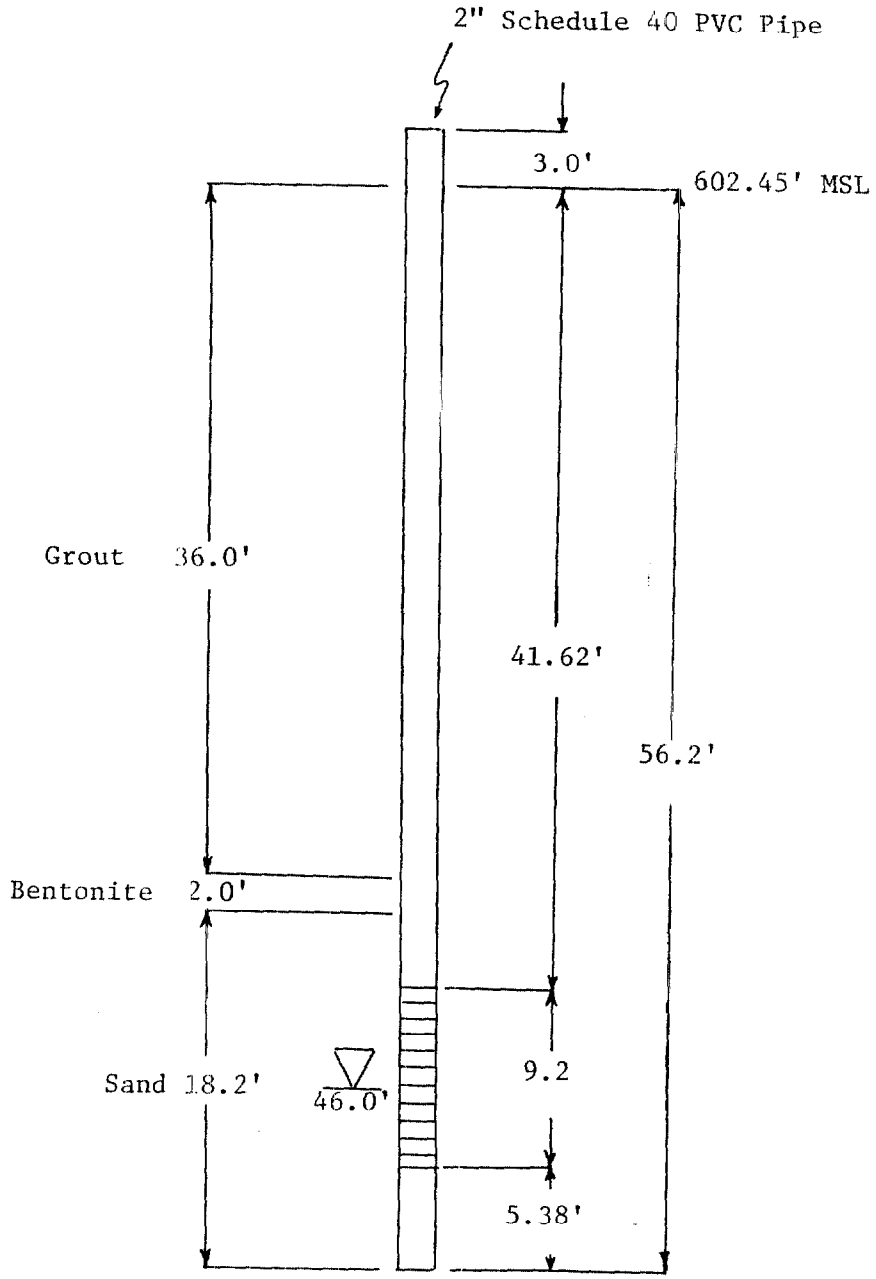
NWSC, Crane, Indiana
Dye Burial Grounds
Well Completion
Boring Number: WES-2-7-81



Water depth at time of drilling

Well screen

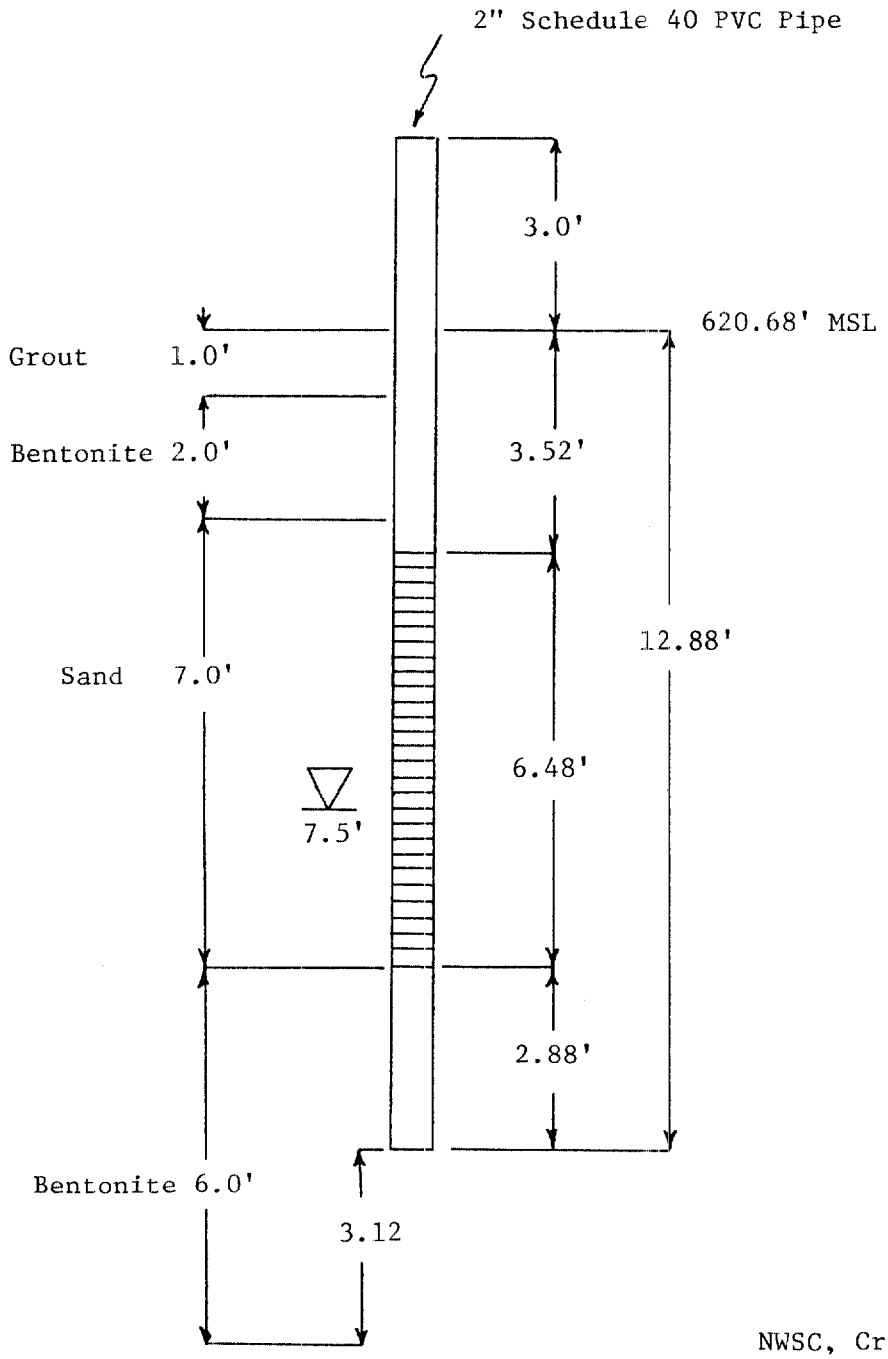
NWSC, Crane, Indiana
Dye Burial Grounds
Well Completion
Boring Number: WES-2-8-81



Water depth at time of drilling

Well screen

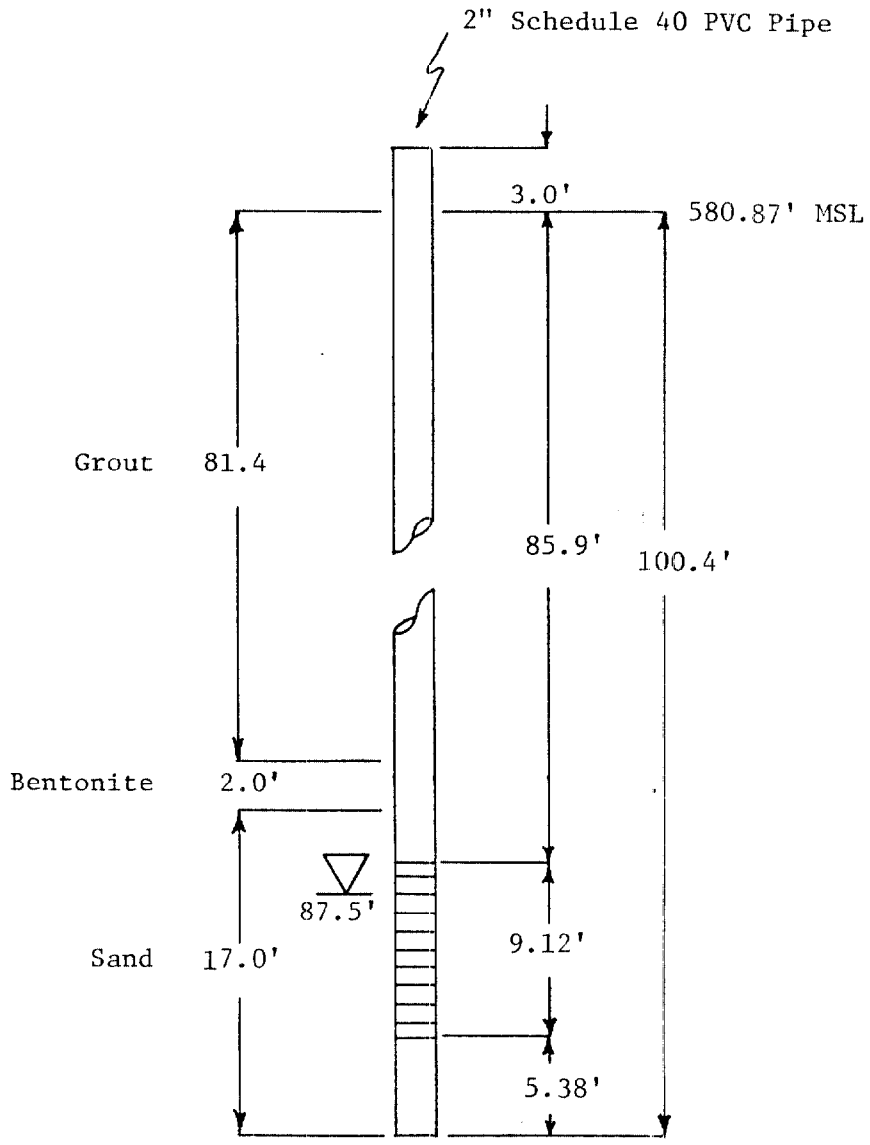
NWSC, Crane, Indiana
Ammunition Burning Grounds
Well Completion
Boring Number: WES-3-1-81



NWSC, Crane, Indiana
Ammunition Burning Grounds
Well Completion
Boring Number: WES-3-2-81

Water depth at time of drilling

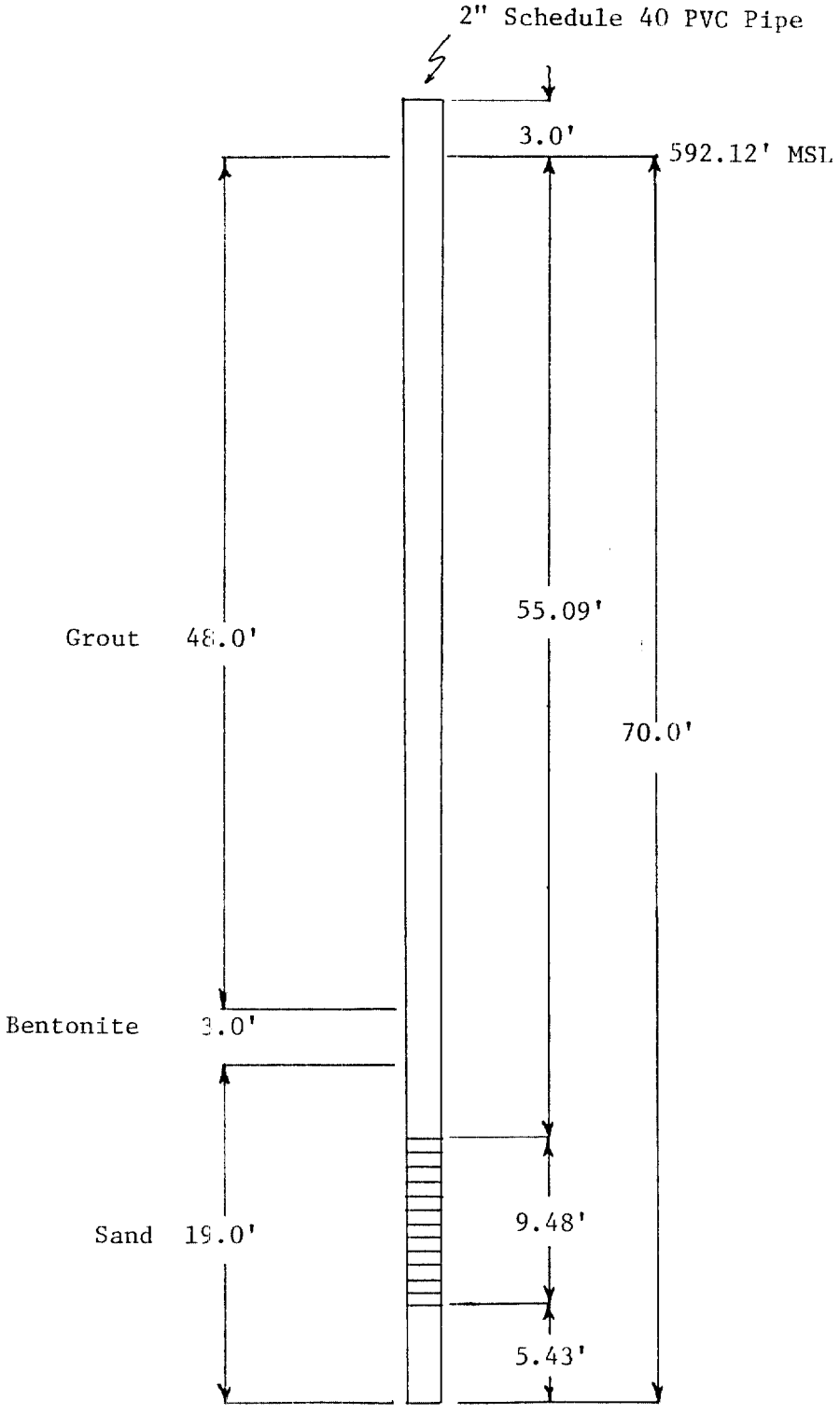
Well screen



Water depth at time of drilling

Well screen

NWSC, Crane, Indiana
Ammunition Burning Grounds
Well Completion
Boring Number: WES-3-3-81



Water depth at time of drilling was unobtainable

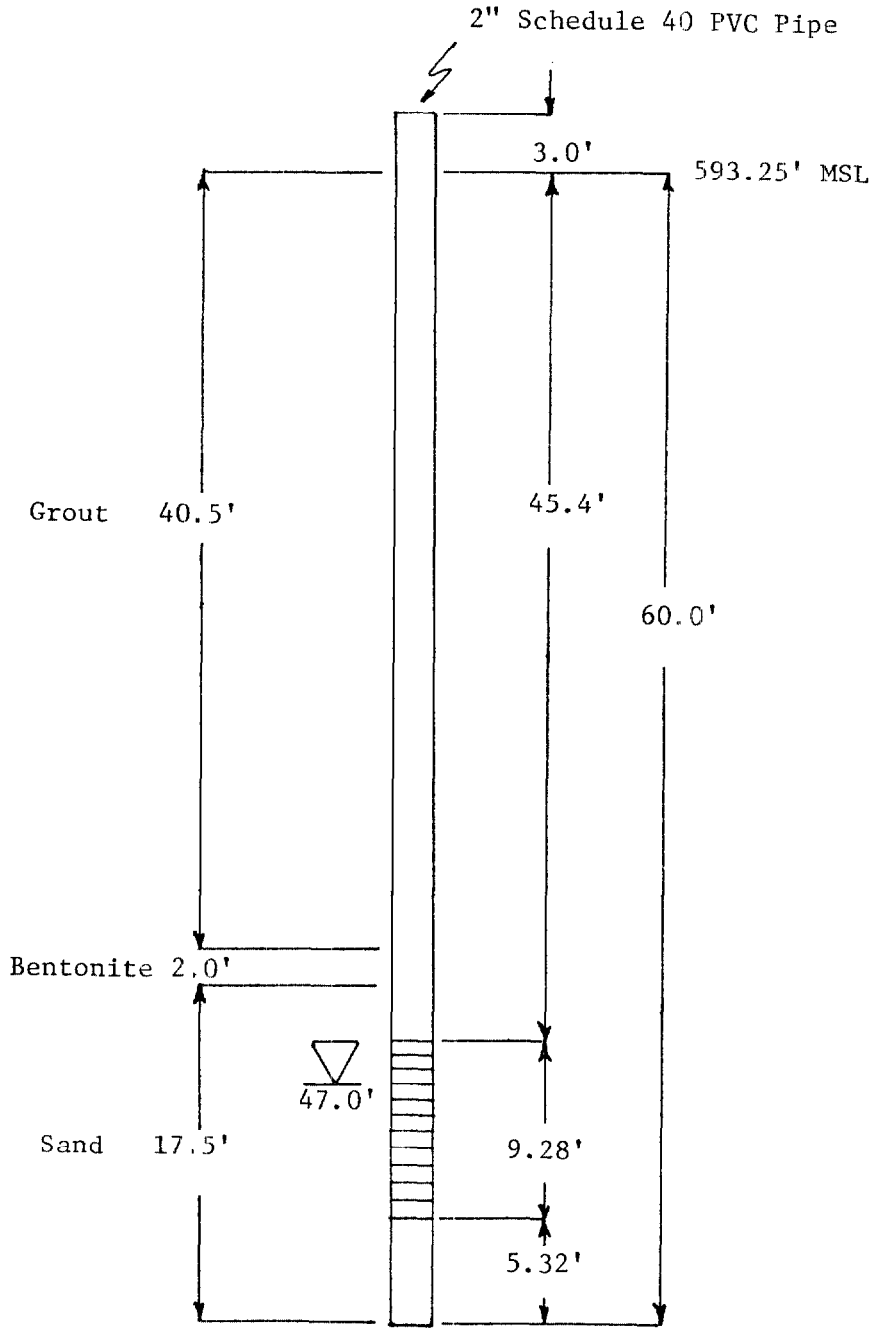
Well screen

NWSC, Crane, Indiana

Ammunition Burning Grounds

Well Completion

Boring Number: WES-3-4-81



Water depth at time of drilling

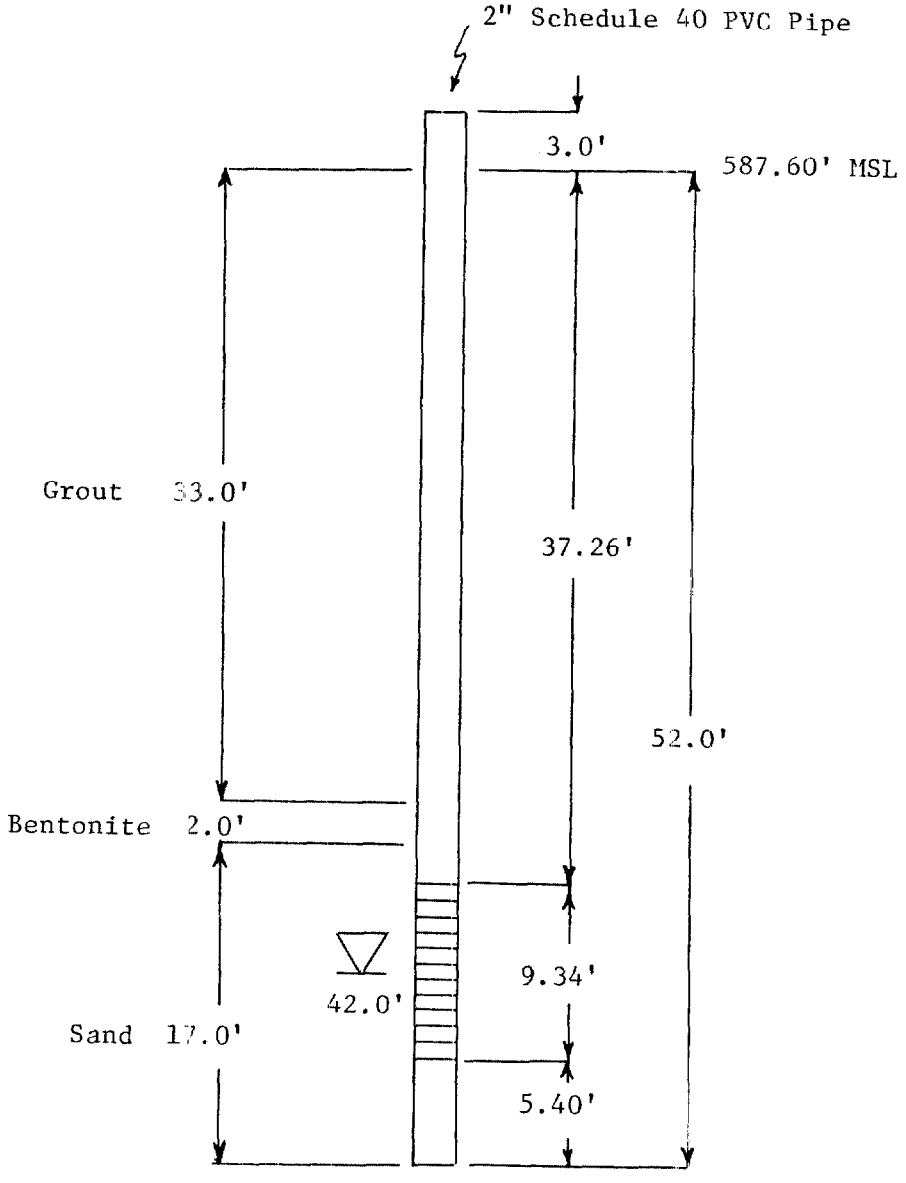
Well screen

NWSC, Crane, Indiana

Ammunition Burning Grounds

Well Completion

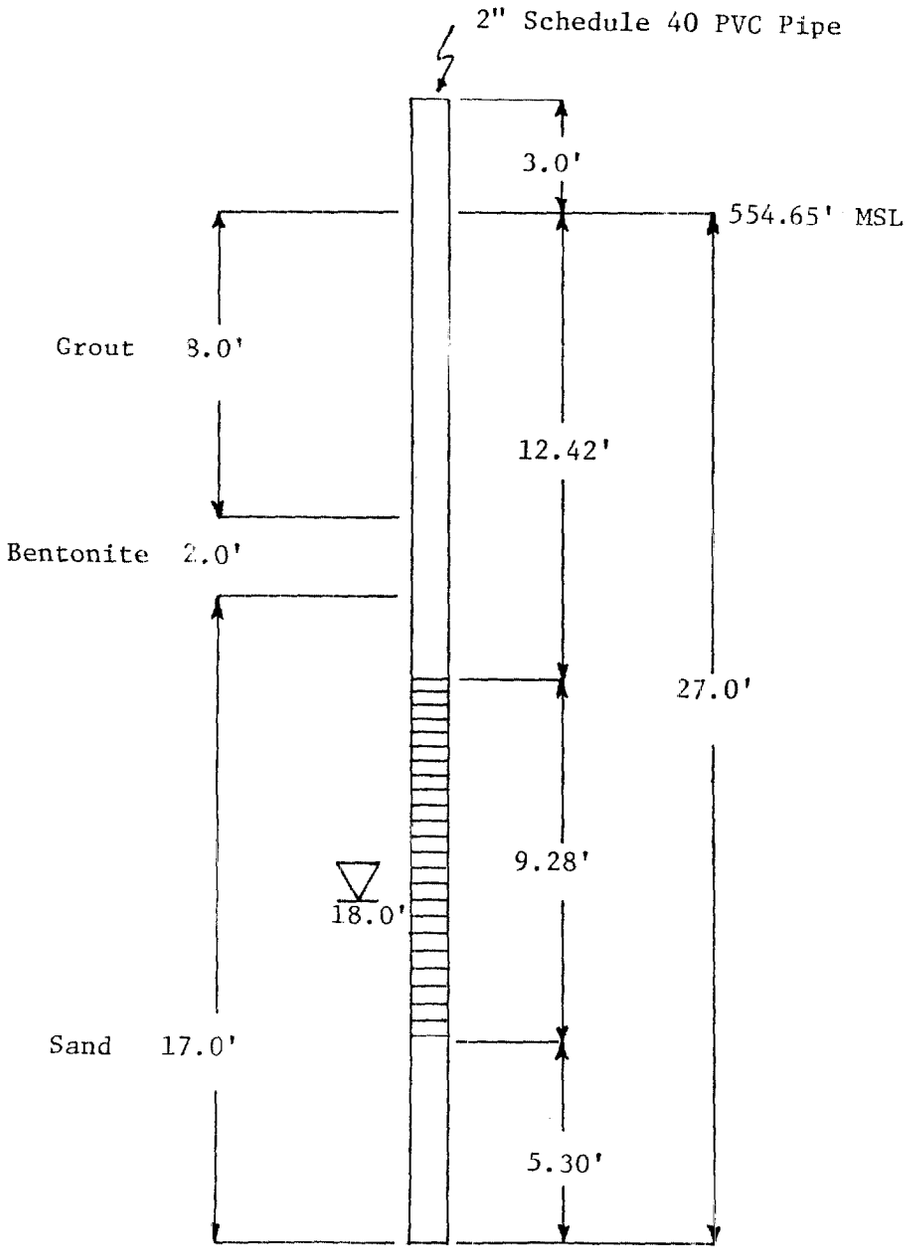
Boring Number: WES-3-5-81



Water depth at time of drilling

Well screen

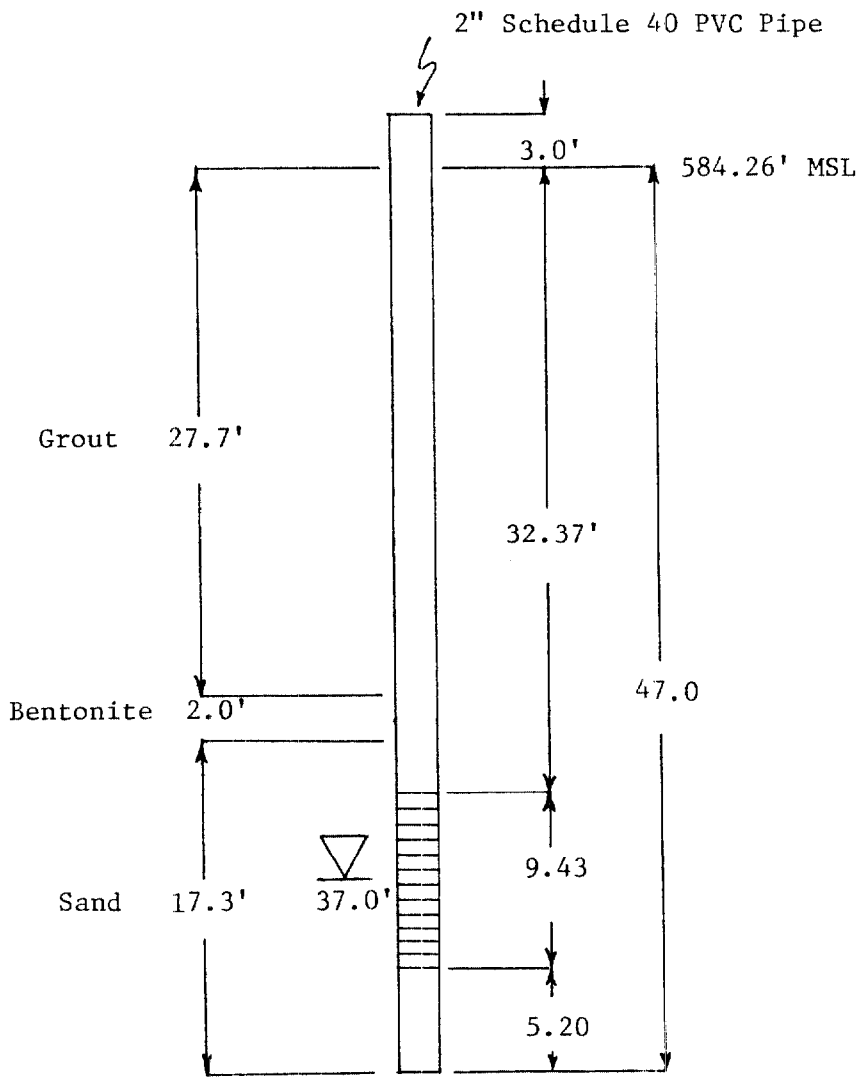
NWSC, Crane, Indiana
Ammunition Burning Grounds
Well Completion
Boring Number: WES-3-6-81



Water depth at time of drilling

Well screen

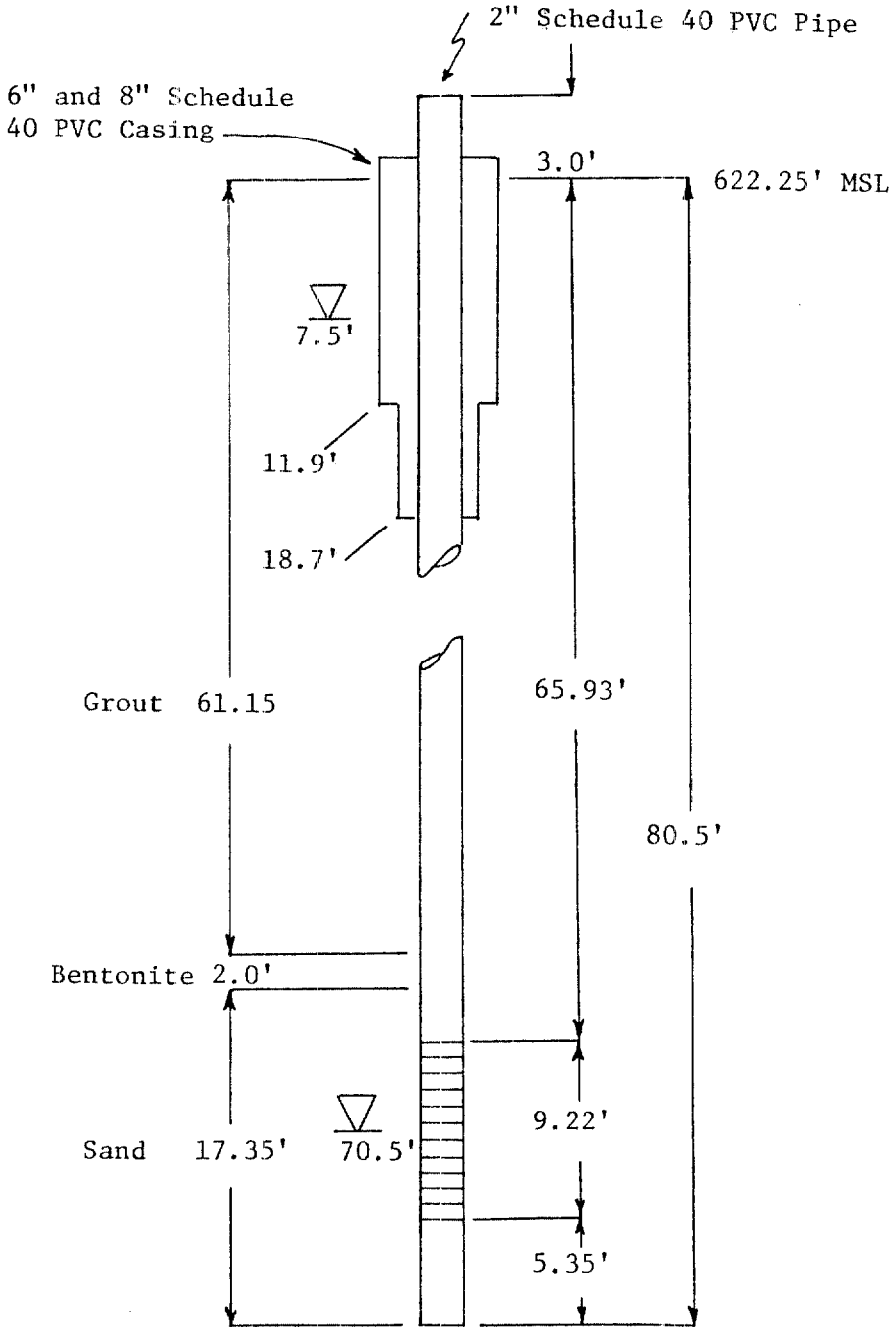
NWSC, Crane, Indiana
Ammunition Burning Grounds
Well Completion
Boring Number: WES-3-7-81



Water depth at time of drilling

Well screen

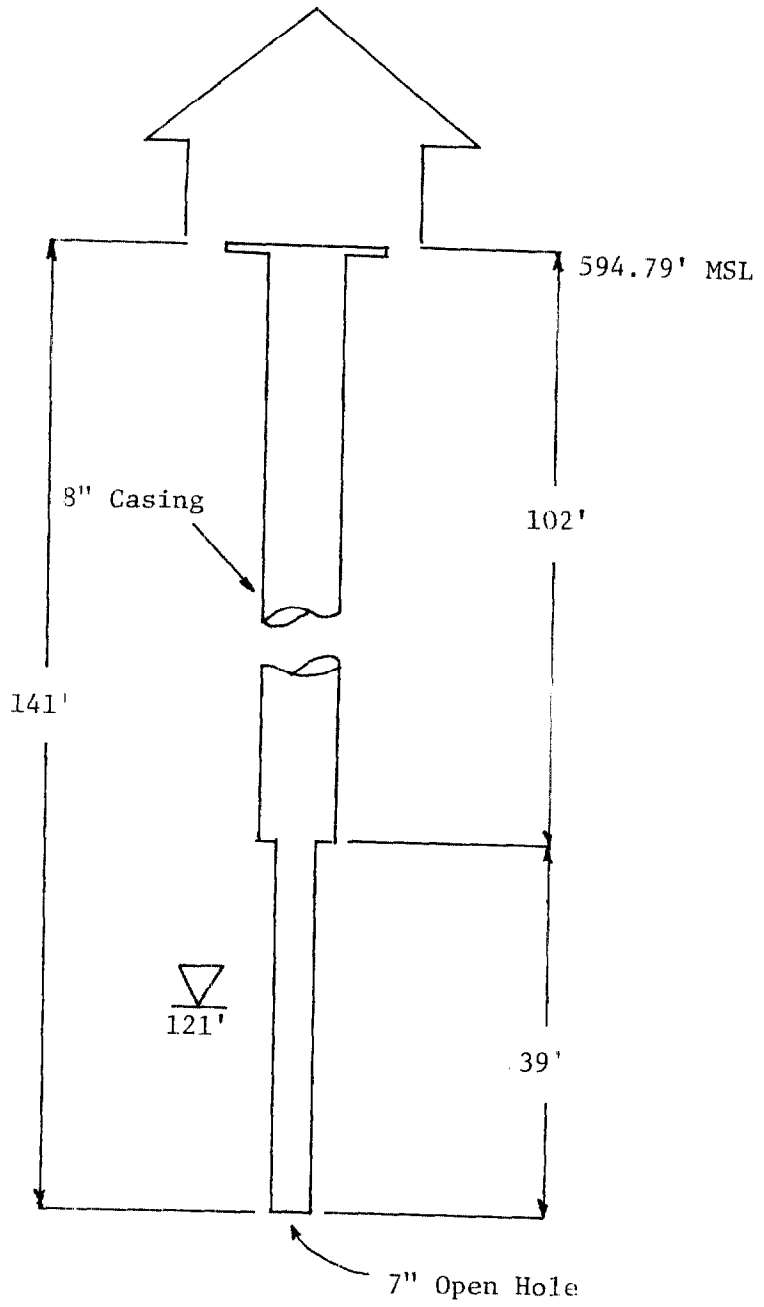
NWSC, Crane, Indiana
Ammunition Burning Grounds
Well Completion
Boring Number: WES-3-8-81



Water depth at time of drilling

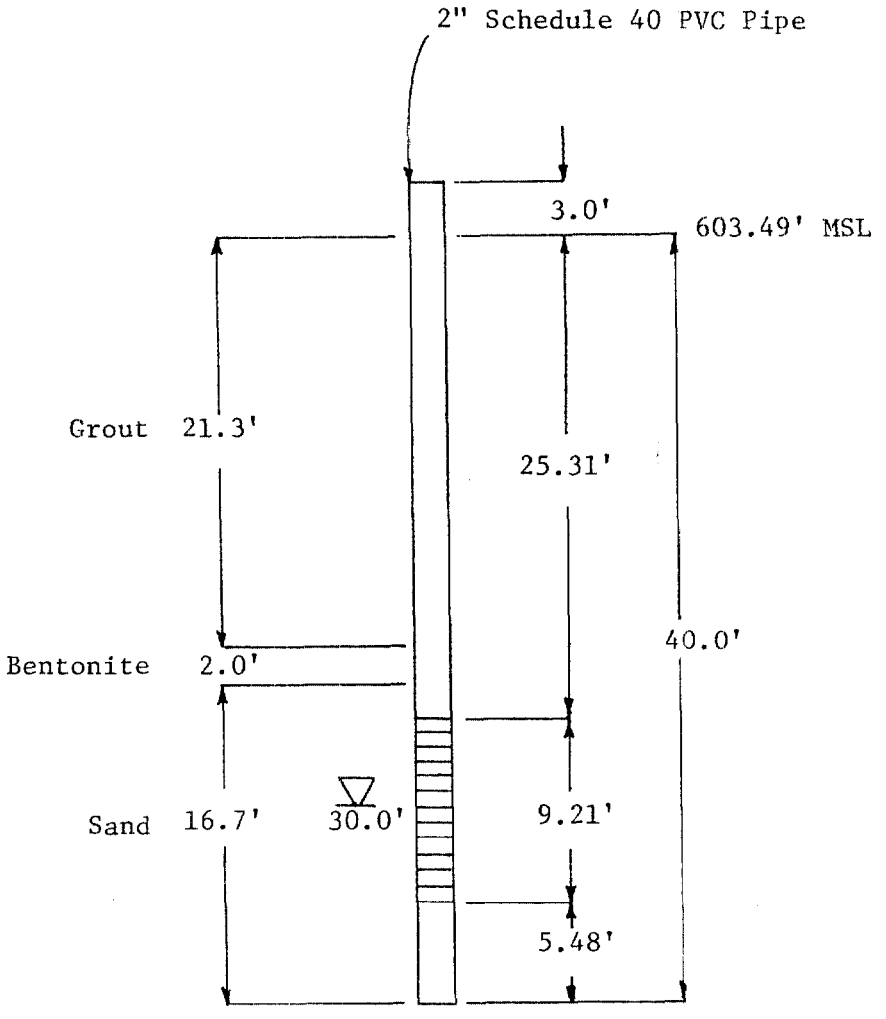
Well screen

NWSC, Crane, Indiana
Ammunition Burning Grounds
Well Completion
Boring Number: WES-3-9-81



▽ Water depth at time of drilling

NWSC, Crane, Indiana
Ammunition Burning Grounds
Well Completion
Pump House-Building 3004



Water depth at time of drilling

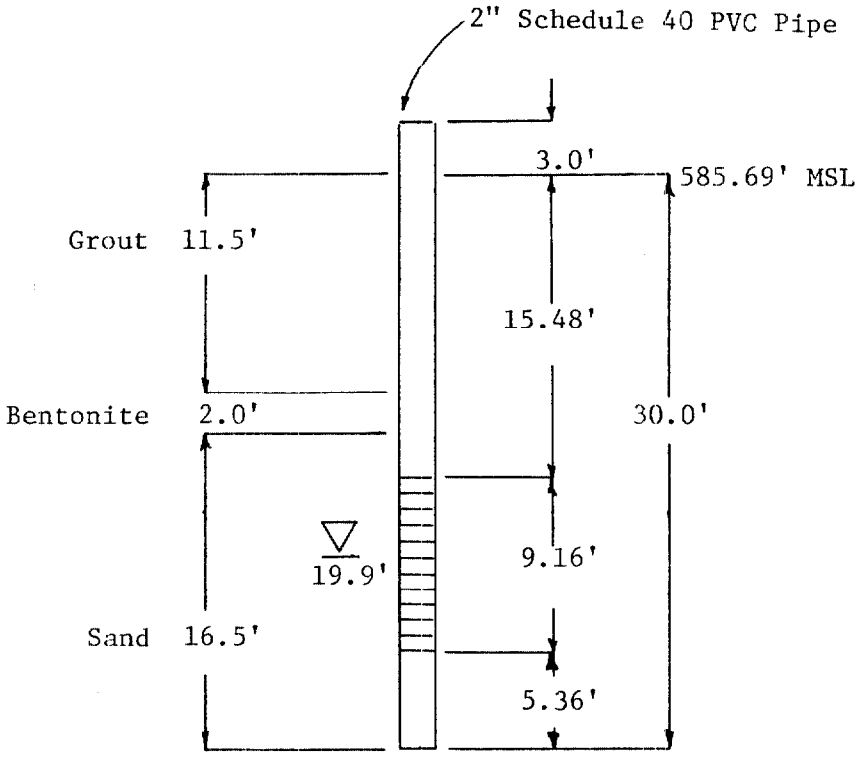
Well screen

NWSC, Crane, Indiana

McComish Gorge

Well Completion

Boring Number: WES-4-1-81



Water depth at time of drilling

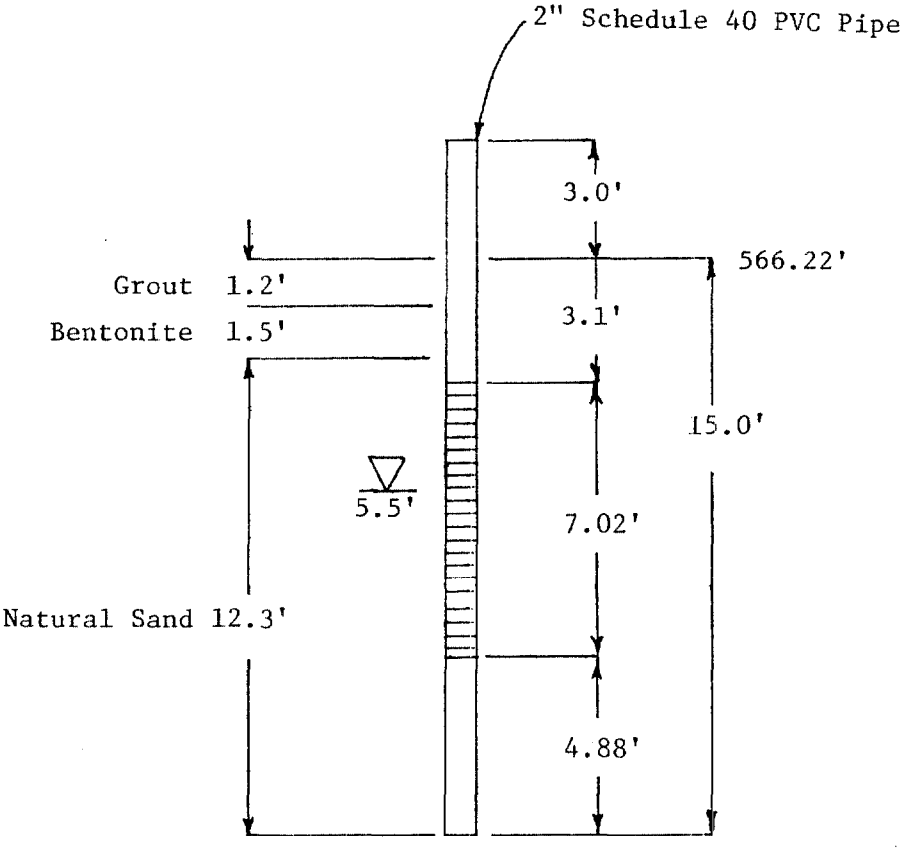
Well screen

NWSC, Crane, Indiana

McComish Gorge

Well Completion

Boring Number: WES-4-2-81



Water depth at time of drilling

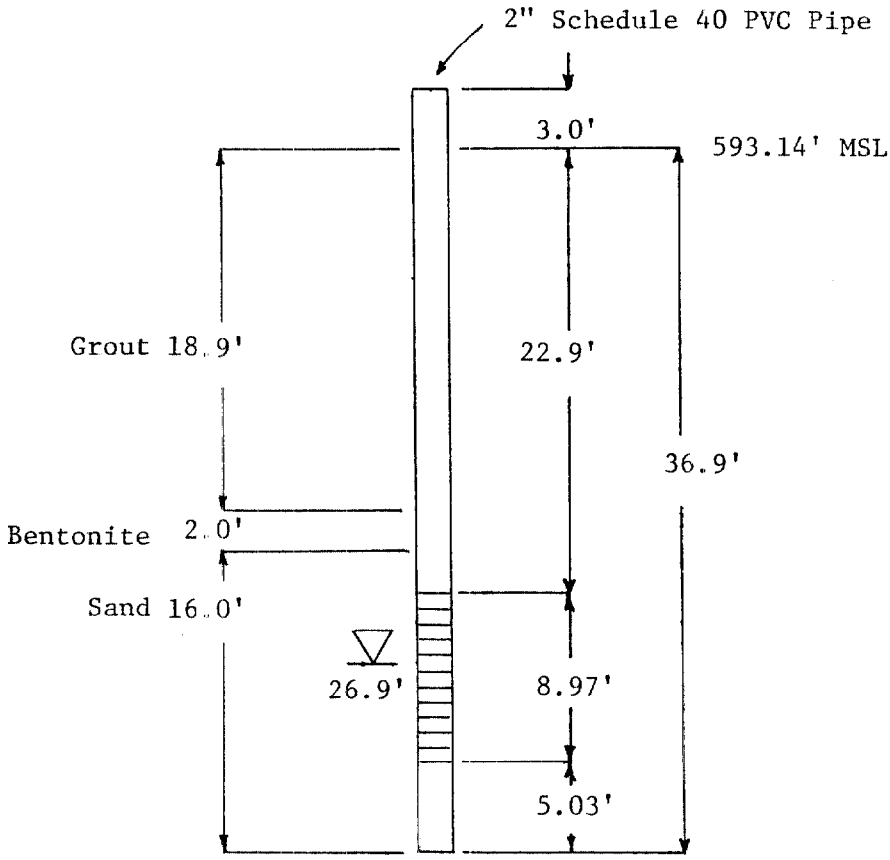
Well screen

NWSC, Crane, Indiana

McComish Gorge

Well Completion

Boring Number: WES-4-3-81



Water depth at time of drilling

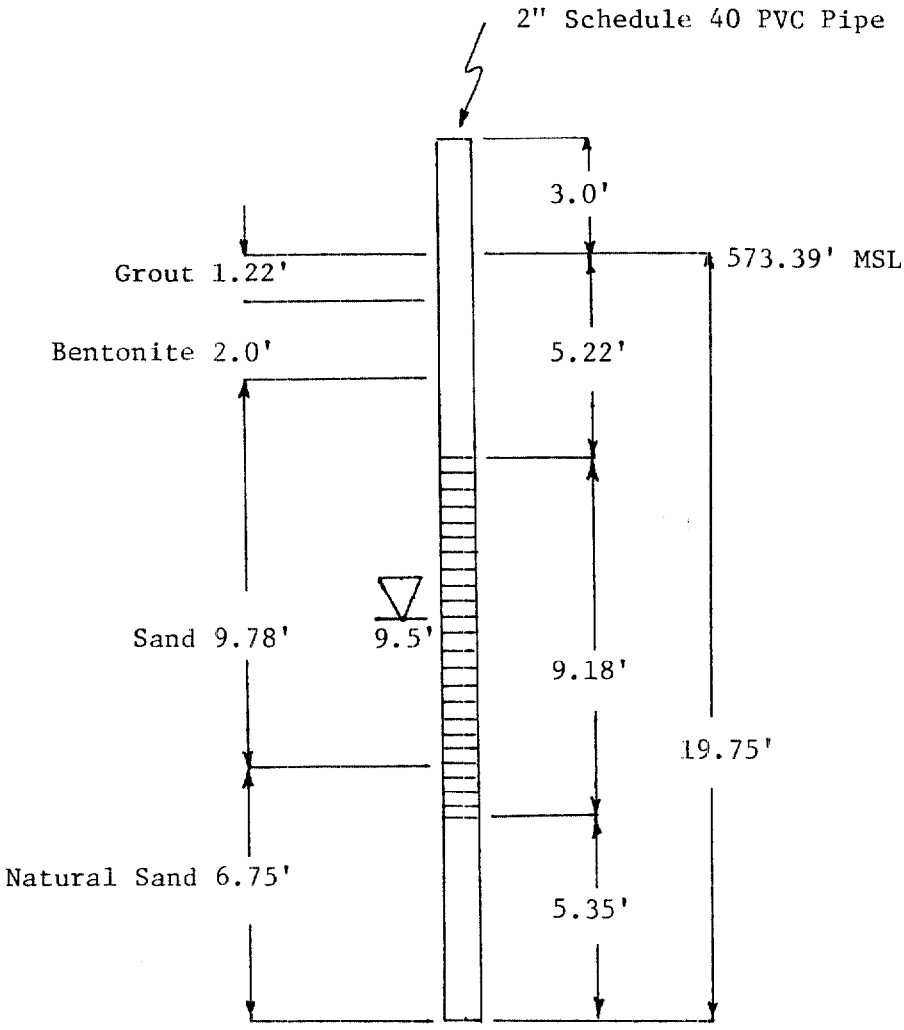
Well screen

NWSC, Crane, Indiana

McComish Gorge

Well Completion

Boring Number: WES-4-4-81



Water depth at time of drilling

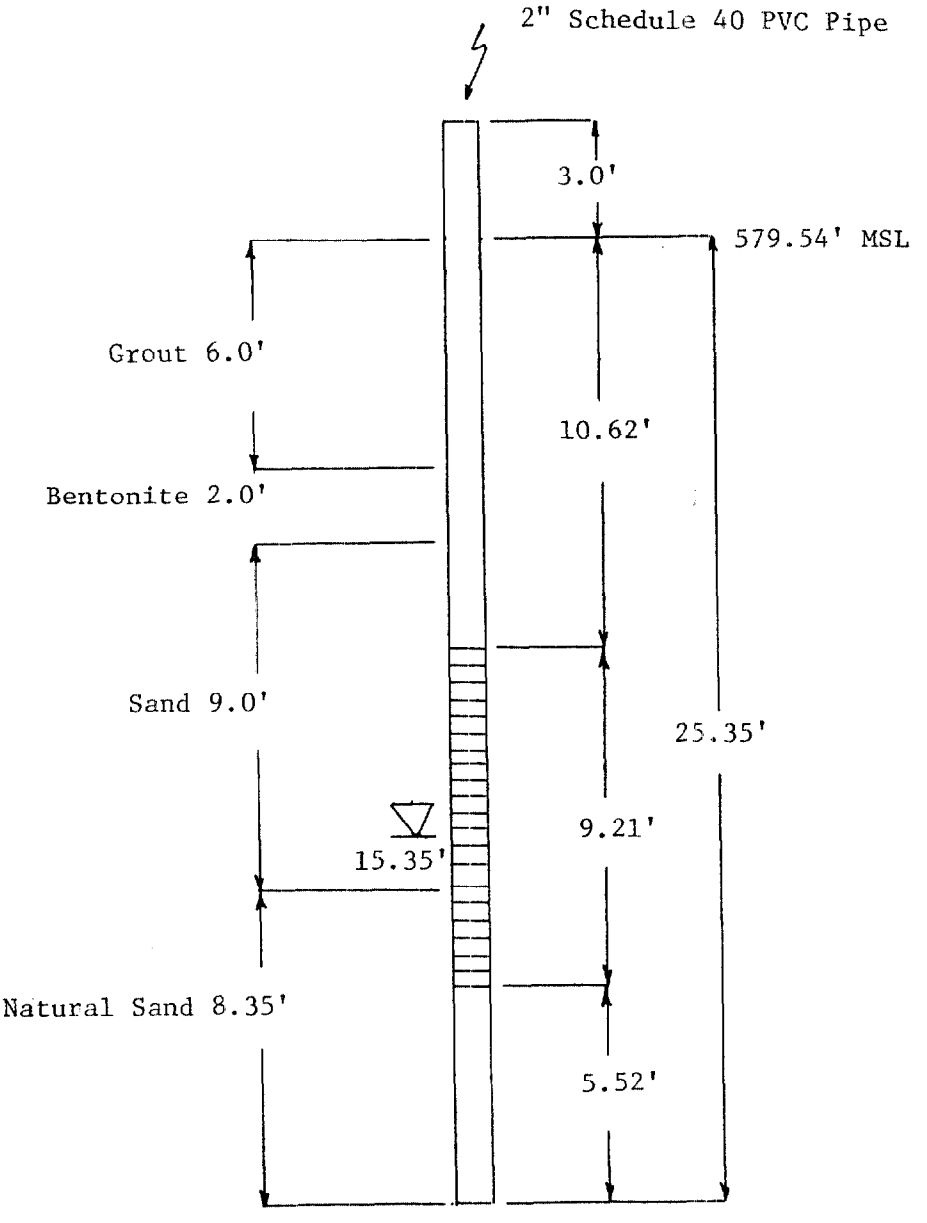
Well screen

NWSC, Crane, Indiana

McComish Gorge

Well Completion

Boring Number: WES-4-5-81



Water depth at time of drilling

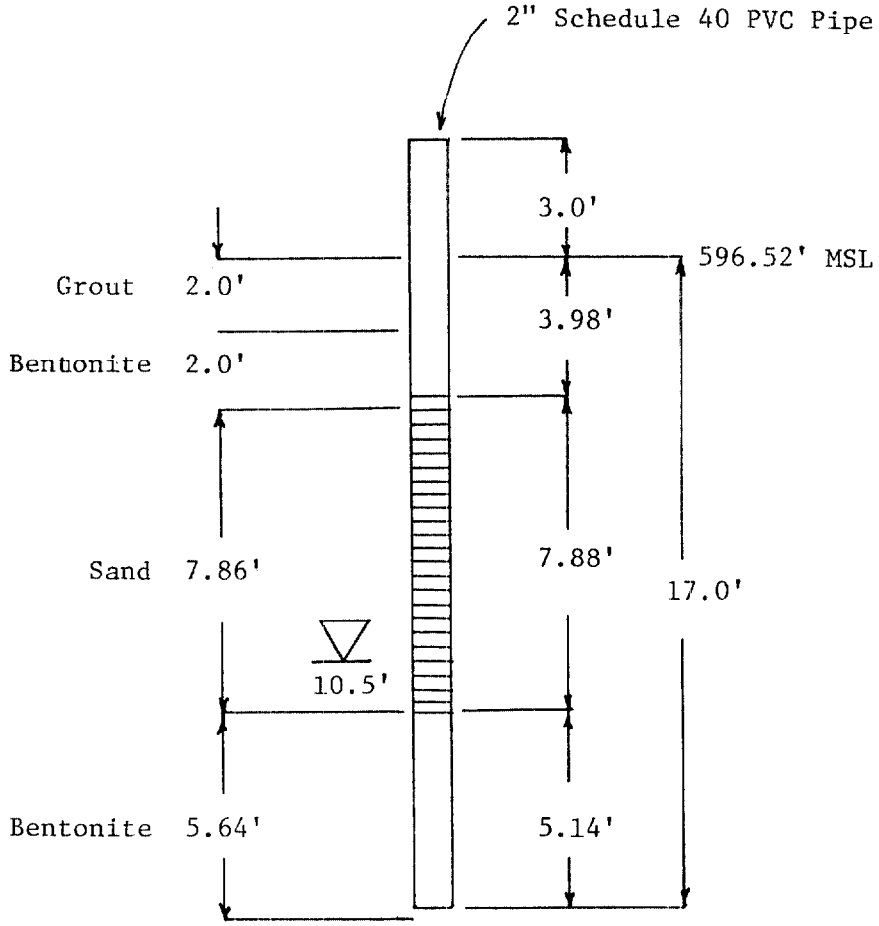
Well screen

NWSC, Crane, Indiana

McComish Gorge

Well Completion

Boring Number: WES-4-6-81



Water depth at time of drilling

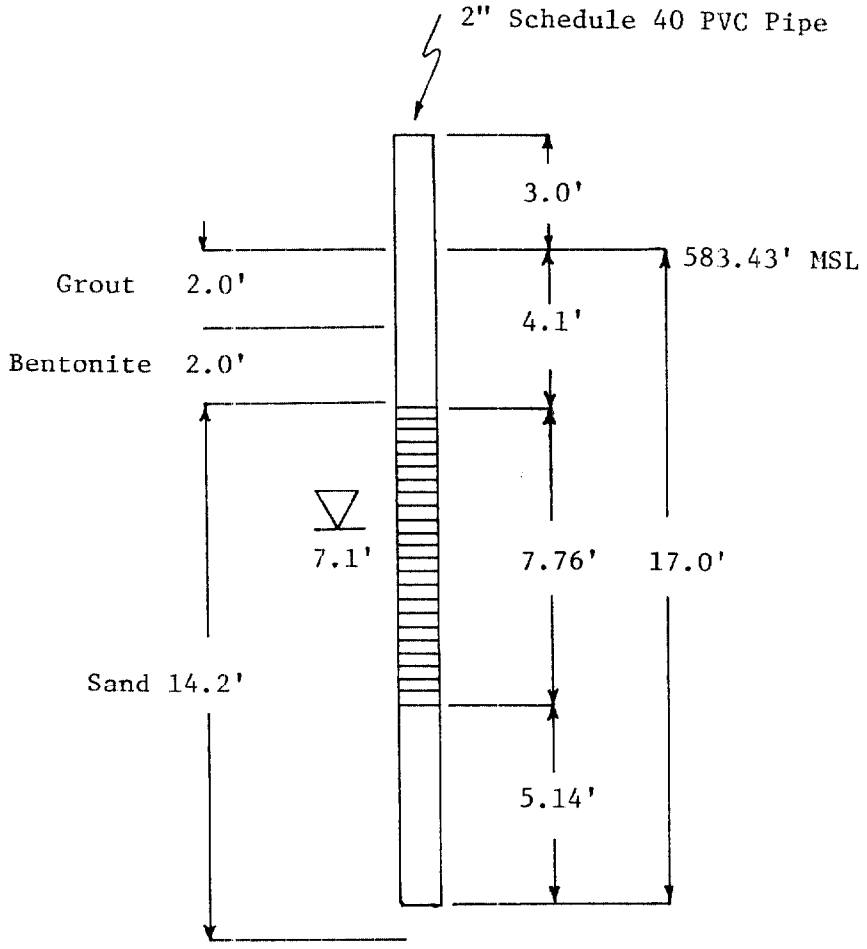
Well screen

NWSC, Crane, Indiana

Old Burning Pit

Well Completion

Boring Number: WES-5-1-81



Water depth at time of drilling

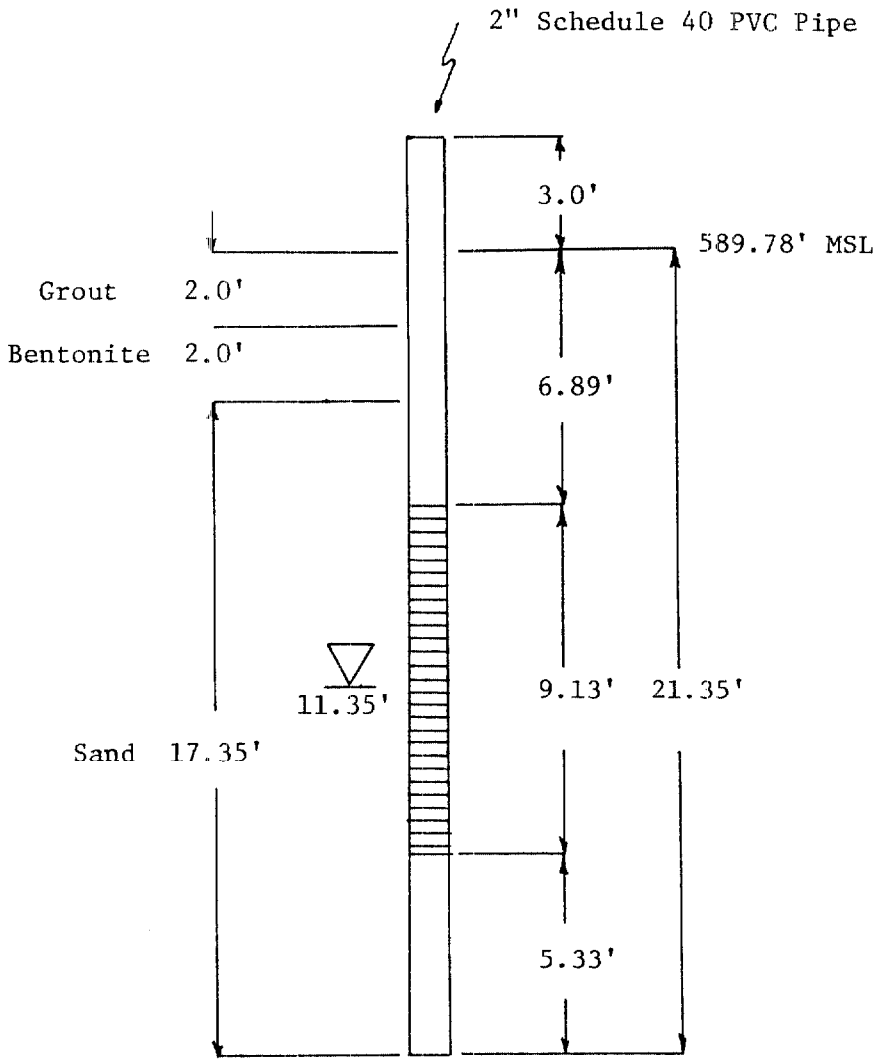
Well screen

NWSC, Crane, Indiana

Old Burning Pit

Well Completion

Boring Number: WES-5-2-81



Water depth at time of drilling

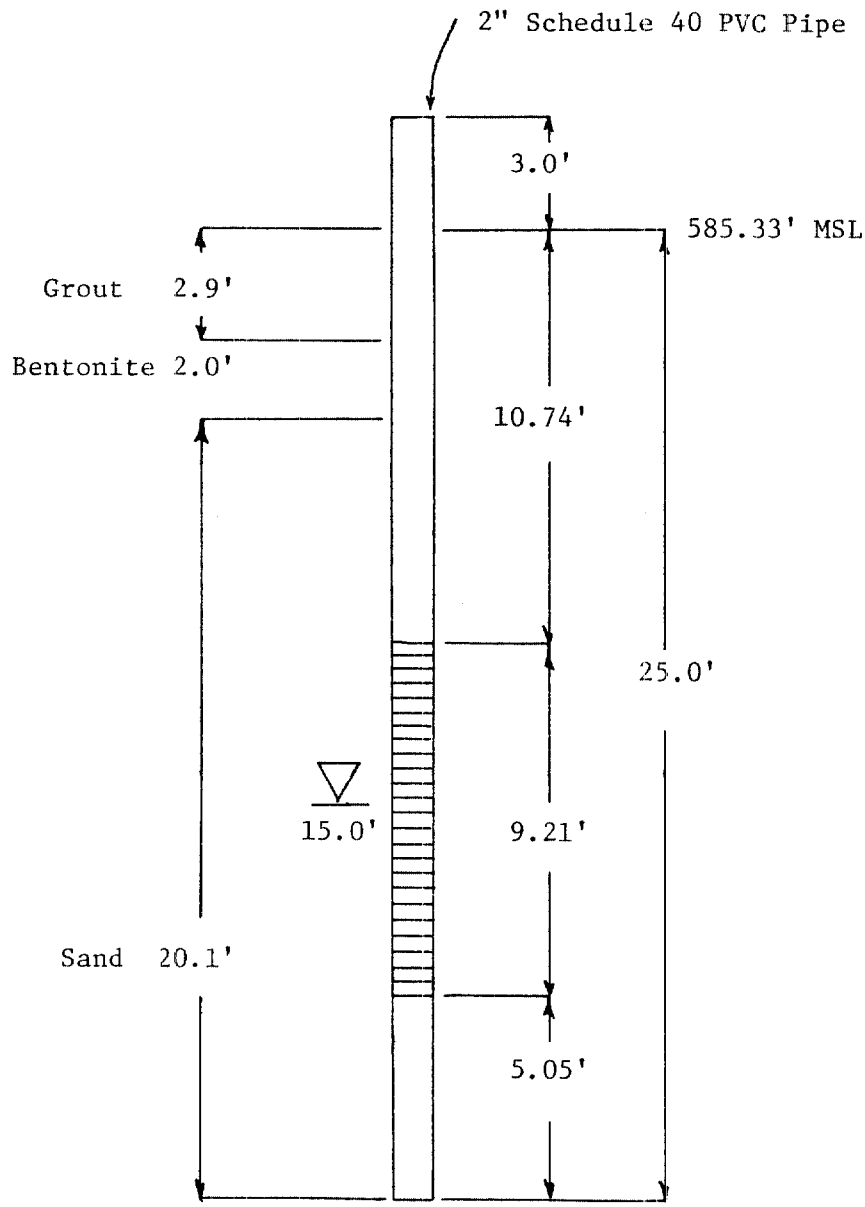
Well screen

NWSC, Crane, Indiana

Old Burning Pit

Well Completion

Boring Number: WES-5-3-81



Water depth at time of drilling

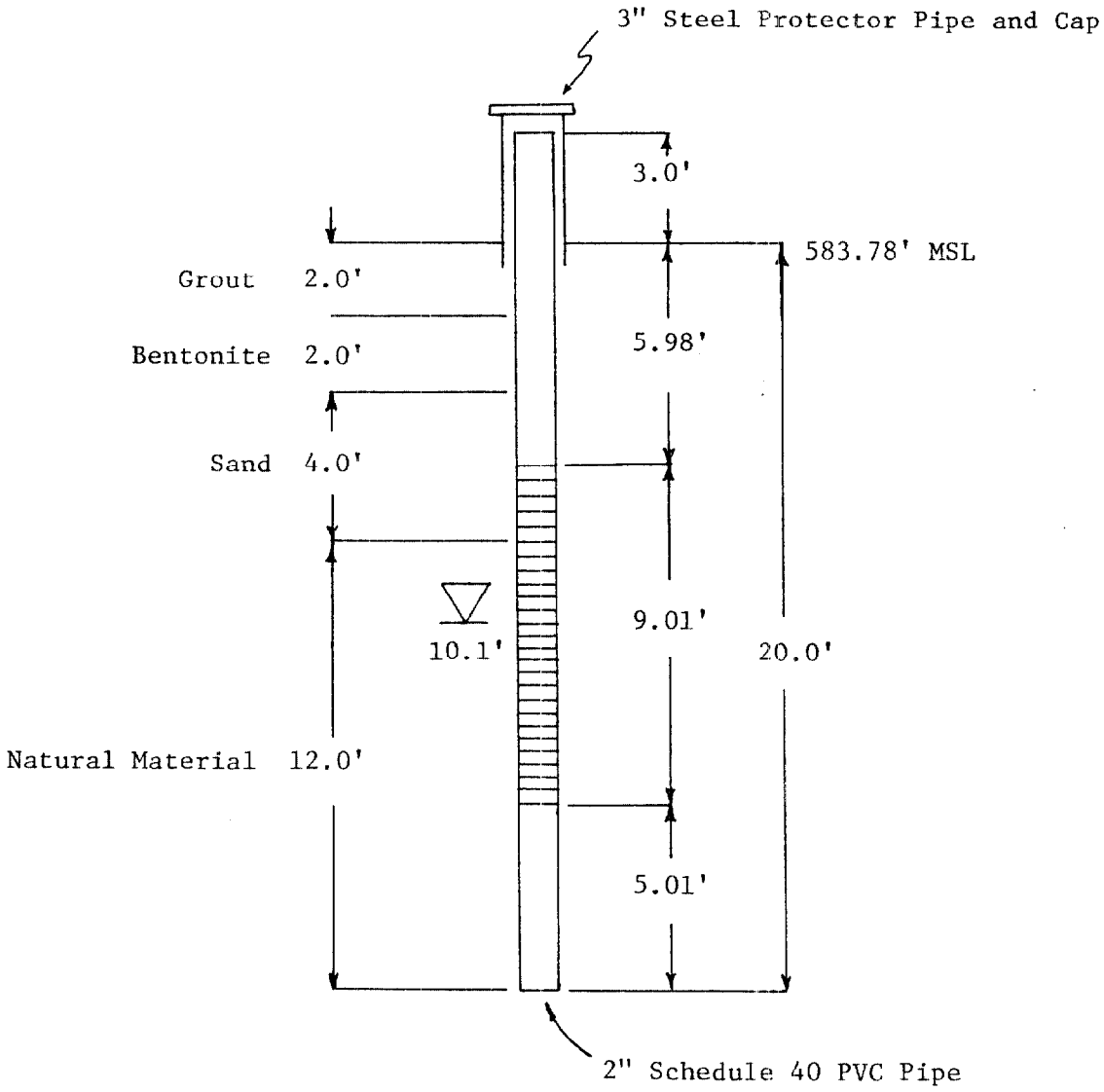
Well screen

NWSC, Crane, Indiana

Old Burning Pit

Well Completion

Boring Number: WES-5-4-81



Water depth at time of drilling

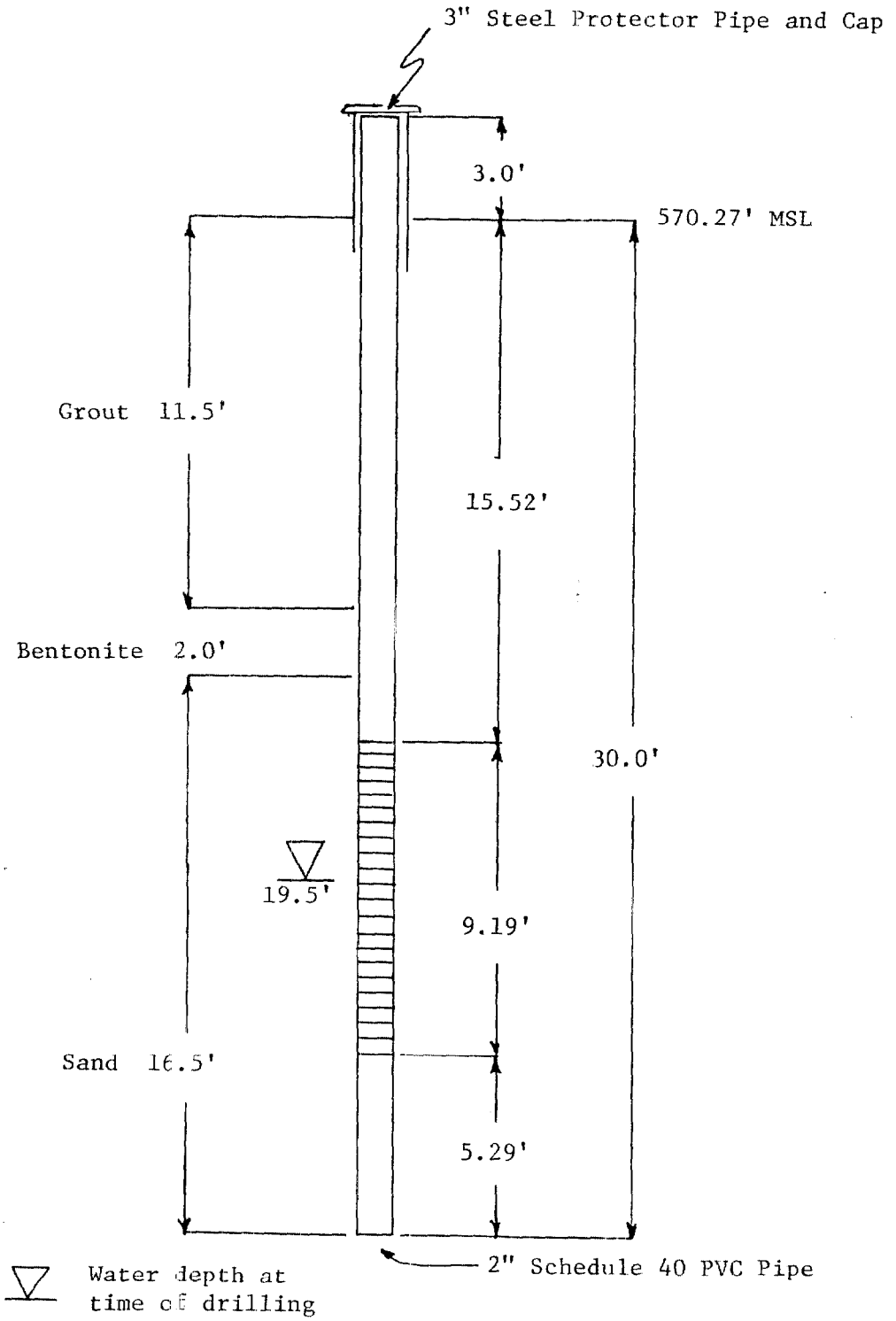
Well screen

NWSC, Crane, Indiana

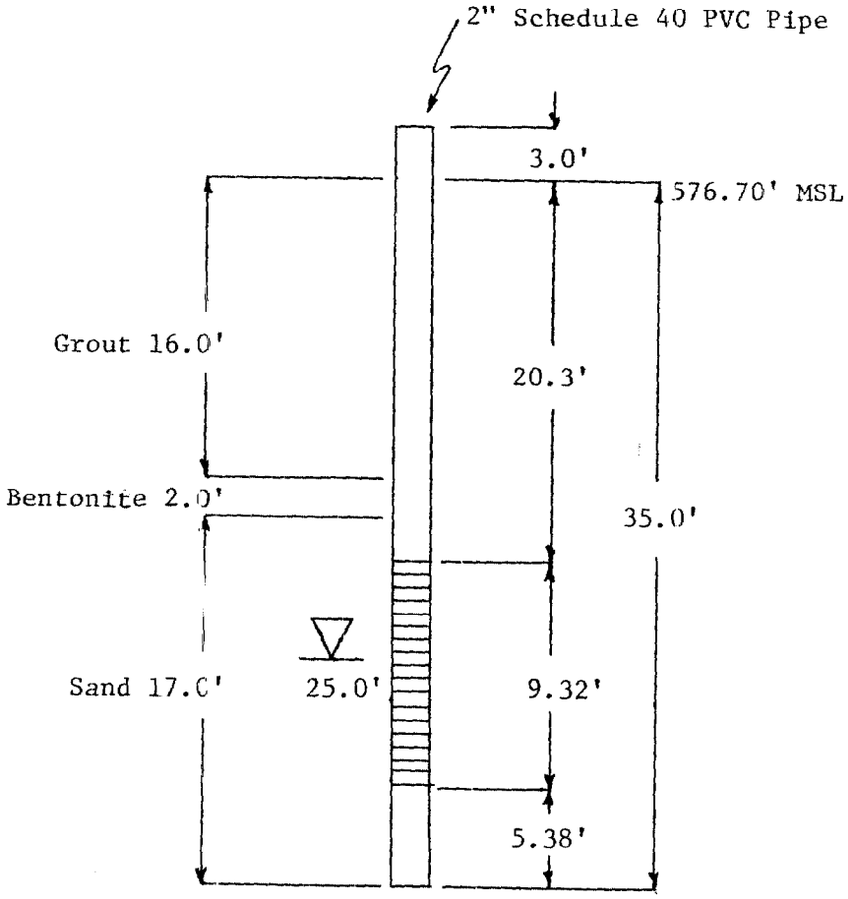
Old Burning Pit

Well Completion

Boring Number: WES-5-5-81



NWSC, Crane, Indiana
Old Burning Pit
Well Completion
Boring Number: WES-5-6-81



Water depth at time of drilling

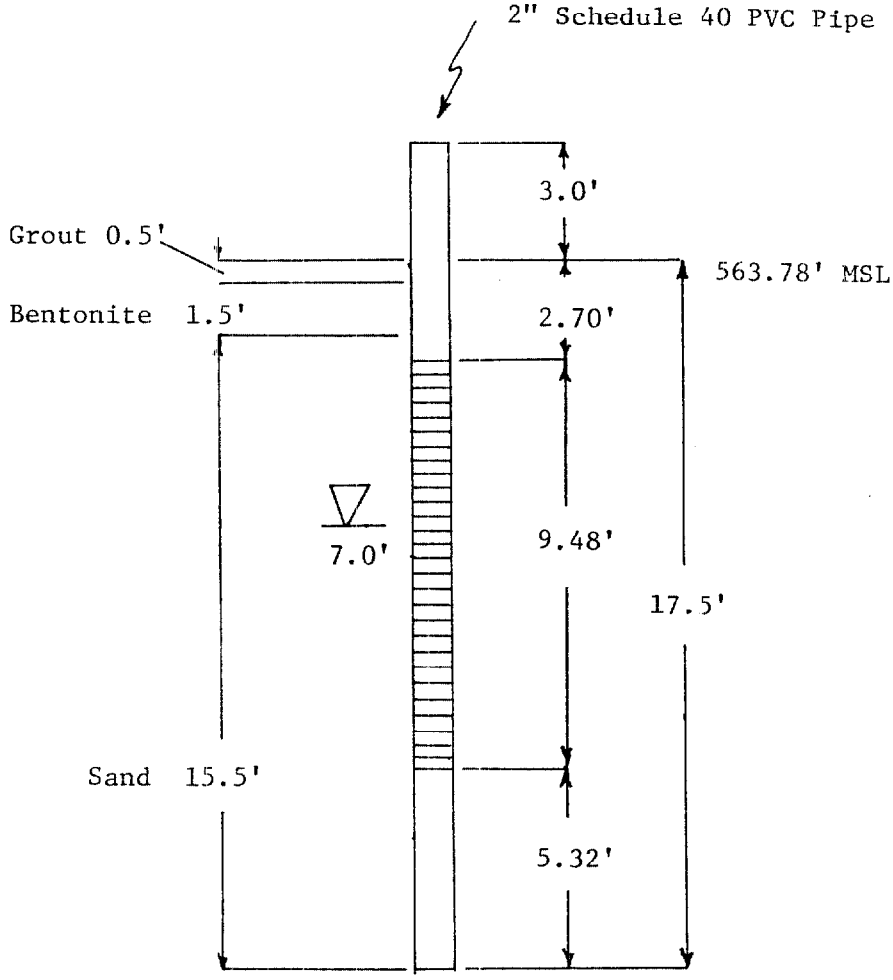
Well screen

NWSC, Crane, Indiana

Old Burning Pit

Well Completion

Boring Number: WES-5-7-81



Water depth at time of drilling

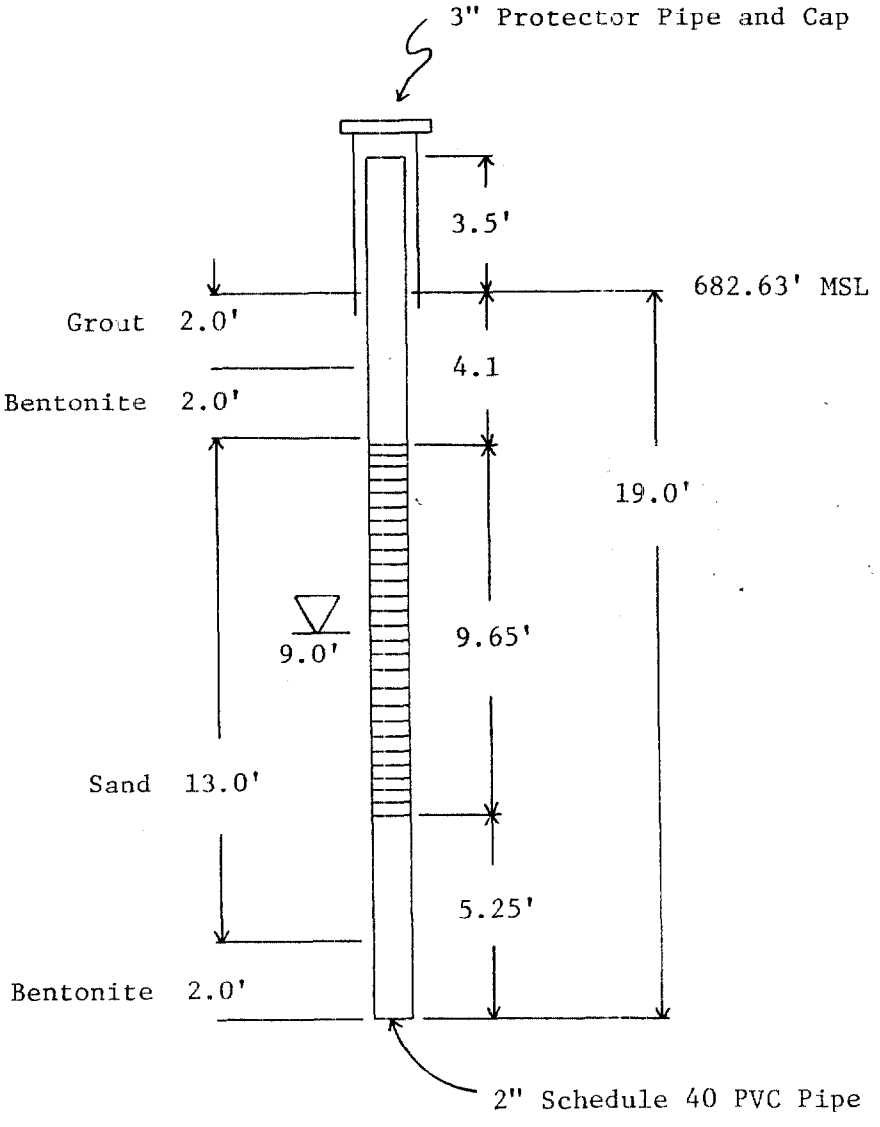
Well screen

NWSC, Crane, Indiana

Old Burning Pit

Well Completion

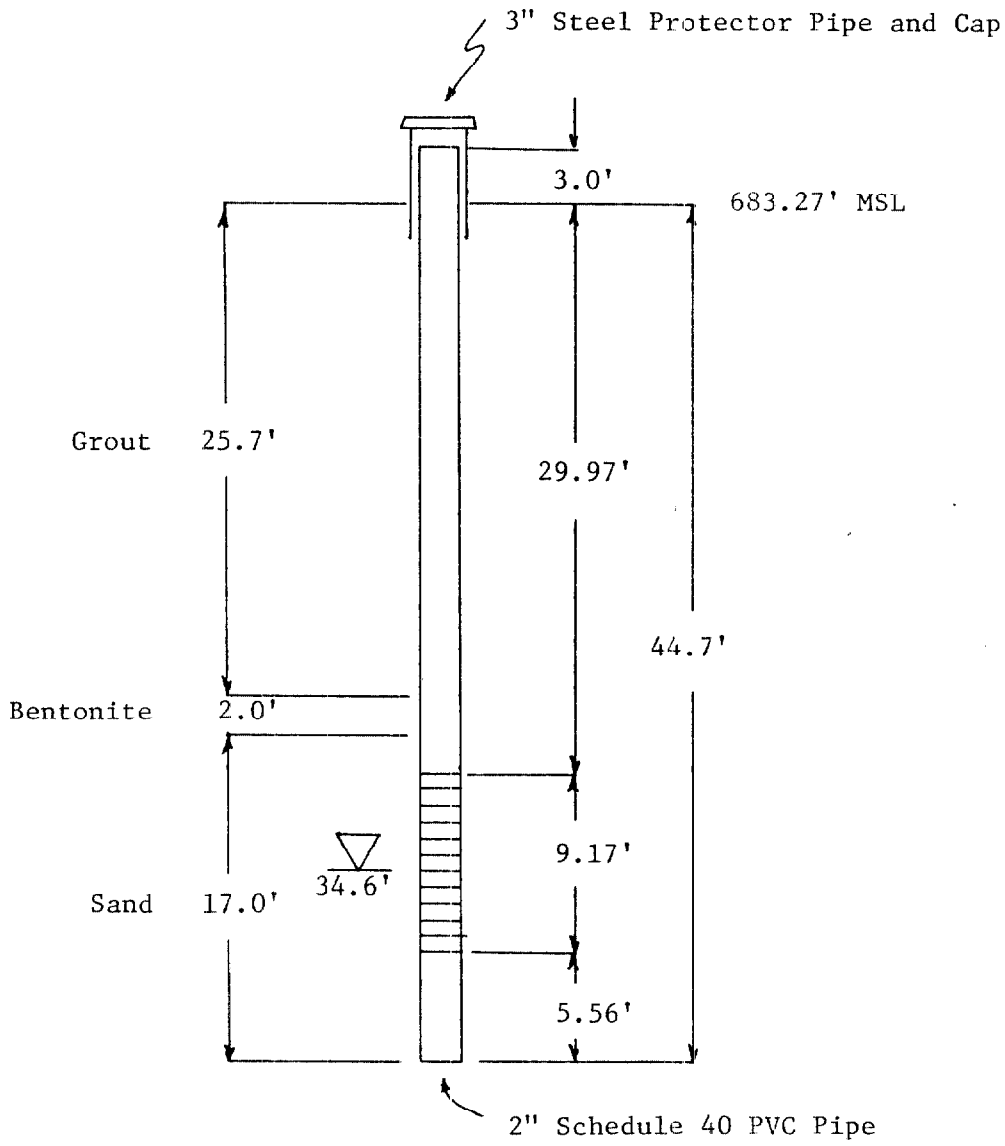
Boring Number: WES-5-8-81



Well screen

Water depth at time of drilling

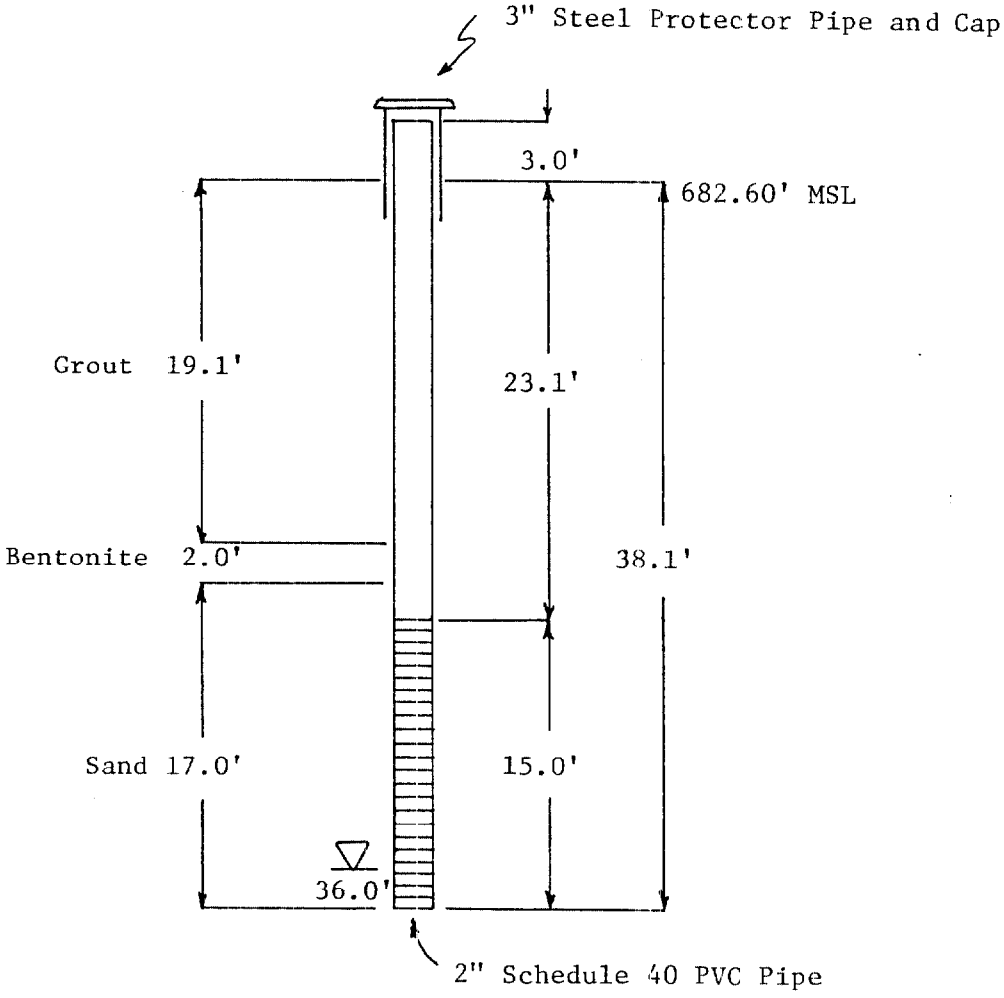
NWSC, Crane, Indiana
Demolition Area
Well Completion
Boring Number: WES-6-1A-81



Well screen

Water depth at time of drilling

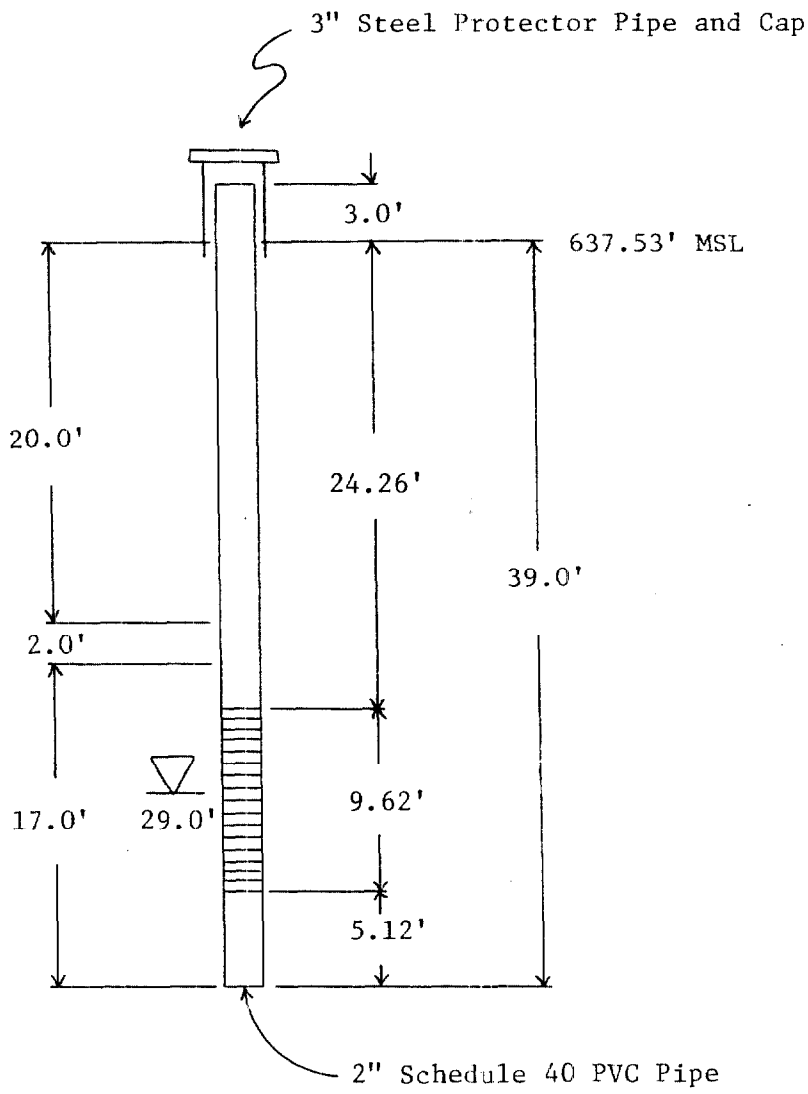
NWSC, Crane, Indiana
Demolition Area
Well Completion
Boring Number: WES-6-1B-81



Well screen

Water depth at time of drilling

NWSC, Crane, Indiana
Demolition Area
Well Completion
Boring Number: WES-6-1C-81



Well screen

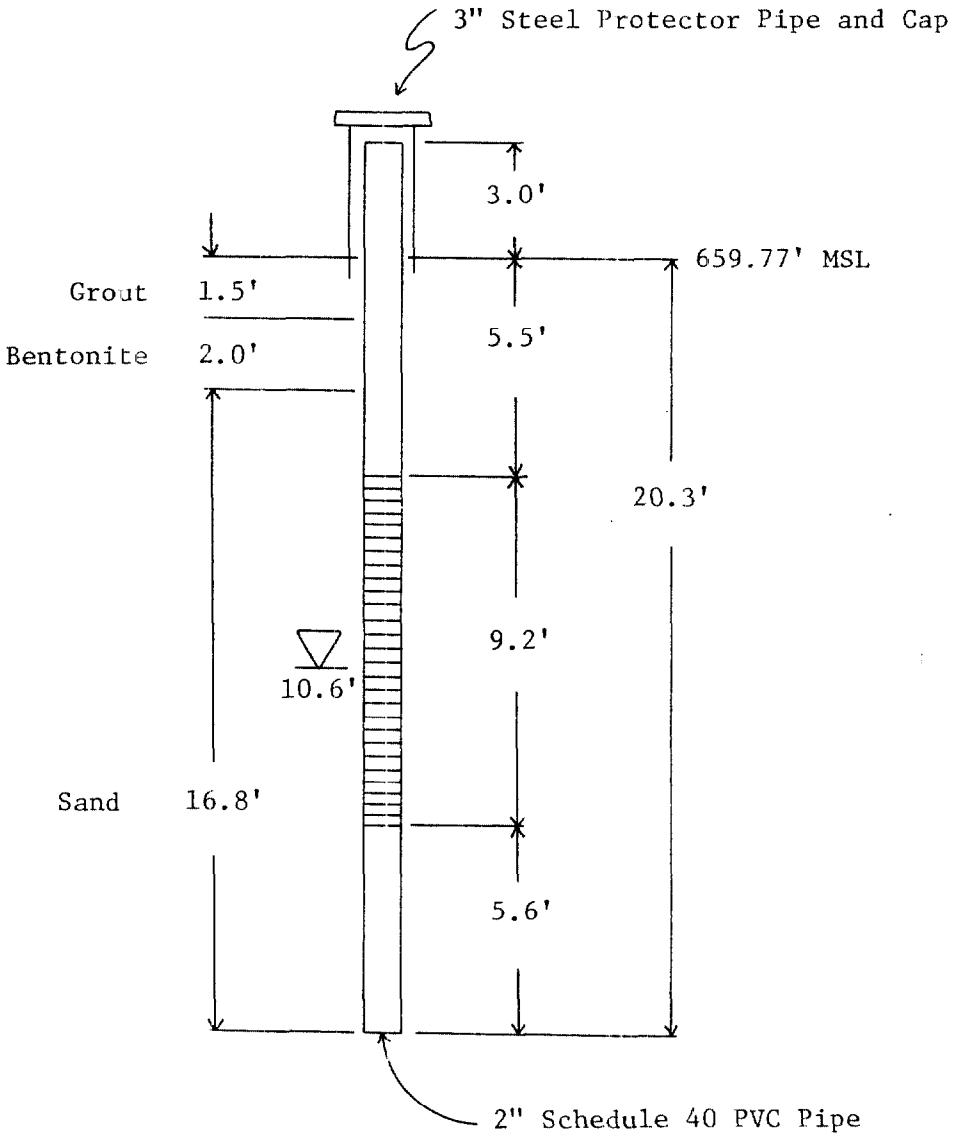
Water depth at time of drilling

NWSC, Crane, Indiana

Demolition Area

Well Completion

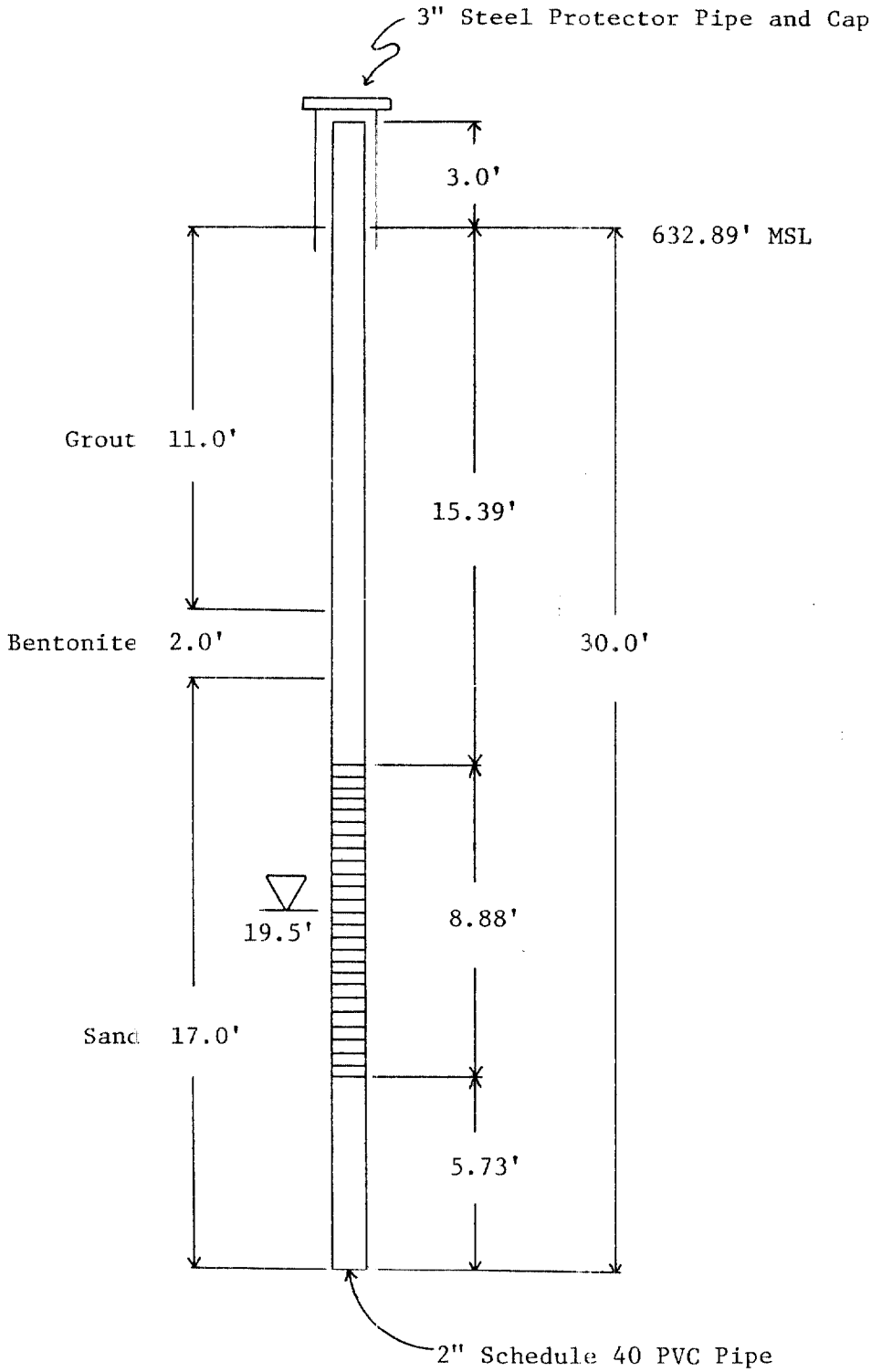
Boring Number: WES-6-2-81



Well screen

Water depth at time of drilling

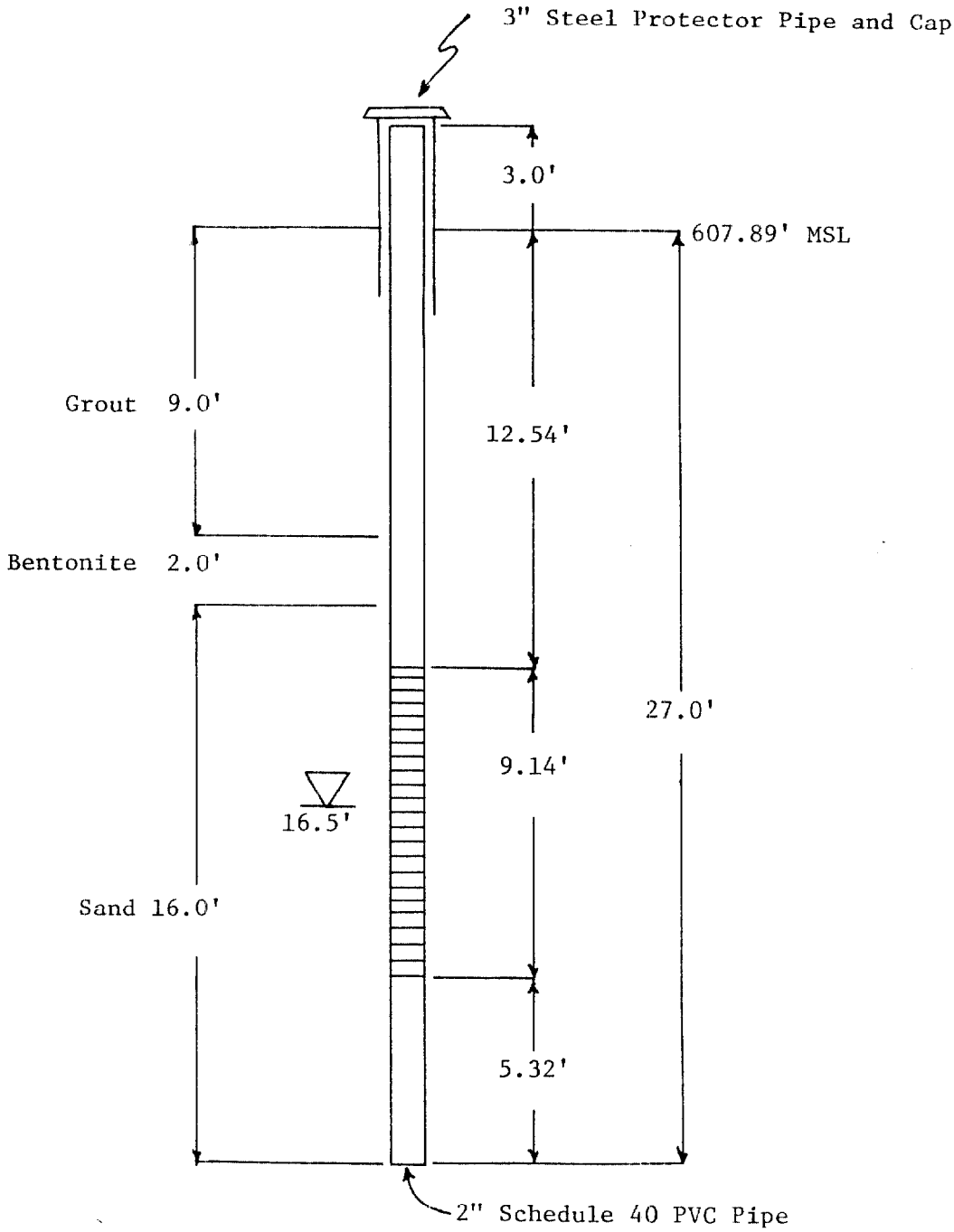
NWSC, Crane, Indiana
Demolition Area
Well Completion
Boring Number: WES-6-3-81



Well screen

Water depth at time of drilling

NWSC, Crane, Indiana
Demolition Area
Well Completion
Boring Number: WES-6-4-81



Well screen

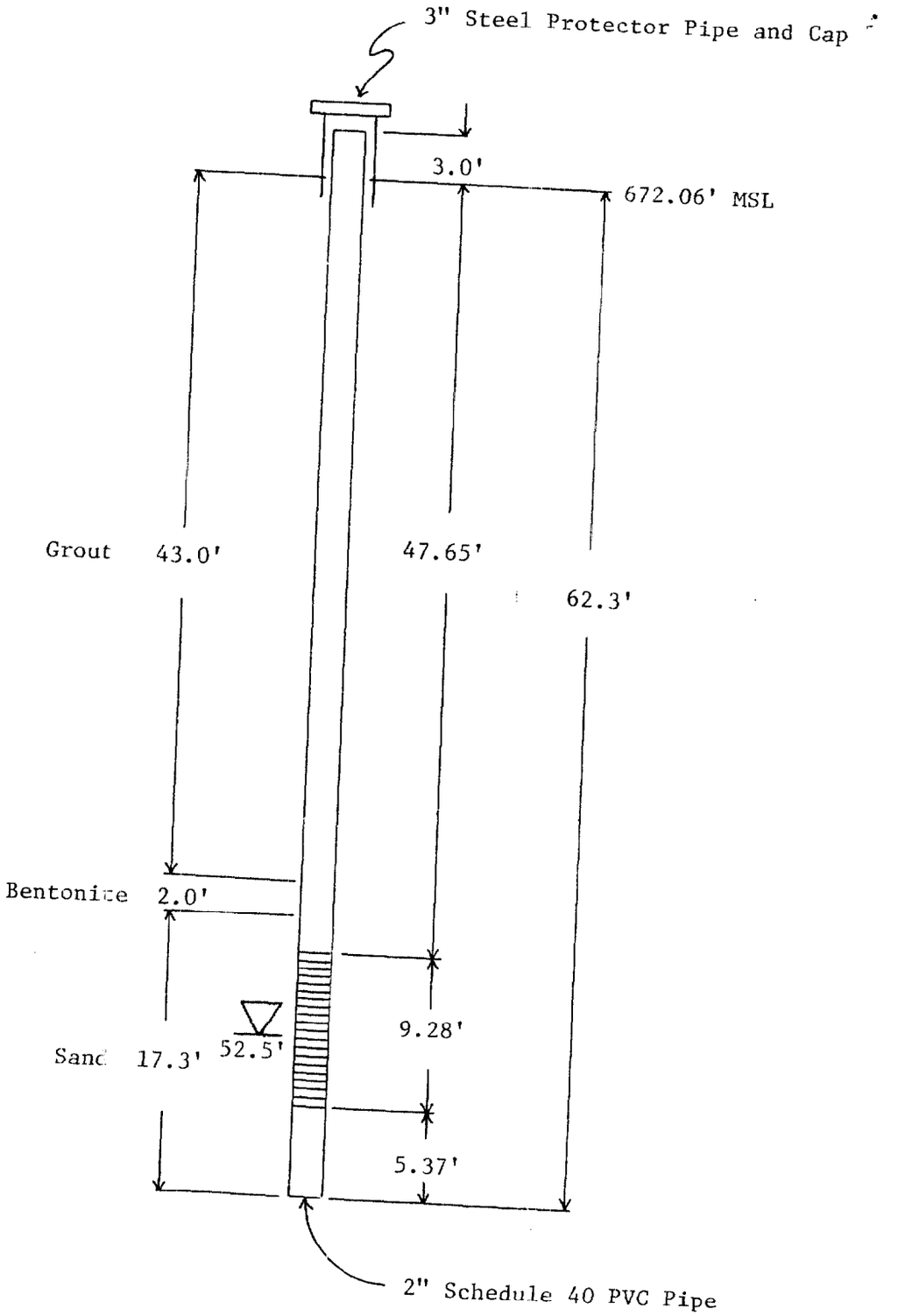
Water depth at time of drilling

NWSC, Crane, Indiana

Demolition Area

Well Completion

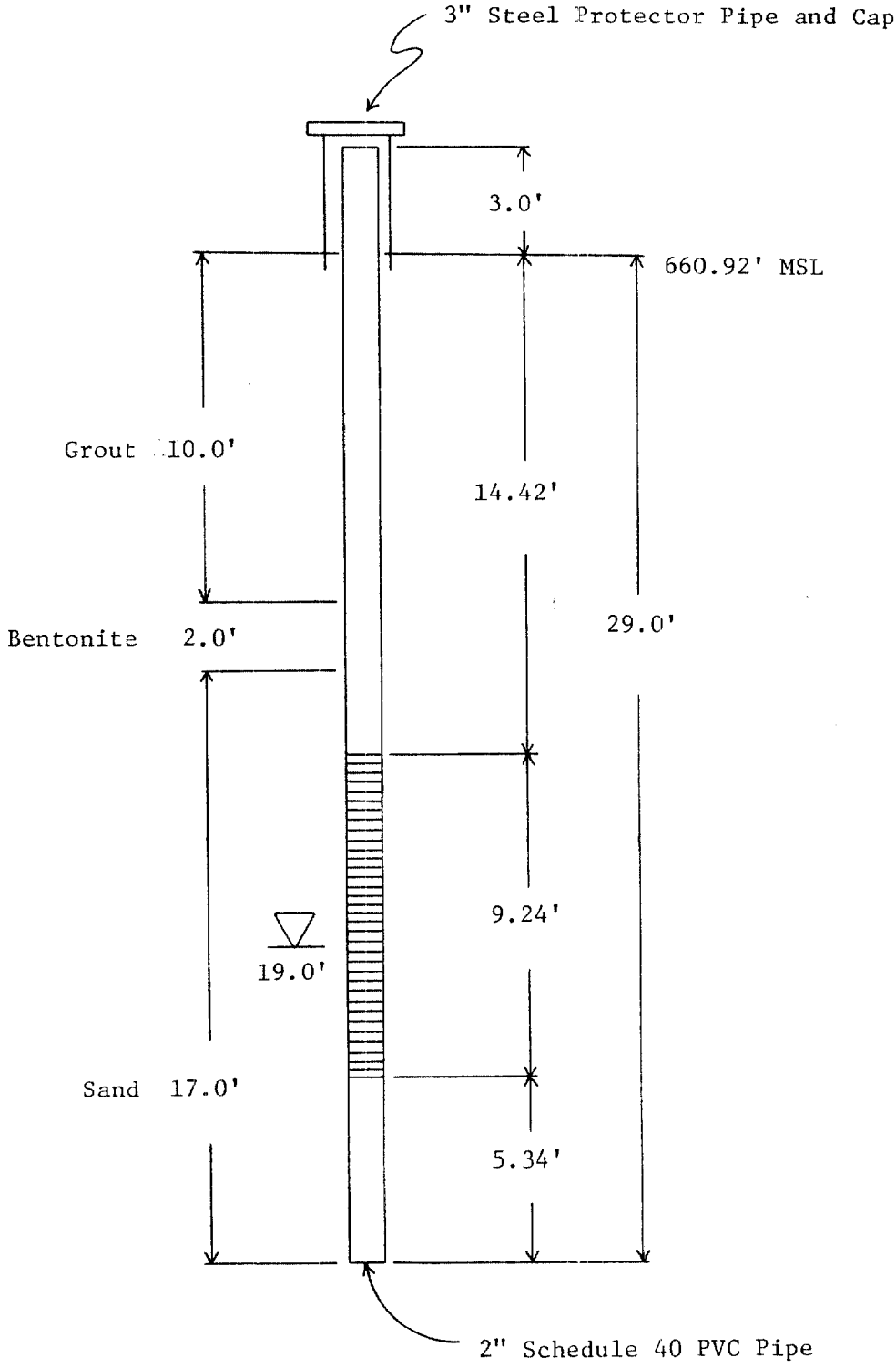
Boring Number: WES-6-5-81



Well screen

Water depth at time of drilling

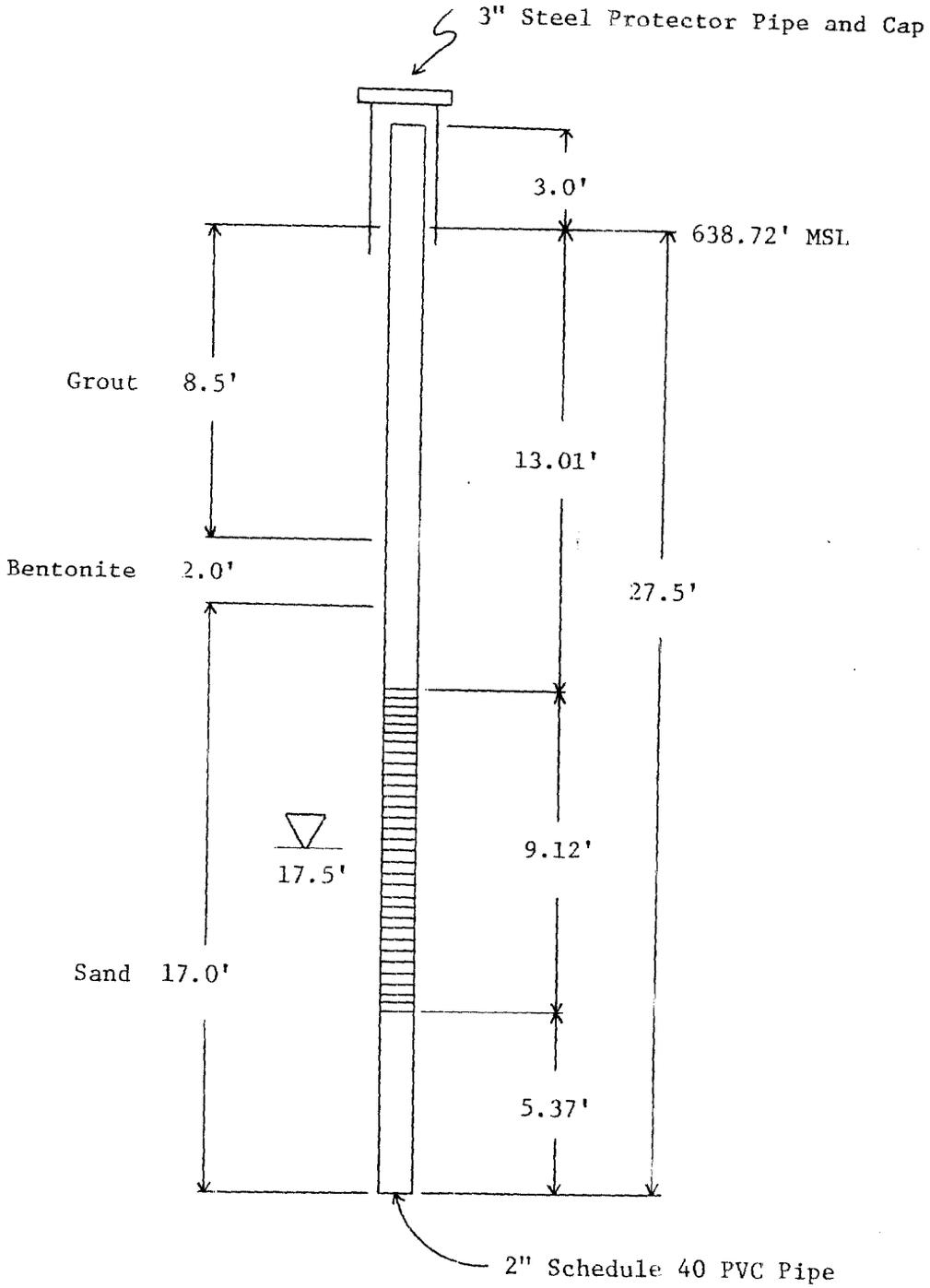
NWSC, Crane, Indiana
Demolition Area
Well Completion
Boring Number: WES-6-6-81



Well screen

Water depth at time of drilling

NWSC, Crane, Indiana
Demolition Area
Well Completion
Boring Number: WES-6-7-81



Well screen

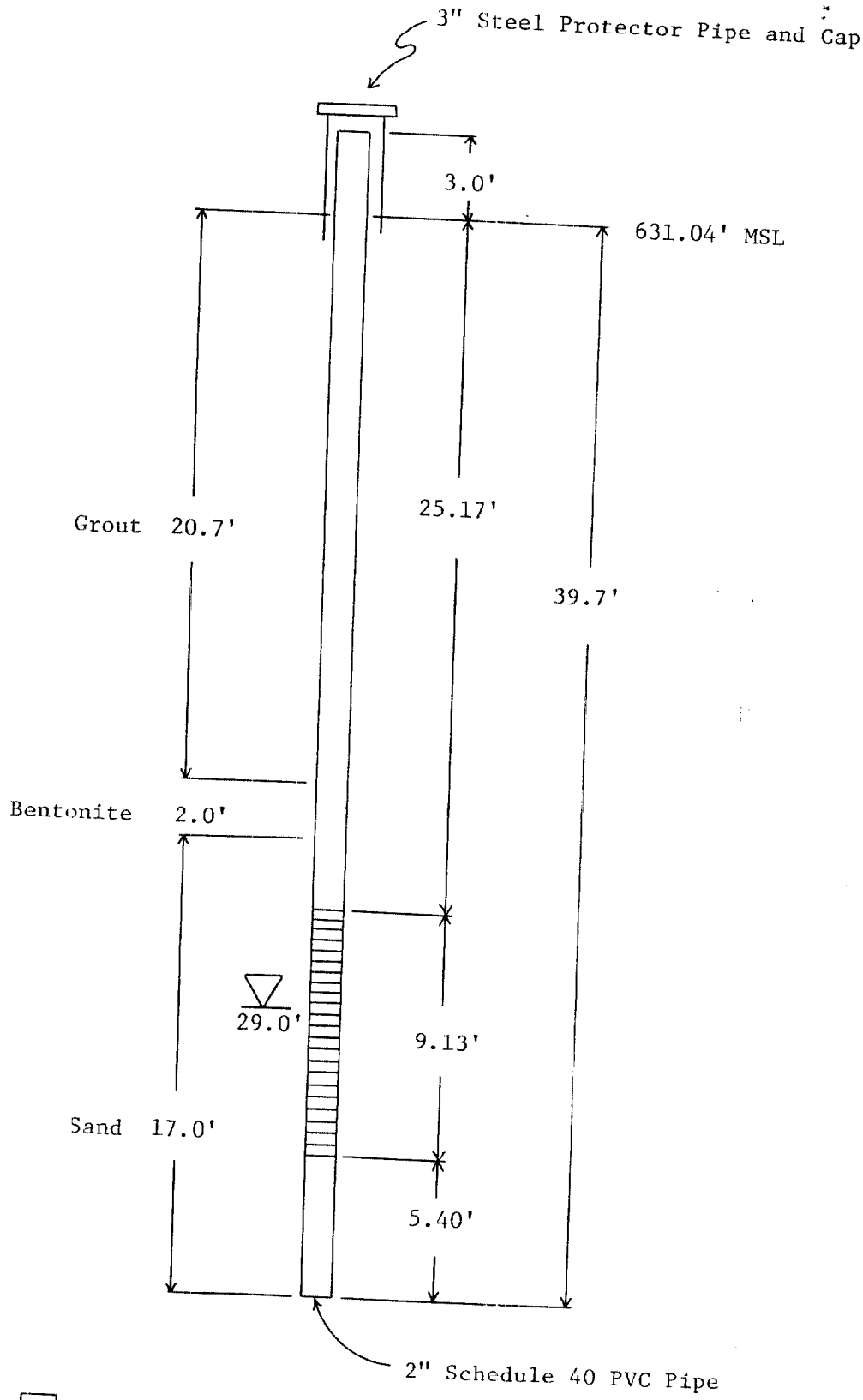
Water depth at time of drilling

NWSC, Crane, Indiana

Demolition Area

Well Completion

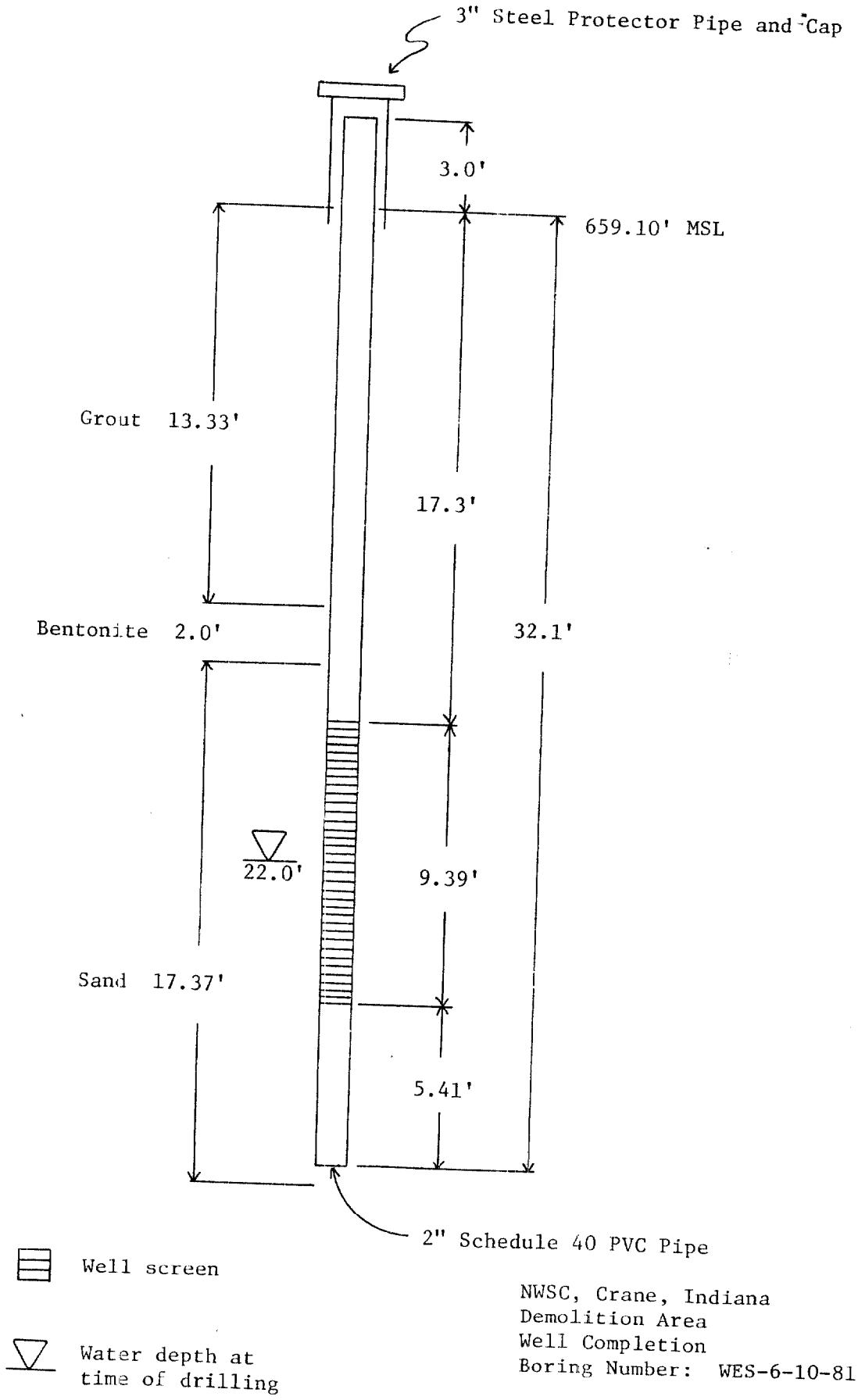
Boring Number: WES-6-8-81



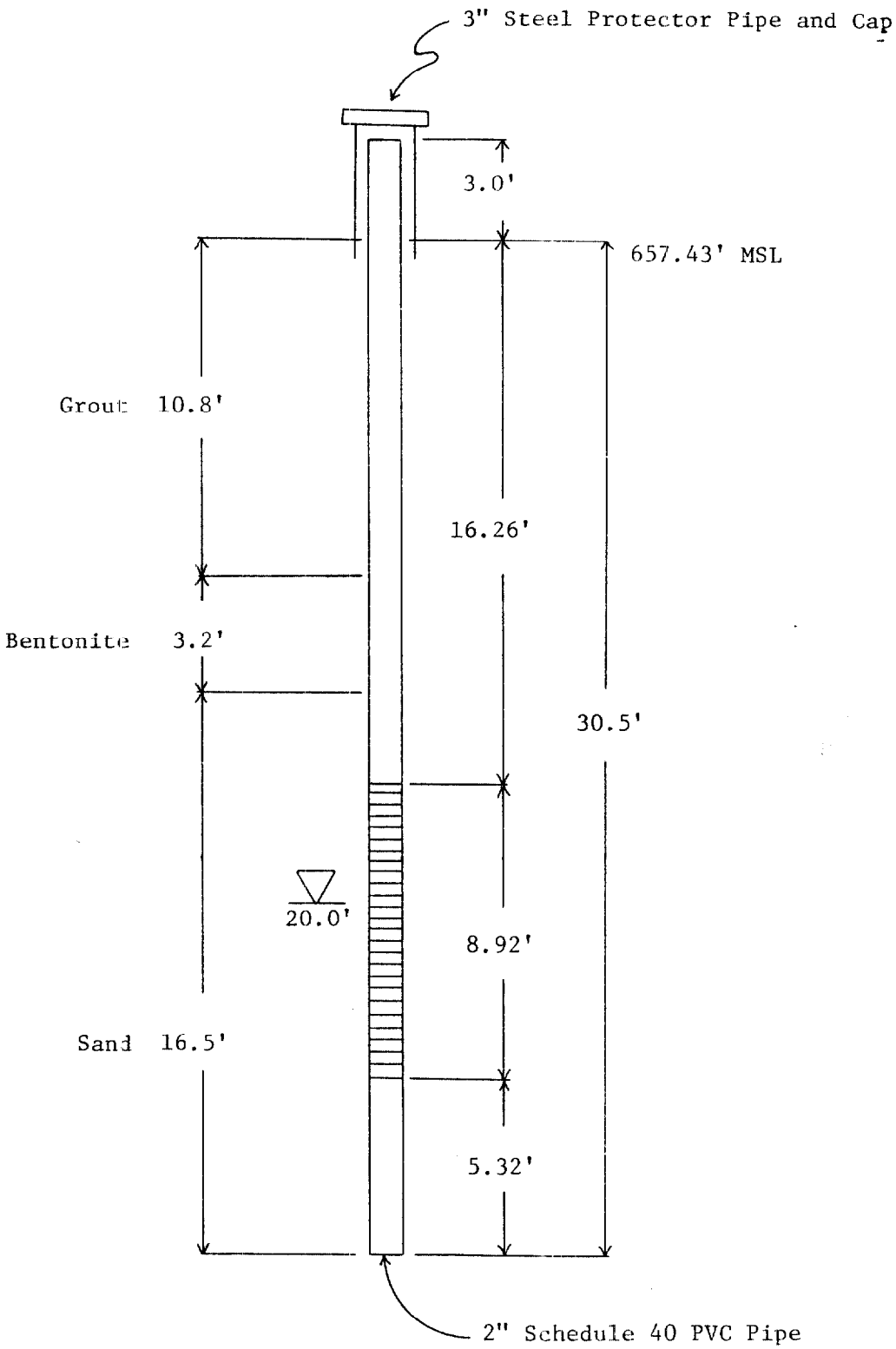
Well screen

Water depth at time of drilling

NWSC, Crane, Indiana
Demolition Area
Well Completion
Boring Number: WES-6-9-81



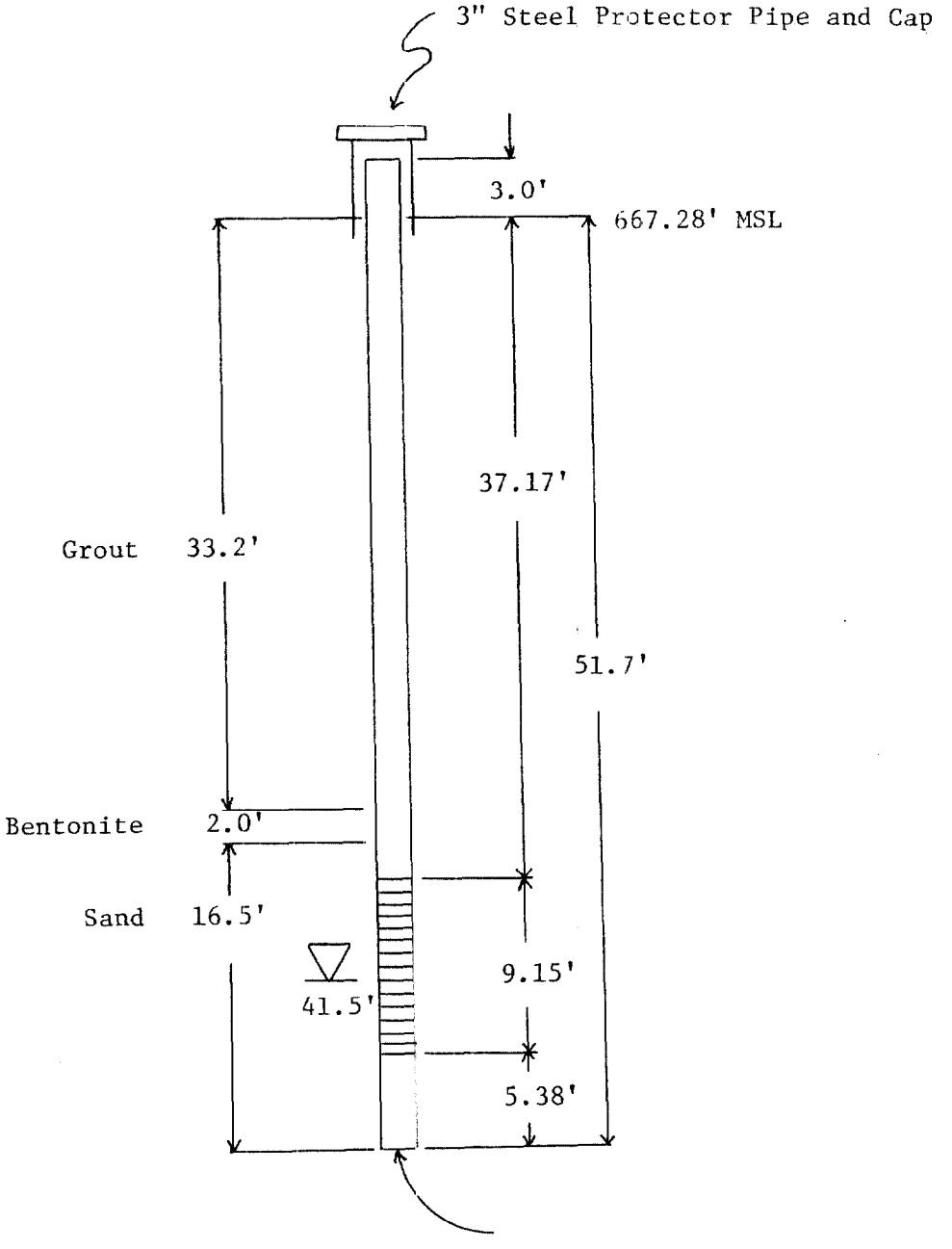
NWSC, Crane, Indiana
Demolition Area
Well Completion
Boring Number: WES-6-10-81



Well screen

Water depth at time of drilling

NWSC, Crane, Indiana
Demolition Area
Well Completion
Boring Number: WES-6-11-81



Well screen

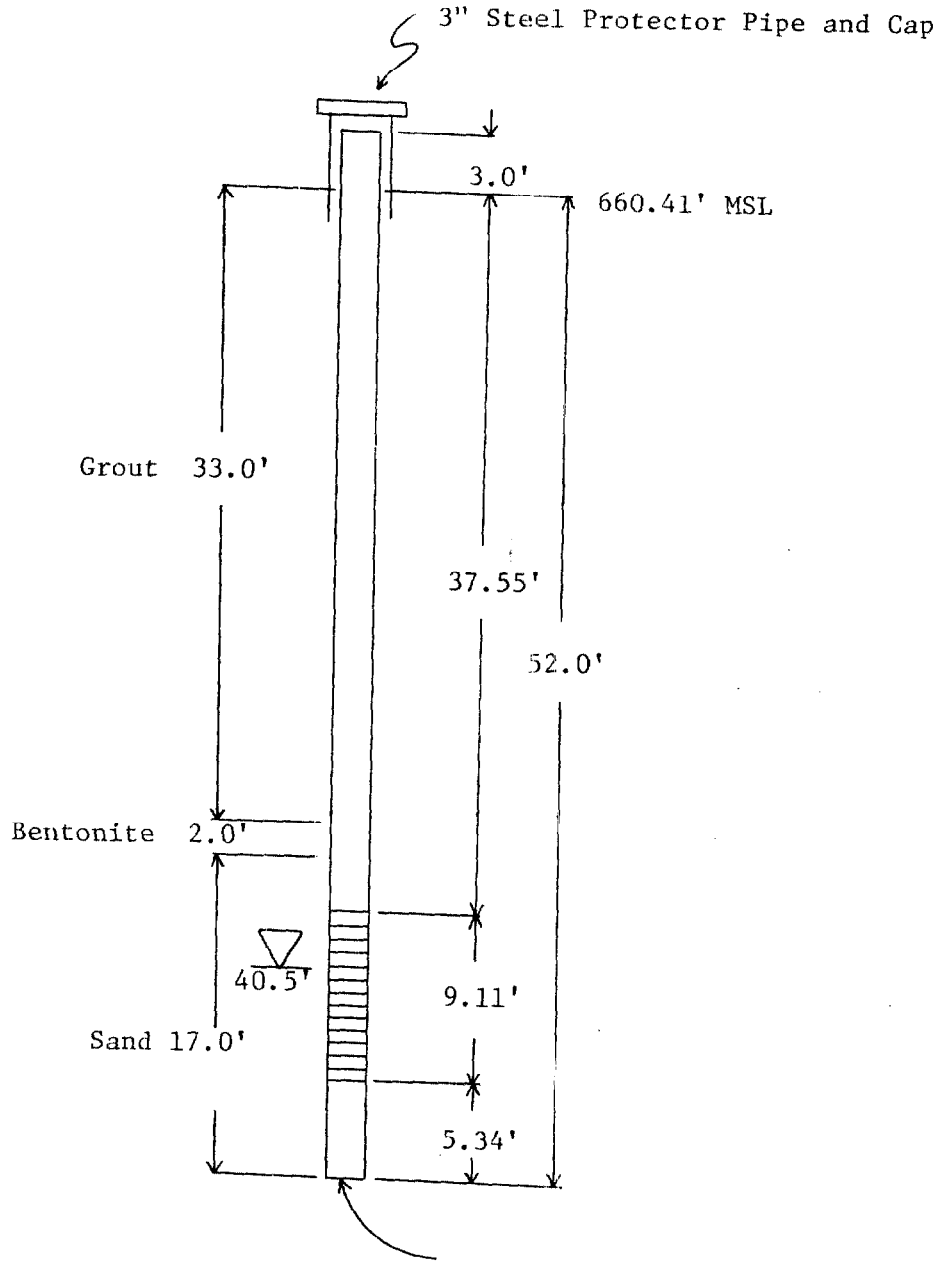
Water depth at time of drilling

NWSC, Crane, Indiana

Demolition Area

Well Completion

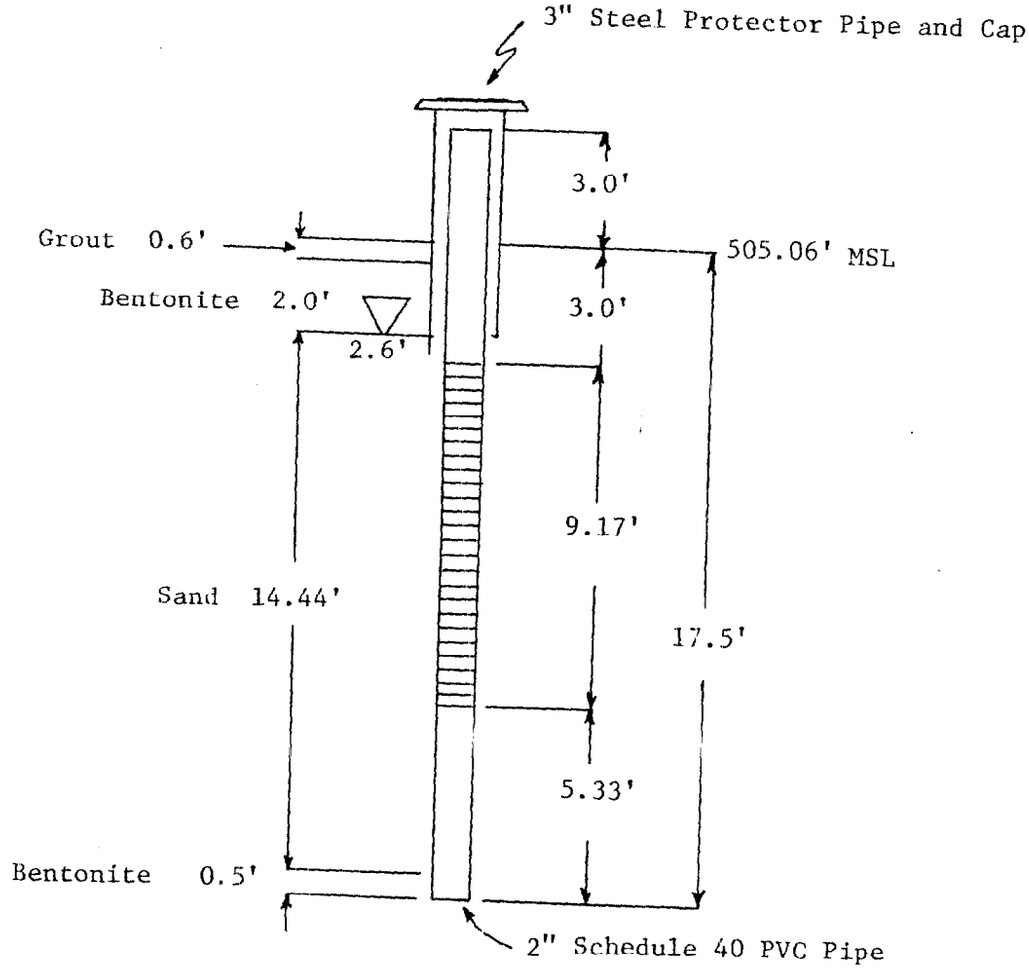
Boring Number: WES-6-12-81



Well screen

Water depth at time of drilling

NWSC, Crane, Indiana
Demolition Area
Well Completion
Boring Number: WES-6-13-81



Well screen

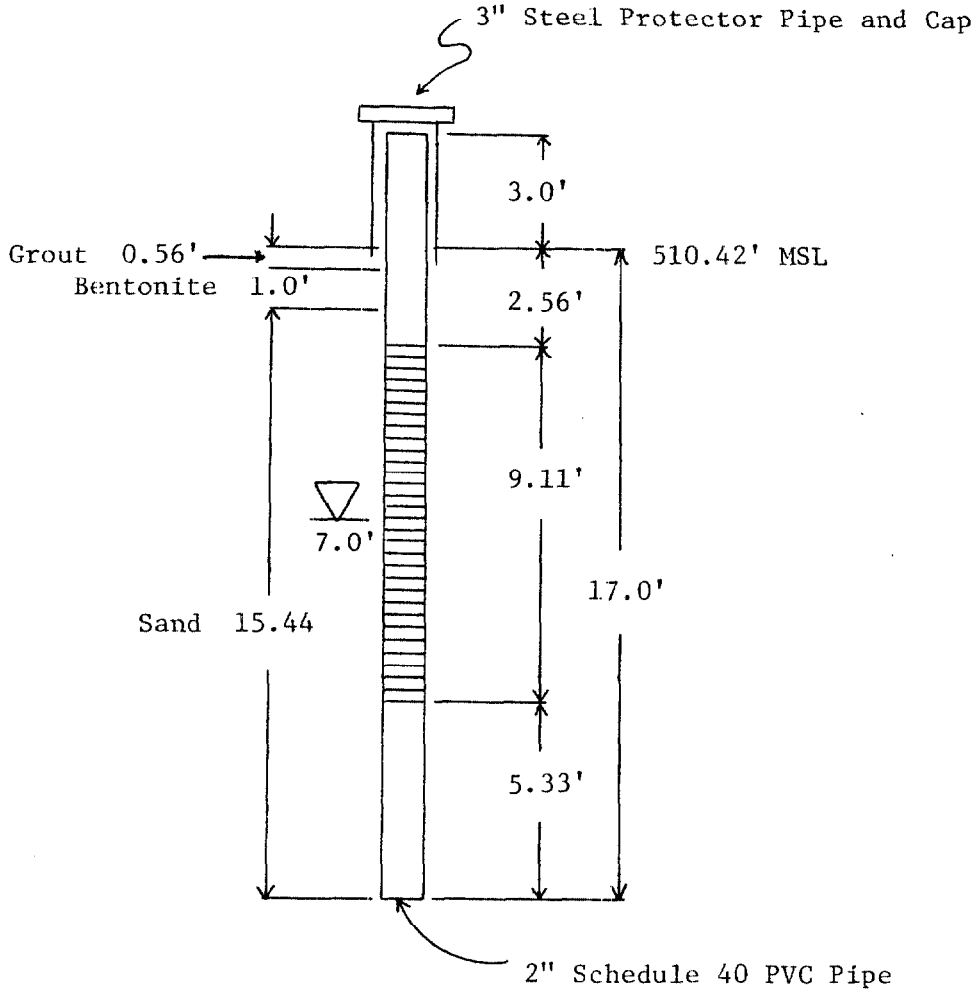
Water depth at time of drilling

NWSC, Crane, Indiana

Rifle Range

Well Completion

Boring Number: WES-6-14-81



Well screen

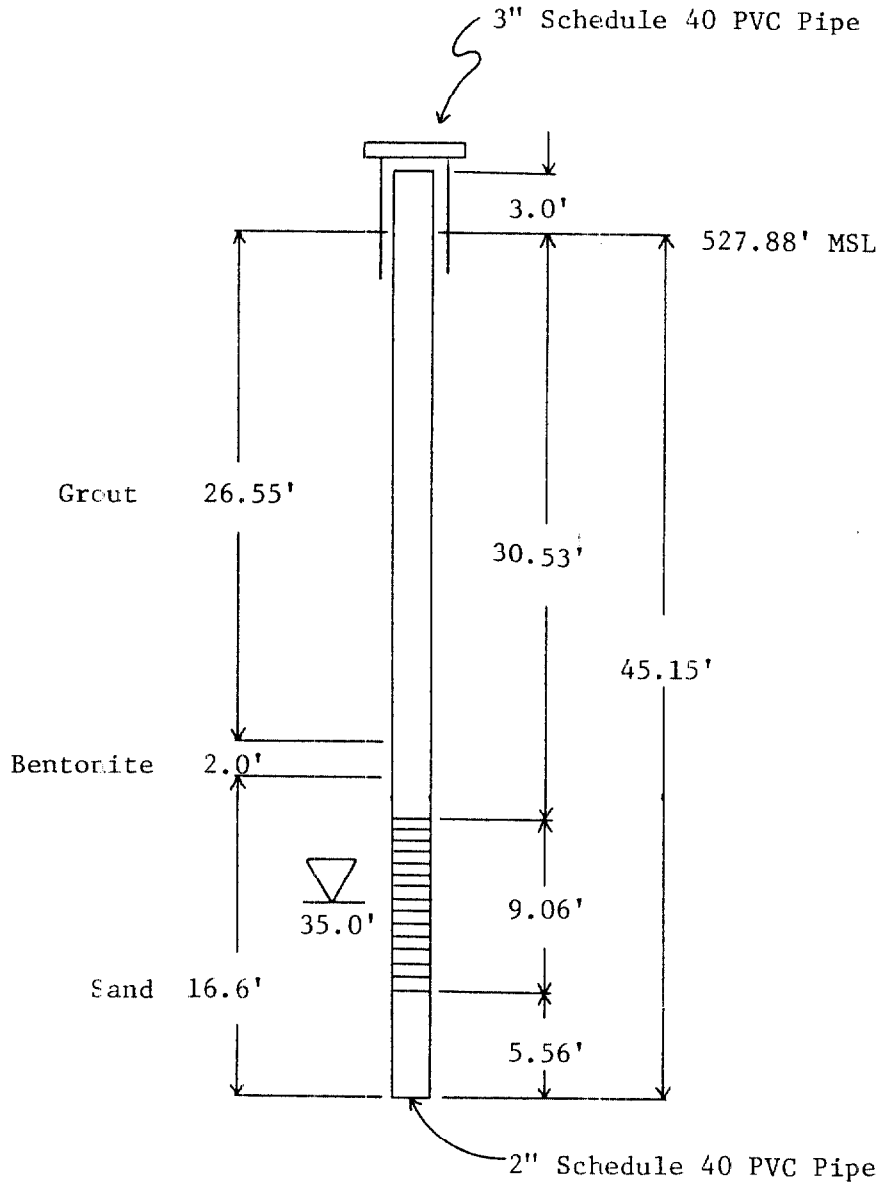
Water depth at time of drilling

NWSC, Crane, Indiana

Rifle Range

Well Completion

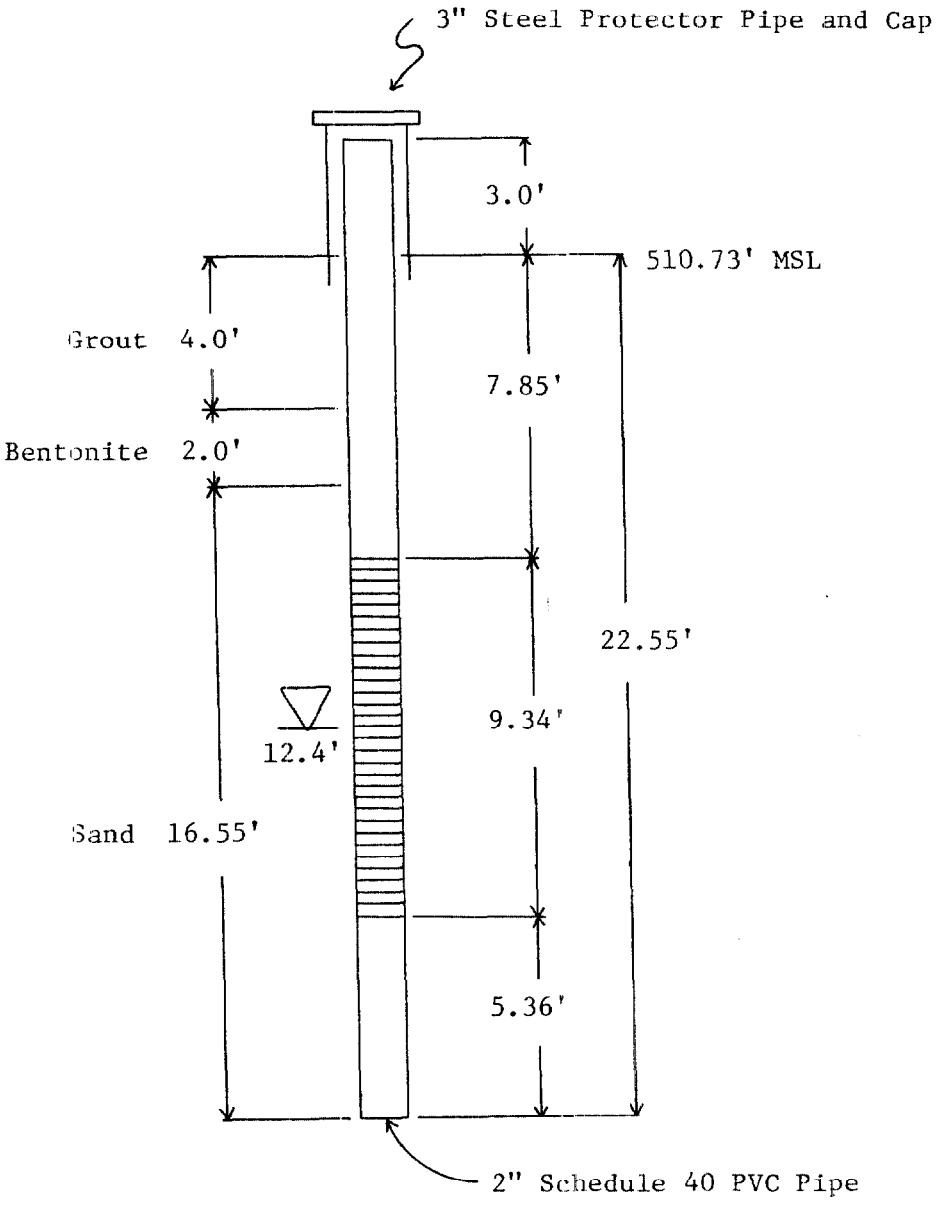
Boring Number: WES-6-15-81



Well screen

Water depth at time of drilling

NWSC, Crane, Indiana
Rifle Range
Well Completion
Boring Number: WES-6-16-81



Well screen

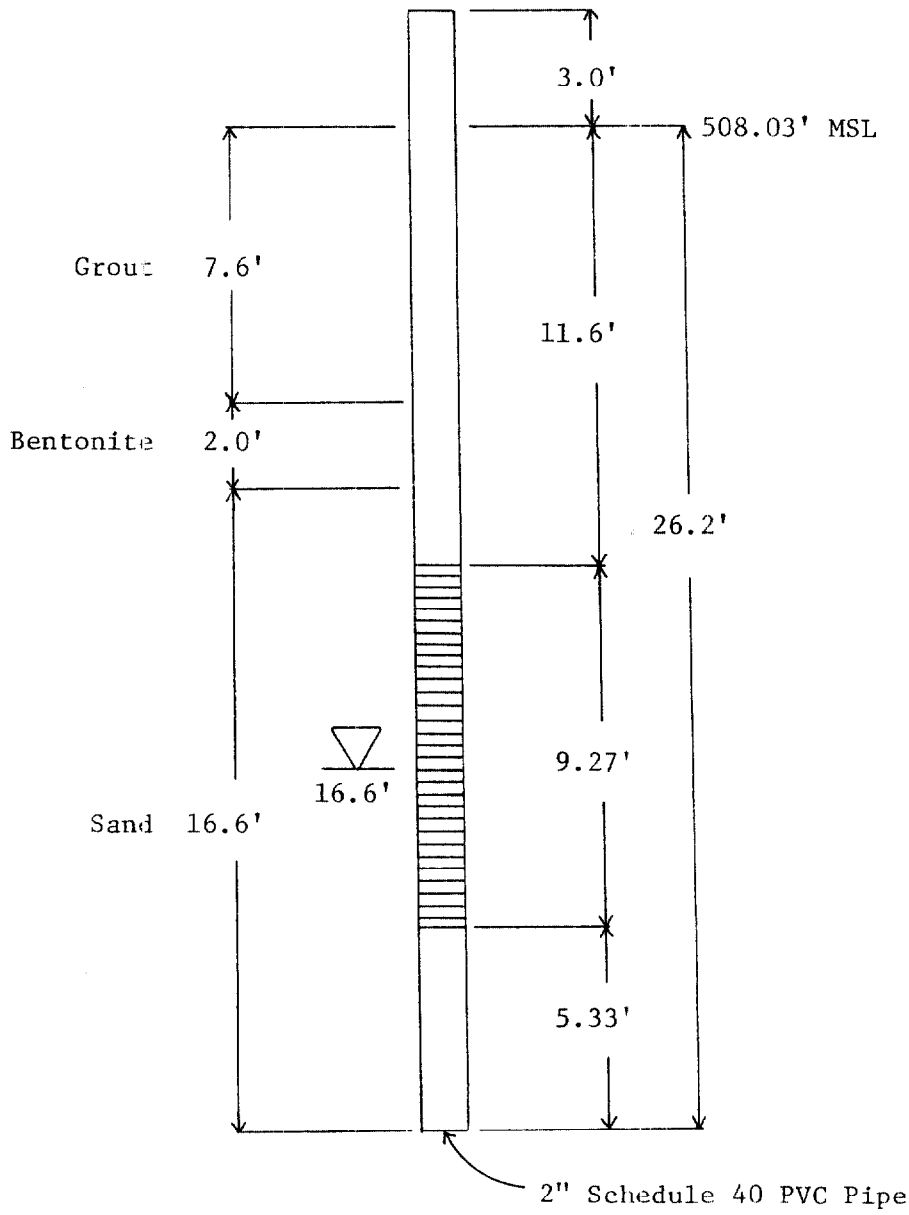
Water depth at time of drilling

NWSC, Crane, Indiana

Rifle Range

Well Completion

Boring Number: WES-6-17-81



Well screen

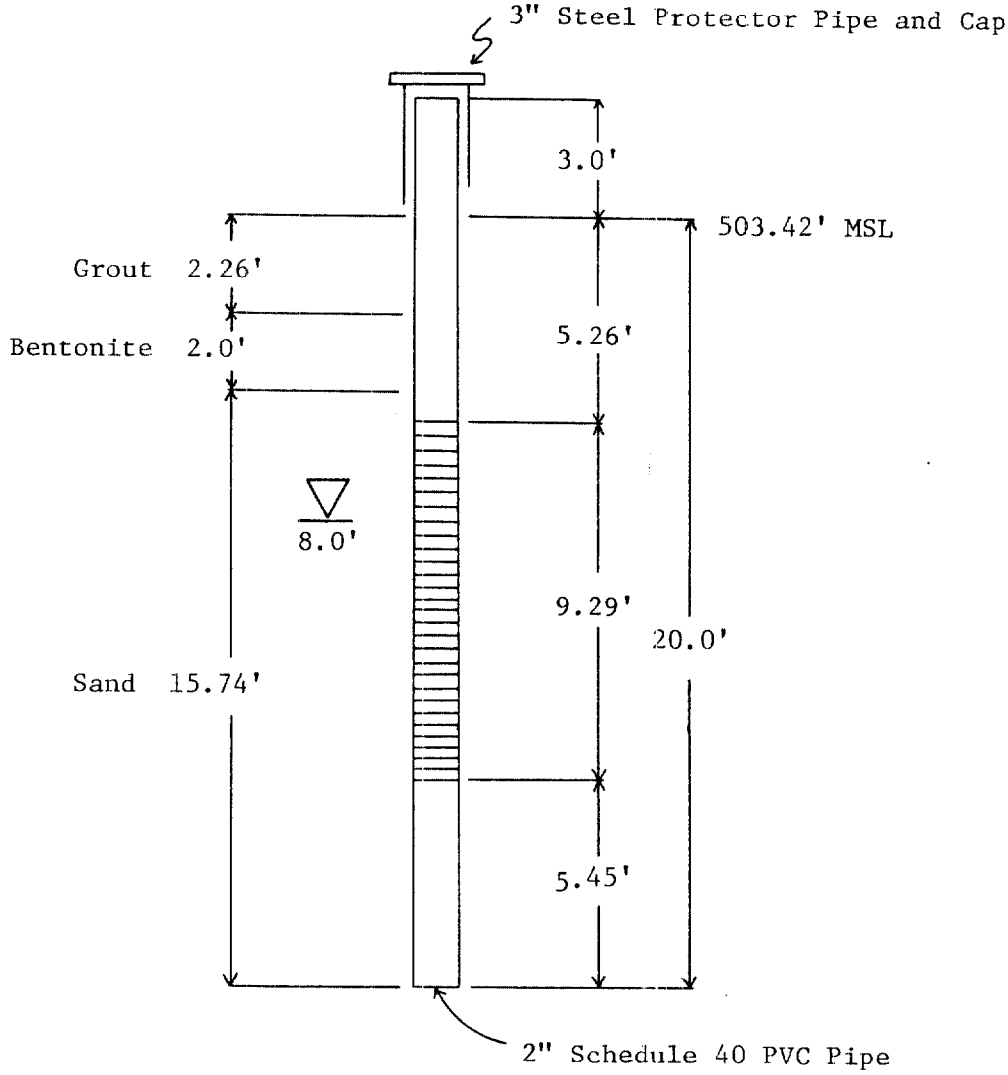
Water depth at time of drilling

NWSC, Crane, Indiana

Rifle Range

Well Completion

Boring Number: WES-6-18-81



Well screen

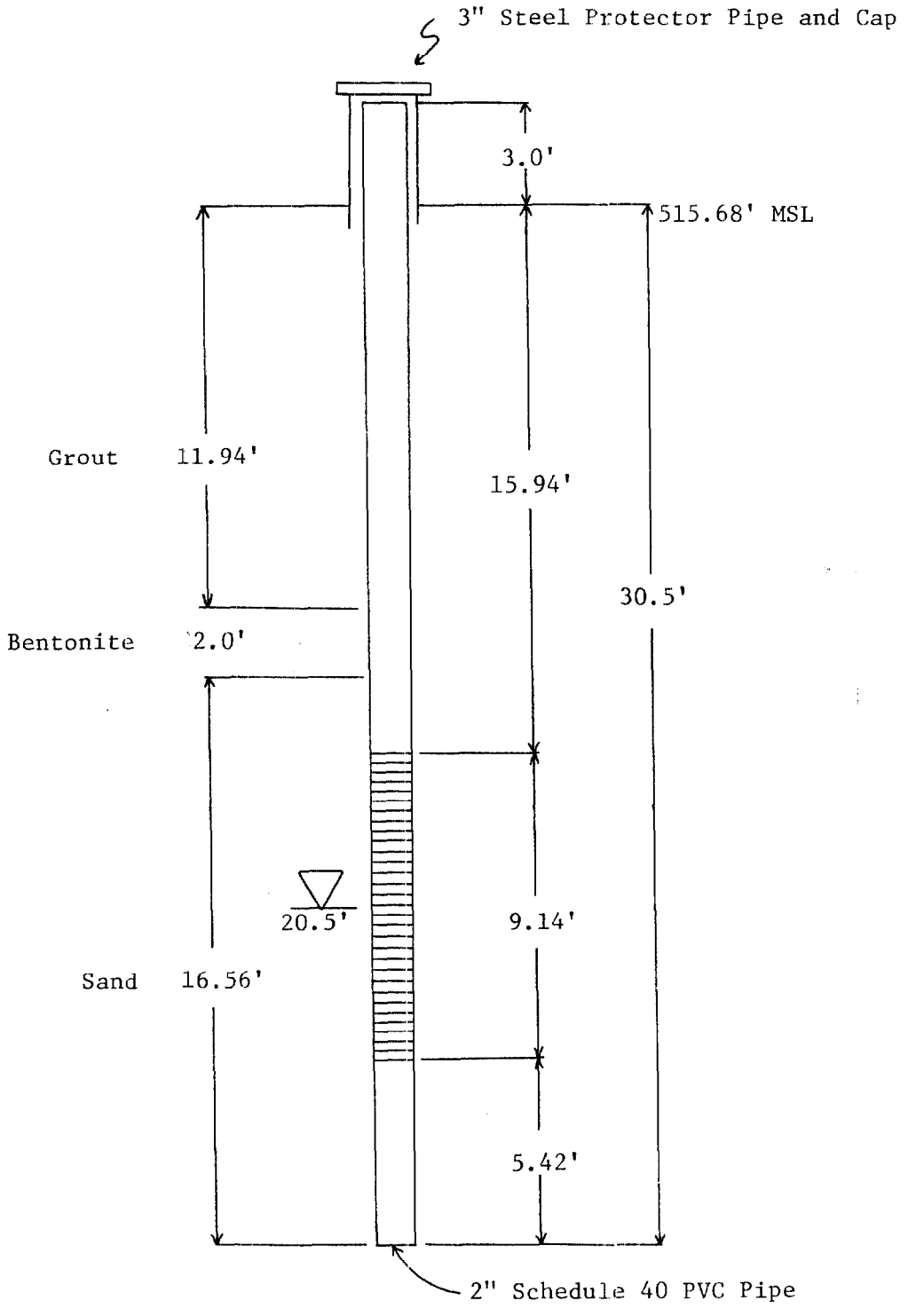
Water depth at time of drilling

NWSC, Crane, Indiana

Rifle Range

Well Completion

Boring Number: WES-6-19-81



Well screen

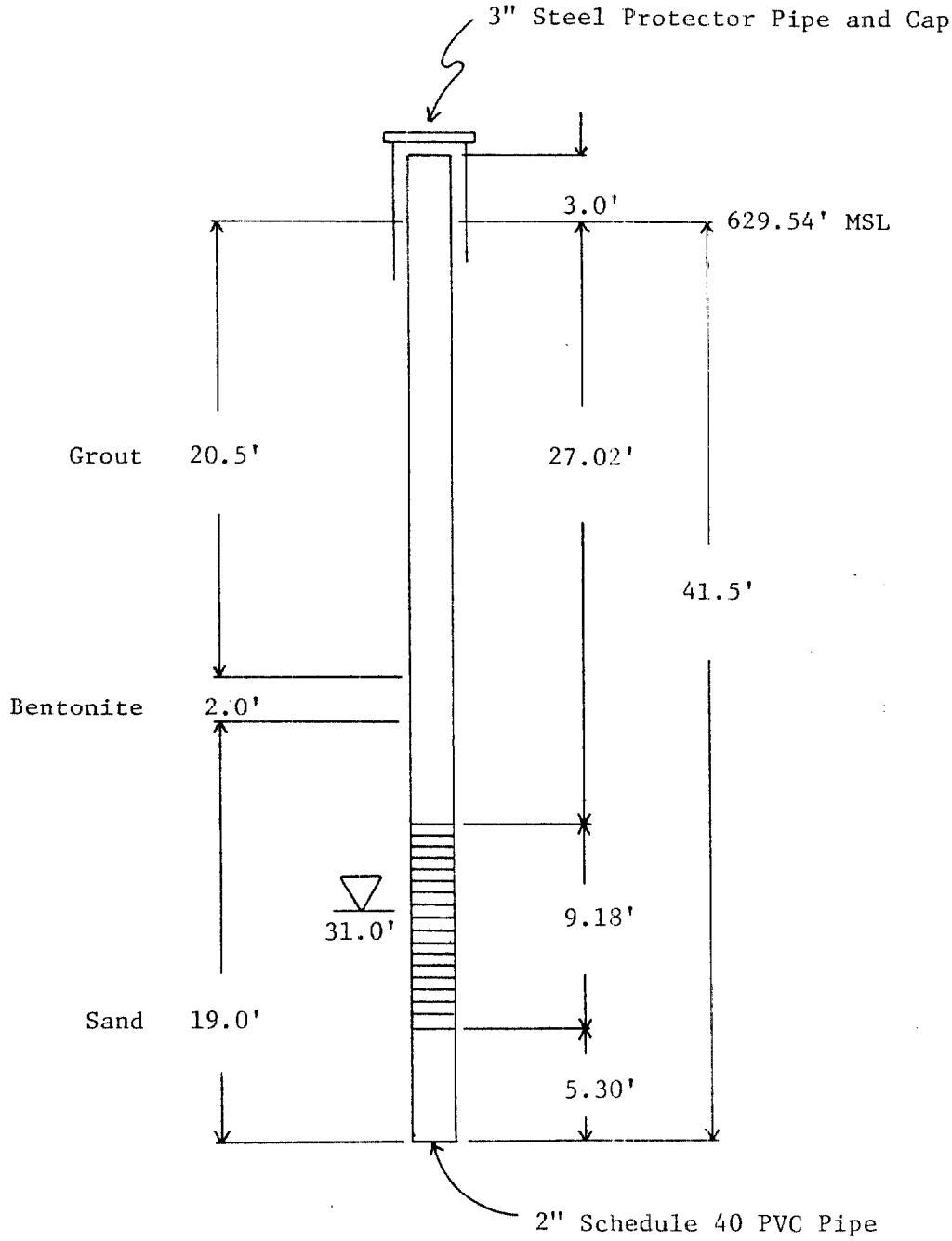
Water depth at time of drilling

NWSC, Crane, Indiana

Rifle Range

Well Completion

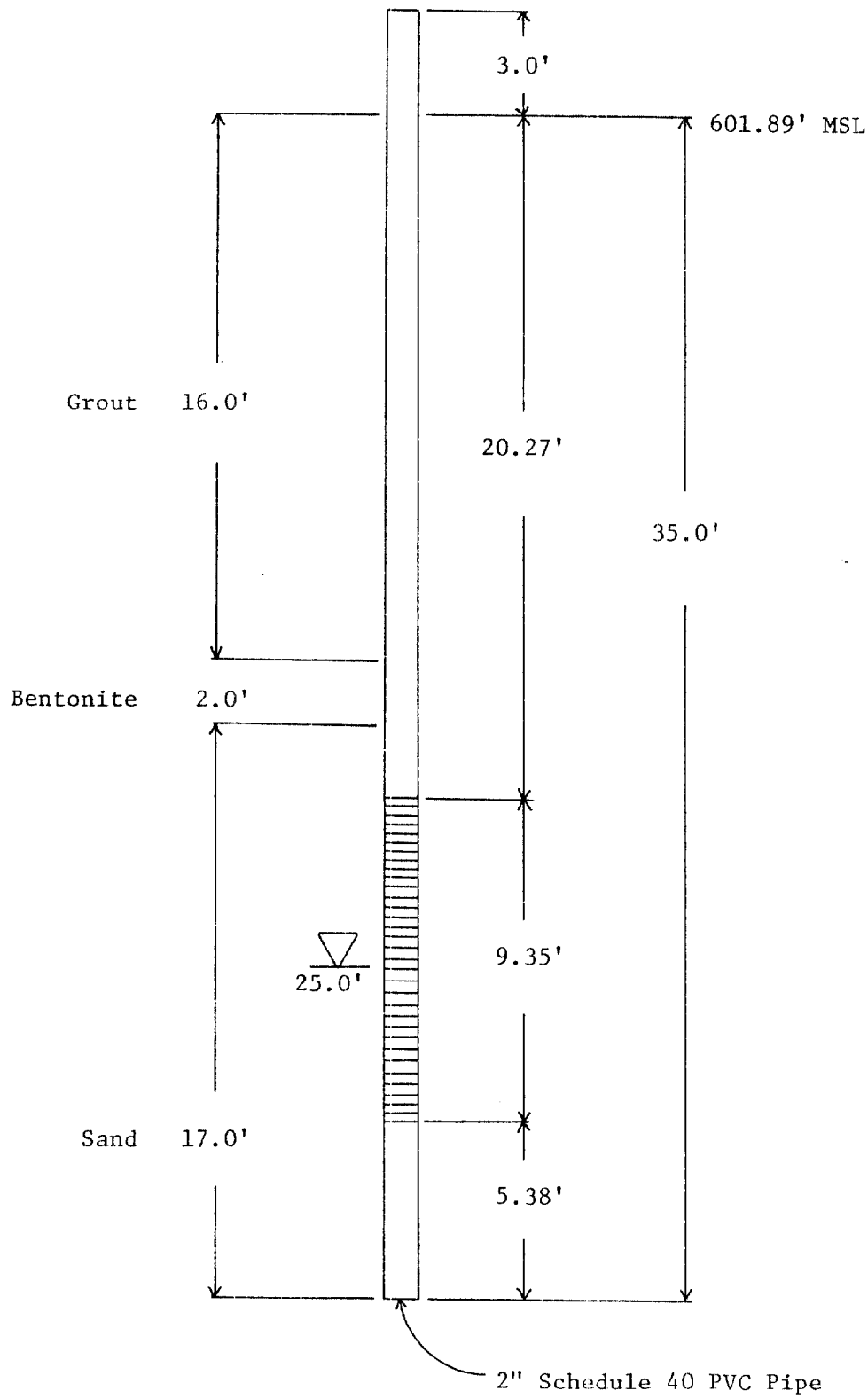
Boring Number: WES-6-20-81



Well screen

Water depth at time of drilling

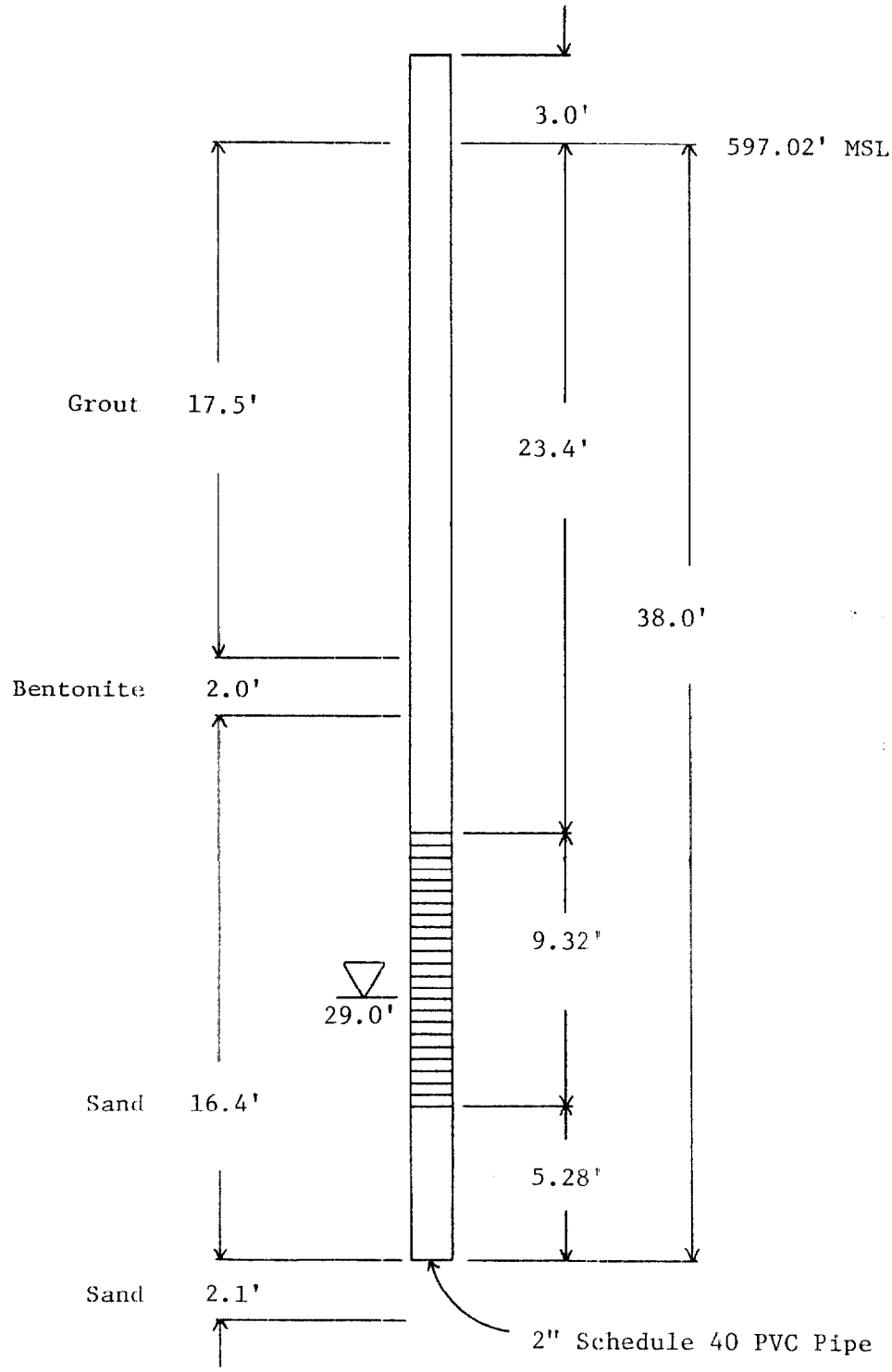
NWSC, Crane, Indiana
Highway 58 Dump Site A
Well Completion
Boring Number: WES-7-1-81



Well screen

Water depth at time of drilling

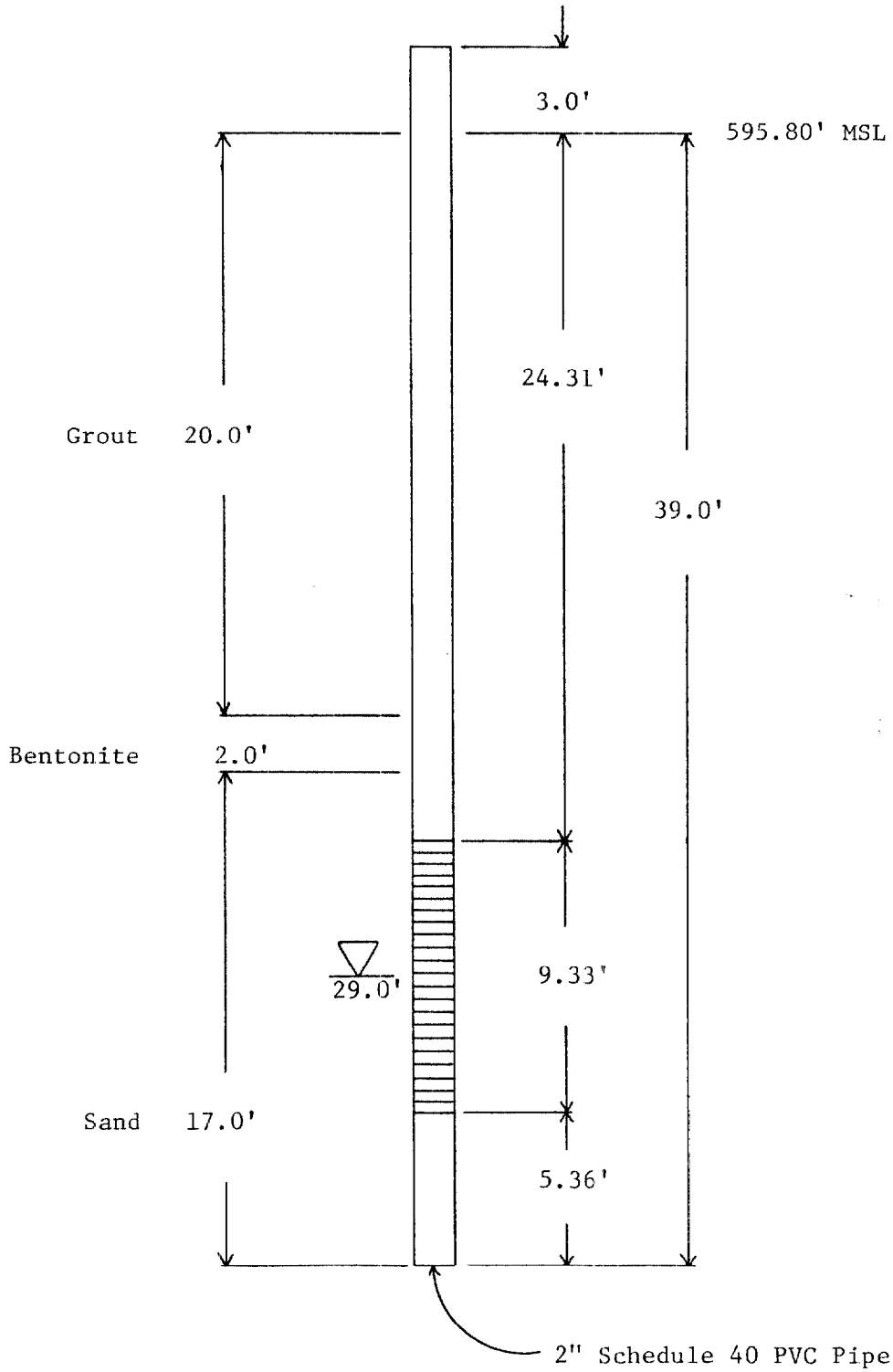
NWSC, Crane, Indiana
Highway 58 Dump Site A
Well Completion
Boring Number: WES-7-2-81



Well screen

Water depth at time of drilling

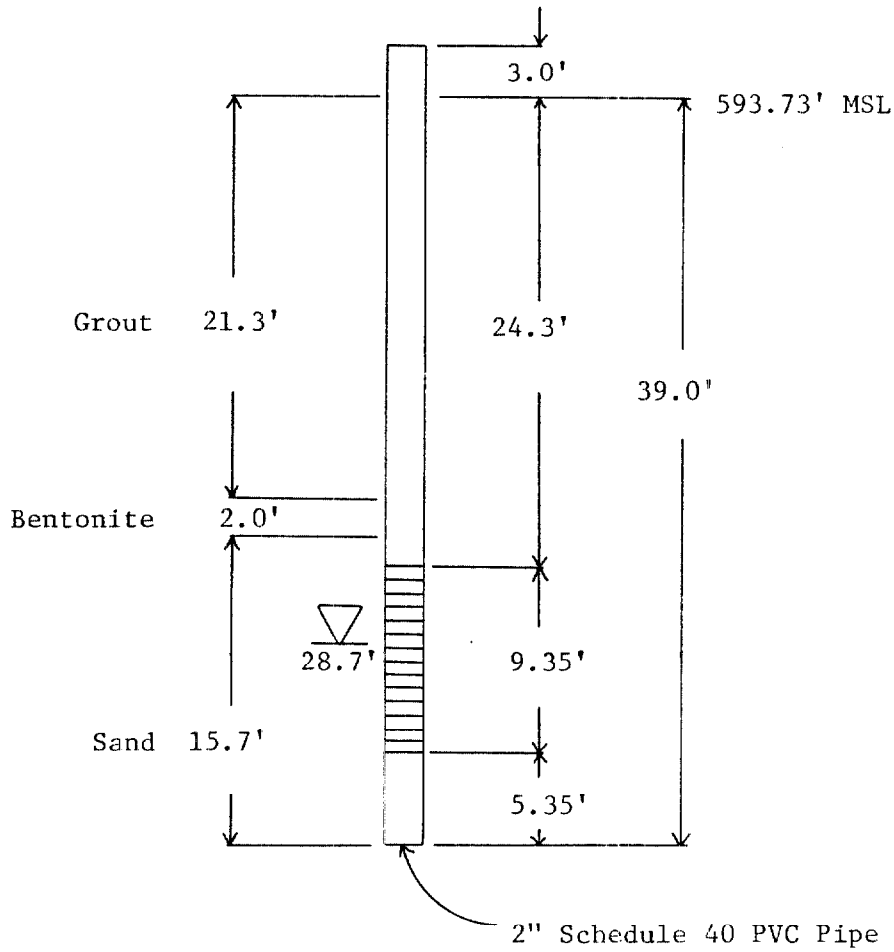
NWSC, Crane, Indiana
Highway 58 Dump Site A
Well Completion
Boring Number: WES-7-3-81



Well screen

Water depth at time of drilling

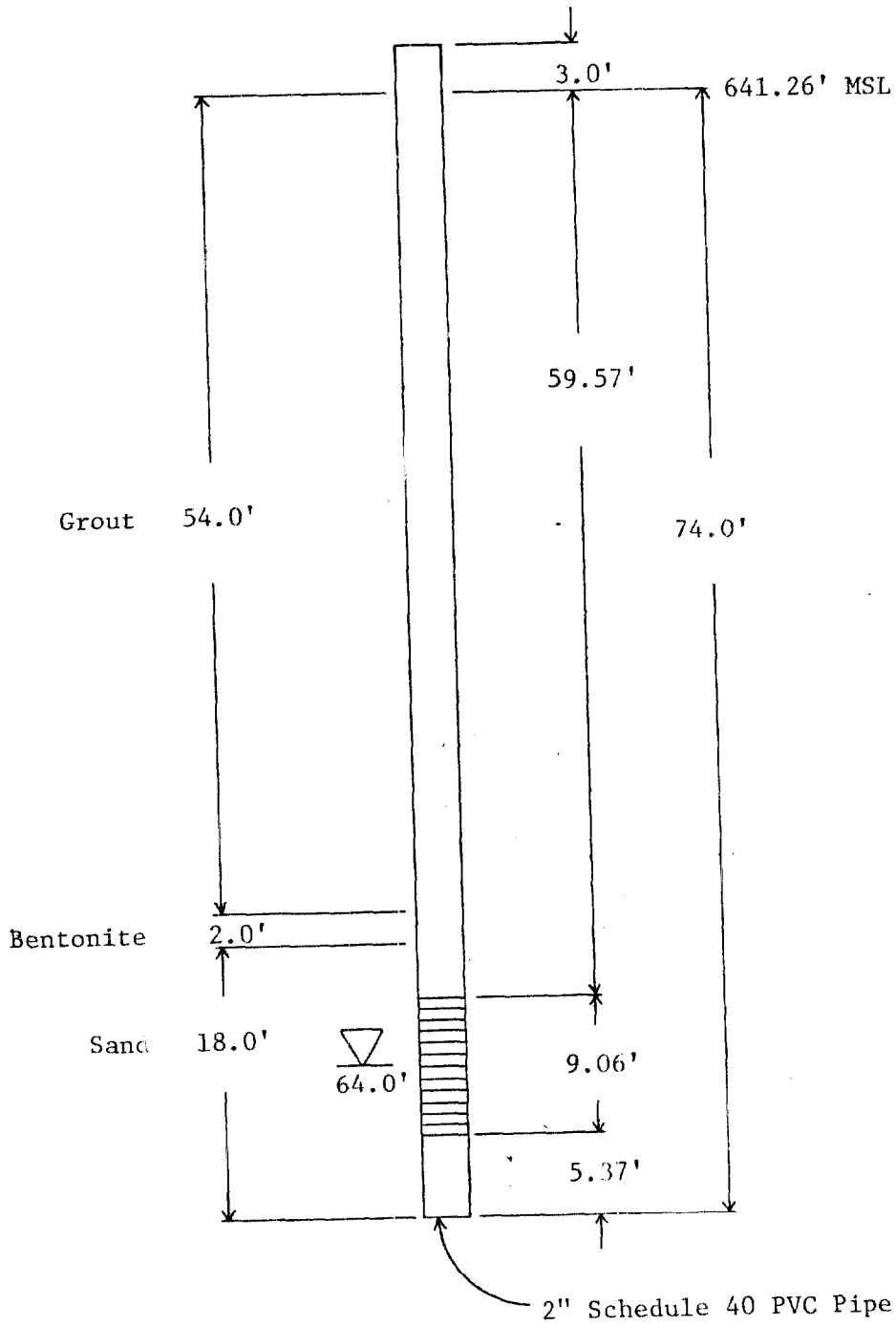
NWSC, Crane, Indiana
Highway 58 Dump Site A
Well Completion
Boring Number: WES-7-4-81



Well screen

Water depth at time of drilling

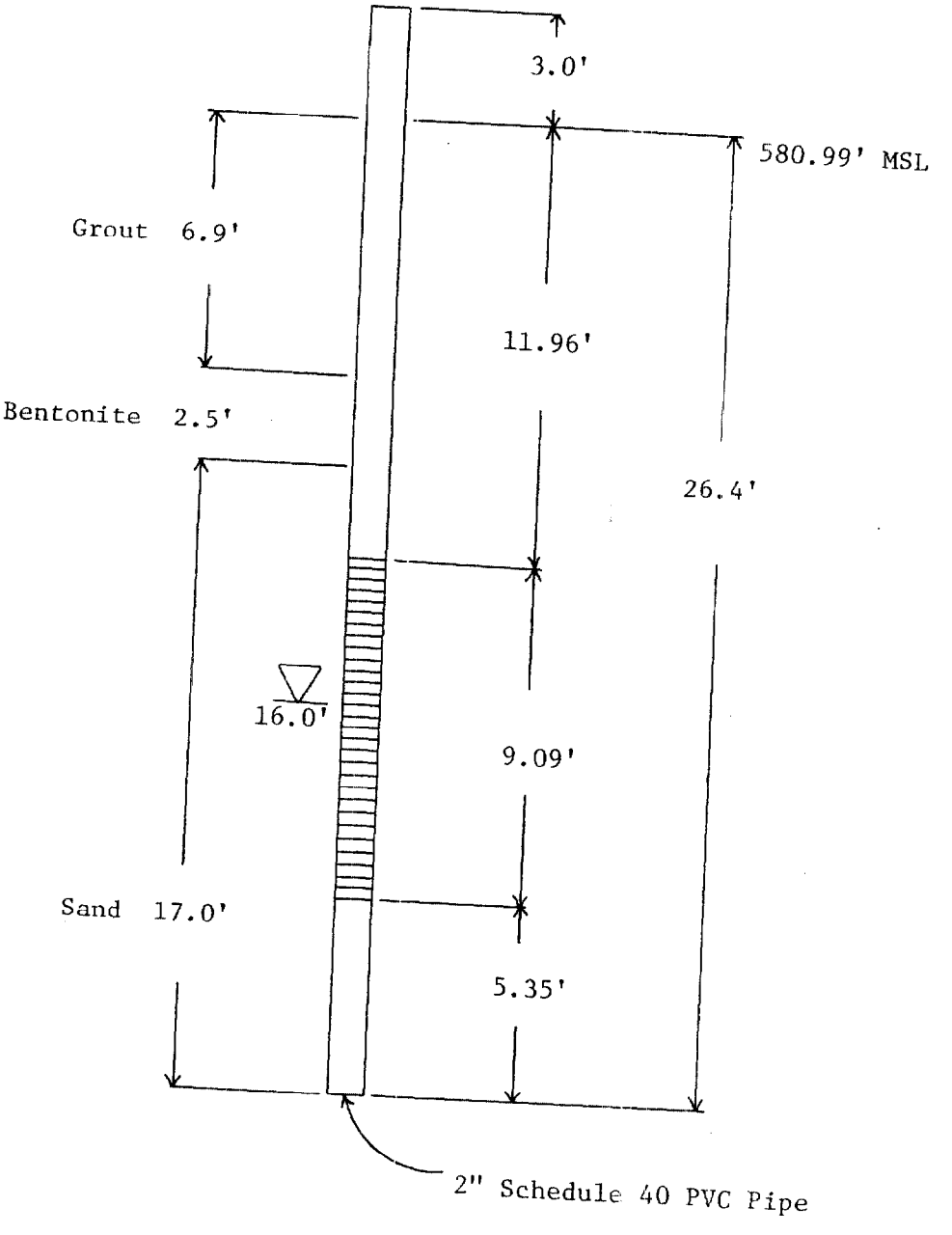
NWSC, Crane, Indiana
Highway 58 Dump Site A
Well Completion
Boring Number: WES-7-5-81



Well screen

Water depth at time of drilling

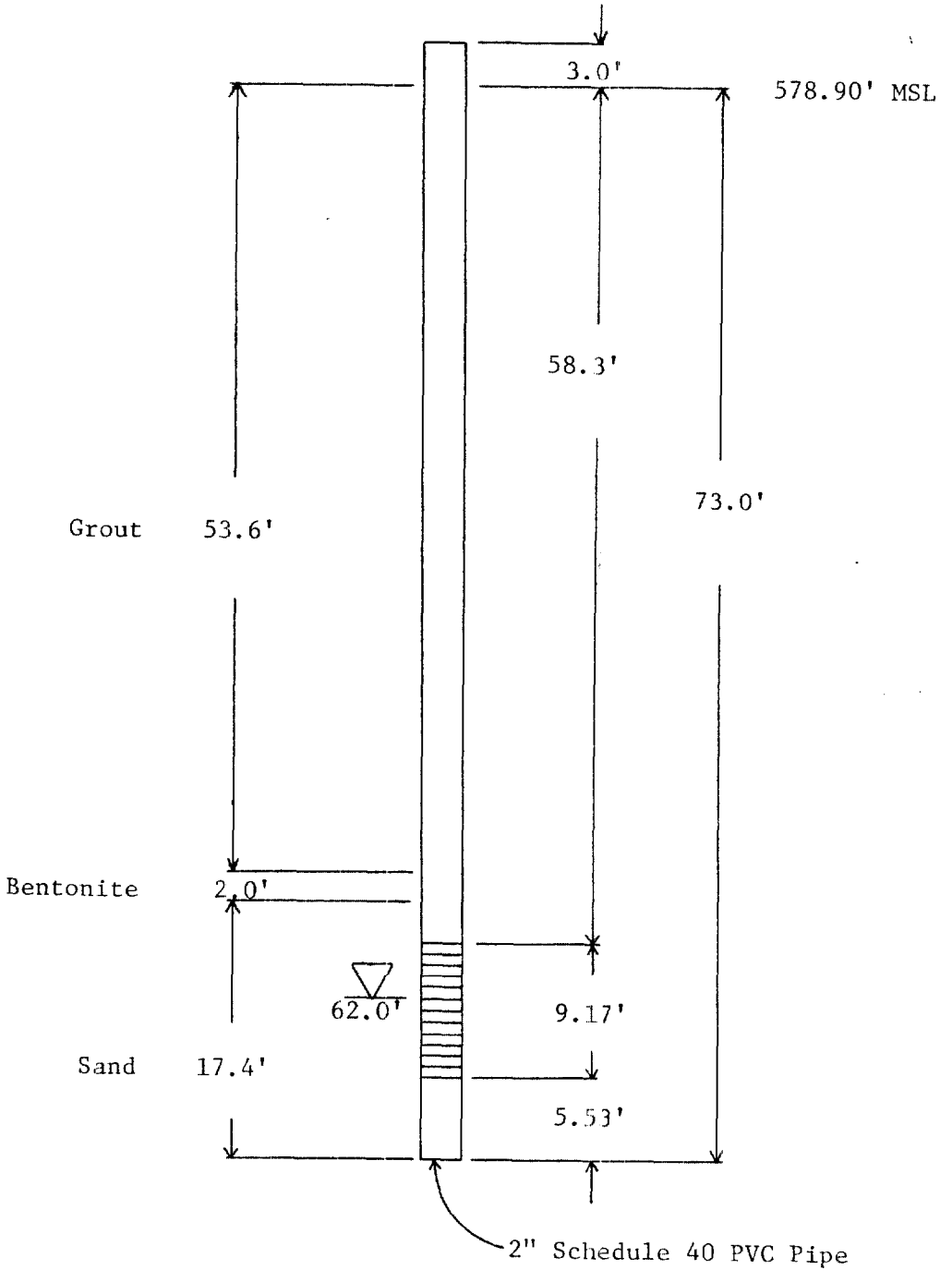
NWSC, Crane, Indiana
Highway 58 Dump Site B
Well Completion
Boring Number: WES-8-1-81



Well screen

Water depth at time of drilling

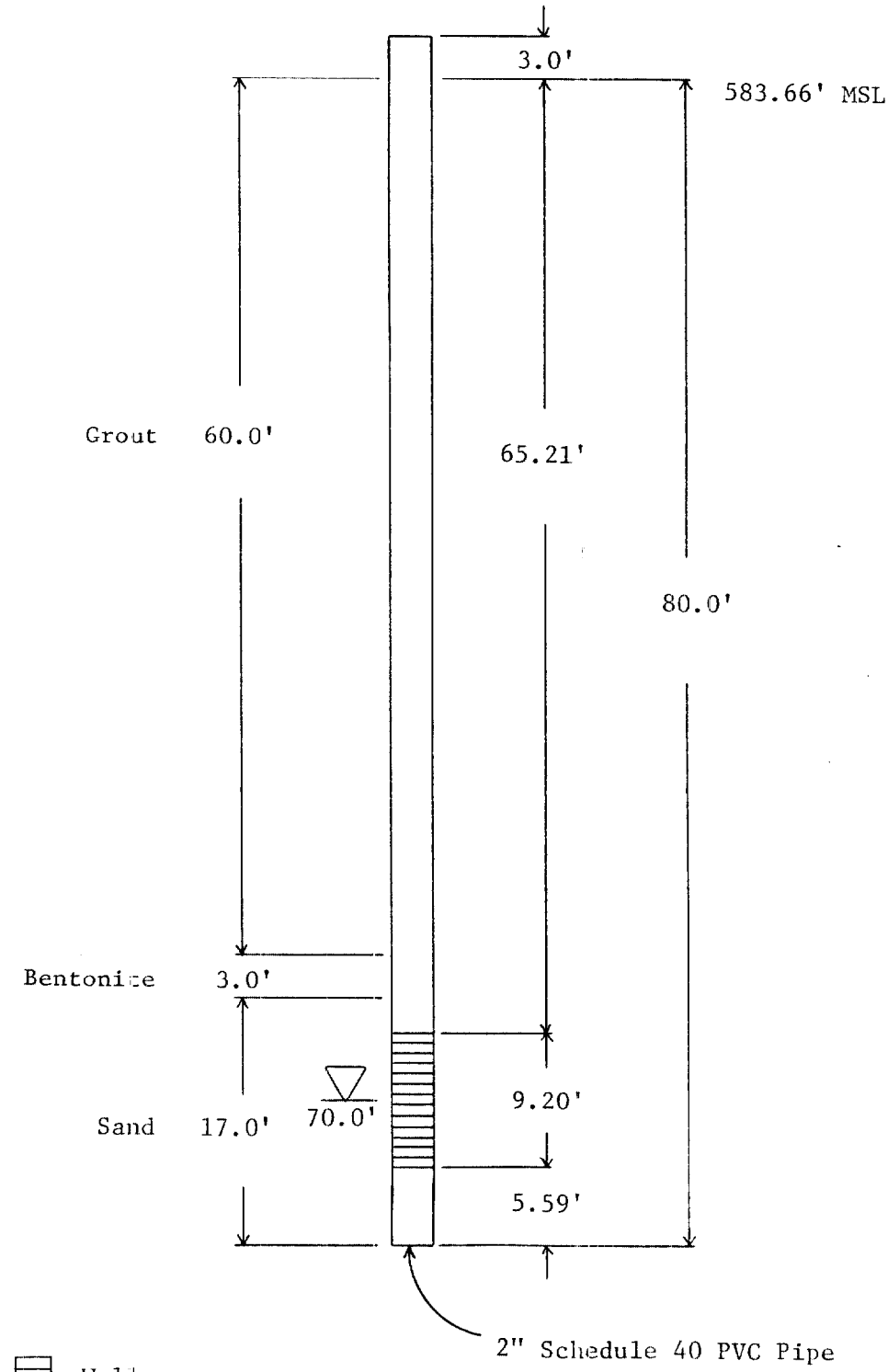
NWSC, Crane, Indiana
Highway 58 Dump Site B
Well Completion
Boring Number: WES-8-2-81



Well screen

Water depth at time of drilling

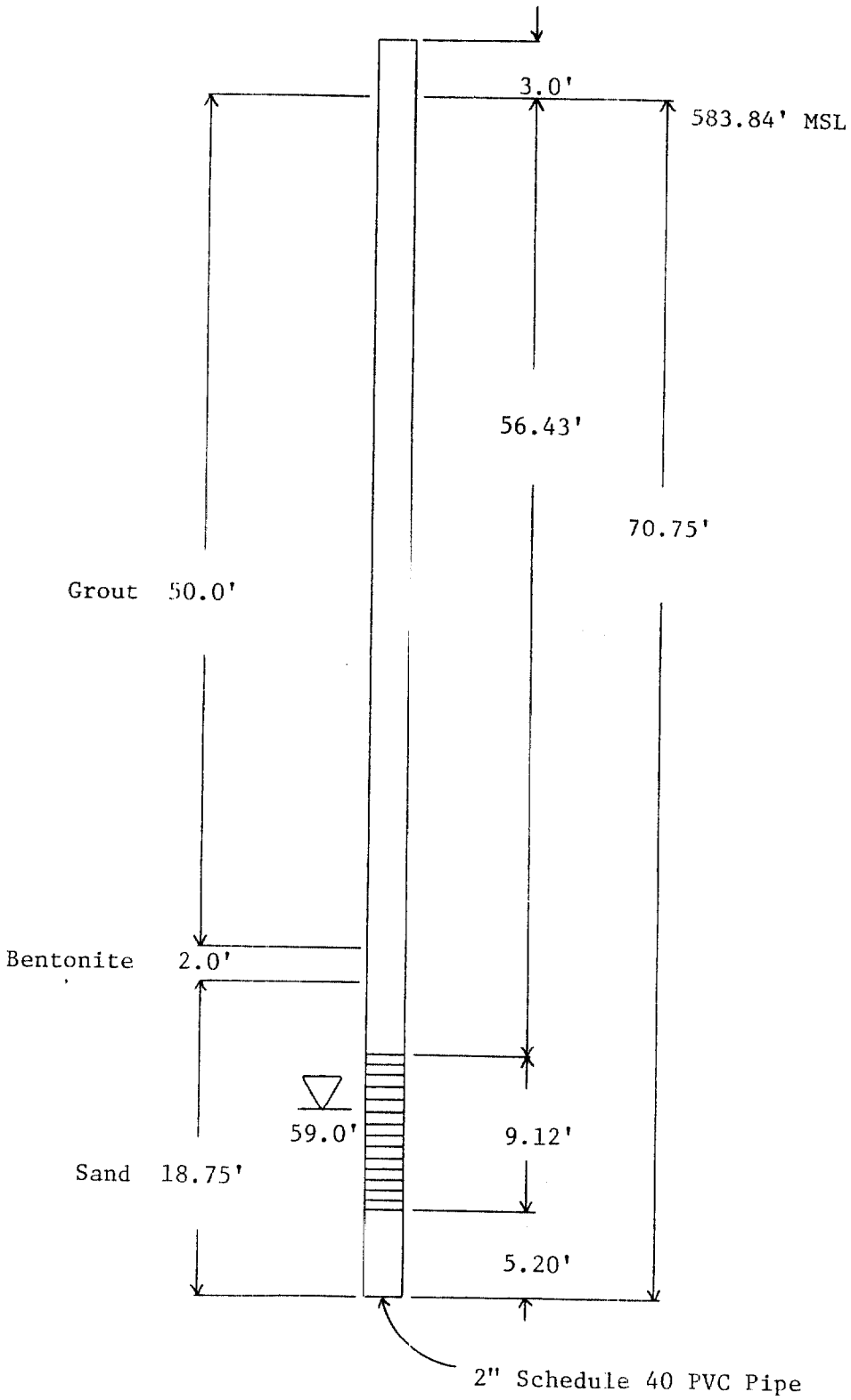
NWSC, Crane, Indiana
Highway 58 Dump Site B
Well Completion
Boring Number: WES-8-3-81



Well screen

Water depth at time of drilling

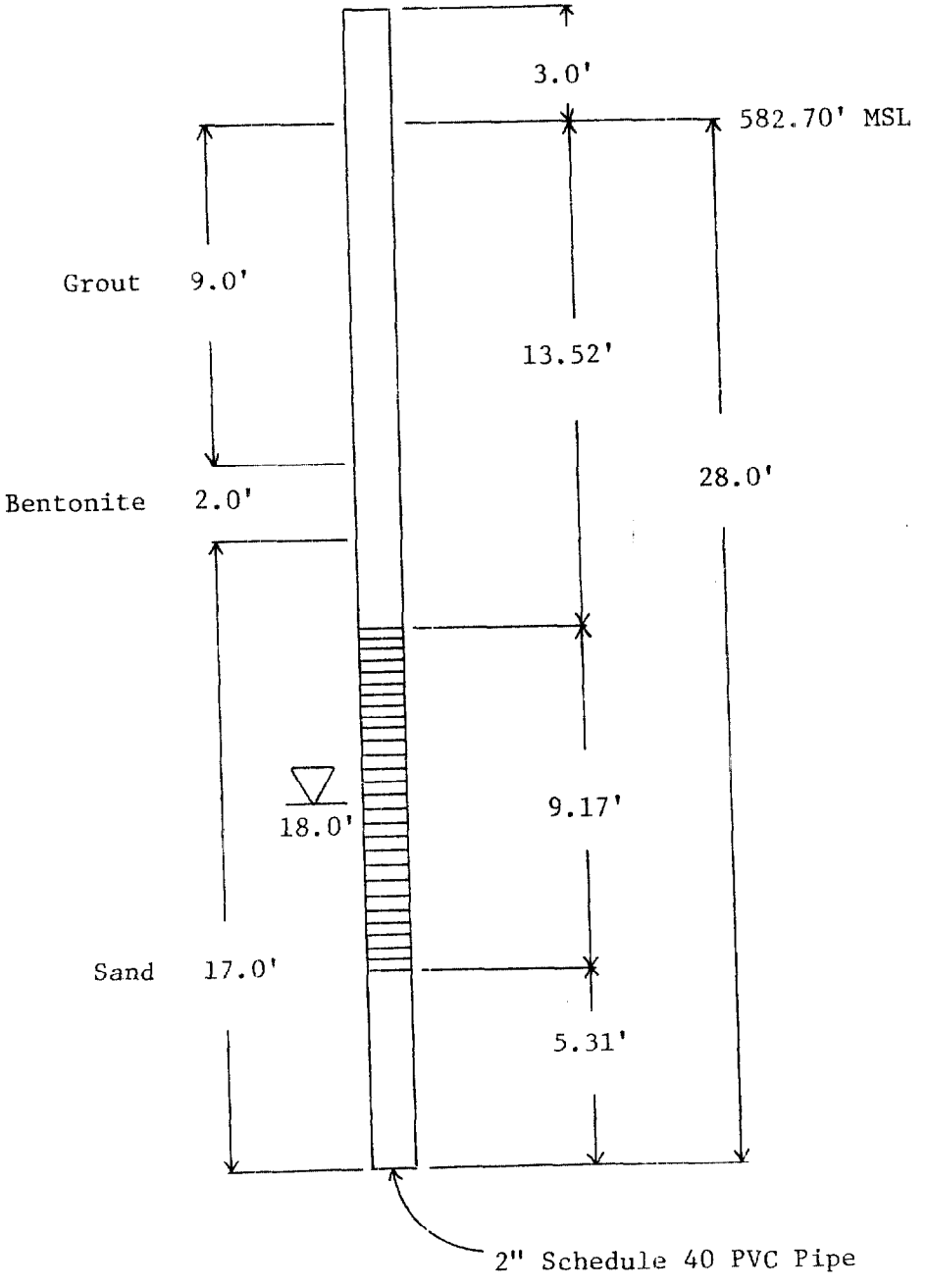
NWSC, Crane, Indiana
Highway 58 Dump Site B
Well Completion
Boring Number: WES-8-4-81



Well screen

Water depth at time of drilling

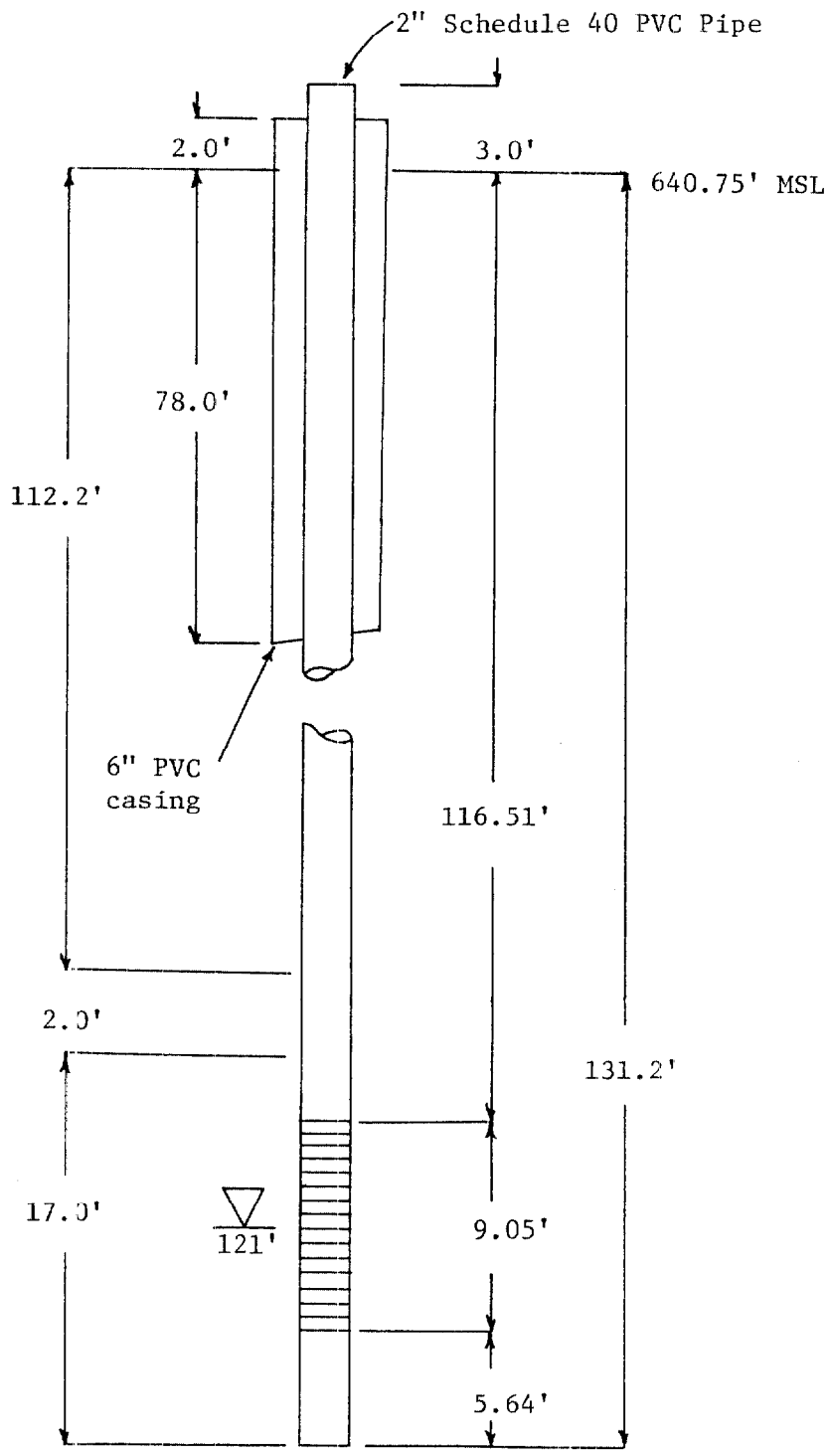
NWSC, Crane, Indiana
Highway 58 Dump Site B
Well Completion
Boring Number: WES-8-5-81



Well screen

Water depth at time of drilling

NWSC, Crane, Indiana
Highway 58 Dump Site B
Well Completion
Boring Number: WES-8-6-81



Water depth at time of drilling

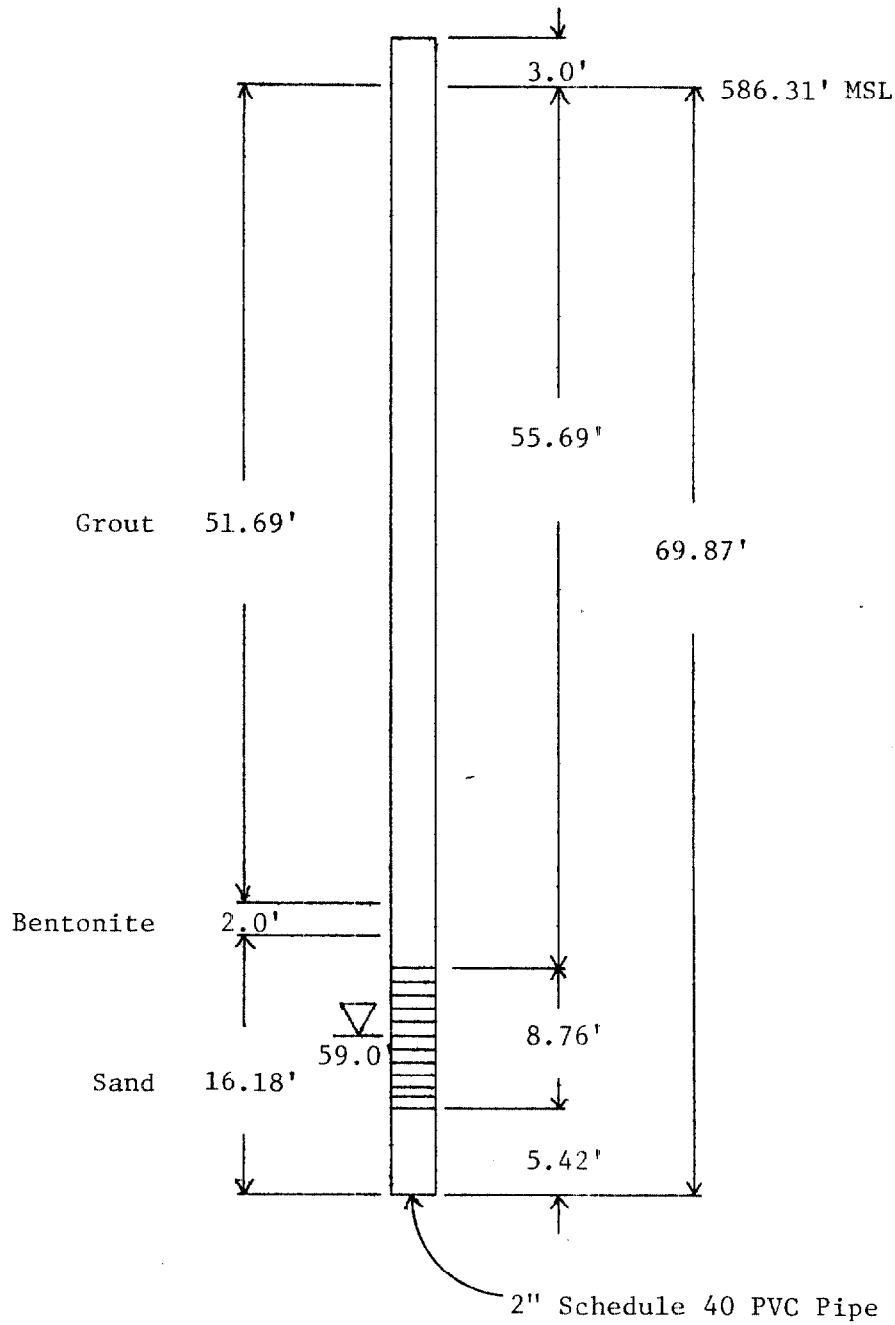
Well screen

NWSC, Crane, Indiana

Highway 58 Dump Site B

Well Completion

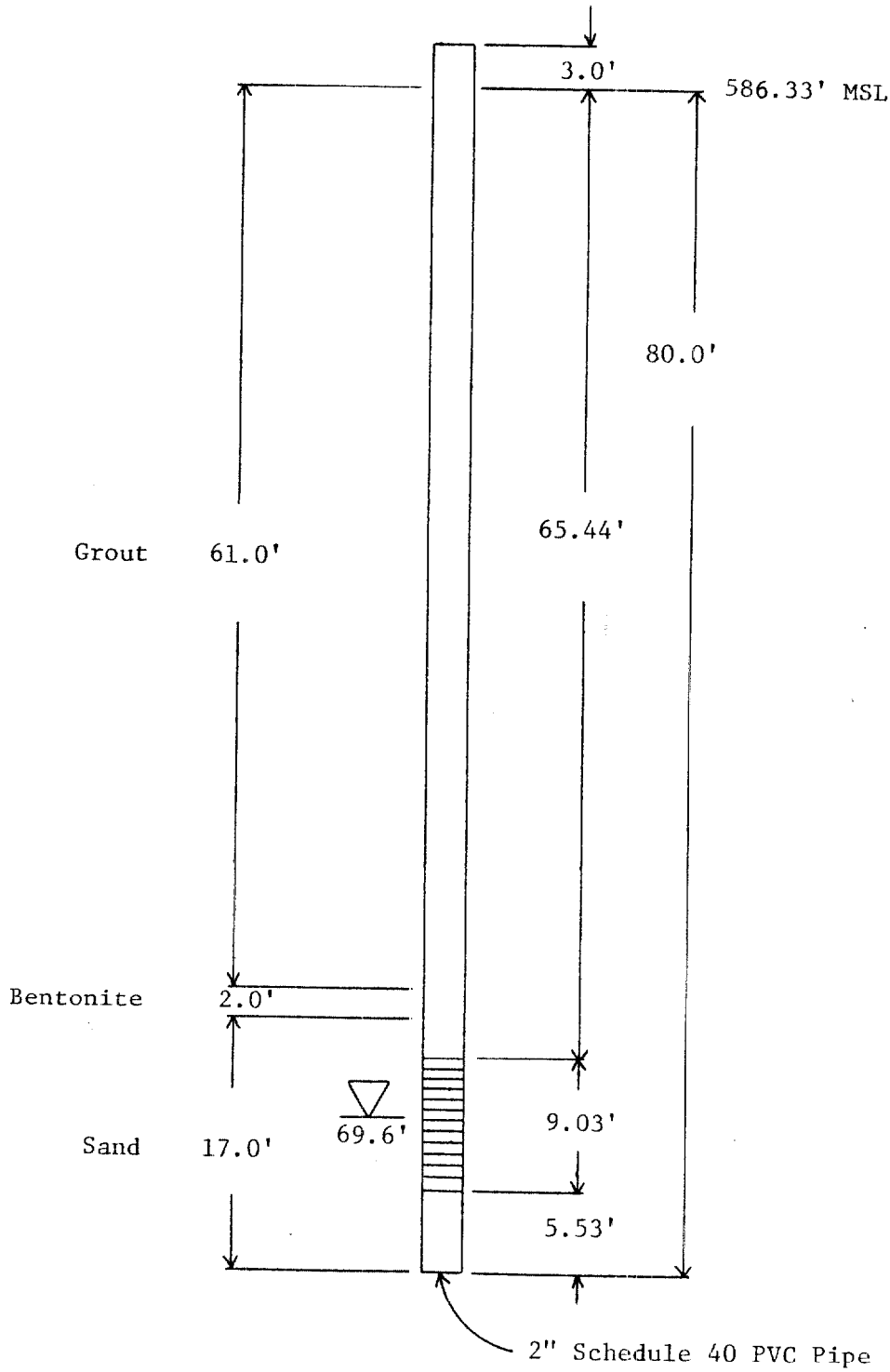
Boring Number: WES-8-7-81



Well screen

Water depth at time of drilling

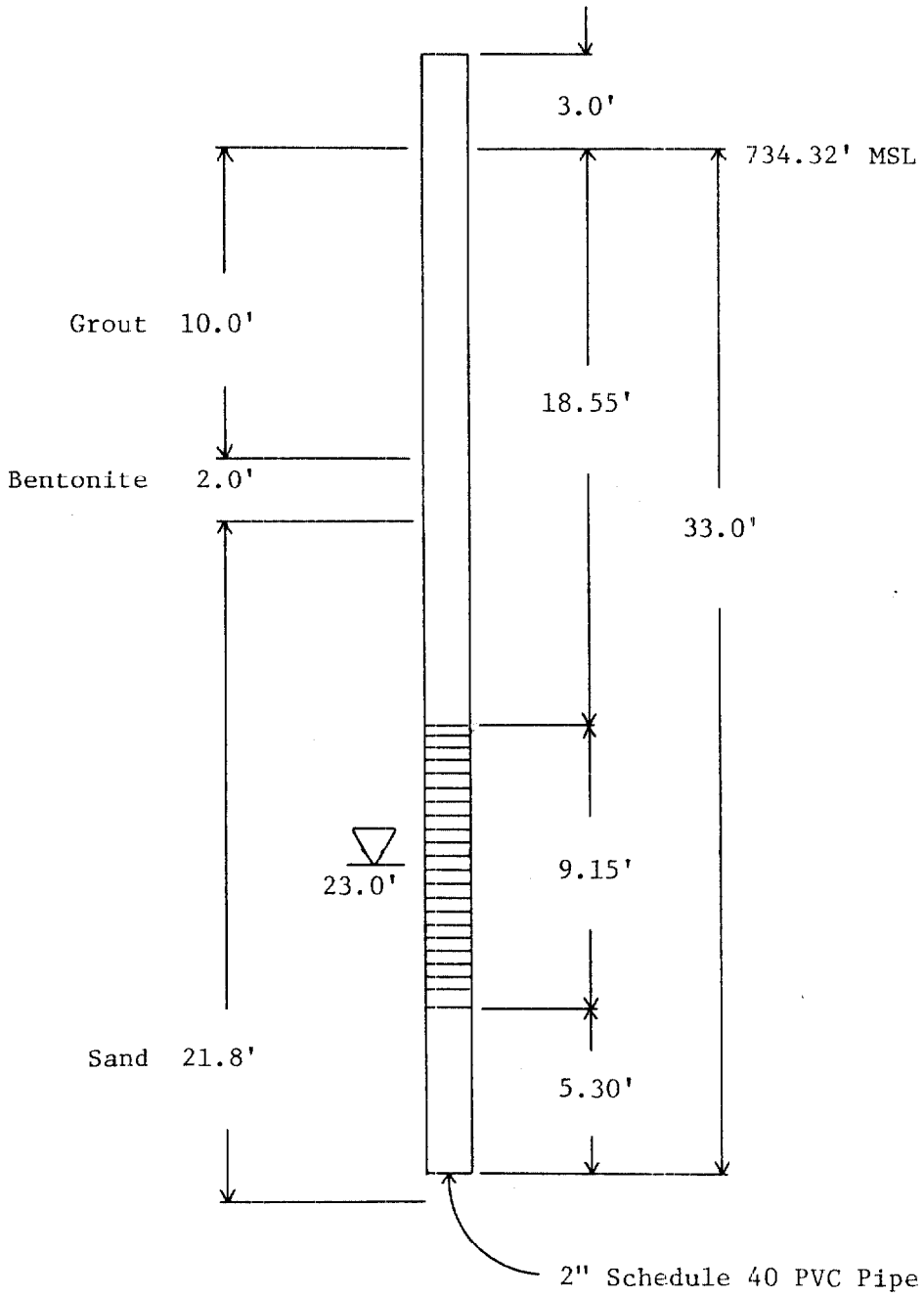
NWSC, Crane, Indiana
Highway 58 Dump Site B
Well Completion
Boring Number: WES-8-8-81



Well screen

Water depth at time of drilling

NWSC, Crane, Indiana
Highway 58 Dump Site B
Well Completion
Boring Number: WES-8-9-81



Well screen

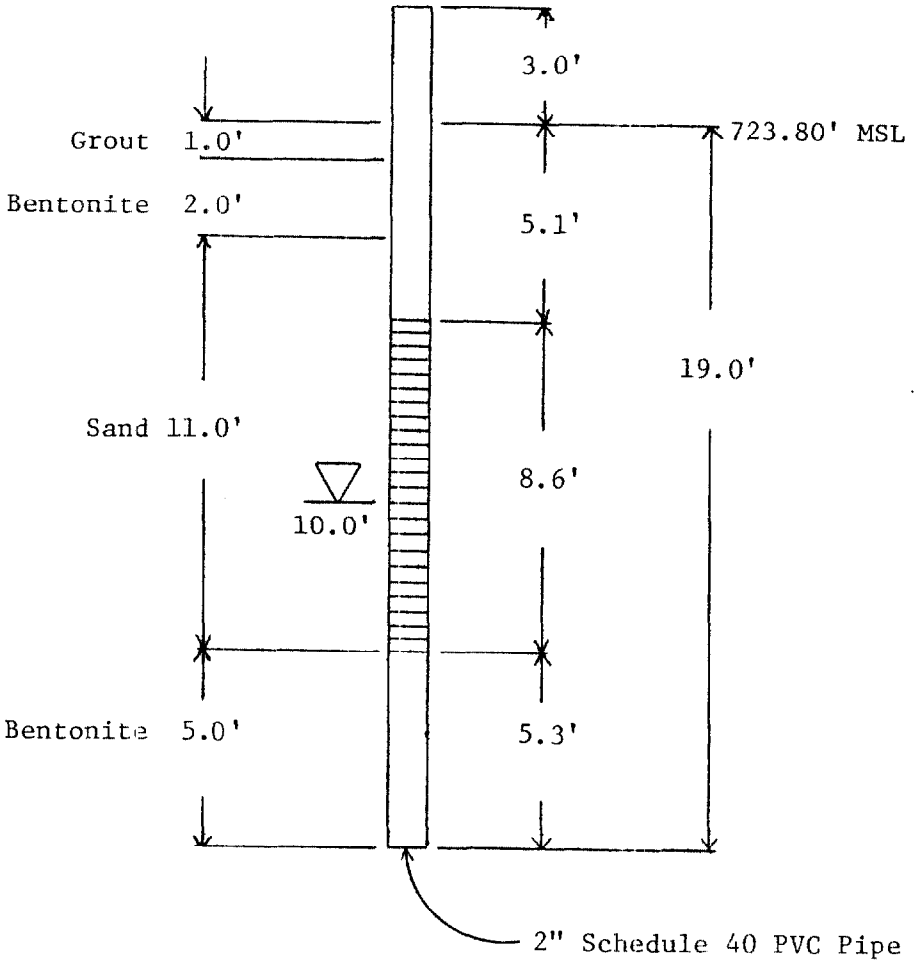
Water depth at time of drilling

NWSC, Crane, Indiana

Pest Control Area

Well Completion

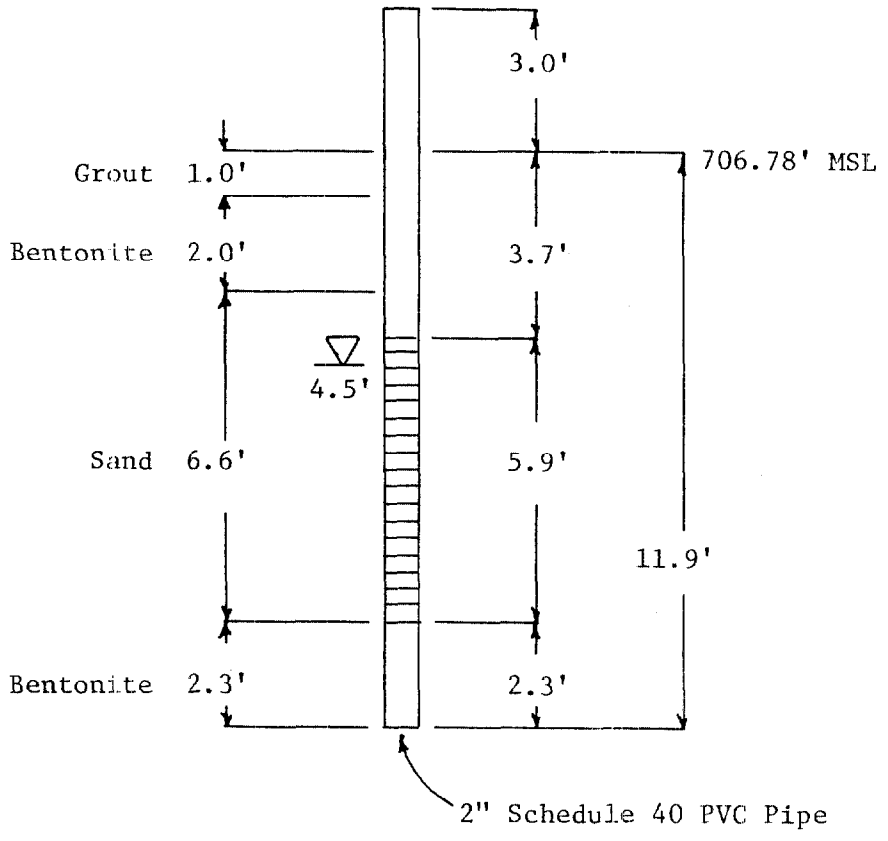
Boring Number: WES-9-1-81



Well screen

Water depth at time of drilling

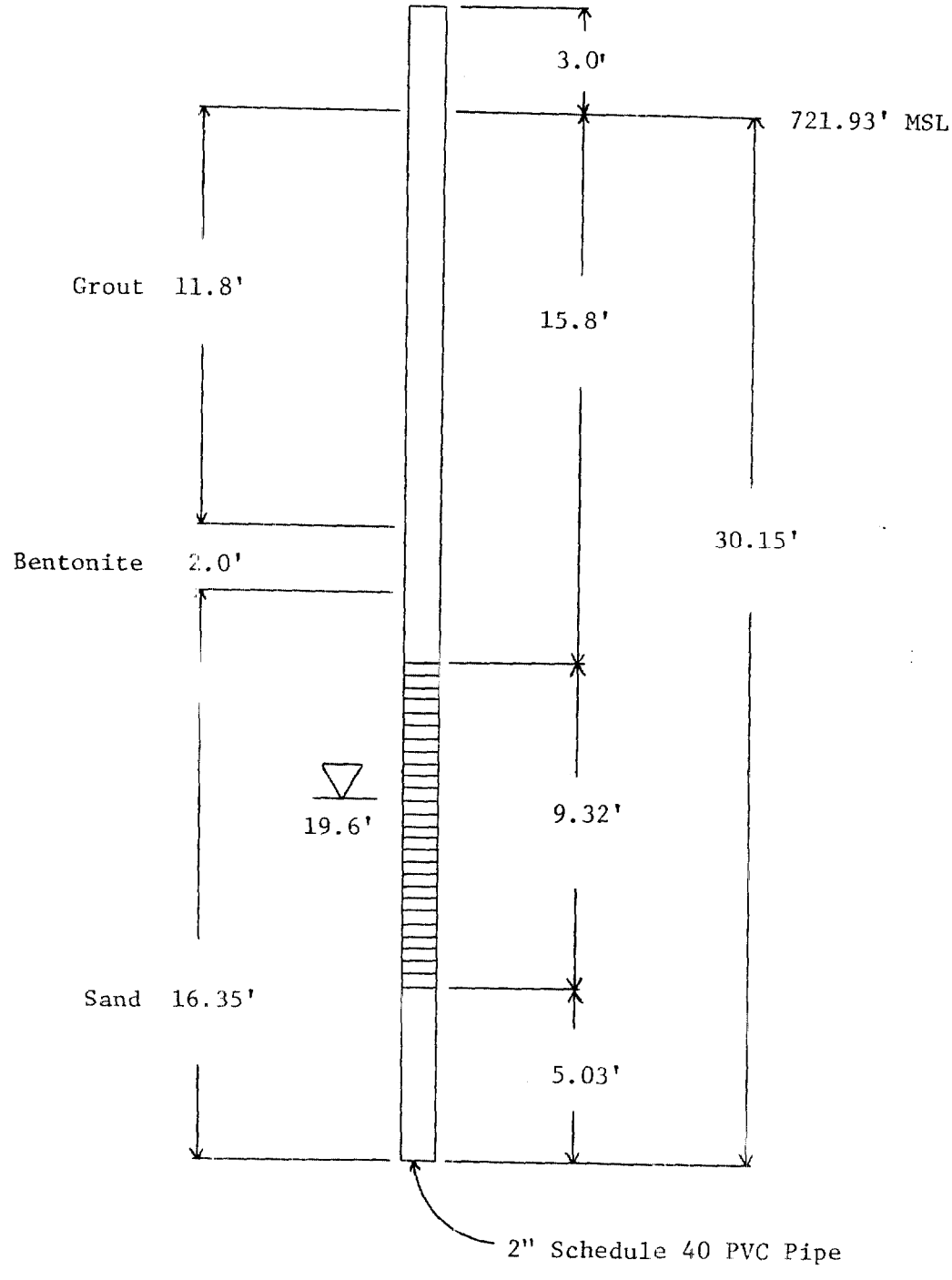
NWSC, Crane, Indiana
Pest Control Area
Well Completion
Boring Number: WES-9-2-81



Well screen

Water depth at time of drilling

NWSC, Crane, Indiana
Pest Control Area
Well Completion
Boring Number: WES-9-3-81



Well screen

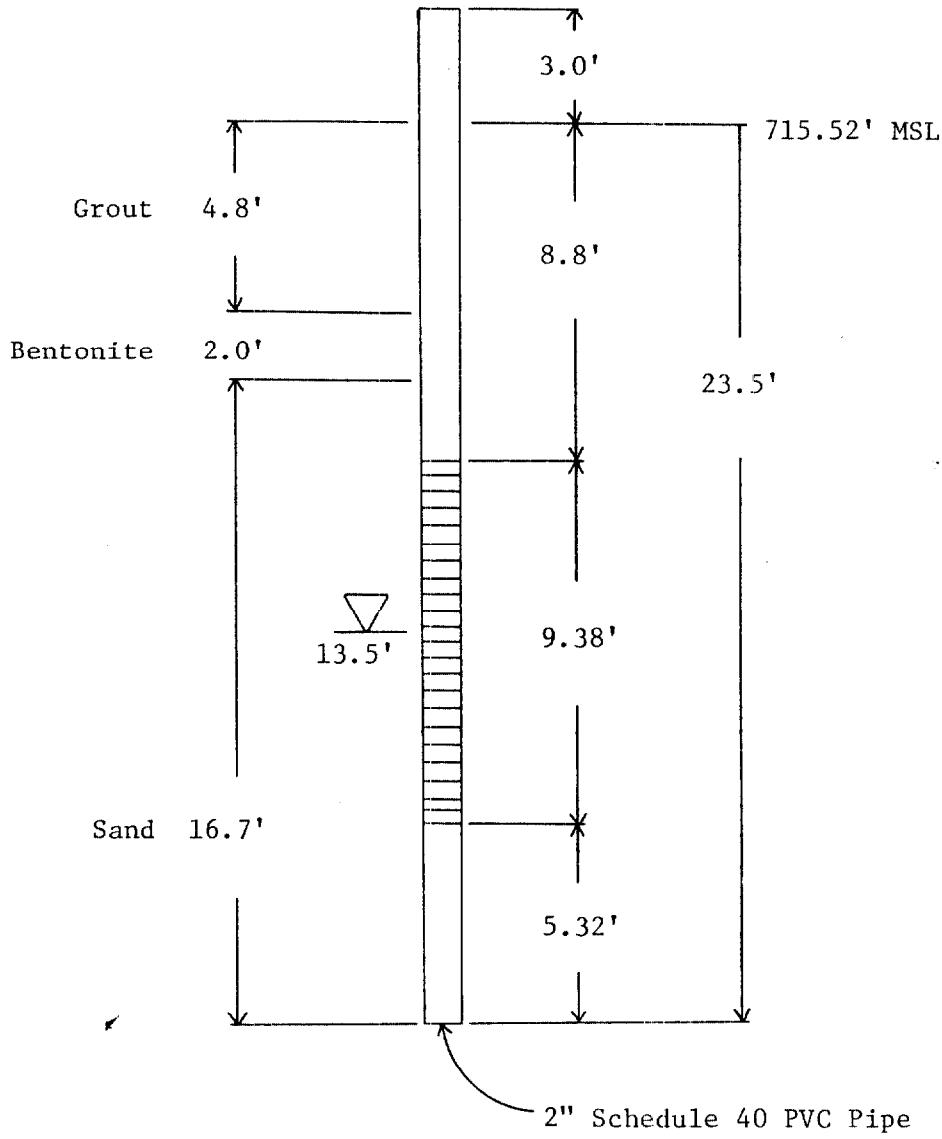
Water depth at time of drilling

NWSC, Crane, Indiana

Pest Control Area

Well Completion

Boring Number: WES-9-4-81



Well screen

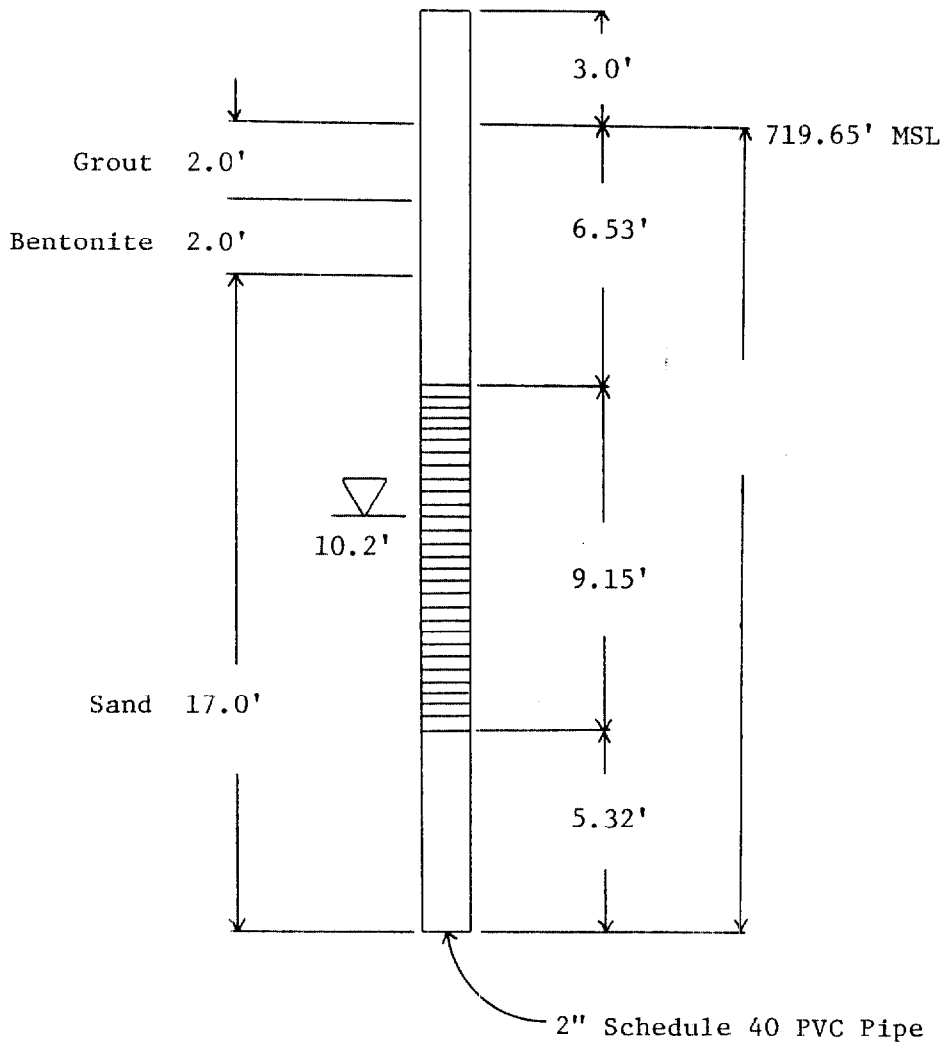
Water depth at time of drilling

NWSC, Crane, Indiana

Pest Control Area

Well Completion

Boring Number: WES-9-5-81



Well screen

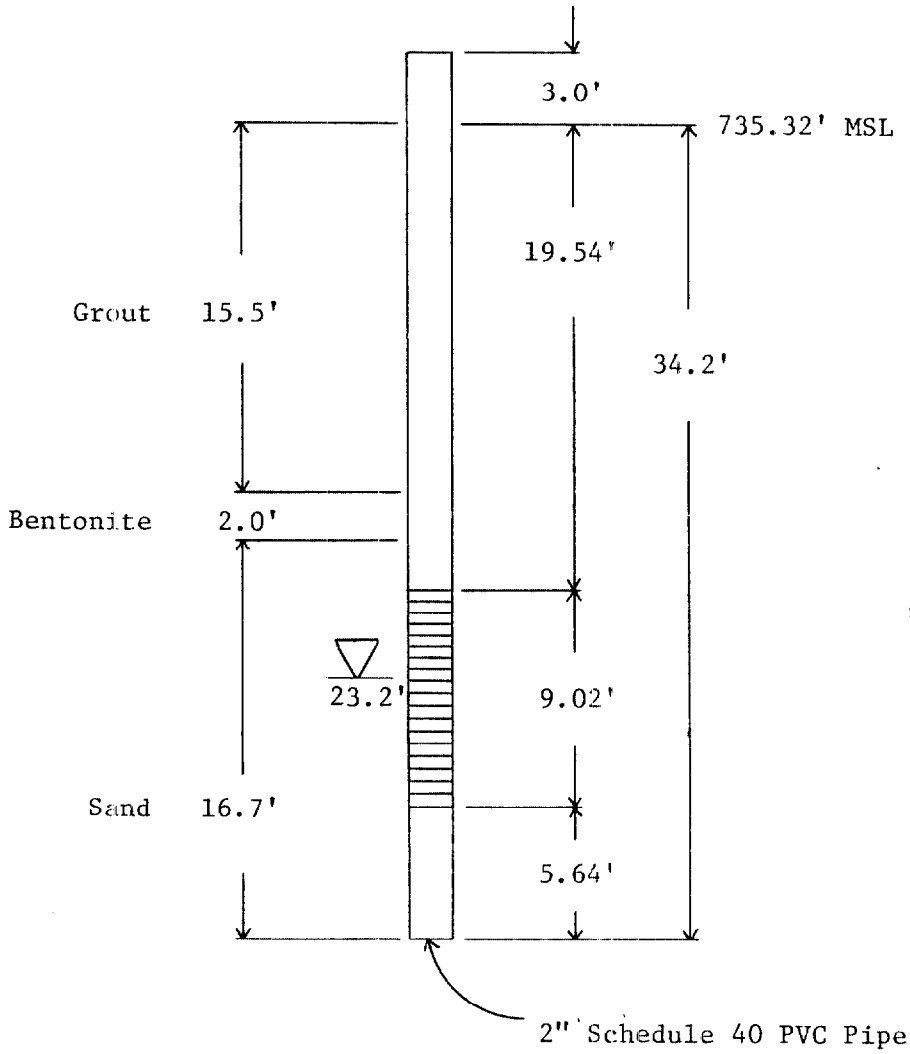
Water depth at time of drilling

NWSC, Crane, Indiana

Pest Control Area

Well Completion

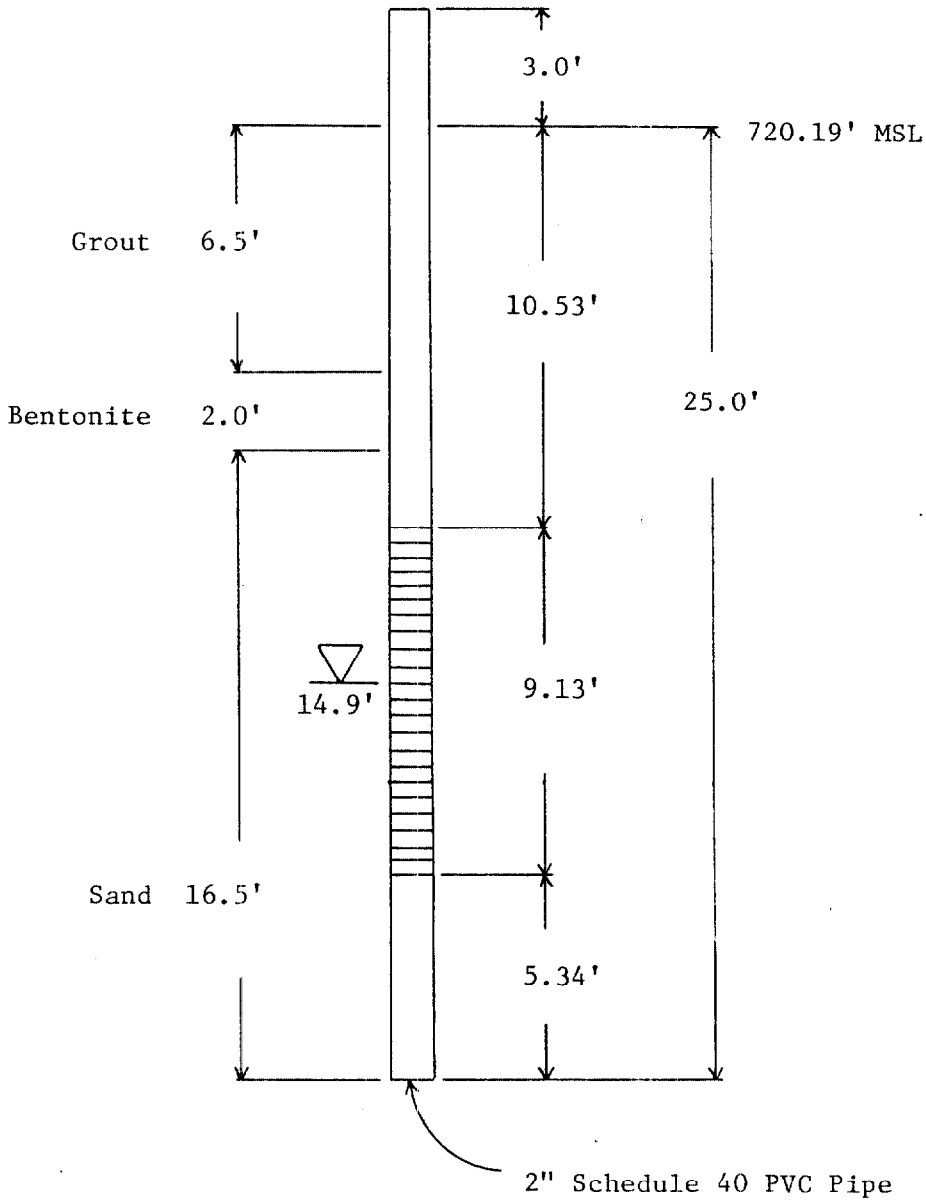
Boring Number: WES-9-6-81



Well screen

Water depth at time of drilling

NWSC, Crane, Indiana
Pest Control Area
Well Completion
Boring Number: WES-9-7-81



Well screen

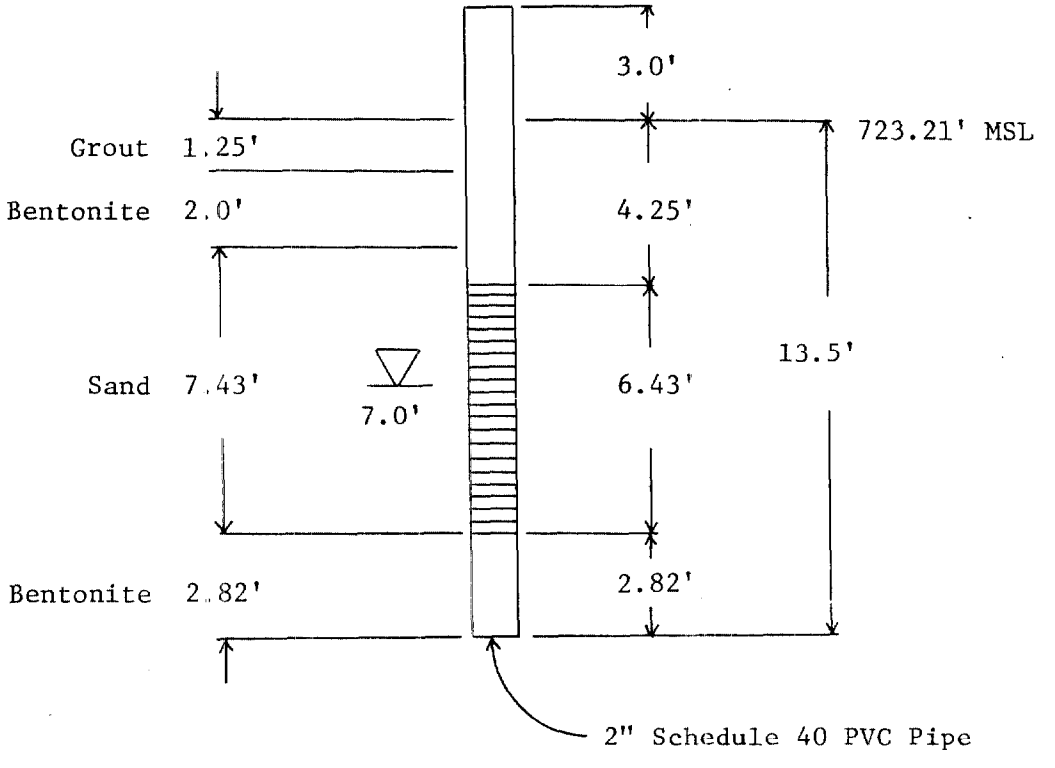
Water depth at time of drilling

NWSC, Crane, Indiana

Pest Control Area

Well Completion

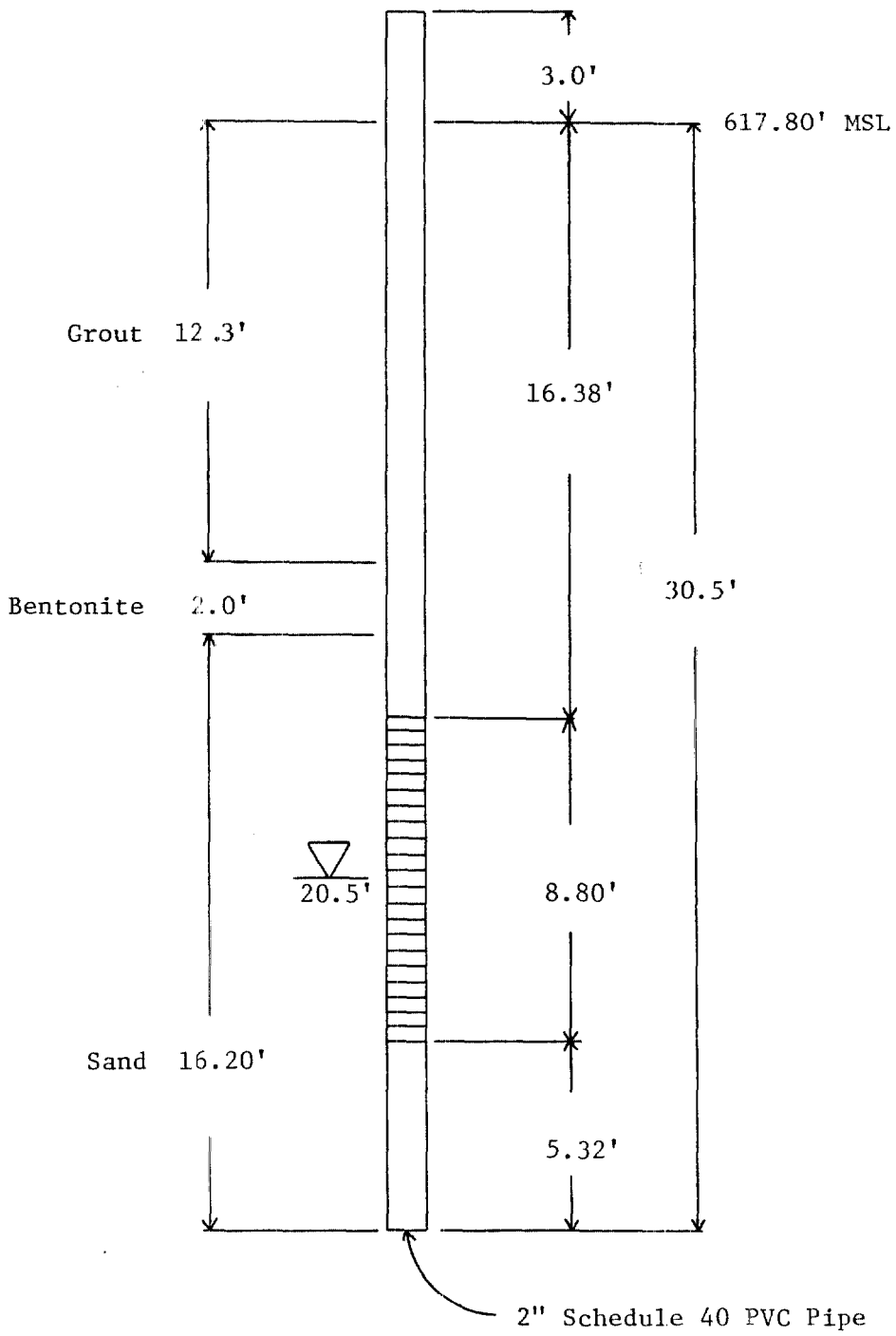
Boring Number: WES-9-8-81



Well screen

Water depth at time of drilling

NWSC, Crane, Indiana
Pest Control Area
Well Completion
Boring Number: WES-9-9-81



Well screen

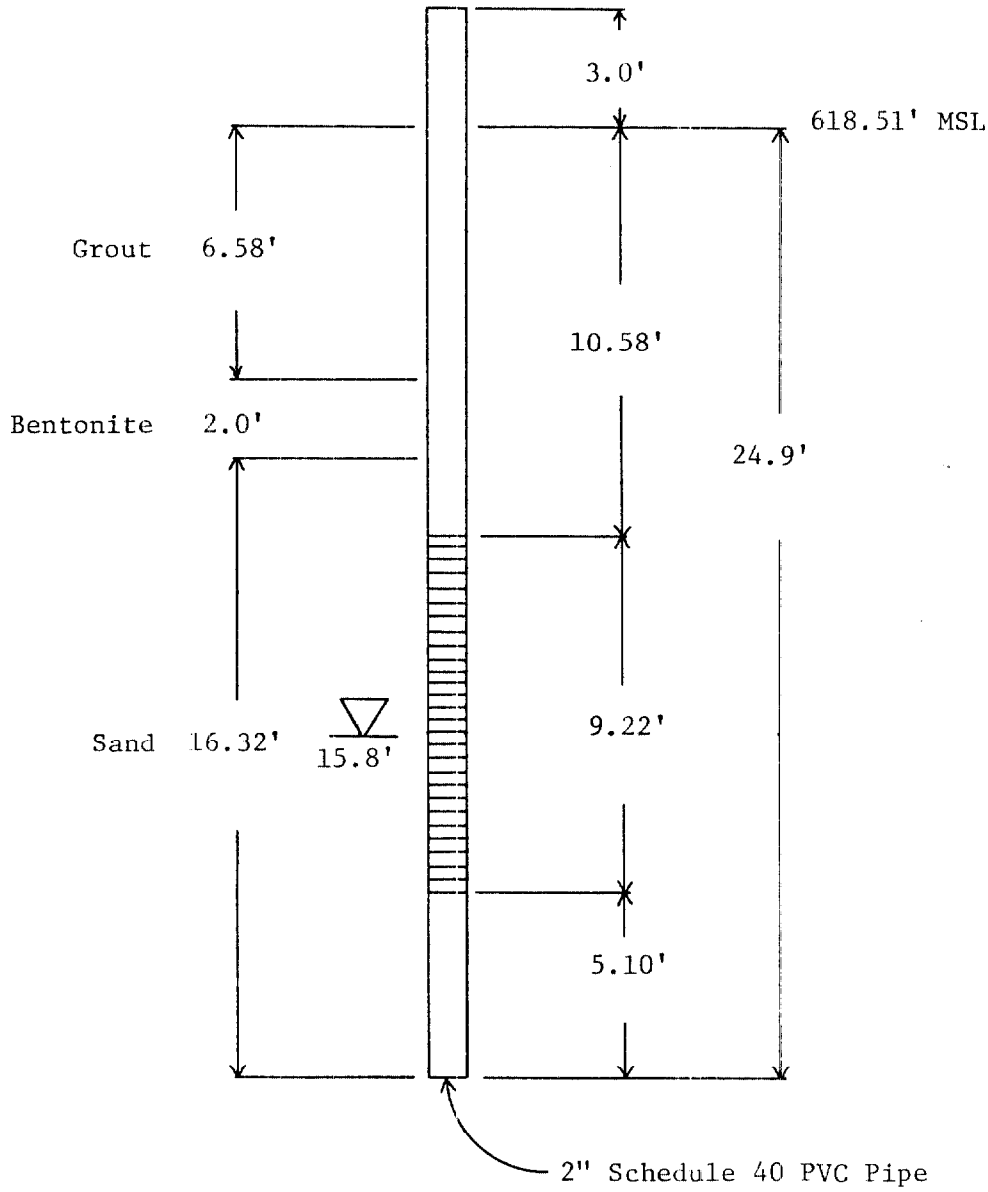
Water depth at time of drilling

NWSC, Crane, Indiana

Rockeye Site

Well Completion

Boring Number: WES-10-1-81



Well screen

Water depth at time of drilling

NWSC, Crane, Indiana
Rockeye Site
Well Completion
Boring Number: WES-10-2-81

APPENDIX D

GROUNDWATER ELEVATIONS

WORKING DRAFT

Groundwater Elevations

Mustard Gas Burial Grounds

Boring Number: WES-1-1-81

Top of Pipe Elevation: 686.14 ft MSL

Screen Interval: from 650.00 to 640.37 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
22 Aug 81	3:10	27.30	658.84	
23 Aug 81	10:31	27.21	658.93	
24 Aug 81	4:20	26.99	659.15	
25 Aug 81	10:45	27.09	659.05	
26 Aug 81	8:39	26.86	659.28	
27 Aug 81	8:25	26.87	659.27	
28 Aug 81	7:47	26.91	659.23	
29 Aug 81	7:43	26.87	659.27	
5 Sep 81	8:45	26.93	659.21	
12 Sep 81	6:45	26.87	659.27	
19 Sep 81	9:20	26.97	659.17	
26 Sep 81	7:53	26.82	659.32	
3 Oct 81	7:45	27.09	659.05	
10 Oct 81	10:22	26.91	659.23	
17 Oct 81	8:44	26.98	659.16	
24 Oct 81	10:00	27.38	658.76	
31 Oct 81	7:55	27.54	658.60	
7 Nov 81	10:15	27.59	658.55	
15 Nov 81	3:45	27.18	658.96	
22 Nov 81	10:12	27.43	658.71	
29 Nov 81	8:22	27.78	658.36	

Groundwater Elevations

Mustard Gas Burial Grounds

Boring Number: WES-1-2-81

Top of Pipe Elevation: 667.04 ft MSL

Screen Interval: from 655.80 to 646.44 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
23 Aug 81	10:45	12.18	651.86	Open hole
24 Aug 81	4:00	13.88	653.16	
25 Aug 81	10:13	13.92	653.12	
26 Aug 81	8:51	13.49	653.55	
27 Aug 81	8:34	13.41	653.63	
28 Aug 81	8:00	13.55	653.49	
29 Aug 81	7:50	13.68	653.36	
30 Aug 81	12:55	13.60	653.44	
5 Sep 81	9:02	13.85	653.19	
12 Sep 81	7:06	13.97	653.07	
19 Sep 81	9:30	14.08	652.96	
26 Sep 81	7:46	14.13	652.91	
3 Oct 81	7:53	14.37	652.67	
10 Oct 81	10:31	14.45	652.59	
17 Oct 81	8:53	14.51	652.53	
24 Oct 81	10:09	14.93	652.11	
31 Oct 81	8:04	15.15	651.89	
7 Nov 81	10:25	15.01	652.03	
15 Nov 81	3:52	14.83	652.21	
17 Nov 81	10:20	15.24	651.80	
29 Nov 81	8:49	15.45	651.59	

Groundwater Elevations

Mustard Gas Burial Grounds

Boring Number: WES-1-3-81

Top of Pipe Elevation: 670.43 ft MSL

Screen Interval: from 663.44 to 654.02 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
26 Aug 81	8:45	11.02	659.41	
27 Aug 81	8:29	11.19	659.24	
28 Aug 81	7:51	11.45	658.98	
29 Aug 81	7:47	11.55	658.88	
30 Aug 81	12:50	11.56	658.87	
31 Aug 81	8:40	11.63	658.80	
1 Sep 81	7:47	11.63	658.80	
5 Sep 81	8:50	11.78	658.65	
12 Sep 81	7:01	11.87	658.56	
19 Sep 81	9:25	12.17	658.26	
26 Sep 81	7:50	12.37	658.06	
3 Oct 81	7:56	12.86	657.57	
10 Oct 81	10:33	13.02	657.41	
17 Oct 81	8:55	13.18	657.25	
24 Oct 81	10:12	13.82	656.61	
31 Oct 81	8:07	13.89	656.54	
7 Nov 81	10:28	13.87	656.56	
15 Nov 81	3:55	13.12	657.31	
22 Nov 81	10:23	12.96	657.47	
29 Nov 81	8:52	11.80	658.63	

Groundwater Elevations

Mustard Gas Burial Grounds

Boring Number: WES-1-4-81

Top of Pipe Elevation: 672.95 ft MSL

Screen Interval: from 653.48 to 644.27 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
23 Sep 81	8:50	21.00	651.95	Open hole
24 Sep 81	9:55	18.52	654.43	
25 Sep 81	8:10	18.04	654.91	
26 Sep 81	7:40	17.61	655.34	
27 Sep 81	3:01	17.50	655.45	
28 Sep 81	9:27	17.62	655.33	
29 Sep 81	11:10	17.70	655.25	
30 Sep 81	8:00	17.65	655.30	
3 Oct 81	7:48	17.52	655.43	
10 Oct 81	10:25	17.51	655.44	
17 Oct 81	8:47	17.74	655.21	
24 Oct 81	10:04	18.23	654.72	
31 Oct 81	7:59	18.30	654.65	
7 Nov 81	10:19	18.31	654.64	
15 Nov 81	3:47	18.46	654.49	
22 Nov 81	10:14	18.61	654.34	
29 Nov 81	8:43	18.98	653.97	

Groundwater Elevations

Mustard Gas Burial Grounds

Boring Number: WES-1-5-81

Top of Pipe Elevation: 668.69 ft MSL

Screen Interval: from 649.51 to 640.39 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
25 Sep 81	8:10	16.78	651.91	
26 Sep 81	7:43	16.39	652.30	
27 Sep 81	3:08	16.32	652.37	
28 Sep 81	9:31	16.44	652.25	
29 Sep 81	11:15	16.43	652.26	
30 Sep 81	8:07	16.15	652.54	
1 Oct 81	11:35	15.98	652.71	
3 Oct 81	7:50	16.22	652.47	
10 Oct 81	10:29	16.17	652.52	
17 Oct 81	8:50	16.28	652.41	
24 Oct 81	10:07	16.78	651.91	
31 Oct 81	8:02	16.81	651.88	
7 Nov 81	10:22	16.90	651.79	
15 Nov 81	3:50	16.80	651.89	
22 Nov 81	10:17	17.05	651.64	
29 Nov 81	8:46	17.20	651.49	

Groundwater Elevations

Dye Burial Grounds

Boring Number: WES-2-1-81

Top of Pipe Elevation: 741.66 ft MSL

Screen Interval: from 723.41 to 713.86 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
26 Aug 81	5:08	--	--	No water
27 Aug 81	9:02	22.99	718.67	
28 Aug 81	8:25	20.47	721.19	
29 Aug 81	8:37	19.80	721.86	
30 Aug 81	12:36	19.25	722.41	
31 Aug 81	9:45	19.24	722.42	
1 Sep 81	10:00	19.15	722.51	
2 Sep 81	7:50	19.00	722.66	
9 Sep 81	12:45	19.08	722.58	
16 Sep 81	8:20	18.87	722.79	
23 Sep 81	12:45	19.29	722.37	
30 Sep 81	8:28	19.29	722.37	
7 Oct 81	10:48	19.23	722.43	
14 Oct 81	10:41	19.20	722.46	
21 Oct 81	9:24	19.14	722.52	
28 Oct 81	12:55	19.08	722.58	
4 Nov 81	11:18	19.30	722.36	
11 Nov 81	1:51	19.53	722.13	
16 Nov 81	12:00	19.41	722.25	Blew dry
18 Nov 81	12:57	19.34	722.32	
25 Nov 81	3:56	19.27	722.39	

Groundwater Elevations

Dye Burial Grounds

Boring Number: WES-2-2-81

Top of Pipe Elevation: 728.46 ft MSL

Screen Interval: from 685.79 to 676.19 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
4 Sep 81	8:35	45.65	682.81	
5 Sep 81	8:27	46.10	682.36	
6 Sep 81	12:30	46.22	682.24	
7 Sep 81	8:50	46.01	682.45	
8 Sep 81	12:13	46.01	682.45	
9 Sep 81	12:50	46.13	682.33	
10 Sep 81	3:00	46.09	682.37	
16 Sep 81	8:27	46.05	682.41	
23 Sep 81	12:50	46.70	681.76	
30 Sep 81	8:45	46.33	682.13	
7 Oct 81	9:59	46.66	681.86	
14 Oct 81	10:52	46.54	681.92	
21 Oct 81	9:12	46.50	681.96	
28 Oct 81	12:43	46.62	681.84	
4 Nov 81	11:05	46.47	681.99	
11 Nov 81	1:40	46.58	681.88	
16 Nov 81	3:59	46.09	682.37	Blew dry
18 Nov 81	12:31	46.33	682.13	
25 Nov 81	3:45	46.41	682.05	

Groundwater Elevations

Dye Burial Grounds

Boring Number: WES-2-3-81

Top of Pipe Elevation: 723.02 ft MSL

Screen Interval: from 668.84 to 659.73 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
4 Sep 81	9:10	55.80	664.22	Open hole
5 Sep 81	8:14	52.53	667.49	Open hole
6 Sep 81	12:25	40.78	682.24	
7 Sep 81	9:08	41.31	681.71	
8 Sep 81	12:20	41.78	681.24	
9 Sep 81	12:55	42.28	680.74	
10 Sep 81	3:05	42.60	680.42	
11 Sep 81	9:10	42.81	680.21	
12 Sep 81	7:33	43.20	679.82	
16 Sep 81	8:33	43.75	679.27	
23 Sep 81	12:57	44.67	678.35	
30 Sep 81	8:40	44.89	678.13	
7 Oct 81	9:06	44.91	678.11	
14 Oct 81	10:54	45.19	677.83	
21 Oct 81	9:07	45.33	677.69	
28 Oct 81	12:47	45.32	677.70	
4 Nov 81	11:03	45.29	677.73	
11 Nov 81	1:36	45.26	677.76	
16 Nov 81	4:43	45.35	677.67	Blew dry
18 Nov 81	12:38	55.15	667.87	
25 Nov 81	3:43	51.60	671.42	

Groundwater Elevations

Dye Burial Grounds

Boring Number: WES-2-4-81

Top of Pipe Elevation: 719.66 ft MSL

Screen Interval: from 680.76 to 671.56 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
6 Sep 81	12:21	38.84	680.82	
7 Sep 81	9:10	38.62	681.04	
8 Sep 81	12:25	38.67	680.99	
9 Sep 81	1:00	38.67	680.99	
10 Sep 81	3:07	38.50	681.16	
11 Sep 81	9:14	38.68	680.98	
12 Sep 81	7:29	38.73	680.93	
16 Sep 81	8:40	38.52	681.14	
23 Sep 81	12:59	39.06	680.60	
30 Sep 81	8:50	38.65	681.01	
7 Oct 81	9:04	38.75	680.91	
14 Oct 81	10:57	38.84	680.82	
21 Oct 81	8:50	38.89	680.77	
28 Oct 81	12:50	38.96	680.70	
4 Nov 81	10:55	38.88	680.78	
11 Nov 81	1:32	38.99	680.67	
16 Nov 81	5:01	38.60	681.06	Blew dry
18 Nov 81	12:43	38.72	680.94	
25 Nov 81	3:40	38.95	680.71	

Groundwater Elevations

Dye Burial Grounds

Boring Number: WES-2-5-81

Top of Pipe Elevation: 742.24 ft MSL

Screen Interval: from 689.04 to 679.56 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
7 Sep 81	8:20	54.5-55.0	684.24	Open hole
8 Sep 81	12:08	57.66	684.58	
9 Sep 81	1:10	57.79	684.45	
10 Sep 81	3:14	57.60	684.64	
11 Sep 81	8:50	57.84	684.40	
12 Sep 81	7:15	57.83	684.41	
13 Sep 81	2:01	57.68	684.56	
14 Sep 81	3:40	57.52	684.72	
16 Sep 81	8:13	57.68	684.56	
23 Sep 81	3:59	58.01	684.23	
30 Sep 81	8:25	57.93	684.31	
7 Oct 81	9:45	57.90	684.34	
14 Oct 81	10:35	58.00	684.24	
21 Oct 81	9:27	58.11	684.13	
28 Oct 81	12:59	58.10	684.14	
4 Nov 81	11:20	58.00	684.24	
11 Nov 81	1:55	58.08	684.16	
16 Nov 81	11:13	57.95	684.29	Blew dry
18 Nov 81	1:00	57.87	684.37	
25 Nov 81	3:58	57.90	684.34	

Groundwater Elevations

Dye Burial Grounds

Boring Number: WES-2-6-81

Top of Pipe Elevation: 739.58 ft MSL

Screen Interval: from 686.13 to 676.87 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
24 Sep 81	8:00	55.36	681.22	Open hole
25 Sep 81	3:55	54.74	684.74	
26 Sep 81	9:01	55.32	684.26	
27 Sep 81	3:25	55.40	684.18	
28 Sep 81	8:55	55.56	684.02	
29 Sep 81	11:34	55.64	683.94	
30 Sep 81	8:31	55.36	684.22	
1 Oct 81	11:55	55.30	684.28	
7 Oct 81	9:49	55.51	684.07	
14 Oct 81	10:44	55.54	684.04	
21 Oct 81	9:22	55.60	683.98	
28 Oct 81	12:35	55.74	683.84	
4 Nov 81	11:16	55.80	683.78	
11 Nov 81	1:49	55.65	683.93	
16 Nov 81	12:40	55.18	684.40	Blew dry
18 Nov 81	12:55	55.48	684.10	
25 Nov 81	3:53	55.69	683.89	

Groundwater Elevations

Dye Burial Grounds

Boring Number: WES-2-7-81

Top of Pipe Elevation: 731.73 ft MSL

Screen Interval: from 685.97 to 676.73 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
25 Sep 81	9:01	45.34	683.39	Open hole
26 Sep 81	9:00	48.02	683.71	
27 Sep 81	3:25	48.34	683.39	
28 Sep 81	9:03	48.31	683.42	
29 Sep 81	11:39	48.24	683.49	
30 Sep 81	8:35	48.23	683.50	
1 Oct 81	11:59	47.85	683.88	
2 Oct 81	8:06	48.06	683.67	
7 Oct 81	9:50	48.20	683.53	
14 Oct 81	10:45	48.20	683.53	
21 Oct 81	9:19	48.27	683.46	
28 Oct 81	12:40	48.32	683.41	
4 Nov 81	11:09	48.31	683.42	
11 Nov 81	1:43	48.29	683.44	
16 Nov 81	1:20	47.84	683.89	Blew dry
18 Nov 81	12:52	48.01	683.72	
25 Nov 81	3:50	48.00	683.73	

Groundwater Elevations

Dye Burial Grounds

Boring Number: WES-2-8-81

Top of Pipe Elevation: 733.29 ft MSL

Screen Interval: from 684.42 to 675.52 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
26 Sep 81	8:50	47.0	683.29	Open hole
27 Sep 81	3:29	49.75	683.54	
28 Sep 81	9:07	49.94	683.35	
29 Sep 81	11:43	49.89	683.40	
30 Sep 81	8:38	49.78	683.51	
1 Oct 81	12:03	49.52	683.77	
2 Oct 81	8:10	49.68	683.61	
3 Oct 81	8:15	49.85	683.44	
7 Oct 81	9:55	49.83	683.46	
14 Oct 81	10:49	49.88	683.41	
21 Oct 81	9:15	49.92	683.37	
28 Oct 81	12:30	50.00	683.29	
4 Nov 81	11:13	49.95	683.34	
11 Nov 81	1:46	49.97	683.32	
16 Nov 81	2:13	49.52	683.77	Blew dry
18 Nov 81	12:46	49.76	683.53	
25 Nov 81	3:47	49.76	683.53	

Groundwater Elevations

Ammunition Burning Grounds

Boring Number: WES-3-1-81

Top of Pipe Elevation: 605.45 ft MSL

Screen Interval: from 560.83 to 551.63 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
6 Sep 81	12:10	45.91	559.54	
7 Sep 81	1:58	45.71	559.74	
8 Sep 81	11:51	45.80	559.65	
9 Sep 81	8:14	45.95	559.50	
10 Sep 81	4:08	45.73	559.72	
11 Sep 81	9:30	45.94	559.51	
12 Sep 81	10:59	45.86	559.59	
19 Sep 81	8:59	46.00	559.45	
26 Sep 81	9:18	45.97	559.48	
29 Sep 81	11:50	46.04	559.41	
6 Oct 81	4:04	45.76	559.69	
13 Oct 81	8:10	46.09	559.36	
20 Oct 81	8:31	46.12	559.33	
27 Oct 81	5:05	45.83	559.62	
3 Nov 81	8:10	46.06	559.39	
10 Nov 81	8:37	46.11	559.34	
15 Nov 81	4:16	45.57	559.88	Blew dry
17 Nov 81	7:54	45.66	559.79	
17 Nov 81	9:51	45.54	559.91	
24 Nov 81	9:05	45.72	559.73	
29 Nov 81	10:10	46.30	559.15	

Groundwater Elevations

Ammunition Burning Grounds

Boring Number: WES-3-2-81

Top of Pipe Elevation: 623.68 ft MSL

Screen Interval: from 617.16 to 610.68 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
8 Sep 81	11:40	6.25	617.43	
9 Sep 81	8:18	6.67	617.01	
10 Sep 81	4:15	6.80	616.88	
11 Sep 81	9:40	6.81	616.87	
12 Sep 81	11:03	6.85	616.83	
13 Sep 81	12:55	7.01	616.67	
14 Sep 81	3:25	7.08	616.60	
15 Sep 81	4:30	7.20	616.48	
22 Sep 81	4:02	7.39	616.29	
29 Sep 81	11:55	7.67	616.01	
6 Oct 81	4:10	7.71	615.97	
13 Oct 81	8:14	7.84	615.84	
20 Oct 81	8:42	7.96	615.72	
27 Oct 81	5:00	7.90	615.78	
3 Nov 81	8:20	7.91	615.77	
10 Nov 81	8:31	7.89	615.79	
15 Nov 81	4:12	6.58	617.10	Blew dry
17 Nov 81	7:45	6.73	616.95	
17 Nov 81	10:25	10.72	612.95	
24 Nov 81	9:10	6.26	617.42	
29 Nov 81	10:15	6.15	617.53	

Groundwater Elevations

Ammunition Burning Grounds

Boring Number: WES-3-3-81

Top of Pipe Elevation: 583.87 ft MSL

Screen Interval: from 494.97 to 485.85 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
17 Sep 81	8:00	87.5	493.37	Open hole
18 Sep 81	7:38	77.25	506.62	
19 Sep 81	9:05	77.19	506.68	
20 Sep 81	10:05	77.00	506.87	
21 Sep 81	9:00	76.75	507.12	
22 Sep 81	2:25	76.47	507.40	
23 Sep 81	12:35	76.42	507.45	
29 Sep 81	12:06	75.66	508.21	
6 Oct 81	4:20	75.00	508.87	
13 Oct 81	8:27	74.53	509.34	
20 Oct 81	8:54	74.06	509.81	
27 Oct 81	5:26	73.67	510.20	
3 Nov 81	8:43	73.40	510.47	
10 Nov 81	8:52	73.05	510.82	
15 Nov 81	4:28	72.61	511.26	
17 Nov 81	8:39	90.55	493.32	Blew dry
24 Nov 81	9:34	93.48	490.39	
29 Nov 81	10:35	93.19	490.68	

Groundwater Elevations

Ammunition Burning Grounds

Boring Number: WES-3-4-81

Top of Pipe Elevation: 595.12 ft MSL

Screen Interval: from 537.03 to 527.55 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
26 Sep 81	9:10	45.55	546.57	Open hole
28 Sep 81	8:05	--	--	Open hole w/plug
29 Sep 81	12:12	70.00	525.12	
30 Sep 81	9:03	68.97	526.15	
1 Oct 81	9:05	67.85	527.25	
2 Oct 81	8:25	67.15	527.97	
3 Oct 81	8:30	66.67	528.45	
4 Oct 81	11:24	66.18	528.94	
5 Oct 81	4:10	65.67	529.45	
6 Oct 81	10:15	65.07	530.05	
13 Oct 81	8:32	65.40	529.72	
20 Oct 81	8:55	58.82	536.30	
27 Oct 81	5:21	54.15	540.97	
3 Nov 81	8:40	53.28	541.84	
10 Nov 81	8:47	52.18	542.94	
15 Nov 81	4:23	51.61	543.51	Blew dry
17 Nov 81	8:43	52.71	542.41	
24 Nov 81	9:28	51.75	543.37	
29 Nov 81	10:32	51.10	544.02	

Groundwater Elevations

Ammunition Burning Grounds

Boring Number: WES-3-5-81

Top of Pipe Elevation: 596.25 ft MSL

Screen Interval: from 547.85 to 538.57 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
1 Oct 81	9:12	48.96	547.29	
2 Oct 81	8:30	48.92	547.33	
3 Oct 81	8:35	48.90	547.35	
4 Oct 81	11:34	49.08	547.17	
5 Oct 81	4:17	48.90	547.35	
6 Oct 81	10:20	48.94	547.31	
7 Oct 81	10:19	48.76	547.49	
13 Oct 81	8:22	48.94	547.31	
20 Oct 81	8:49	48.88	547.37	
27 Oct 81	5:15	48.90	547.35	
3 Nov 81	8:30	49.04	547.21	
10 Nov 81	8:39	49.01	547.24	
15 Nov 81	4:20	49.00	547.25	Blew dry
17 Nov 81	8:21	49.17	547.08	
24 Nov 81	9:24	49.04	547.21	
29 Nov 81	10:25	48.95	547.30	

Groundwater Elevations

Ammunition Burning Grounds

Boring Number: WES-3-6-81

Top of Pipe Elevation: 590.60 ft MSL

Screen Interval: from 550.34 to 541.00 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
8 Oct 81	9:10	46.91	543.61	
9 Oct 81	3:19	45.03	545.57	
10 Oct 81	9:01	45.24	545.36	
11 Oct 81	12:29	45.12	545.48	
12 Oct 81	7:55	45.16	545.44	
13 Oct 81	8:31	45.12	545.48	
14 Oct 81	10:29	45.20	545.40	
20 Oct 81	8:58	45.31	545.29	
27 Oct 81	5:23	45.30	545.30	
3 Nov 81	8:36	45.20	545.40	
10 Nov 81	8:49	45.37	545.23	
15 Nov 81	4:25	45.43	545.17	Blew dry
17 Nov 81	8:35	46.50	544.10	
24 Nov 81	7:29	45.39	545.21	
29 Nov 81	10:30	45.29	545.31	

Groundwater Elevations

Ammunition Burning Grounds

Boring Number: WES-3-7-81

Top of Pipe Elevation: 557.65 ft MSL

Screen Interval: from 542.23 to 532.95 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
9 Oct 81	3:24	22.00	535.65	
10 Oct 81	9:48	17.15	540.50	
11 Oct 81	12:19	13.30	544.35	
12 Oct 81	7:45	13.20	544.45	
13 Oct 81	8:39	13.02	544.63	
14 Oct 81	10:20	13.09	544.56	
15 Oct 81	2:47	13.05	544.60	
20 Oct 81	9:04	13.13	544.52	
27 Oct 81	5:35	11.80	545.85	
3 Nov 81	8:47	12.10	545.55	
10 Nov 81	9:01	11.40	546.25	
15 Nov 81	4:31	11.32	546.33	Blew dry
17 Nov 81	8:47	11.64	546.01	
24 Nov 81	9:41	10.60	547.05	
29 Nov 81	10:40	11.00	546.65	

Groundwater Elevations

Ammunition Burning Grounds

Boring Number: WES-3-8-81

Top of Pipe Elevation: 587.26 ft MSL

Screen Interval: from 551.89 to 542.46 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
11 Oct 81	12:33	41.77	545.49	
12 Oct 81	7:59	40.50	546.76	
13 Oct 81	8:25	39.94	547.32	
14 Oct 81	10:33	40.23	547.03	
15 Oct 81	2:53	40.28	546.98	
16 Oct 81	3:50	40.39	546.87	
17 Oct 81	8:22	40.34	546.92	
20 Oct 81	8:52	40.30	546.96	
27 Oct 81	5:18	40.35	546.91	
3 Nov 81	8:34	40.40	546.86	
10 Nov 81	8:44	40.54	546.72	
15 Nov 81	4:22	40.58	546.68	Blew dry
17 Nov 81	8:30	40.62	546.64	
24 Nov 81	9:26	40.46	546.80	
29 Nov 81	10:27	40.50	546.76	

Groundwater Elevations

Ammunition Burning Grounds

Boring Number: WES-3-9-81

Top of Pipe Elevation: 625.25 ft MSL

Screen Interval: from 556.32 to 547.10 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
1 Nov 81	10:50	67.75	557.50	
2 Nov 81	8:08	67.81	557.44	
3 Nov 81	8:20	67.87	557.38	
4 Nov 81	11:35	67.70	557.55	
5 Nov 81	10:29	67.53	557.72	
6 Nov 81	11:09	67.56	557.69	
7 Nov 81	10:46	67.71	557.54	
10 Nov 81	8:25	67.95	557.30	
15 Nov 81	4:10	67.48	557.77	
17 Nov 81	7:43	67.40	557.85	Blew dry
17 Nov 81	11:00	--	--	No water
24 Nov 81	9:11	67.55	557.70	
29 Nov 81	10:17	67.95	557.30	

Groundwater Elevations

Ammunition Burning Grounds

Pump House - Building 3004

Top of Casing Plate Elevation: 594.79 ft MSL

Screen Interval: No screen, open hole from 492.79 to 453.79 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
6 Sep 81	9:00	81.66	513.13	
12 Sep 81	11:10	81.82	512.97	
13 Sep 81	1:45	81.69	513.10	
19 Sep 81	9:10	81.67	513.12	
22 Sep 81	4:08	81.85	512.94	
29 Sep 81	12:02	81.94	512.85	
6 Oct 81	4:16	81.84	512.95	
13 Oct 81	8:19	81.87	512.92	
20 Oct 81	8:46	81.89	512.90	
27 Oct 81	5:10	81.97	512.82	
24 Nov 81	9:20	81.97	512.82	
29 Nov 81	10:20	82.00	512.79	

Water measurements made through a ½-in. screw plug on top of casing plate.

Groundwater Elevations

McComish Gorge

Boring Number: WES-4-1-81

Top of Pipe Elevation: 606.49 ft MSL

Screen Interval: from 578.18 to 568.97 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
11 Sep 81	7:55	31.82	574.67	
12 Sep 81	9:02	31.83	574.66	
13 Sep 81	2:20	31.79	574.70	
14 Sep 81	8:15	31.89	574.60	
15 Sep 81	5:55	31.81	574.68	
16 Sep 81	9:15	31.94	574.55	
17 Sep 81	11:02	31.89	574.60	
24 Sep 81	12:50	32.05	574.44	
1 Oct 81	8:20	32.05	574.44	
8 Oct 81	2:50	32.05	574.44	
15 Oct 81	5:10	32.11	574.38	
22 Oct 81	8:34	32.26	574.23	
29 Oct 81	2:11	32.31	574.18	
5 Nov 81	9:15	32.55	573.94	
12 Nov 81	4:31	32.43	574.06	
19 Nov 81	10:58	32.42	574.07	
26 Nov 81	9:54	32.44	574.05	
29 Nov 81	1:45	32.57	573.92	

Groundwater Elevations

McComish Gorge

Boring Number: WES-4-2-81

Top of Pipe Elevation: 588.69 ft MSL

Screen Interval: from 570.21 to 561.05 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
12 Sep 81	8:35	19.9	565.79	Open hole
13 Sep 81	2:24	21.71	566.98	
14 Sep 81	8:24	21.71	566.98	
15 Sep 81	5:55	21.68	567.01	
16 Sep 81	9:21	21.81	566.88	
17 Sep 81	11:05	21.79	566.90	
18 Sep 81	11:01	21.73	566.96	
19 Sep 81	7:23	21.74	566.95	
24 Sep 81	12:53	21.75	566.94	
1 Oct 81	8:26	22.02	566.67	
8 Oct 81	2:53	22.13	566.56	
15 Oct 81	5:12	22.00	566.69	
22 Oct 81	8:37	22.08	566.61	
29 Oct 81	2:15	22.08	566.61	
5 Nov 81	9:21	22.15	566.54	
12 Nov 81	4:34	22.30	566.39	
19 Nov 81	10:59	22.17	566.52	
26 Nov 81	9:57	22.11	566.58	
29 Nov 81	1:46	22.14	566.55	

Groundwater Elevations

McComish Gorge

Boring Number: WES-4-3-81

Top of Pipe Elevation: 569.22 ft MSL

Screen Interval: from 563.12 to 556.10 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
13 Sep 81	2:29	6.65	562.57	
14 Sep 81	3:30	6.80	562.42	
15 Sep 81	5:00	6.57	562.65	
16 Sep 81	9:25	6.70	562.52	
17 Sep 81	11:14	6.48	562.74	
18 Sep 81	11:06	6.61	562.61	
19 Sep 81	7:28	6.54	562.68	
24 Sep 81	12:58	6.70	562.52	
1 Oct 81	8:36	6.59	562.63	
8 Oct 81	3:00	6.59	562.63	
15 Oct 81	5:20	6.74	562.48	
22 Oct 81	3:44	6.64	562.58	
29 Oct 81	2:23	6.48	562.74	
5 Nov 81	9:31	6.60	562.62	
12 Nov 81	4:45	6.49	562.73	
19 Nov 81	11:06	6.52	562.70	
26 Nov 81	10:06	6.40	562.82	
29 Nov 81	1:53	6.32	562.90	

Groundwater Elevations

McComish Gorge

Boring Number: WES-4-4-81

Top of Pipe Elevation: 596.14 ft MSL

Screen Interval: from 570.24 to 561.27 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
29 Sep 81	2:00	28.79	567.35	
30 Sep 81	9:40	28.75	567.39	
1 Oct 81	8:30	28.88	567.26	
2 Oct 81	3:15	28.64	567.50	
3 Oct 81	2:20	28.77	567.37	
4 Oct 81	11:53	28.77	567.37	
5 Oct 81	8:01	28.78	567.36	
8 Oct 81	2:55	28.82	567.32	
15 Oct 81	5:19	28.86	567.28	
22 Oct 81	8:42	28.94	567.20	
29 Oct 81	2:20	28.95	567.19	
5 Nov 81	9:27	29.09	567.05	
12 Nov 81	4:39	29.20	566.94	
19 Nov 81	11:05	29.25	566.89	
26 Nov 81	10:02	29.25	566.89	
29 Nov 81	1:50	29.27	566.87	

Groundwater Elevations

McComish Gorge

Boring Number: WES-4-5-81

Top of Pipe Elevation: 576.39 ft MSL

Screen Interval: from 568.17 to 558.99 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
1 Oct 81	8:33	11.15	565.24	
2 Oct 81	3:18	11.33	565.06	
3 Oct 81	2:25	11.41	564.98	
4 Oct 81	11:56	11.35	565.04	
5 Oct 81	8:09	11.54	564.85	
6 Oct 81	11:35	11.43	564.96	
7 Oct 81	8:58	11.47	564.92	
8 Oct 81	2:58	11.79	564.60	
15 Oct 81	5:22	12.04	564.35	
22 Oct 81	8:46	12.43	563.96	
29 Oct 81	2:25	12.58	563.81	
5 Nov 81	9:33	12.50	563.89	
12 Nov 81	4:43	12.57	563.82	
19 Nov 81	11:09	12.59	563.80	
26 Nov 81	10:05	12.11	564.28	
29 Nov 81	1:54	11.87	564.52	

Groundwater Elevations

McComish Gorge

Boring Number: WES-4-6-81

Top of Pipe Elevation: 582.54 ft MSL

Screen Interval: from 568.92 to 559.71 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
9 Oct 81	4:35	18.01	564.53	
10 Oct 81	4:30	18.06	564.48	
11 Oct 81	1:04	18.04	564.50	
12 Oct 81	8:55	18.15	564.39	
13 Oct 81	9:08	18.30	564.24	
14 Oct 81	9:44	18.03	564.51	
15 Oct 81	5:16	18.09	564.45	
22 Oct 81	8:39	18.08	564.46	
29 Oct 81	2:17	18.00	564.54	
5 Nov 81	9:23	18.01	564.53	
12 Nov 81	4:36	18.10	564.44	
19 Nov 81	11:02	17.96	564.58	
26 Nov 81	9:59	17.97	564.57	
29 Nov 81	1:49	17.88	564.66	

Groundwater Elevations

Old Burning Pit

Boring Number: WES-5-1-81

Top of Pipe Elevation: 599.52 ft MSL

Screen Interval: from 592.54 to 584.66 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
15 Sep 81	5:50	8.39	591.13	
16 Sep 81	9:12	8.48	591.04	
17 Sep 81	10:45	8.34	591.18	
18 Sep 81	11:14	8.28	591.24	
19 Sep 81	7:14	8.26	591.26	
20 Sep 81	10:27	8.25	591.27	
21 Sep 81	3:22	8.23	591.29	
28 Sep 81	12:59	8.79	590.73	
5 Oct 81	8:20	9.55	589.97	
12 Oct 81	8:48	9.88	589.64	
19 Oct 81	11:29	10.18	589.34	
26 Oct 81	10:55	10.09	589.43	
2 Nov 81	9:58	10.19	589.33	
9 Nov 81	12:28	10.26	589.26	
16 Nov 81	2:22	10.00	589.52	
23 Nov 81	11:28	9.21	590.31	
29 Nov 81	2:06	8.05	591.47	

Groundwater Elevations

Old Burning Pit

Boring Number: WES-5-2-81

Top of Pipe Elevation: 586.43 ft MSL

Screen Interval: from 579.33 to 571.57 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
17 Sep 81	10:58	9.77	576.66	
18 Sep 81	11:16	9.82	576.61	
19 Sep 81	8:17	9.68	576.75	
20 Sep 81	10:30	9.70	576.73	
21 Sep 81	3:25	9.62	576.81	
22 Sep 81	5:20	9.90	576.53	
23 Sep 81	3:15	9.91	576.52	
28 Sep 81	1:02	10.00	576.43	
5 Oct 81	8:22	9.90	576.53	
12 Oct 81	8:50	10.32	576.11	
19 Oct 81	11:32	10.63	575.80	
26 Oct 81	10:52	10.21	576.22	
2 Nov 81	10:01	10.68	575.75	
9 Nov 81	12:31	10.99	575.44	
16 Nov 81	2:25	10.80	575.63	
23 Nov 81	11:31	10.72	575.71	
29 Nov 81	2:08	10.78	575.65	

Groundwater Elevations

Old Burning Pit

Boring Number: WES-5-3-81

Top of Pipe Elevation: 592.78 ft MSL

Screen Interval: from 582.89 to 573.76 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
18 Sep 81	11:11	17.62	575.16	
19 Sep 81	7:10	15.46	577.32	
20 Sep 81	10:24	15.42	577.36	
21 Sep 81	3:40	15.44	577.34	
22 Sep 81	5:75	15.50	577.28	
23 Sep 81	3:10	15.54	577.24	
24 Sep 81	12:42	15.56	577.22	
28 Sep 81	12:55	15.52	577.06	
5 Oct 81	8:16	15.76	577.02	
12 Oct 81	8:44	15.96	576.82	
19 Oct 81	11:26	16.23	576.55	
26 Oct 81	10:49	16.15	576.63	
2 Nov 81	10:53	16.49	576.29	
9 Nov 81	12:18	16.67	576.11	
16 Nov 81	2:12	16.66	576.12	
23 Nov 81	11:25	16.89	575.89	
29 Nov 81	1:59	16.93	575.85	

Groundwater Elevations

Old Burning Pit

Boring Number: WES-5-4-81

Top of Pipe Elevation: 588.33 ft MSL

Screen Interval: from 574.59 to 565.38 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
2 Oct 81	3:08	13.38	574.95	
3 Oct 81	2:30	13.20	575.13	
4 Oct 81	11:59	13.29	575.04	
5 Oct 81	8:15	13.45	574.88	
6 Oct 81	11:26	13.44	574.89	
7 Oct 81	8:50	13.39	574.94	
8 Oct 81	4:06	13.41	574.92	
12 Oct 81	8:40	13.57	574.76	
19 Oct 81	11:23	13.94	574.39	
26 Oct 81	10:41	13.91	574.42	
2 Nov 81	9:48	14.26	574.07	
9 Nov 81	12:13	14.48	573.85	
16 Nov 81	2:06	14.61	573.72	
23 Nov 81	11:20	14.56	573.77	
29 Nov 81	1:58	14.63	573.70	

Groundwater Elevations

Old Burning Pit

Boring Number: WES-5-5-81

Top of Pipe Elevation: 586.78 ft MSL

Screen Interval: from 577.80 to 568.79 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
3 Oct 81	2:32	11.57	575.21	
4 Oct 81	12:01	11.60	575.18	
5 Oct 81	8:09	11.64	575.14	
6 Oct 81	11:29	11.75	575.03	
7 Oct 81	8:53	11.92	574.86	
8 Oct 81	4:10	11.82	574.96	
9 Oct 81	4:40	11.82	574.96	
12 Oct 81	8:53	12.02	574.76	
19 Oct 81	11:35	12.40	574.38	
26 Oct 81	10:44	12.48	574.30	
2 Nov 81	9:51	12.66	574.12	
9 Nov 81	12:15	13.16	573.62	
16 Nov 81	2:09	12.92	573.86	
23 Nov 81	11:23	12.88	573.90	
29 Nov 81	2:09	12.61	574.17	

Groundwater Elevations

Old Burning Pit

Boring Number: WES-5-6-81

Top of Pipe Elevation: 573.27 ft MSL

Screen Interval: from 554.75 to 545.56 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
15 Oct 81	5:28	12.56	560.71	
16 Oct 81	1:20	12.48	560.79	
17 Oct 81	4:45	12.48	560.79	
18 Oct 81	--	--	--	
19 Oct 81	11:55	12.45	560.82	
20 Oct 81	4:45	12.56	560.71	
21 Oct 81	3:56	12.39	560.88	
26 Oct 81	11:03	12.40	560.87	
2 Nov 81	10:04	12.48	560.79	
9 Nov 81	12:40	12.63	560.64	
16 Nov 81	2:31	12.41	560.86	
23 Nov 81	11:34	12.37	560.90	
29 Nov 81	2:12	12.25	561.02	

Groundwater Elevations

Old Burning Pit

Boring Number: WES-5-7-81

Top of Pipe Elevation: 579.70 ft MSL

Screen Interval: from 556.40 to 547.08 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
22 Oct 81	4:40	13.04	566.66	Blew well
23 Oct 81	10:21	13.89	565.81	
24 Oct 81	11:20	13.90	565.80	
25 Oct 81	4:37	13.96	565.74	
26 Oct 81	10:58	13.82	565.88	
27 Oct 81	12:58	13.75	565.95	
28 Oct 81	10:37	13.80	565.90	
2 Nov 81	9:55	13.86	565.84	
9 Nov 81	12:22	14.02	565.68	
16 Nov 81	2:17	13.67	566.03	
23 Nov 81	11:24	13.36	566.34	
29 Nov 81	2:04	13.35	566.35	

Groundwater Elevations

Old Burning Pit

Boring Number: WES-5-8-81

Top of Pipe Elevation: 566.78 ft MSL

Screen Interval: from 561.08 to 551.60 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
5 Nov 81	9:43	6.20	560.58	
6 Nov 81	11:50	6.23	560.55	
7 Nov 81	3:10	6.20	560.58	
8 Nov 81	11:28	6.13	560.65	
9 Nov 81	12:45	5.94	560.84	
10 Nov 81	4:35	6.04	560.74	
11 Nov 81	4:45	6.04	560.74	
16 Nov 81	2:36	6.01	560.77	
23 Nov 81	11:39	5.93	560.85	
29 Nov 81	2:15	5.89	560.89	

Groundwater Elevations

Demolition Area

Boring Number: WES-6-1A-81

Top of Pipe Elevation: 686.13 ft MSL

Screen Interval: from 678.53 to 668.88 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
18 Sep 81	8:05	11.35	671.28	Open hole
19 Sep 81	4:00	14.60	671.53	
20 Sep 81	9:50	14.00	672.13	
21 Sep 81	12:35	12.59	673.54	
22 Sep 81	10:26	12.08	674.05	
23 Sep 81	3:30	12.09	674.04	
24 Sep 81	1:50	11.87	674.26	
25 Sep 81	7:20	11.76	674.37	
2 Oct 81	8:43	11.26	674.87	
9 Oct 81	12:08	11.42	674.70	
16 Oct 81	12:25	11.66	674.47	
23 Oct 81	3:45	17.60*	668.53	
30 Oct 81	10:01	17.42*	668.71	
6 Nov 81	2:20	17.39*	668.74	
12 Nov 81				Blew hole and rinsed
13 Nov 81	8:50	--	--	No water
16 Nov 81	8:40	--	--	No water
20 Nov 81	3:30	--	--	No water
27 Nov 81	9:02	17.02*	669.11	

* Water level below screen

Groundwater Elevations

Demolition Area

Boring Number: WES-6-1B-81

Top of Pipe Elevation: 686.27 ft MSL

Screen Interval: from 653.30 to 644.13 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
8 Nov 81	--	--	--	No water
9 Nov 81	5:25	--	--	" "
10 Nov 81	11:20	--	--	" "
11 Nov 81	2:30	--	--	" "
12 Nov 81	10:30	--	--	" "
13 Nov 81	9:00	--	--	" "
16 Nov 81	8:50	--	--	" "
20 Nov 81	8:35	--	--	" "
27 Nov 81	8:57	--	--	" "

Groundwater Elevations

Demolition Area

Boring Number: WES-6-1C-81

Top of Pipe Elevation: 685.60 ft MSL

Screen Interval: from 659.50 to 644.50 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
16 Nov 81	7:34	29.95	652.65	Open hole
17 Nov 81				Open hole - jetted dry
18 Nov 81	11:24	32.38	650.22	Open hole - jetted dry
19 Nov 81	10:00	33.52	652.08	
20 Nov 81	8:31	33.57	652.03	
22 Nov 81	9:04	35.42	650.18	
23 Nov 81	10:35	35.13	650.47	
24 Nov 81	10:14	34.26	651.34	
25 Nov 81	3:20	35.35	650.25	
27 Nov 81	9:00	35.27	650.33	
30 Nov 81	10:48	36.25	649.35	

Groundwater Elevations

Demolition Area

Boring Number: WES-6-2-81

Top of Pipe Elevation: 640.53 ft MSL

Screen Interval: from 613.27 to 603.65 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
21 Sep 81	1:55	24.40	613.13	Open hole
22 Sep 81	10:30	27.31	613.22	
23 Sep 81	3:35	27.55	612.98	
24 Sep 81	2:50	27.64	612.89	
25 Sep 81	7:25	27.69	612.84	
26 Sep 81	7:00	27.49	613.04	
27 Sep 81	2:10	27.49	613.04	
2 Oct 81	8:50	27.65	612.88	
9 Oct 81	12:45	27.55	612.98	
16 Oct 81	11:50	27.95	612.58	
23 Oct 81	3:02	28.11	612.42	
30 Oct 81	10:31	28.29	612.24	
6 Nov 81	3:05	28.15	612.38	
13 Nov 81	9:39	28.54	611.99	
15 Nov 81	8:21	28.36	612.17	Blew dry
16 Nov 81	7:29	28.21	612.32	
20 Nov 81	4:14	28.30	612.23	
27 Nov 81	8:52	28.51	612.02	

Groundwater Elevations

Demolition Area

Boring Number: WES-6-3-81

Top of Pipe Elevation: 662.77 ft MSL

Screen Interval: from 654.27 to 645.07 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
22 Sep 81	9:01	10.6	649.17	Open hole
23 Sep 81	3:40	13.57	649.20	
24 Sep 81	2:50	13.58	649.19	
25 Sep 81	7:30	13.42	649.35	
26 Sep 81	7:05	13.42	649.35	
27 Sep 81	2:20	13.50	649.27	
28 Sep 81	5:05	13.66	649.11	
2 Oct 81	8:55	13.63	649.14	
9 Oct 81	12:29	13.61	649.16	
16 Oct 81	12:59	13.83	648.94	
23 Oct 81	3:39	14.31	648.46	
30 Oct 81	10:09	14.39	648.38	
6 Nov 81	2:25	14.22	648.55	
13 Nov 81	5:11	14.50	648.27	
15 Nov 81	7:46	14.43	648.34	Blew dry
16 Nov 81	7:15	14.12	648.65	
20 Nov 81	3:40	14.58	648.19	
27 Nov 81	8:21	14.76	648.01	

Groundwater Elevations

Demolition Area

Boring Number: WES-6-4-81

Top of Pipe Elevation: 635.89 ft MSL

Screen Interval: from 617.50 to 608.62 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
2 Oct 81	8:50	19.50	613.39	Open hole
3 Oct 81	9:45	23.45	612.44	
4 Oct 81	11:01	23.45	612.44	
5 Oct 81	9:20	23.59	612.30	
6 Oct 81	12:00	23.52	612.37	
7 Oct 81	4:45	23.67	612.22	
8 Oct 81	11:30	23.72	612.17	
9 Oct 81	12:40	23.54	612.35	
16 Oct 81	12:05	23.90	611.99	
23 Oct 81	3:33	24.25	611.64	
30 Oct 81	10:19	24.40	611.49	
6 Nov 81	2:30	24.30	611.59	
13 Nov 81	5:22	24.45	611.44	
15 Nov 81	7:56	24.30	611.59	Blew dry
20 Nov 81	3:48	24.35	611.59	
27 Nov 81	8:27	24.48	611.41	

Groundwater Elevations

Demolition Area

Boring Number: WES-6-5-81

Top of Pipe Elevation: 610.89 ft MSL

Screen Interval: from 595.35 to 586.21 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
3 Oct 81	1:15	19.90	590.99	
4 Oct 81	11:08	17.54	593.35	
5 Oct 81	9:31	17.45	593.44	
6 Oct 81	12:06	17.25	593.64	
7 Oct 81	4:50	17.09	593.80	
8 Oct 81	11:35	17.02	593.87	
9 Oct 81	12:56	17.02	593.87	
16 Oct 81	11:55	17.00	593.89	
23 Oct 81	3:10	17.15	593.74	
30 Oct 81	10:32	17.25	593.64	
6 Nov 81	3:02	17.18	593.71	
13 Nov 81	5:44	17.17	593.72	
15 Nov 81	8:15	17.14	593.75	Blew dry
16 Nov 81	7:27	17.24	593.65	
20 Nov 81	4:10	17.28	593.61	
27 Nov 81	8:47	16.81	594.08	

Groundwater Elevations

Demolition Area

Boring Number: WES-6-6-81

Top of Pipe Elevation: 675.06 ft MSL

Screen Interval: from 624.41 to 615.13 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
15 Oct 81	12:36	46.56	628.50	
16 Oct 81	12:25	46.10	628.96	
17 Oct 81	3:44	46.60	628.46	
18 Oct 81	3:38	45.54	629.52	
19 Oct 81	9:59	45.14	629.92	
20 Oct 81	9:44	45.79	629.27	
21 Oct 81	10:12	45.74	629.32	
23 Oct 81	3:53	45.76	629.30	
30 Oct 81	10:45	45.61	629.45	
6 Nov 81	3:15	45.48	629.58	
13 Nov 81	5:52	45.52	629.54	
15 Nov 81	8:41	45.24	629.82	Blew dry
16 Nov 81	8:10	45.42	629.64	
20 Nov 81	5:29	45.37	629.69	
27 Nov 81	9:07	45.26	629.80	

Groundwater Elevations

Demolition Area

Boring Number: WES-6-7-81

Top of Pipe Elevation: 663.92 ft MSL

Screen Interval: from 646.50 to 637.26 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
15 Oct 81	12:35	18.10	645.82	
17 Oct 81	3:49	18.15	645.77	
18 Oct 81	3:45	18.73	645.19	
19 Oct 81	10:01	18.43	645.49	
20 Oct 81	9:50	18.44	645.48	
21 Oct 81	10:20	18.36	645.56	
22 Oct 81	12:59	18.36	645.56	
23 Oct 81	3:56	18.54	645.38	
30 Oct 81	10:50	18.81	645.11	
6 Nov 81	3:31	18.55	645.37	
13 Nov 81	6:04	18.60	645.32	
15 Nov 81	9:25	18.45	645.47	Blew dry
16 Nov 81	8:20	18.45	645.47	
20 Nov 81	5:43	18.42	645.50	
27 Nov 81	9:34	18.36	645.56	

Groundwater Elevations

Demolition Area

Boring Number: WES-6-8-81

Top of Pipe Elevation: 641.72 ft MSL

Screen Interval: from 625.71 to 616.59 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
16 Oct 81	12:31	11.10	630.62	
17 Oct 81	3:52	11.79	629.93	
18 Oct 81	3:55	11.60	630.12	
19 Oct 81	10:07	11.23	630.49	
20 Oct 81	9:46	11.22	630.50	
21 Oct 81	10:15	11.18	630.54	
22 Oct 81	1:01	11.21	630.51	
23 Oct 81	3:59	11.31	630.41	
30 Oct 81	10:47	11.02	630.70	
6 Nov 81	3:23	10.90	630.82	
13 Nov 81	6:01	10.40	631.32	
15 Nov 81	9:08	10.34	631.38	Blew dry
16 Nov 81	8:31	10.12	631.60	
20 Nov 81	5:37	10.18	631.54	
27 Nov 81	9:39	9.66	632.06	

Groundwater Elevations

Demolition Area

Boring Number: WES-6-9-81

Top of Pipe Elevation: 634.04 ft MSL

Screen Interval: from 605.87 to 596.74 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
17 Oct 81	3:33	25.71	608.33	
18 Oct 81	3:32	25.62	608.42	
19 Oct 81	9:49	25.79	608.25	
20 Oct 81	9:39	26.06	607.98	
21 Oct 81	10:04	25.94	608.10	
22 Oct 81	12:54	26.00	608.04	
23 Oct 81	3:14	25.98	608.06	
30 Oct 81	10:30	26.00	608.04	
6 Nov 81	2:58	26.05	607.99	
13 Nov 81	5:34	26.34	607.70	
15 Nov 81	8:05	26.16	607.88	Blew dry
16 Nov 81	7:24	26.19	607.85	
20 Nov 81	4:05	26.10	607.94	
27 Nov 81	8:44	26.25	607.79	

Groundwater Elevations

Demolition Area

Boring Number: WES-6-10-81

Top of Pipe Elevation: 662.10 ft MSL

Screen Interval: from 641.80 to 632.41 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
20 Oct 81	9:31	22.19	639.91	
21 Oct 81	9:58	22.20	639.90	
22 Oct 81	12:45	22.26	639.84	
23 Oct 81	3:19	22.25	639.85	
24 Oct 81	11:04	22.24	639.86	
25 Oct 81	4:45	22.26	639.84	
26 Oct 81	8:10	22.28	639.82	
30 Oct 81	10:26	22.35	639.75	
6 Nov 81	2:53	22.70	639.40	
13 Nov 81	5:28	22.63	639.47	
15 Nov 81	8:03	22.59	639.51	Blew dry
16 Nov 81	7:22	22.56	639.54	
20 Nov 81	4:02	22.61	639.49	
27 Nov 81	8:40	22.72	639.38	

Groundwater Elevations

Demolition Area

Boring Number: WES-6-11-81

Top of Pipe Elevation: 660.43 ft MSL

Screen Interval: from 641.17 to 632.25 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
18 Oct 81	3:20	14.18	646.25	
19 Oct 81	9:45	14.14	646.29	
20 Oct 81	9:36	14.12	646.31	
21 Oct 81	9:59	14.18	646.25	
22 Oct 81	12:48	14.06	646.37	
23 Oct 81	3:23	14.11	646.32	
24 Oct 81	11:07	14.15	646.28	
30 Oct 81	10:24	14.12	646.31	
6 Nov 81	2:55	14.05	646.38	
13 Nov 81	5:21	14.14	646.29	
15 Nov 81	7:59	14.10	646.33	Blew dry
16 Nov 81	7:18	16.26	644.17	
20 Nov 81	3:58	14.40	646.03	
27 Nov 81	8:34	14.41	646.02	

Groundwater Elevations

Demolition Area

Boring Number: WES-6-12-81

Top of Pipe Elevation: 670.28 ft MSL

Screen Interval: from 630.11 to 620.96 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
5 Nov 81	12:55	39.65	630.63	
6 Nov 81	3:17	39.36	630.92	
7 Nov 81	8:20	39.60	630.68	
8 Nov 81	12:07	39.38	630.90	
9 Nov 81	5:05	39.62	630.66	
10 Nov 81	11:10	39.67	630.61	
11 Nov 81	2:17	39.50	630.78	
13 Nov 81	5:55	39.45	630.83	
15 Nov 81	8:59	39.20	631.08	Blew dry
16 Nov 81	8:23	39.12	631.16	
20 Nov 81	5:32	39.25	631.03	
27 Nov 81	9:10	39.25	631.03	

Groundwater Elevations

Demolition Area

Boring Number: WES-6-13-81

Top of Pipe Elevation: 663.41 ft MSL

Screen Interval: from 622.86 to 613.75 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
6 Nov 81	3:21	54.93	605.48	No water
7 Nov 81	8:25	47.44	612.97	
8 Nov 81	12:11	40.76	619.65	
9 Nov 81	5:10	35.90	624.51	
10 Nov 81	11:17	34.64	625.77	
11 Nov 81	2:20	34.53	625.88	
12 Nov 81	3:30	32.95	627.46	
13 Nov 81	5:57	32.18	628.23	
15 Nov 81	9:20	31.40	632.01	Blew dry
16 Nov 81	8:28	39.12	621.29	
20 Nov 81	5:35	32.65	630.76	
27 Nov 81	9:13	30.72	632.69	
30 Nov 81	10:56	30.50	632.91	

Groundwater Elevations

Old Rifle Range

Boring Number: WES-6-14-81

Top of Pipe Elevation: 508.06 ft MSL

Screen Interval: from 502.06 to 492.89 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
28 Oct 81	4:35	5.57	502.49	
29 Oct 81	9:21	5.60	502.46	
30 Oct 81	4:10	5.64	502.42	
31 Oct 81	7:40	5.70	502.36	
1 Nov 81	10:30	5.75	502.31	
2 Nov 81	10:59	5.78	502.28	
3 Nov 81	1:49	5.85	502.21	
6 Nov 81	10:44	5.90	502.16	
13 Nov 81	1:31	5.19	502.87	
15 Nov 81	3:34	5.35	502.71	Blew dry
16 Nov 81	10:53	5.30	502.76	
20 Nov 81	10:34	3.54	504.52	
27 Nov 81	10:07	3.65	504.41	

Groundwater Elevations

Old Rifle Range

Boring Number: WES-6-15-81

Top of Pipe Elevation: 513.42 ft MSL

Screen Interval: from 507.86 to 498.75 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
1 Nov 81	10:35	14.40	499.02	
2 Nov 81	11:25	14.30	499.12	
3 Nov 81	1:45	14.69*	498.73	
4 Nov 81	10:31	14.77*	498.65	
5 Nov 81	10:12	14.73*	498.69	
6 Nov 81	10:55	14.74*	498.68	
7 Nov 81	10:58	14.74*	498.68	
9 Nov 81				Blew well and rinsed with clean water
10 Nov 81	11:33	--	--	No water
13 Nov 81	4:31	--	--	" "
15 Nov 81	2:35	--	--	" "
17 Nov 81	5:15	--	--	" "
20 Nov 81	10:22	15.50*	497.92	
27 Nov 81	10:26	13.51	499.91	

* Water level below screen

Groundwater Elevations

Old Rifle Range

Boring Number: WES-6-16-81

Top of Pipe Elevation: 530.88 ft MSL

Screen Interval: from 497.35 to 488.29 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
4 Nov 81	10:43	29.74	498.14	Open hole
5 Nov 81	10:07	32.76	498.12	
6 Nov 81	10:47	32.80	498.08	
7 Nov 81	11:02	32.95	497.93	
8 Nov 81	11:58	32.70	498.18	
9 Nov 81	2:42	32.84	498.04	
10 Nov 81	11:30	32.75	498.13	
11 Nov 81	2:45	32.80	498.08	
13 Nov 81	1:36	32.60	498.28	
15 Nov 81	3:30	32.51	498.37	Blew dry
16 Nov 81	10:45	32.20	498.68	
20 Nov 81	10:27	32.11	498.77	
27 Nov 81	10:16	31.60	499.28	

Groundwater Elevations

Old Rifle Range

Boring Number: WES-6-17-81

Top of Pipe Elevation: 513.73 ft MSL

Screen Interval: from 502.88 to 493.54 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
12 Nov 81	3:39	15.44	498.29	
13 Nov 81	1:35	15.49	498.24	
15 Nov 81	2:33	15.12	498.61	Blew dry
16 Nov 81	10:30	15.00	498.73	
17 Nov 81	5:19	15.15	498.58	
18 Nov 81	11:35	15.22	498.51	
19 Nov 81	2:35	14.80	498.93	
20 Nov 81	10:21	15.02	498.71	
24 Nov 81	10:21	14.27	499.46	
27 Nov 81	10:23	14.12	499.61	
29 Nov 81	11:25	13.96	499.77	

Groundwater Elevations

Old Rifle Range

Boring Number: WES-6-18-81

Top of Pipe Elevation: 511.03 ft MSL

Screen Interval: from 496.43 to 487.16 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
18 Nov 81	11:38	14.22	496.88	
19 Nov 81	2:38	14.00	497.03	
20 Nov 81	10:31	13.88	497.15	
22 Nov 81	9:13	13.66	497.37	
23 Nov 81	9:09	13.59	497.44	
24 Nov 81	10:24	13.38	497.65	
25 Nov 81	11:07	13.41	497.62	
27 Nov 81	10:13	13.42	497.61	
29 Nov 81	11:22	13.30	497.73	
6 Dec 81	9:20	12.75	498.28	Readings by NWSC

Groundwater Elevations

Old Rifle Range

Boring Number: WES-6-19-81

Top of Pipe Elevation: 506.42 ft MSL

Screen Interval: from 498.16 to 488.87 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
25 Nov 81	11:00	8.28	498.14	
26 Nov 81	3:59	7.94	498.48	
27 Nov 81	10:10	8.11	498.31	
29 Nov 81	11:20	7.85	498.57	
30 Nov 81	10:40	7.99	498.43	
6 Dec 81	9:25	8.08	498.34	Readings by NWSC
3 Jan 82	10:30	6.80	499.62	Readings by NWSC
1 Mar 82	10:00	6.50	499.92	Readings by NWSC

Groundwater Elevations

Old Rifle Range

Boring Number: WES-6-20-81

Top of Pipe Elevation: 518.68 ft MSL

Screen Interval: From 499.74 to 490.60 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
26 Nov 81	4:02	19.85	498.83	
27 Nov 81	10:20	20.29	498.39	
29 Nov 81	11:23	20.12	498.56	
30 Nov 81	10:37	19.91	498.77	
6 Dec 81	9:30	19.67	499.01	Readings by NWSC
3 Jan 82	9:55	18.10	500.58	Readings by NWSC
1 Mar 82	8:15	17.0	501.68	Readings by NWSC

Groundwater Elevations

Highway 58 Dump Site A

Boring Number: WES-7-1-81

Top of Pipe Elevation: 632.54 ft MSL

Screen Interval: 602.52 to 593.34 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
6 Oct 81	4:32	25.35	607.19	
7 Oct 81	4:55	25.43	607.11	
8 Oct 81	10:25	25.45	607.09	
9 Oct 81	3:42	25.35	607.22	
10 Oct 81	11:38	25.39	607.15	
11 Oct 81	12:43	25.44	607.10	
12 Oct 81	8:15	25.60	606.94	
19 Oct 81	10:36	25.53	607.01	
26 Oct 81	9:15	25.68	606.86	
2 Nov 81	8:46	25.90	606.64	
9 Nov 81	4:37	25.90	606.64	
16 Nov 81	12:46	25.73	606.81	Blew dry
23 Nov 81	12:02	25.73	606.81	
29 Nov 81	11:38	25.79	606.75	

Groundwater Elevations

Highway 58 Dump Site A

Boring Number: WES-7-2-81

Top of Pipe Elevation: 604.89 ft MSL

Screen Interval: 581.62 to 572.27 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
6 Oct 81	4:35	27.09	577.80	
7 Oct 81	5:00	28.63	576.26	
8 Oct 81	10:49	30.00	574.89	
9 Oct 81	3:49	30.78	574.11	
10 Oct 81	11:44	31.00	573.89	
11 Oct 81	12:50	31.70	573.19	
12 Oct 81	8:18	31.96	572.93	
19 Oct 81	10:41	32.60	572.29	
26 Oct 81	9:25	32.68*	572.21	
2 Nov 81	8:53	32.85*	572.04	
9 Nov 81	4:50	32.80*	572.09	
16 Nov 81	12:55	33.38*	571.51	Blew water from well
23 Nov 81	12:13	33.32*	571.57	
29 Nov 81	11:42	33.26*	571.63	

* Water level below screen

Groundwater Elevations

Highway 58 Dump Site A

Boring Number: WES-7-3-81

Top of Pipe Elevation: 600.02 ft MSL

Screen Interval: 573.62 to 564.30 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
7 Oct 81	4:58	27.99	572.03	
8 Oct 81	10:46	29.76	570.26	
9 Oct 81	3:44	29.76	570.26	
10 Oct 81	11:41	29.68	570.34	
11 Oct 81	12:45	29.89	570.13	
12 Oct 81	8:23	29.89	570.13	
13 Oct 81	8:51	29.93	570.09	
19 Oct 81	10:45	30.03	569.99	
26 Oct 81	9:05	29.65	570.37	
2 Nov 81	8:48	29.93	570.09	
9 Nov 81	4:39	30.06	569.96	
16 Nov 81	12:49	29.48	570.54	
23 Nov 81	12:05	29.55	570.47	
29 Nov 81	11:40	29.87	570.15	

Groundwater Elevations

Highway 58 Dump Site A

Boring Number: WES-7-4-81

Top of Pipe Elevation: 598.80 ft MSL

Screen Interval: 571.49 to 562.16 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
13 Oct 81	8:54	29.39	569.41	
14 Oct 81	11:15	29.55	569.25	
15 Oct 81	2:26	29.43	569.37	
16 Oct 81	12:45	29.34	569.46	
17 Oct 81	9:32	29.29	569.51	
18 Oct 81	--	--	--	
19 Oct 81	10:31	29.50	569.30	
26 Oct 81	9:20	29.01	569.79	
2 Nov 81	8:51	29.30	569.50	
9 Nov 81	4:45	29.32	569.48	
16 Nov 81	12:53	28.86	569.94	
23 Nov 81	12:10	28.88	569.92	
29 Nov 81	11:41	29.23	569.57	

Groundwater Elevations

Highway 58 Dump Site A

Boring Number: WES-7-5-81

Top of Pipe Elevation: 596.73 ft MSL

Screen Interval: 569.43 to 560.08 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
6 Nov 81	10:36	26.48	570.25	
7 Nov 81	11:09	26.72	570.01	
8 Nov 81	11:50	26.61	570.12	
9 Nov 81	4:42	26.78	569.95	
10 Nov 81	4:01	26.70	570.03	
11 Nov 81	2:10	26.67	570.06	
12 Nov 81	4:08	26.51	570.22	
16 Nov 81	12:51	26.19	570.54	
23 Nov 81	12:08	26.40	570.33	
29 Nov 81	11:41	26.60	570.13	

Groundwater Elevations

Highway 58 Dump Site B

Boring Number: WES-8-1-81

Top of Pipe Elevation: 644.26 ft MSL

Screen Interval: from 581.69 to 572.63 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
27 Oct 81	9:14	63.95	577.31	Open hole
28 Oct 81	1:21	67.30	576.96	
29 Oct 81	9:38	67.02	577.24	
30 Oct 81	11:45	66.94	577.32	
31 Oct 81	8:19	66.95	577.31	
1 Nov 81	10:00	66.94	577.32	
2 Nov 81	8:30	66.95	577.31	
9 Nov 81	4:18	67.04	577.22	
16 Nov 81	1:15	66.61	577.65	
23 Nov 81	9:32	66.72	577.54	
29 Nov 81	10:50	66.68	577.58	

Groundwater Elevations

Highway 58 Dump Site B

Boring Number: WES-8-2-81

Top of Pipe Elevation: 583.99 ft MSL

Screen Interval: from 569.03 to 559.94 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
22 Oct 81	3:55	18.04	565.95	
23 Oct 81	8:30	18.22	565.77	
24 Oct 81	9:37	18.17	565.82	
25 Oct 81	4:15	18.05	565.94	
26 Oct 81	9:20	18.24	565.75	
27 Oct 81	1:15	18.31	565.68	
28 Oct 81	9:31	18.39	565.60	
29 Oct 81	11:55	18.42	565.57	
2 Nov 81	8:39	18.45	565.54	
9 Nov 81	4:11	18.84	565.15	
16 Nov 81	1:20	18.66	565.33	
20 Nov 81	10:04	19.13	564.86	
23 Nov 81	10:10	18.99	565.00	
29 Nov 81	11:05	18.81	565.18	

Groundwater Elevations

Highway 58 Dump Site B

Boring Number: WES-8-3-81

Top of Pipe Elevation: 581.90 ft MSL

Screen Interval: from 520.60 to 511.43 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
24 Oct 81	9:41	56.07	525.83	
25 Oct 81	4:18	55.71	526.19	
26 Oct 81	9:45	55.76	526.14	
27 Oct 81	1:12	56.05	525.85	
28 Oct 81	9:43	56.02	525.82	
29 Oct 81	12:01	56.10	525.80	
30 Oct 81	12:05	56.15	525.75	
2 Nov 81	8:41	56.05	525.85	
9 Nov 81	4:15	56.16	525.74	
16 Nov 81	1:31	55.77	526.13	
23 Nov 81	10:16	56.02	525.88	
29 Nov 81	11:09	56.27	525.63	

Groundwater Elevations

Highway 58 Dump Site B

Boring Number: WES-8-4-81

Top of Pipe Elevation: 586.66 ft MSL

Screen Interval: from 518.45 to 509.25 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
12 Nov 81	3:48	65.45	521.21	
13 Nov 81	10:04	65.57	521.09	
15 Nov 81	11:30	65.42	521.24	
16 Nov 81	1:08	65.35	521.31	
17 Nov 81	2:57	65.45	521.21	
18 Nov 81	11:50	65.50	521.16	
19 Nov 81	2:51	65.18	521.48	
20 Nov 81	10:05	65.56	521.10	
23 Nov 81	10:01	65.45	521.21	
29 Nov 81	11:00	65.70	520.96	

Groundwater Elevations

Highway 58 Dump Site B

Boring Number: WES-8-5-81

Top of Pipe Elevation: 586.84 ft MSL

Screen Interval: from 527.41 to 518.29 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
16 Nov 81	1:27	61.90	521.94	Open hole
17 Nov 81	3:08	63.37	523.47	
18 Nov 81	11:54	63.52	523.32	
19 Nov 81	2:55	63.65	523.19	
20 Nov 81	10:01	63.77	523.07	
22 Nov 81	9:26	64.17	522.67	
23 Nov 81	10:13	64.00	522.84	
29 Nov 81	11:07	64.22	522.62	

Groundwater Elevations

Highway 58 Dump Site B

Boring Number: WES-8-6-81

Top of Pipe Elevation: 585.70 ft MSL

Screen Interval: from 569.18 to 560.01 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
20 Nov 81	10:06	18.48	564.22	Open hole
22 Nov 81	9:23	18.22	564.48	" "
23 Nov 81	10:04	18.22	564.48	" "
24 Nov 81	10:40	15.85	566.85	" "
27 Nov 81	1:37	17.60	568.10	
29 Nov 81	10:20	20.08	565.52	
30 Nov 81	10:24	20.60	565.10	
3 Dec 81	9:15	24.60	561.10	Readings by NWSC
6 Dec 81	9:40	20.67	565.03	Readings by NWSC
13 Dec 81	10:45	20.42	565.28	Readings by NWSC

Groundwater Elevations

Highway 58 Dump Site B

Boring Number: WES-8-7-81

Top of Pipe Elevation: 643.75 ft MSL

Screen Interval: from 524.24 to 515.19 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
27 Nov 81	10:57	121.05	522.70	
29 Nov 81	10:52	121.20	522.55	
30 Nov 81	9:37	120.91	522.84	
6 Dec 81	9:50	121.08	522.67	Readings by NWSC
13 Dec 81	9:42	120.90	522.85	Readings by NWSC

Groundwater Elevations

Highway 58 Dump Site B

Boring Number: WES-8-8-81

Top of Pipe Elevation: 589.31 ft MSL

Screen Interval: from 530.62 to 521.86 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
29 Nov 81	11:02	69.87*	519.44	
30 Nov 81	10:19	69.92*	519.39	
3 Dec 81	9:15	67.83*	521.48	Readings by NWSC
6 Dec 81	9:45	67.33*	521.98	Readings by NWSC
13 Dec 81	9:28	67.50*	521.81	Readings by NWSC

* Water level below screen

Groundwater Elevations

Highway 58 Dump Site B

Boring Number: WES-8-9-81

Top of Pipe Elevation: 589.33 ft MSL

Screen Interval: from 520.89 to 511.86 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
29 Nov 81	11:06	67.57	521.76	
30 Nov 81	10:21	67.27	522.06	
3 Dec 81	9:30	67.50	521.83	Readings by NWSC
6 Dec 81	9:43	67.60	521.73	Readings by NWSC
13 Dec 81	9:27	67.50	521.83	Readings by NWSC

Groundwater Elevations

Pest Control Area

Boring Number: WES-9-1-81

Top of Pipe Elevation: 737.32 ft MSL

Screen Interval: from 715.77 to 706.62 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
25 Oct 81	4:24	17.48	719.84	
26 Oct 81	10:14	17.58	719.74	
27 Oct 81	1:50	17.74	719.58	
28 Oct 81	2:08	17.95	719.37	
29 Oct 81	9:07	17.81	719.51	
30 Oct 81	8:35	17.91	719.41	
31 Oct 81	8:35	18.01	719.31	
3 Nov 81	9:40	17.80	719.52	
10 Nov 81	9:35	17.91	719.41	
17 Nov 81	2:19	17.48	719.84	
24 Nov 81	2:41	17.55	719.77	
29 Nov 81	12:51	17.62	719.70	
13 Dec 81	8:00	17.50	719.82	Readings by NWSC

Groundwater Elevations

Pest Control Area

Boring Number: WES-9-2-81

Top of Pipe Elevation: 726.80 ft MSL

Screen Interval: from 718.70 to 710.10 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
24 Oct 81	7:55	13.35	713.45	
25 Oct 81	4:27	13.14	713.66	
26 Oct 81	10:09	13.08	713.72	
27 Oct 81	2:00	12.57	714.23	
28 Oct 81	2:15	12.51	714.29	
29 Oct 81	9:01	12.50	714.30	
30 Oct 81	8:40	12.52	714.28	
3 Nov 81	9:43	12.55	714.25	
10 Nov 81	9:50	12.38	714.42	
17 Nov 81	2:35	12.02	714.78	
24 Nov 81	2:29	11.48	715.32	
29 Nov 81	1:02	11.44	715.36	
13 Dec 81	7:45	11.60	715.20	Readings by NWSC

Groundwater Elevations

Pest Control Area

Boring Number: WES-9-3-81

Top of Pipe Elevation: 709.78 ft MSL

Screen Interval: from 703.08 to 697.18 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
27 Oct 81	1:44	4.45	705.33	
28 Oct 81	2:01	4.29	705.49	
29 Oct 81	9:13	4.25	705.53	
30 Oct 81	8:30	4.23	705.55	
31 Oct 81	8:25	4.25	705.53	
1 Nov 81	10:15	4.24	705.54	
2 Nov 81	9:35	4.15	705.63	
3 Nov 81	9:37	4.18	705.60	
10 Nov 81	9:21	4.35	705.43	
17 Nov 81	1:57	3.91	705.87	Bailed well
24 Nov 81	2:21	3.70	706.08	
29 Nov 81	12:43	3.60	706.18	
13 Dec 81	9:05	4.30	705.48	Readings by NWSC

Groundwater Elevations

Pest Control Area

Boring Number: WES-9-4-81

Top of Pipe Elevation: 724.93 ft MSL

Screen Interval: from 706.13 to 696.81 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
8 Nov 81	11:45	28.22	696.71	
9 Nov 81	3:16	23.07	701.86	
10 Nov 81	9:26	21.98	702.95	
11 Nov 81	4:00	19.81	705.12	
12 Nov 81	5:05	19.56	705.37	
13 Nov 81	5:00	19.01	705.92	
14 Nov 81	5:07	18.42	706.51	
17 Nov 81	2:15	17.85	707.08	
24 Nov 81	2:16	17.90	707.03	
29 Nov 81	12:49	18.08	706.85	
13 Dec 81	8:04	18.20	706.73	Readings by NWSC

Groundwater Elevations

Pest Control Area

Boring Number: WES-9-5-81

Top of Pipe Elevation: 718.52 ft MSL

Screen Interval: from 706.72 to 697.34 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
8 Nov 81	11:41	14.15	704.37	
9 Nov 81	3:13	14.22	704.30	
10 Nov 81	9:29	14.38	704.14	
11 Nov 81	4:03	14.04	704.48	
12 Nov 81	5:08	14.18	704.34	
13 Nov 81	5:03	14.10	704.42	
14 Nov 81	5:05	13.85	704.67	
17 Nov 81	2:10	13.88	704.64	
24 Nov 81	2:08	14.00	704.52	
29 Nov 81	12:46	14.13	704.39	
13 Dec 81	8:08	14.30	704.22	Readings by NWSC

Groundwater Elevations

Pest Control Area

Boring Number: WES-9-6-81

Top of Pipe Elevation: 722.65 ft MSL

Screen Interval: from 713.12 to 703.97 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
10 Nov 81	8:42	5.73	716.92	
11 Nov 81	4:10	5.54	717.11	
12 Nov 81	5:01	5.60	717.05	
13 Nov 81	5:07	5.60	717.05	
15 Nov 81	5:08	5.20	717.45	
16 Nov 81	12:39	5.10	717.35	
17 Nov 81	2:25	5.15	717.50	
24 Nov 81	2:37	5.33	717.32	
29 Nov 81	12:59	5.21	717.44	
13 Dec 81	7:54	5.30	717.35	Readings by NWSC

Groundwater Elevations

Pest Control Area

Boring Number: WES-9-7-81

Top of Pipe Elevation: 738.32 ft MSL

Screen Interval: from 715.78 to 706.76 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
19 Nov 81	8:55	18.58	719.74	
20 Nov 81	11:05	18.75	719.57	
22 Nov 81	8:39	19.00	719.32	
23 Nov 81	12:48	18.97	719.35	
24 Nov 81	2:33	18.81	719.51	
25 Nov 81	4:50	18.78	719.54	
26 Nov 81	7:50	18.60	719.72	
27 Nov 81	10:38	18.82	719.50	
29 Nov 81	12:56	18.90	719.42	
13 Dec 81	7:50	19.20	719.12	Readings by NWSC

Groundwater Elevations

Pest Control Area

Boring Number: WES-9-8-81

Top of Pipe Elevation: 723.19 ft MSL

Screen Interval: from 709.66 to 700.53 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
19 Nov 81	9:26	12.72	710.47	
20 Nov 81	11:09	13.00	710.19	
22 Nov 81	8:42	13.67	709.52	
23 Nov 81	12:29	13.77	709.42	
24 Nov 81	2:13	13.87	709.32	
25 Nov 81	4:00	13.50	709.69	
26 Nov 81	4:08	13.33	709.86	
29 Nov 81	12:47	13.95	709.24	
13 Dec 81	8:06	14.20	708.99	Readings by NWSC

Groundwater Elevations

Pest Control Area

Boring Number: WES-9-9-81

Top of Pipe Elevation: 726.21 ft MSL

Screen Interval: from 718.96 to 712.53 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
26 Nov 81	7:43	5.67	717.54	Open hole
27 Nov 81	10:35	8.61	717.60	
29 Nov 81	12:54	8.57	717.64	
30 Nov 81	2:00	8.42	717.79	
6 Dec 81	9:05	8.75	717.46	Readings by NWSC
13 Dec 81	7:47	8.80	717.41	Readings by NWSC

Groundwater Elevations

Rockeye Site

Boring Number: WES-10-1-81

Top of Pipe Elevation: 620.80 ft MSL

Screen Interval: 601.42 to 592.60 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
22 Nov 81	10:45	17.69	603.11	
23 Nov 81	3:05	18.00	602.80	
24 Nov 81	9:58	14.94	605.86	
25 Nov 81	4:15	18.07	602.73	
26 Nov 81	4:32	17.70	603.10	
27 Nov 81	3:17	17.66	603.14	
29 Nov 81	1:12	17.95	602.85	

Groundwater Elevations

Rockeye Site

Boring Number: WES-10-2-81

Top of Pipe Elevation: 621.51 ft MSL

Screen Interval: 607.93 to 598.71 ft MSL

Grid Coordinates:

Date	Time	Depth to Water, ft	Water Elevation, ft MSL	Remarks
23 Nov 81	3:10	19.46	602.05	
24 Nov 81	9:55	14.94	606.57	
25 Nov 81	4:12	19.85	601.66	
26 Nov 81	4:30	19.83	601.68	
27 Nov 81	3:14	19.85	601.66	
29 Nov 81	1:14	20.16	601.35	

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HYDROGEOLOGIC INVESTIGATION OF WASTE DISPOSAL SITES AT THE NAVAL WEAPONS SUPPORT CENTER, CRANE, INDIANA

APPENDIX E

C+D

by

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April 1982

APPENDIX E

DEFINITION OF SOIL TESTS AND SOIL TEST RESULTS

WORKING DRAFT

APPENDIX E: DEFINITION OF SOIL TESTS AND SOIL TEST RESULTS

Physical Test

Standard soil test procedures as specified by Engineer Manual 1110-2-1906, "Laboratory Soil Testing," were followed during testing.

Unified Soil Classification System

Classification of soils according to the USCS depends upon grain-size distribution and the Atterberg limits. Grain-size distribution is determined with sieves and the liquidity and plasticity limits (Atterberg limits) are determined with standard devices. The liquid and plastic limits are the water contents at the boundaries between the semiliquid and plastic state and the plastic and semisolid state, respectively. Figure E-1 shows the USCS by which the NWSC soil samples were described. Figures E-2 and E-3 present examples of the laboratory data sheets for the classification of two samples; one a coarse-grained material (SP-SM) and the other a fine-grained material (CL). Laboratory data sheets for all the NWSC soil samples are presented in the end of this Appendix.

Water content and density

Water content and soil density are important engineering relationships and are useful correlations among samples for which a full suite of physical test data are not available. Water content is the amount of free water in a soil and is determined by the following formula:

$$W = \frac{W_w}{W_s}$$

where

W = water content

W_w = weight of water

W_s = dry weight of soil

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Density or dry unit weight is determined according to the following formula:

$$D = \frac{W_s}{V}$$

where

D = density

W_s = dry weight of soil

V = volume of soil

Permeability

Permeability is a measure of a soil's ability to transmit a fluid; in the current study the fluid is water. The flow of water through a soil is governed by Darcy's law:

$$q = KiA$$

where

q = rate of discharge through a soil of cross-sectional area A

K = coefficient of permeability

i = hydraulic gradient (the loss of hydraulic head per unit distance of flow)

A = sample area perpendicular to flow

For coarse-grained materials, permeability tests are usually conducted in a constant head apparatus. In this equipment, an overflowing reservoir maintains a constant head on a soil sample of specified dimensions and the amount of water passing through the soil in a specified time is collected and measured. The permeability is then calculated according to the formula:

$$K_{20} = \frac{QLR_t}{hAt}$$

where

K_{20} = coefficient of permeability, cm/sec at 20°

Q = quantity of flow, cc

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L = length of specimen over which head loss is measured, cm. If piezometer taps are used, L is equal to the distance between piezometer taps.

R_t = temperature correction factor for viscosity of water

h = head loss across sample or between piezometer taps, cm

Chemical Test

Cation Exchange Capacity

Cation Exchange Capacity (CEC) test procedures as specified by Technical Report EPA/CE 81-1, "Procedures for Handling and Chemical Analysis of Sediment and Water Samples," were followed during testing. The CEC of a soil is a measure of the cations reversibility capacity from the surface of the crystalline matrix of a mineral. The CEC is expressed in millequivalents per 100 grams and is calculated from the following formula:

$$\text{CEC/100g} = \frac{(X\ \text{mg}/\ell)\ (.05)\ (100)}{(18\ \text{mg/meq})\ (\text{g})\ (\%\ S)}$$

where

X = ammonia concentration in NaCl leachate, mg/ℓ

.05 = volume of NaCl leachate, ℓ

18 = millequivalent weight of ammonium ion, mg/meq

g = weight of sediment sample, g

% S = percent solids in sediment sample (as decimal fraction)

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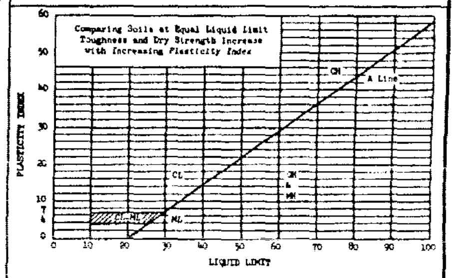
UNIFIED SOIL CLASSIFICATION
(Including Identification and Description)

Major Divisions (1)	Major Divisions (2)		Group Symbols (3)	Typical Names (4)	Field Identification Procedures (Excluding particles larger than 3 in. and basing fractions on estimated weights) (5)	Information Required for Describing Soils (6)	Laboratory Classification Criteria (7)
Coarse-grained Soils: More than half of material is larger than No. 200 sieve size. The No. 200 sieve size is about the smallest particle visible to the naked eye.	Gravels: More than half of coarse fraction is larger than No. 4 sieve size. (For visual classification, the 1/4-in. size may be used as equivalent to the No. 4 sieve size)	Clean Gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.	For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions, and drainage characteristics.	Use grain-size curve in identifying the fractions as given under field identification. Determine percentages of gravel and sand from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse-grained soils are classified as follows: Less than 5% = GW, GP, SW, SP; More than 12% = GM, GC, SM, SC; 5% to 12% = Borderline cases requiring use of dual symbols. $C_u = \frac{D_{60}}{D_{10}}$ Greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.		Not meeting all gradation requirements for GW
		Gravels with Fines (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixture.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below)	Give typical name; indicate approximate percentages of sand and gravel, maximum size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbol in parentheses.	Atterberg limits below "A" line or PI less than 4. Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols.
			GC	Clayey gravels, gravel-sand-clay mixtures.	Plastic fines (for identification procedures see CL below).		Atterberg limits above "A" line with PI greater than 7
	Sands: More than half of coarse fraction is smaller than No. 4 sieve size.	Clean Sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines.	Wide range in grain size and substantial amounts of all intermediate particle sizes.		$C_u = \frac{D_{60}}{D_{10}}$ Greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
			SP	Poorly graded sands or gravelly sands, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.	Example: Silty sand, gravelly; about 20% hard, angular gravel particles 1/2-in. maximum size; rounded and subangular sand grains, coarse to fine; about 15% nonplastic fines with low dry strength; well compacted and moist in place; alluvial sand; (SM).	Not meeting all gradation requirements for SW
		Sands with Fines (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below).		Atterberg limits below "A" line or PI less than 4. Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols.
			SC	Clayey sands, sand-clay mixtures.	Plastic fines (for identification procedures see CL below).		Atterberg limits above "A" line with PI greater than 7

Major Divisions (1)	Major Divisions (2)	Group Symbols (3)	Typical Names (4)	Identification Procedures on Fraction Smaller than No. 40 Sieve Size: Dry Strength (Crushing characteristics)	Dilatancy (Reaction to shaking)	Toughness (Consistency near PL)	Information Required for Describing Soils (6)
Fine-grained Soils: More than half of material is smaller than No. 200 sieve size.	Silts and Clays: Liquid limit is less than 50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.	None to slight	Quick to slow	None	For undisturbed soils add information on structure, stratification, consistency in undisturbed and remolded states, moisture and drainage conditions.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.	Medium to high	None to very slow	Medium	
		OL	Organic silts and organic silty clays of low plasticity.	Slight to medium	Slow	Slight	Give typical name; indicate degree and character of plasticity; amount and maximum size of coarse grains; color in wet condition; odor, if any; local or geologic name and other pertinent descriptive information; and symbol in parentheses.
	Silts and Clays: Liquid limit is greater than 50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	Slight to medium	Slow to none	Slight to medium	
		CH	Inorganic clays of high plasticity, fat clays.	High to very high	None	High	
		OH	Organic clays of medium to high plasticity, organic silts	Medium to high	None to very slow	Slight to medium	Example: Clayey silt, brown; slightly plastic; small percentage of fine sand; numerous vertical root holes; firm and dry in place; loess; (ML).
Highly Organic Soils		Pt	Peat and other highly organic soils.	Readily identified by color, odor, spongy feel and frequently by fibrous texture.			

Laboratory Classification Criteria (7), fine-grained soils:



PLASTICITY CHART

For laboratory classification of fine-grained soils

(1) Boundary classifications: Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW-GC, well-graded gravel-sand mixture with clay binder. (2) All sieve sizes on this chart are U. S. standard.

FIELD IDENTIFICATION PROCEDURES FOR FINE-GRAINED SOILS OR FRACTIONS

These procedures are to be performed on the minus No. 40 sieve size particles, approximately 1/64 in. For field classification purposes, screening is not intended, simply remove by hand the coarse particles that interfere with the tests.

Dilatancy (reaction to shaking)

After removing particles larger than No. 40 sieve size, prepare a pat of moist soil with a volume of about one-half cubic inch. Add enough water *if necessary* to make the soil soft but not sticky.

Place the pat in the open palm of one hand and shake horizontally, striking vigorously against the other hand several times. A positive reaction consists of the appearance of water on the surface of the pat which changes to a livery consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the pat stiffens, and finally it cracks or crumbles. The rapidity of appearance of water during shaking and of its disappearance during squeezing assist in identifying the character of the fines in a soil.

Very fine clean sands give the quickest and most distinct reaction whereas a plastic clay has no reaction. Inorganic silts, such as a typical rock flour, show a moderately quick reaction.

Dry Strength (crushing characteristics)

After removing particles larger than No. 40 sieve size, mold a pat of soil to the consistency of putty, adding water if necessary. Allow the pat to dry completely by oven, sun, or air-drying, and then test its strength by breaking and crumbling between the fingers. This strength is a measure of the character and quantity of the colloidal fraction contained in the soil. The dry strength increases with *increasing plasticity*.

High dry strength is characteristic for clays of the CH group. A typical inorganic silt possesses only very slight dry strength. Silty fine sands and silts have about the same slight dry strength, but can be distinguished by the feel when powdering the dried specimen. *Fine sand feels gritty whereas a typical silt has the smooth feel of flour.*

Toughness (consistency near plastic limit)

After particles larger than the No. 40 sieve size are removed, a specimen of soil about one-half inch cube in size, is molded to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture by evaporation. Then the specimen is rolled out by hand on a smooth surface or between the palms into a thread about one-eighth inch in diameter. The thread is then folded and rerolled repeatedly. During this manipulation the moisture content is gradually reduced and the specimen stiffens, finally loses its plasticity, and crumbles when the plastic limit is reached.

After the thread crumbles, the pieces should be lumped together and a slight kneading action continued *until the lump crumbles*.

The tougher the thread near the plastic limit and the stiffer the lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil. Weakness of the thread at the plastic limit and quick loss of coherence of the lump below the plastic limit indicate either *inorganic clay of low plasticity*, or materials such as kaolin-type clays and organic clays which occur below the A-line.

Highly organic clays have a very weak and spongy feel at the plastic limit.

Figure E-1. Unified Soil Classification System (USCS)

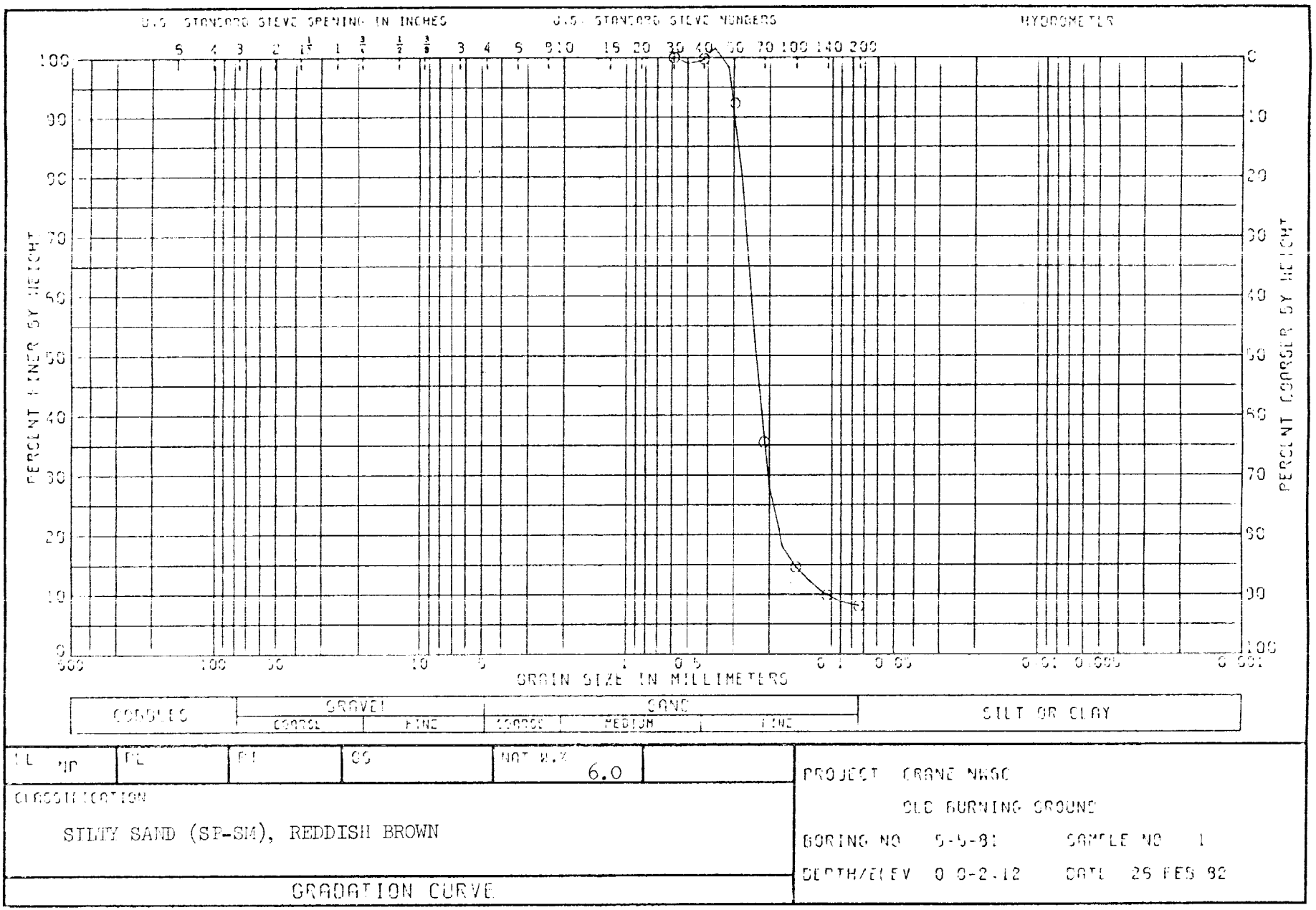
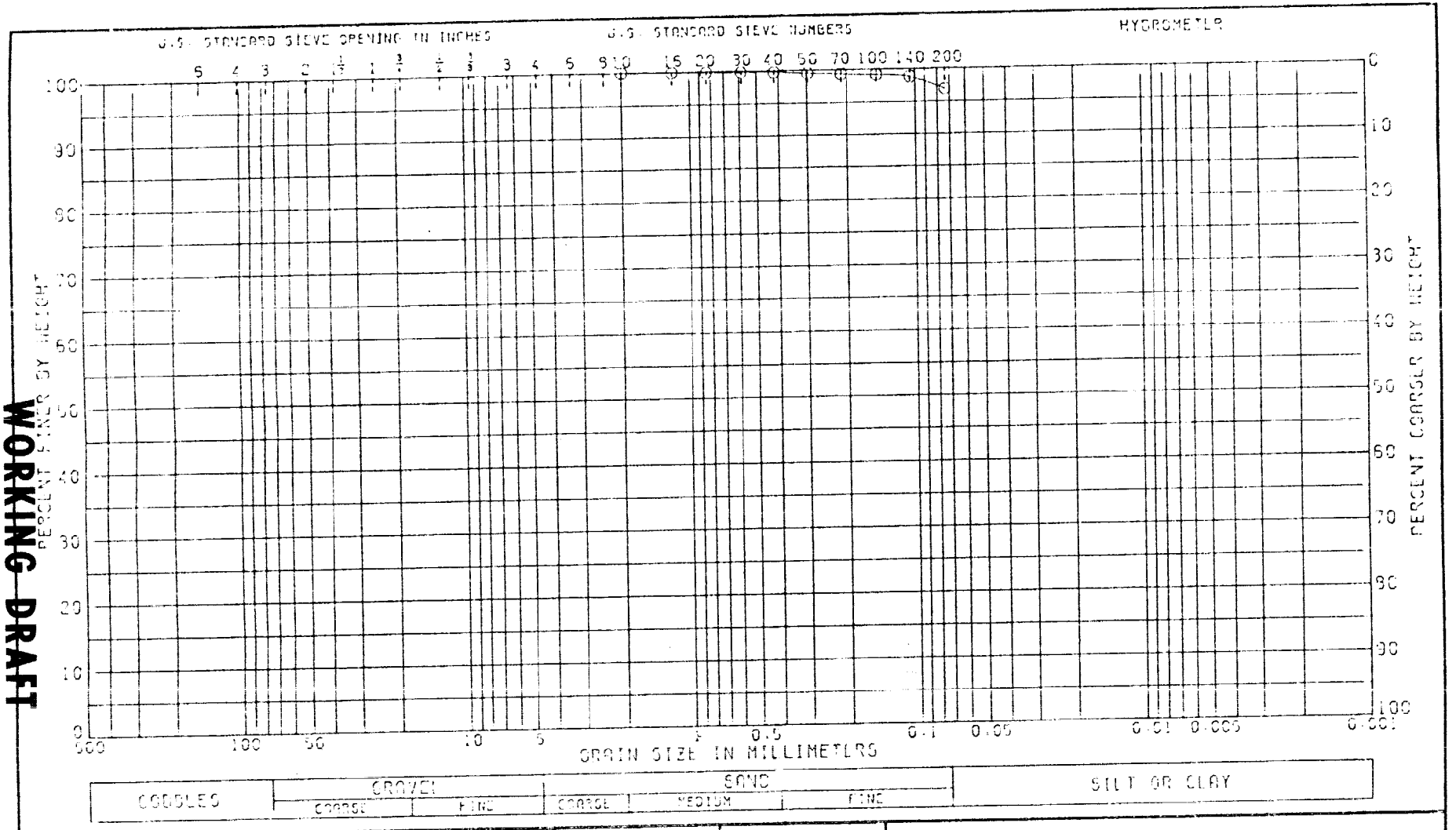


Figure E-2. Laboratory data sheet of grain size curve for a coarse-grained soil.

WORKING DRAFT



WORKING DRAFT

LL	PL	PI	CC	NAT W.%
31	19	12		17.8

CLASSIFICATION

CLAY (CL), BROWN: TRACE OF SAND

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO. 5-6-81 SAMPLE NO. 2

DEPTH/ELEV 5.0-7.17 DATE 11 FEB 82

Figure E-3. Laboratory data sheet of grain size curve for a fine-grained soil.

Laboratory Soil Test Results

Mustard Gas Burial Grounds

Boring Number	Sample Number	Depth ft	Dry Density lbs/cu ft	Water Content Percent	Liquid Limit Percent	Plastic Limit Percent	Plasticity Index Percent	USCS**	Permeability cm/sec	Cation Exchange Capacity meq/100 g
1-1-81	1	0.0-1.85	104.6	21.7	36	18	18	CL		1.30
1-1-81	2	5.0-6.37	121.2	13.6	27	14	13	SC		
1-2-81	1A*	0.0-0.65	--	7.1	35	18	17	SC		
1-3-81	1	0.0-2.3	114.3	14.2	28	13	15	CL		6.84
1-3-81	2	5.0-6.02	106.5	17.9	37	18	19	CL		
1-4-81	1	0.0-2.43	107.2	11.2	30	13	17	CL		
1-4-81	2	5.0-6.35	120.8	12.8	32	19	13	CL		0.40
1-5-81	1	0.0-2.28	92.2	11.4	33	18	15	CL	1.72×10^{-4}	6.42

* Jar sample
** See Figure E-1

WORKING DRAFT

Laboratory Soil Test Results

Dye Burial Grounds

Boring Number	Sample Number	Depth ft	Dry Density lbs/cu ft	Water Content Percent	Liquid Limit Percent	Plastic Limit Percent	Plasticity Index Percent	USCS**	Permeability cm/sec	Cation Exchange Capacity meq/100 g
2-1-81	1	0.92-1.87	101.0	21.9	38	19	19	CL		7.83
2-1-81	2	6.0-6.95	125.1	11.1	25	14	11	CL		
2-2-81	1	0.0-1.65	93.3	21.2	46	21	25	CL	2.97×10^{-7}	2.54
2-3-81	1	0.0-1.15	108.9	18.4	44	23	21	CL		4.49
2-3-81	2A*	5.0-5.65	--	14.3	38	14	24	CL		
2-4-81	1	0.0-2.2	91.4	18.5	42	21	21	CL		2.81
2-5-81	1	0.0-1.55	93.8	18.0	44	23	21	CL		4.51
2-5-81	2	5.0-6.1	117.0	8.8	25	14	11	CL		
2-6-81	1	0.0-2.2	82.7	15.8	31	17	14	CL		
2-6-81	2	5.0-6.33	106.3	15.4	38	15	23	CL	3.86×10^{-5}	0.49
2-7-81	1	0.0-2.0	105.5	9.2	34	15	19	CL		5.06
2-8-81	1	0.0-2.25	84.8	17.1	39	18	21	CL		
2-8-81	2	5.0-6.69	117.0	13.4	39	16	23	CL	5.98×10^{-8}	6.38

* Jar sample
** See Figure E-1

WORKING DRAFT

Laboratory Soil Test Results

Ammunition Burning Grounds

Boring Number	Sample Number	Depth ft	Dry Density lbs/cu ft	Water Content Percent	Liquid Limit Percent	Plastic Limit Percent	Plasticity Index Percent	USCS**	Permeability cm/sec	Cation Exchange Capacity meq/100 g
3-1-81	1	0.0-1.35	115.5	17.3	42	17	25	SC		4.26
3-1-81	2	5.0-5.79	118.1	15.1	43	18	25	CL		
3-1-81	3	10.0-10.85	123.3	10.2	37	19	18	CL		
3-2-81	1	0.0-1.5	119.8	3.7	32	19	13	SC		3.86
3-2-81	2	5.0-7.4	113.5	15.4	27	13	14	SC		
3-3-81	1	0.0-1.23	98.9	19.8	31	17	14	CL		0.97
3-4-81	1	0.0-1.3	115.6	9.8	31	16	15	SC	4.69×10^{-6}	3.84
3-5-81	1	0.0-1.25	115.1	12.0	24	15	9	GC	5.04×10^{-5}	2.46
3-6-81	1	0.0-1.73	115.8	13.7	27	16	11	SC		4.50
3-7-81	1	0.0-0.72	122.4	12.3	38	16	22	SC		
3-7-81	2	5.0-6.24								4.28
3-7-81	3	10.0-11.57	114.1	17.9	24	13	11	SC		
3-7-81	4	15.0-16.33	122.0	12.6	26	15	11	SC		
3-8-81	1	0.0-1.86	102.1	18.4	36	20	16	CL		1.31
3-8-81	2	5.0-6.01	112.6	8.0	23	14	9	SC		
3-9-81	1	0.0-0.89	114.0	15.3	25	16	9	CL		3.03

* Jar sample

** See Figure E-1

WORKING DRAFT

WORKING DRAFT

Laboratory Soil Test Results

McComish Gorge

Boring Number	Sample Number	Depth ft	Dry Density lbs/cu ft	Water Content Percent	Liquid Limit Percent	Plastic Limit Percent	Plasticity Index Percent	USCS**	Permeability cm/sec	Cation Exchange Capacity meq/100 g
4-1-81	1	0.0-2.08	115.1	15.0	29	15	14	CL		4.28
4-1-81	2	5.0-6.55	110.8	17.8	27	16	11	SC		
4-1-81	3	10.0-10.3	86.6	10.3	19	12	7	SP-SC		
4-1-81	4	15.0-16.97	100.0	15.0	28	17	11	SC		
4-1-81	5	20.0-22.05	87.8	11.3	NP+	NP	NP	SP-SM		
4-1-81	6	25.0-27.08	95.6	15.5	NP	NP	NP	SM		
4-1-81	7A*	30.0-30.3	--	21.5	NP	NP	NP	--		
4-1-81	8	32.5-33.3	97.1	19.1	25	18	7	CL		
4-1-81	9	37.5-39.55	102.4	23.1	26	18	8	CL		
4-1-81	10	40.3-42.48	104.4	17.2	NP	NP	NP	ML		
4-2-81	1	0.0-1.27	118.8	10.6	22	13	9	SC		
4-2-81	2	5.0-5.9	116.7	12.6	27	12	15	SC		
4-2-81	3	10.0-11.97	96.9	13.9	24	16	8	SC		
4-2-81	4	15.0-16.60	101.1	22.9	29	24	5	ML		
4-2-81	5A*	20.0-21.5	--	30.0	21	16	5	CL-ML		
4-2-81	6	25.0-27.05	100.5	13.6	NP	NP	NP	SM		2.87
4-2-81	7	30.0-32.05	99.7	14.6	NP	NP	NP	SM		
4-3-81	1	0.0-2.08	105.8	14.1	25	13	12	SC		
4-3-81	2	5.0-7.13	64.3	49.7	NP	NP	NP	ML		2.93
4-3-81	3	10.0-11.83	97.4	4.9	NP	NP	NP	SM		
4-3-81	4A*	15.0-17.0	--	24.3	NP	NP	NP	SP-SM		

(Continued)

\+ Not plastic
* Jar sample
** See Figure E-1

Laboratory Soil Test Results

McComish Gorge (Concluded)

Boring Number	Sample Number	Depth ft	Dry Density lbs/cu ft	Water Content Percent	Liquid Limit Percent	Plastic Limit Percent	Plasticity Index Percent	USCS**	Permeability cm/sec	Cation Exchange Capacity meq/100 g
4-4-81	1	0.0-2.26	99.0	20.7	39	18	21	CL		6.58
4-4-81	2	5.0-6.64	103.8	21.8	45	20	25	CL		
4-4-81	3	10.0-12.19	98.8	12.0	35	19	16	CL		
4-4-81	4	15.0-16.7	87.7	9.9	32	14	18	SC		
4-4-81	5	20.0-22.08	91.1	5.8	NP	NP	NP	SP-SM		
4-4-81	6	25.0-26.50	93.7	18.4	NP	NP	NP	SP-SM		
4-4-81	7	27.8-29.90	98.4	23.9	NP	NP	NP	SM	3.99×10^{-5}	
4-4-81	8	35.0-37.05	89.8	33.6	31	16	15	CL		
4-5-81	1	0.0-1.8	100.5	23.6	35	16	19	CL		
4-5-81	2	5.0-6.36	102.5	21.1	38	18	20	CL		
4-5-81	3	10.0-11.10	91.8	22.9	30	17	13	SC		3.36
4-5-81	4	14.3-16.0	96.7	14.7	NP	NP	NP	SP		
4-5-81	5	18.6-20.05	89.8	22.4	NP	NP	NP	SM		
4-6-81	1	0.0-2.14	115.0	12.4	NP	NP	NP	SM		2.74
4-6-81	2	5.0-7.08	93.3	10.2	NP	NP	NP	SM		
4-6-81	3	10.0-11.71	83.4	19.2	NP	NP	NP	ML		
4-6-81	4	15.0-17.17	92.3	27.4	NP	NP	NP	SM		
4-6-81	5	19.5-20.35	103.1	18.4	NP	NP	NP	SM		
4-6-81	6	24.2-26.36	101.9	23.1	20	17	3	SM		

* Jar sample

** See Figure E-1

WORKING DRAFT

Laboratory Soil Test Results

Old Burning Pit

Boring Number	Sample Number	Depth ft	Dry Density lbs/cu ft	Water Content Percent	Liquid Limit Percent	Plastic Limit Percent	Plasticity Index Percent	USCS**	Permeability cm/sec	Cation Exchange Capacity meq/100 g
5-1-81	1	0.0-1.55	111.1	9.9	19	11	8	SC		1.96
5-1-81	2	5.0-6.59	105.8	14.4	26	12	14	SC		
5-1-81	3	10.0-11.81	120.0	15.9	33	15	18	CL		
5-1-81	4	15.0-15.65	124.2	10.3	29	13	16	CL		
5-2-81	1	0.0-1.75	120.5	13.6	25	12	13	SC		
5-2-81	2	5.0-7.15	97.7	23.0	21	16	5	CL-ML		3.26
5-2-81	3	10.0-11.46	82.2	19.3	NP+	NP	NP	SM		
5-2-81	4A*	15.0-18.2	--	28.4	22	17	5	CL-ML		
5-3-81	1	0.0-1.75	112.5	7.7	21	12	9	SC		
5-3-81	2	5.0-6.76	89.6	10.4	NP	NP	NP	SP-SM		
5-3-81	3	10.0-11.95	96.8	21.7	24	19	5	CL-ML	8.05×10^{-6}	
5-3-81	4	15.0-17.15	98.8	24.4	25	16	9	CL		2.97
5-3-81	5	20.0-21.38	90.6	28.9	31	20	11	CL		
5-4-81	1	0.0-2.04	112.0	7.6	NP	NP	NP	SM		1.78
5-4-81	2	5.0-6.78	98.2	16.9	NP	NP	NP	ML		
5-4-81	3A*	10.0-12.0	--	23.7	21	14	7	CL		
5-4-81	5B*	22.5-23.0	--	33.1	31	19	12	CL		
5-4-81	6	25.0-27.18	102.0	24.6	28	18	10	SP-SC		

(Continued)

\+ Not plastic
* Jar sample
** See Figure E-1

WORKING DRAFT

Laboratory Soil Test Results

Old Burning Pit (Concluded)

Boring Number	Sample Number	Depth ft	Dry Density lbs/cu ft	Water Content Percent	Liquid Limit Percent	Plastic Limit Percent	Plasticity Index Percent	USCS**	Permeability cm/sec	Cation Exchange Capacity meq/100 g
5-5-81	1	0.0-2.12	100.4	6.0	NP	NP	NP	SP-SM		
5-5-81	2	5.0-6.81	89.1	7.4	NP	NP	NP	SP-SM		3.22
5-5-81	3	10.5-12.02	99.4	25.0	23	20	3	ML		
5-5-81	4	15.0-16.85	96.3	20.6	NP	NP	NP	ML		
5-5-81	5	20.4-22.15	95.5	25.3	24	19	5	CL-ML		
5-6-81	1	0.0-2.03	108.4	14.3	34	14	20	SC		
5-6-81	2	5.0-7.17	94.5	17.8	31	19	12	CL		
5-6-81	3	10.0-12.09	102.5	23.6	28	19	9	CL		
5-6-81	4	15.0-17.15	100.6	23.8	24	16	8	CL		
5-6-81	5	20.0-21.19	97.0	20.8	25	18	7	CL		2.37
5-6-81	7A*	30.0-33.5		25.8	19	15	4	CL-ML		
5-7-81	1	0.0-1.89	101.8	20.3	25	19	6	CL-ML		
5-7-81	2	5.0-6.99	97.5	18.2	38	20	18	CL		2.91
5-7-81	3	10.0-11.91	97.3	21.9	29	21	8	CL		
5-7-81	4	15.0-16.36	101.3	23.8	24	19	5	CL-ML		
5-7-81	6	25.0-27.05	101.8	21.2	26	16	10	CL	5.39×10^{-6}	
5-7-81	7	30.0-32.07	101.1	20.9	NP	NP	NP	ML		
5-7-81	8	35.0-37.08	100.2	21.1	22	18	4	CL-ML		
5-8-81	1	0.0-0.8	106.7	18.7	31	14	17	CL		
5-8-81	2	5.0-7.08	108.8	19.8	29	16	13	CL		
5-8-81	3	10.0-12.15	98.8	23.1	NP	NP	NP	ML	2.35×10^{-5}	
5-8-81	4	15.0-17.1	101.8	23.5	22	16	6	CL-ML		

* Jar sample
** See Figure E-1

WORKING DRAFT

WORKING DRAFT

Laboratory Soil Test Results

Demolition Area

Boring Number	Sample Number	Depth ft	Dry Density lbs/cu ft	Water Content Percent	Liquid Limit Percent	Plastic Limit Percent	Plasticity Index Percent	USCS**	Permeability cm/sec	Cation Exchange Capacity meq/100 g
6-1A-81	1	0.0-2.17	102.6	21.0	42	18	24	CL		
6-1A-81	2	5.0-6.21	115.2	18.6	63	20	43	CH		
6-1B-81	1	0.0-1.14	120.2	15.0	34	18	16	CL		
6-1B-81	2	5.0-6.14	114.1	17.9	48	16	32	CL		11.0
6-1C-81	1	0.0-1.34	111.9	17.8	49	19	30	CL		20.0
6-1C-81	2	5.0-6.25	116.6	17.7	57	19	38	CH		
6-2-81	1	0.0-1.58	98.8	22.8	35	20	15	CL		8.60
6-3-81	1	0.0-1.74	81.0	26.8	35	19	16	CL		4.60
6-3-81	2A*	5.0-5.3	--	15.6	44	18	26	CL		
6-4-81	1	0.0-1.46	103.5	19.3	33	20	13	CL		4.79
6-5-81	1	0.0-1.8	110.9	9.1	35	17	18	CL		5.73
6-5-81	2	5.0-6.85	118.5	16.0	44	22	22	CL		
6-6-81	1	0.0-1.41	110.8	14.1	40	16	24	CL	0	
6-6-81	2	5.0-6.27	119.3	14.5	43	17	26	CL		5.60
6-6-81	3	10.0-11.30	120.4	14.9	45	22	23	CL		
6-7-81	1	0.0-2.22	111.3	16.3	46	16	30	CL		5.67
6-7-81	2	5.0-6.45	118.7	17.0	42	20	22	CL		
6-8-81	1	0.0-1.55	103.8	21.5	36	21	15	CL		7.72
6-8-81	2	5.0-5.99	122.8	10.8	25	15	10	CL		

(Continued)

* Jar sample
** See Figure E-1

Laboratory Soil Test Results

Demolition Area (Concluded)

Boring Number	Sample Number	Depth ft	Dry Density lbs/cu ft	Water Content Percent	Liquid Limit Percent	Plastic Limit Percent	Plasticity Index Percent	USCS**	Permeability cm/sec	Cation Exchange Capacity meq/100 g
6-9-81	1A*	0.0-1.7	--	7.4	30	13	17	SC		
6-10-81	1	0.0-2.08	81.6	14.8	41	19	22	CL		
6-10-81	2	5.0-6.99	109.7	17.4	45	19	26	CL	3.01×10^{-8}	35.8
6-10-81	3	10.0-11.49	110.0	20.8	47	25	22	CL		
6-11-81	1	0.0-2.39	98.5	13.0	32	18	14	CL		7.19
6-11-81	2	5.0-5.71	101.1	22.0	36	19	17	CL		
6-12-81	1	1.10-2.20	108.4	20.8	57	18	39	CH		3.53
6-12-81	2	5.0-6.01	132.9	7.9	26	12	14	CL		
6-13-81	1	0.0-1.29	113.2	17.3	50	17	33	CH		10.7

* Jar sample
** See Figure E-1

WORKING DRAFT

Laboratory Soil Test Results

Old Rifle Range

Boring Number	Sample Number	Depth ft	Dry Density lbs/cu ft	Water Content Percent	Liquid Limit Percent	Plastic Limit Percent	Plasticity Index Percent	USCS**	Permeability cm/sec	Cation Exchange Capacity meq/100 g
6-14-81	1	0.0-1.61	115.6	15.8	27	16	11	SC		
6-14-81	2	5.0-7.06	98.8	24.0	28	19	9	CL	2.77×10^{-6}	5.65
6-14-81	3	10.0-11.67	101.1	23.5	33	18	15	CL		
6-14-81	4	15.0-17.07	87.0	33.3	61	24	37	CH		
6-15-81	1	0.0-1.35	111.5	16.5	27	17	10	CL		
6-16-81	1	0.0-1.37	102.4	13.8	37	20	17	CL		11.2
6-16-81	2A*	5.0-5.4	--	10.7	29	15	14	CL		
6-17-81	1	0.0-1.39	101.0	22.7	28	17	11	CL		3.71
6-18-81	1	0.0-1.63	117.4	15.0	35	18	17	CL		
6-18-81	2	5.0-6.58	112.9	13.9	24	14	10	SC		
6-19-81	1	5.0-6.88	103.6	23.2	42	18	24	CL		10.2
6-19-81	2	10.0-11.66	99.7	25.2	44	17	27	CL		
6-20-81	1	0.0-1.78	110.8	19.1	27	15	12	CL		4.65
6-20-81	2	5.0-6.75	109.9	18.9	35	14	21	CL		

* Jar sample
** See Figure E-1

WORKING DRAFT

WORKING DRAFT

Laboratory Soil Test Results

Highway 58 Dump Site A

Boring Number	Sample Number	Depth ft	Dry Density lbs/cu ft	Water Content Percent	Liquid Limit Percent	Plastic Limit Percent	Plasticity Index Percent	USCS**	Permeability cm/sec	Cation Exchange Capacity meq/100 g
7-1-81	1	0.0-1.05	108.0	11.8	40	16	24	GC		3.86
7-1-81	2	5.0-6.79	113.6	15.7	42	19	23	CL	0	
7-1-81	3	10.0-11.44	127.4	12.2	35	16	19	CL		
7-2-81	1	0.0-1.55	126.0	8.2	30	16	14	SC		
7-2-81	2	5.0-7.06	113.7	16.1	47	22	25	CL		9.85
7-2-81	3A*	10.5-11.5	--	13.9	38	15	23	CL		5.23
7-3-81	1	0.0-1.77	120.2	12.1	35	20	15	CL		4.12
7-3-81	2	5.0-6.14	111.1	9.1	30	14	16	CL		
7-5-81	1	0.0-0.95	108.7	18.2	41	16	25	CL		
7-5-81	2	5.0-7.07	115.2	14.9	36	17	19	CL		3.79
7-5-81	3	10.0-11.39	115.9	17.2	37	18	19	CL		
7-5-81	4	15.0-16.39	113.6	18.1	35	18	17	CL		

* Jar sample
** See Figure E-1

Laboratory Soil Test Results

Highway 58 Dump Site B

Boring Number	Sample Number	Depth ft	Dry Density lbs/cu ft	Water Content Percent	Liquid Limit Percent	Plastic Limit Percent	Plasticity Index Percent	USCS**	Permeability cm/sec	Cation Exchange Capacity meq/100 g
8-1-81	1A*	0.0-0.7	--	5.0	35	16	19	CL		
8-4-81	1A*	0.0-0.8	--	9.1	32	15	17	GC		8.13
8-5-81	1	0.0-0.94	101.0	8.9	43	17	26	CL	2.07×10^{-8}	3.58
8-8-81	1A*	0.0-0.9	--	--						2.55
8-9-81	1A*	0.0-0.65	--	--						3.83

* Jar sample
** See Figure E-1

WORKING DRAFT

Laboratory Soil Test Results

Pest Control Area

Boring Number	Sample Number	Depth ft	Dry Density lbs/cu ft	Water Content Percent	Liquid Limit Percent	Plastic Limit Percent	Plasticity Index Percent	USCS**	Permeability cm/sec	Cation Exchange Capacity meq/100 g
9-1-81	1	0.0-0.5	110.4	15.5	49	24	25	CL		7.25
9-1-81	2	5.0-7.09	111.7	14.0	37	15	22	SC		
9-1-81	3	10.0-11.33	120.6	13.3	32	19	13	CL		
9-2-81	1	0.0-2.28	106.5	9.3	28	19	9	SC		
9-2-81	2	5.0-6.16	103.0	19.6	30	16	14	CL		6.48
9-2-81	3	10.0-12.08	86.6	31.3	37	21	16	CL		
9-3-81	1	0.0-2.29	109.9	16.7	35	17	18	CL	3.52×10^{-7}	6.72
9-3-81	2	5.0-6.40	104.7	21.9	26	15	11	CL		
9-4-81	1	0.0-2.15	103.1	17.9	41	16	25	CL		2.15
9-4-81	2	5.0-6.43	126.2	8.1	35	18	17	SC		
9-5-81	1	0.0-1.54	122.7	13.4	40	17	23	CL		1.57
9-5-81	2	5.0-6.17	124.5	10.2	34	17	17	CL		
9-6-81	1	0.0-2.37	94.4	12.2	35	19	16	CL		5.25
9-7-81	1	0.0-1.58	116.3	13.0	38	20	18	SC		
9-7-81	2	5.0-7.10	109.0	9.3	27	18	9	SC		4.48
9-8-81	1	0.0-1.39	104.1	19.9	45	18	27	CL		9.02
9-8-81	2	5.0-6.38	122.8	14.1	38	20	18	CL		
9-8-81	3A*									6.90
9-9-81	1	0.0-1.75	116.7	12.9	29	16	13	SC		1.20
9-9-81	2	5.0-6.28	111.5	18.2	34	20	14	CL		

* Jar sample

** See Figure E-1

WORKING DRAFT

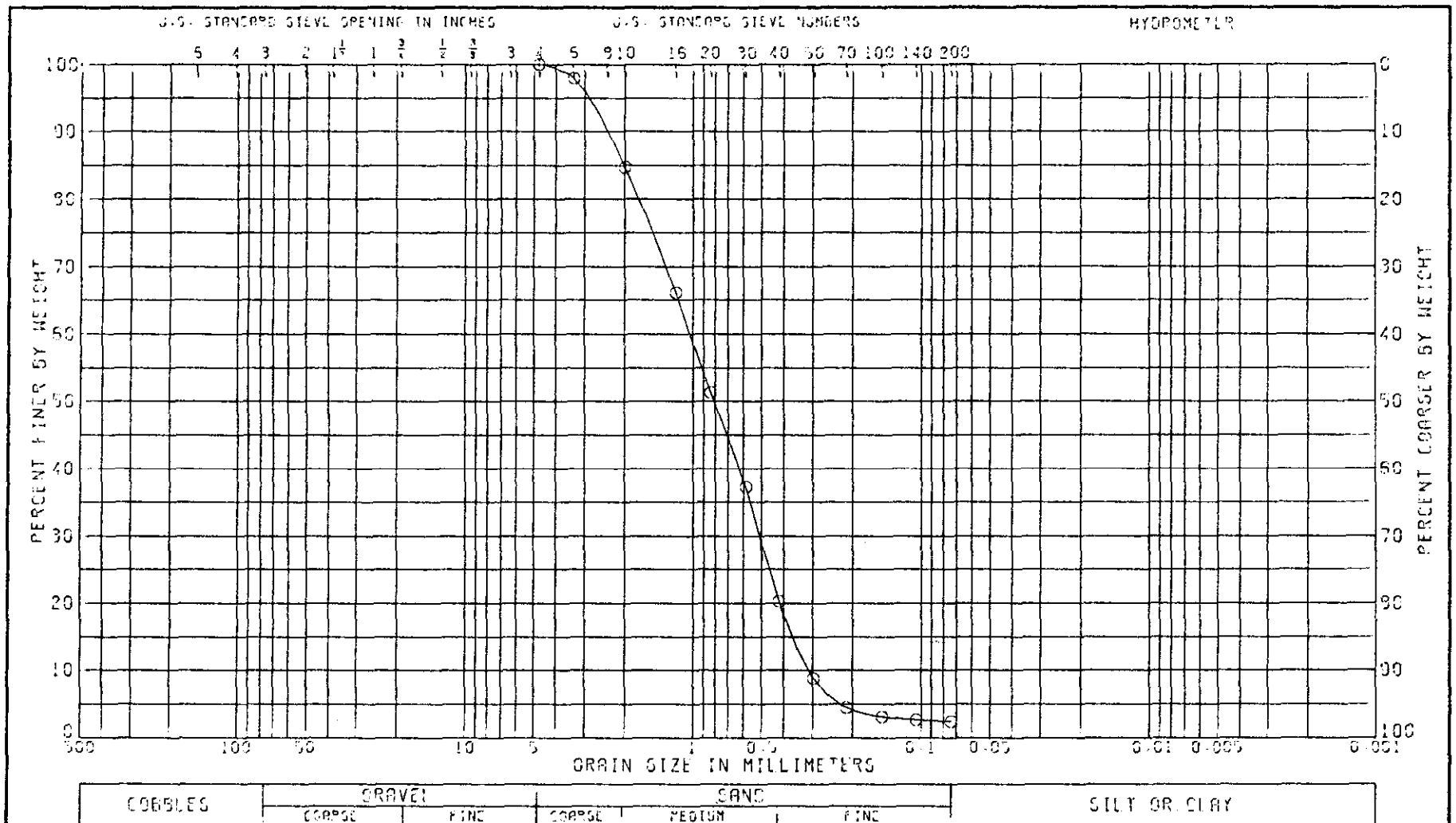
Laboratory Soil Test Results

Rockeye Site

Boring Number	Sample Number	Depth ft	Dry Density lbs/cu ft	Water Content Percent	Liquid Limit Percent	Plastic Limit Percent	Plasticity Index Percent	USCS**	Permeability cm/sec	Cation Exchange Capacity meq/100 g
10-1-81	1	0.0-1.84	116.2	9.6	NP+	NP	NP	SM		
10-1-81	2	5.0-6.16	118.0	9.6	24	15	9	GC		1.76
10-2-81	1	0.0-1.29	101.4	18.2	33	20	13	CL	5.20×10^{-6}	5.98

\+ Not plastic
** See Figure E-1

WORKING DRAFT



LL	PL	PI	CC	NAT W.%	

CLASSIFICATION

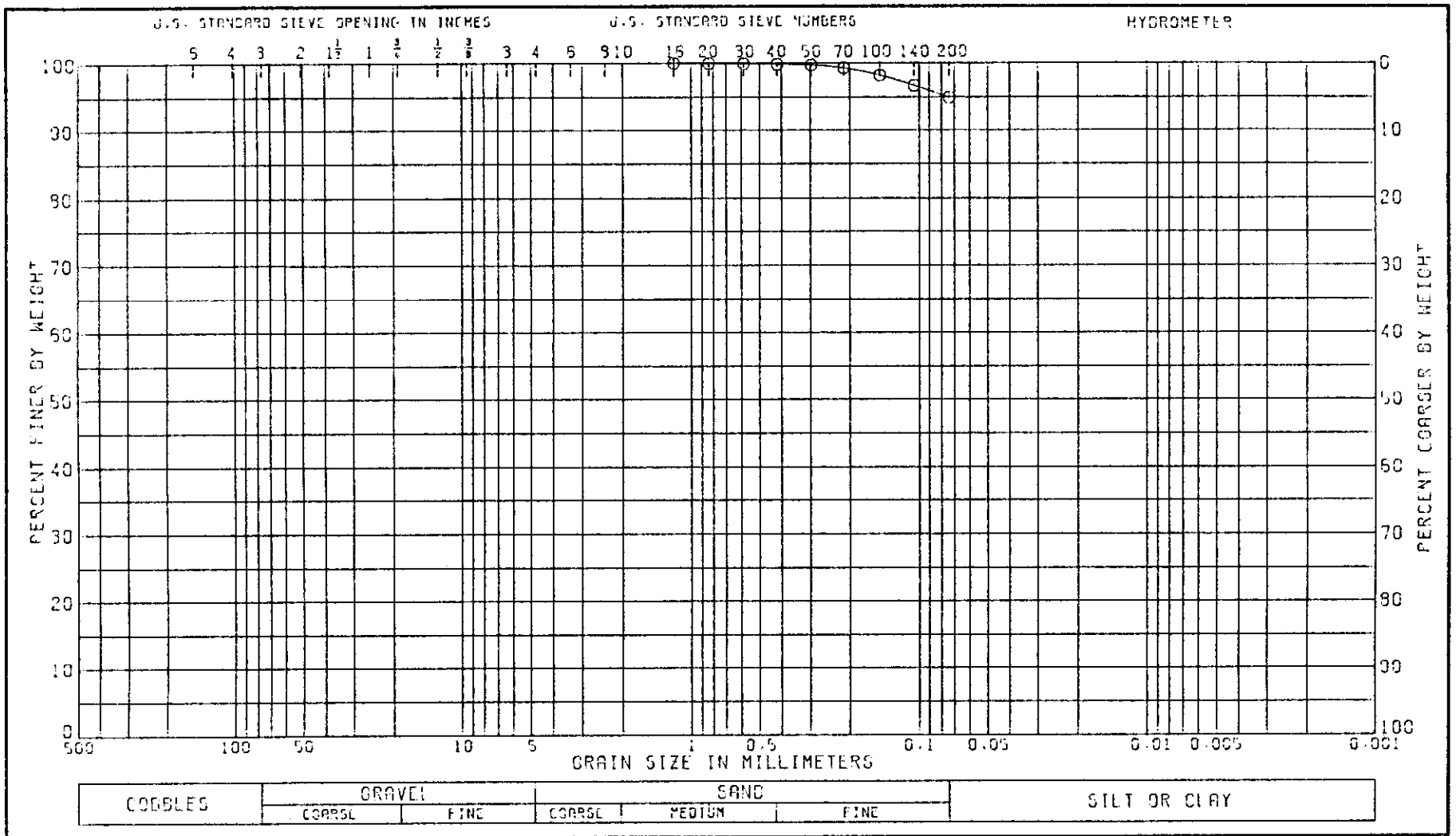
SAND (SP), GRAYISH BROWN

GRADATION CURVE

PROJECT CRANE NWSC SCREEN SAND

BORING NO. 0 SAMPLE NO. 0

DEPTH/ELEV 0 DATE 14 APR 92



LL	PL	PI	CS	NAT W.%
36	18	18		21.7

CLASSIFICATION

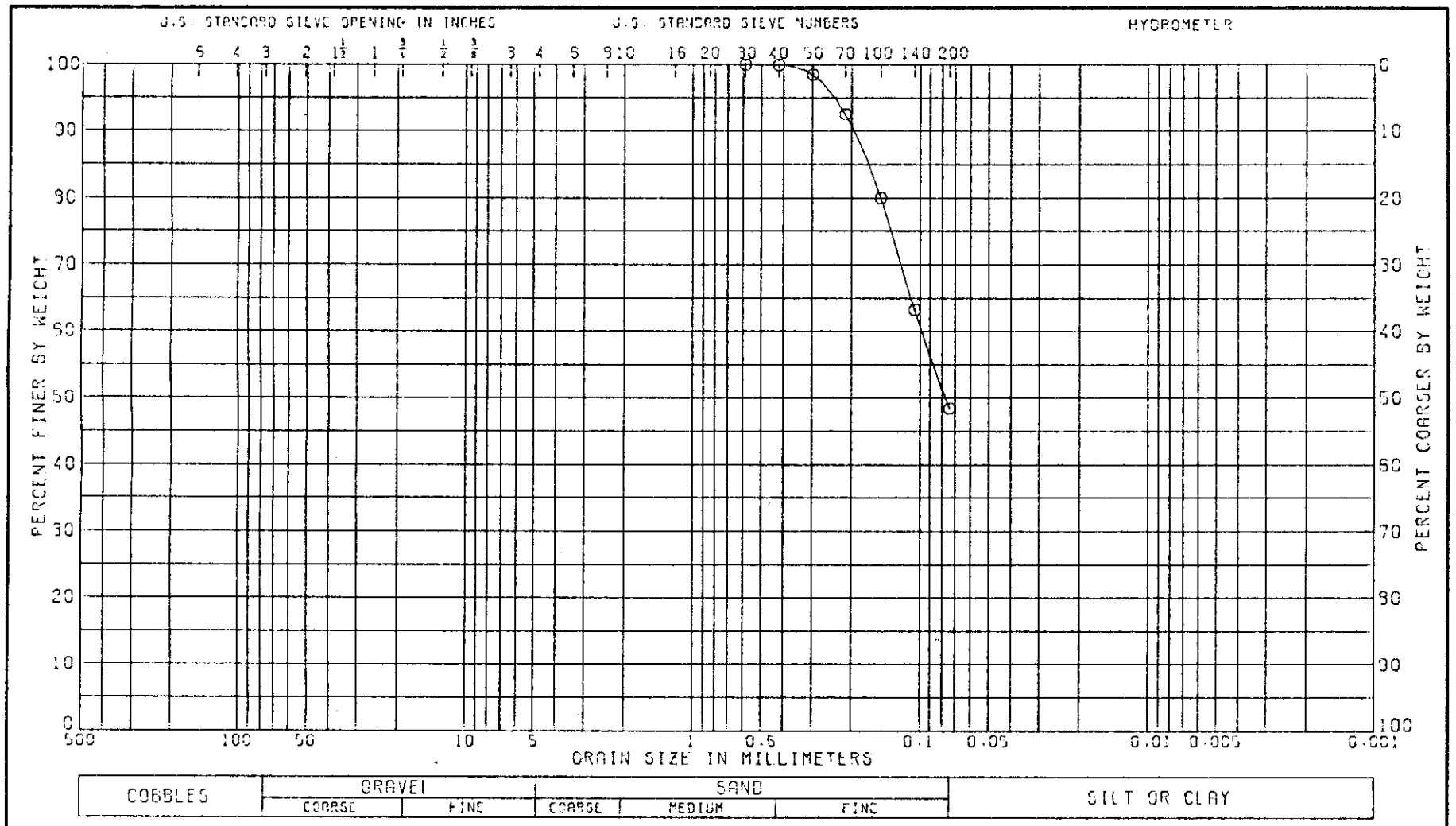
CLAY (CL), BROWN: WITH SAND

GRADATION CURVE

PROJECT CRANE NWSC

BORING NO. 1-1-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-1.85 DATE 30 MAR 82



LL	PL	PI	CS	NAT W.%
27	14	13	.	13.6

CLASSIFICATION

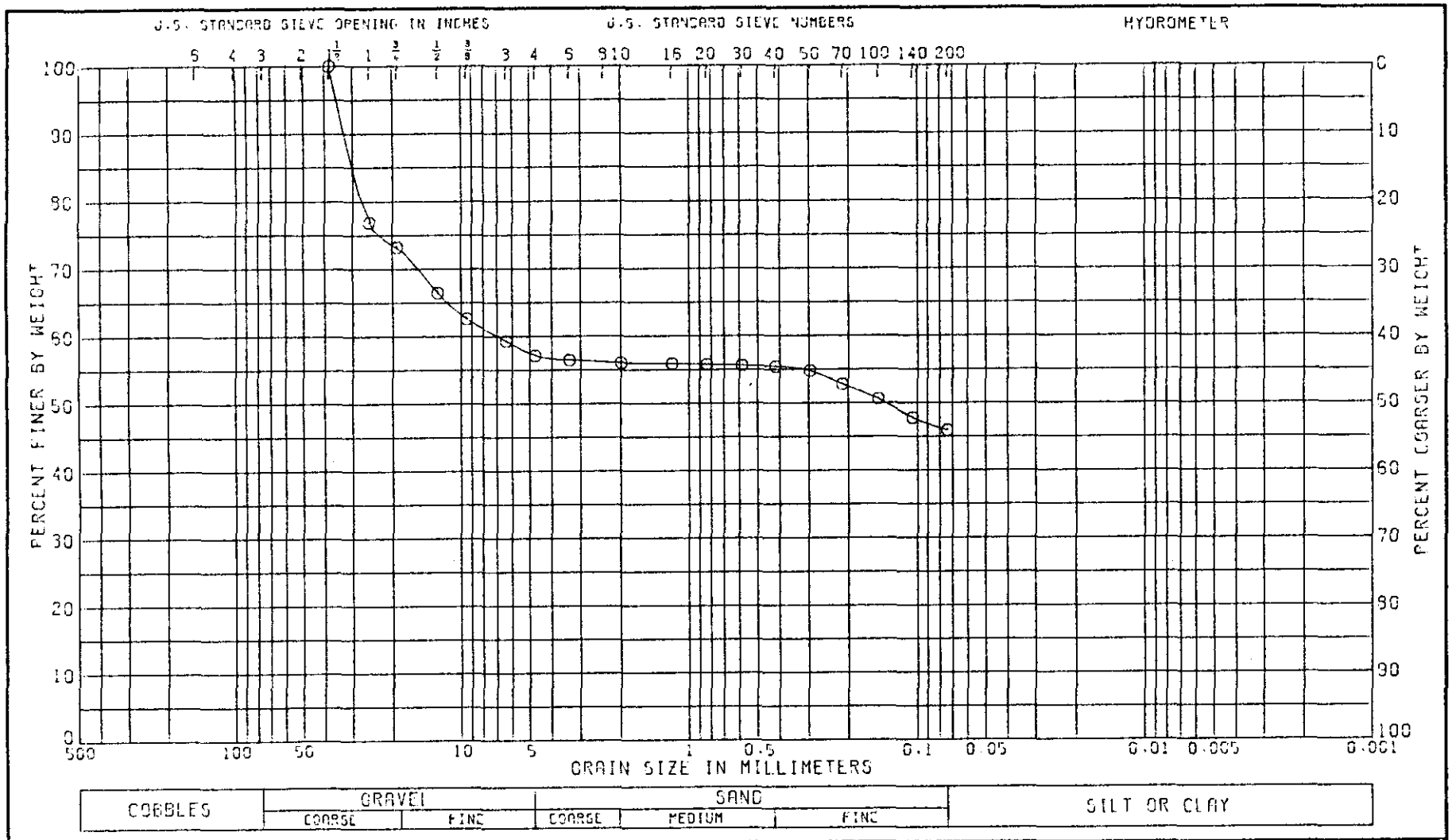
CLAYEY SAND (SC), LIGHT BROWN

GRADATION CURVE

PROJECT CRANE NWSC

BORING NO. 1-1-81 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.37 DATE 30 MAR 82



LL	PL	PI	CS	NAT W.%
35	18	17		7.1

CLASSIFICATION

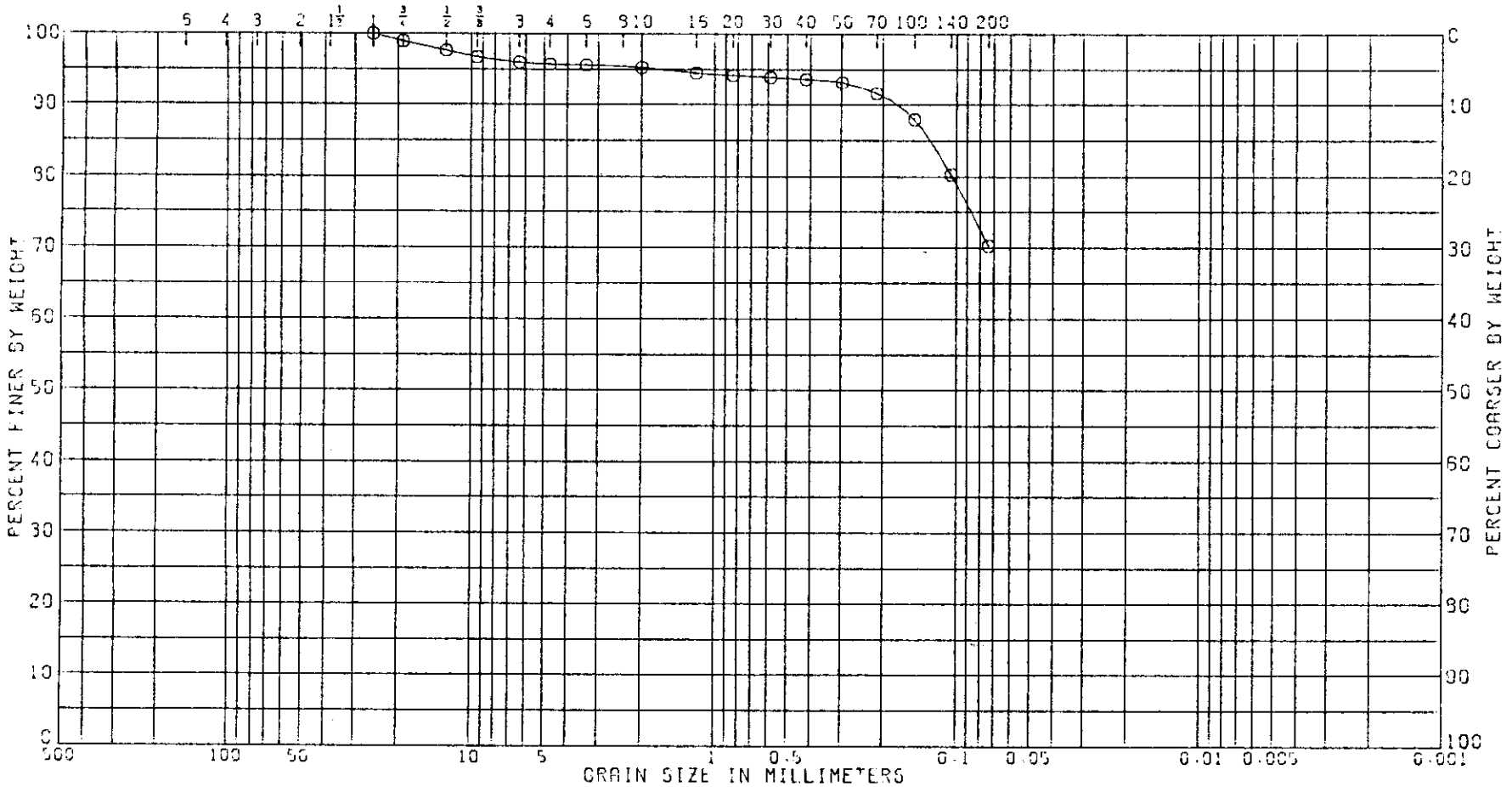
GRAVELLY CLAYEY SAND (SC), REDDISH BROWN
INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

GRADATION CURVE

PROJECT CRANE NWSC

BORING NO. 1-2-81 SAMPLE NO. 1A

DEPTH/ELEV 0.0-0.65 DATE 30 MAR 92



LL 29	PL 13	PI 15	CS	NAT W.% 14.2	

CLASSIFICATION

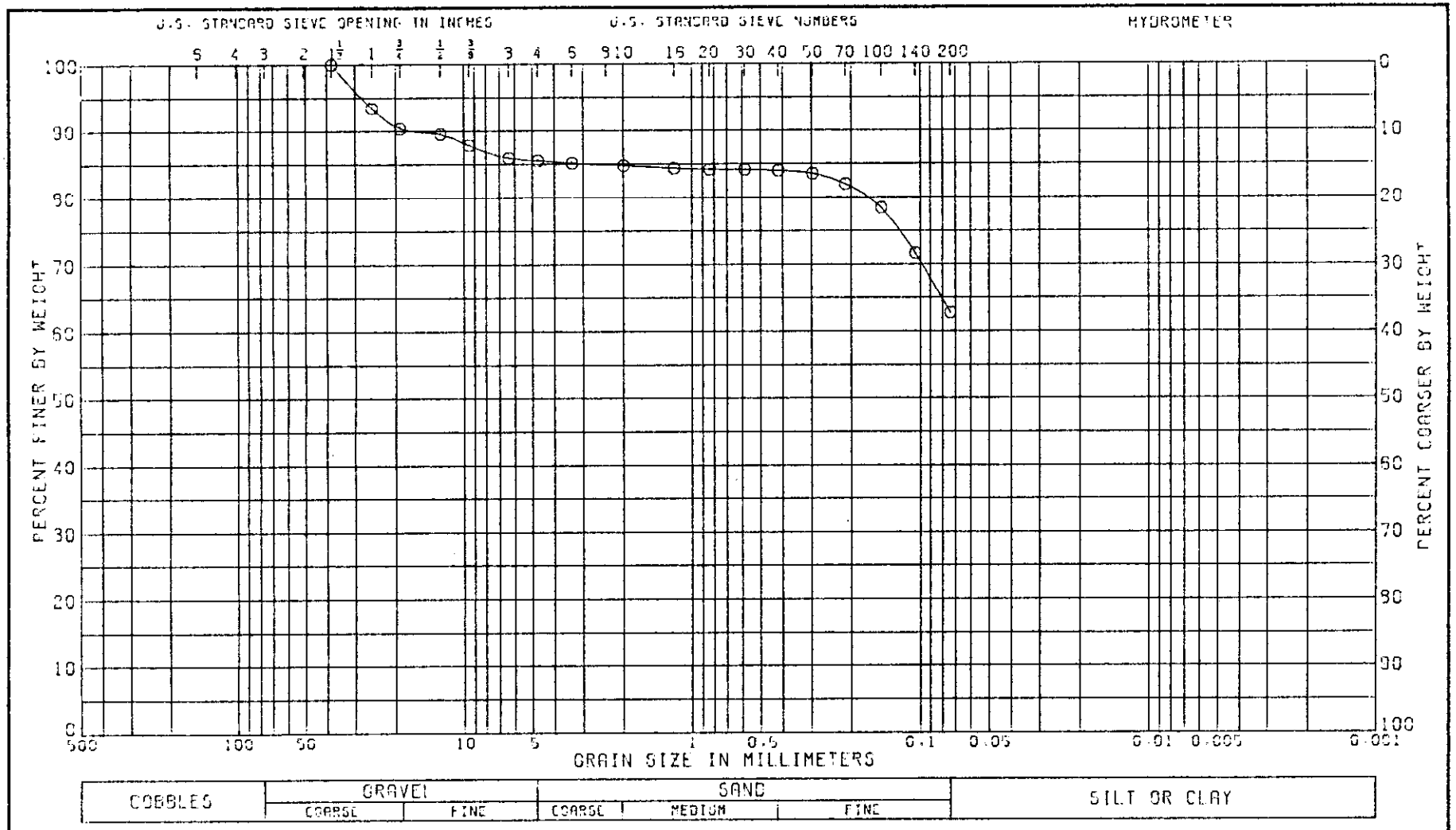
SANDY CLAY (CL), BROWN: TRACE OF GRAVEL

GRADATION CURVE

PROJECT CRANE NWSC

BORING NO. 1-3-91 SAMPLE NO. 1

DEPTH/ELEV 0.0-2.3 DATE 30 MAR 92



LL	PL	PI	GS	NAT W.%
37	18	19		17.9

CLASSIFICATION

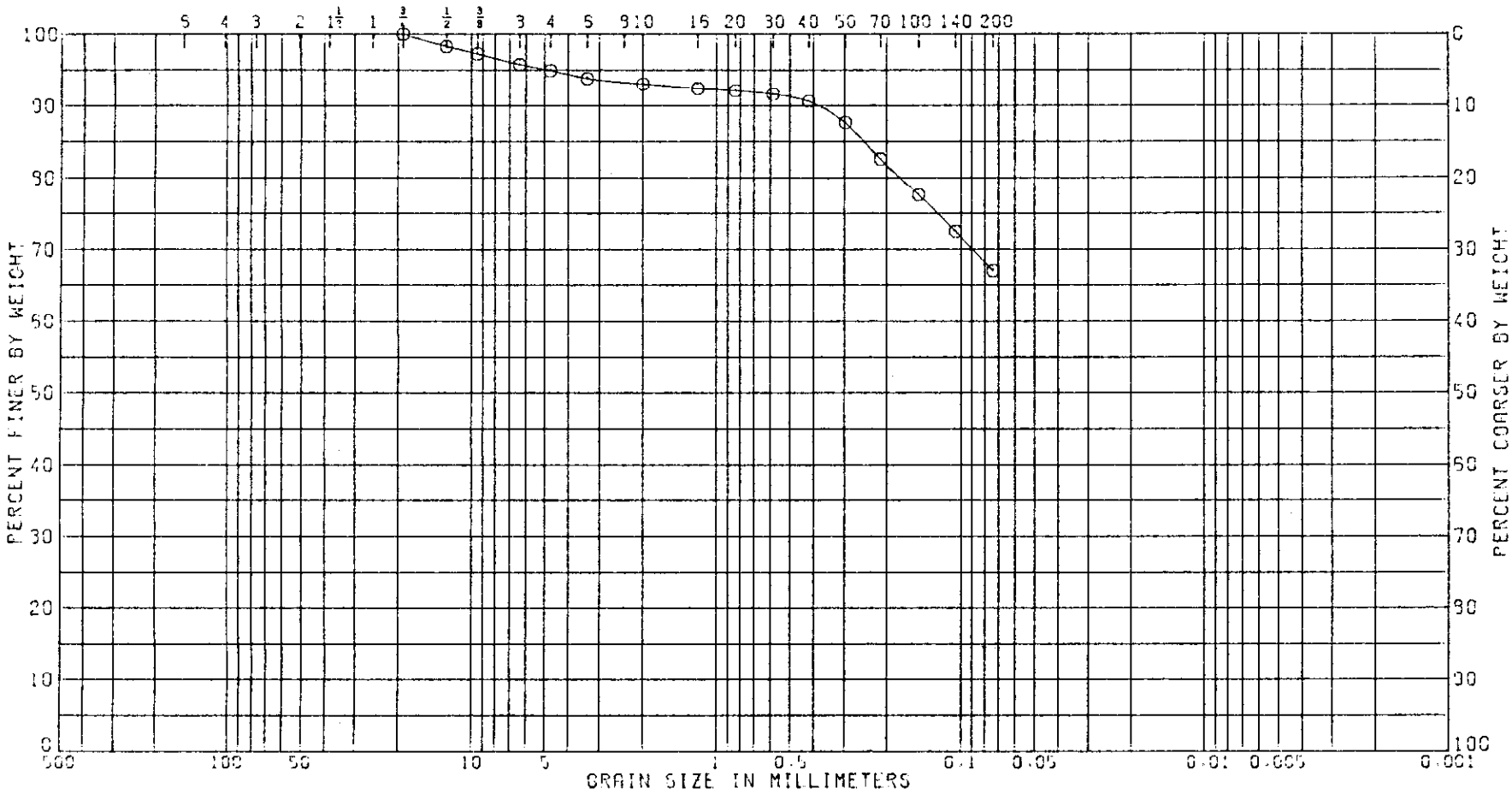
GRAVELLY SANDY CLAY (CL), TAN
INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

GRADATION CURVE

PROJECT CRANE NWSC

BORING NO. 1-3-91 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.02 DATE 30 MAR 92



LL	PL	PI	CS	NAT W.%
30	13	17		11.2

CLASSIFICATION

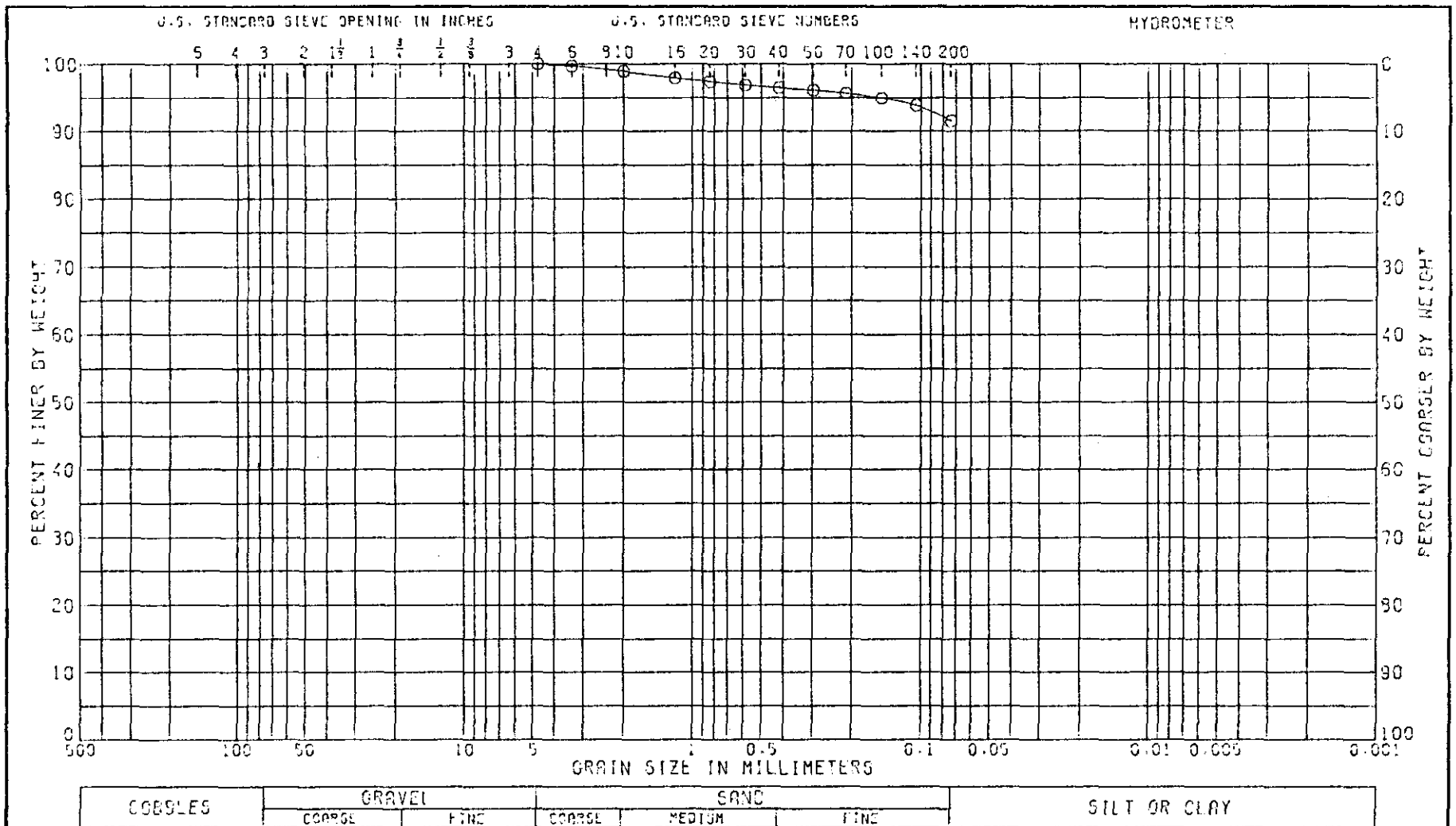
SANDY CLAY (CL) BROWN: WITH TRACE OF GRAVEL

GRADATION CURVE

PROJECT CRANE NWSC

BORING NO. 1-4-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-2.43 DATE 30 MAR 82



LL	PL	PI	GS	NAT W.%
32	19	13		12.8

CLASSIFICATION

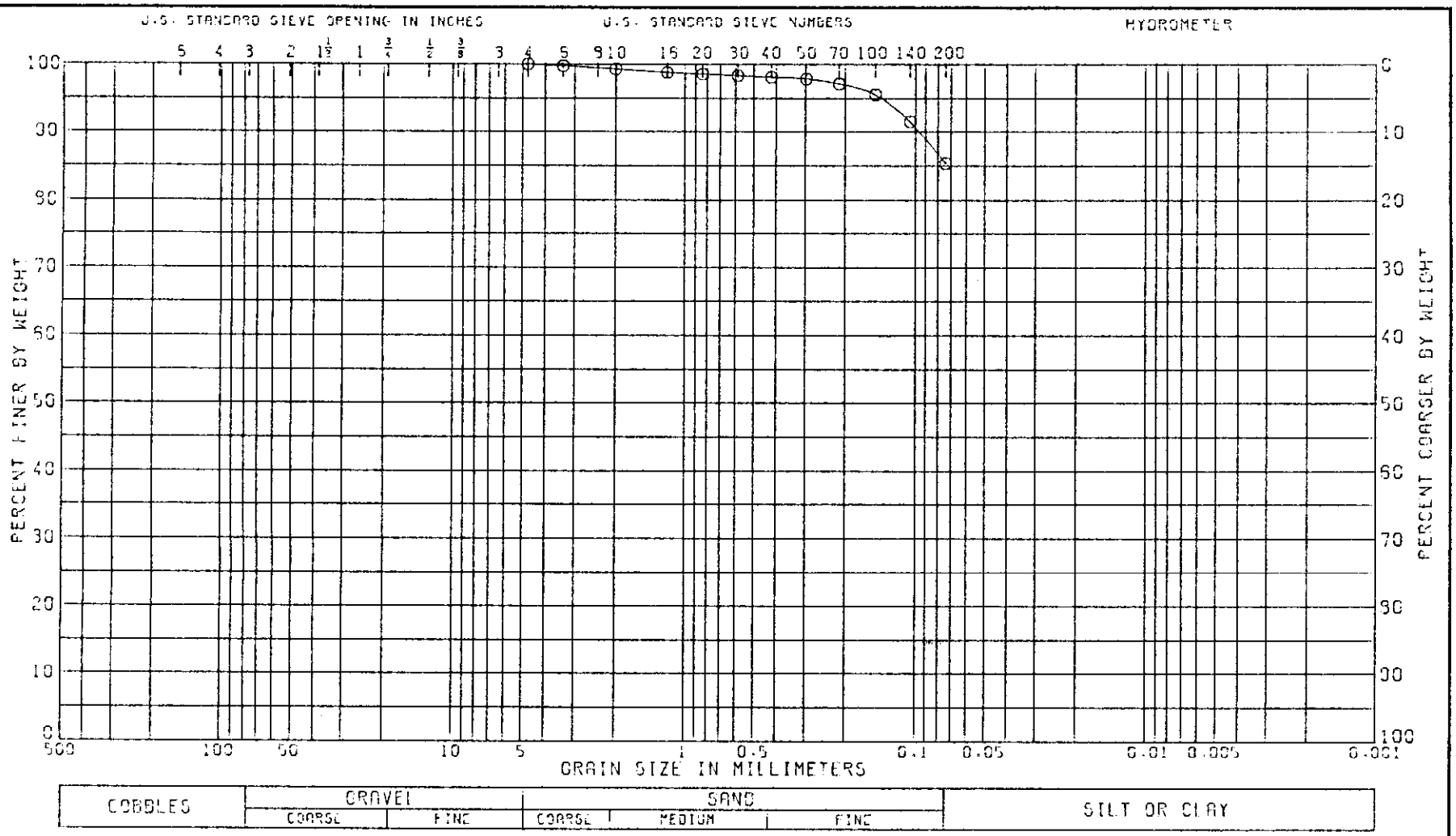
CLAY (CL), TAN: WITH SAND

GRADATION CURVE

PROJECT CRANE NWSC

BORING NO. 1-4-91 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.35 DATE 11 FEB 92



LL	PL	PI	CS	NAT W.%	
33	18	15		11.4	

CLASSIFICATION

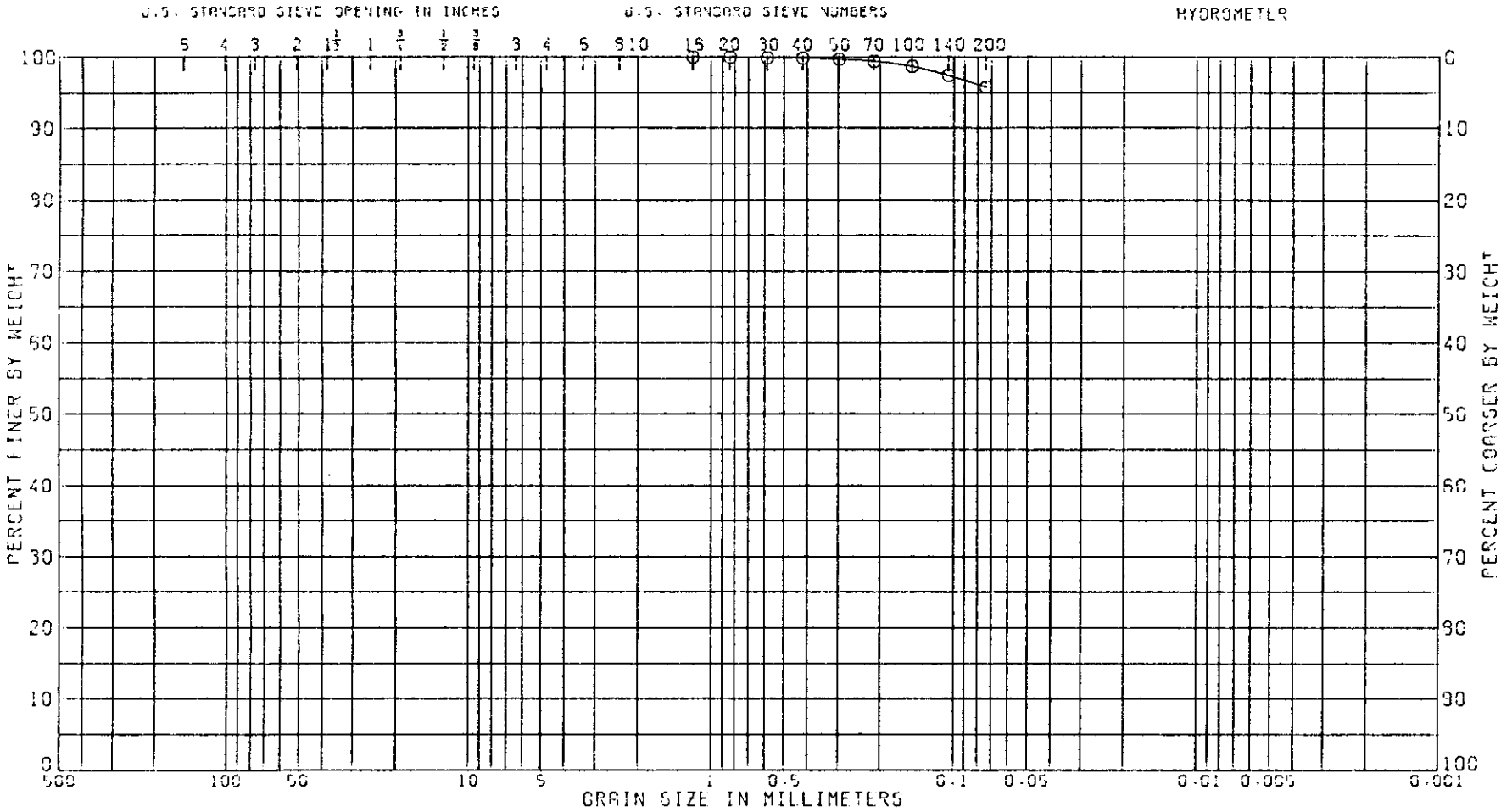
SANDY CLAY (CL), BROWN

GRADATION CURVE

PROJECT CRANE NWSC

BORING NO. 1-5-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-2.29 DATE 30 MAR 82



LL	PL	PI	CS	NAT W.%
39	19	19		21.9

CLASSIFICATION

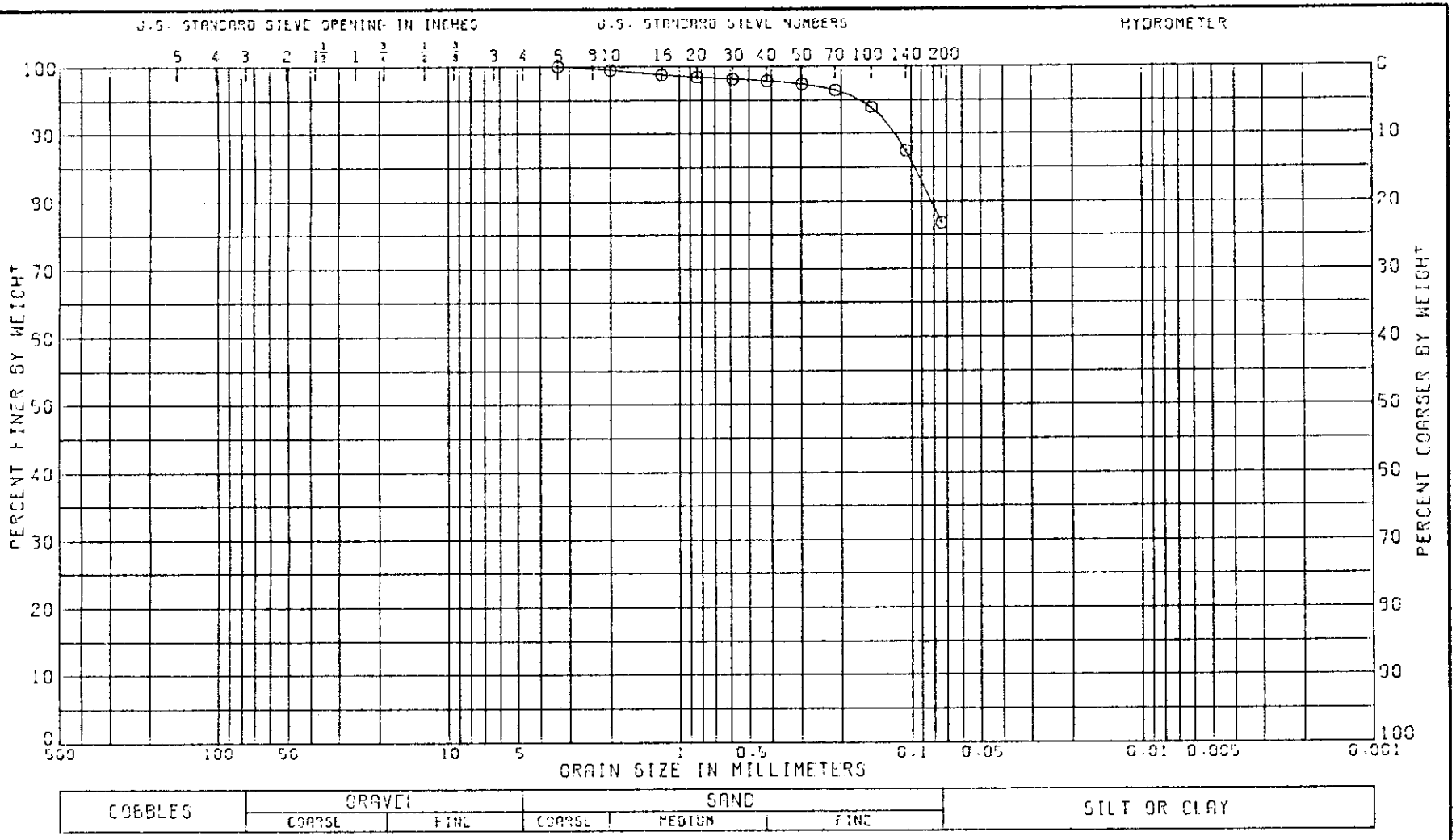
CLAY (CL), BROWN: TRACE OF SAND

GRADATION CURVE

PROJECT CRANE NWSC DYE BURIAL

BORING NO. 2-1-81 SAMPLE NO. 1

DEPTH/ELEV 0.92-1.87 DATE 30 MAR 92



LL	PL	PI	CS	NAT W.%	
25	14	11		11.1	

CLASSIFICATION

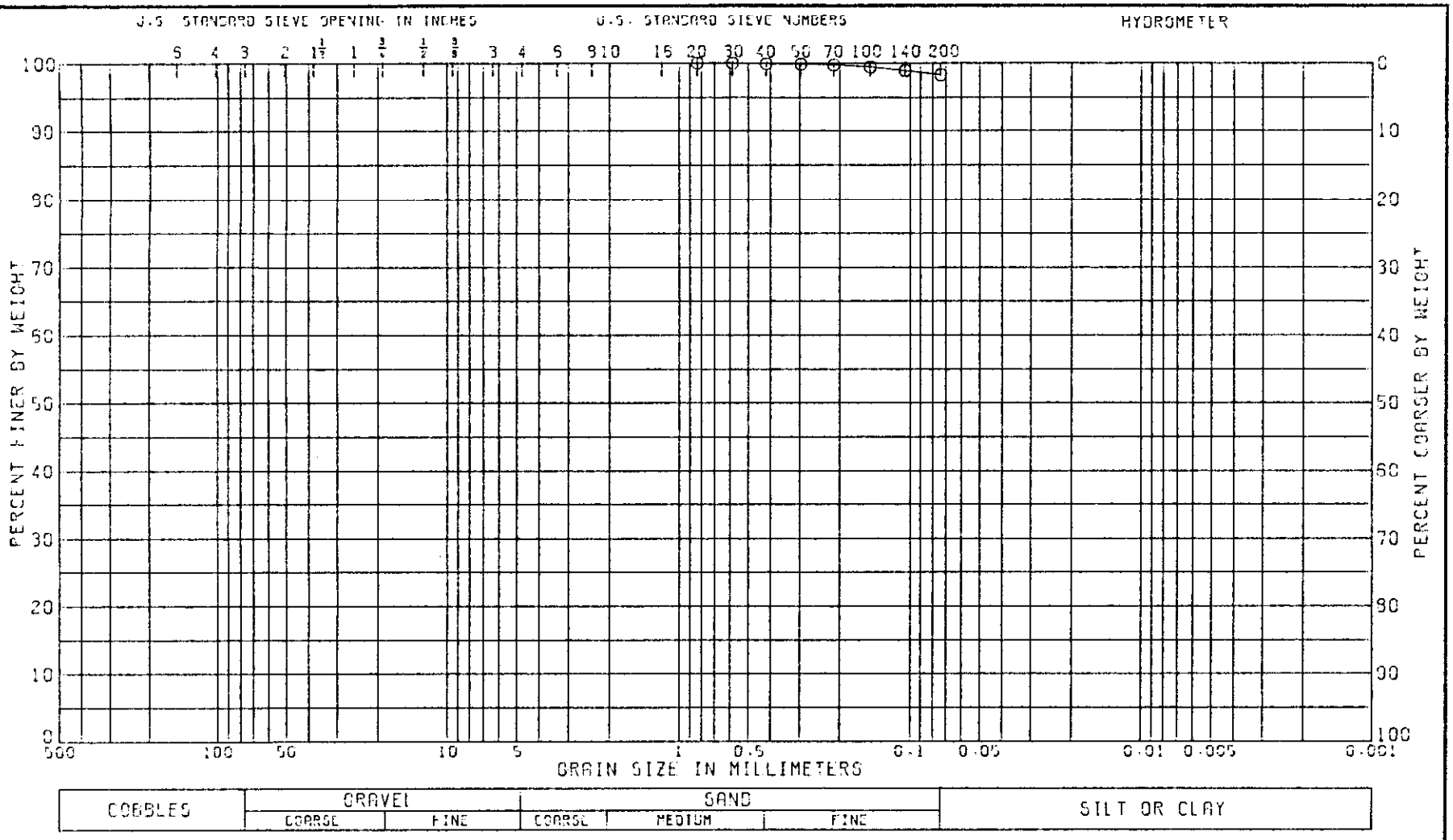
SANDY CLAY (CL), LIGHT BROWN

GRADATION CURVE

PROJECT CRANE NWSC DYE BURIAL

BORING NO. 2-1-91 SAMPLE NO 2

DEPTH/ELEV 6.0-6.95 DATE 30 MAR 92



LL	PL	PI	CS	NAT W.%
46	21	25		21.2

CLASSIFICATION

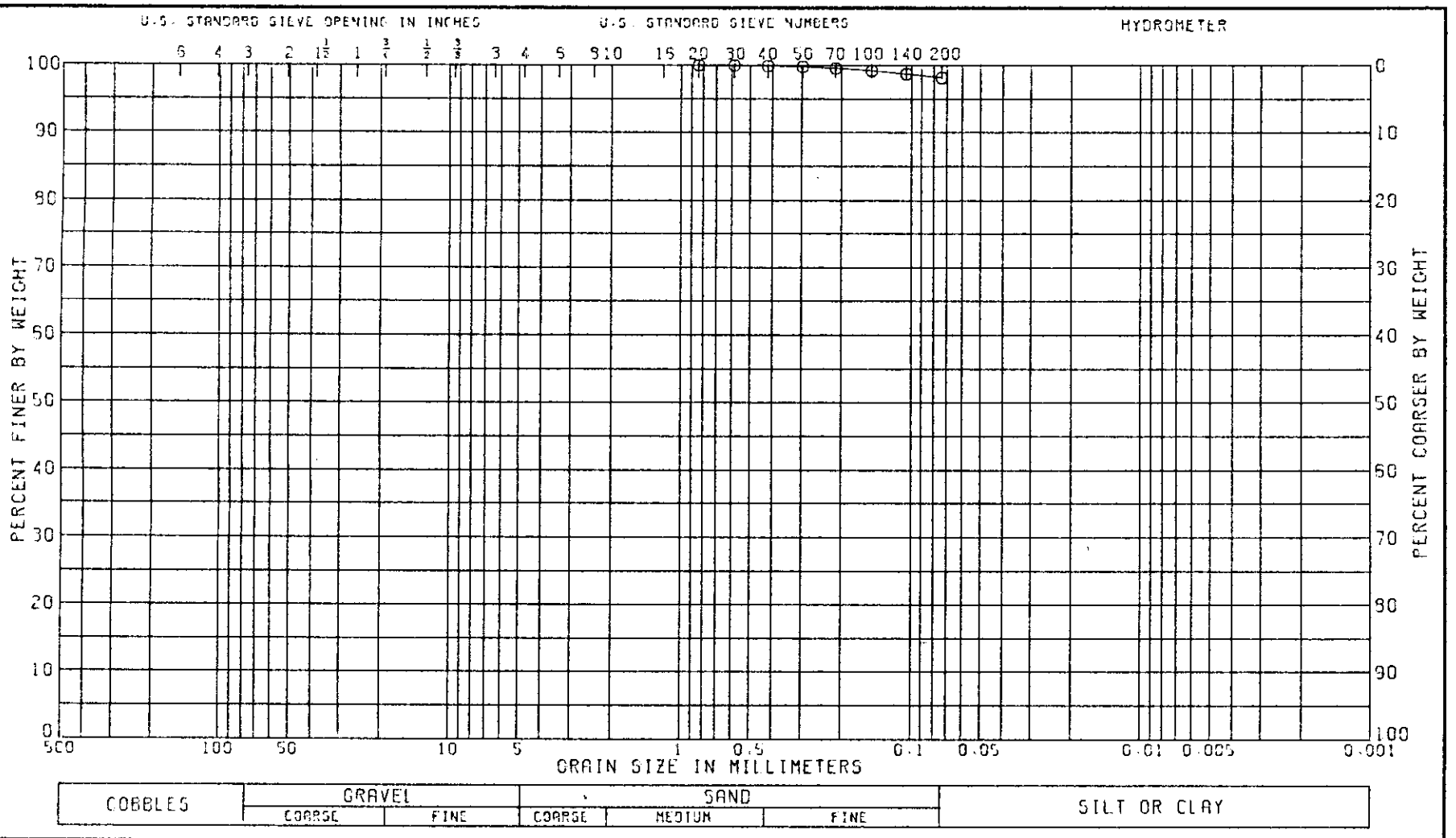
CLAY (CL), BROWN

GRADATION CURVE

PROJECT CRANE NWSC DYE BURIAL

BORING NO. 2-2-91 SAMPLE NO. 1

DEPTH/ELEV 0.0-1.65 DATE 30 MAR 92



LL	PL	PI	OS	NAT W.%
44	23	21		18.4

CLASSIFICATION

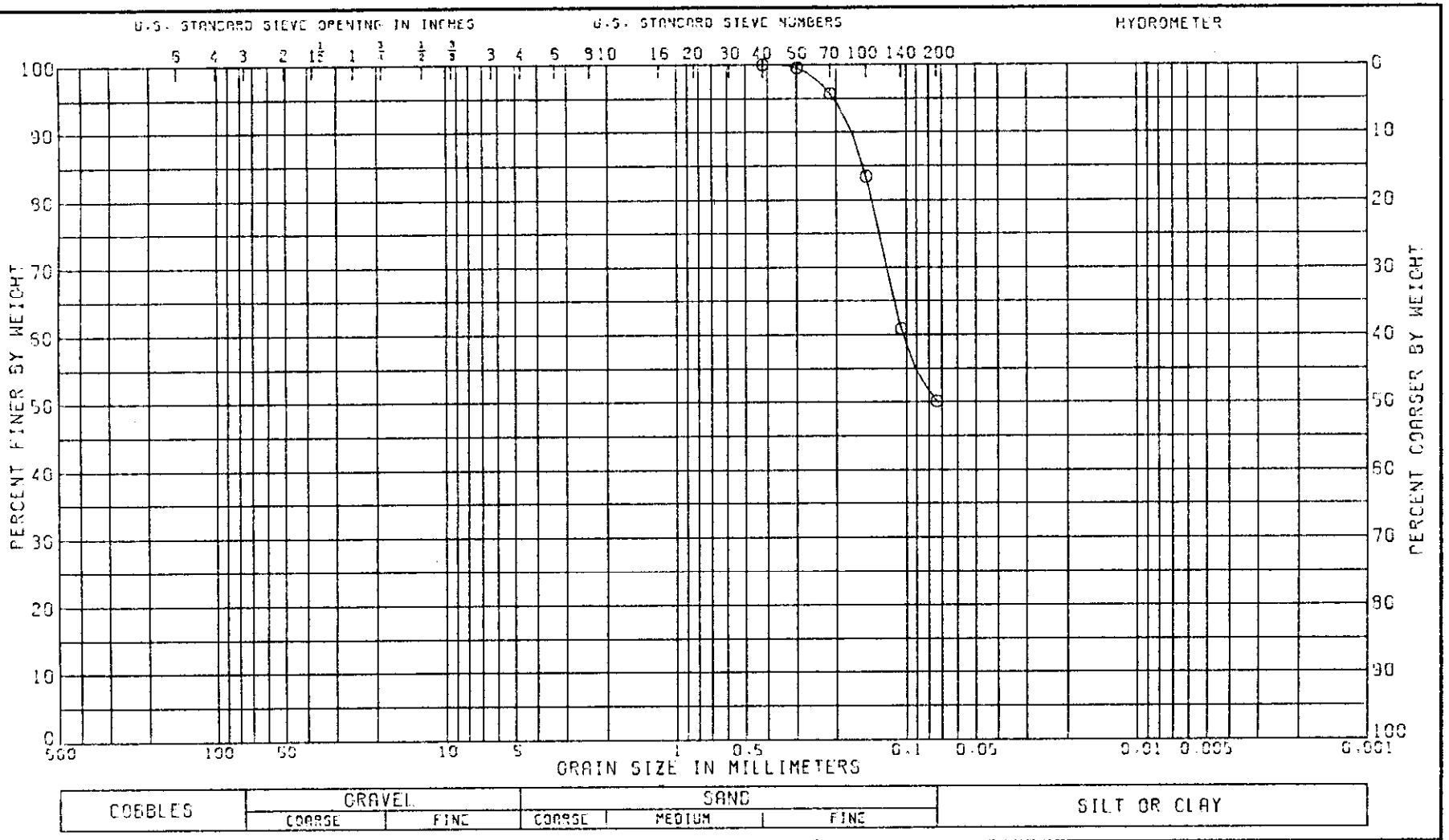
CLAY (CL), BROWN

GRADATION CURVE

PROJECT CRANE NWSC DYE BURIAL

BORING NO. 2-3-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-1.15 DATE 30 MAR 82



LL	PL	PI	OS	NAT W.%
39	14	24		14.3

CLASSIFICATION

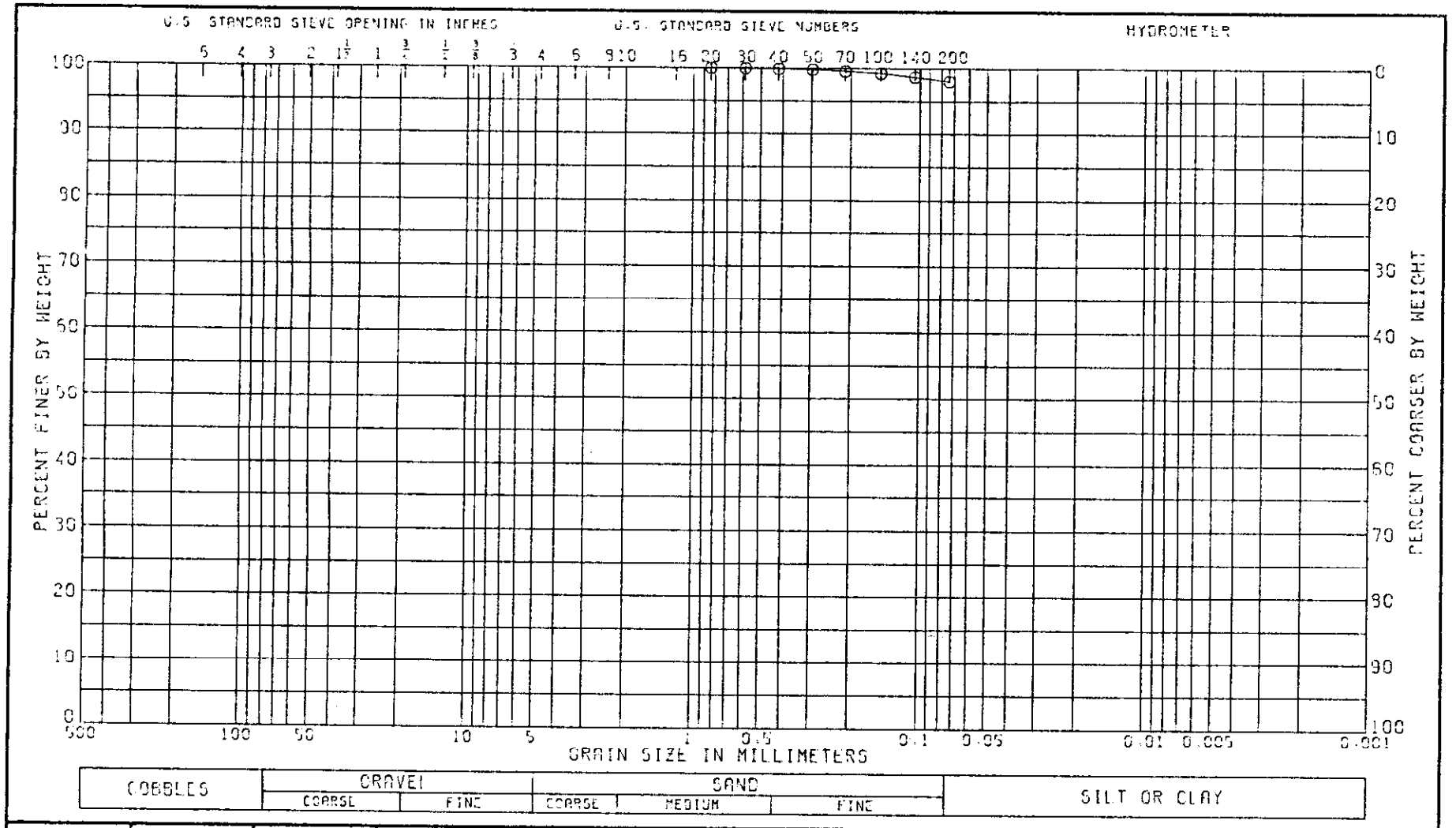
SANDY CLAY (CL), BROWN

GRADATION CURVE

PROJECT CRANE NWSC DYE BURIAL

BORING NO. 2-3-81 SAMPLE NO. 2A

DEPTH/ELEV 5.0-5.65 DATE 30 MAR 92



LL	PL	PI	CS	NAT W.%
42	21	21		18.5

CLASSIFICATION

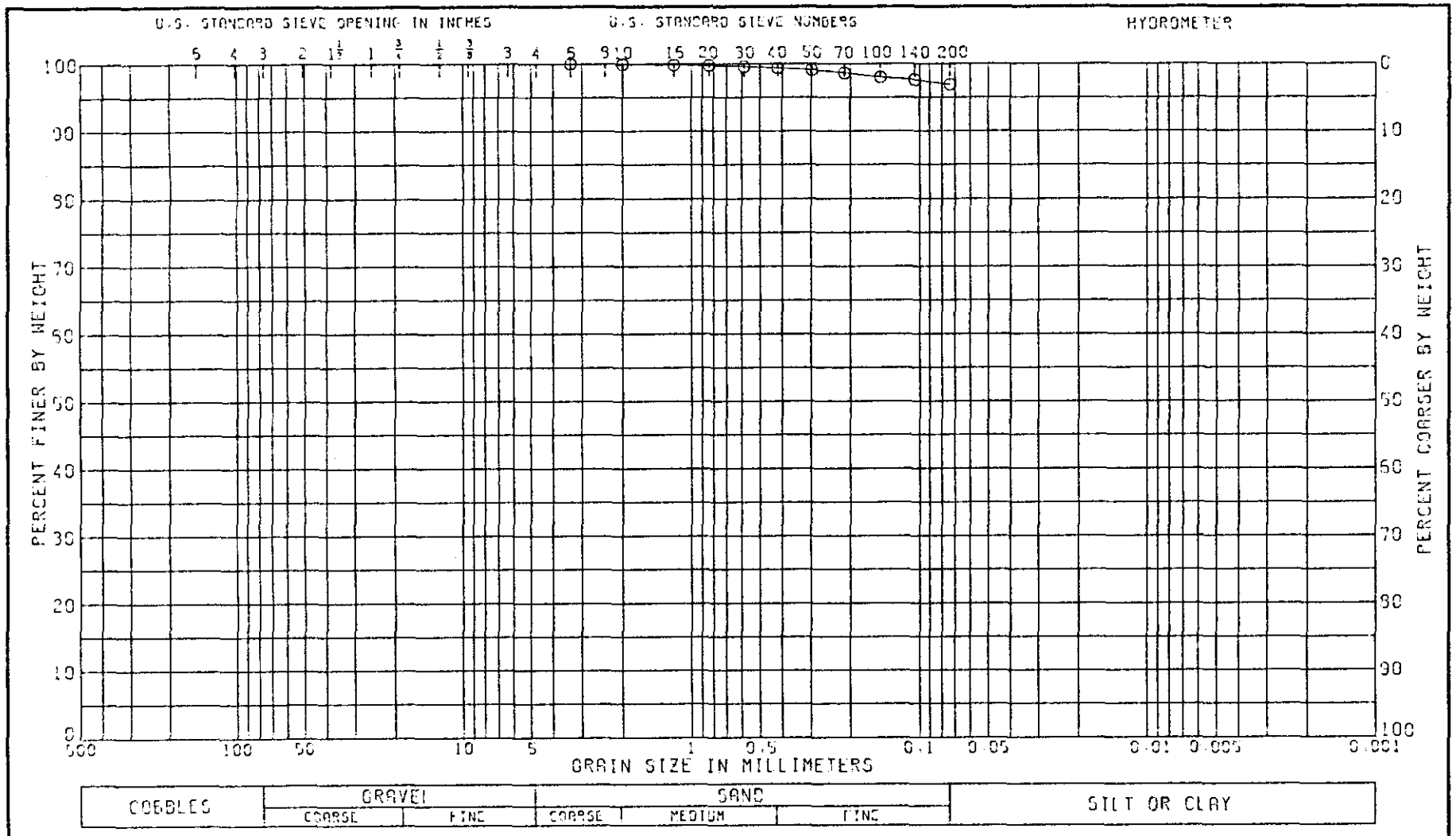
CLAY (CL), BROWN

GRADATION CURVE

PROJECT CRANE NWSC DYE BURIAL

BORING NO. 2-4-91 SAMPLE NO. 1

DEPTH/ELEV 0.0-2.2 DATE 30 MAR 92



LL	PL	PI	GS	NAT W.%
44	23	21		18.0

CLASSIFICATION

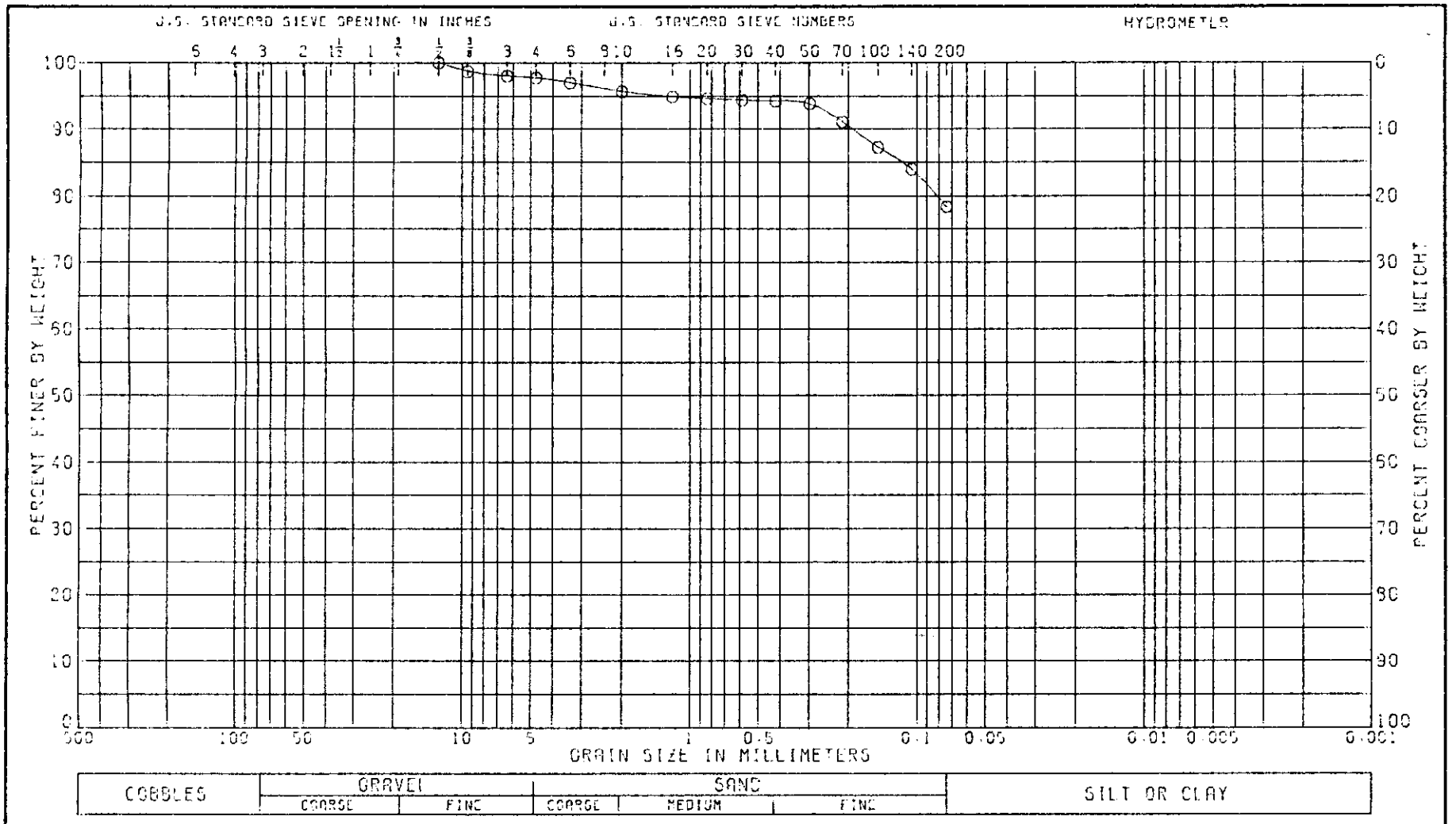
CLAY (CL), DARK TAN: TRACE OF SAND

GRADATION CURVE

PROJECT CRANE NWSC DYE BURIAL

BORING NO. 2-5-81 SAMPLE NO 1

DEPTH/ELEV 0.0-1.55 DATE 30 MAR 82



LL	PL	PI	CS	NAT W.%
25	14	11		8.8

CLASSIFICATION

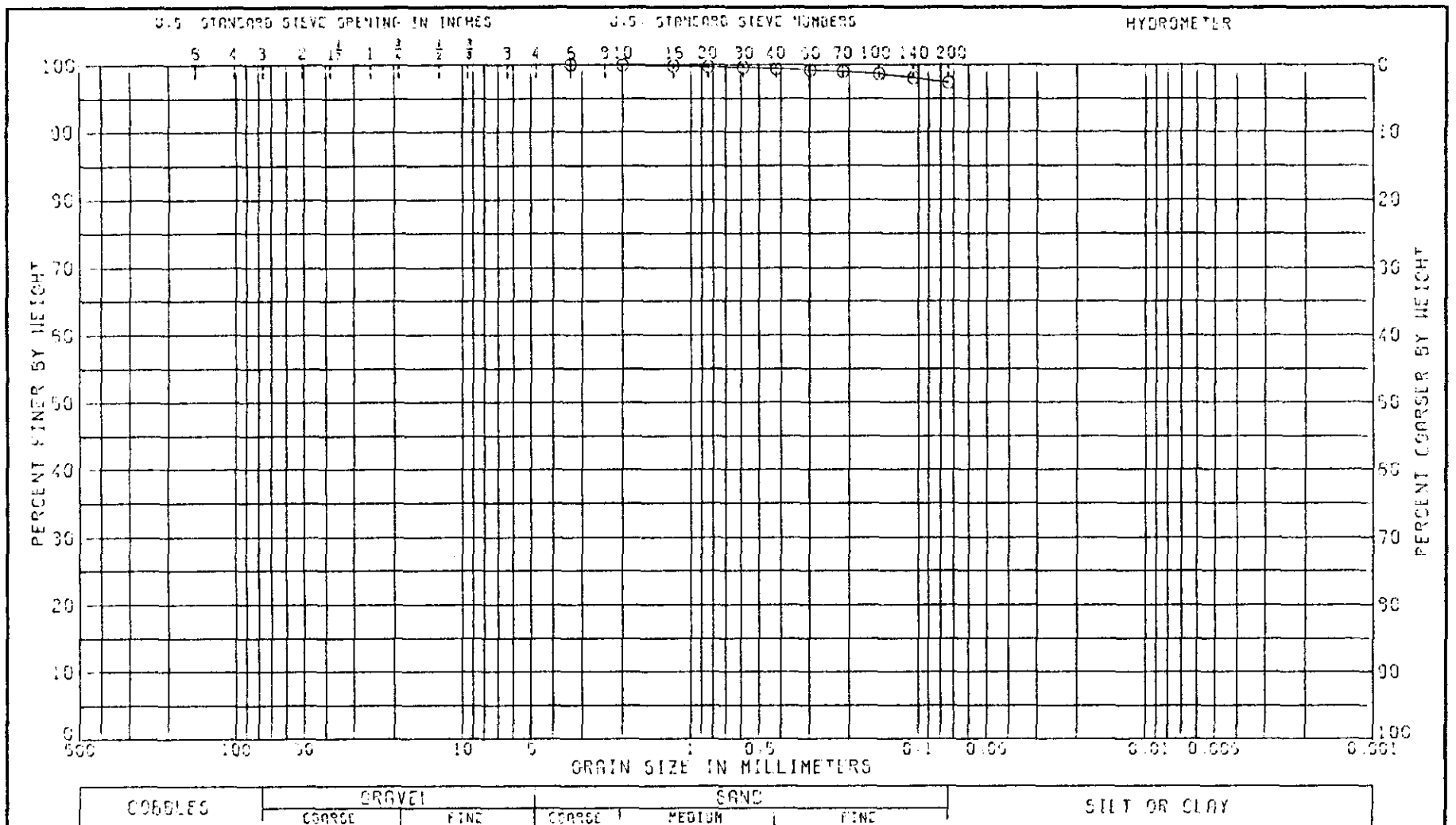
SANDY CLAY (CL), TAN

GRADATION CURVE

PROJECT CRANE NWSC DYE BURIAL

BORING NO. 2-5-91 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.1 DATE 11 FEB 92



LL 31	PL 17	PI 14	CS	NAT W.% 15.8	

CLASSIFICATION

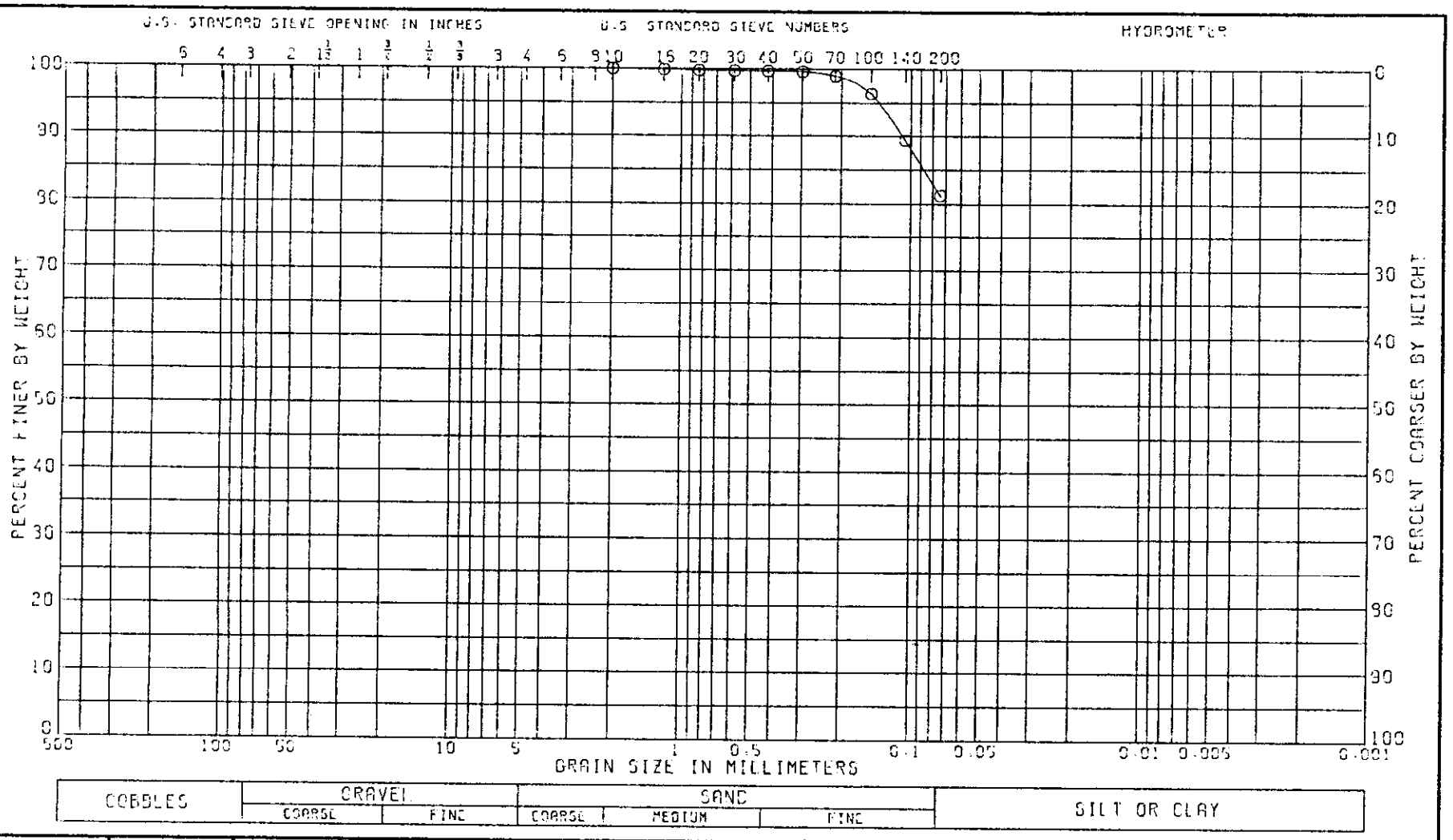
CLAY (CL), BROWN

GRADATION CURVE

PROJECT CRANE NWSC DYE BURIAL

BORING NO 2-6-81 SAMPLE NO 1

DEPTH/ELEV 0.0-2.2 DATE 26 FEB 82



LL	PL	PI	OS	NAT W.%
38	15	23		15.4

CLASSIFICATION

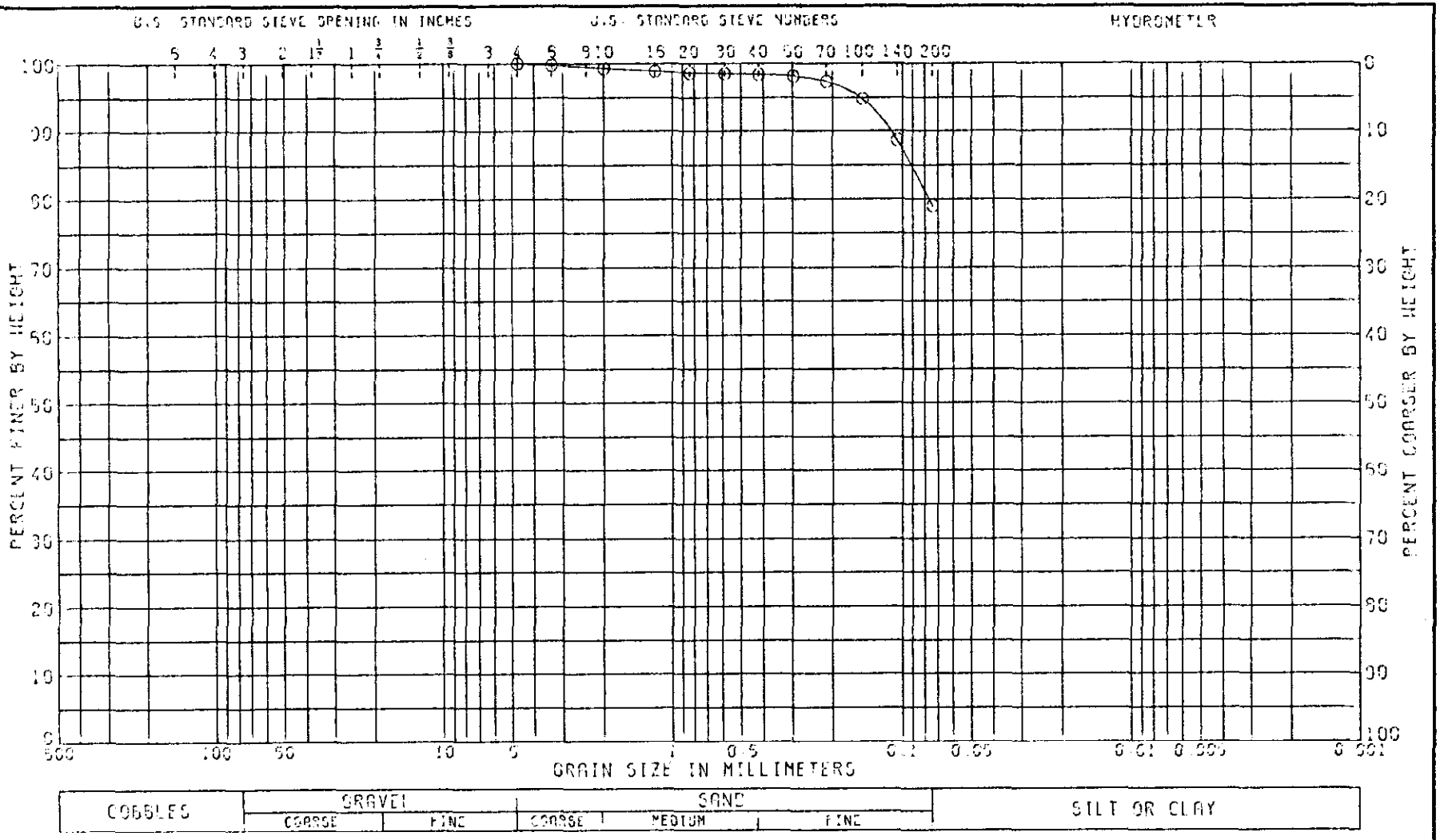
SANDY CLAY (CL), BROWN

GRADATION CURVE

PROJECT CRANE NWSC DYE BURIAL

BORING NO. 2-6-81 SAMPLE NO 2

DEPTH/ELEV 5.0-6.33 DATE 30 MAR 82



LL	PL	PI	GS	NAT W.%
34	15	19		9.2

CLASSIFICATION

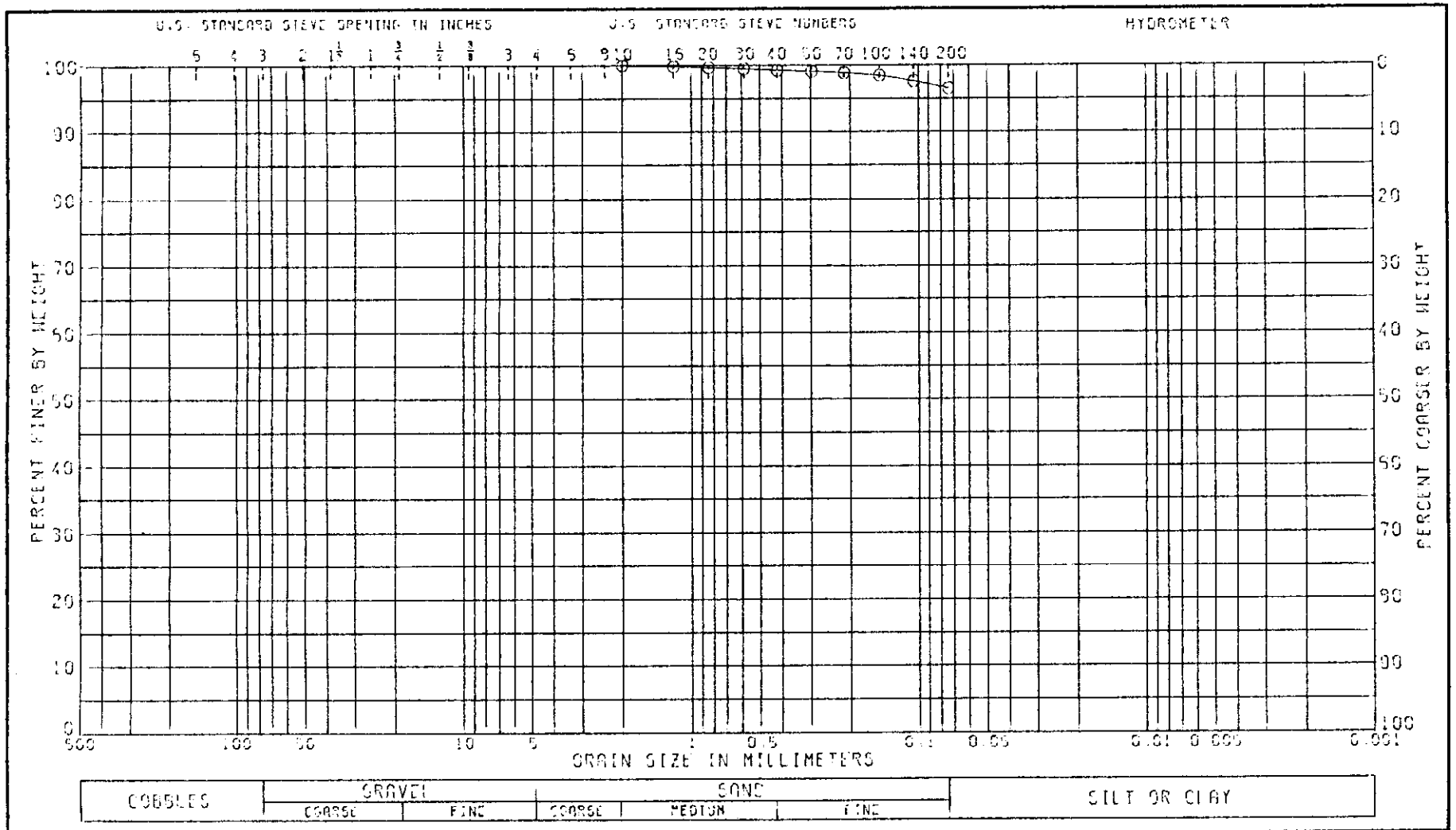
SANDY CLAY (CL), BROWN

GRADATION CURVE

PROJECT CRANE NWSC DYE BURIAL

BORING NO 2-7-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-2.0 DATE 26 FEB 92



LL 39	PL 18	PI 21	CC	NAT W.% 17.1	

CLASSIFICATION

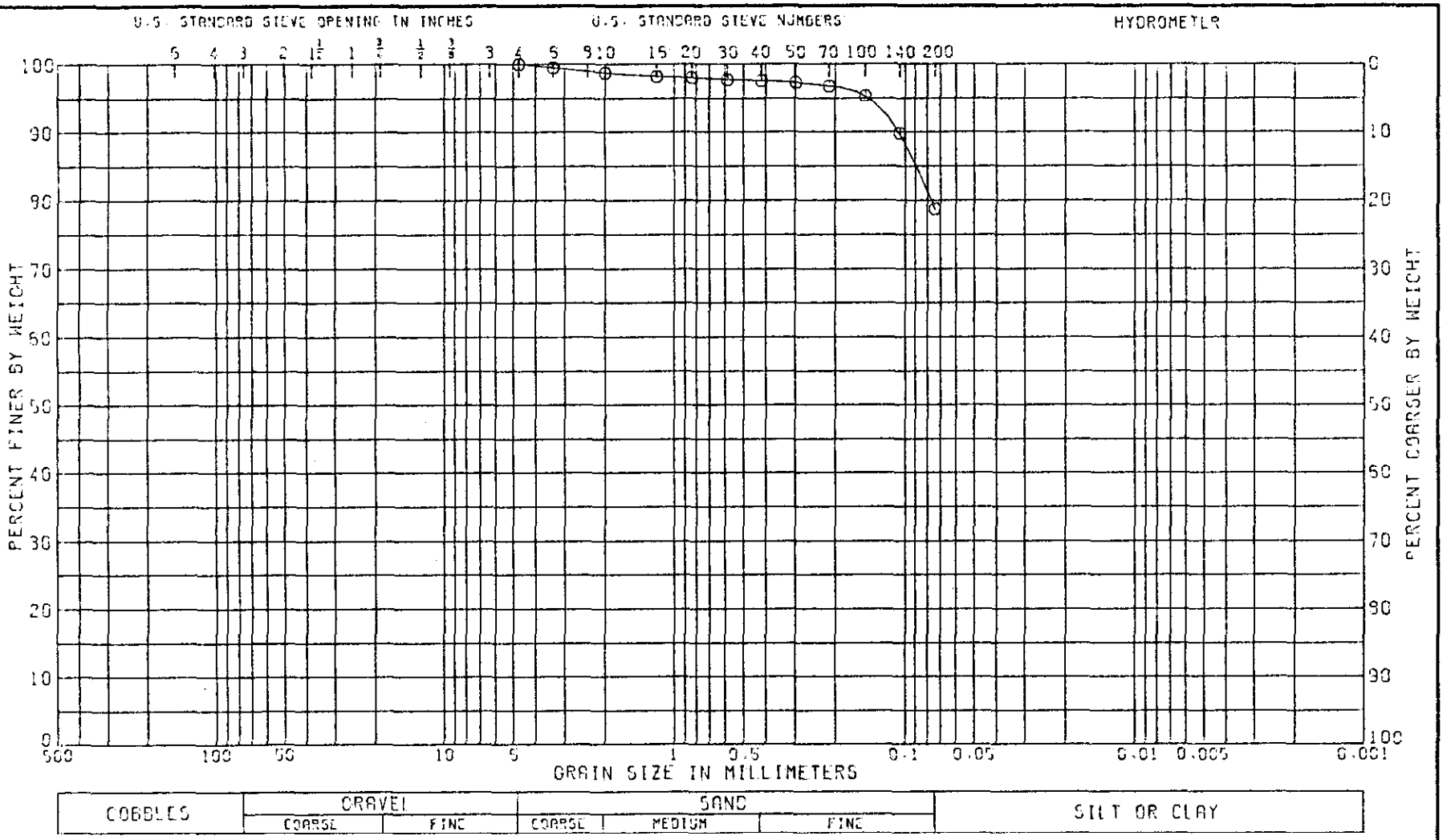
CLAY (CL), BROWN: TRACE OF SAND

GRADATION CURVE

PROJECT CRANE NWSC DYE BURIAL

BORING NO 2-8-81 SAMPLE NO 1

DEPTH/ELEV 0.0-2.25 DATE 25 FEB 82



LL	PL	PI	CS	NAT W.%
39	16	23		13.4

CLASSIFICATION

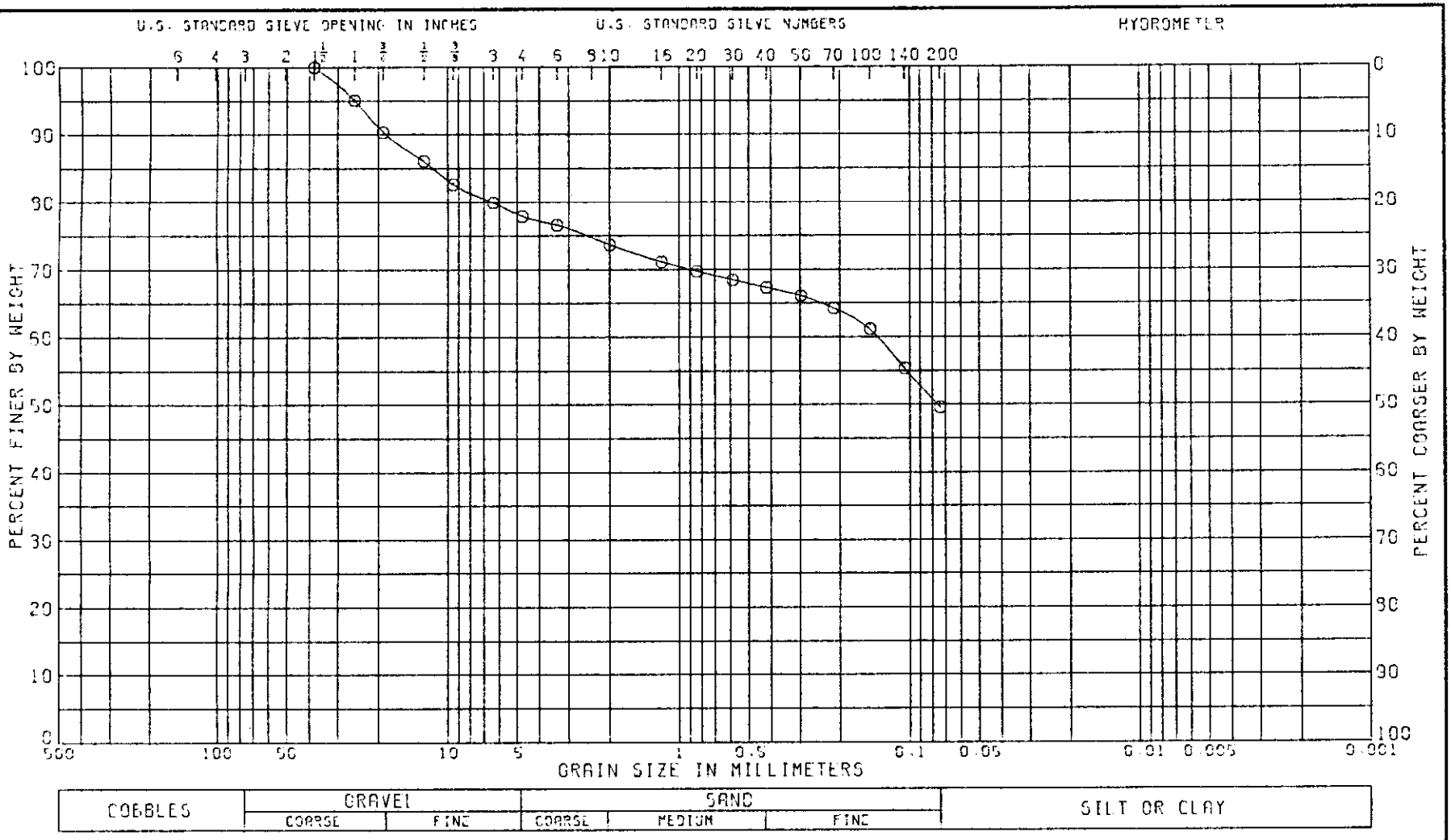
SANDY CLAY (CL), TAN

GRADATION CURVE

PROJECT CRANE NWSC DYE BURIAL

BORING NO. 2-8-81 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.69 DATE 30 MAR 92



LL	PL	PI	GS	NAT W.%
42	17	25		17.3

CLASSIFICATION

GRAVELLY CLAYEY SAND (SC), BROWN

INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

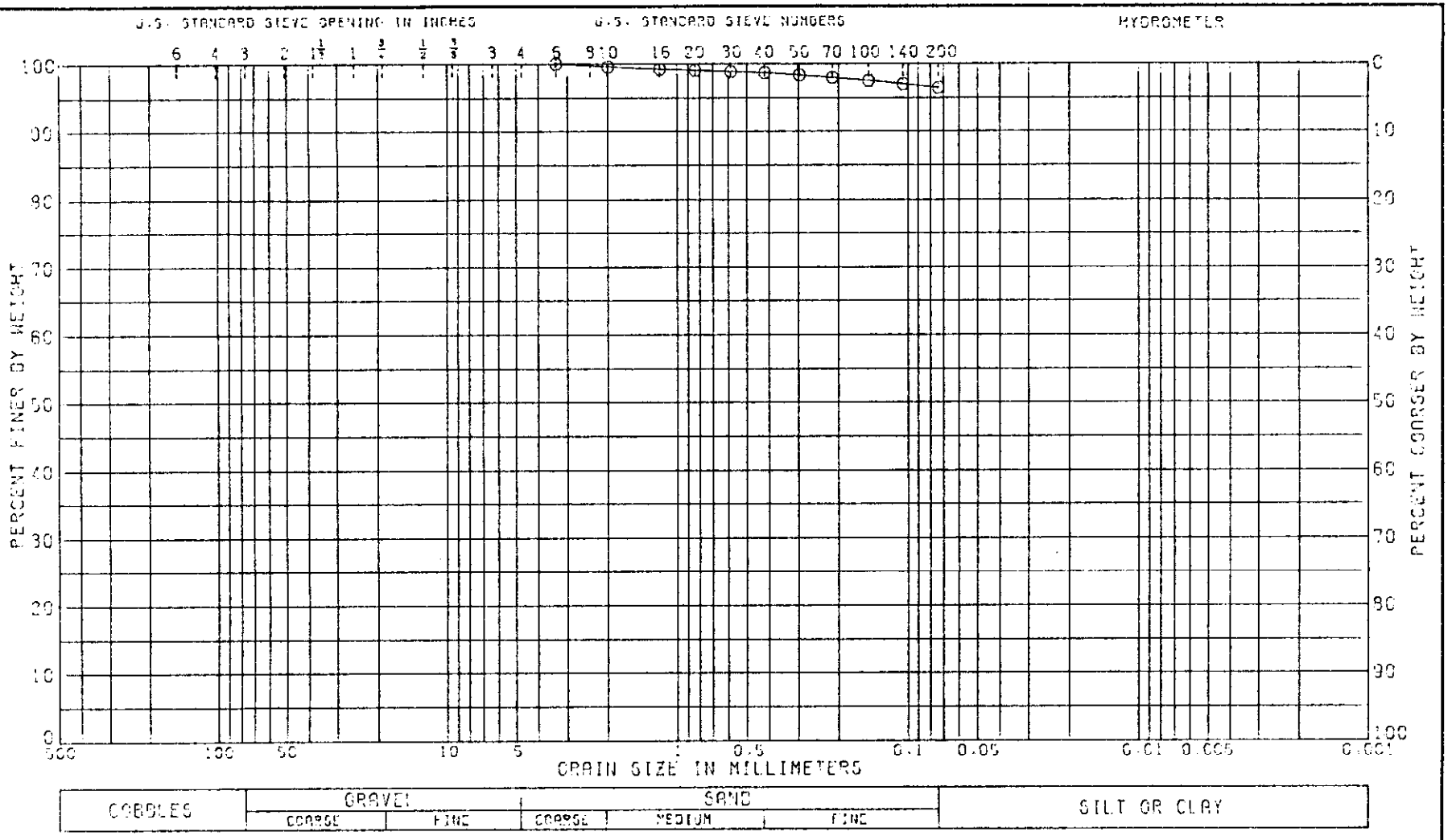
GRADATION CURVE

PROJECT CRANE NWSC

ORDANCE BURNING GROUND

BORING NO. 3-1-81 SAMPLE NO 1

DEPTH/ELEV 0.0-1.35 DATE 30 MAR 82



LL 43	PL 18	PI 25	GS	NAT W.% 15.1	

CLASSIFICATION

CLAY (CL), GRAY; TRACE OF SAND

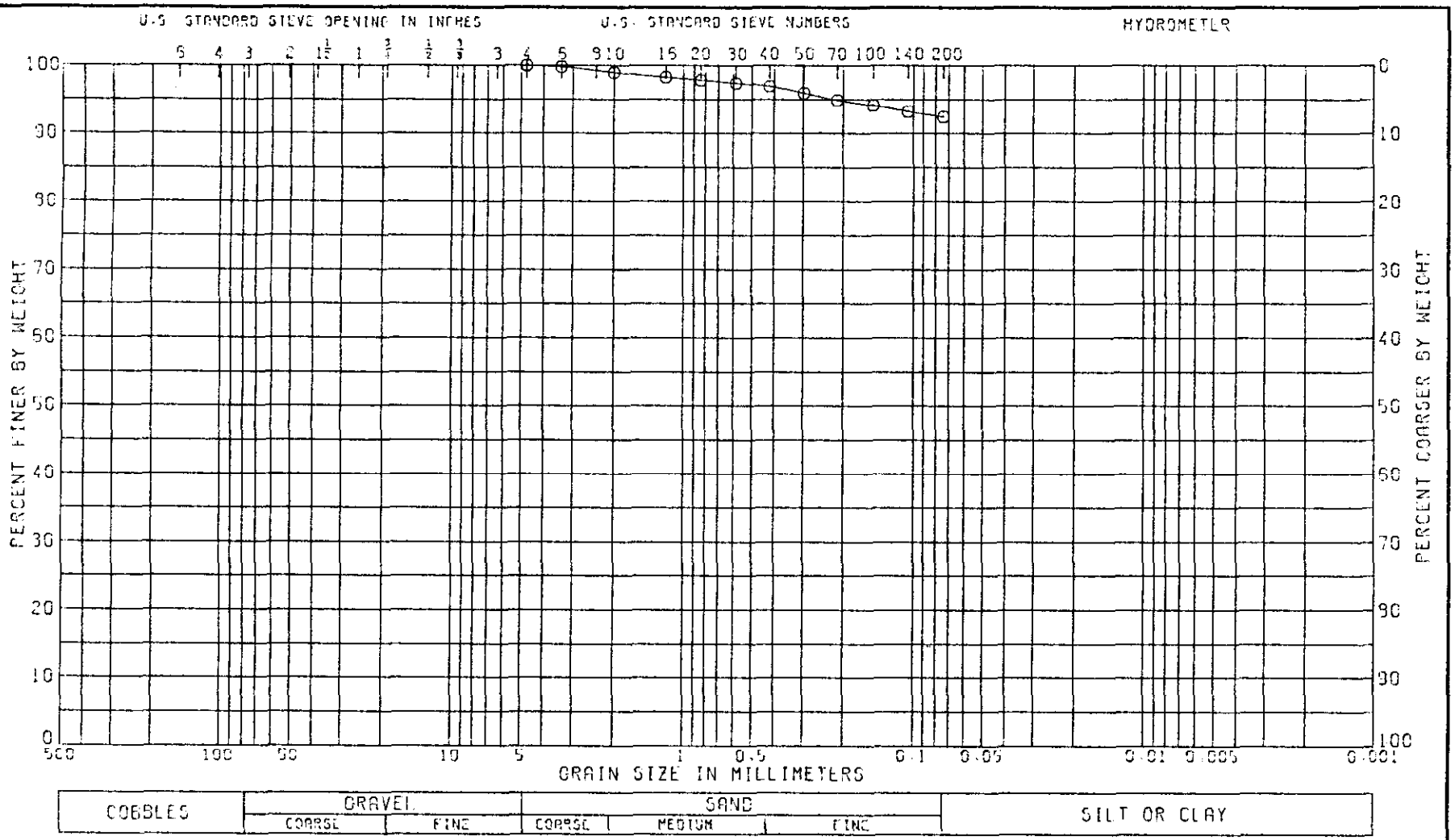
GRADATION CURVE

PROJECT CRANE NWSC

ORDNANCE BURNING GROUND

BORING NO. 3-1-81 SAMPLE NO. 2

DEPTH/ELEV 5.0-5.71 DATE 03 MAR 82



LL	PL	PI	GS	NAT W.%	
37	19	18		10.2	

CLASSIFICATION

CLAY (CL), DARK GRAY: WITH SAND

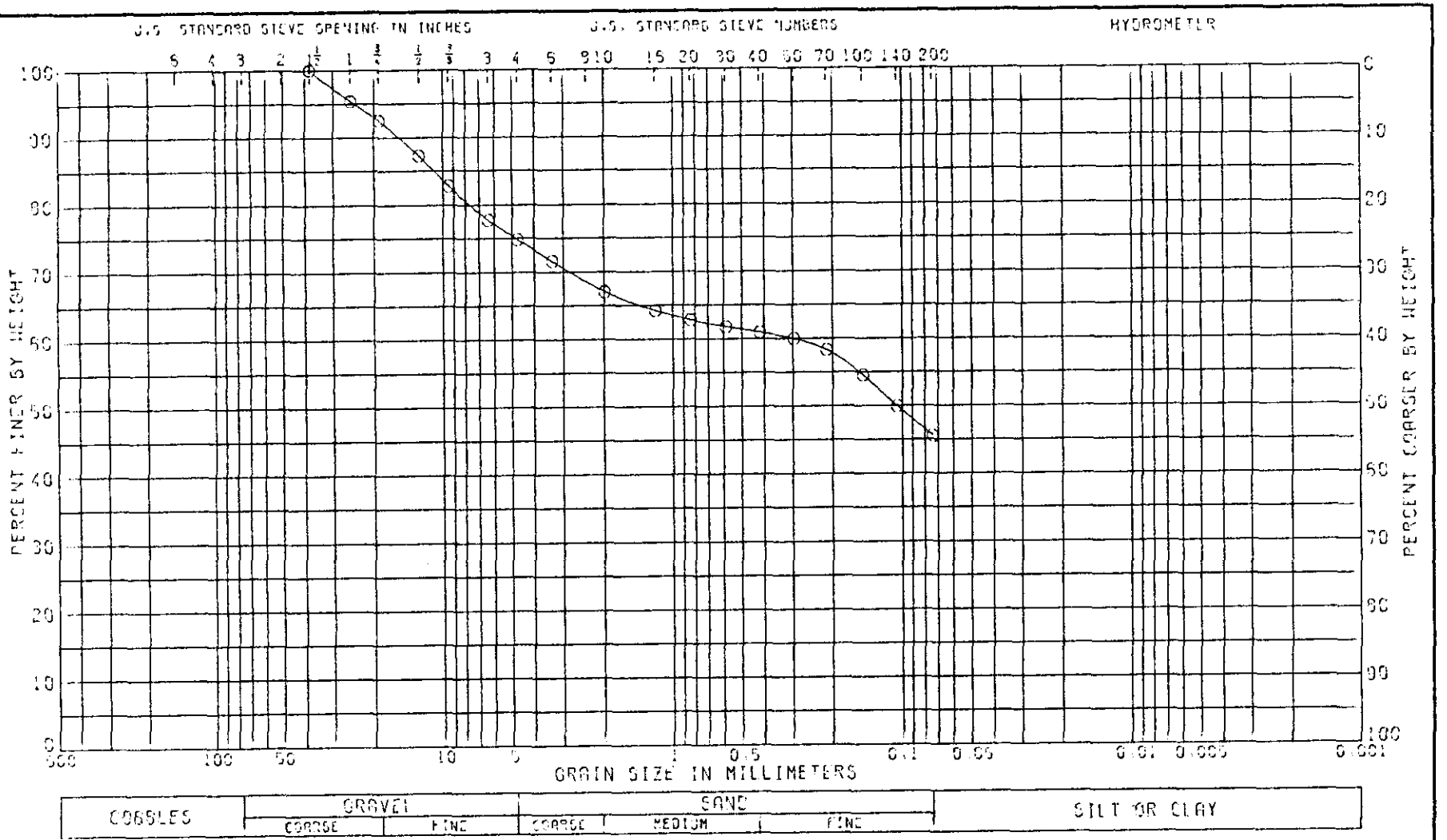
GRADATION CURVE

PROJECT CRANE NWSC

ORDANCE BURNING GROUND

BORING NO. 3-1-81 SAMPLE NO. 3

DEPTH/ELEV 10.0-10.85 DATE 30 MAR 92



LL	PL	PI	GS	NAT W.%
32	19	13		3.7

CLASSIFICATION

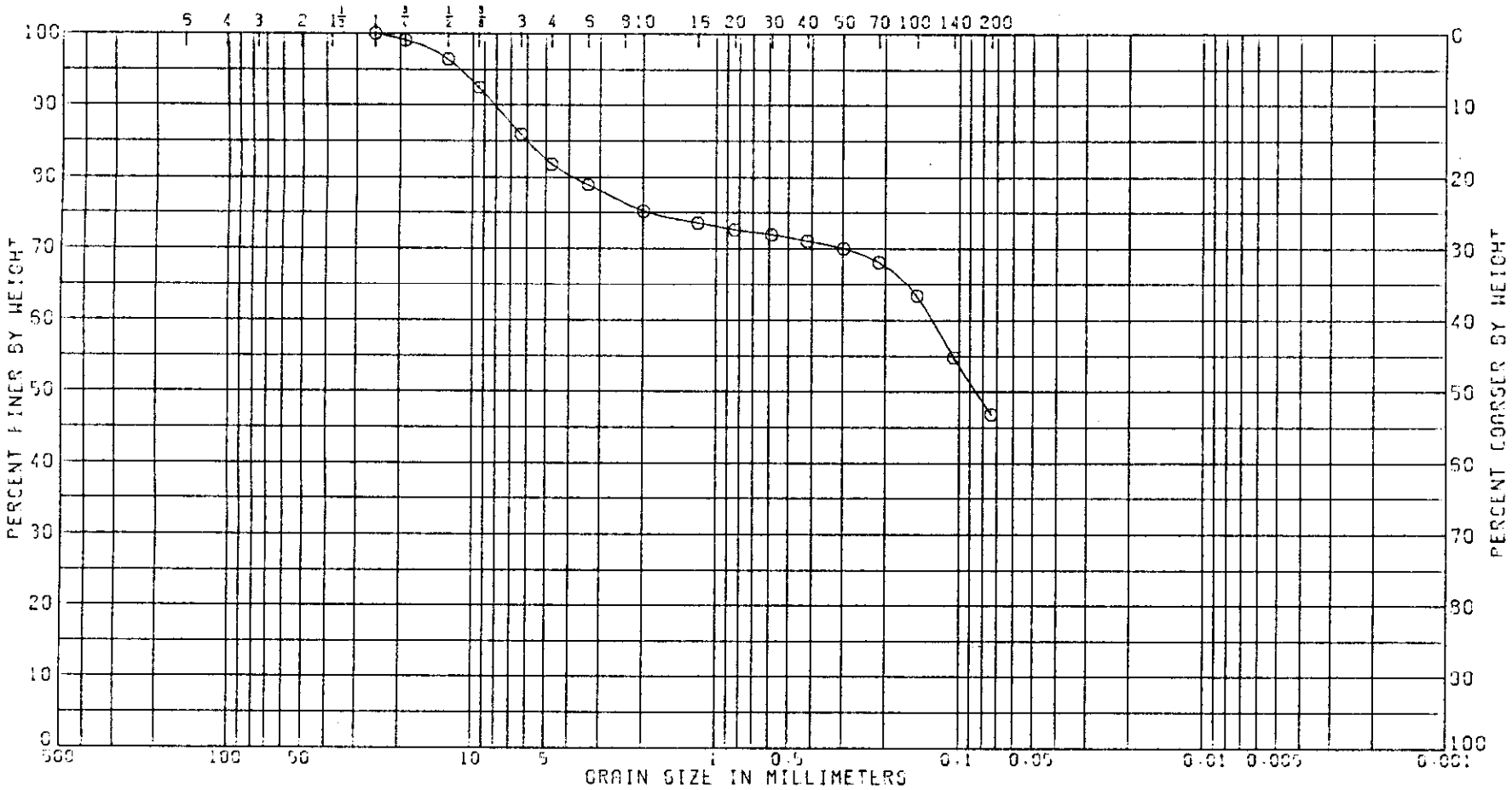
GRAVELLY CLAYEY SAND (SC), BROWN

GRADATION CURVE

PROJECT CRANE NWSC ORDNANCE BURNING GROUND

BORING NO 3-2-81 SAMPLE NO 1

DEPTH/ELEV 0.0-1.5 DATE 26 FEB 82



LL	PL	PI	CS	NAT W.%	
27	13	14			

CLASSIFICATION

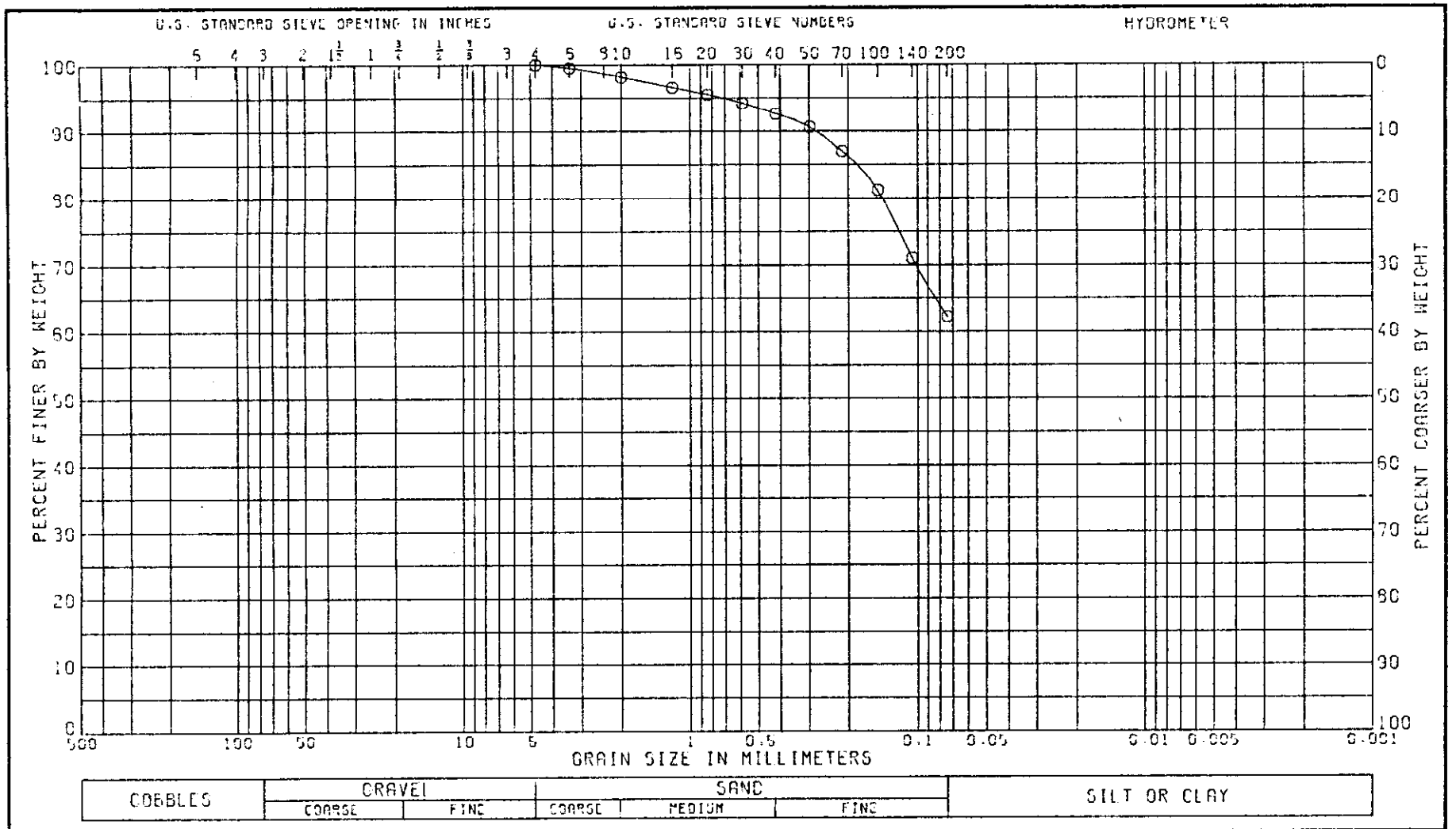
GRAVELLY CLAYEY SAND (SC), BROWN

GRADATION CURVE

PROJECT CRANE NWSC

BORING NO. 3-2--91 SAMPLE NO. 2

DEPTH/ELEV 5.0-7.4 DATE 12 APR 92



LL 31	PL 17	PI 14	OS	NAT W.% 19.8

CLASSIFICATION

SANDY CLAY (CL), BROWN

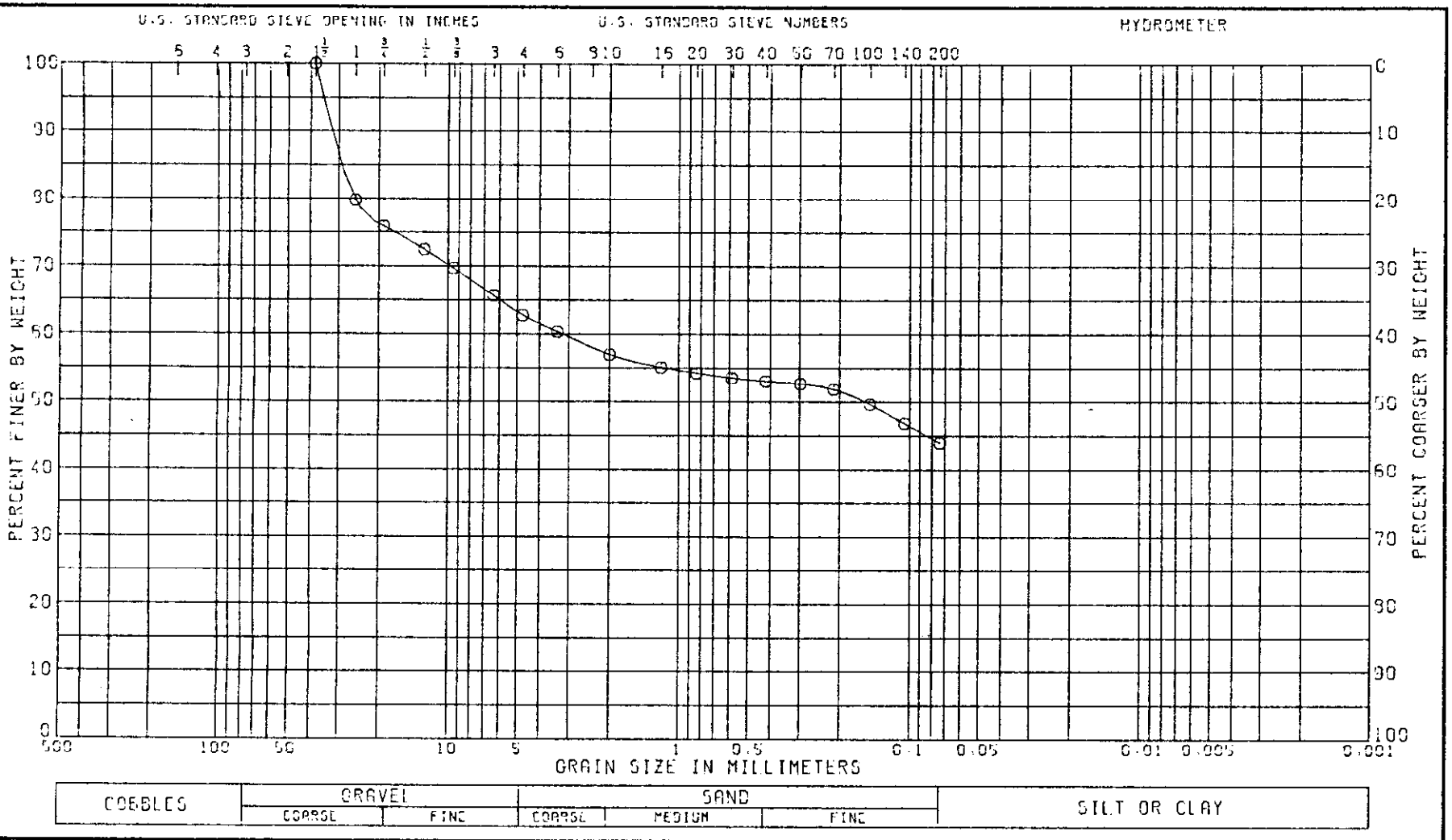
GRADATION CURVE

PROJECT CRANE NWSC

ORDANCE BURNING GROUND

BORING NO. 3-3-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-1.23 DATE 30 MAR 82



LL 31	PL 16	PI 15	GS	NAT W.% 9.8

CLASSIFICATION

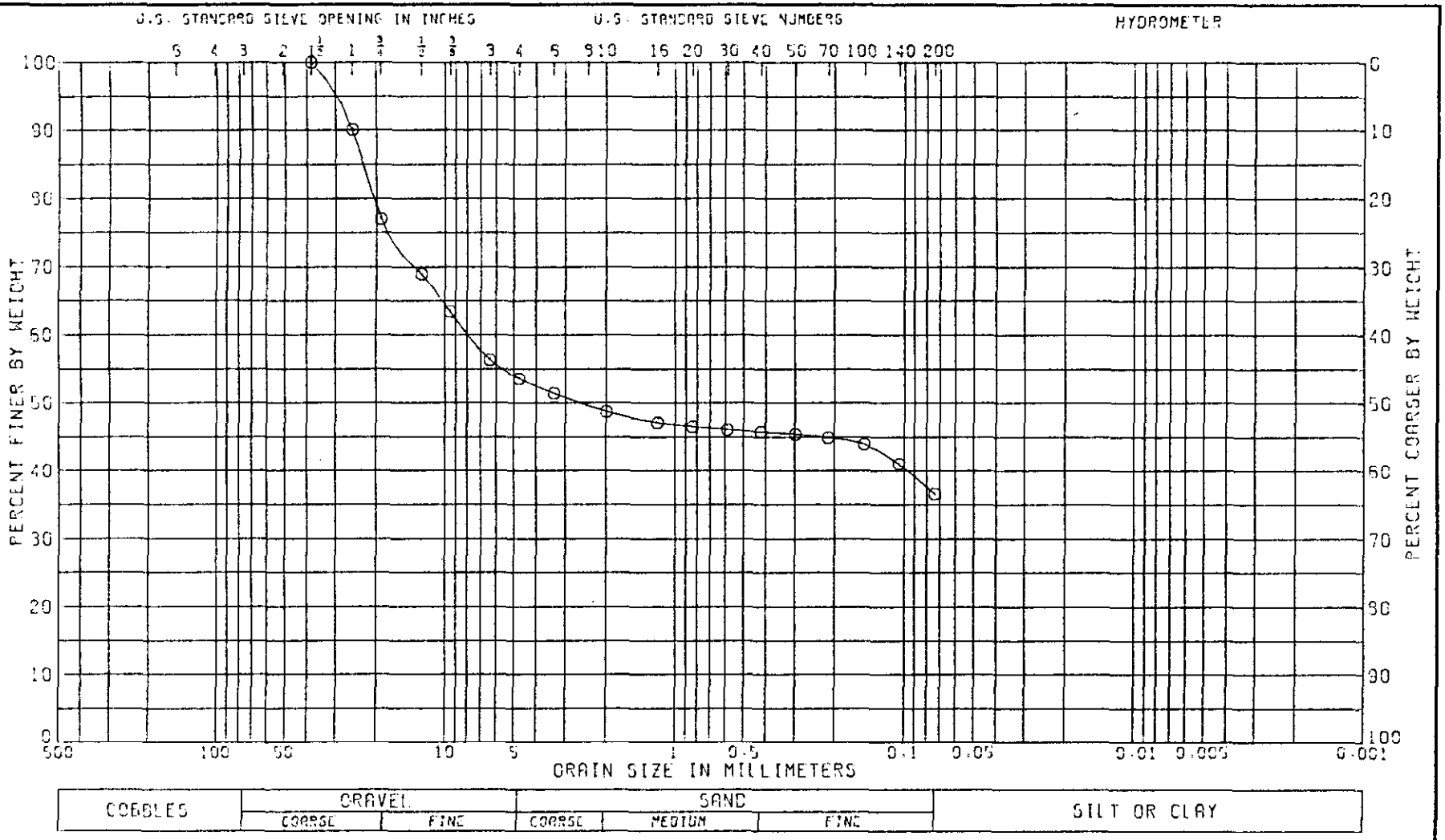
GRAVELLY CLAYEY SAND (SC), BROWN
INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

GRADATION CURVE

PROJECT CRANE NWSC
ORDANCE BURNING GROUND

BORING NO. 3-4-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-1.3 DATE 30 MAR 82



LL	PL	PI	CS	NAT W.%
24	15	9		12.0

CLASSIFICATION

SANDY CLAYEY GRAVEL (GC), TAN

INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

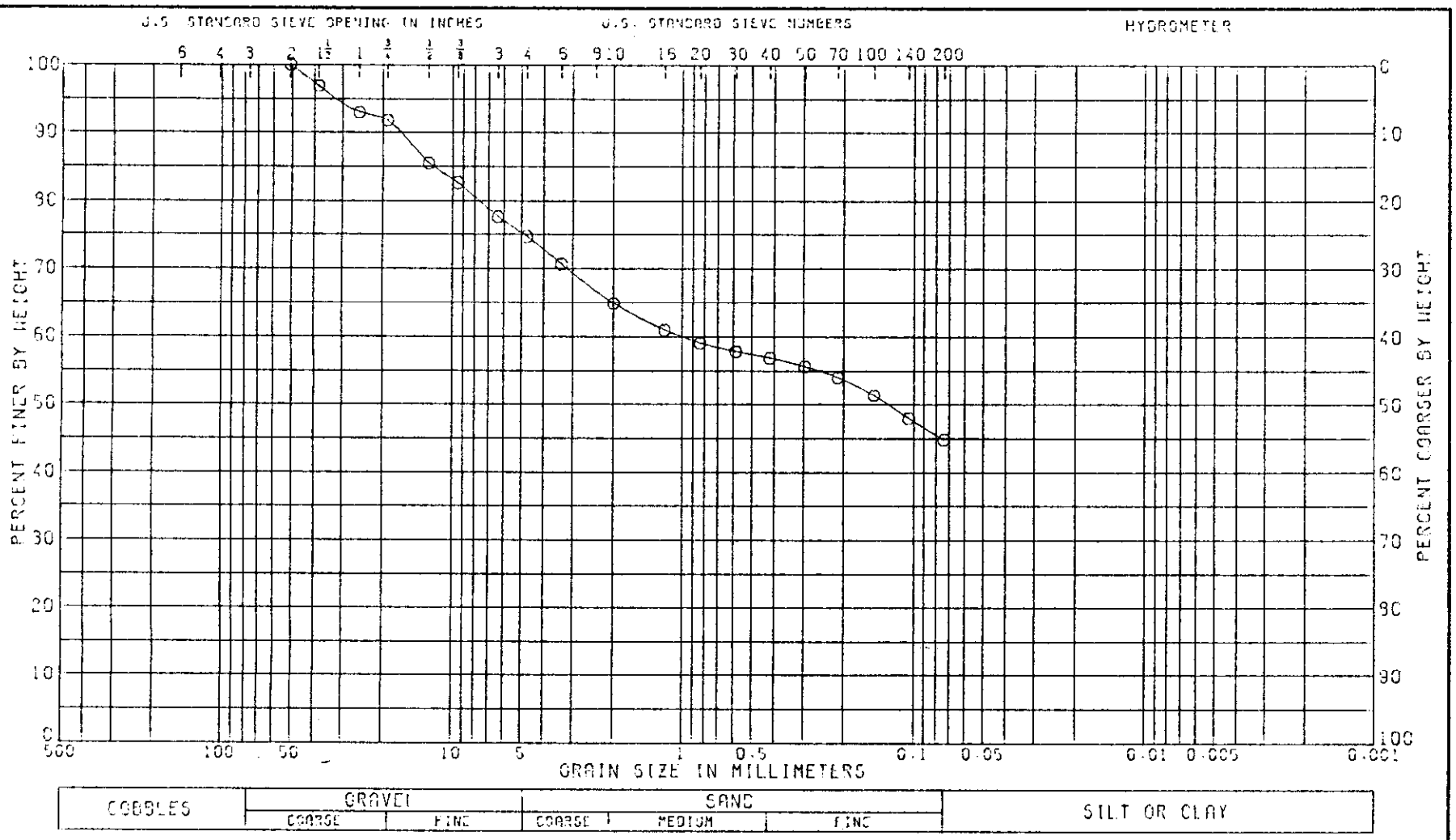
GRADATION CURVE

PROJECT CRANE NWSC

ORDANCE BURNING GROUND

BORING NO. 3-5-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-1.25 DATE 30 MAR 82



LL	PL	PI	GS	NAT W.%	
27	16	11		13.7	

CLASSIFICATION

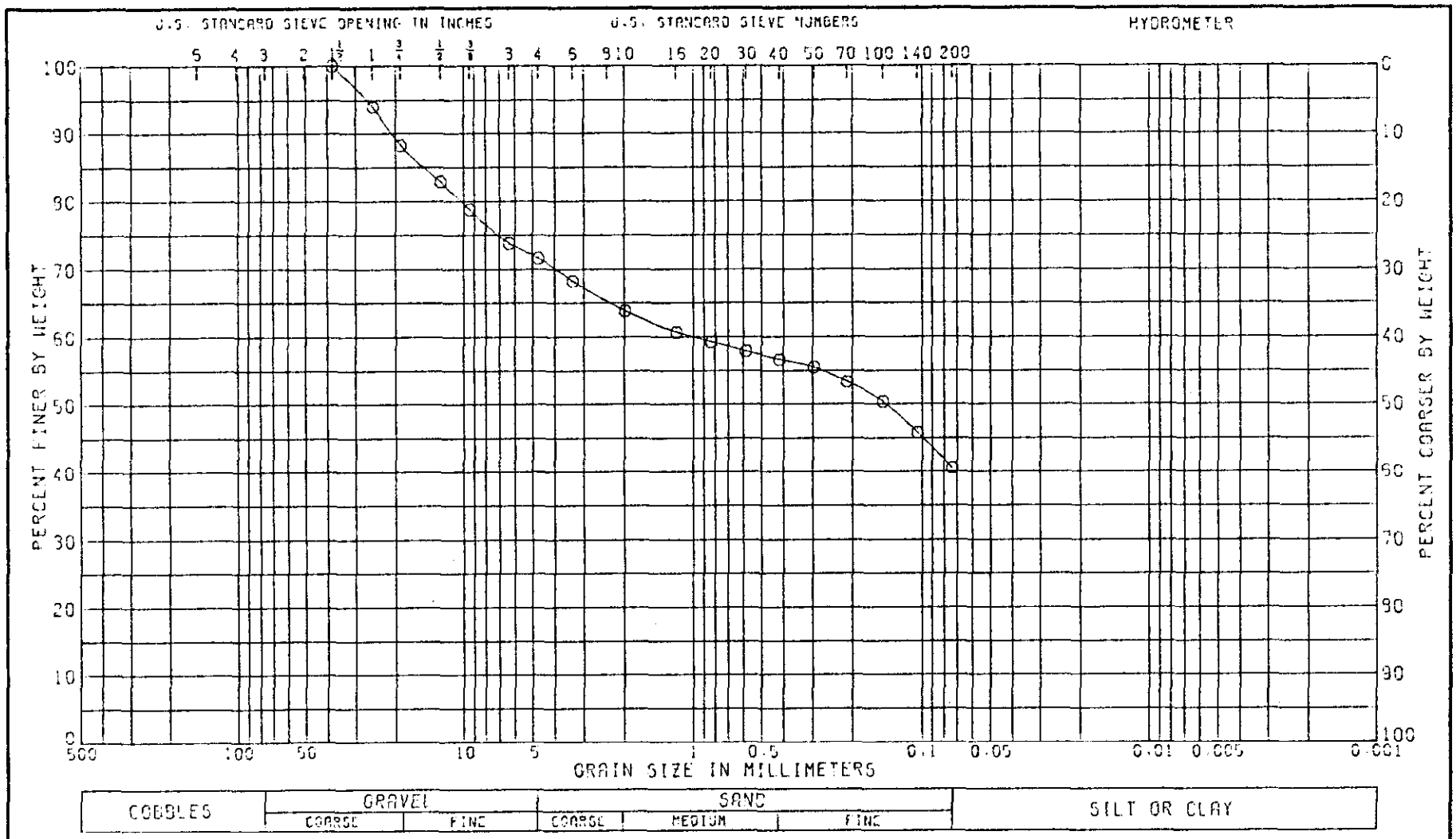
GRAVELLY CLAYEY SAND (SC), TAN

GRADATION CURVE

PROJECT CRANE NWSC ORDANCE BURING GROUND

BORING NO. 3-6-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-1.73 DATE 11 FEB 92



LL	PL	PI	GS	NAT W.%
38	16	22		12.3

CLASSIFICATION

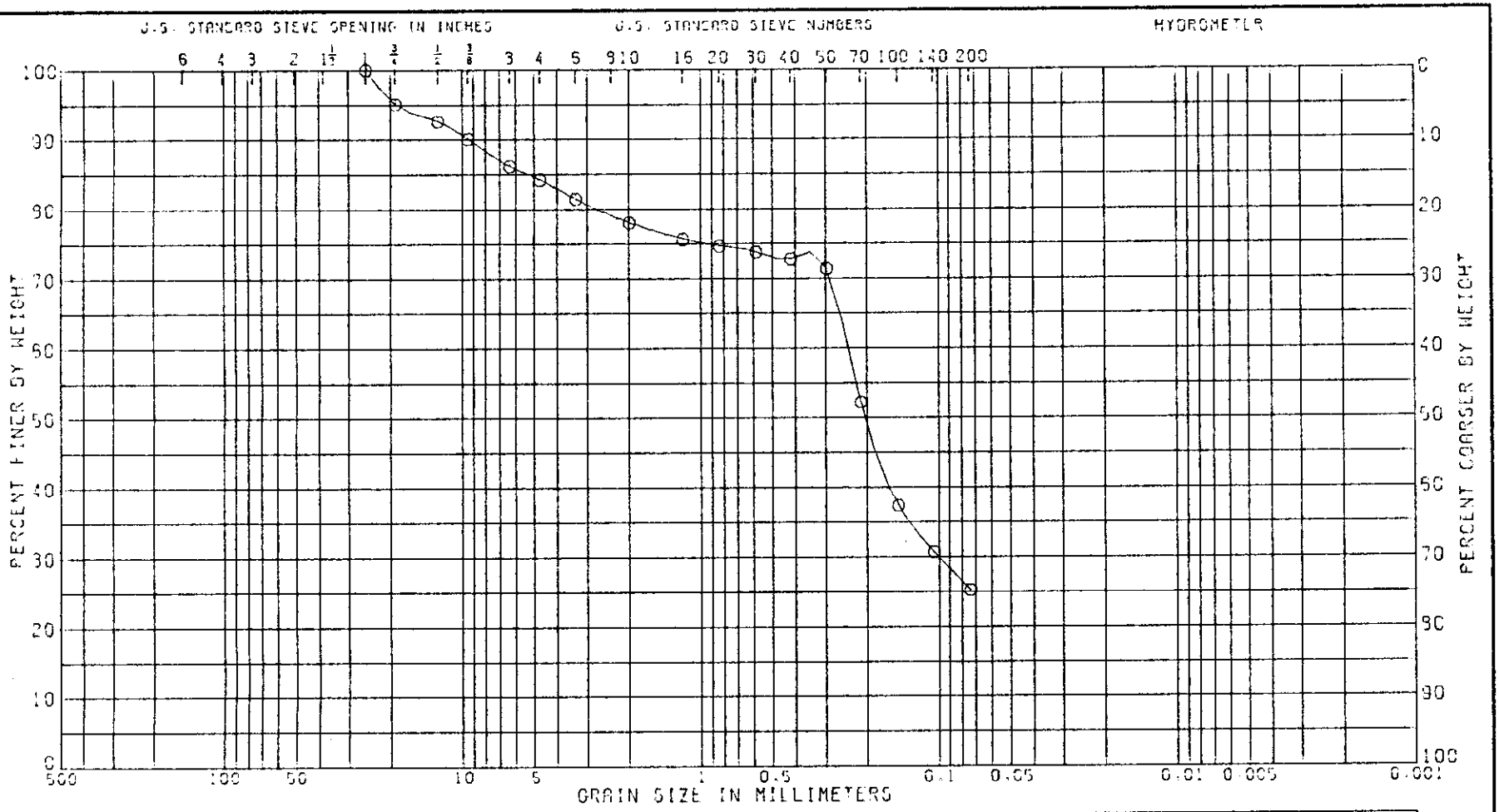
GRAVELLY CLAYEY SAND (SC), BROWN

GRADATION CURVE

PROJECT CRANE NWSC ORDANCE BURING GROUND

BORING NO. 3-7-81 SAMPLE NO. 1

DEPTH/ELEV 0.0--0.72 DATE 11 FEB 82



LL 24	PL 13	PI 11	GS	NAT W.% 17.9

CLASSIFICATION

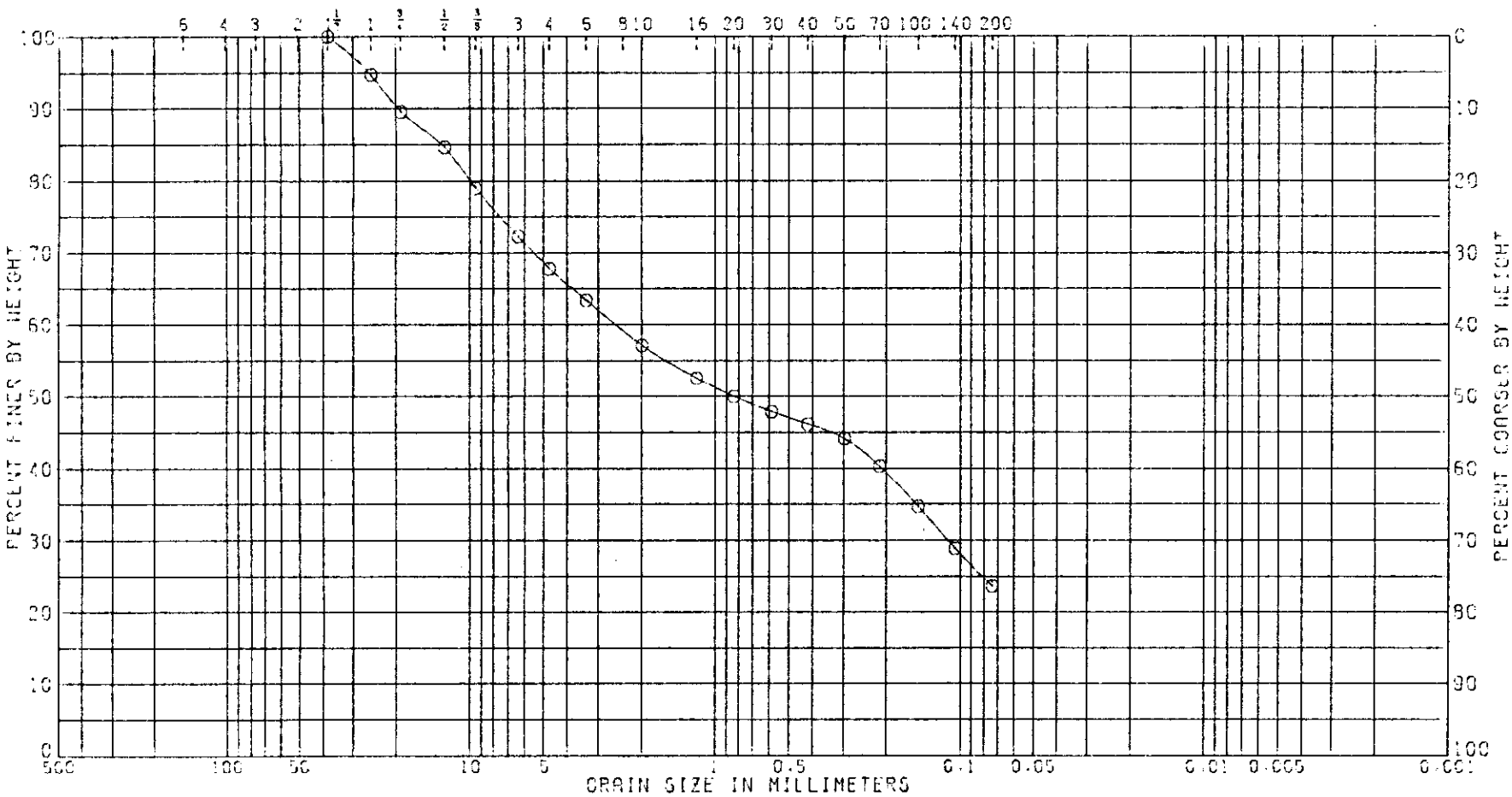
GRAVELLY CLAYEY SAND (SC), REDDISH BROWN

GRADATION CURVE

PROJECT CRANE NWSC ORDANCE DURING GROUND

BORING NO. 3-7-91 SAMPLE NO 3

DEPTH/ELEV 10.0-11.57 DATE 11 FEB 92



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

LL	PL	PI	OS	NAT W.%	
26	15	11		12.6	

CLASSIFICATION

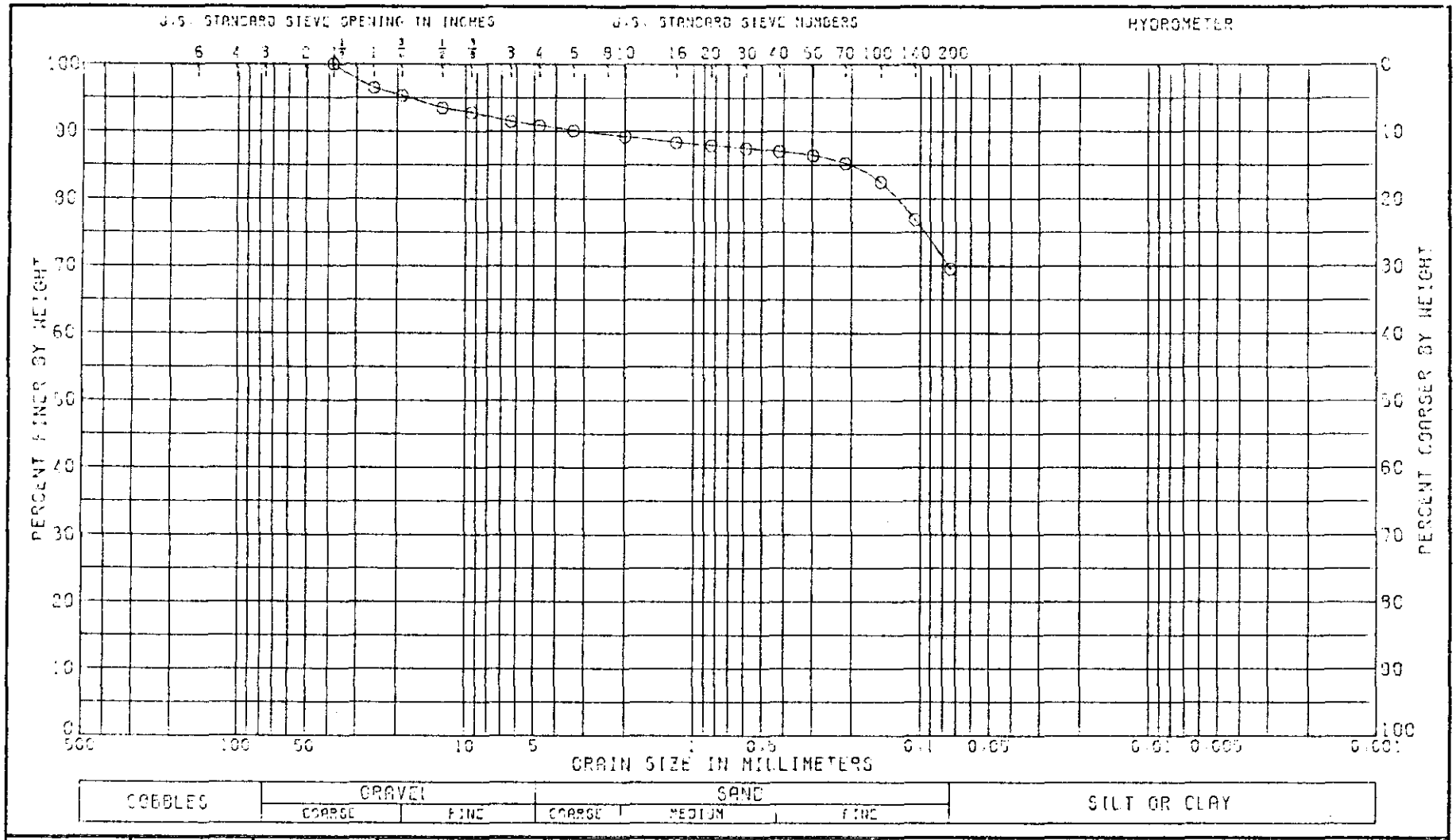
GRAVELLY CLAYEY SAND (SC), BROWN
INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

GRADATION CURVE

PROJECT CRANE NWSC
ORDNANCE BURNING GROUND

BORING NO. 3-7-81 SAMPLE NO. 4

DEPTH/ELEV 15.0-16.33 DATE 09 MAR 82



LL	PL	PI	OS	NAT W.%	
36	20	16		18.4	

CLASSIFICATION

SANDY CLAY (CL), BROWN: WITH GRAVEL

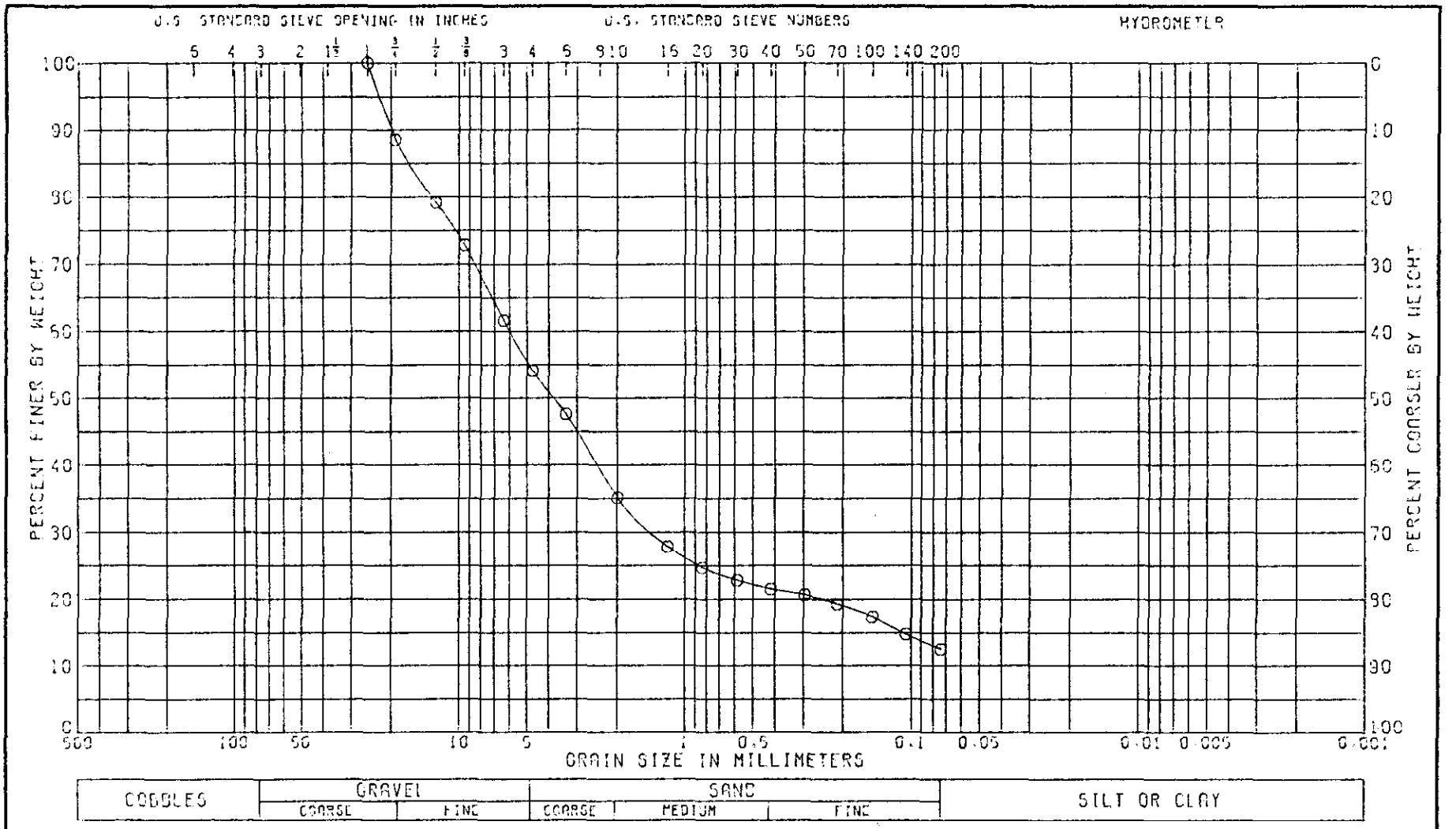
GRADATION CURVE

PROJECT CRANE NLSC

ORDNANCE BURNING GROUND

BORING NO. 3-8-81 SAMPLE NO 1

DEPTH/ELEV 0.0-1.86 DATE 20 MAR 82



LL	PL	PI	GS	NAT W.%
23	14	9		8.0

CLASSIFICATION

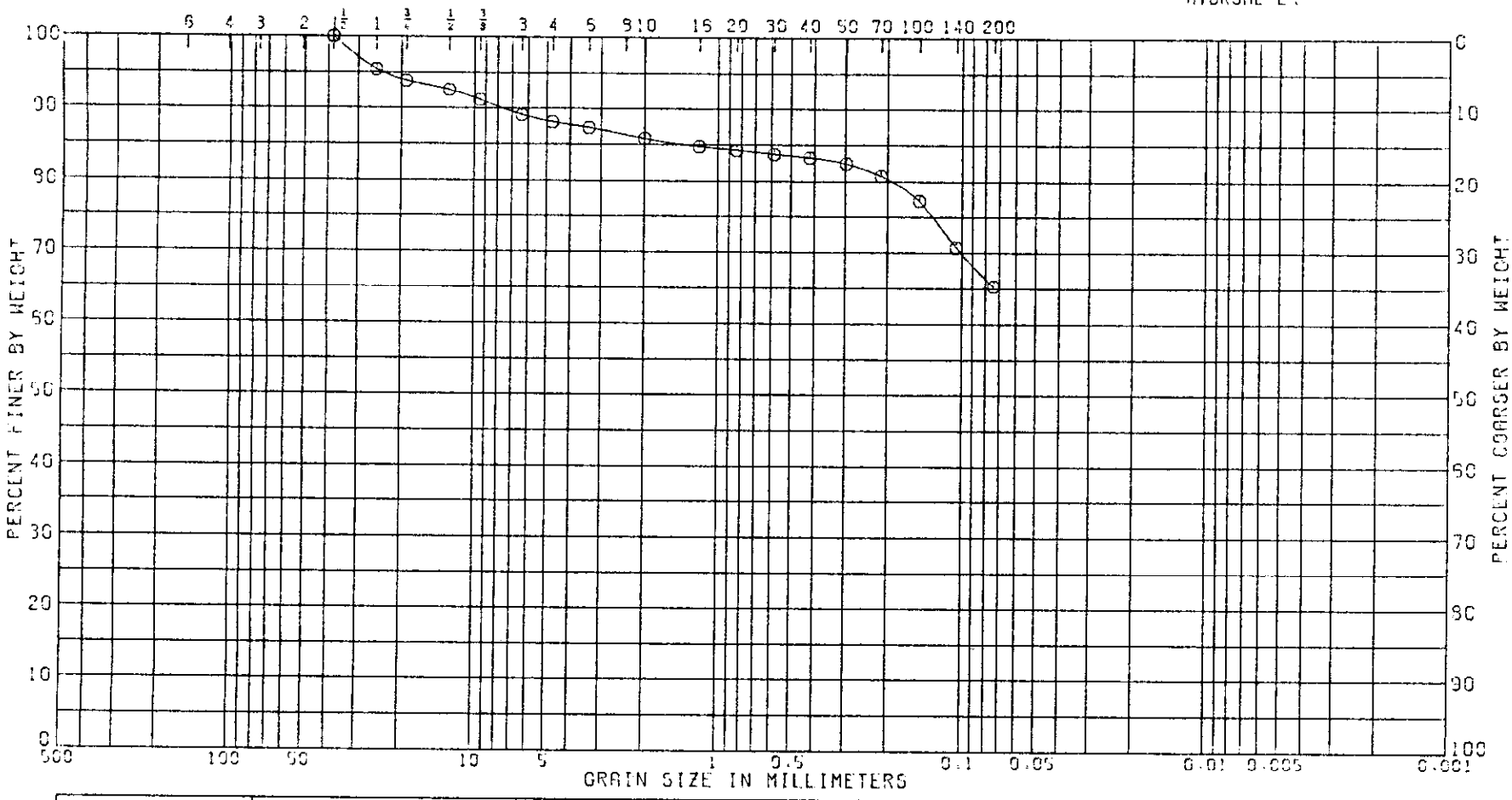
GRAVELLY CLAYEY SAND (SC), REDDISH BROWN
INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

GRADATION CURVE

PROJECT CRANE NWSC ORDANCE BURING GROUND

BORING NO. 3-B-81 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.0' DATE 11 FEB 92



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

LL	PL	PI	GS	NAT W.%
25	16	9		15.3

CLASSIFICATION

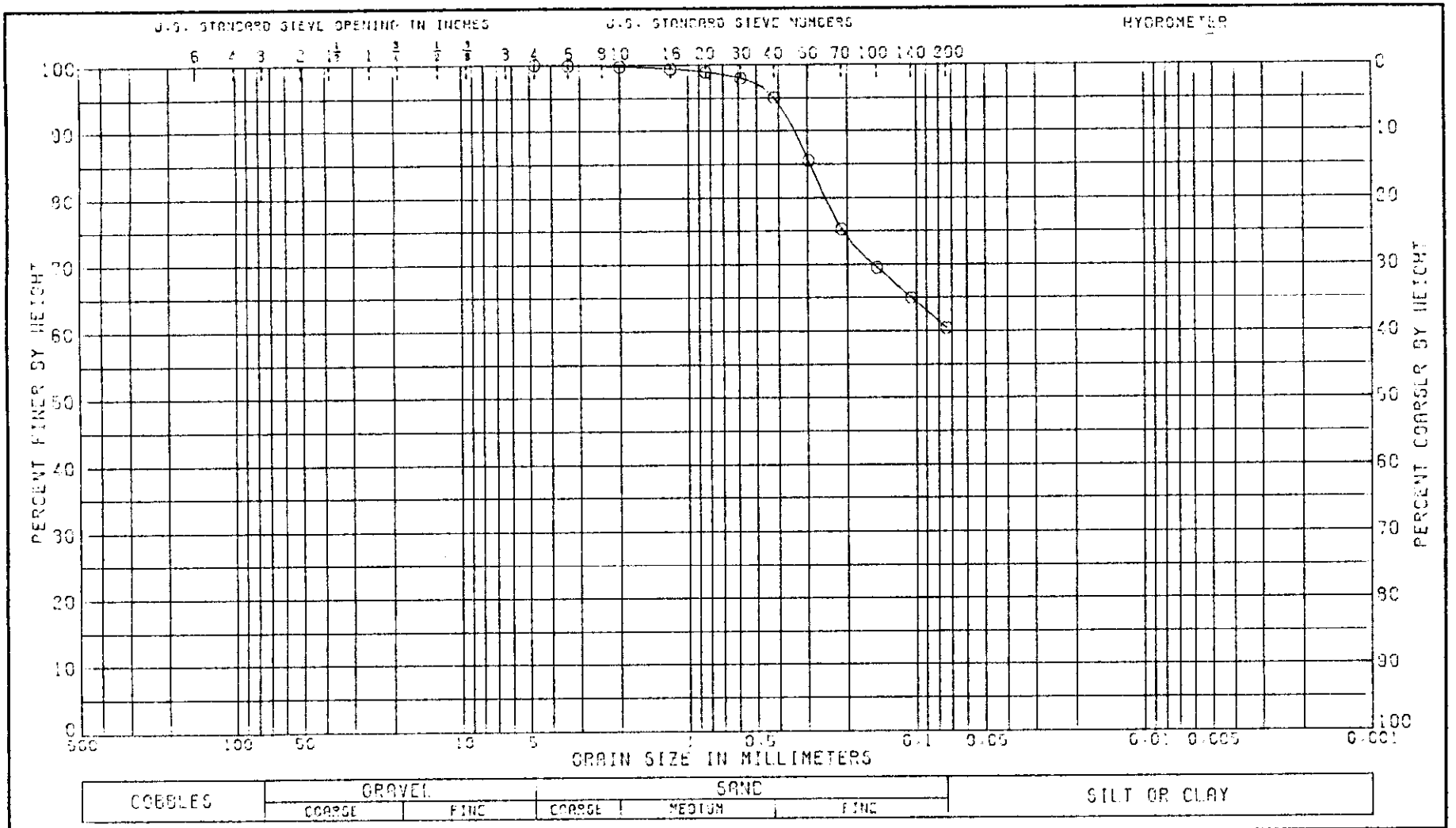
SANDY CLAY (CL), BROWN: WITH GRAVEL
INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

GRADATION CURVE

PROJECT CRANE NWSC
ORDANCE BURNING GROUND

BORING NO. 3-9-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-0.99 DATE 30 MAR 82



LL	PL	PI	GS	NAT W.%	
29	15	14		15.0	

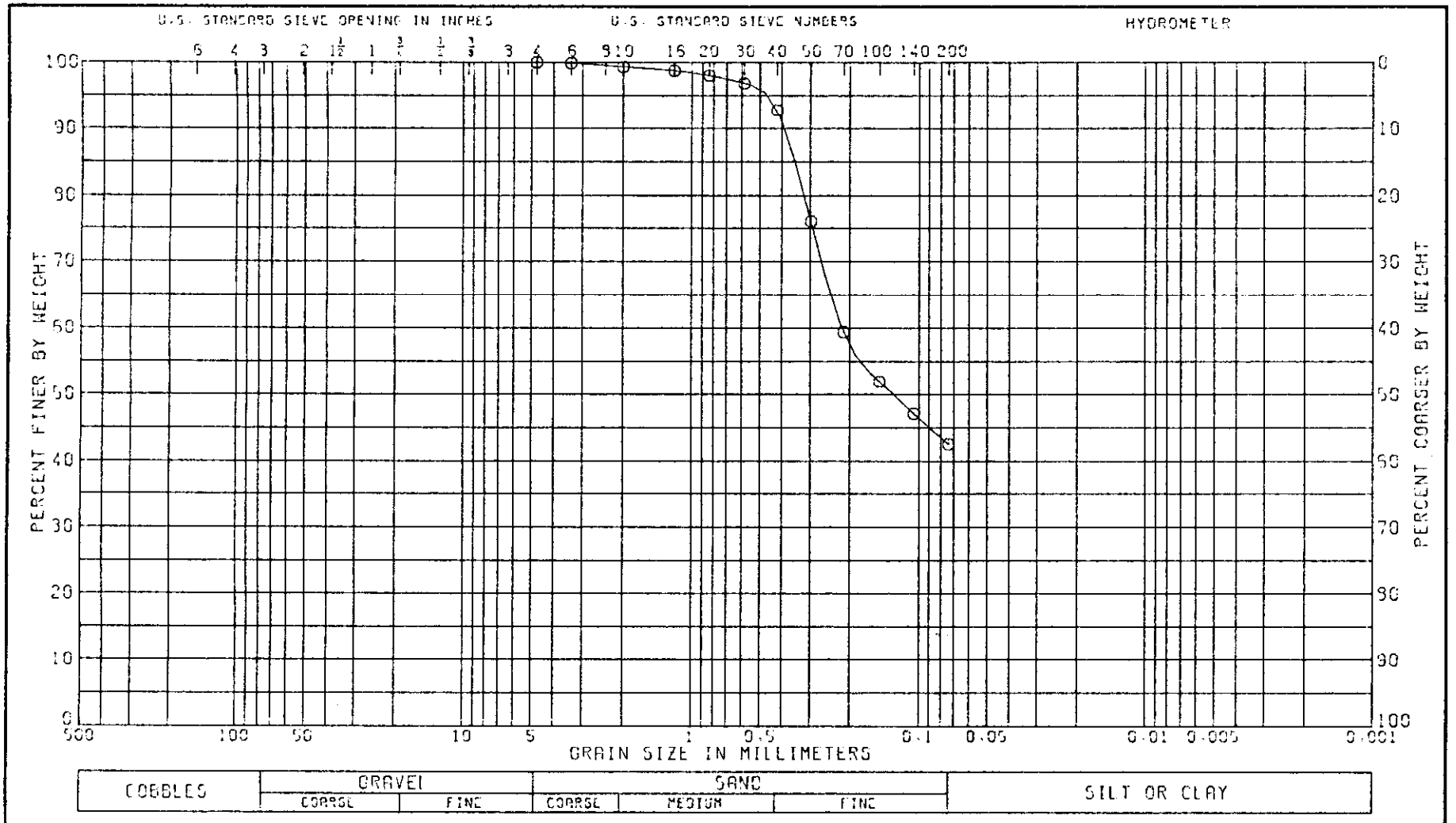
CLASSIFICATION
SANDY CLAY (CL), TAN

GRADATION CURVE

PROJECT CRANE NWSC
MCCOMISH GORGE

BORING NO. 4-1-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-2.09 DATE 09 MAR 82



LL	PL	PI	OS	NAT W.%
27	16	11		17.8

CLASSIFICATION

CLAYEY SAND (SC), TAN

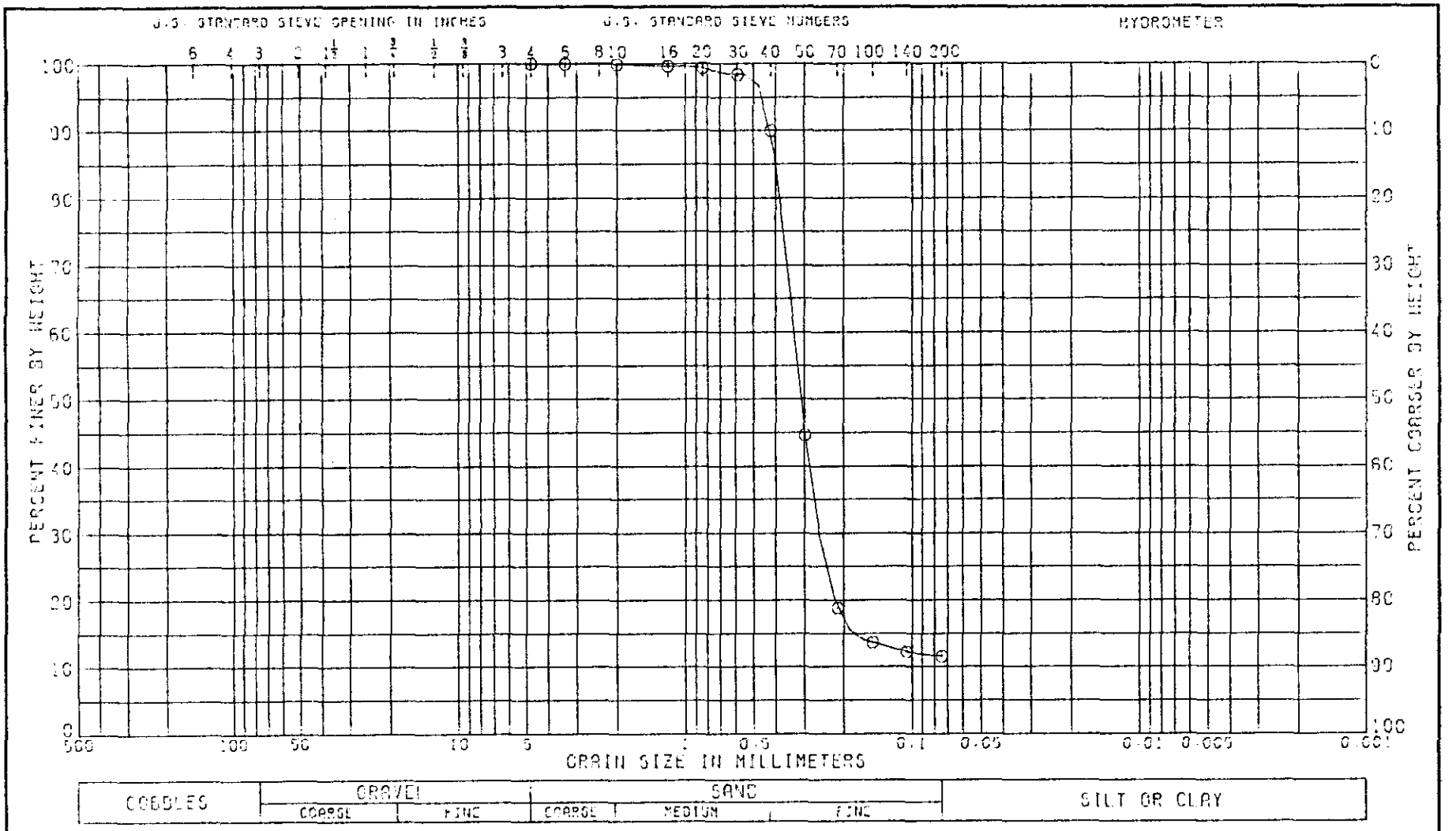
GRADATION CURVE

PROJECT CRANE NWSC

MCCOMISH GORGE

BORING NO. 4-1-81 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.55 DATE 30 MAR 82



LL 19	PL 12	PI 7	GS	NAT W.% 10.3	

CLASSIFICATION

CLAYEY SAND (SP-SC), REDDISH BROWN

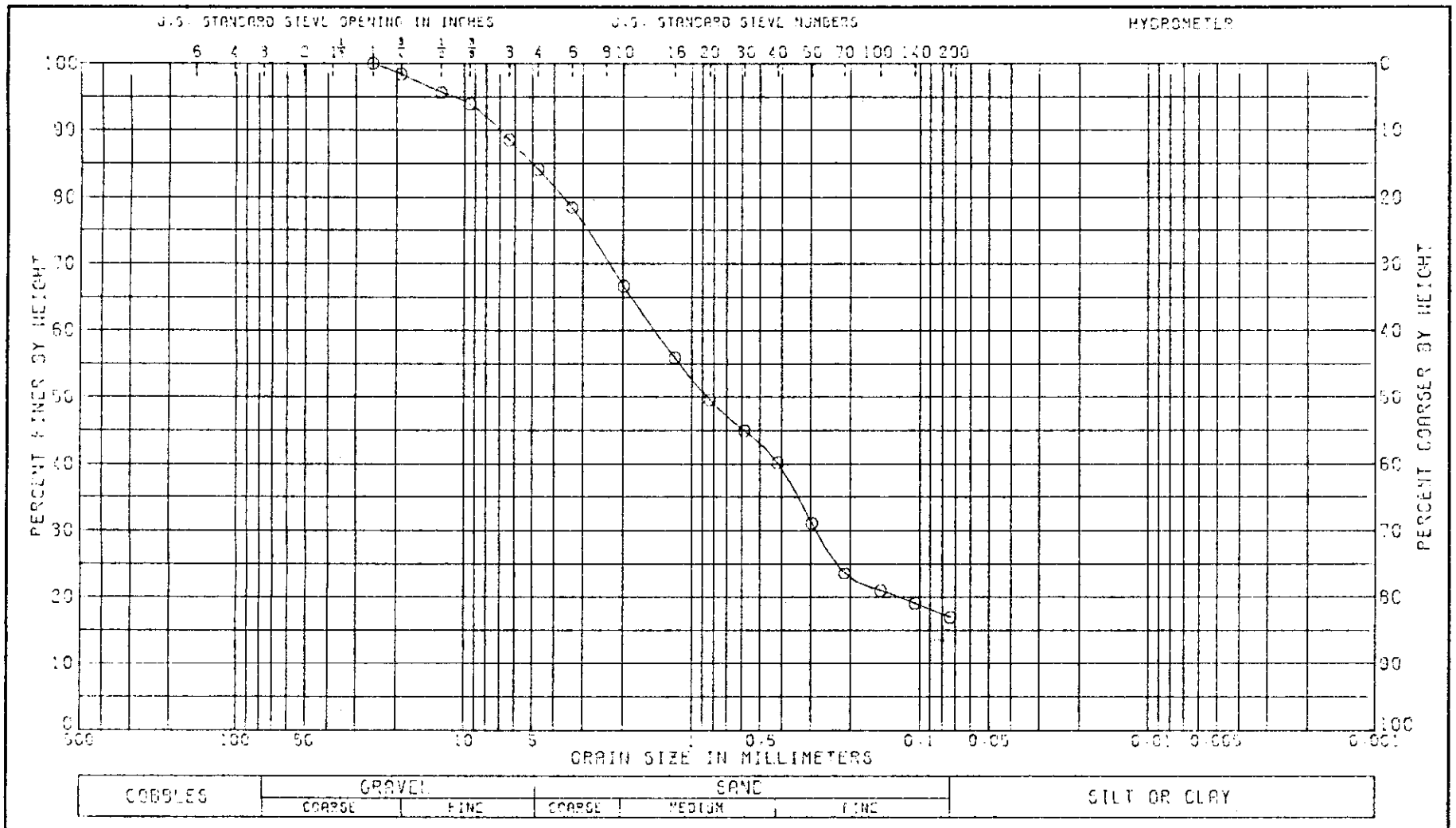
GRADATION CURVE

PROJECT CRANE NWSC

MCCOMISH GORGE

BORING NO. 4-1-81 SAMPLE NO 3

DEPTH/ELEV 10.0-10.3 DATE 09 MAR 82



LL	PL	PI	GS	NAT W.%
28	17	11		15.0

CLASSIFICATION

GRAVELLY CLAYEY SAND (SC), BROWN

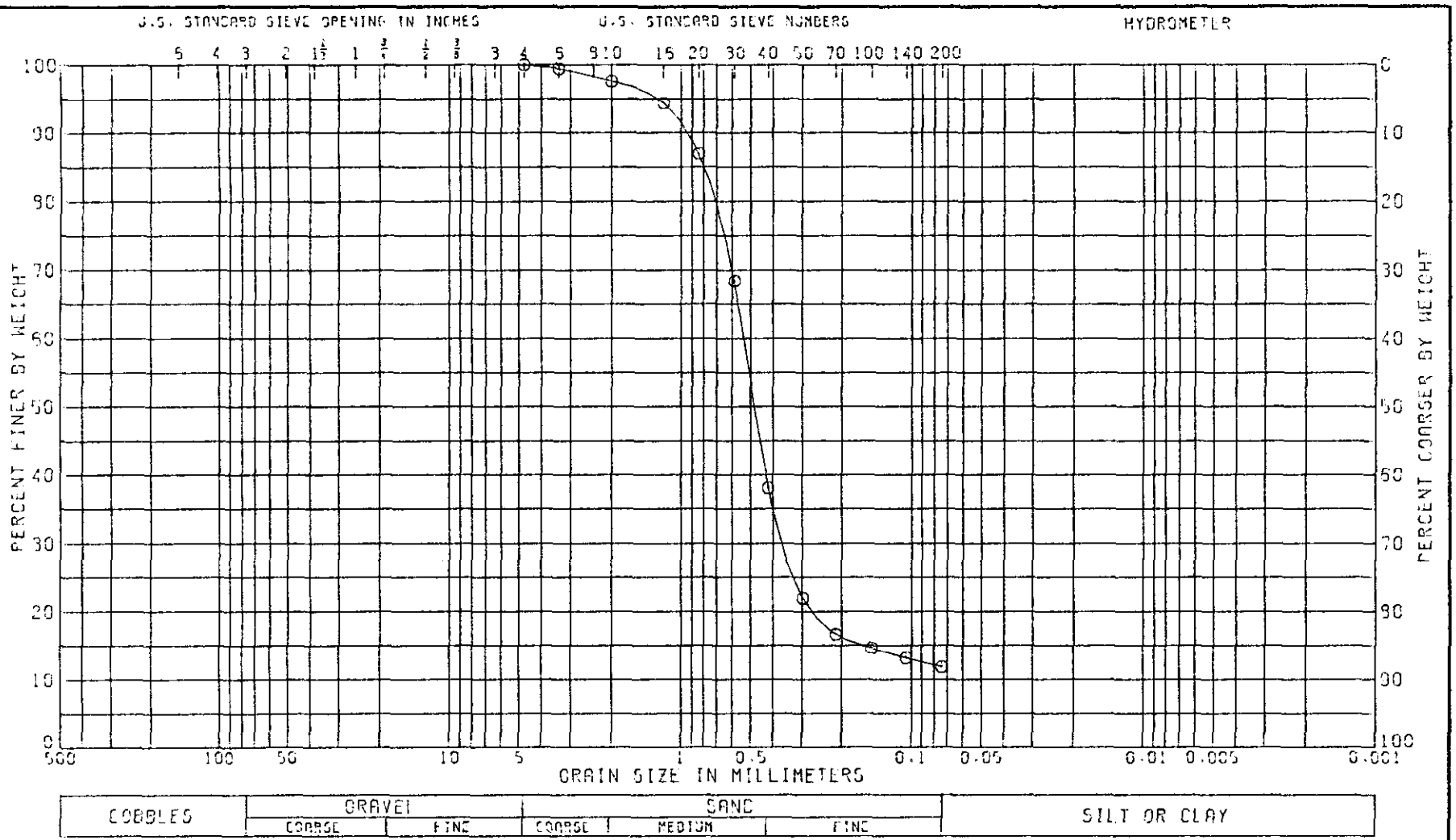
GRADATION CURVE

PROJECT CRANE NWSC

MCCOMISH GORGE

BORING NO 4-1-81 SAMPLE NO. A

DEPTH/ELEV 15.0-16.07 DATE 09 MAR 82



LL	PL	PI	CS	NAT W.%	
NP				11.3	

CLASSIFICATION

SILTY SAND (SP-SM), TAN

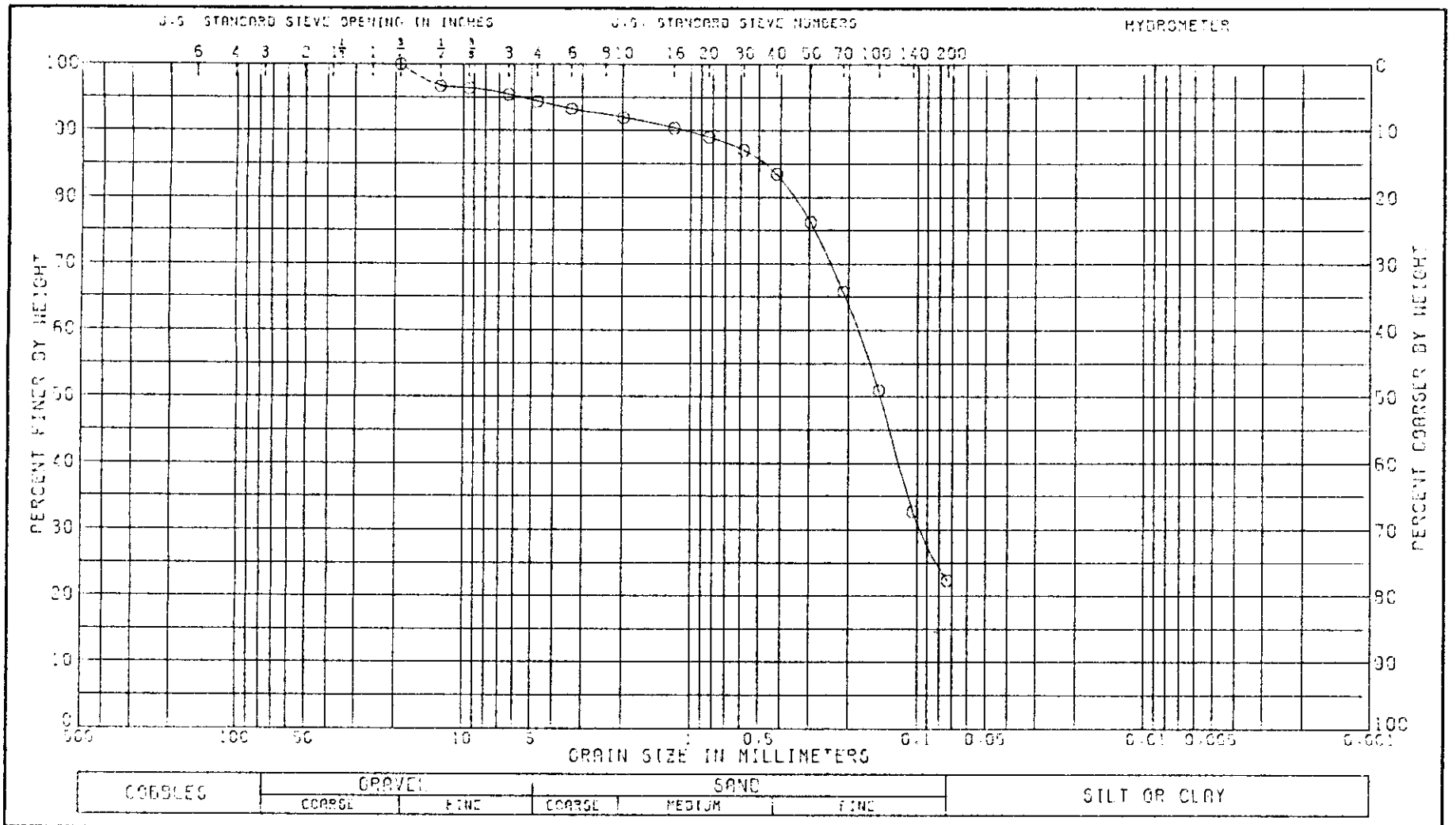
GRADATION CURVE

PROJECT CRANE NWSC

MCCOMISH GORGE

BORING NO. 4-1-81 SAMPLE NO. 5

DEPTH/ELEV 20.0-22.05 DATE 30 MAR 92



LL NP	PL	PI	GS	NAT W.% 15.5	

CLASSIFICATION

SILTY SAND (SM) BROWN: WITH GRAVEL

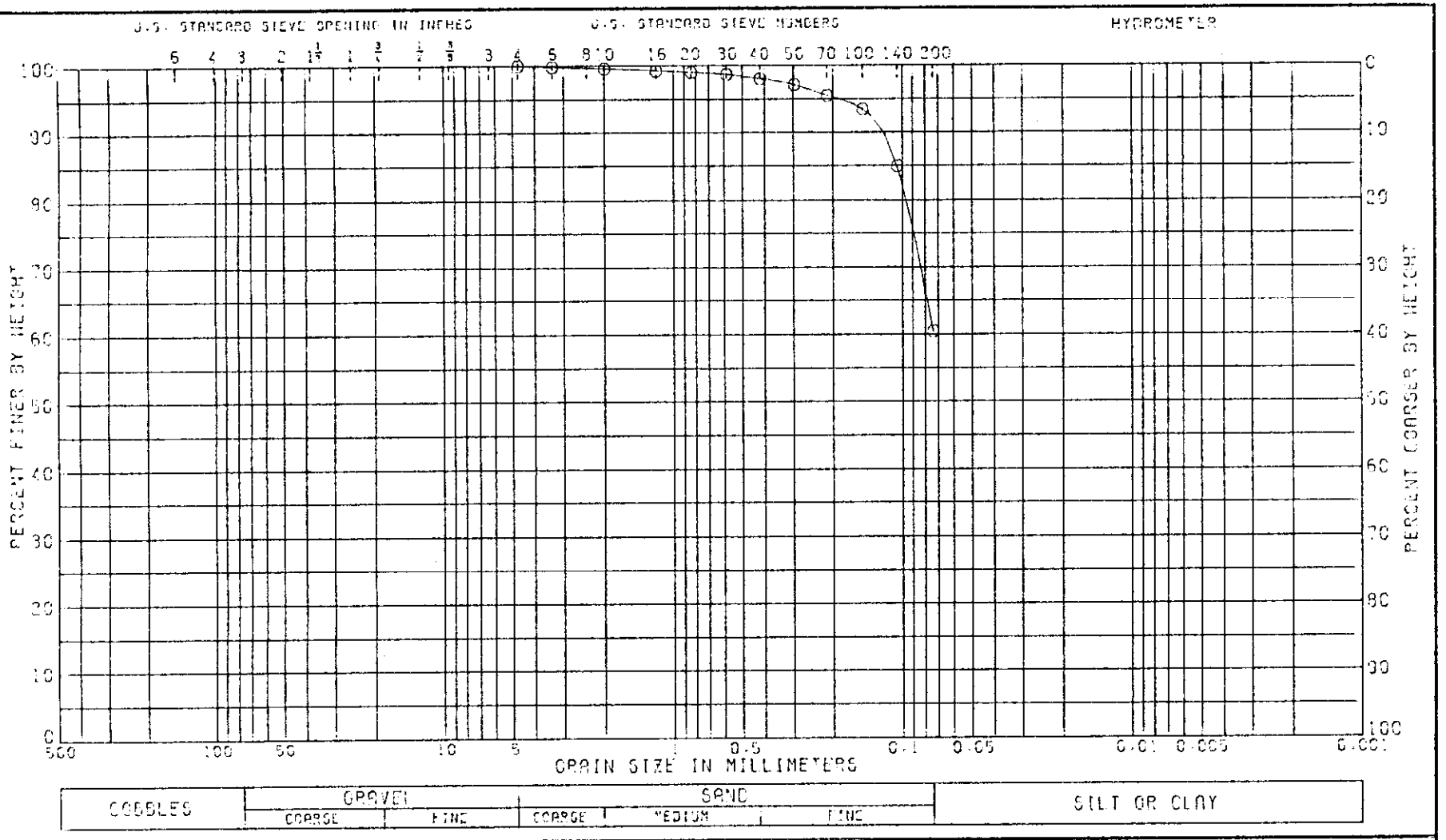
GRADATION CURVE

PROJECT CRANE NLSC

MCCOMISH GORGE

BORING NO. 4--1-81 SAMPLE NO 6

DEPTH/ELEV 25.0-27.8 DATE 03 MAR 82



LL 25	PL 18	PI 7	GS	NAT W.% 19.1	

CLASSIFICATION

SANDY CLAY (CL), BROWN

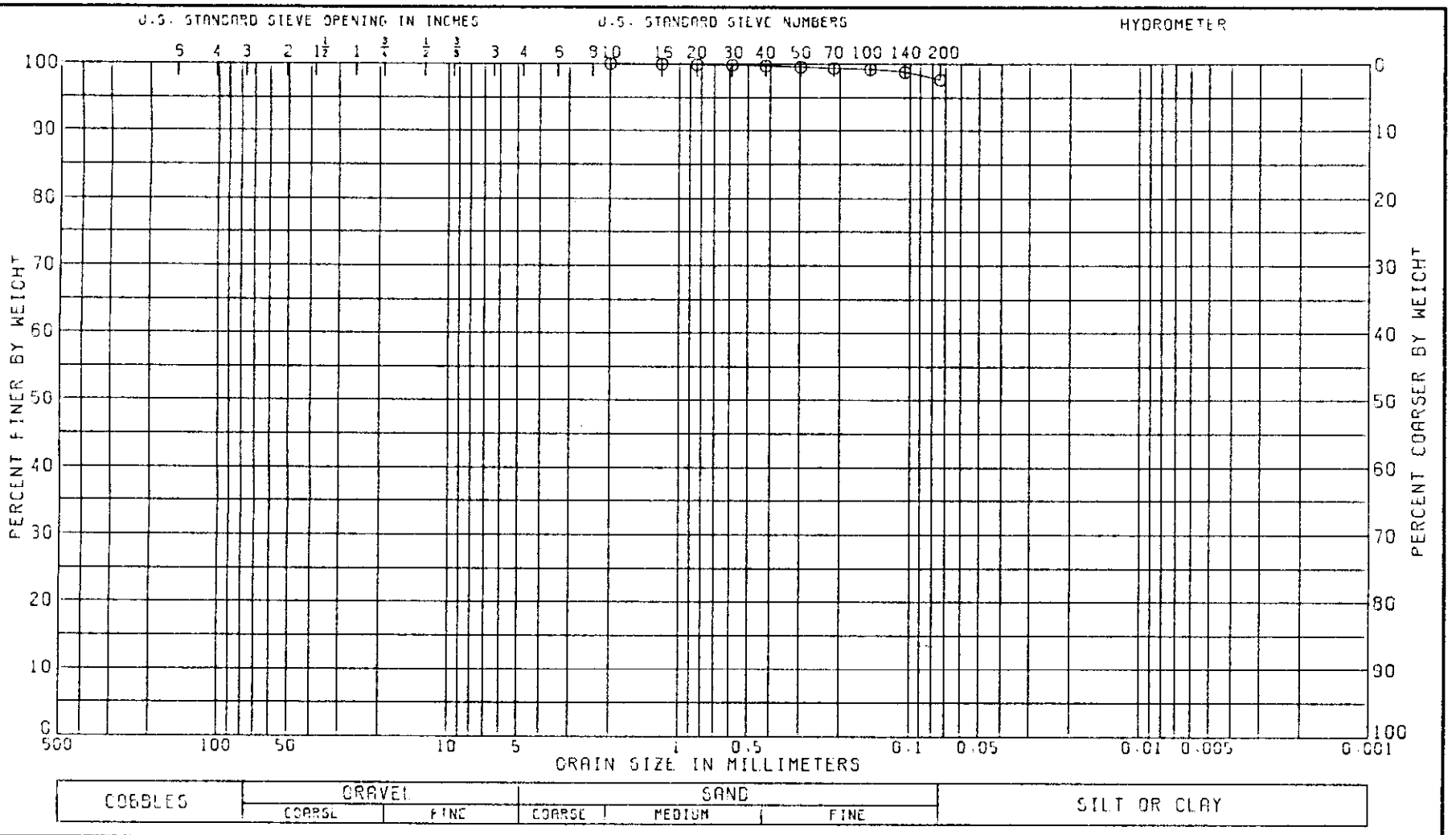
GRADATION CURVE

PROJECT CRANE NWSC

MCCOMISH GORGE

BORING NO. 4-1-81 SAMPLE NO 8

DEPTH/ELEV 32.5-33.3 DATE 09 MAR 82



LL 26	PL 18	PI 8	CS	NAT W.% 23.1

CLASSIFICATION

CLAY (CL), GRAY

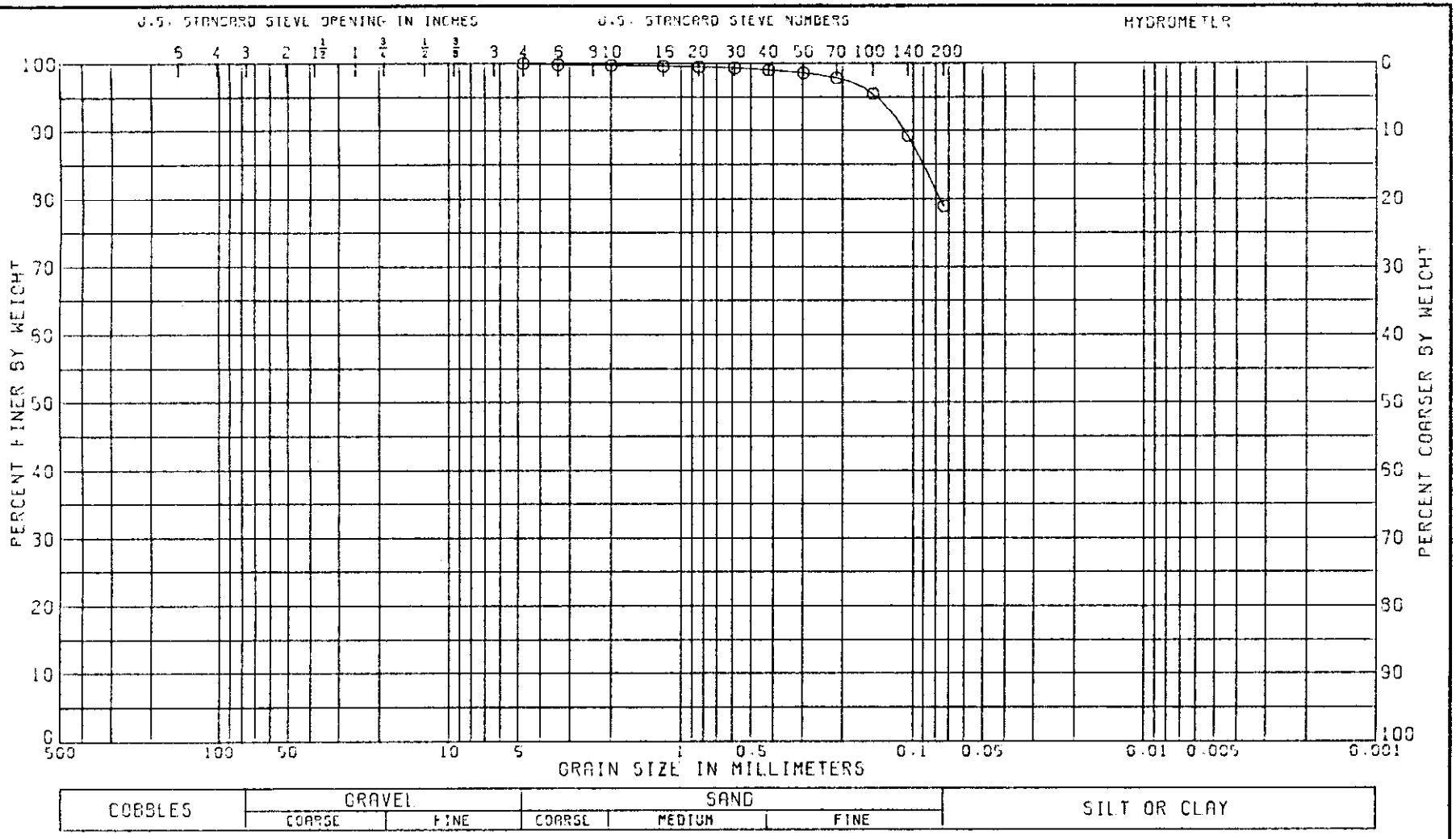
GRADATION CURVE

PROJECT CRANE NWSC

MCCOMISH GORGE

BORING NO. 4-1-81 SAMPLE NO 9

DEPTH/ELEV 37.5-39.55 DATE 30 MAR 82



LL NP	PL	PI	CS	NAT W.% 17.2	

CLASSIFICATION

SANDY SILT (ML), GRAY

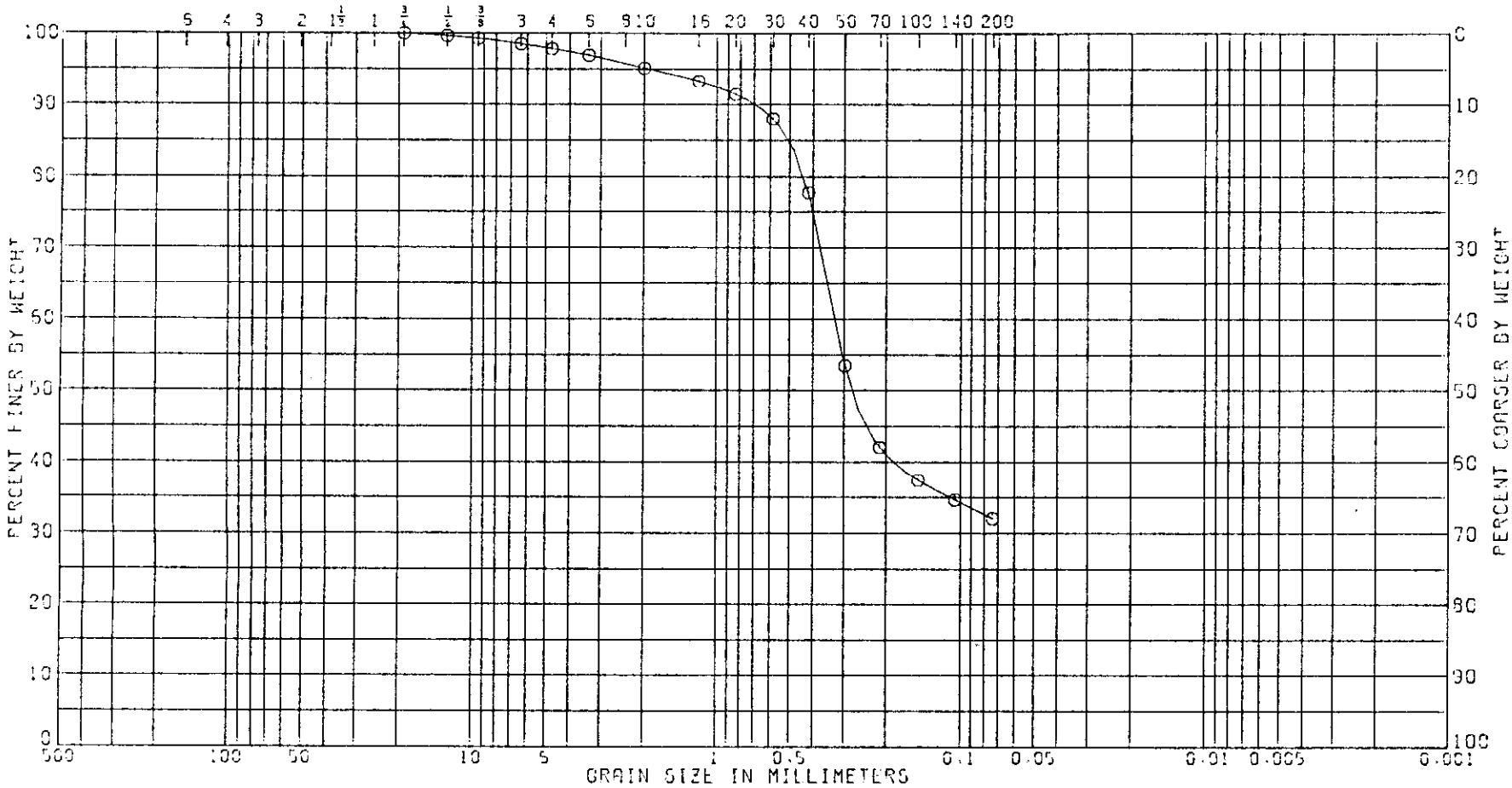
GRADATION CURVE

PROJECT CRANE NWSC

MCCOMISH GORGE

BORING NO. 4-1-81 SAMPLE NO. 10

DEPTH/ELEV 40.3-42.48 DATE 30 MAR 82



LL	PL	PI	CS	NAT W.%
22	13	9		10.6

CLASSIFICATION

CLAYEY SAND (SC). BROWN

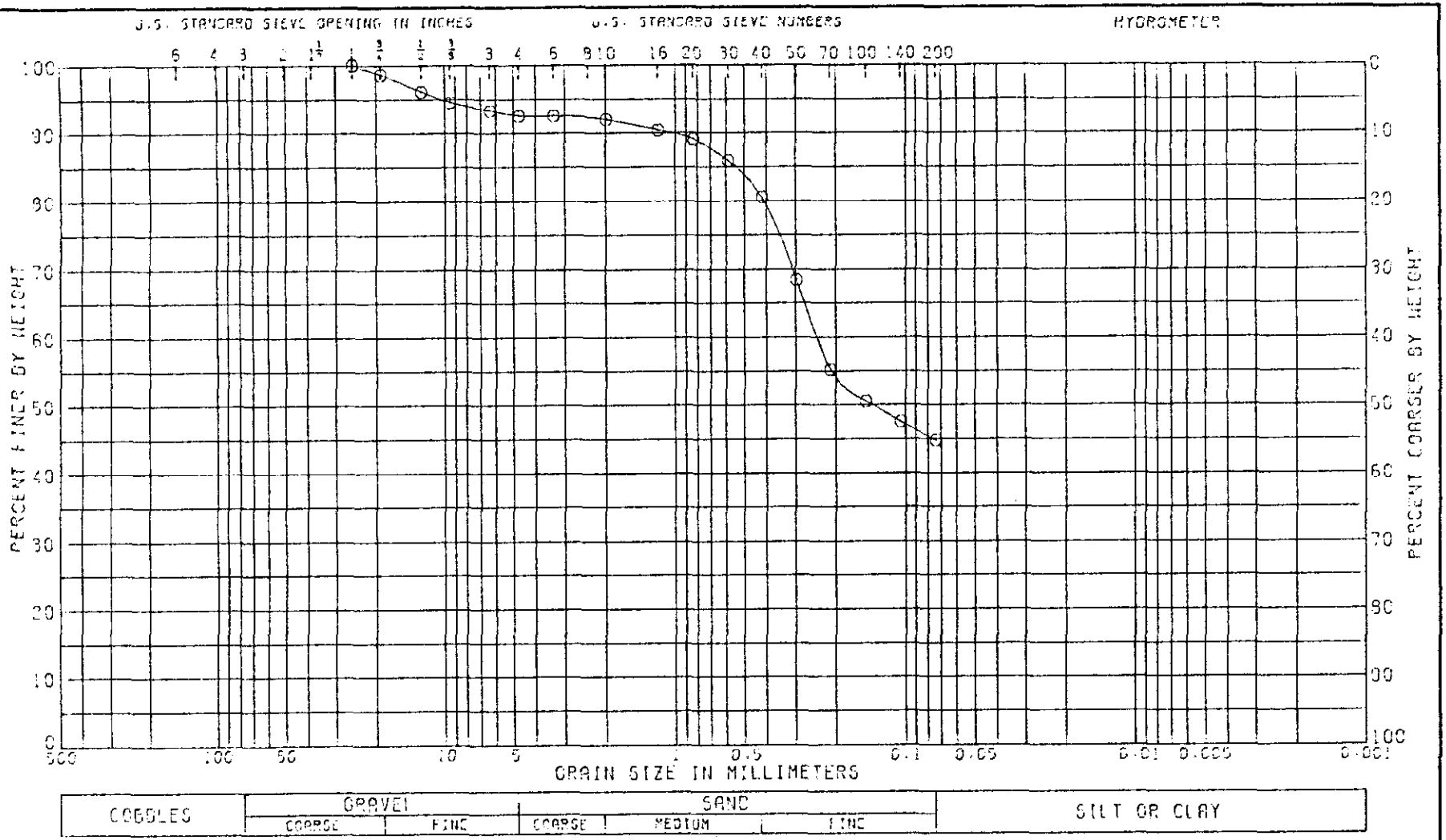
GRADATION CURVE

PROJECT CRANE NWSC

MCCOMISH GORGE

BORING NO. 4-2-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-1.27 DATE 30 MAR 82



LL	PL	PI	GS	NAT W.%
27	12	15		12.6

CLASSIFICATION

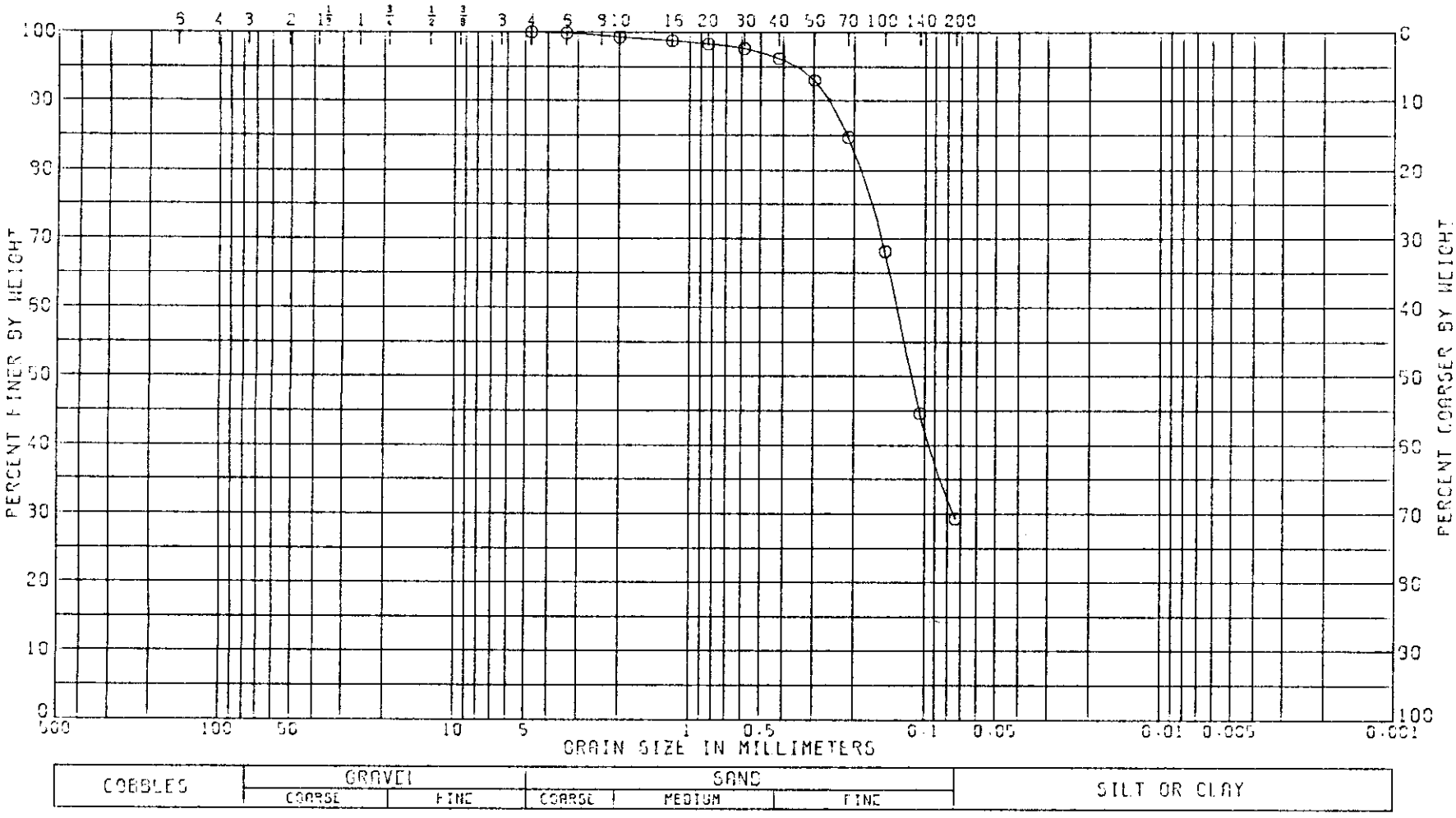
CLAYEY SAND (SC), REDDISH BROWN: WITH GRAVEL
INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

GRADATION CURVE

PROJECT CRANE NWSC
MCCOMISH GORGE

BORING NO. 4-2-81 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.0 DATE 09 MAR 82



LL	PL	PI	CS	NAT W.%
24	15	9		13.9

CLASSIFICATION

CLAYEY SAND (SC), BROWN

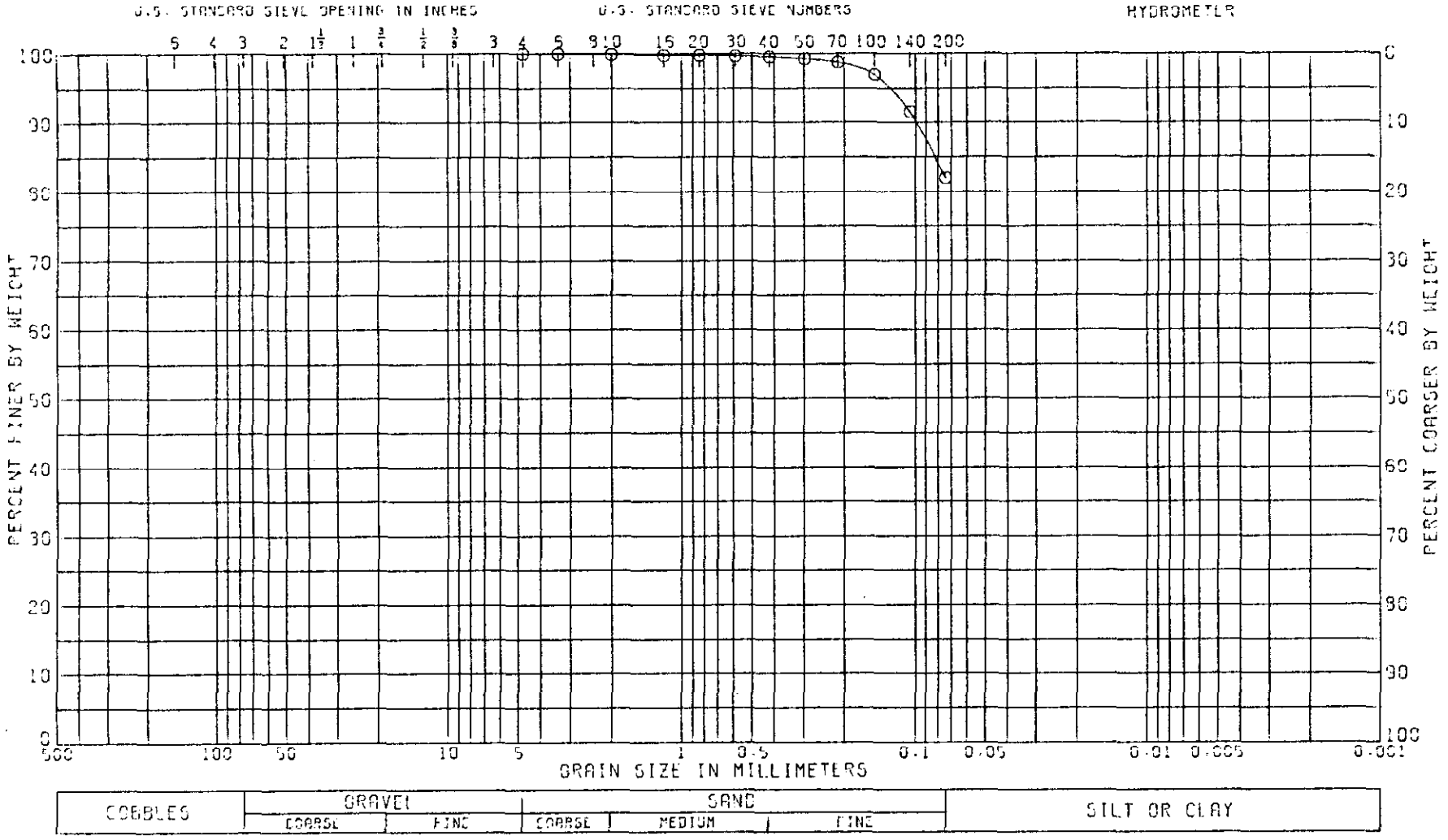
GRADATION CURVE

PROJECT CRANE NWSC

MCCOMISH GORGE

BORING NO. 4-2-81 SAMPLE NO. 3

DEPTH/ELEV 10.0-11.37 DATE 30 MAR 82



LL	PL	PI	GS	NAT W.%
29	24	5		22.9

CLASSIFICATION

SANDY SILT (ML), BROWN

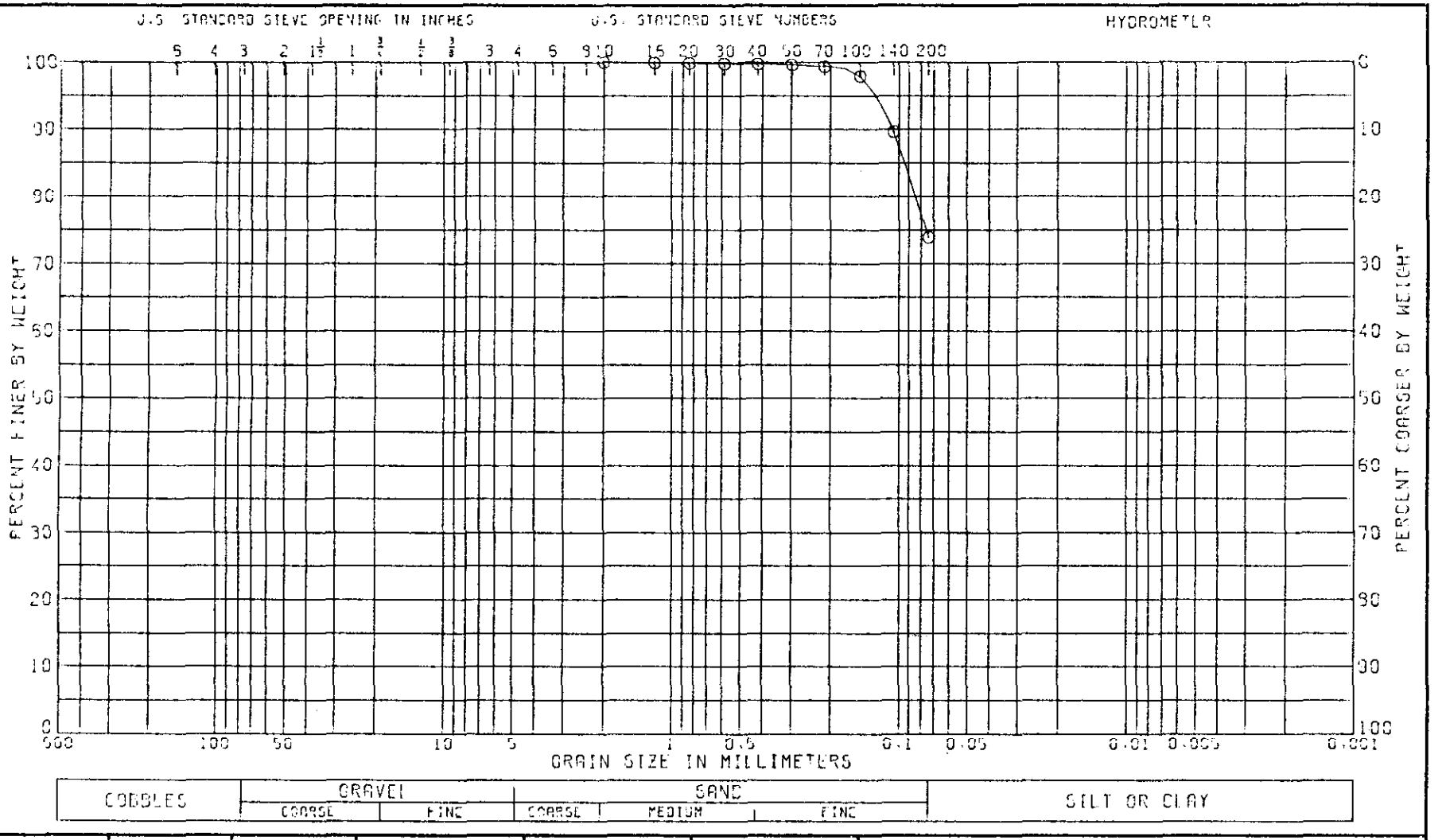
GRADATION CURVE

PROJECT CRANE NWSC

MCCOMISH GORGE

BORING NO. 4-2-91 SAMPLE NO. 4

DEPTH/ELEV 15.0-16.60 DATE 30 MAR 92



LL	PL	PI	CS	NAT W.%	
21	16	5		30.0	

CLASSIFICATION

SANDY CLAYEY SILT (ML-CL), BROWN

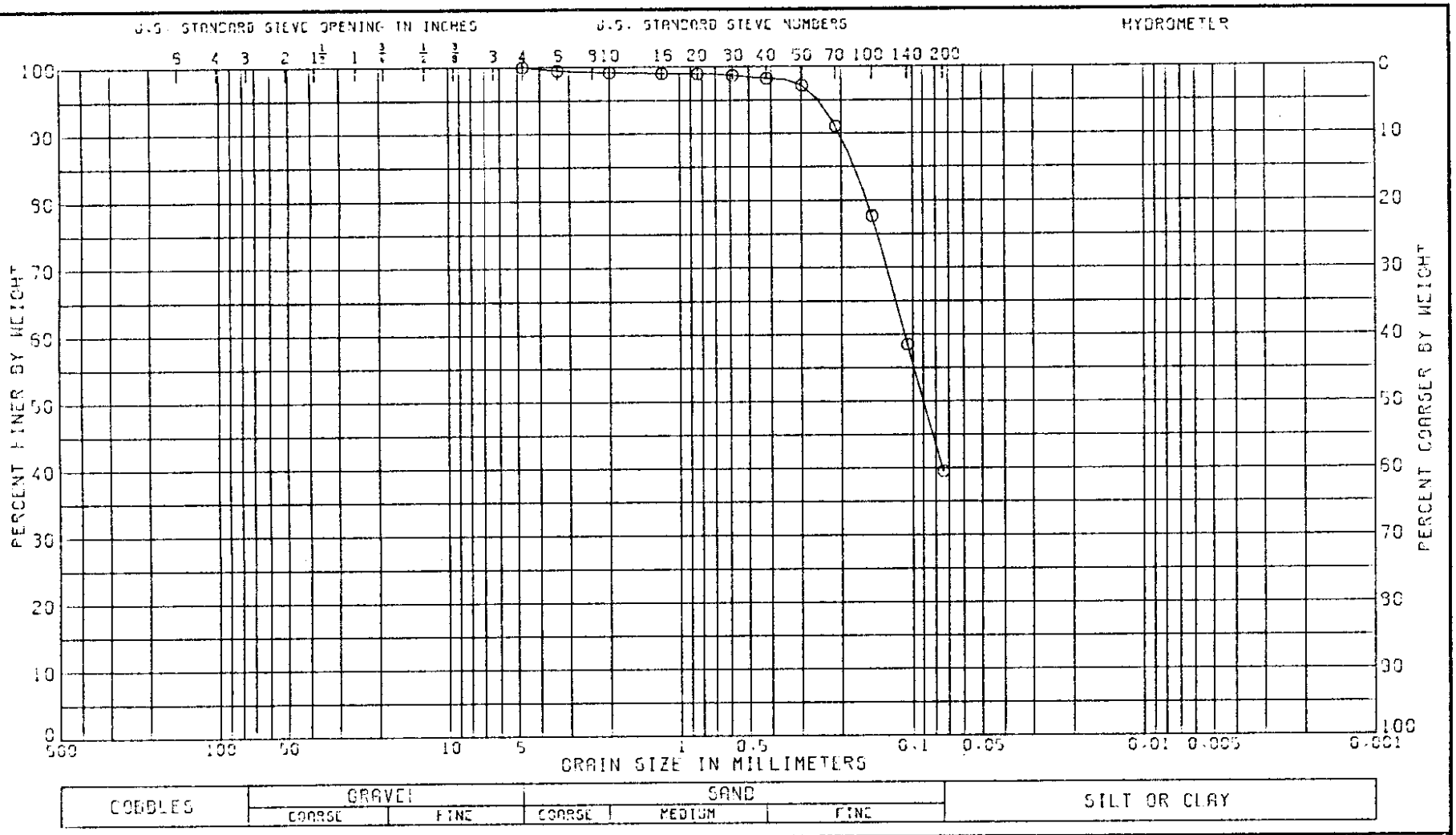
GRADATION CURVE

PROJECT CRANE NWSC

MCCOMISH GORGE

BORING NO. 4-2-91 SAMPLE NO 5A

DEPTH/ELEV 20.0-21.5 DATE 30 MAR 92



LL	PL	PI	CC	NAT W.%
NP				13.6

CLASSIFICATION

SILTY SAND (SM), GRAYISH BROWN

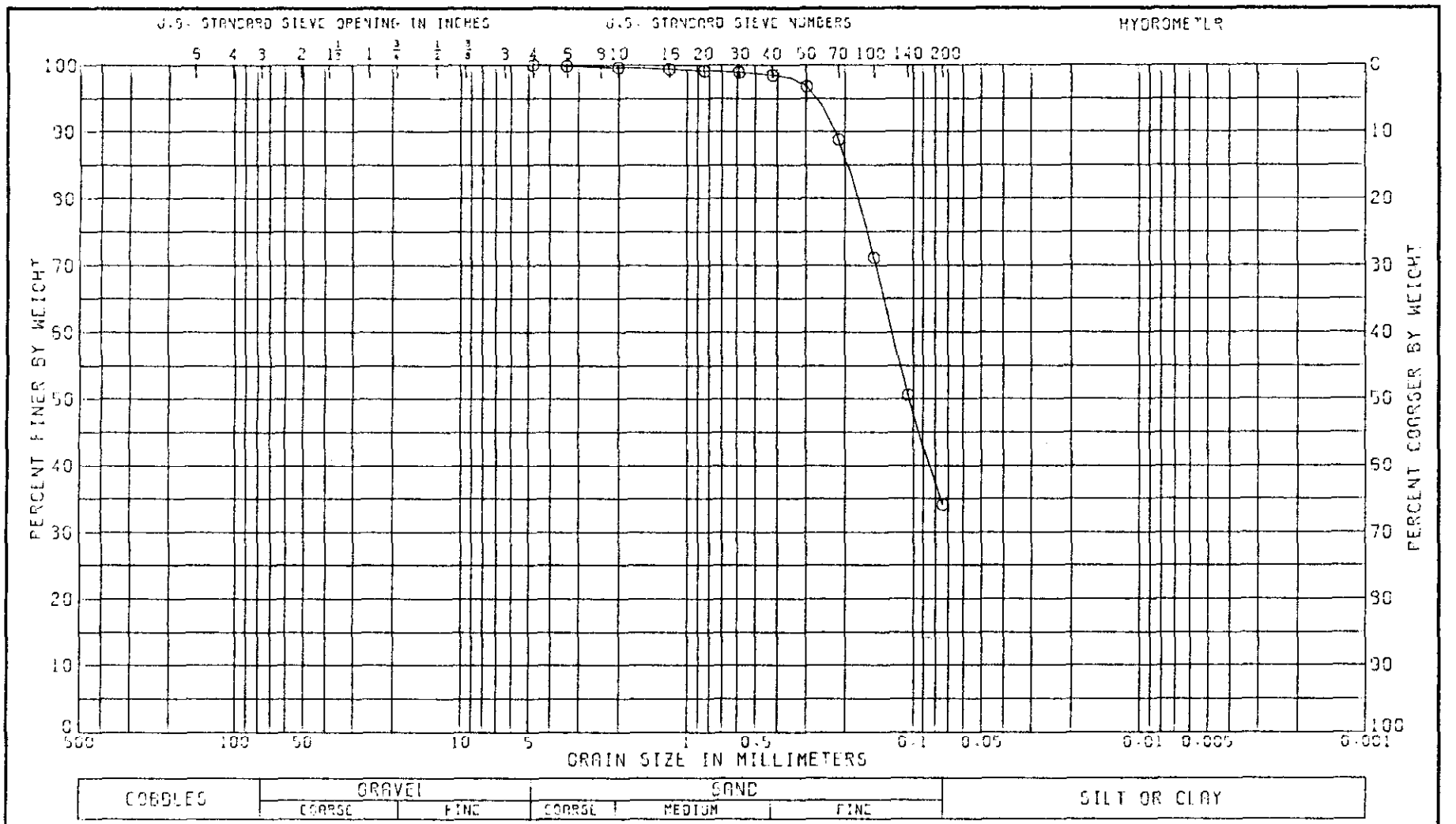
GRADATION CURVE

PROJECT CRANE NWSC

MCCOMISH GORGE

BORING NO. 4-2-81 SAMPLE NO. 6

DEPTH/ELEV 25.0-27.05 DATE 30 MAR 92



LL	PL	PI	CS	NAT W.%	
NP				14.6	

CLASSIFICATION

SILTY SAND (SM), BROWN

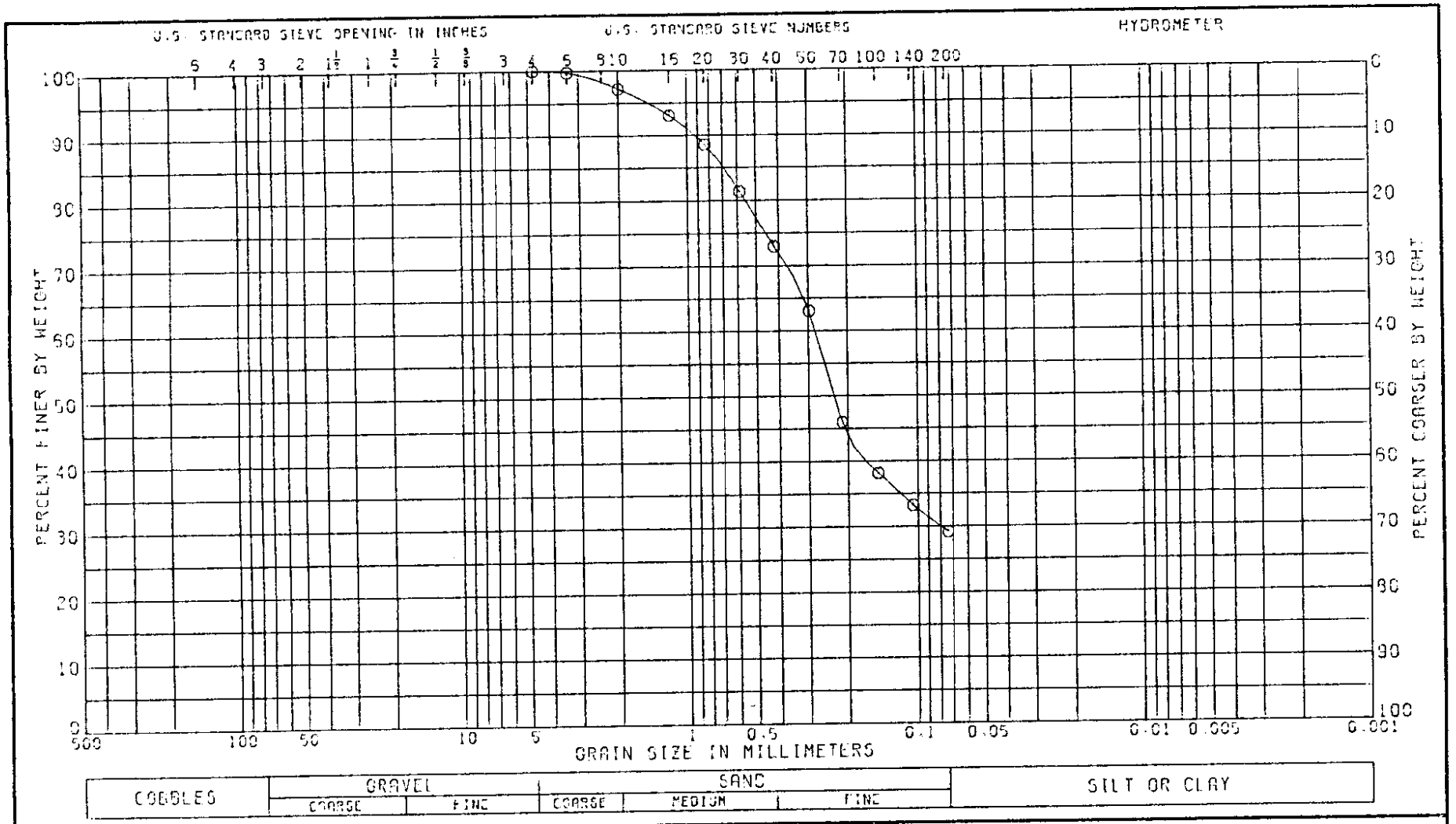
GRADATION CURVE

PROJECT CRANE NWSC

MCCOMISH GORGE

BORING NO. 4-2-91 SAMPLE NO 7

DEPTH/ELEV 30.0-32.05 DATE 30 MAR 92



LL	PL	PI	CS	NAT W.%
25	13	12		14.1

CLASSIFICATION

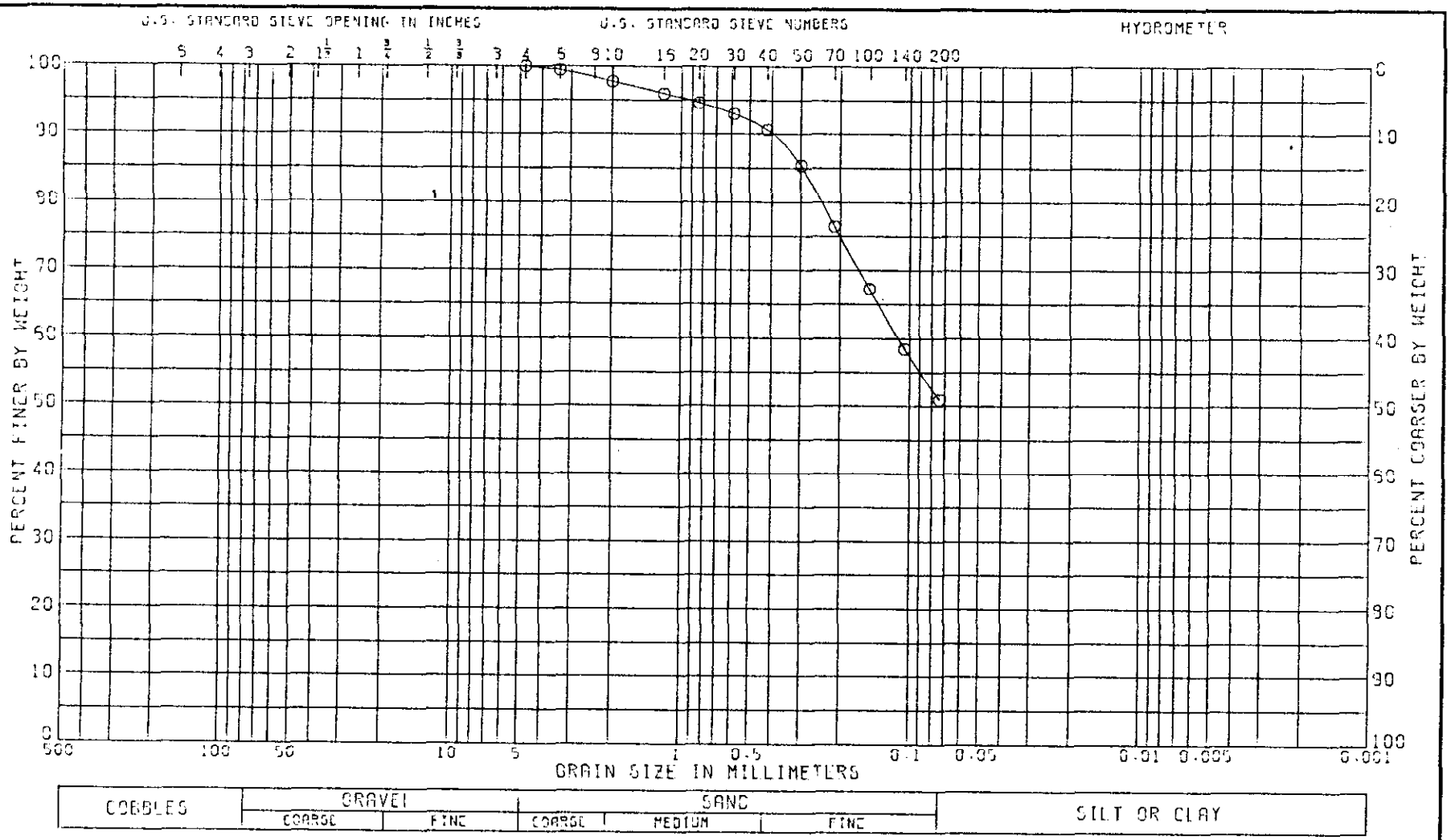
CLAYEY SAND (SC), BROWN

GRADATION CURVE

PROJECT CRANE NWSC MCCOMISH GORGE

BORING NO. 4-3-91 SAMPLE NO. 1

DEPTH/ELEV 0.0-2.08 DATE 11 FEB 92



LL	PL	PI	GS	NAT W.%	
NP				49.7	

CLASSIFICATION

SANDY SILT (ML), GRAYISH BROWN

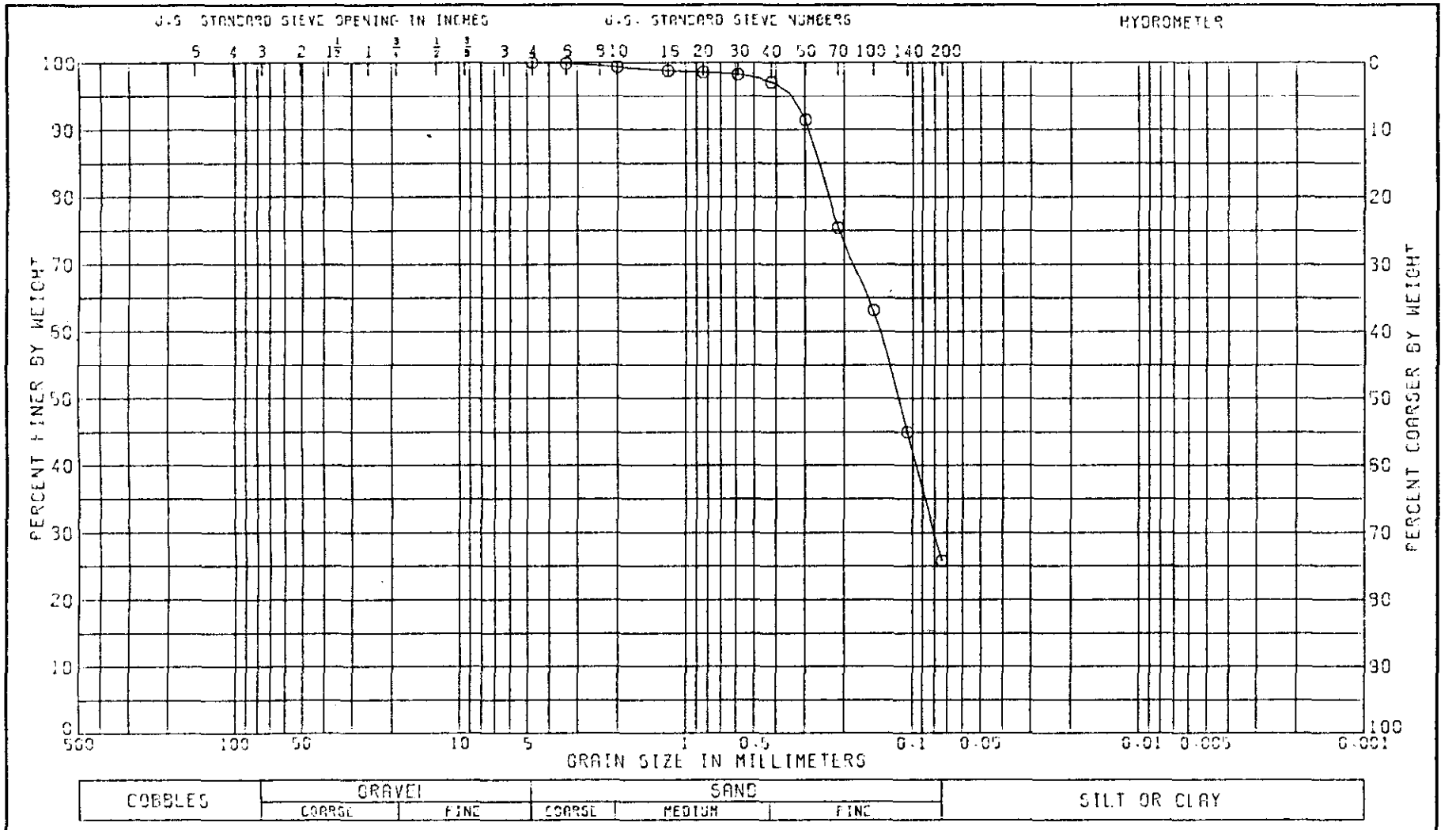
GRADATION CURVE

PROJECT CRANE NWSC

MCCOMISH GORGE

BORING NO. 4-3-91 SAMPLE NO 2

DEPTH/ELEV 5.0-7.13 DATE 30 MAR 92



LL	PL	PI	GS	NAT W.%
NP				4.9

CLASSIFICATION

SILTY SAND (SM), BROWN

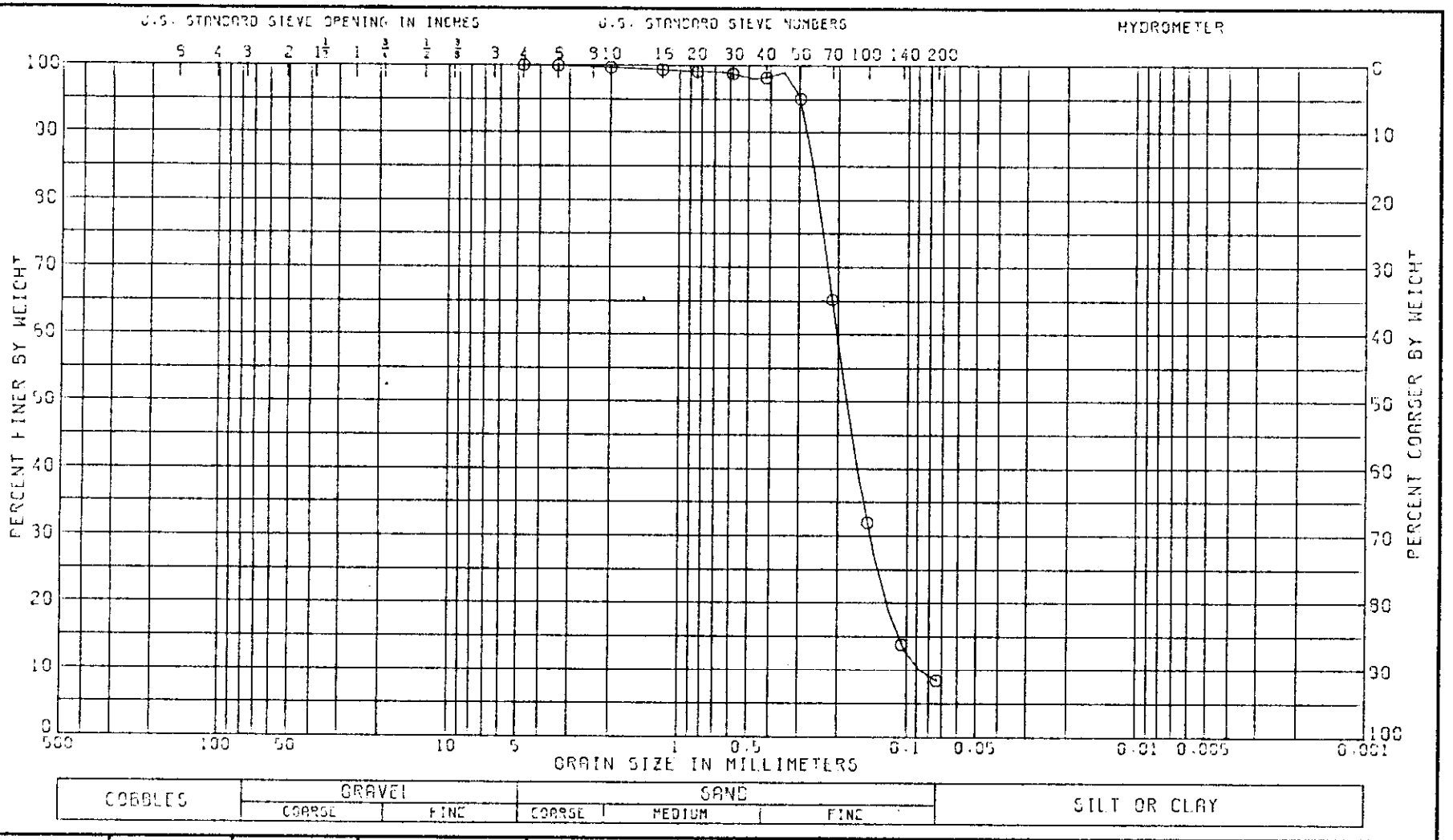
GRADATION CURVE

PROJECT CRANE NWSC

MCCOMISH GORGE

BORING NO. 4-3-81 SAMPLE NO. 3

DEPTH/ELEV 10.0-11.83 DATE 30 MAR 92



LL	PL	PI	GS	NAT W.%
NP				24.3

CLASSIFICATION

SILTY SAND (SP-SM), GRAY

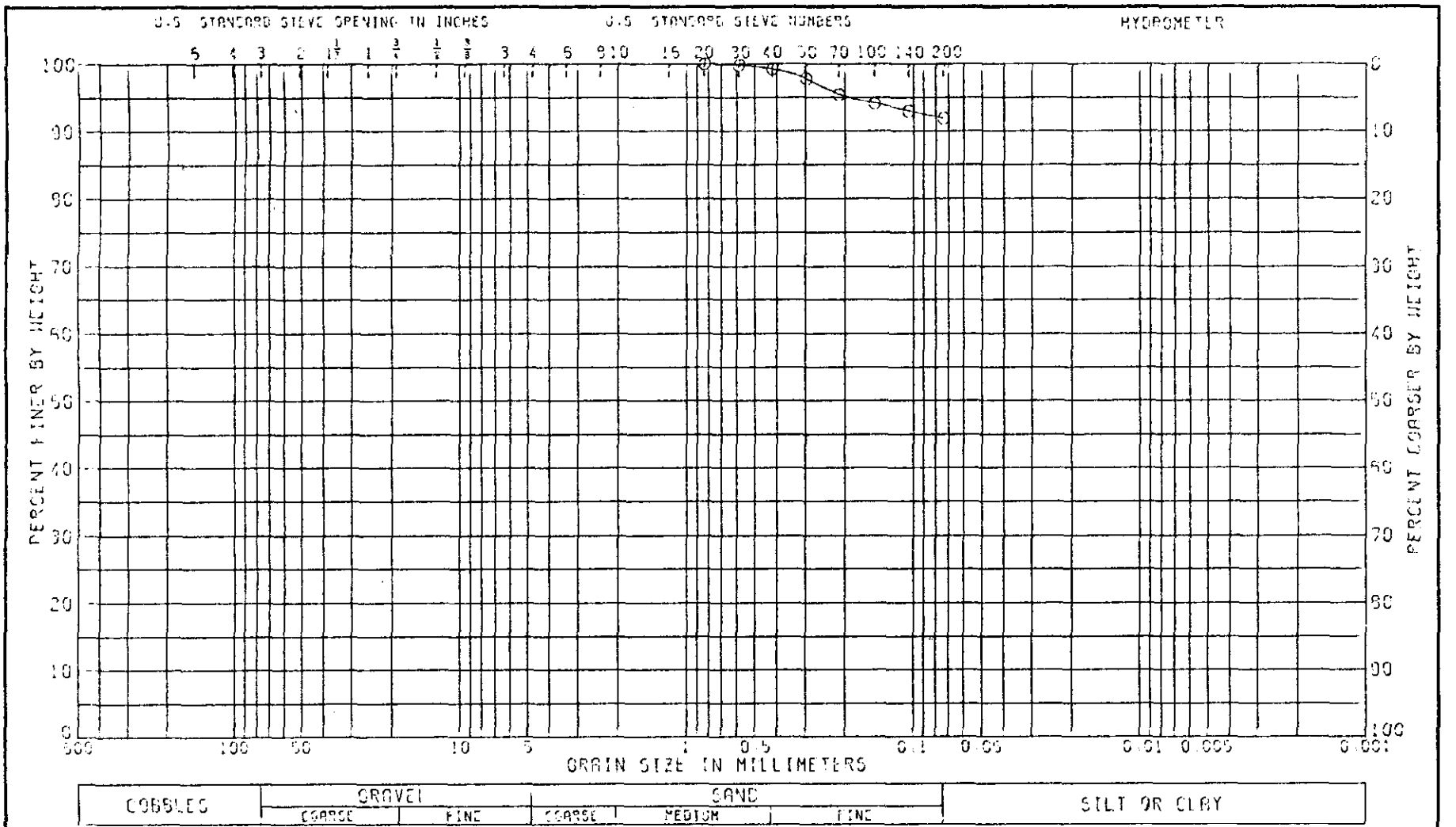
GRADATION CURVE

PROJECT CRANE NWSC

MCCOMISH GORGE

BORING NO. 4-3-81 SAMPLE NO. 49

DEPTH/ELEV 15.0-17.0 DATE 30 MAR 92



LL 39	PL 18	PI 21	CS	NAT W.% 20.7

CLASSIFICATION

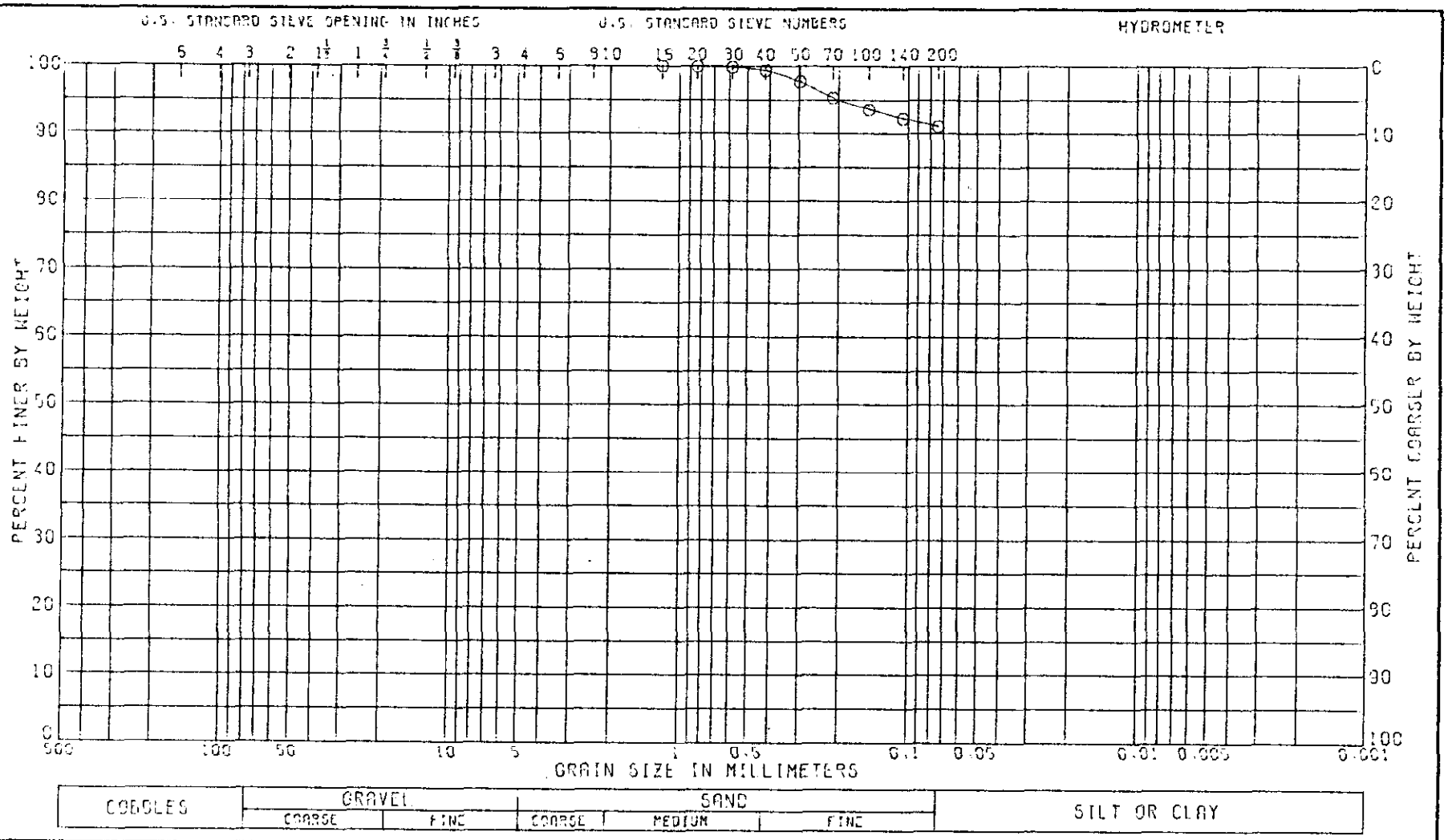
CLAY (CL), REDDISH BROWN; WITH SAND

GRADATION CURVE

PROJECT CRANE NWSC
MCCOMISH GORGE

BORING NO 4-4-81 SAMPLE NO 1

DEPTH/ELEV 0.0-2.26 DATE 26 FEB 82



LL	PL	PI	GS	NAT W.%	
45	20	25		21.8	

CLASSIFICATION

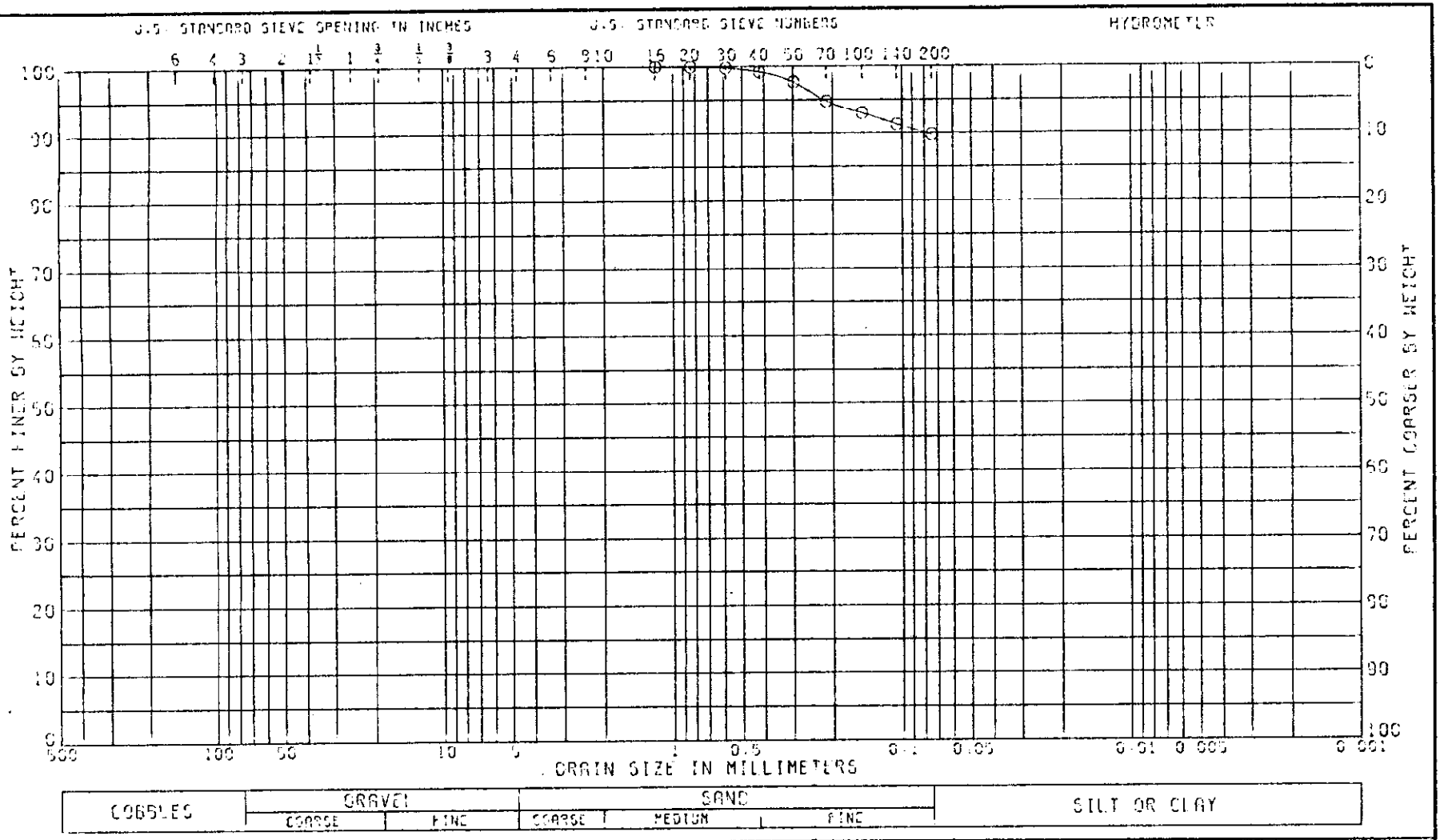
CLAY (CL), BROWN; WITH SAND

GRADATION CURVE

PROJECT CRANE NWSC MCCOMISH GORGE

BORING NO. 4-4-81 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.64 DATE 11 FEB 82



LL	PL	PI	CS	NAT W.%	
35	19	16		12.0	

CLASSIFICATION

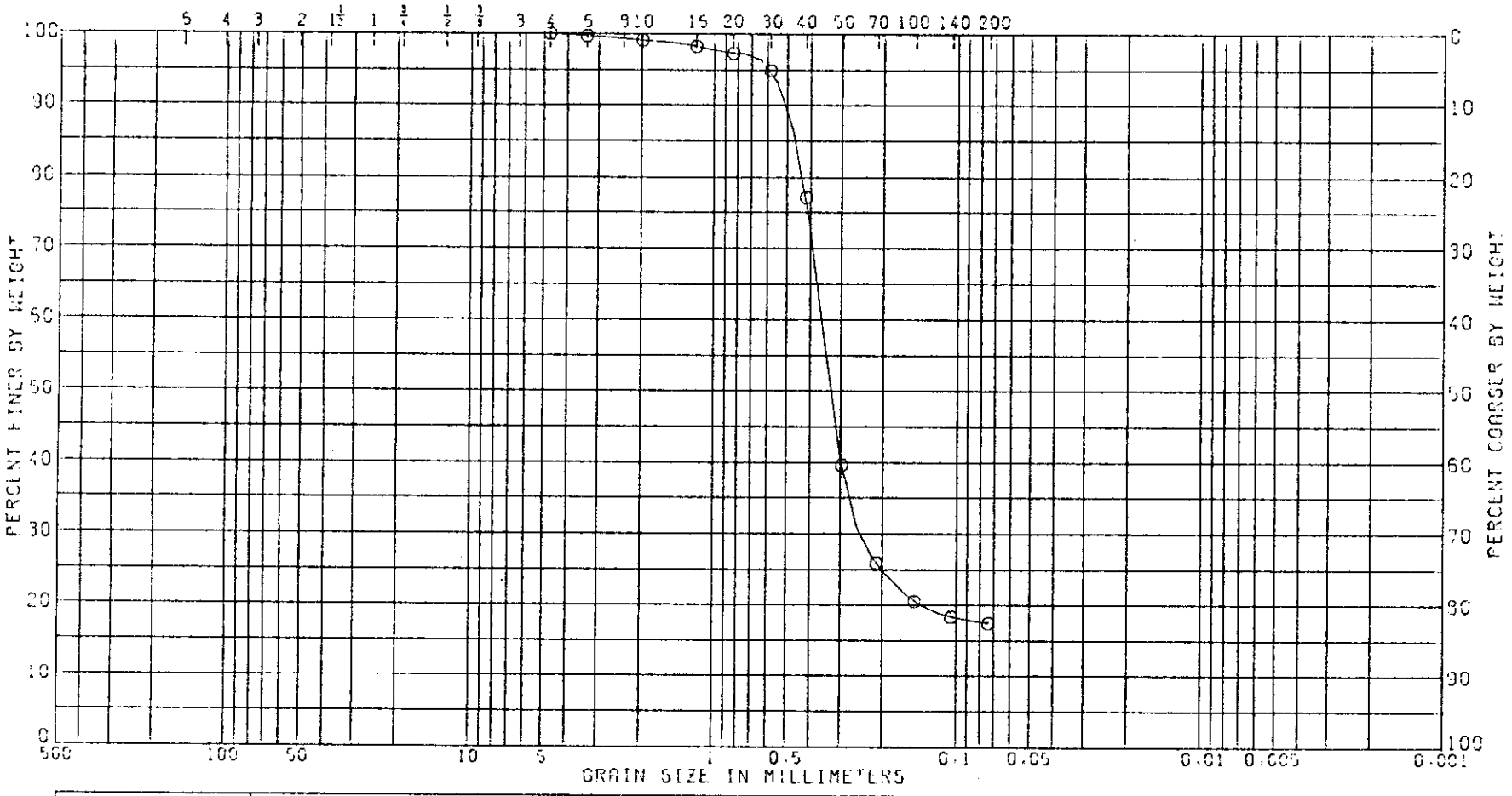
CLAY (CL), BROWN: WITH SAND

GRADATION CURVE

PROJECT CRANE NWSC
MCCOMISH GORGE

BORING NO 4-4-81 SAMPLE NO 3

DEPTH/ELEV 10.0-12.19 DATE 26 FEB 82



LL	PL	PI	CS	NAT W.%
32	14	18		9.9

CLASSIFICATION

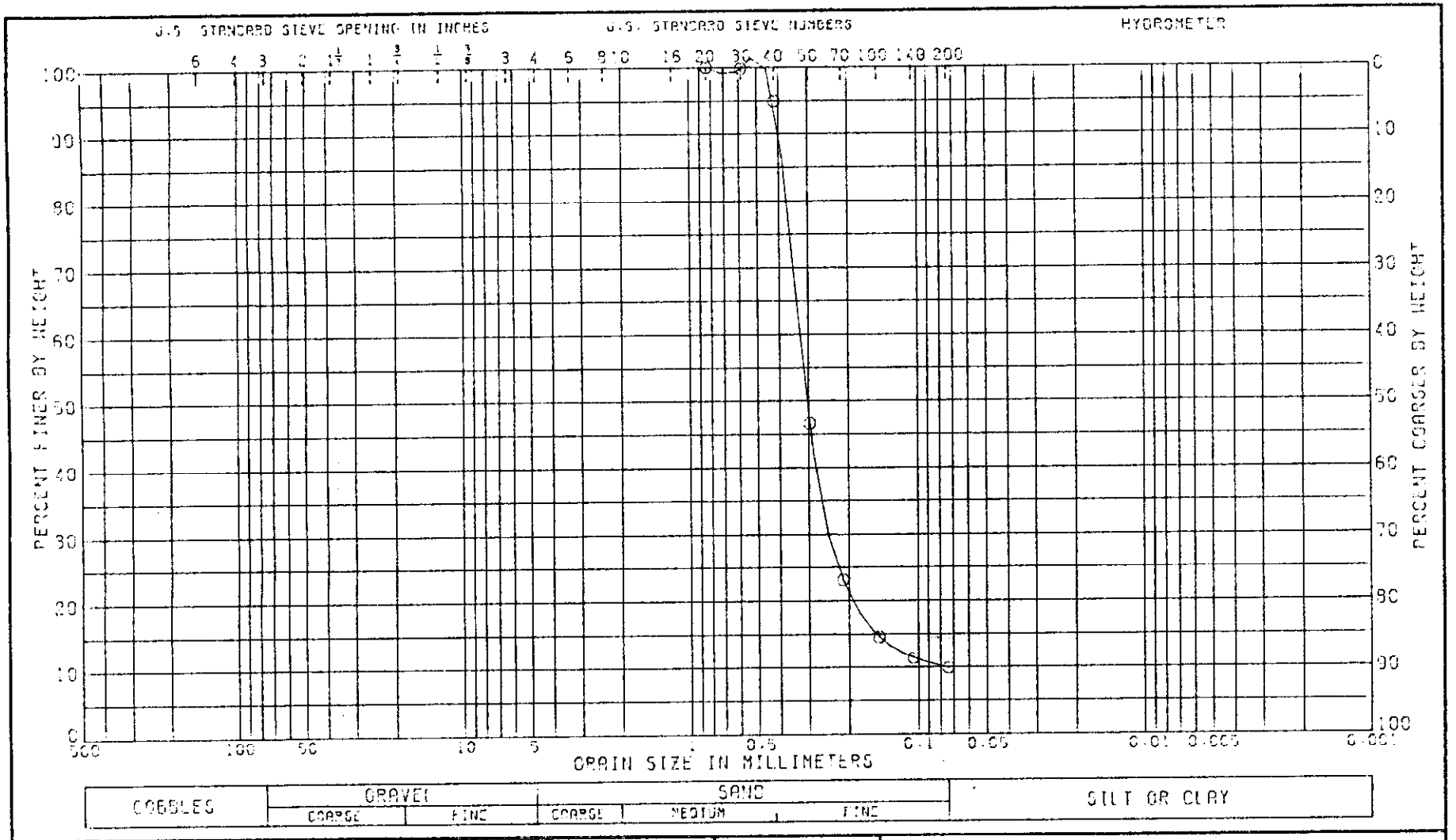
CLAYEY SAND (SC), BROWN

GRADATION CURVE

PROJECT CRANE NWSC MCCOMISH GORGE

BORING NO. 4-4-91 SAMPLE NO. 4

DEPTH/ELEV 15.0-16.97 DATE 11 FEB 92



LL	PL	PI	GS	NAT W.%	
NP				5.8	

CLASSIFICATION

SILTY SAND (SP-SM), BROWN

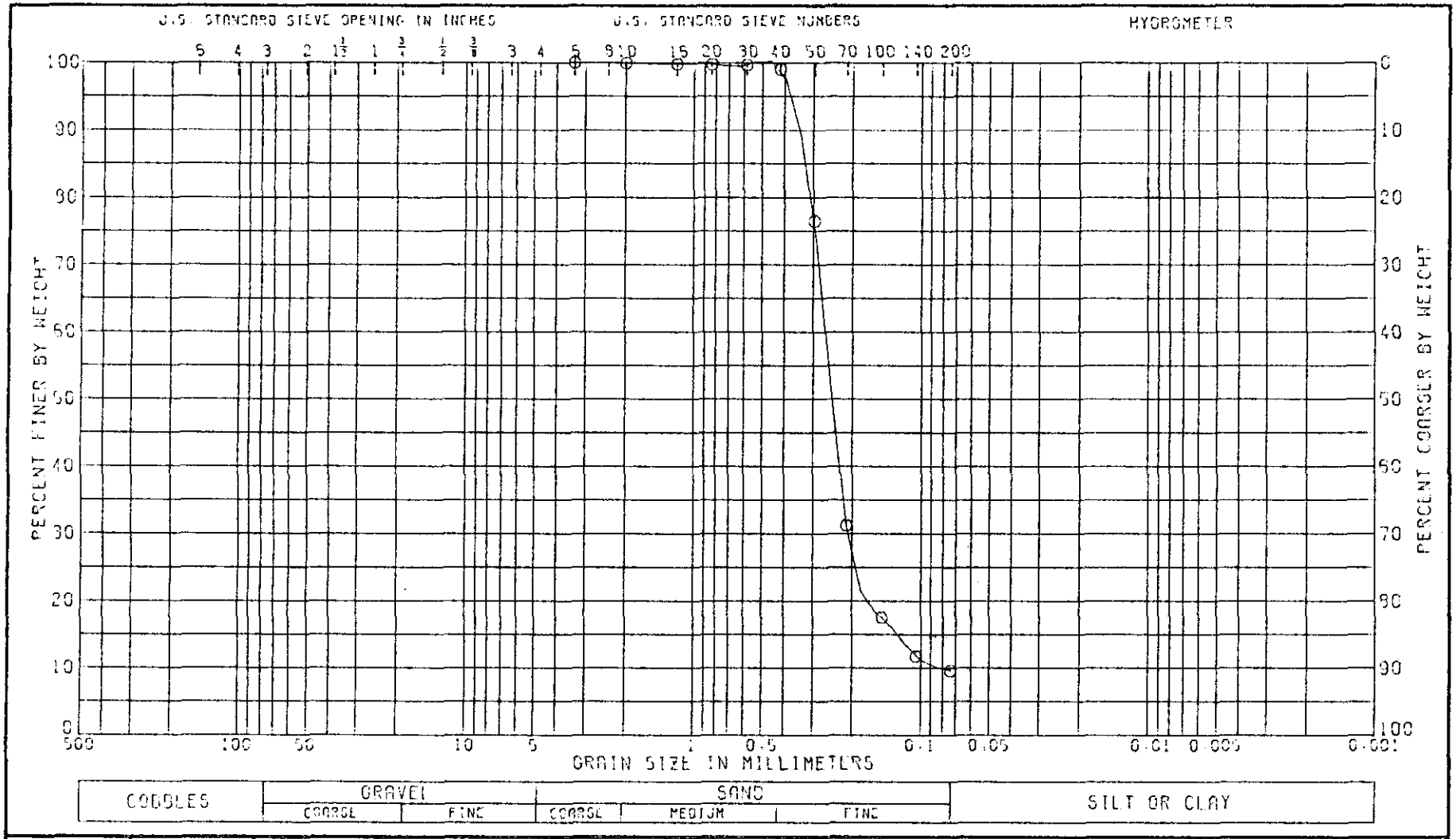
GRADATION CURVE

PROJECT CRANE NESC

MCCOMISH GORGE

BORING NO. 4-4-81 SAMPLE NO. 5

DEPTH/ELEV 20.0-22.08 DATE 03 MAR 82



LL NP	PL	PI	GS	NAT W.% 18.4	

CLASSIFICATION

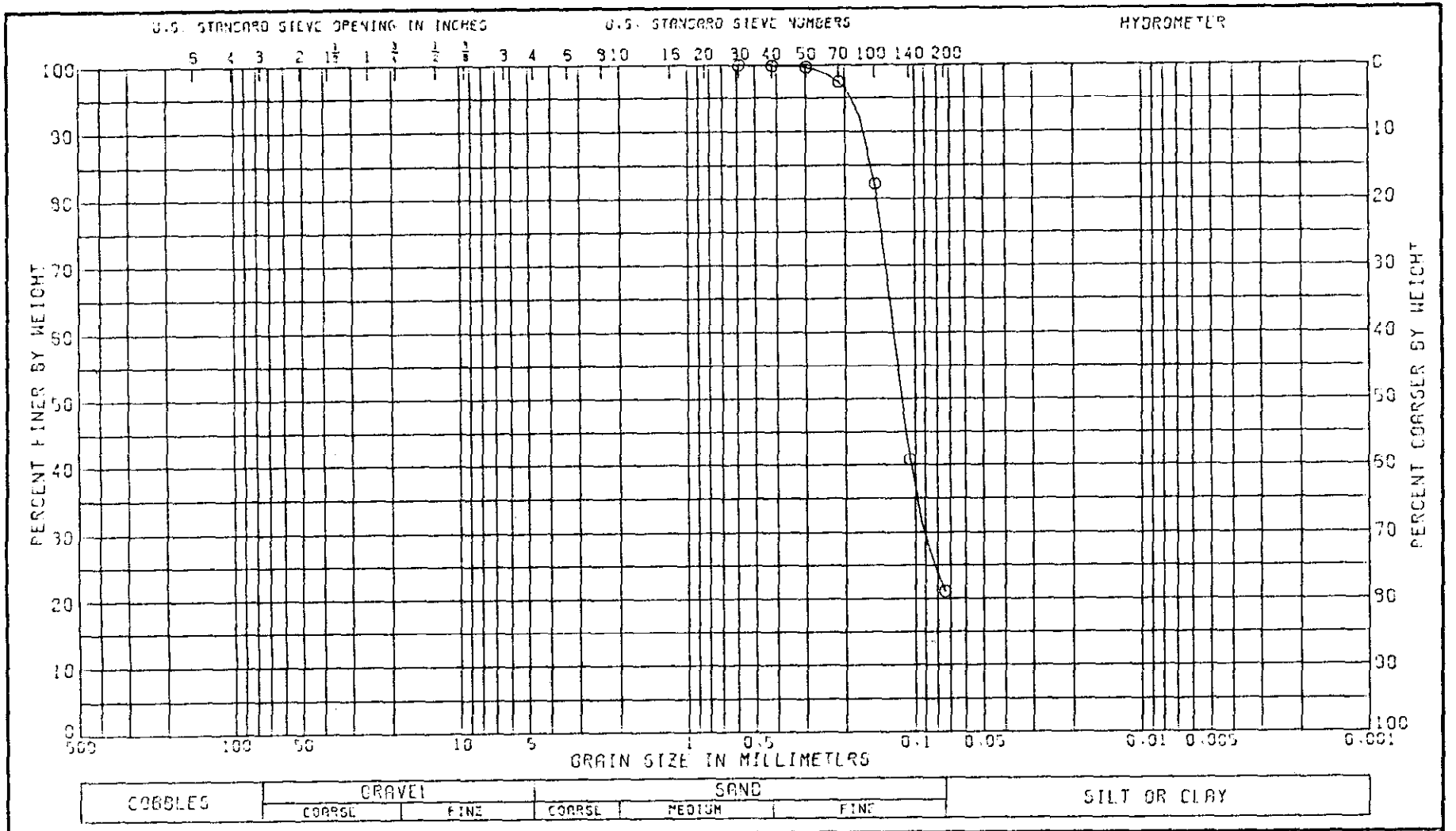
SILTY SAND (SP-SM), REDDISH BROWN

GRADATION CURVE

PROJECT CRANE NWSC MCCOMISH GORGE

BORING NO. 4-4-91 SAMPLE NO 6

DEPTH/ELEV 25.0-26.50 DATE 11 FEB 92



LL	PL	PI	CS	NAT W.%	
NP				23.9	

CLASSIFICATION

SILTY SAND (SM), REDDISH BROWN

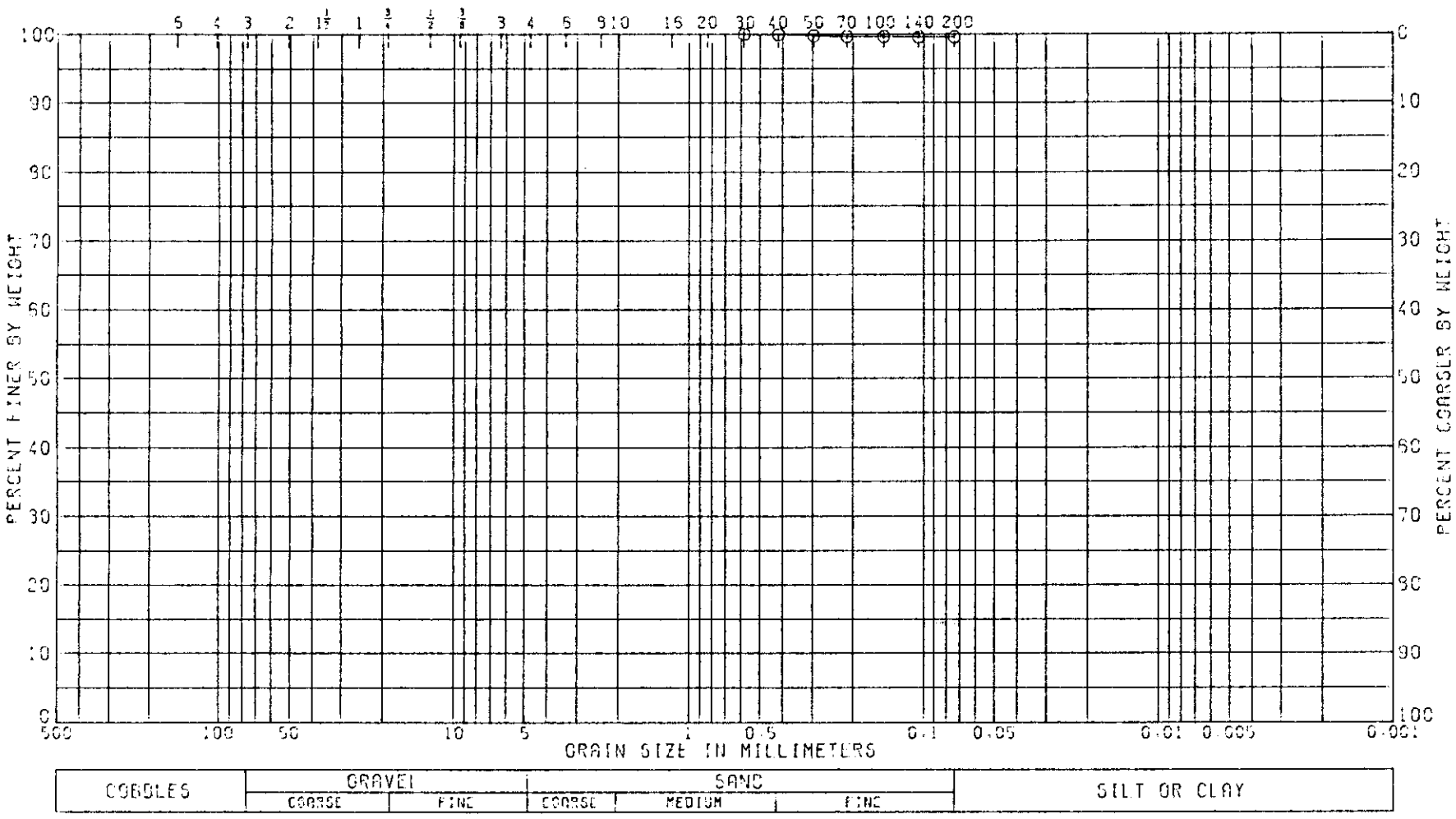
GRADATION CURVE

PROJECT CRANE NWSC

MCCOMISH GORGE

BORING NO. 4-4-81 SAMPLE NO. 7

DEPTH/ELEV 27.8-28.30 DATE 30 MAR 82



LL	PL	PI	GS	NAT W.%
31	16	15		33.6

CLASSIFICATION

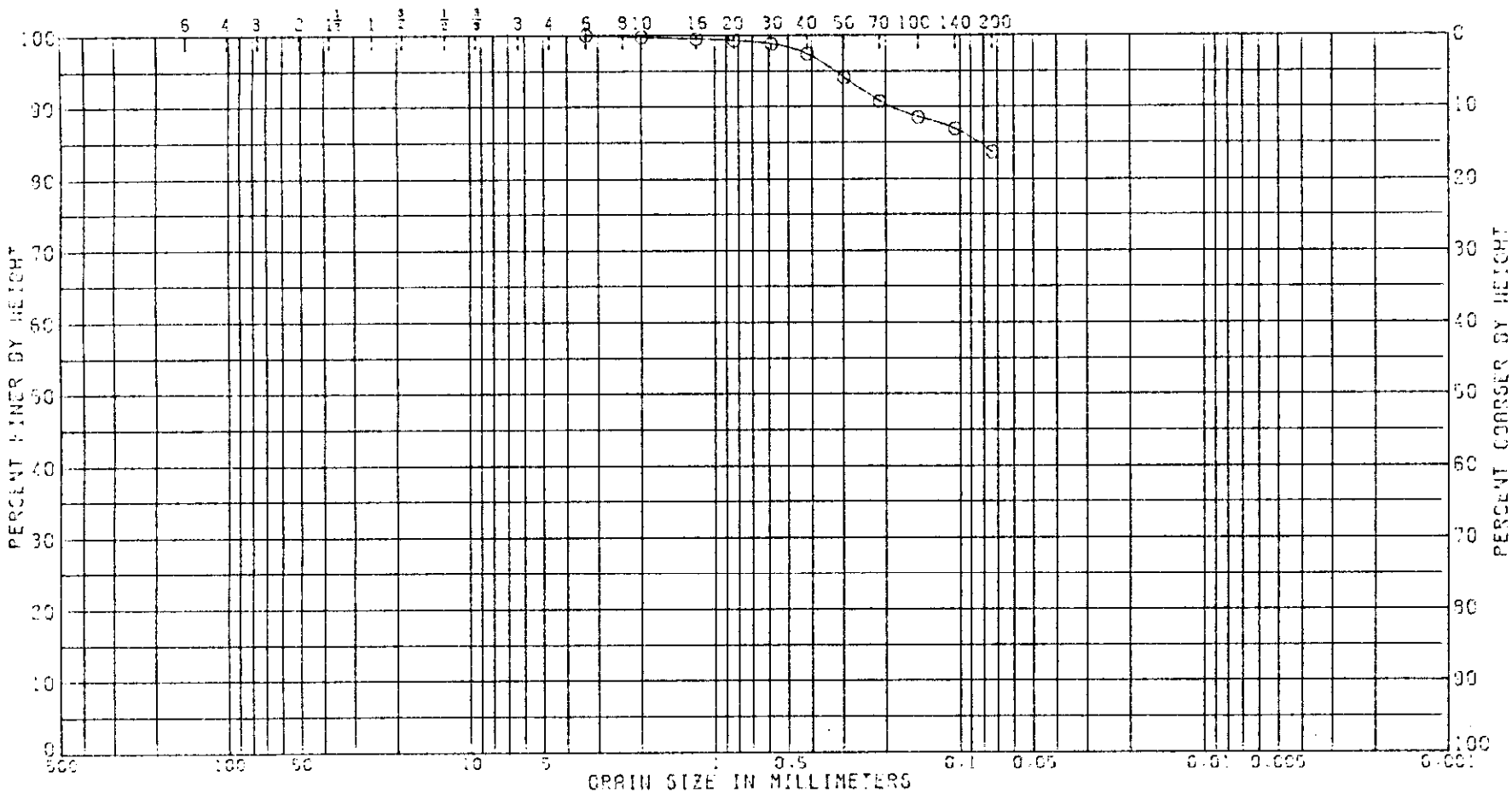
CLAY (CL), GRAY

GRADATION CURVE

PROJECT CRANE NWSC MCCOMISH GORGE

BORING NO. 4-4-91 SAMPLE NO 9

DEPTH/ELEV 35.0-37.05 DATE 11 FEB 92



LL 35	PL 16	PI 19	GS	NAT W.% 23.6

CLASSIFICATION

SANDY CLAY (CL), TAN

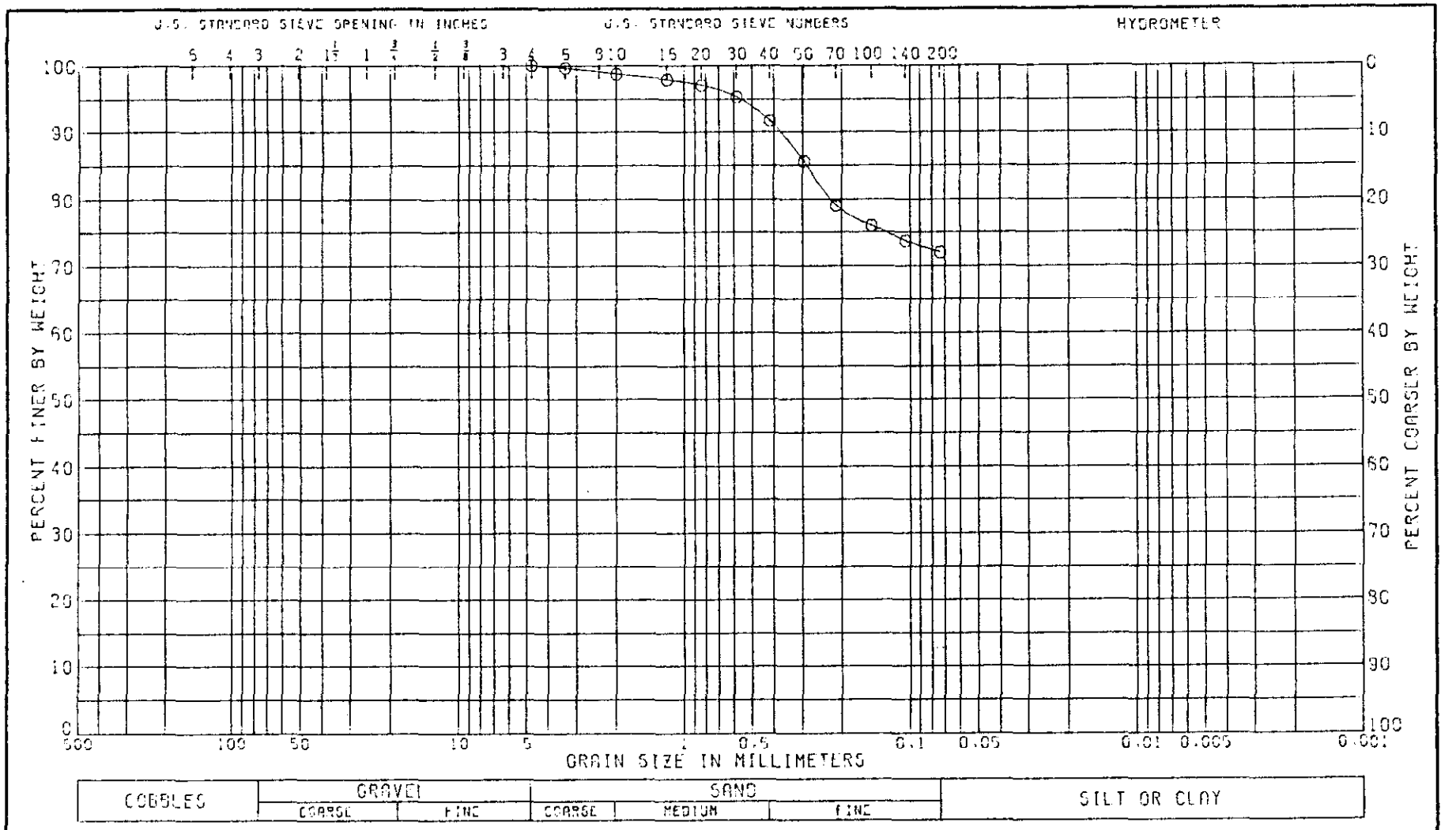
GRADATION CURVE

PROJECT CRANE NLSC

MCCOMISH GORGE

BORING NO. 4--5--81 SAMPLE NO. 1

DEPTH/ELEV 0.0-1.8 DATE 09 MAR 82



LL 38	PL 18	PI 20	GS	NAT W.% 21.1

CLASSIFICATION

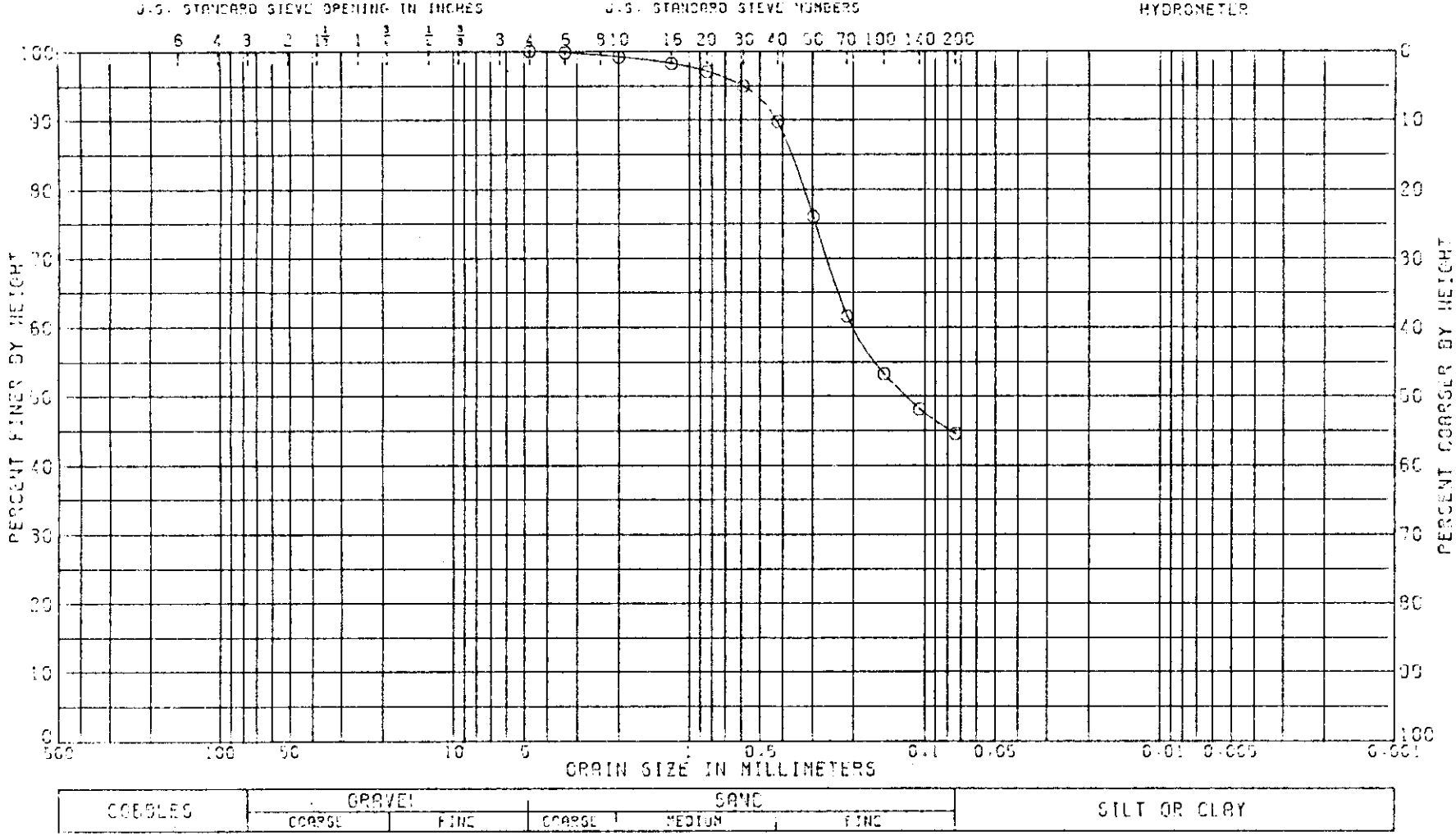
SANDY CLAY (CL), BROWN

GRADATION CURVE

PROJECT CRANE NWSC MCCOMISH GORGE

BORING NO. 4-5-81 SAMPLE NO 2

DEPTH/ELEV 5.0-6.36 DATE 11 FEB 92



LL	PL	PI	GS	NAT W.%
30	17	13		22.9

CLASSIFICATION

CLAYEY SAND (SC), DARK BROWN

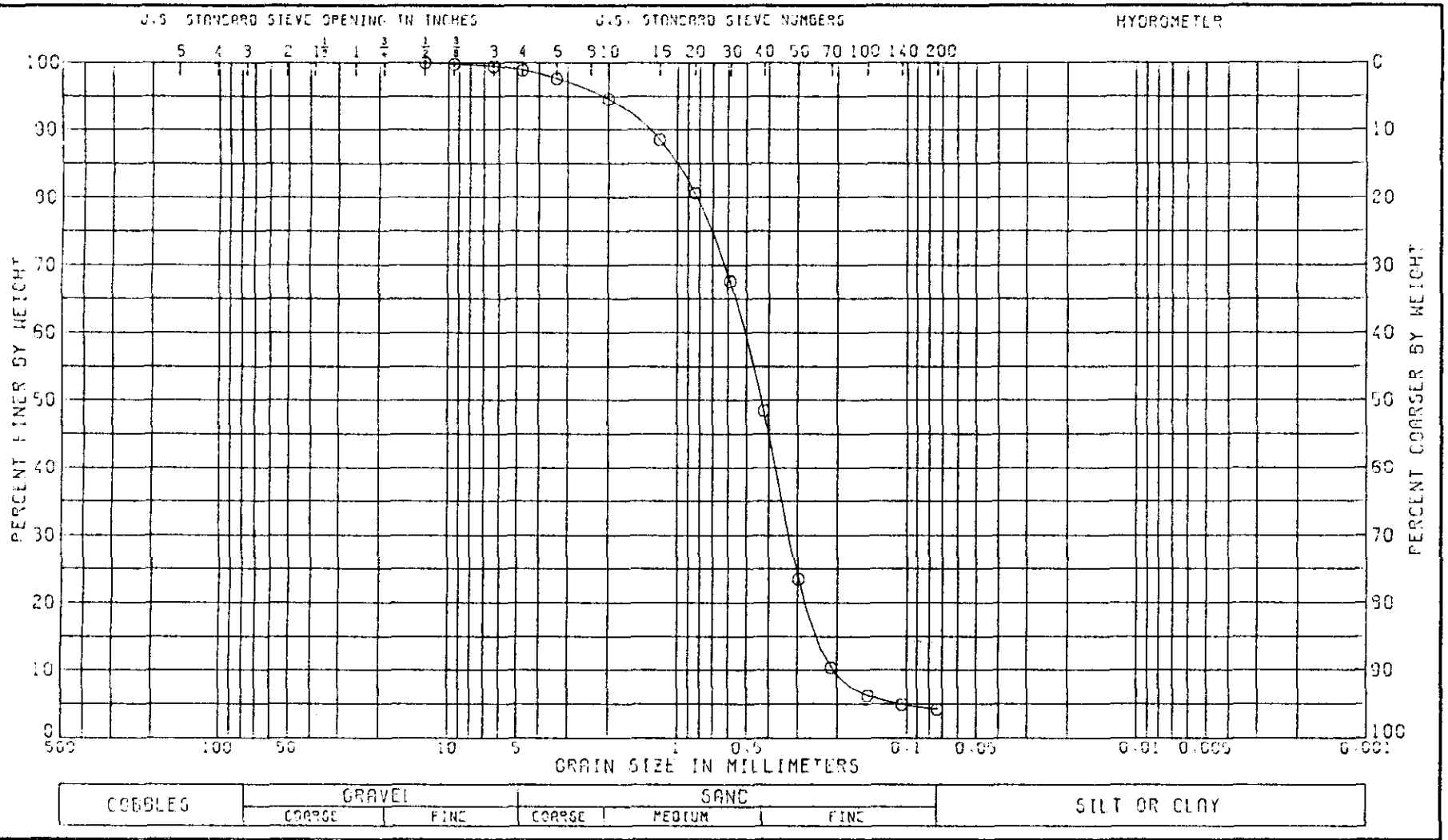
GRADATION CURVE

PROJECT CRANE MUSC

MCCOMISH GORGE

BORING NO. 4-5-81 SAMPLE NO. 3

DEPTH/ELEV 10.0-11.10 DATE 09 MAR 82



LL	PL	PI	OS	NAT W.%	
NP				14.7	

CLASSIFICATION

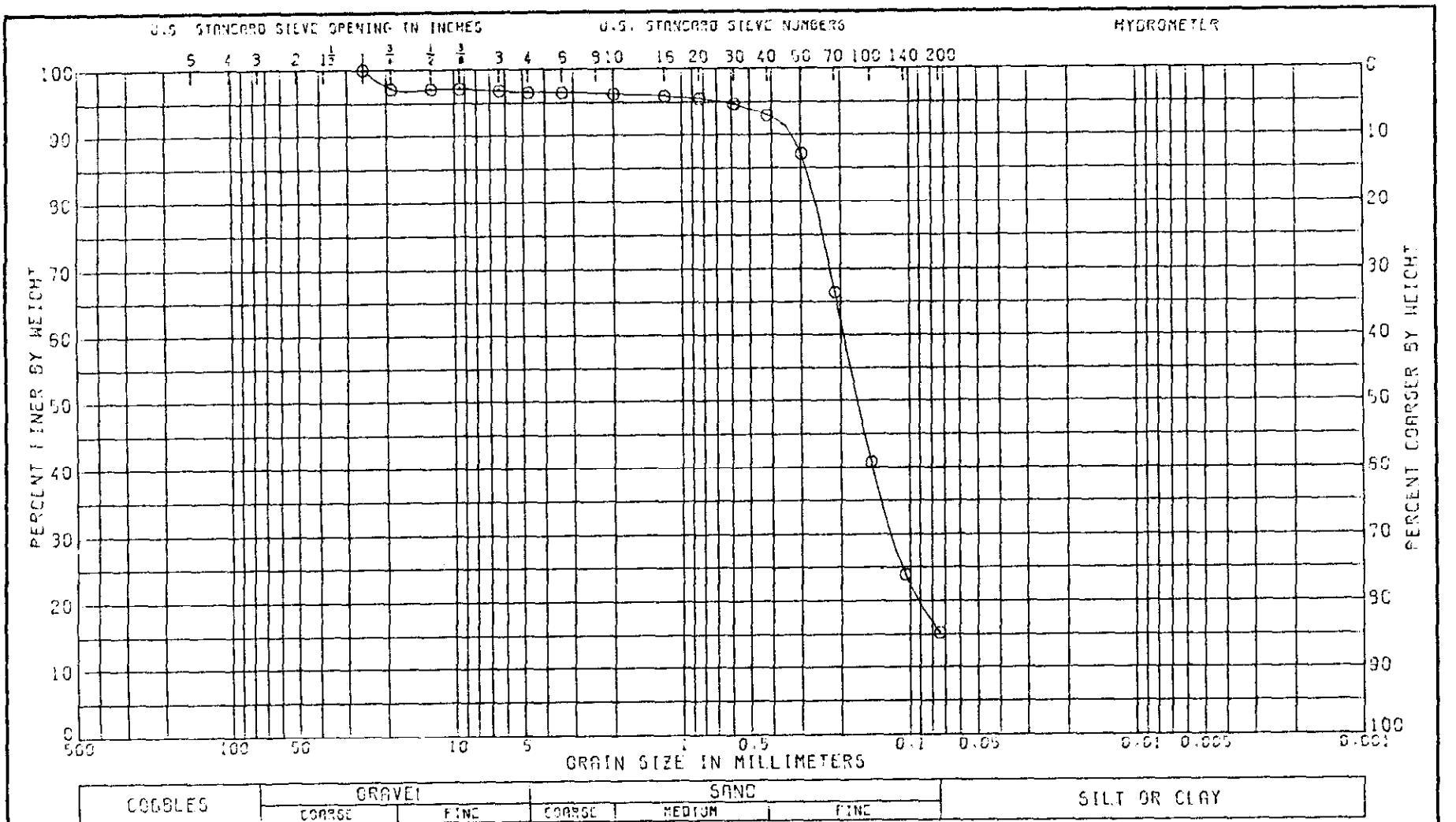
SAND (SP), GRAY

GRADATION CURVE

PROJECT CRANE NWSC MCCOMISH GORGE

BORING NO. 4-5-81 SAMPLE NO. 4

DEPTH/ELEV 14.3-16.0 DATE 11 FEB 92



LL NP	PL	PI	GS	NAT W.% 22.4	

CLASSIFICATION

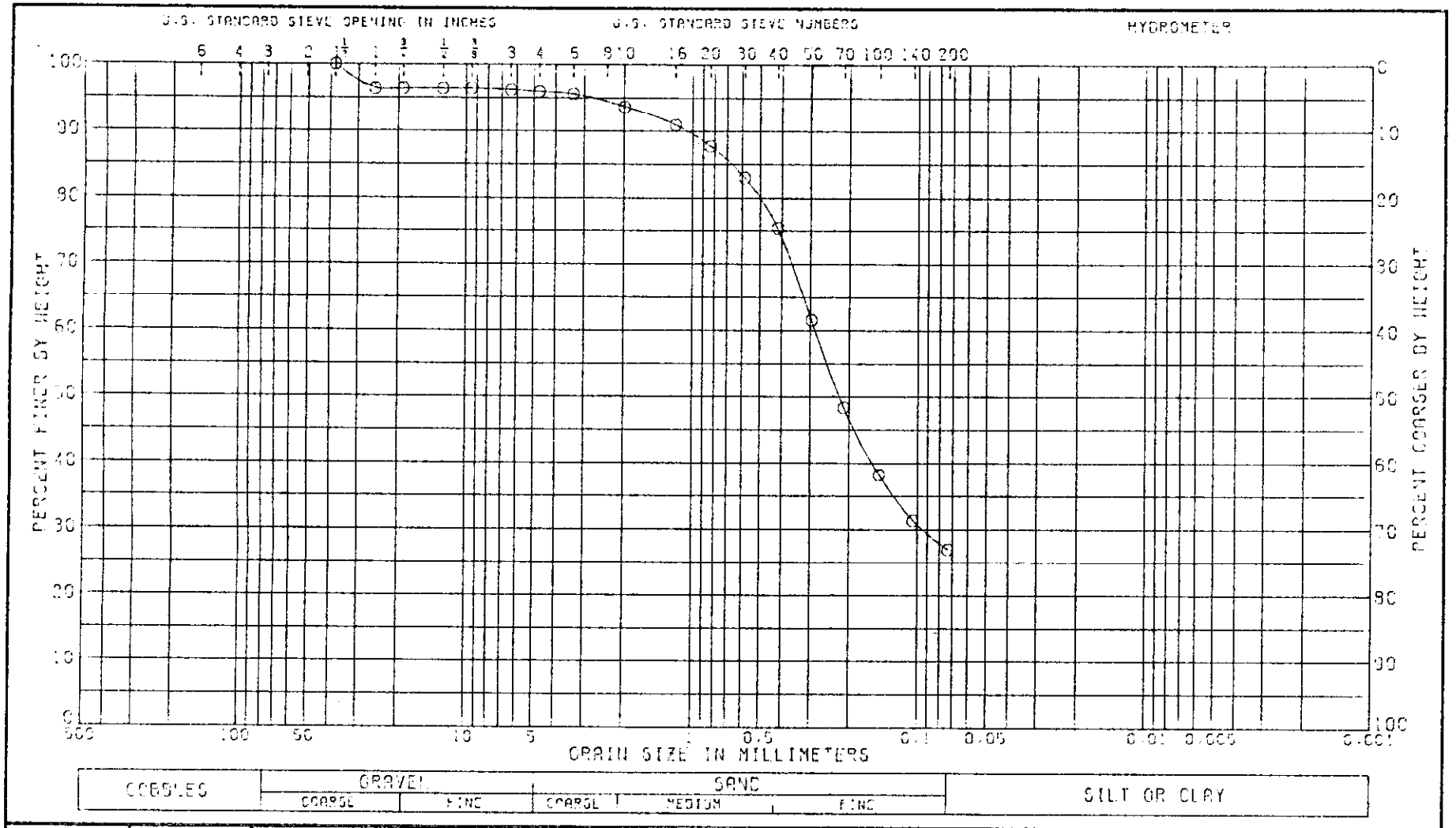
SILTY SAND (SM), BROWN: TRACE OF GRAVEL

GRADATION CURVE

PROJECT CRANE NWSC MCCOMISH GORGE

BORING NO. 4-5-81 SAMPLE NO 5

DEPTH/ELEV 18.6-20.05 DATE 11 FEB 82



LL NP	PL	PI	GS	NAT W.% 12.4	

CLASSIFICATION

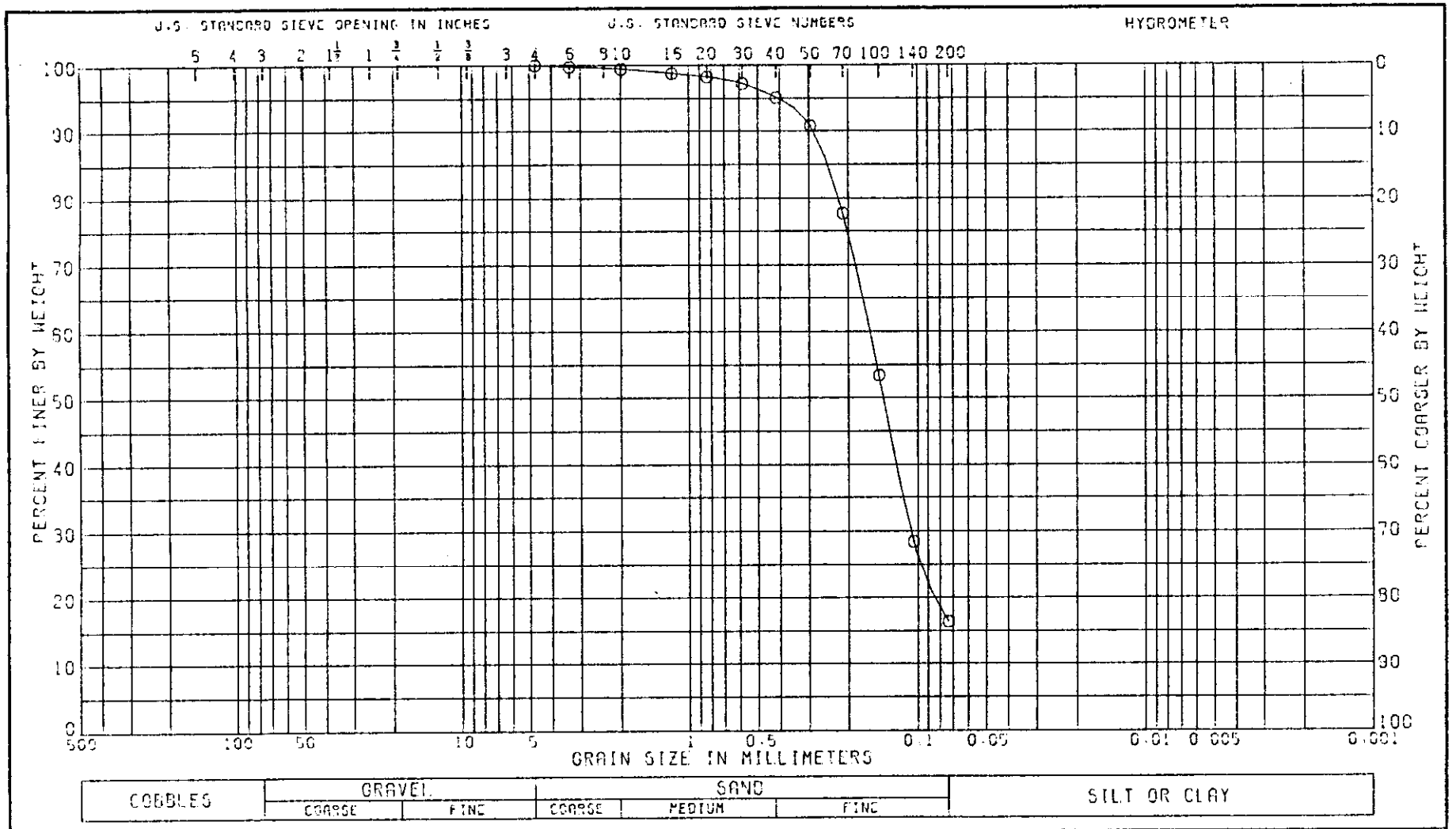
SILTY SAND (SM), LIGHT BROWN: TRACE OF GRAVEL
INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

GRADATION CURVE

PROJECT CRANE NUSC
MCCOMISH GORGE

BORING NO. 4-6-81 SAMPLE NO 1

DEPTH/ELEV 0.0-2.14 DATE 09 MAR 82



LL	PL	PI	GS	NAT W.%	
NP				10.2	

CLASSIFICATION

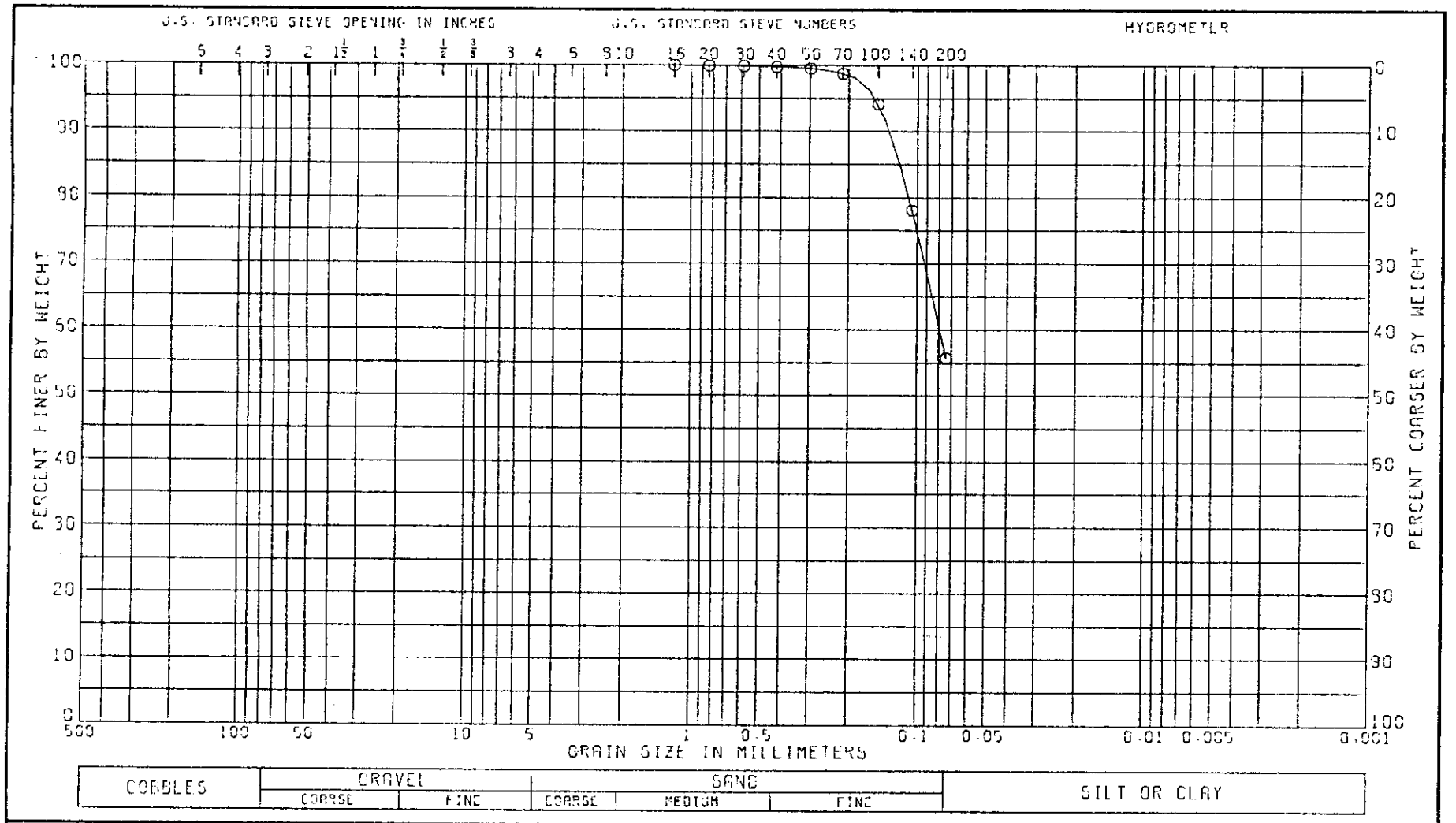
SILTY SAND (SM), DARK BROWN

GRADATION CURVE

PROJECT CRANE NWSC MCCOMISH GORGE

BORING NO. 4-6-81 SAMPLE NO. 2

DEPTH/ELEV 5.0-7.0ft DATE 11 FEB 82



LL NP	PL	PI	CS	NAT W.% 19.2	

CLASSIFICATION

SANDY SILT (ML), TAN

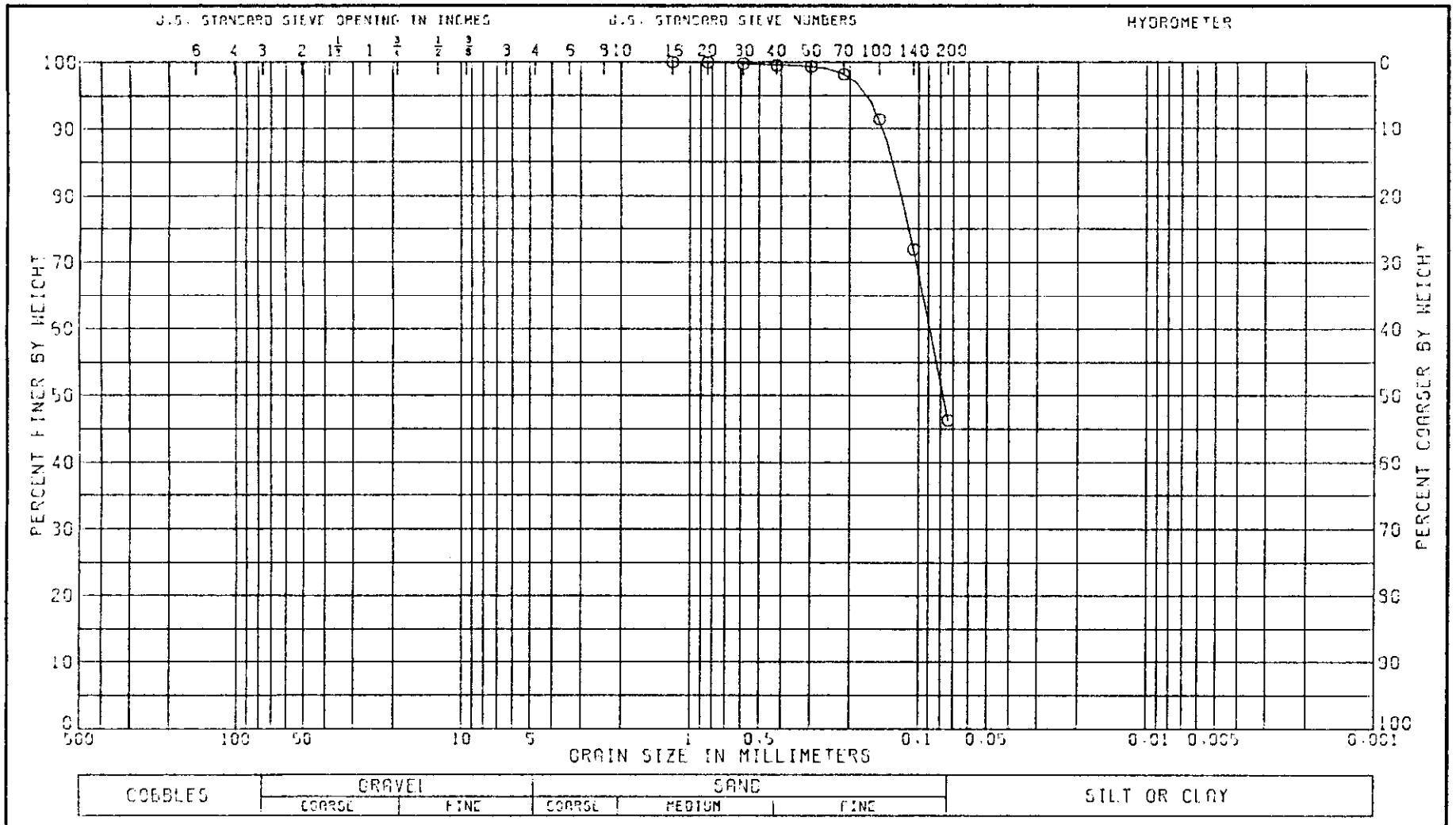
GRADATION CURVE

PROJECT CRANE NWSC

MCCOMISH GORGE

BORING NO. 4-5-91 SAMPLE NO. 3

DEPTH/ELEV 10.0-11.71 DATE 30 MAR 92



LL	PL	PI	CS	NAT W.%	
NP				27.4	

CLASSIFICATION

SILTY SAND (SM) GRAYISH TAN

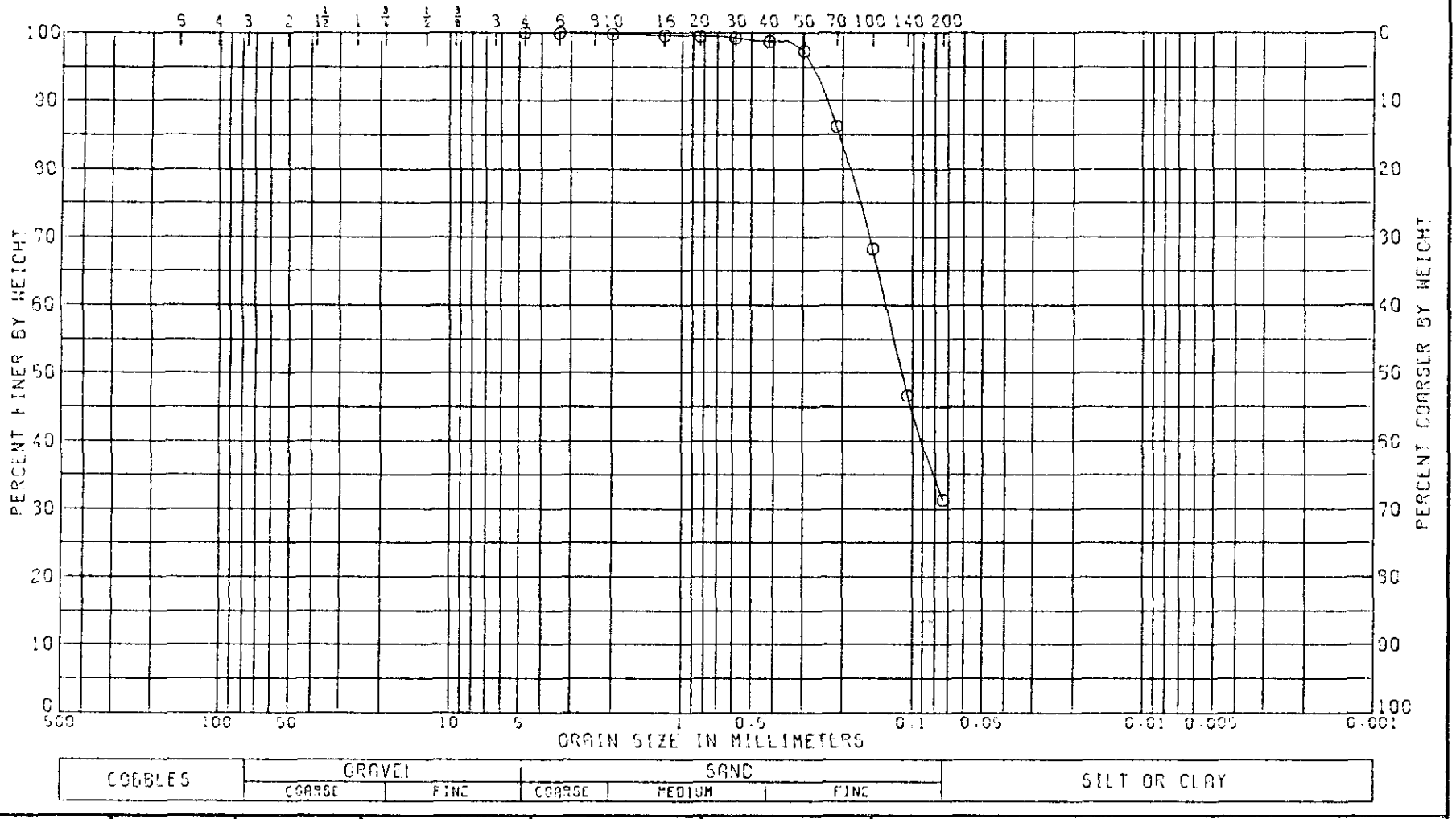
GRADATION CURVE

PROJECT CRANE NWSC

MCCOMISH GORGE

BORING NO. 4-6-81 SAMPLE NO. 4

DEPTH/ELEV 15.0-17.17 DATE 30 MAR 82



LL	PL	PI	GS	NAT W.%
NP				18.4

CLASSIFICATION

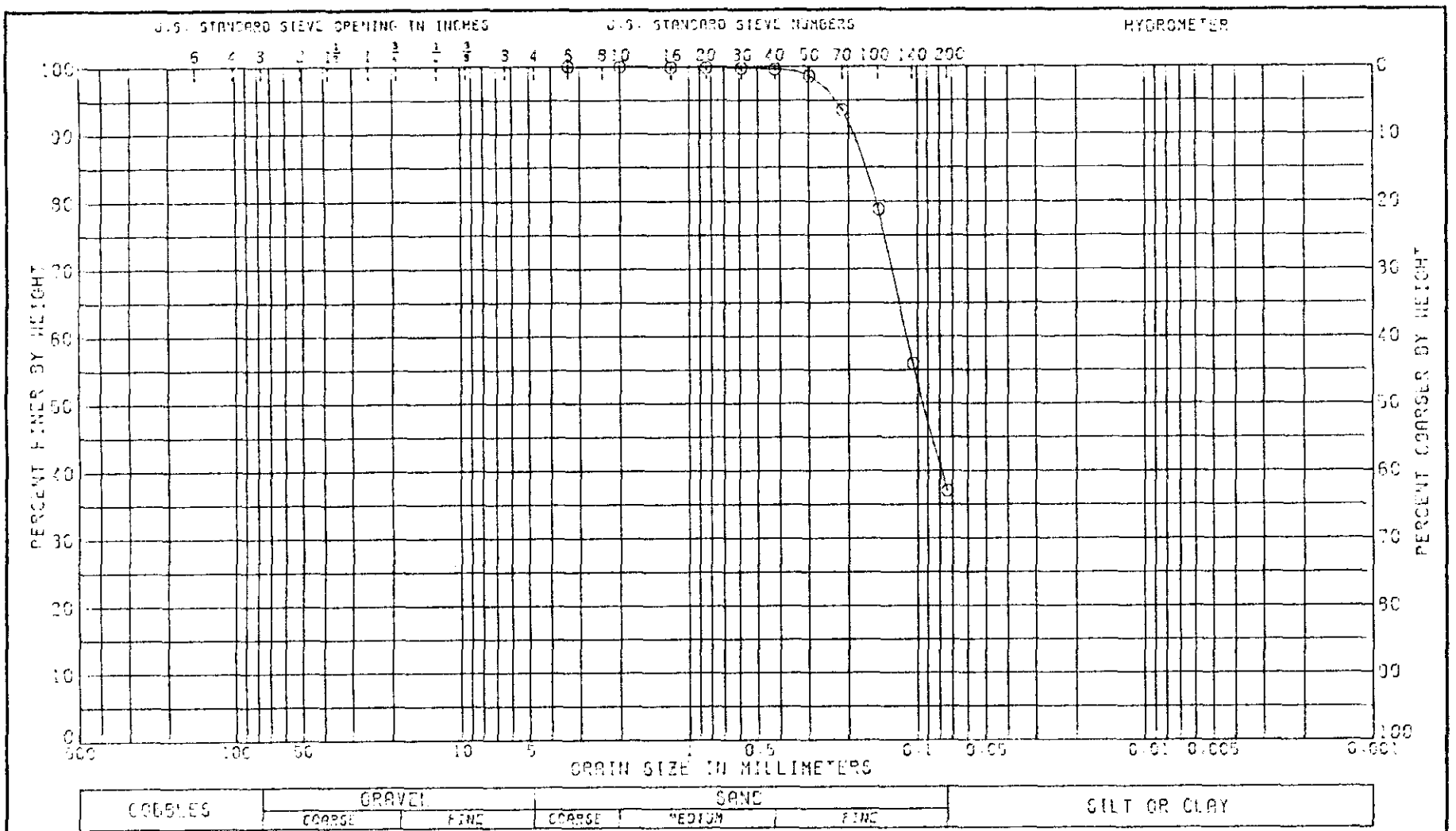
SILTY SAND (SM), BROWN

GRADATION CURVE

PROJECT CRANE NWSC MCCOMISH GORGE

BORING NO. 4-6-81 SAMPLE NO. 5

DEPTH/ELEV 19.5-20.35 DATE 11 FEB 82



LL 20	PL 17	PI 3	GS	NAT W.% 23.1	

CLASSIFICATION

SILTY SAND (SM), BROWN

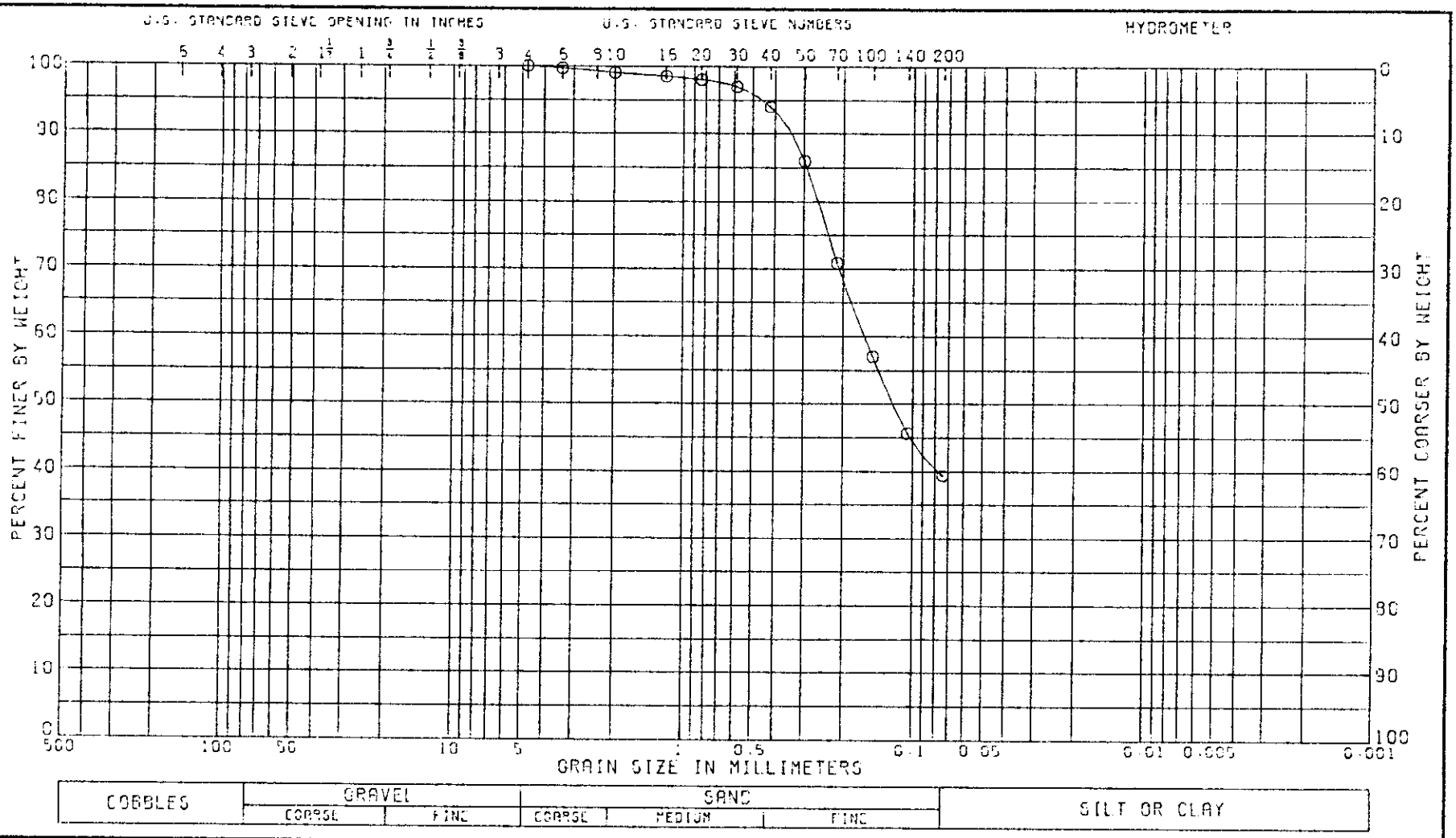
GRADATION CURVE

PROJECT CRANE MKSC

MCCOMISH GORGE

BORING NO. 4-6-81 SAMPLE NO. 6

DEPTH/ELEV 24.2-26.36 DATE 09 MAR 82



LL	PL	PI	GS	NAT W.%
19	11	8		9.9

CLASSIFICATION

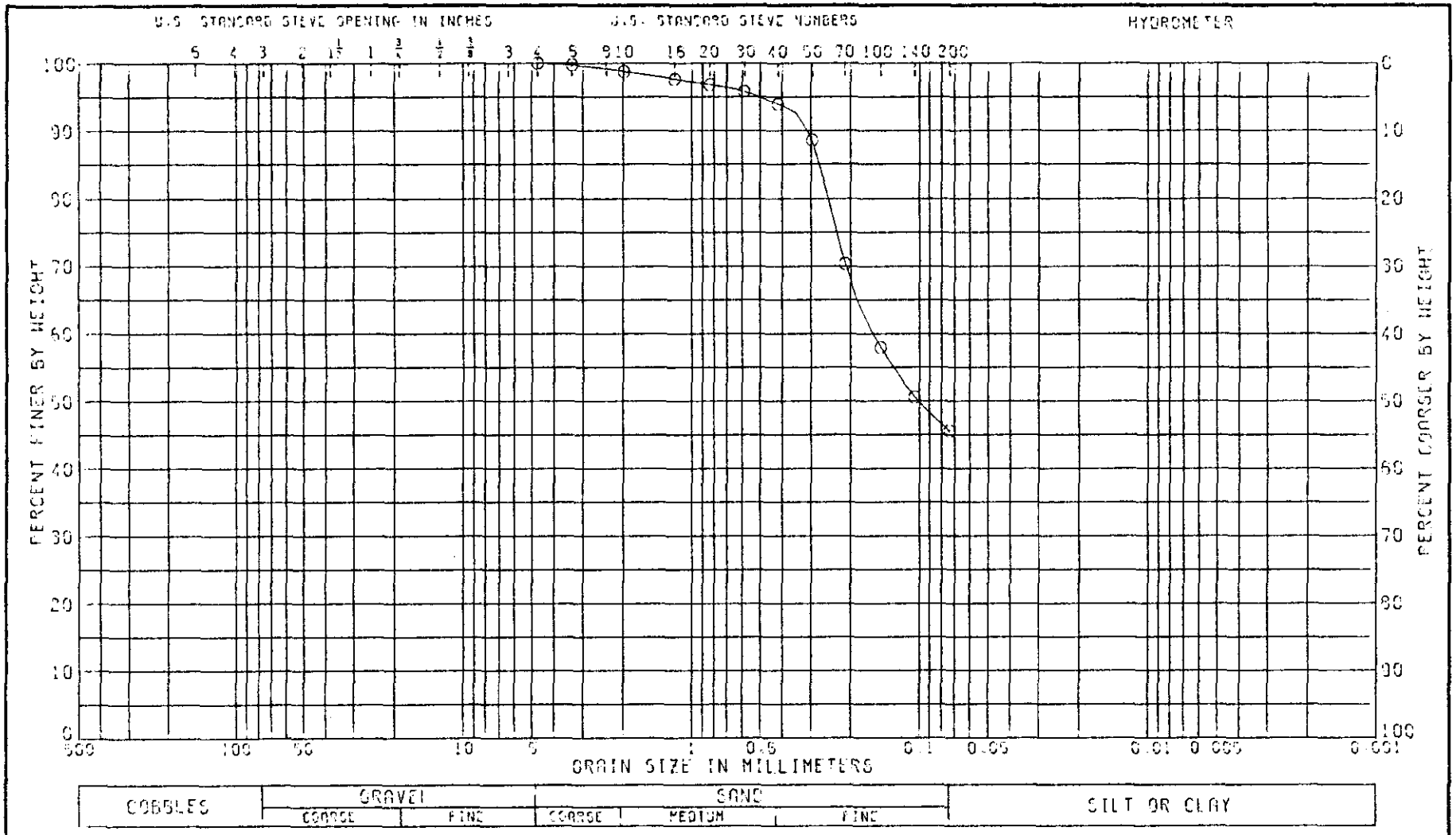
CLAYEY SAND (SC), TAN

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO 5-1-91 SAMPLE NO 1

DEPTH/ELEV 0.0-1.55 DATE 31 MAR 92



LL	PL	PI	CS	NAT W.%
25	12	14		14.4

CLASSIFICATION

CLAYEY SAND (SC), BROWN

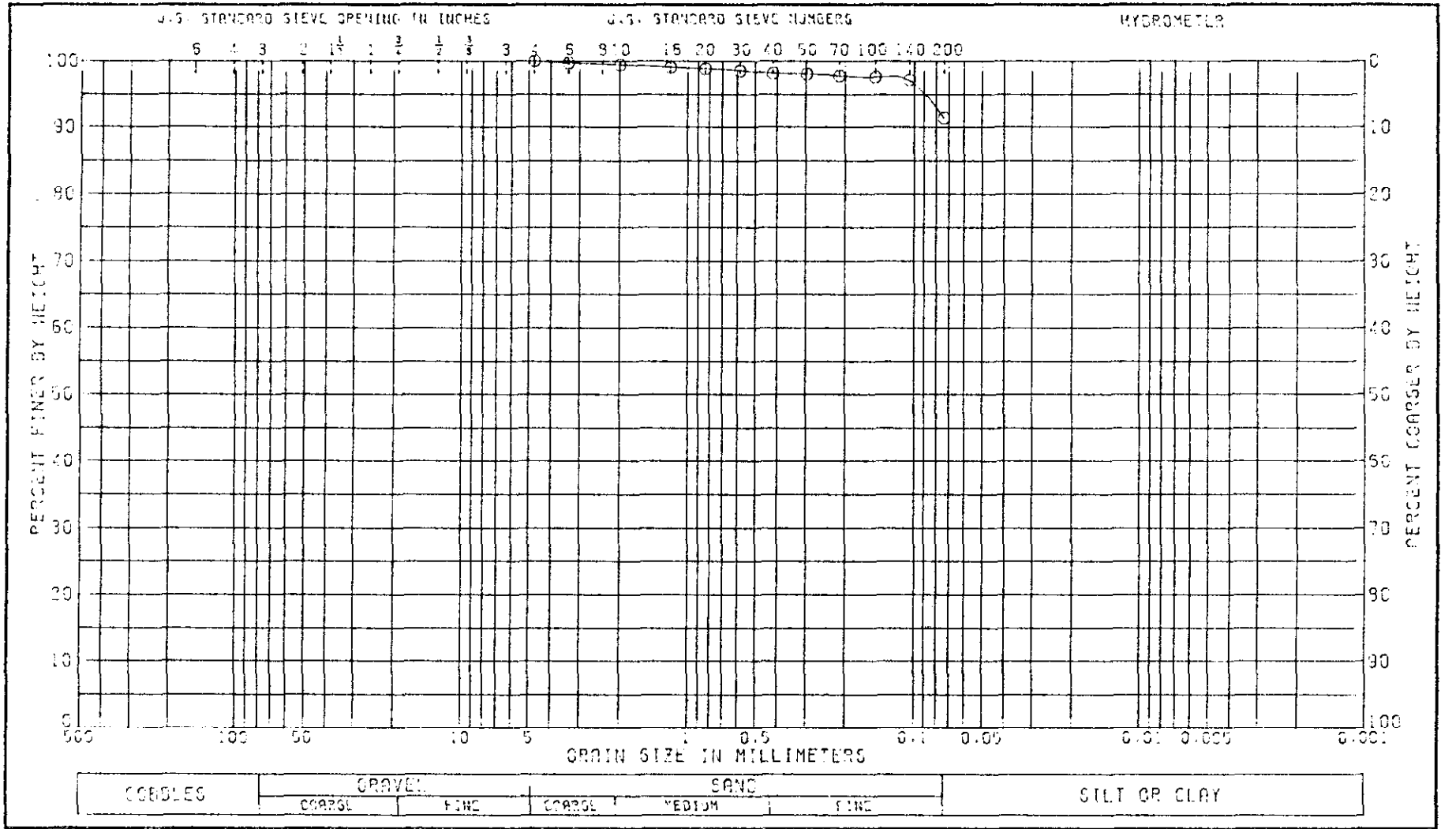
GRADATION CURVE

PROJECT CRANE NWSC

OLD BURNING GROUND

BORING NO 5-1-81 SAMPLE NO 2

DEPTH/ELEV 5.0-6.50 DATE 26 FEB 82



LL 33	PL 15	PI 18	GS	NAT W.% 15.9

CLASSIFICATION

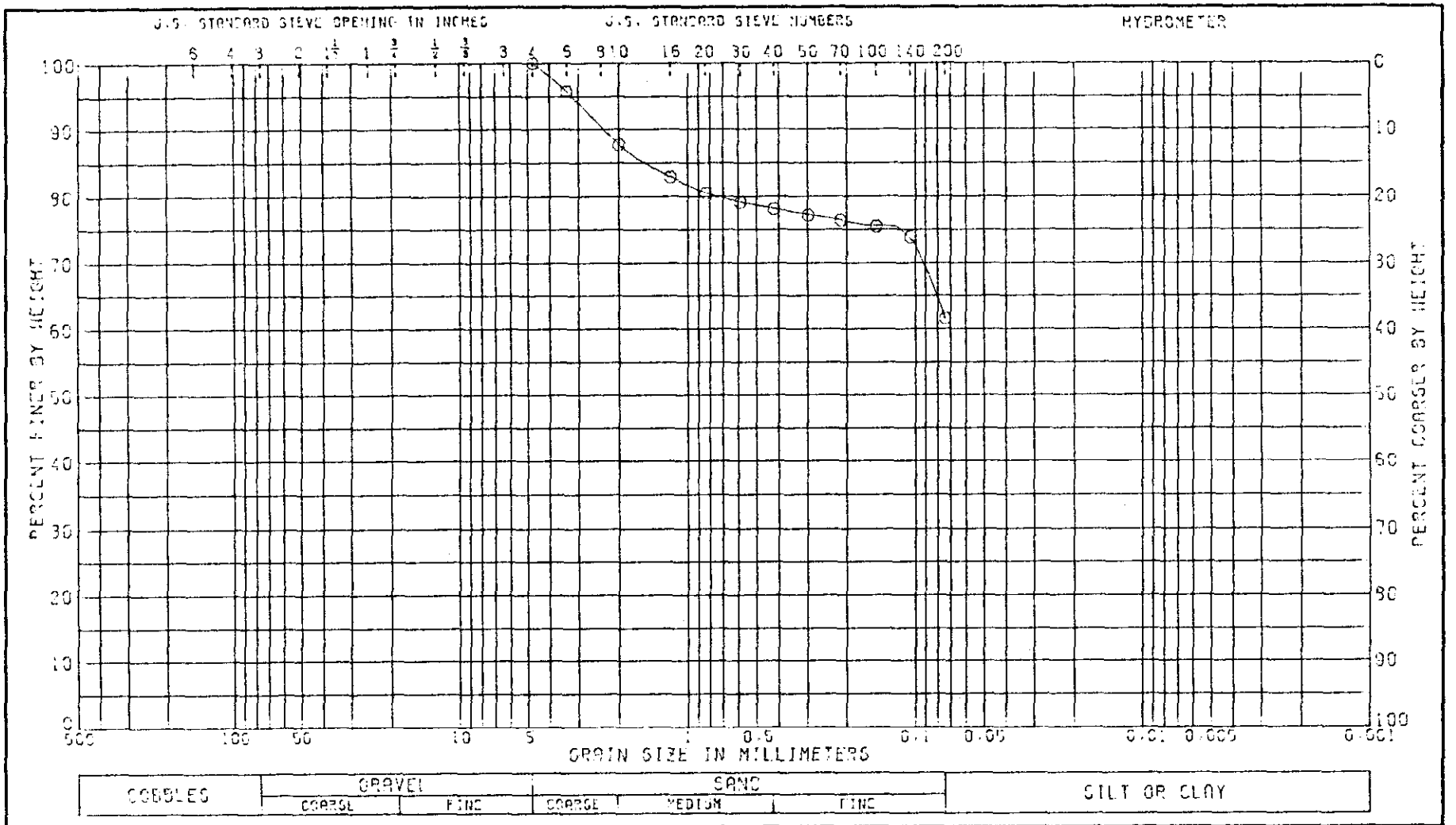
CLAY (CL), LIGHT BROWN: W/SAND

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO. 5-1-81 SAMPLE NO. 3

DEPTH/ELEV 10.0-11.81 DATE 11 FEB 82



LL	PL	PI	GS	NAT W.%
29	13	16		10.3

CLASSIFICATION

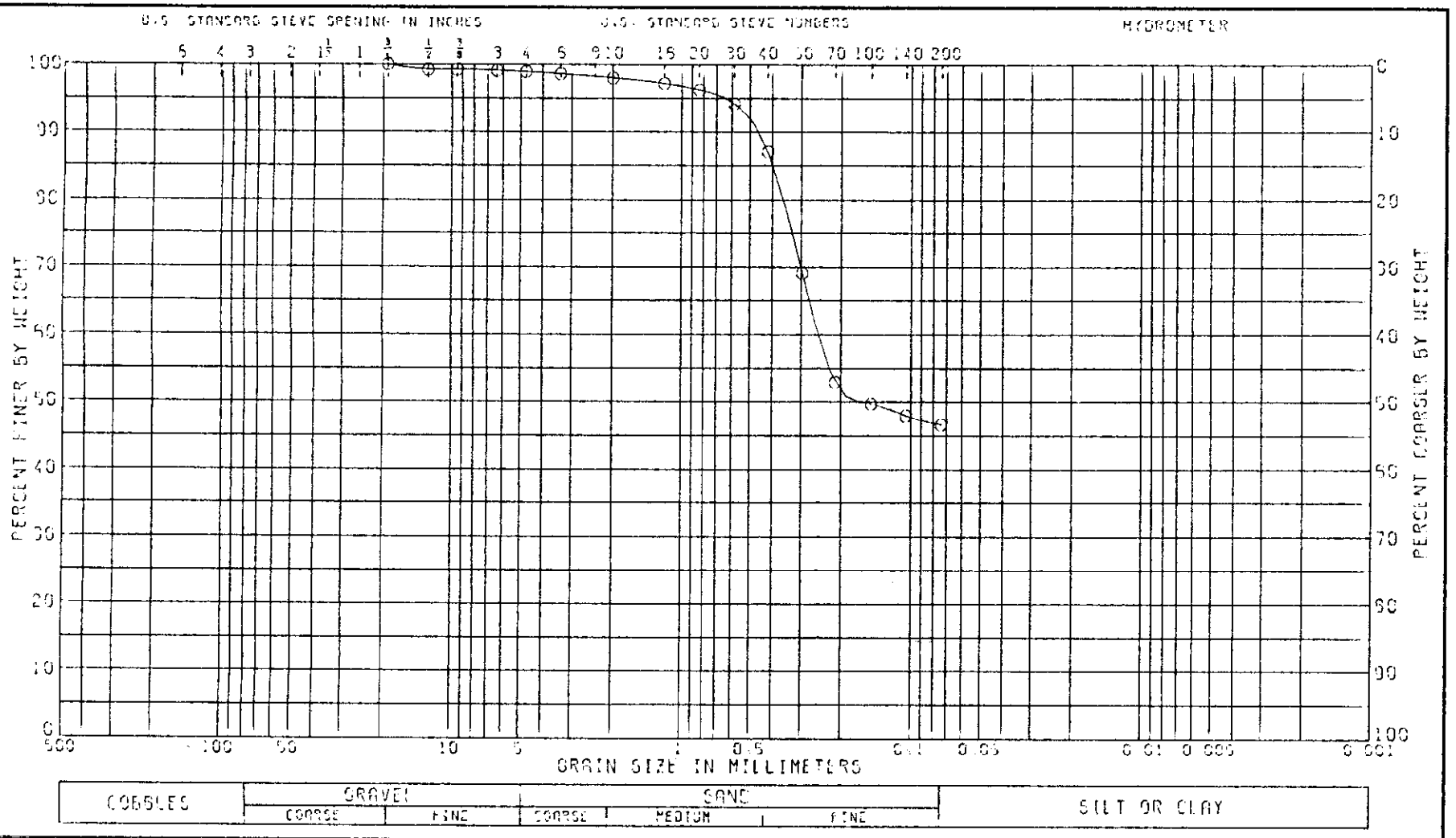
SANDY CLAY (CL), TAN

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO 5-1-81 SAMPLE NO 4

DEPTH/ELEV 15.0-15.65 DATE 11 FEB 92



LL	PL	PI	CS	NAT W.%	
25	12	13		13.6	

CLASSIFICATION

CLAYEY SAND (SC), REDDISH BROWN

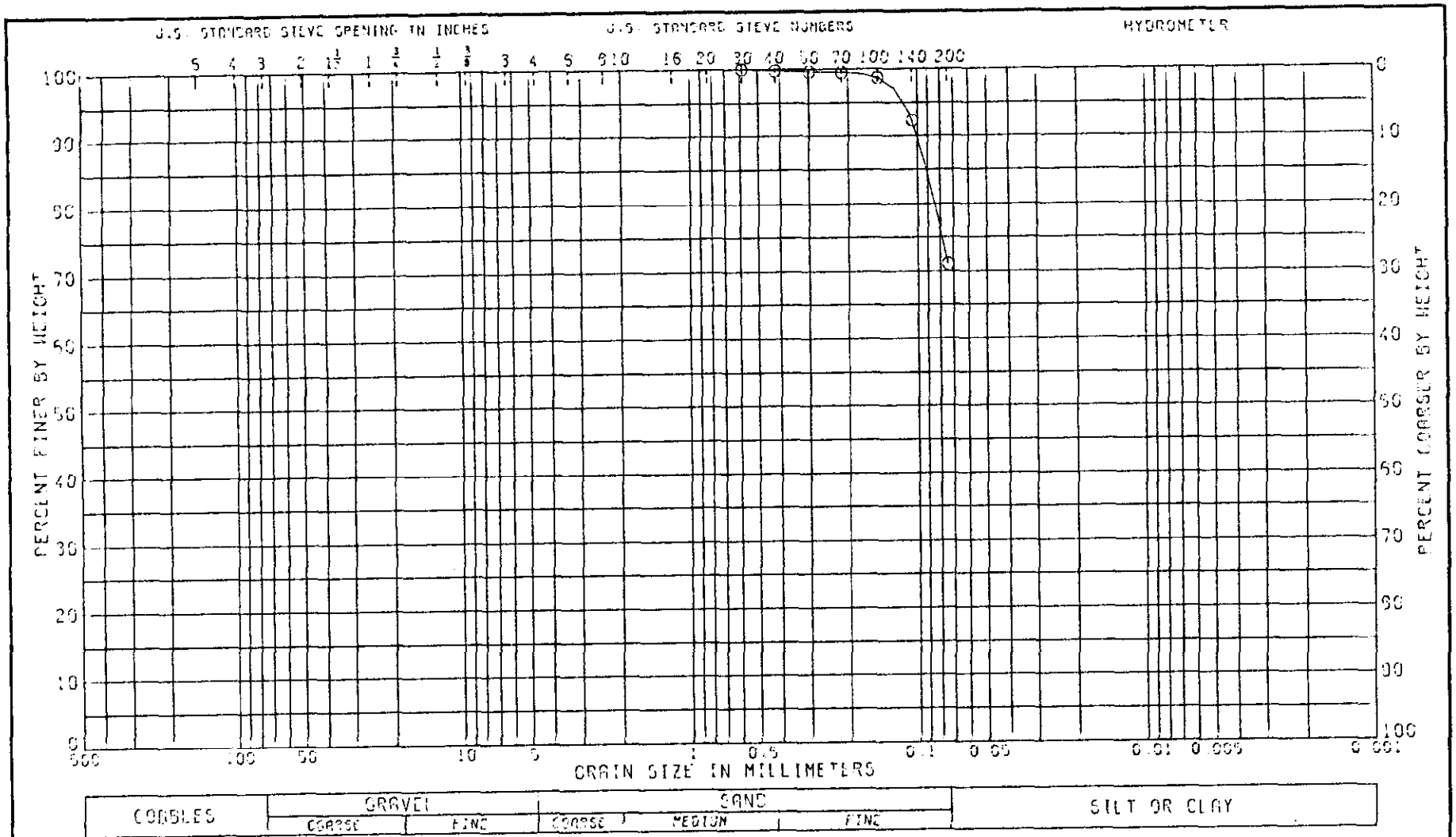
GRADATION CURVE

PROJECT CRANE NWSC

OLD BURNING GROUND

BORING NO 5-2-81 SAMPLE NO 1

DEPTH/ELEV 0.0-1.75 DATE 26 FEB 82



LL 21	PL 16	PI 5	OS	NAT W.% 23.0	

CLASSIFICATION

SANDY CLAYEY SILT (CL-ML), TAN

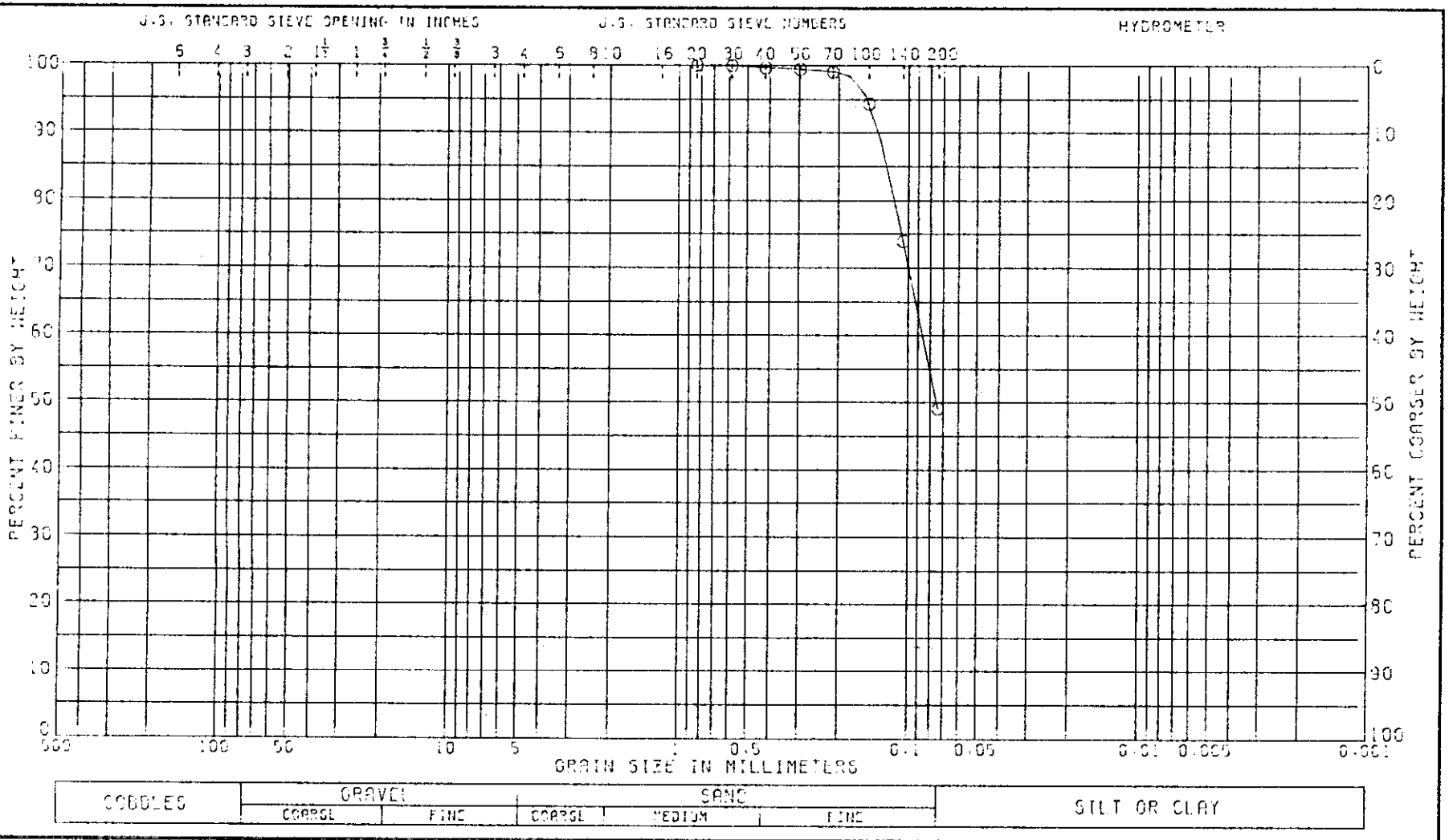
GRADATION CURVE

PROJECT CRANE NASC

OLD BURNING GROUND

BORING NO 5-2-81 SAMPLE NO 2

DEPTH/ELEV 5.0-7.15 DATE 26 FEB 82



LL NP	PL	PI	GS	NAT W.% 19.3	

CLASSIFICATION

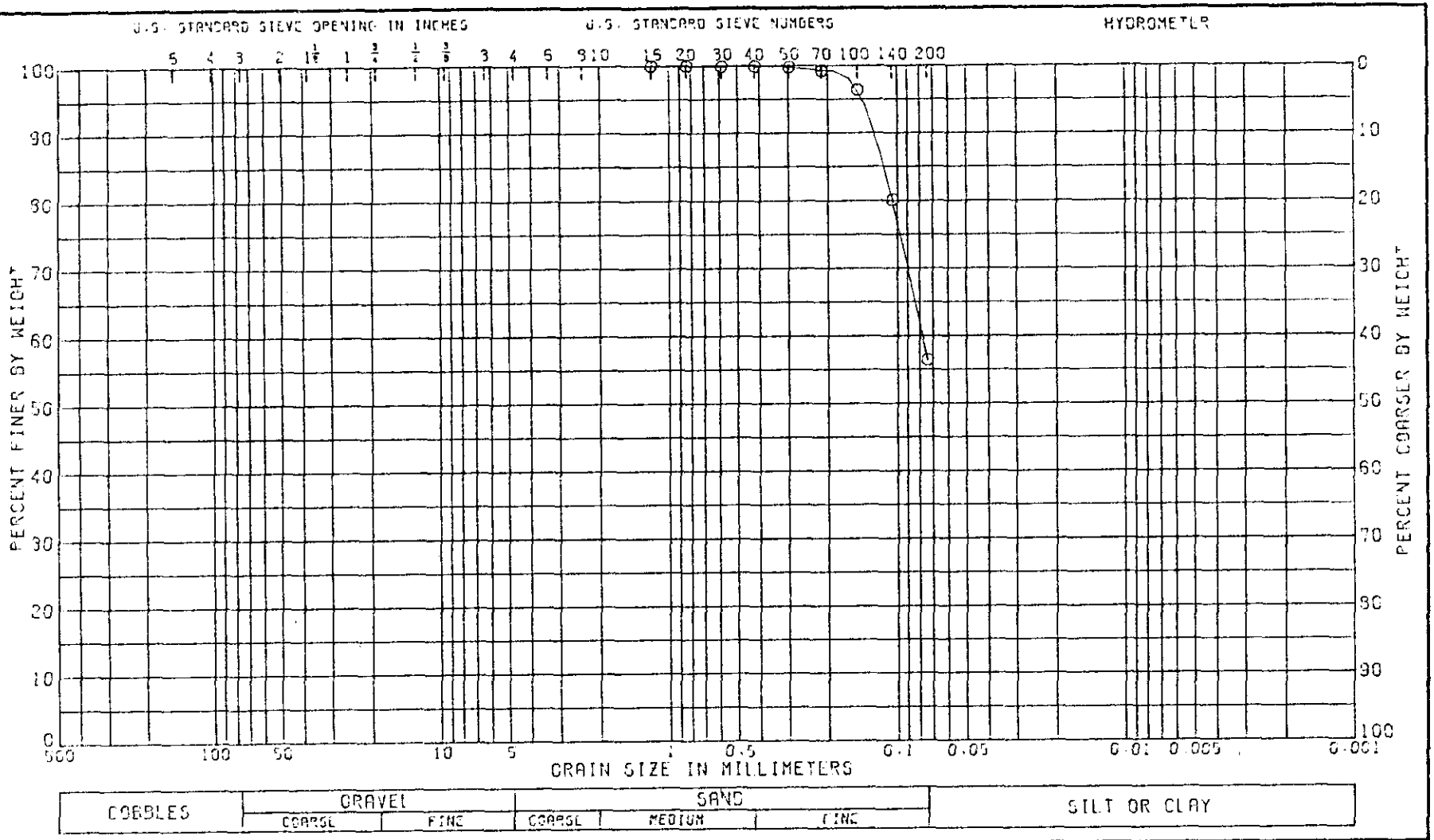
SILTY SAND (SM), BROWN

GRADATION CURVE

PROJECT CRANE NLSC OLD BURNING GROUND

BORING NO 5-2-81 SAMPLE NO. 3

DEPTH/ELEV 10.0-11.46 DATE 11 FEB 82



LL	PL	PI	GS	NAT W.%
22	17	5		28.4

CLASSIFICATION

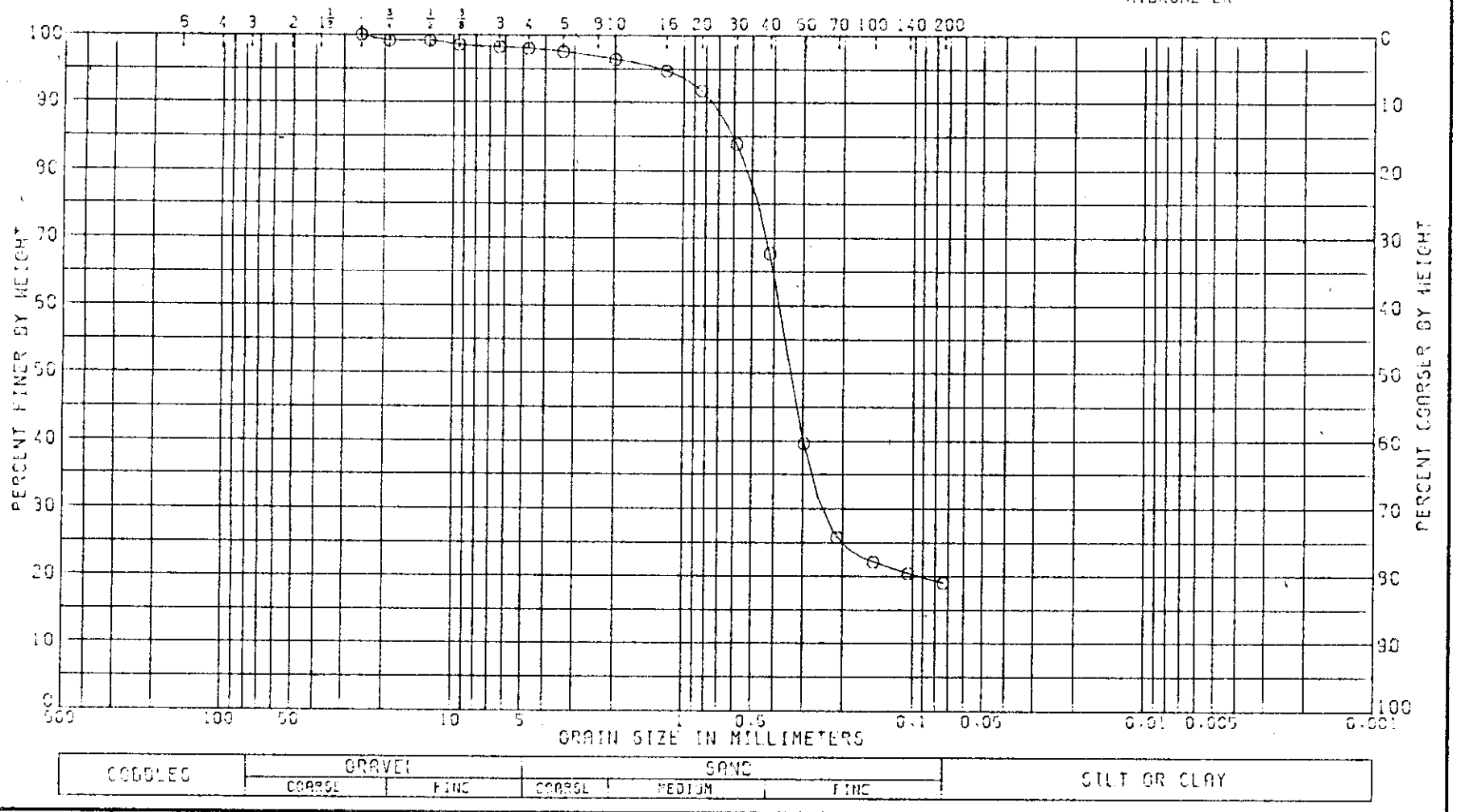
SANDY CLAYEY SILT (CL-ML), BROWN

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO. 5-2-81 SAMPLE NO. 4S

DEPTH/ELEV 15.0-18.2 DATE 31 MAR 82



LL 21	PL 12	PI 9	CC	NAT W.% 7.7	

CLASSIFICATION

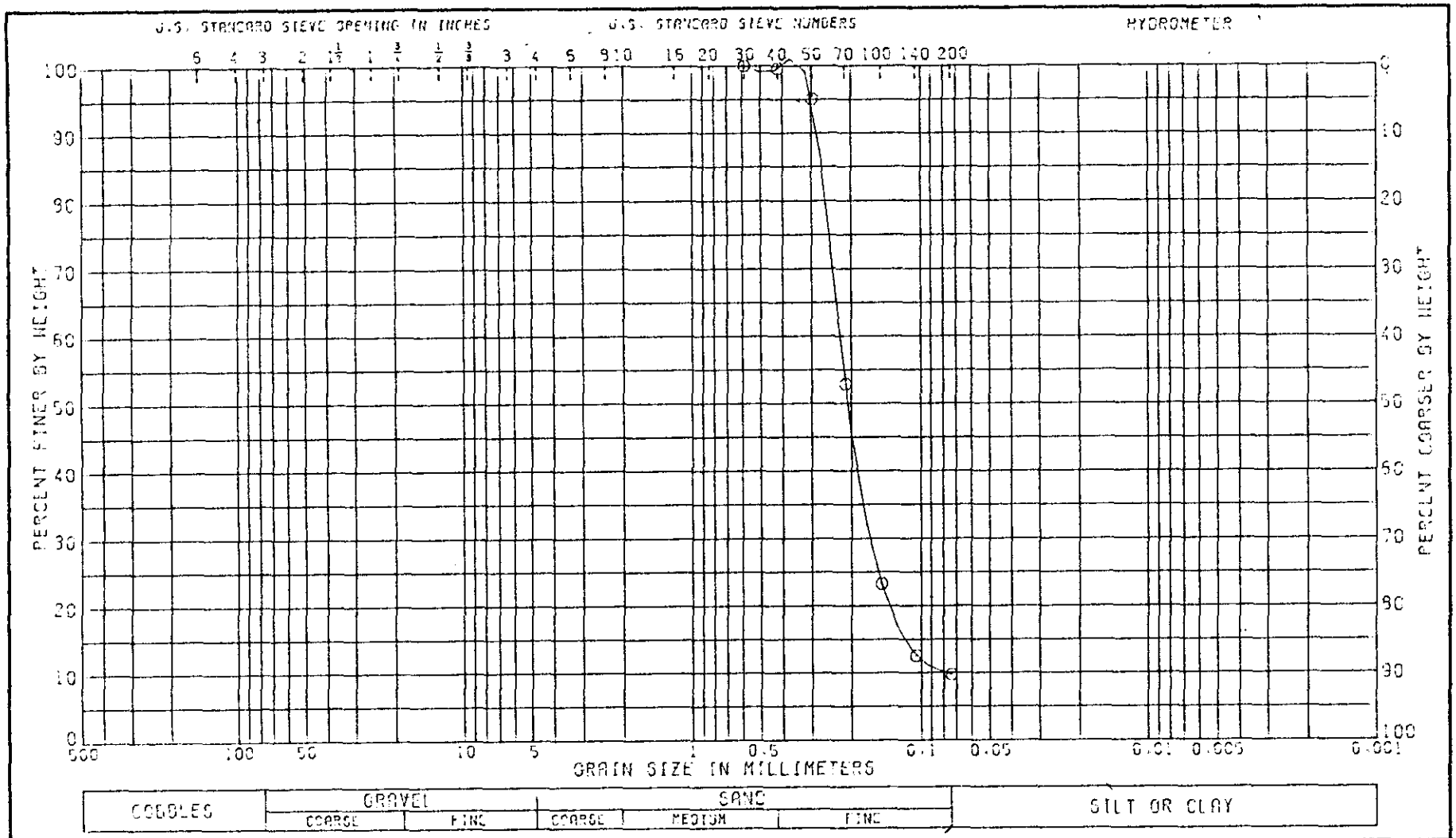
CLAYEY SAND (SC), REDDISH BROWN

GRADATION CURVE

PROJECT CRANE NESC OLD BURNING GROUND

BORING NO. 5-3-91 SAMPLE NO. 1

DEPTH/ELEV 0.0-1.75 DATE 11 FEB 92



LL	PL	PI	CC	NAT W.%
NP				10.4

CLASSIFICATION

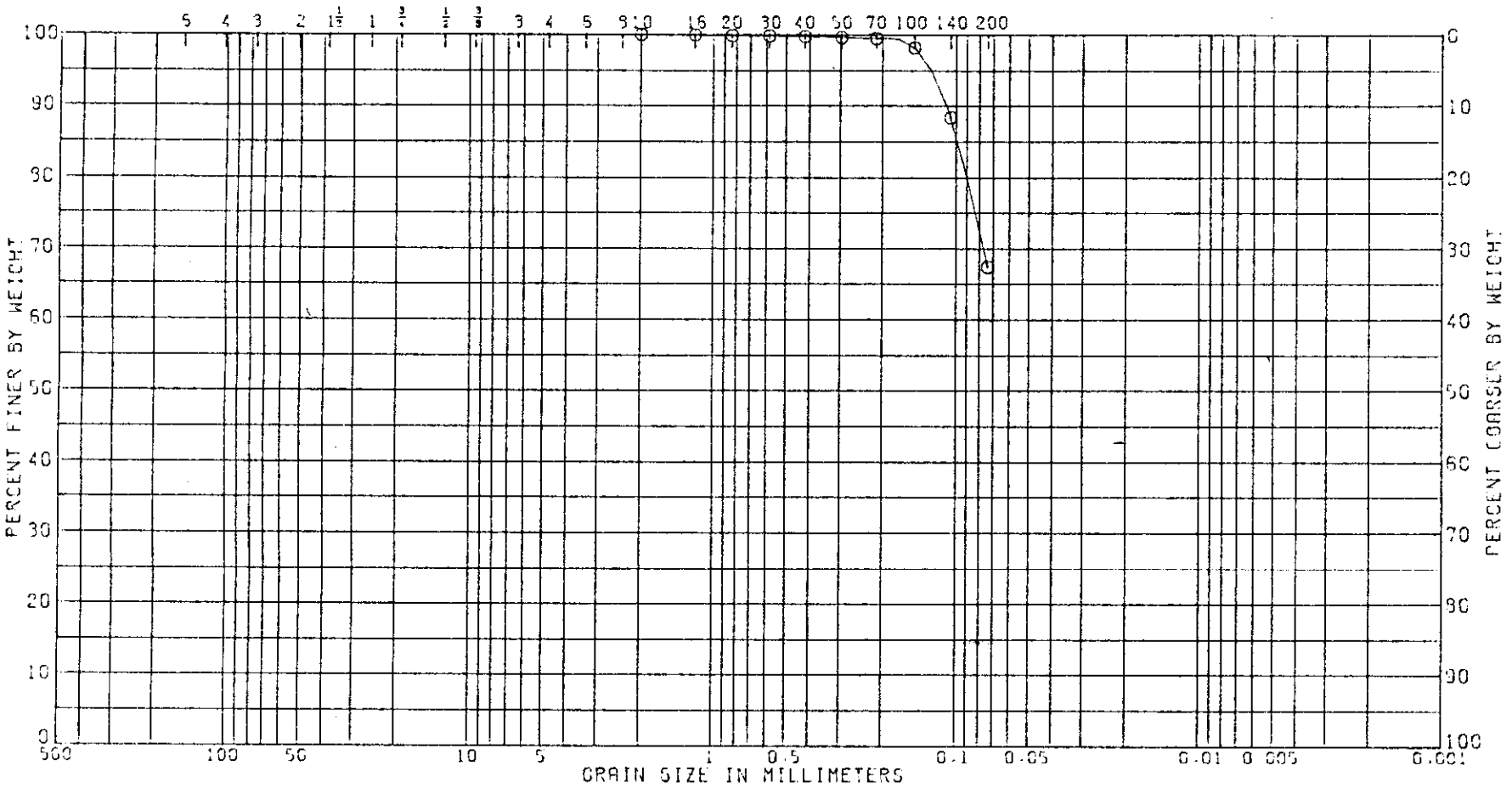
SILTY SAND (SP-SM), REDDISH BROWN

GRADATION CURVE

PROJECT CRANE NLSC OLD BURNING GROUND

BORING NO. 5-3--91 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.76 DATE 11 FEB 92



LL	PL	PI	GS	NAT W.%
24	19	5		21.7

CLASSIFICATION

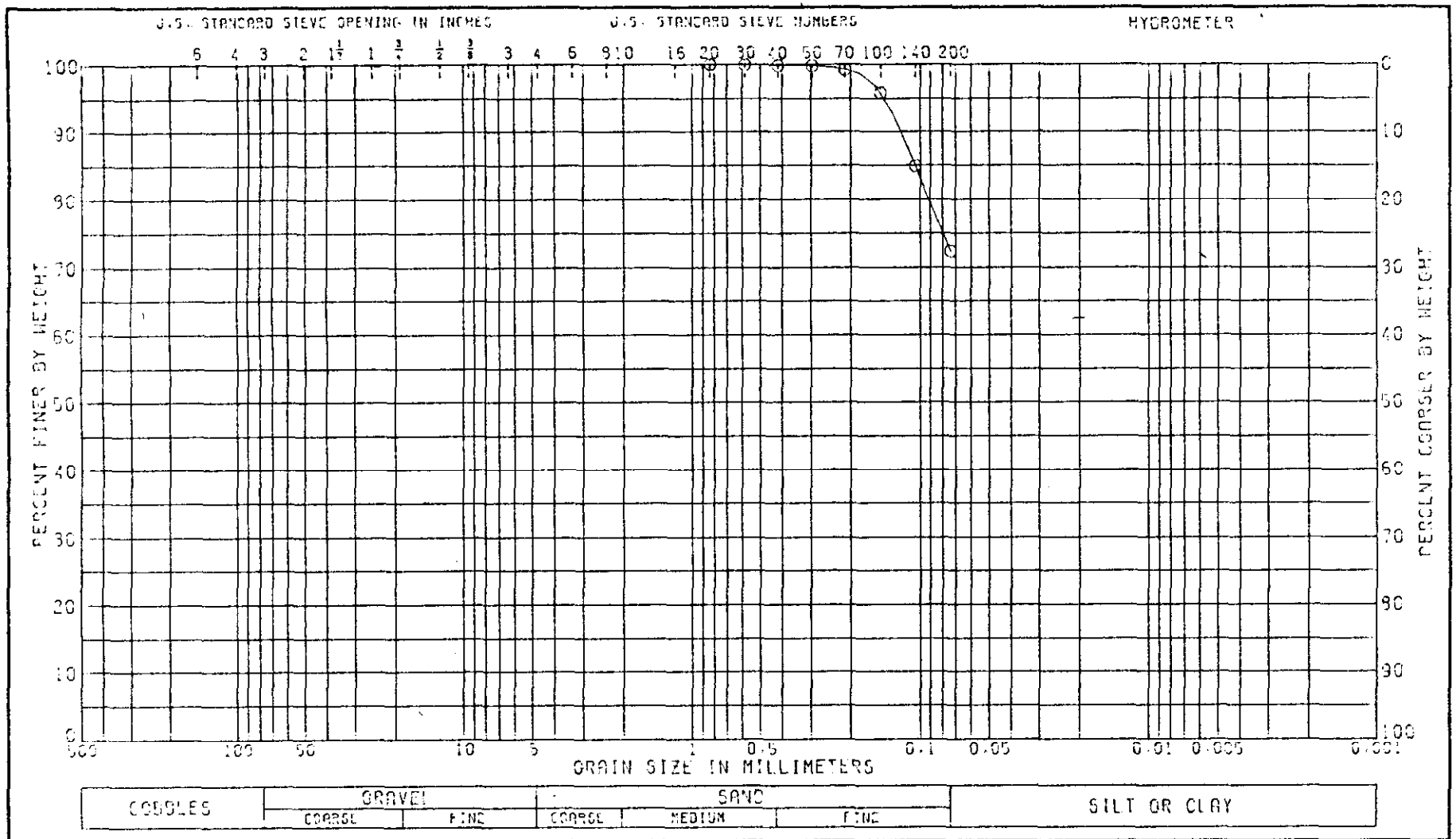
SANDY SILTY CLAY (CL-ML), BROWN

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO. 5-3-81 SAMPLE NO. 3

DEPTH/ELEV 10.0-11.95 DATE 31 MAR 82



LL	PL	PI	GS	NAT W.%
25	16	9		24.4

CLASSIFICATION

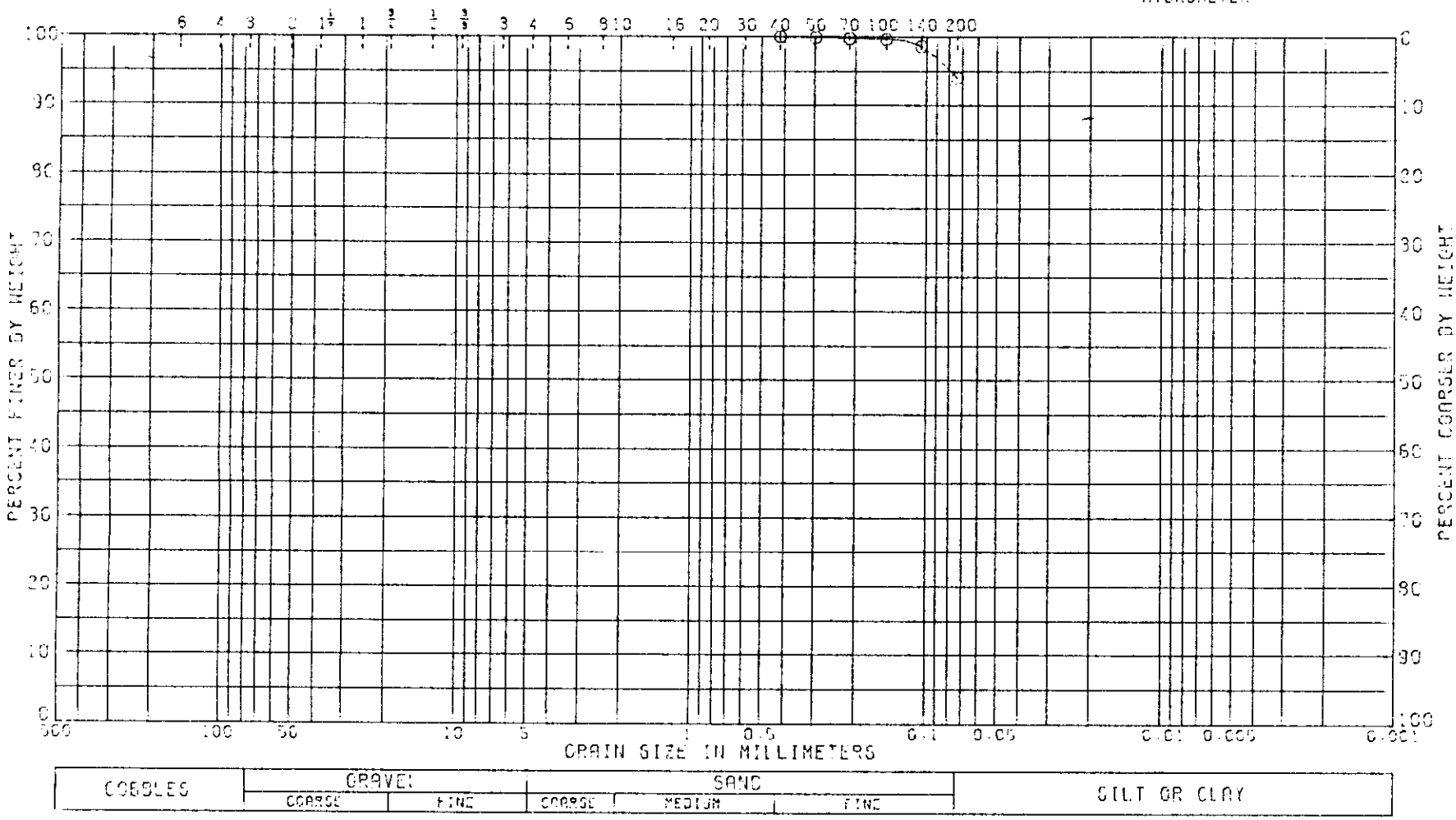
SANDY CLAY (CL), BROWN

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO. 5-3-91 SAMPLE NO. 4

DEPTH/ELEV 15.0-17.15 DATE 11 FEB 92



LL 31	PL 20	PI 11	CS	NAT W.C. 28.9

CLASSIFICATION

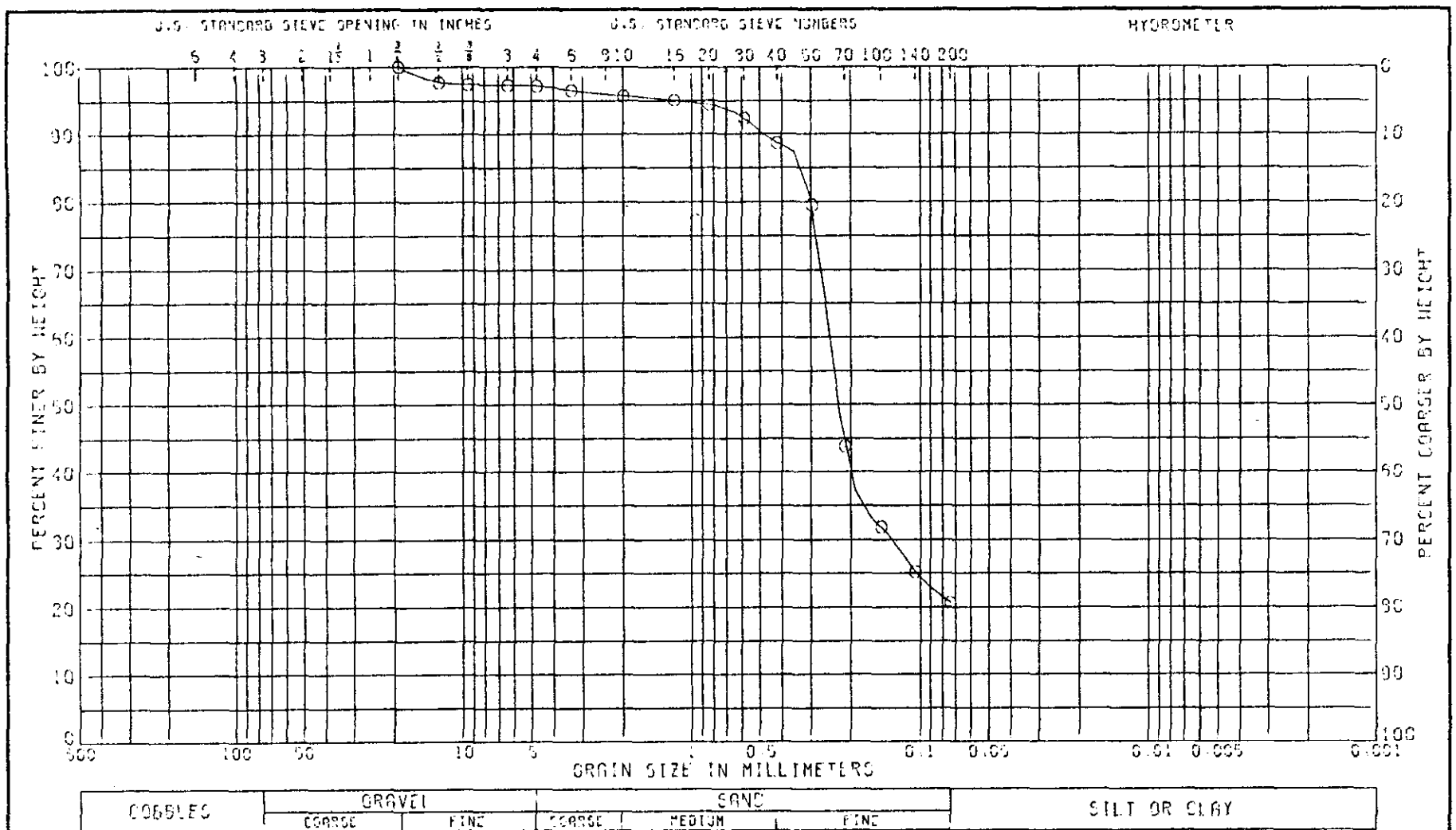
CLAY (CL), BROWN: WITH SAND

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO. 5-3-81 SAMPLE NO. 5

DEPTH/ELEV 20.0-21.39 DATE 12 MAR 82



LL	PL	PI	CS	NAT W.%
NP				7.6

CLASSIFICATION

SILTY SAND (SM), LIGHT BROWN

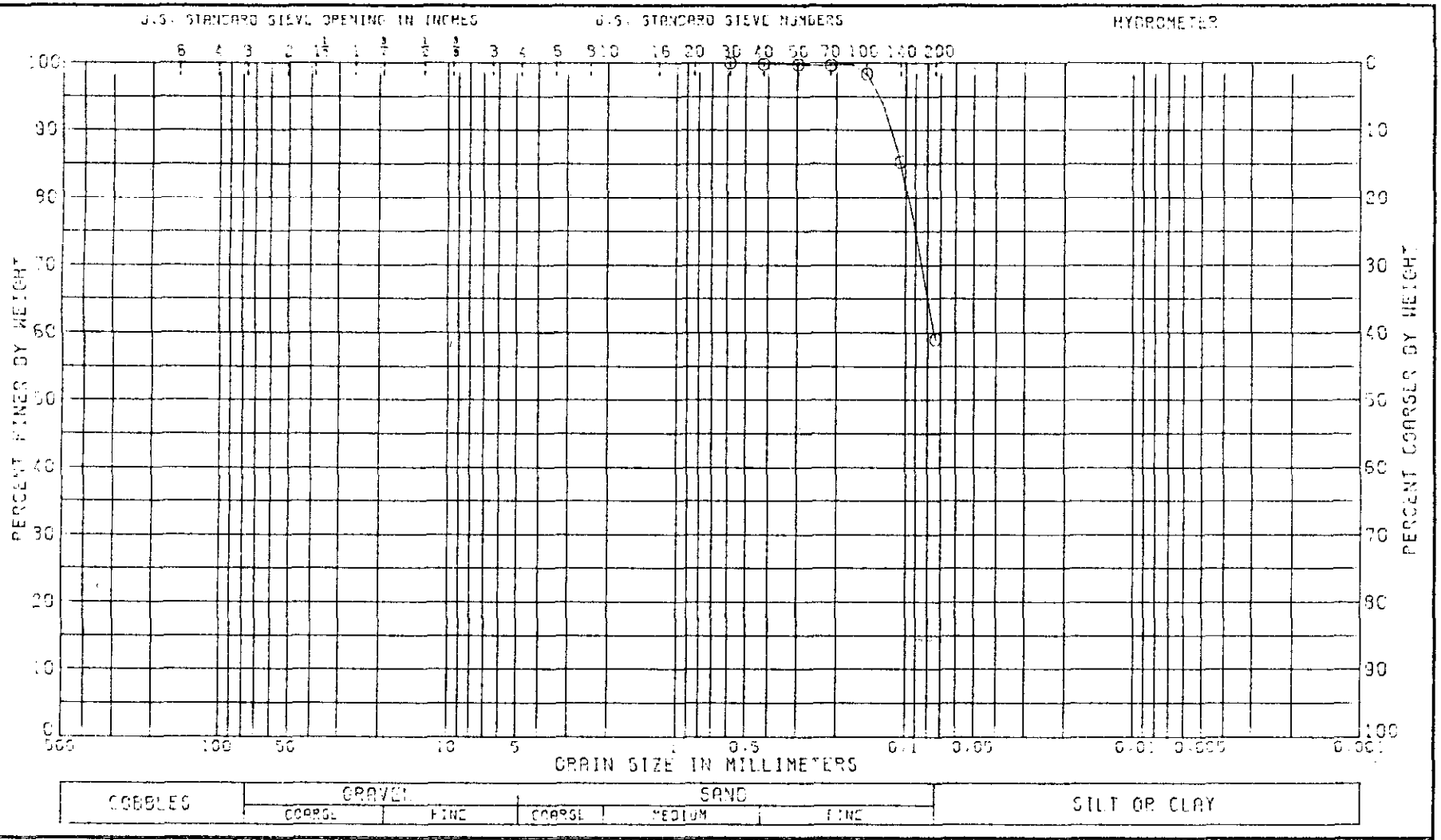
GRADATION CURVE

PROJECT CRANE NWSC

OLD BURNING GROUND

BORING NO 5-4-81 SAMPLE NO 1

DEPTH/ELEV 0.0-2.04 DATE 26 FEB 82



LL	PL	PI	GS	NAT W.% 16.9	

CLASSIFICATION

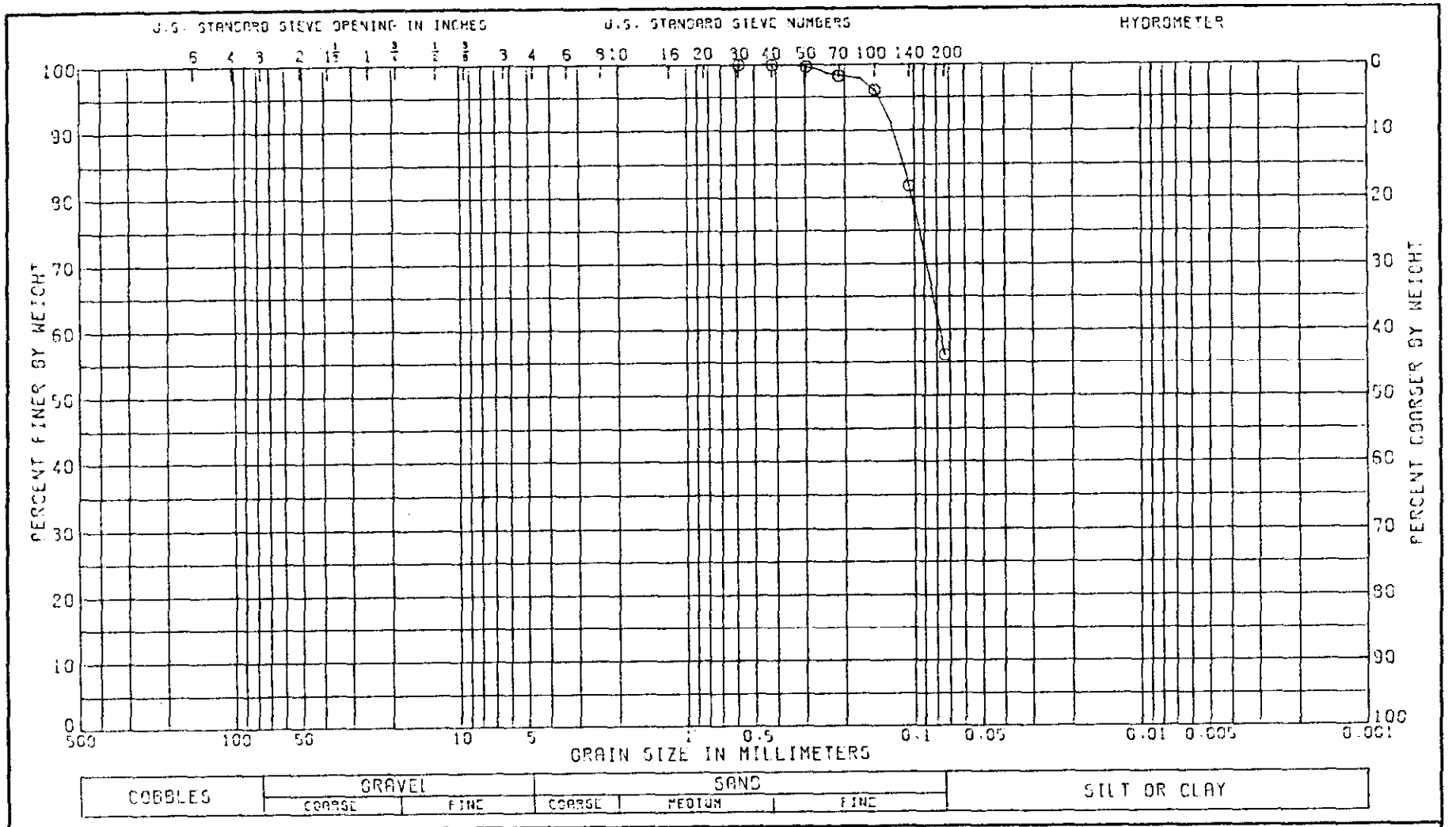
SANDY SILT (ML), BROWN

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO 5-4-81 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.78 DATE 12 MAR 82



LL	PL	PI	CS	NAT W.%
21	14	7		23.7

CLASSIFICATION

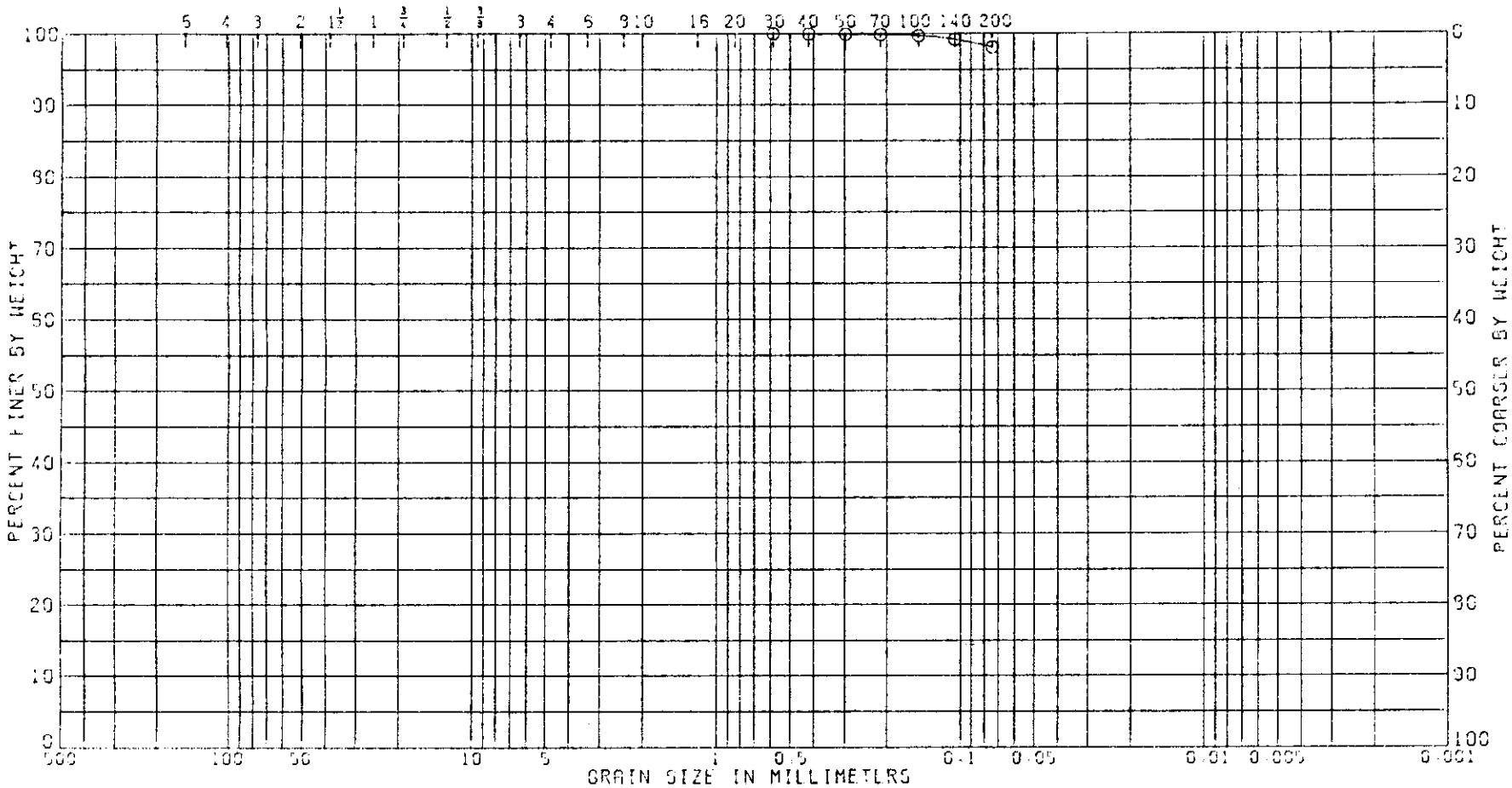
SANDY CLAY (CL) BROWN

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO. 5-4-81 SAMPLE NO. 3A

DEPTH/ELEV 10.0-12.0 DATE 31 MAR 82



LL	PL	PI	CS	NAT W.%
31	19	12		33.1

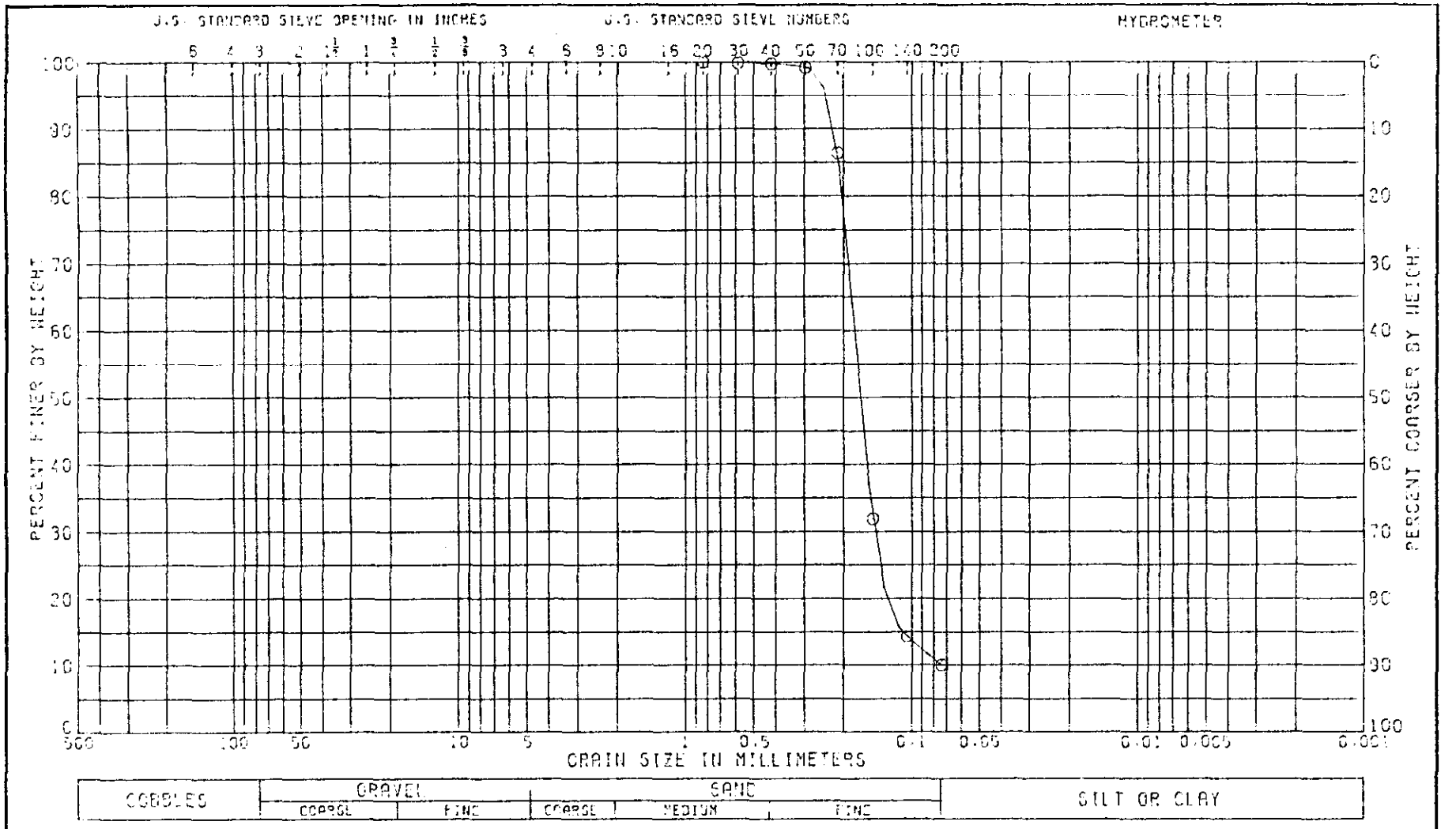
CLASSIFICATION
CLAY (CL), BROWN

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO. 5-4-91 SAMPLE NO. 5B

DEPTH/ELEV 22.5-23.0 DATE 31 MAR 82



LL	PL	PI	OS	NAT W.%
28	18	10		24.6

CLASSIFICATION

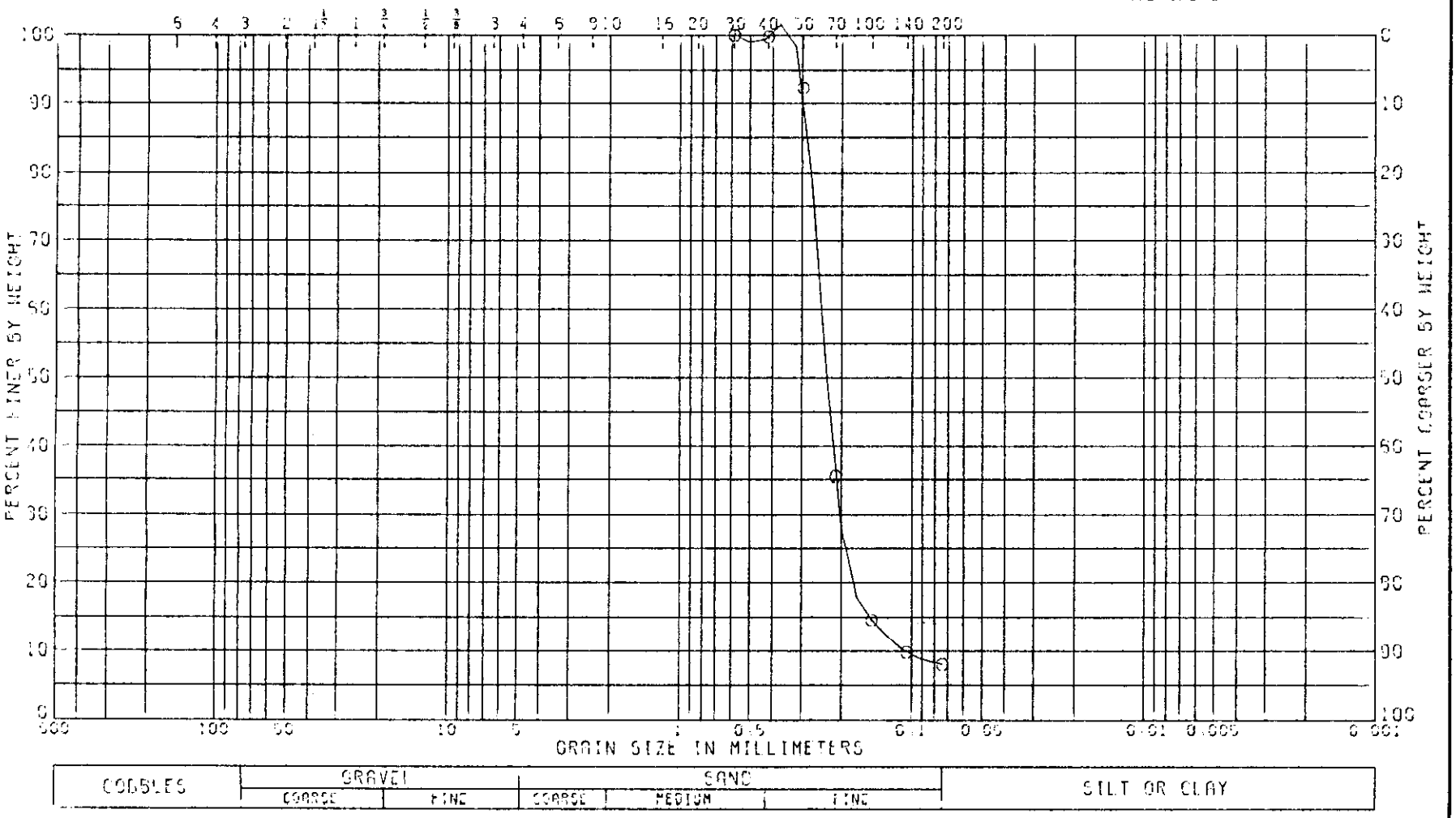
CLAYEY SAND (SP-SC), BROWN

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO 5-4-81 SAMPLE NO. 6

DEPTH/ELEV 25.0-27.18 DATE 12 MAR 82



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

LL NP	PL	PI	GS	NAT W.% 6.0	

CLASSIFICATION

SILTY SAND (SP-SM), REDDISH BROWN

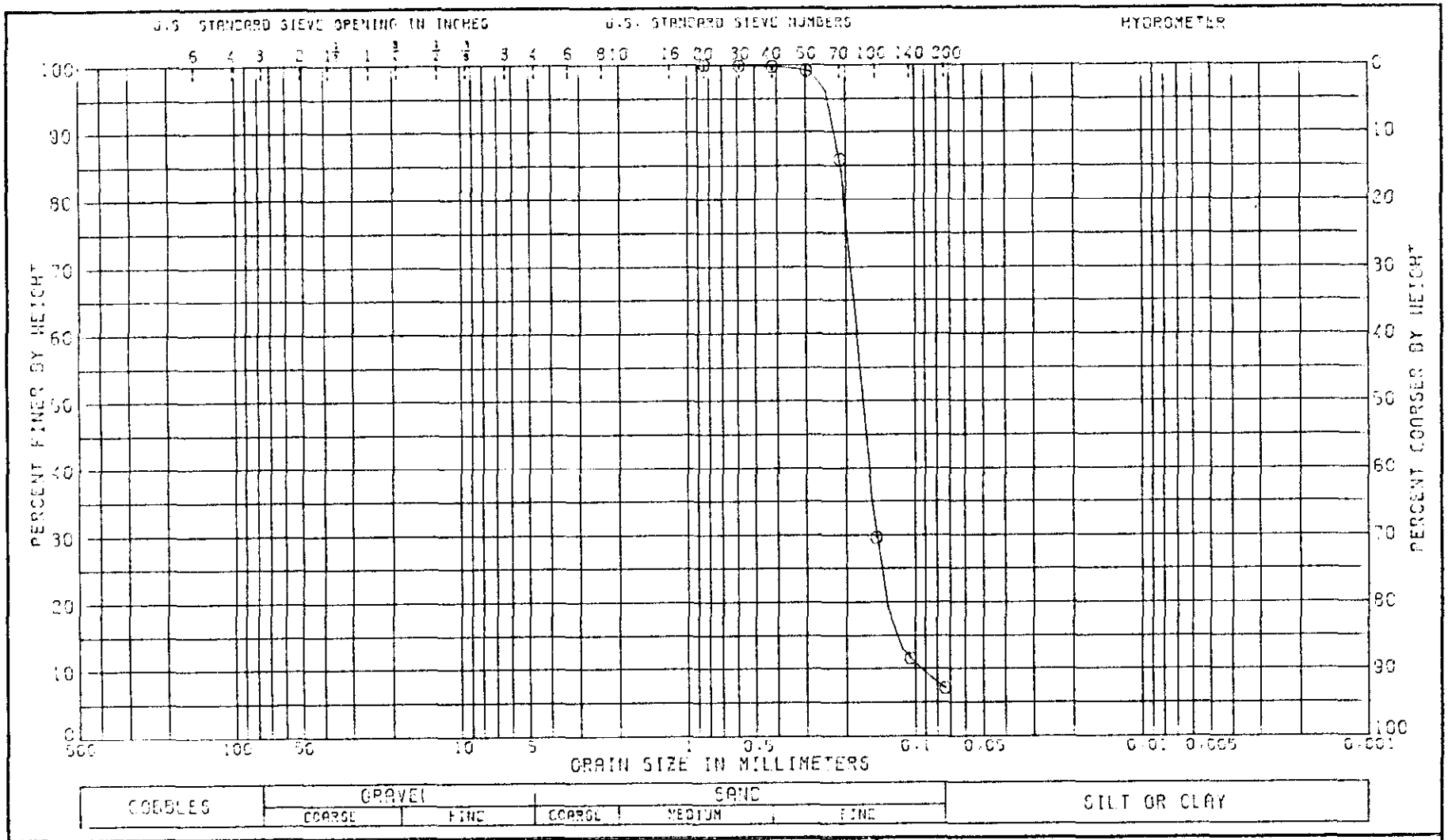
GRADATION CURVE

PROJECT CRANE NWSC

OLD BURNING GROUND

BORING NO 5-5-81 SAMPLE NO 1

DEPTH/ELEV 0.0-2.12 DATE 25 FEB 82



LL	PL	PI	GS	NAT W.%	
NP				7.4	

CLASSIFICATION

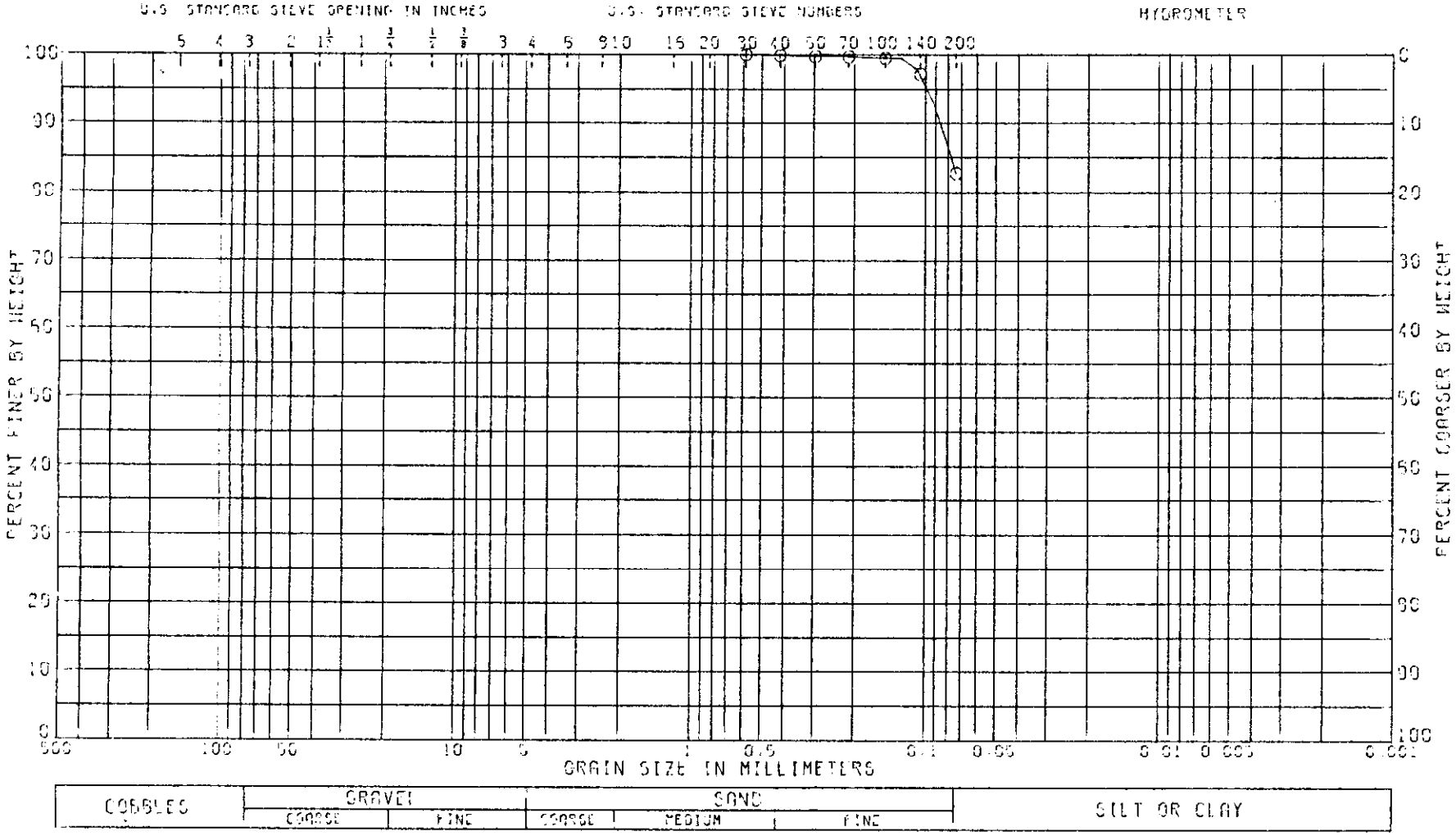
SILTY SAND (SP-SM), BROWN

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO 5-5-81 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.81 DATE 12 MAR 82



LL	PL	PI	GS	NAT W.%	
23	20	3		25.0	

CLASSIFICATION

SANDY SILT (ML), BROWN

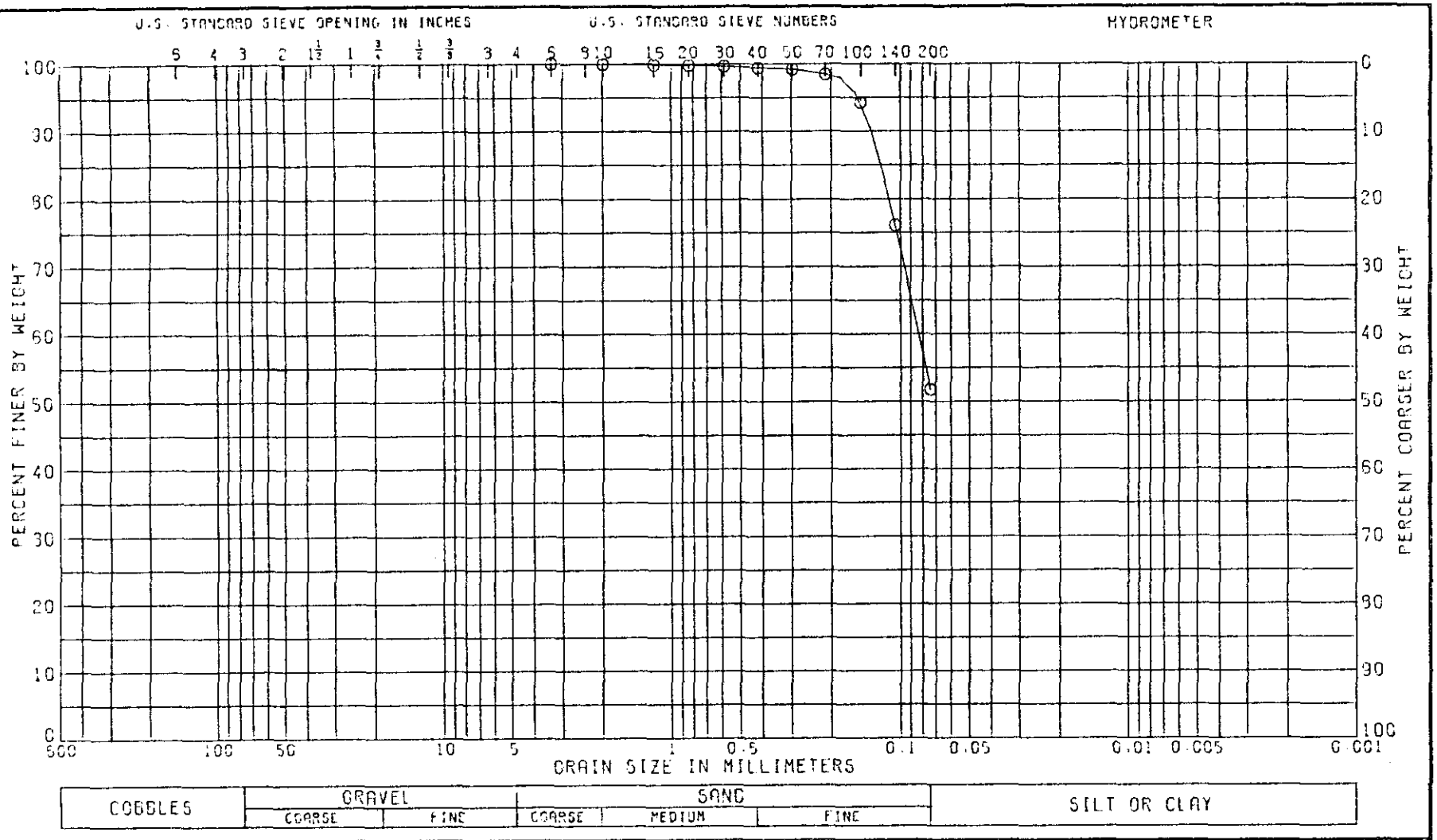
GRADATION CURVE

PROJECT CRANE NWSC

OLD BURNING GROUND

BORING NO 5-5-91 SAMPLE NO 3

DEPTH/ELEV 10.5-12.02 DATE 26 FEB 92



LL	PL	PI	GS	NAT W.%	
NP				20.6	

CLASSIFICATION

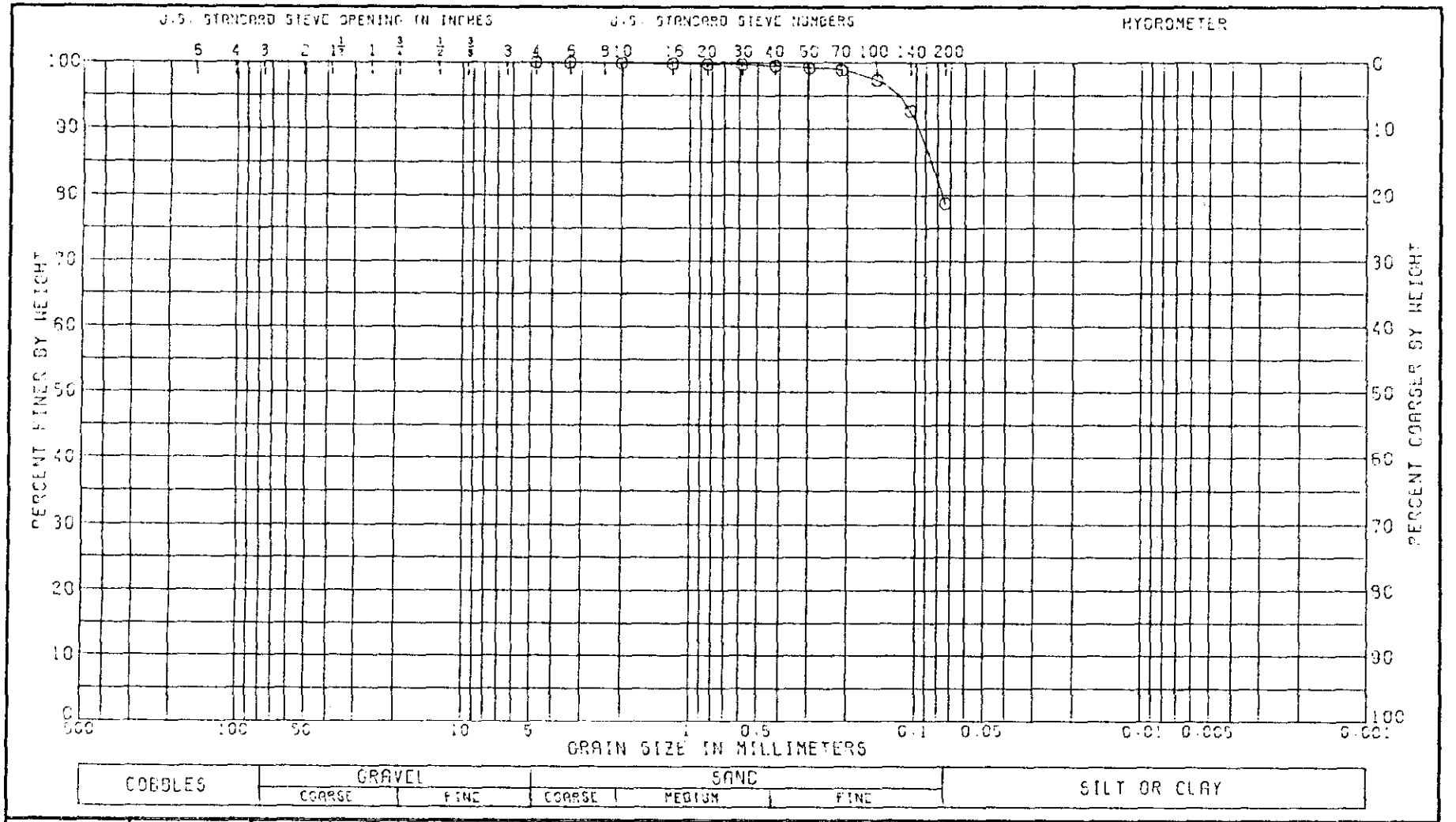
SANDY SILT (ML), BROWN

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO. 5-5-81 SAMPLE NO. 4

DEPTH/ELEV 15.0-16.85 DATE 12 MAR 82



LL	PL	PI	OS	NAT W.%	
24	19	5		25.3	

CLASSIFICATION

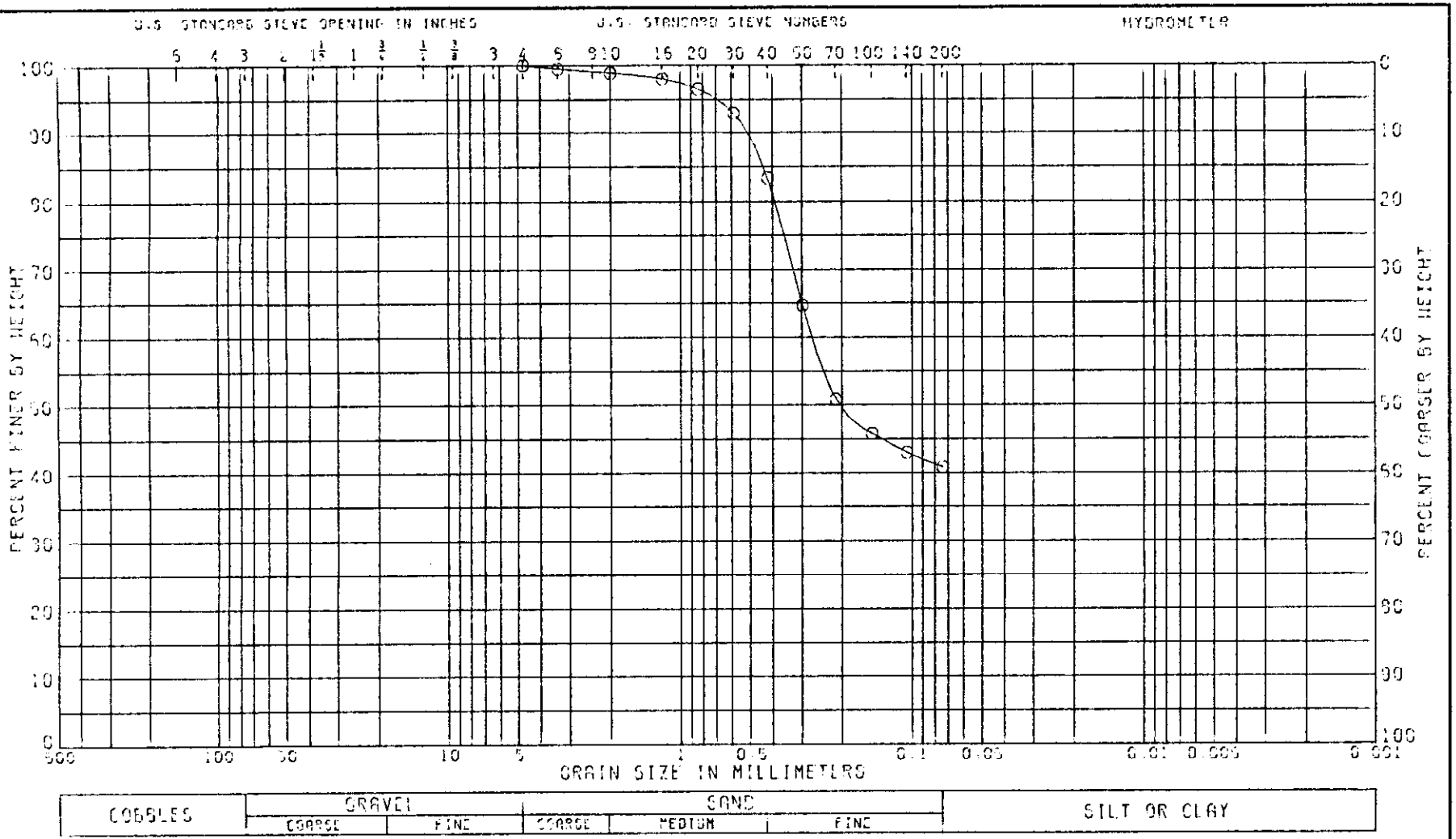
SANDY SILTY CLAY (CL-ML), BROWN

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO. 5-5-81 SAMPLE NO. 5

DEPTH/ELEV 20.4-22.15 DATE 12 MAR 82



LL	PL	PI	GS	NAT W.%
34	14	20		14.3

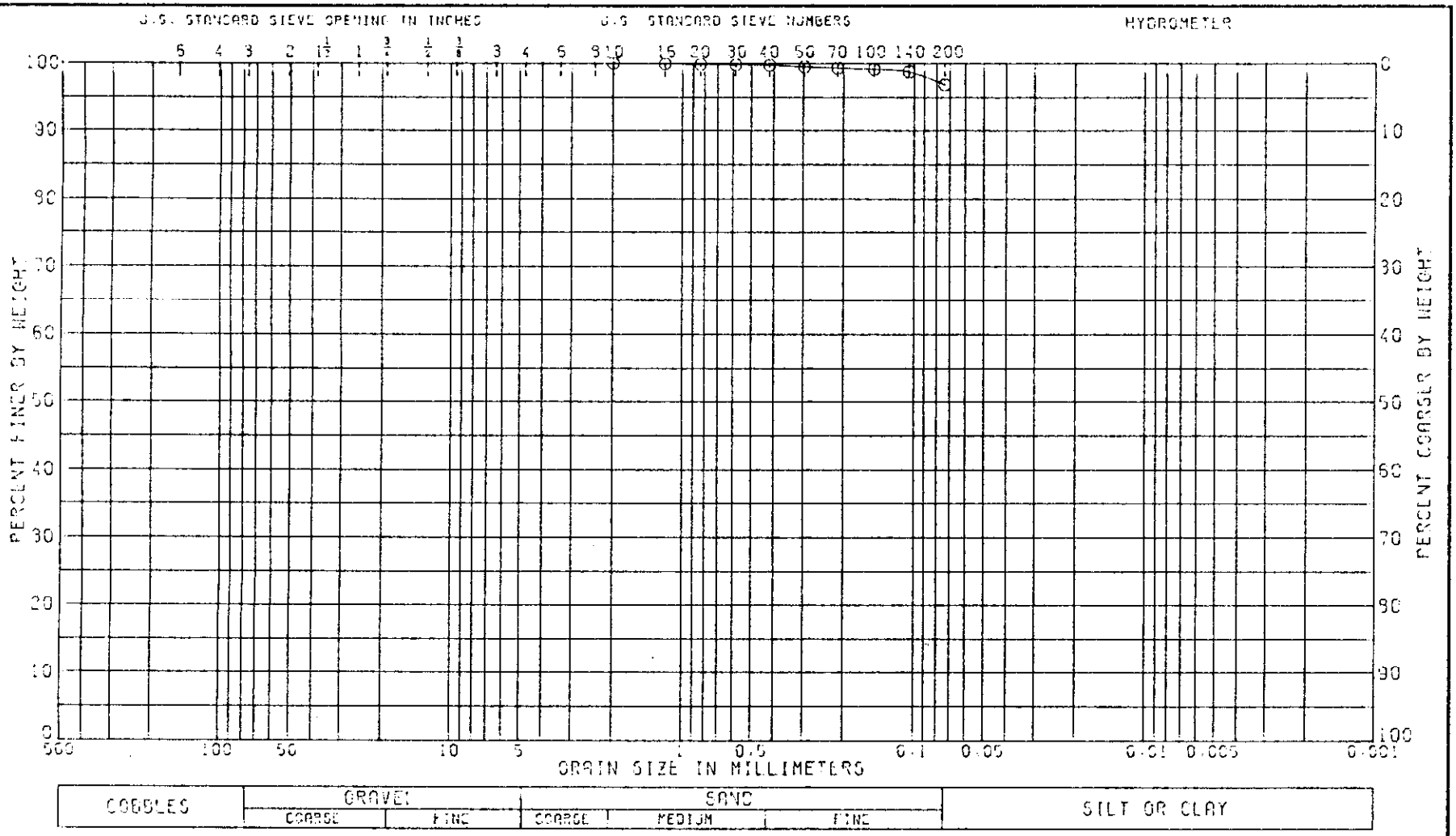
CLASSIFICATION
CLAYEY SAND (SC), REDDISH BROWN

GRADATION CURVE

PROJECT CRANE NWSC
OLD BURNING GROUND

BORING NO 5-6-81 SAMPLE NO 1

DEPTH/ELEV 0.0-2.03 DATE 26 FEB 82



LL	PL	PI	OS	NAT W.%
31	19	12		17.8

CLASSIFICATION

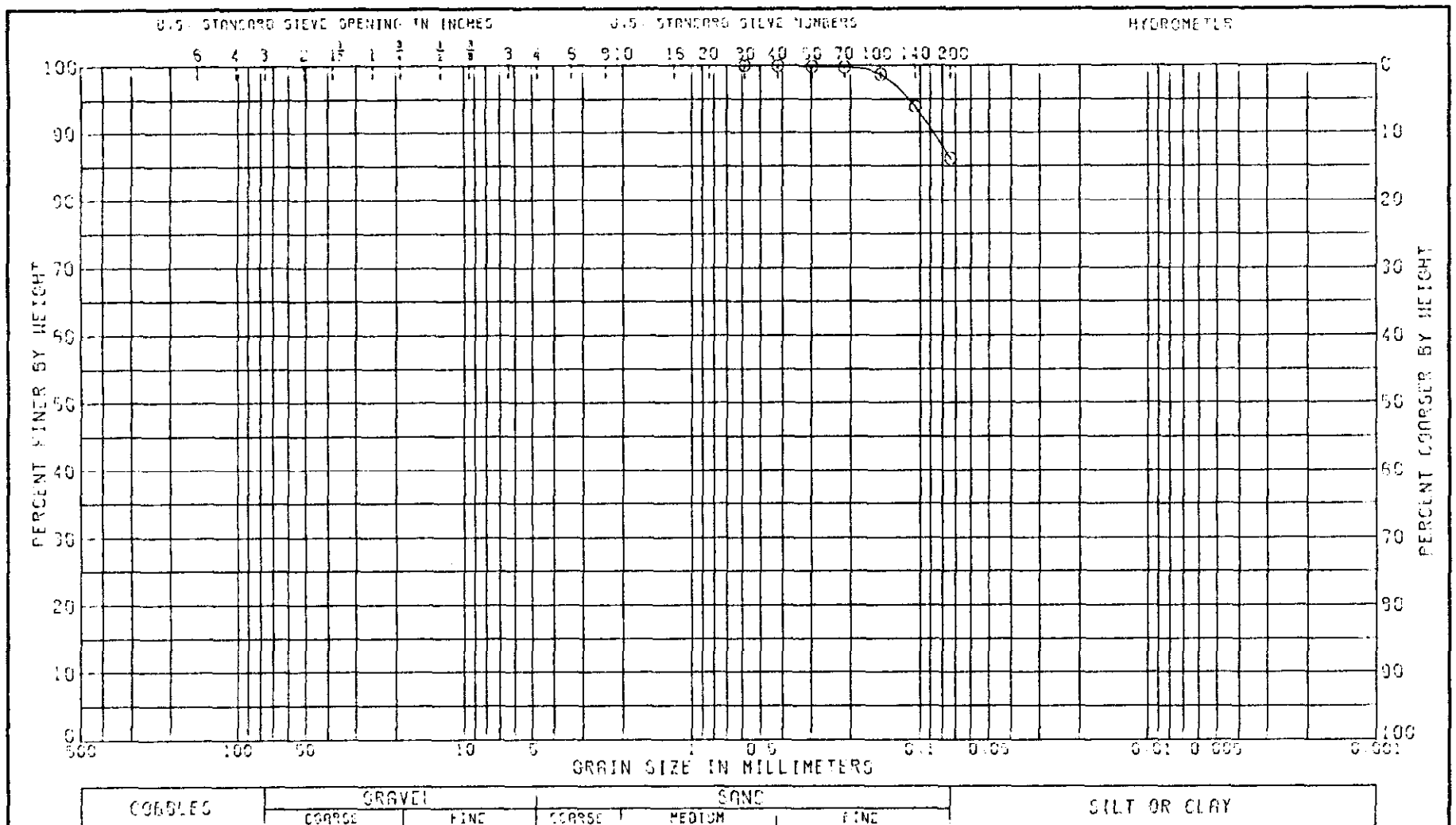
CLAY (CL), BROWN: TRACE OF SAND

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO. 5-6-81 SAMPLE NO. 2

DEPTH/ELEV 5.0-7.17 DATE 11 FEB 82



LL	PL	PI	CC	NAT W.%
28	19	9		23.6

CLASSIFICATION

SANDY CLAY (CL), BROWN

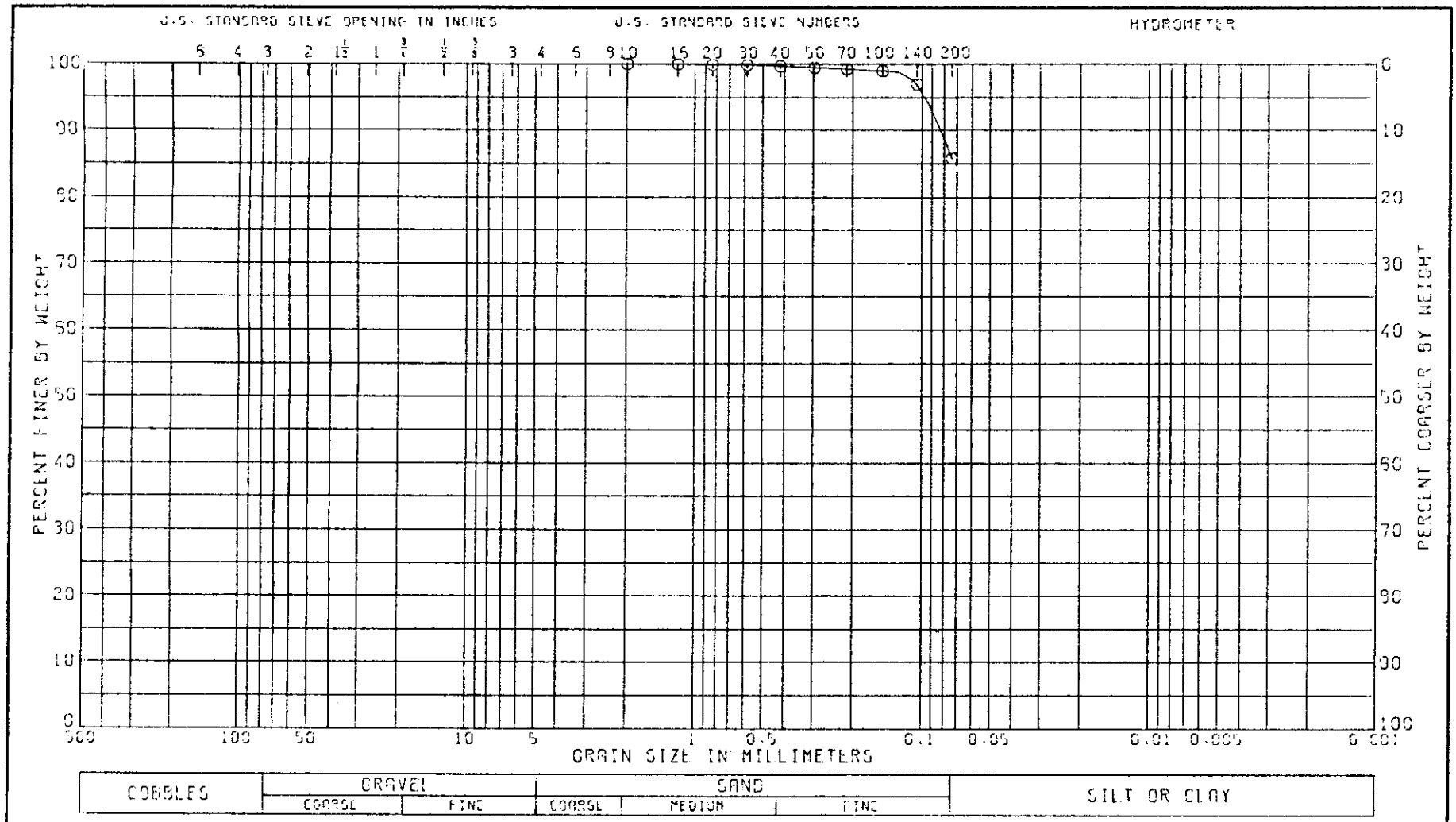
GRADATION CURVE

PROJECT CRANE NWSC

OLD BURNING GROUND

BORING NO 5-6-81 SAMPLE NO 3

DEPTH/ELEV 10.0-12.00 DATE 25 FEB 82



LL	PL	PI	CS	NAT W.%
24	16	8		23.8

CLASSIFICATION

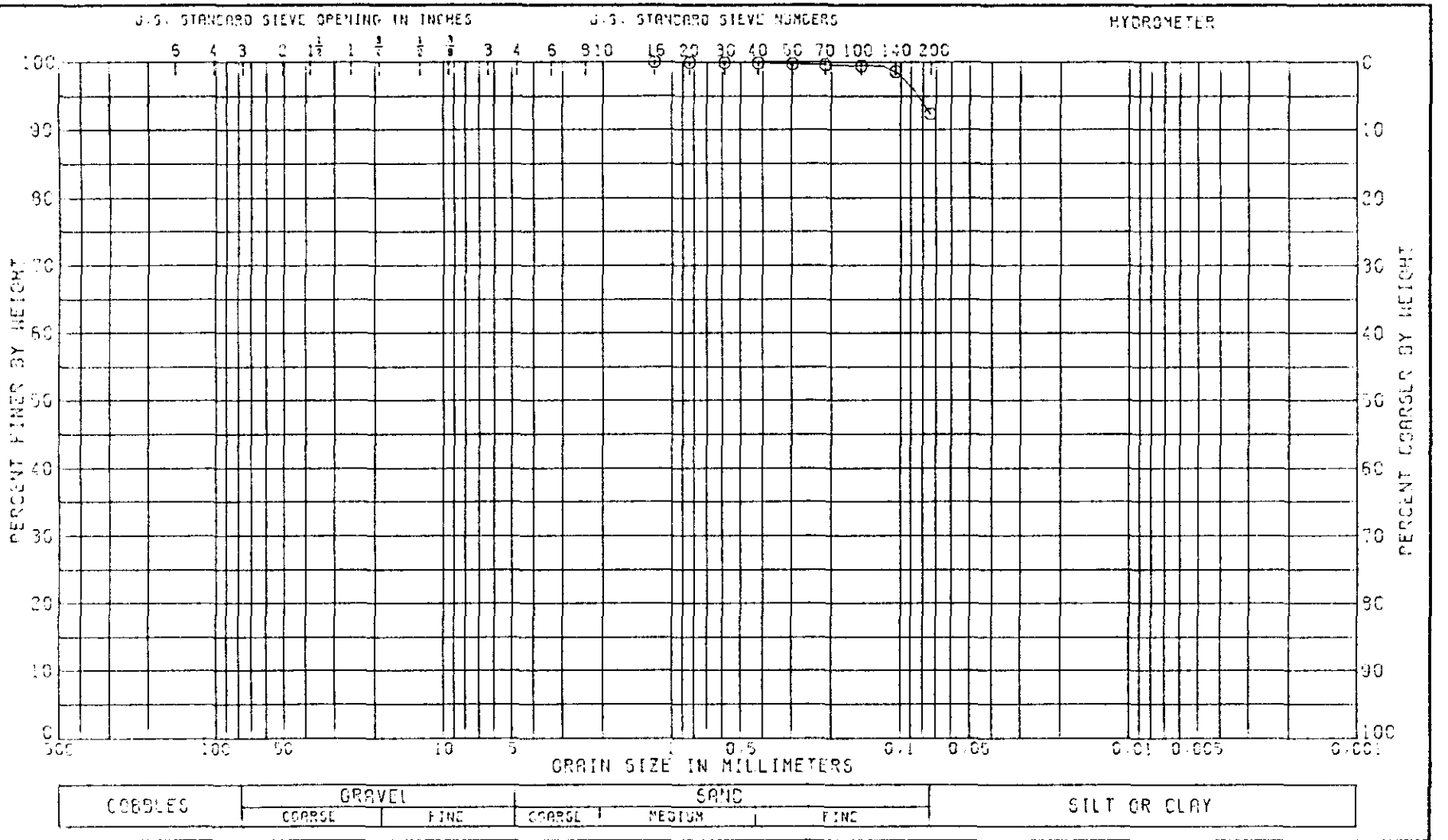
SANDY CLAY (CL), GRAY

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO. 5-6-81 SAMPLE NO 4

DEPTH/ELEV 15.0-17.15 DATE 31 MAR 82



LL	PL	PI	GS	NAT W.%
25	18	7		20.8

CLASSIFICATION

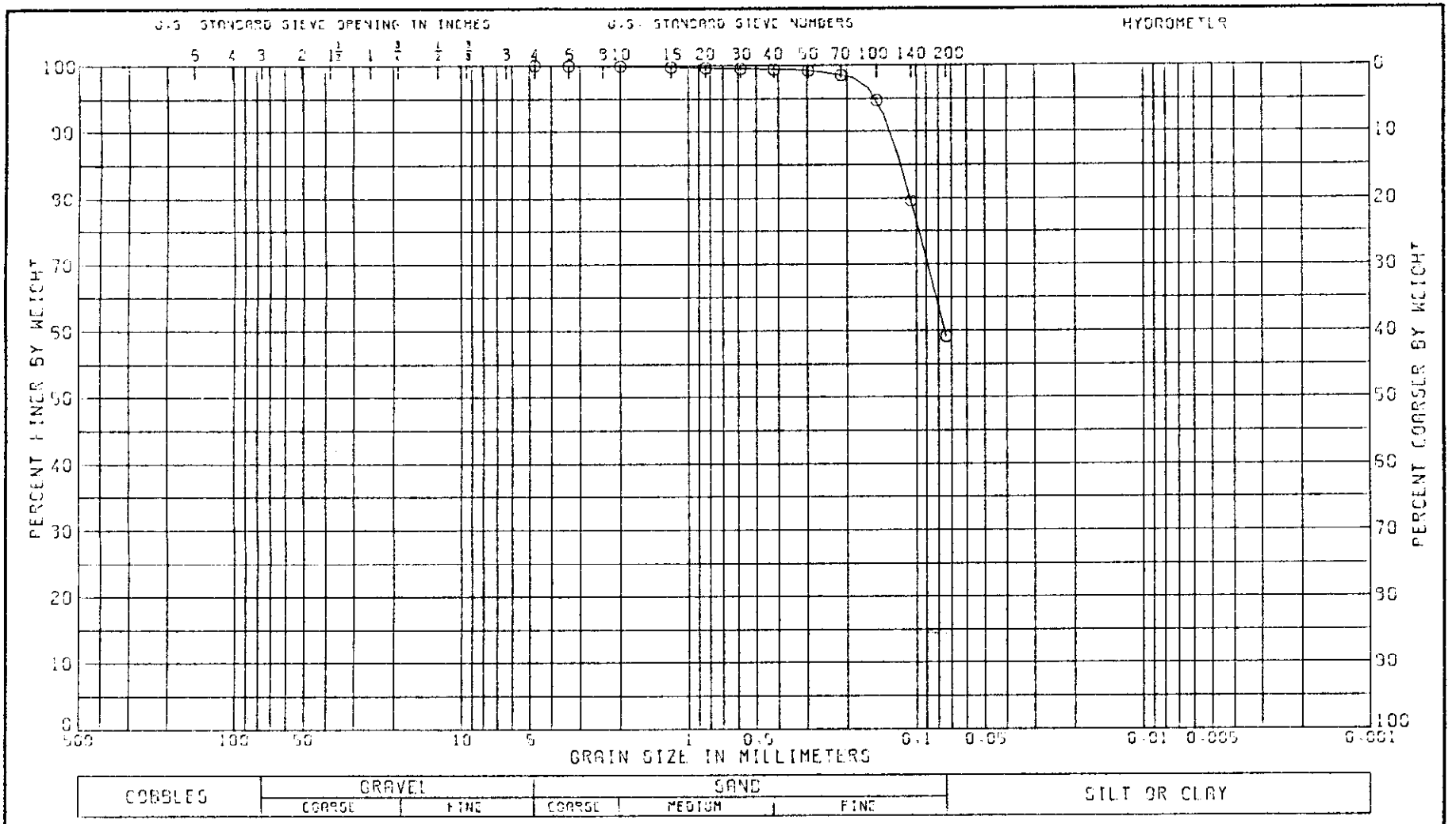
CLAY (CL). BROWN: WITH SAND

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO 5-6-81 SAMPLE NO 5

DEPTH/ELEV 20.0-21.10 DATE 12 MAR 82



LL	PL	PI	CS	NAT W.%	
19	15	4		25.8	

CLASSIFICATION

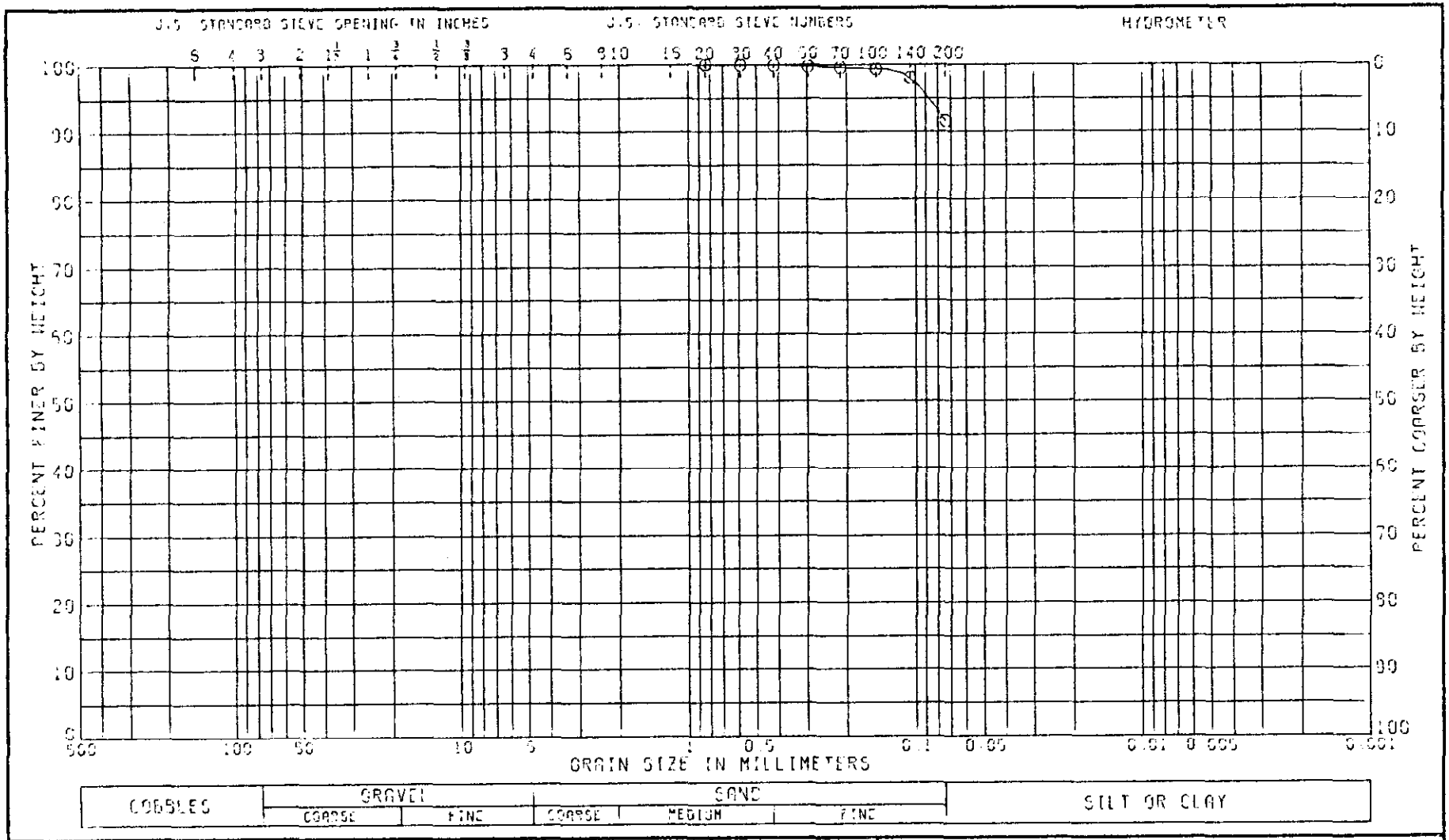
SANDY CLAYEY SILT (CL-ML), GRAY

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO. 5-6-91 SAMPLE NO. 7A

DEPTH/ELEV 30.0-33.5 DATE 31 MAR 92



LL	PL	PI	OS	NAT W.%
25	19	6		20.3

CLASSIFICATION

SILTY CLAY (CL-ML), BROWN: WITH SAND

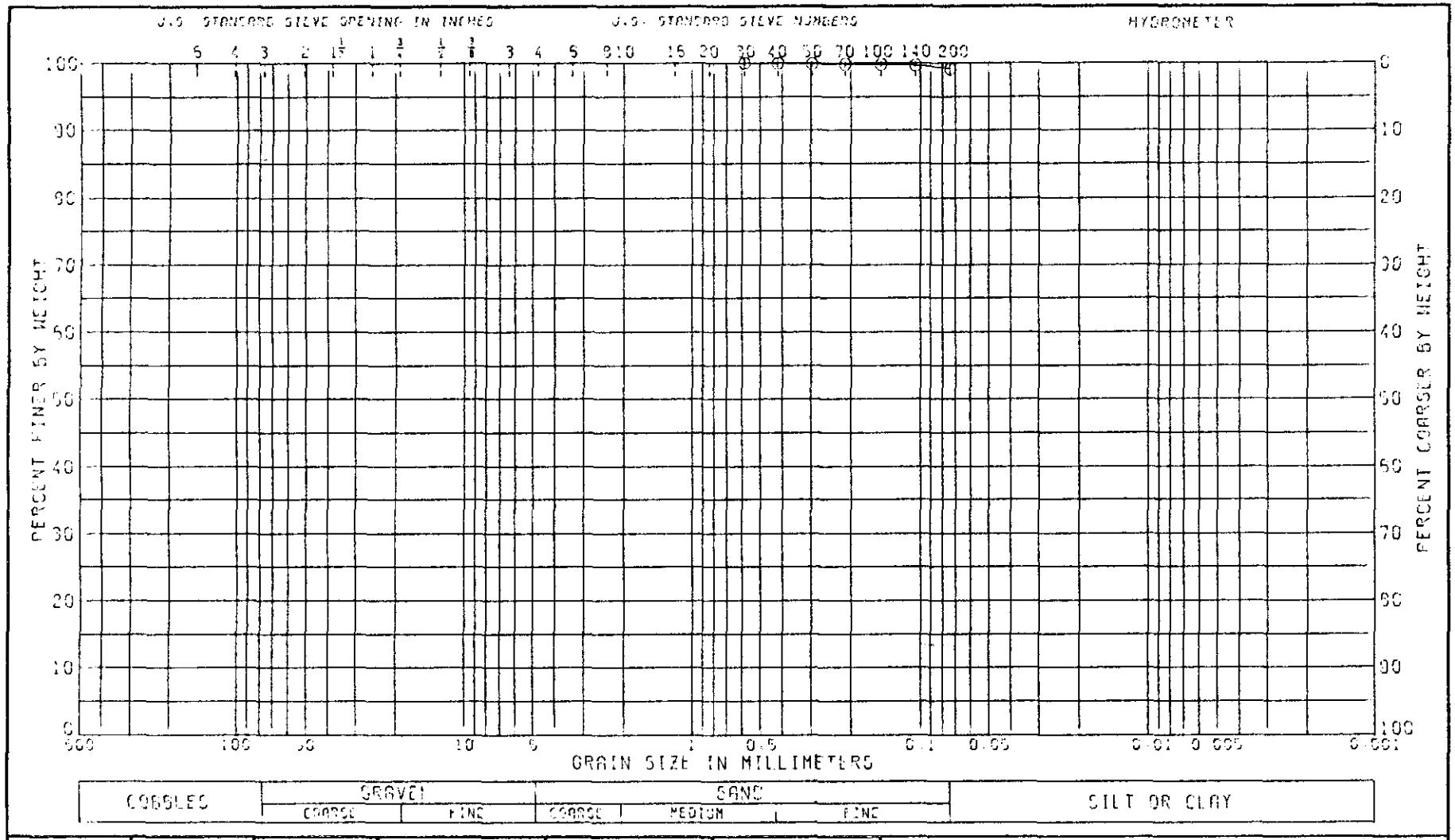
GRADATION CURVE

PROJECT CRANE NWSC

OLD BURNING GROUND

BORING NO. 5-7-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-1.99 DATE 26 FEB 82



LL 39	PL 20	PI 19	GS	NAT W.% 18.2	

CLASSIFICATION

CLAY (CL), BROWN

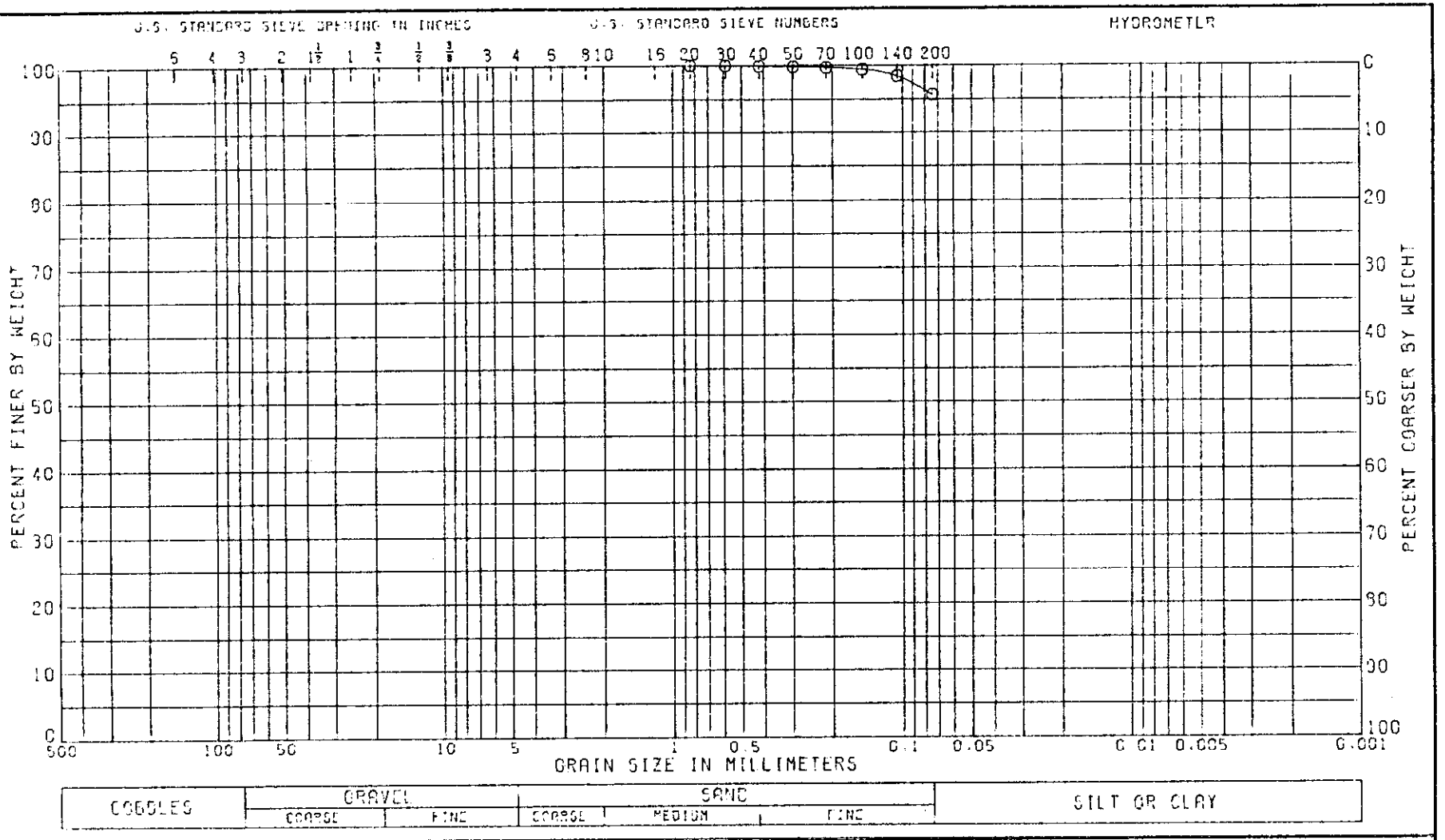
GRADATION CURVE

PROJECT CRONE NASC

OLD BURNING GROUND

BORING NO. 5-7-81 SAMPLE NO 2

DEPTH/ELEV 5.0-5.90 DATE 26 FEB 82



LL	PL	PI	GS	NAT W.%
29	21	8		21.9

CLASSIFICATION

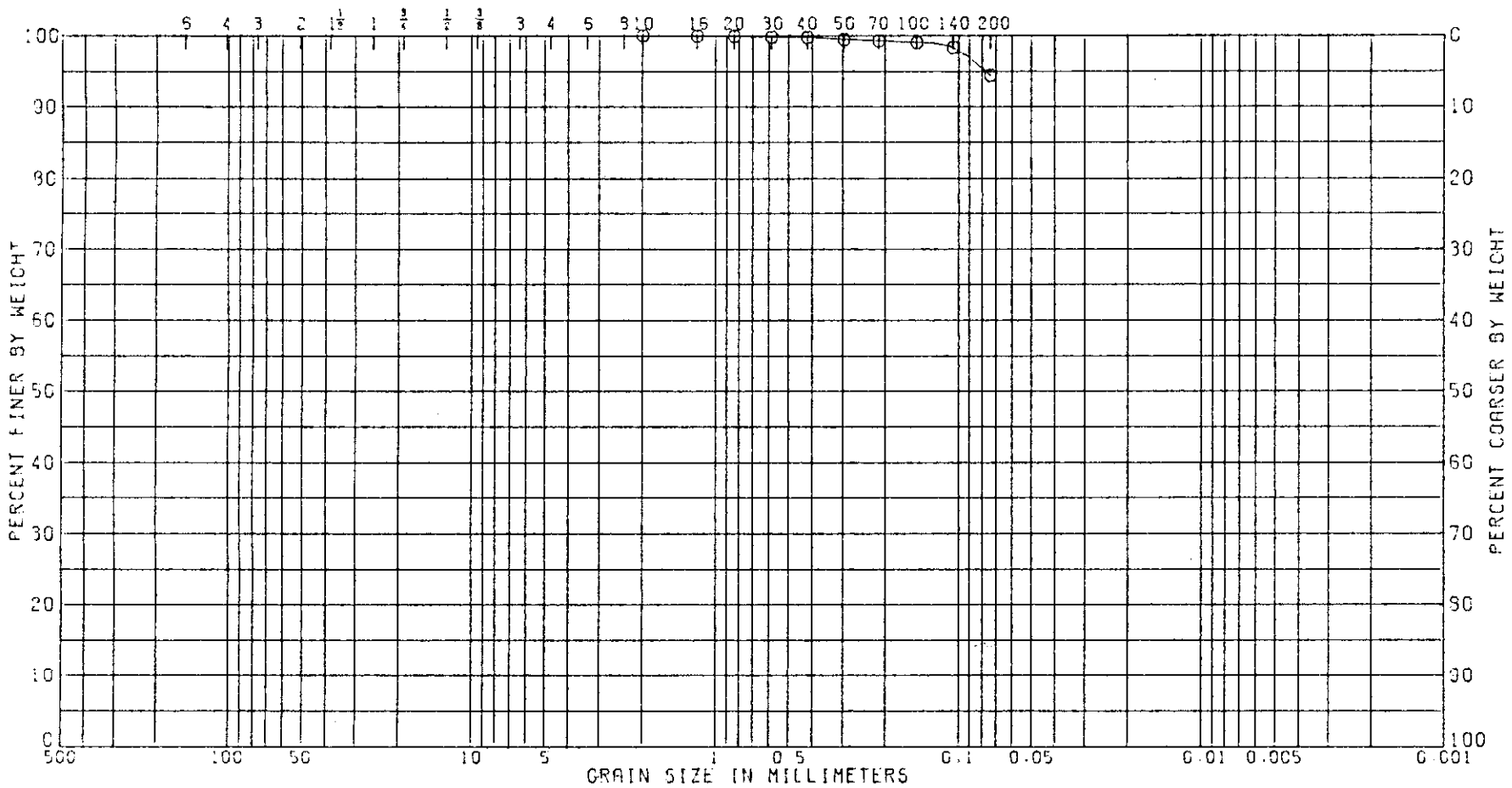
CLAY (CL), BROWN: TRACE OF SAND

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO. 5-7-81 SAMPLE NO. 3

DEPTH/ELEV 10.0-11.91 DATE 12 MAR 82



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

LL	PL	PI	GS	NAT W.%
24	19	5		23.8

CLASSIFICATION

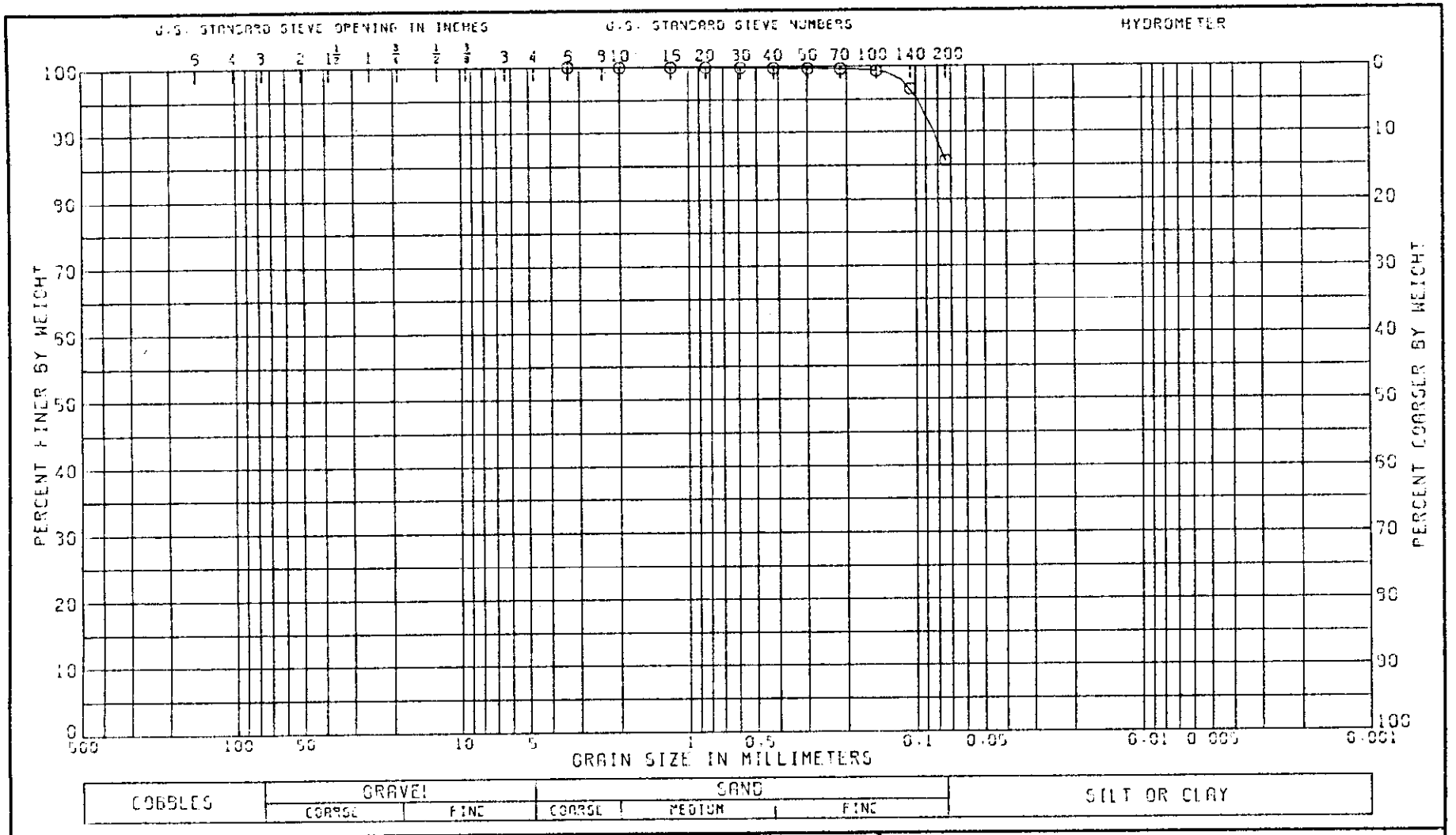
SILTY CLAY (CL-ML), GRAY: WITH SAND

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO. 5-7-81 SAMPLE NO. 4

DEPTH/ELEV 15.0-16.36 DATE 12 MAR 82



LL	PL	PI	CS	NAT W.%	
26	16	10		21.2	

CLASSIFICATION

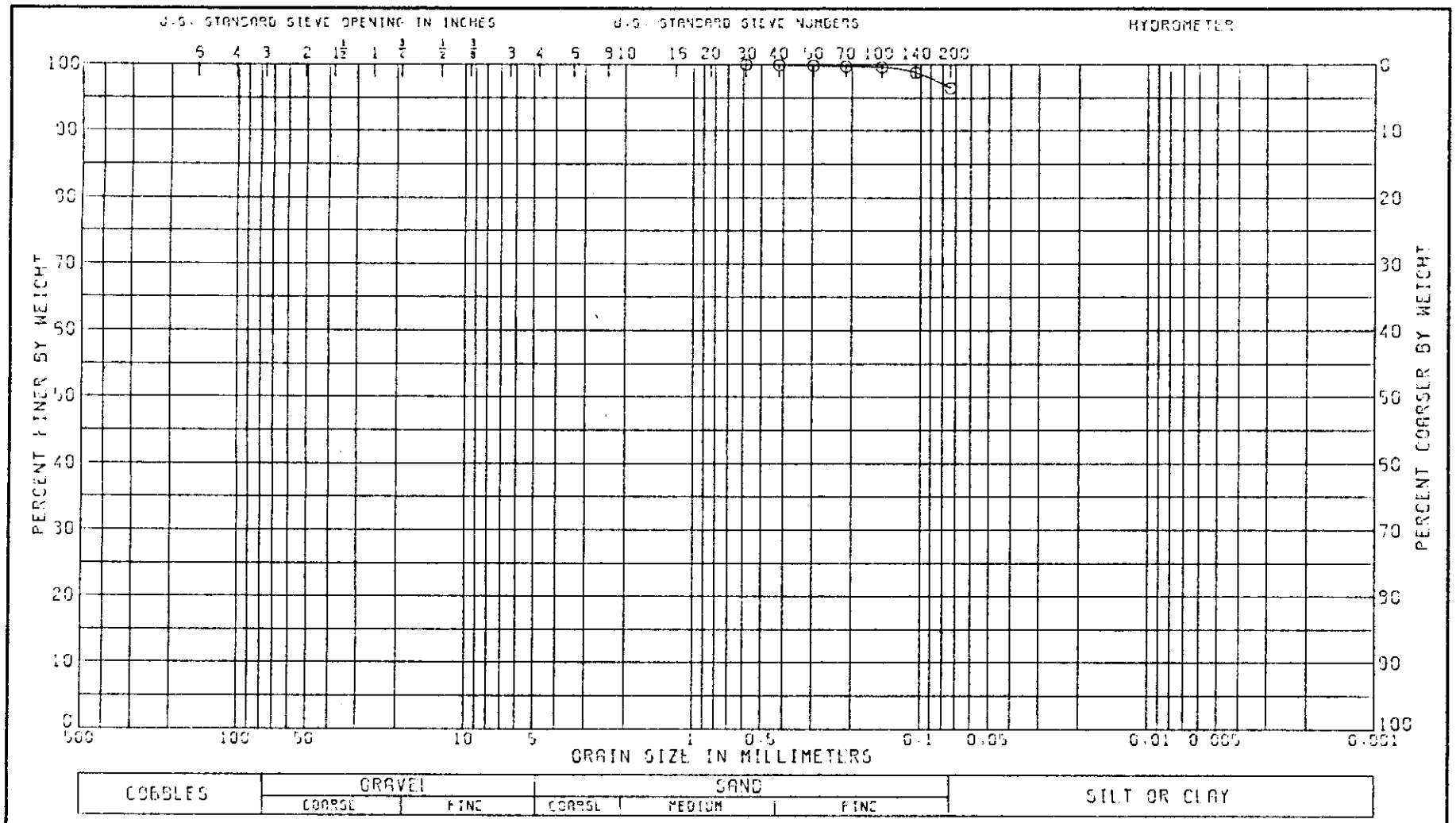
SANDY CLAY (CL), GRAY

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO. 5-7-91 SAMPLE NO. 6

DEPTH/ELEV 25.0-27.0S DATE 31 MAR 92



LL	PL	PI	CS	NAT W.C.	
NP				20.9	

CLASSIFICATION

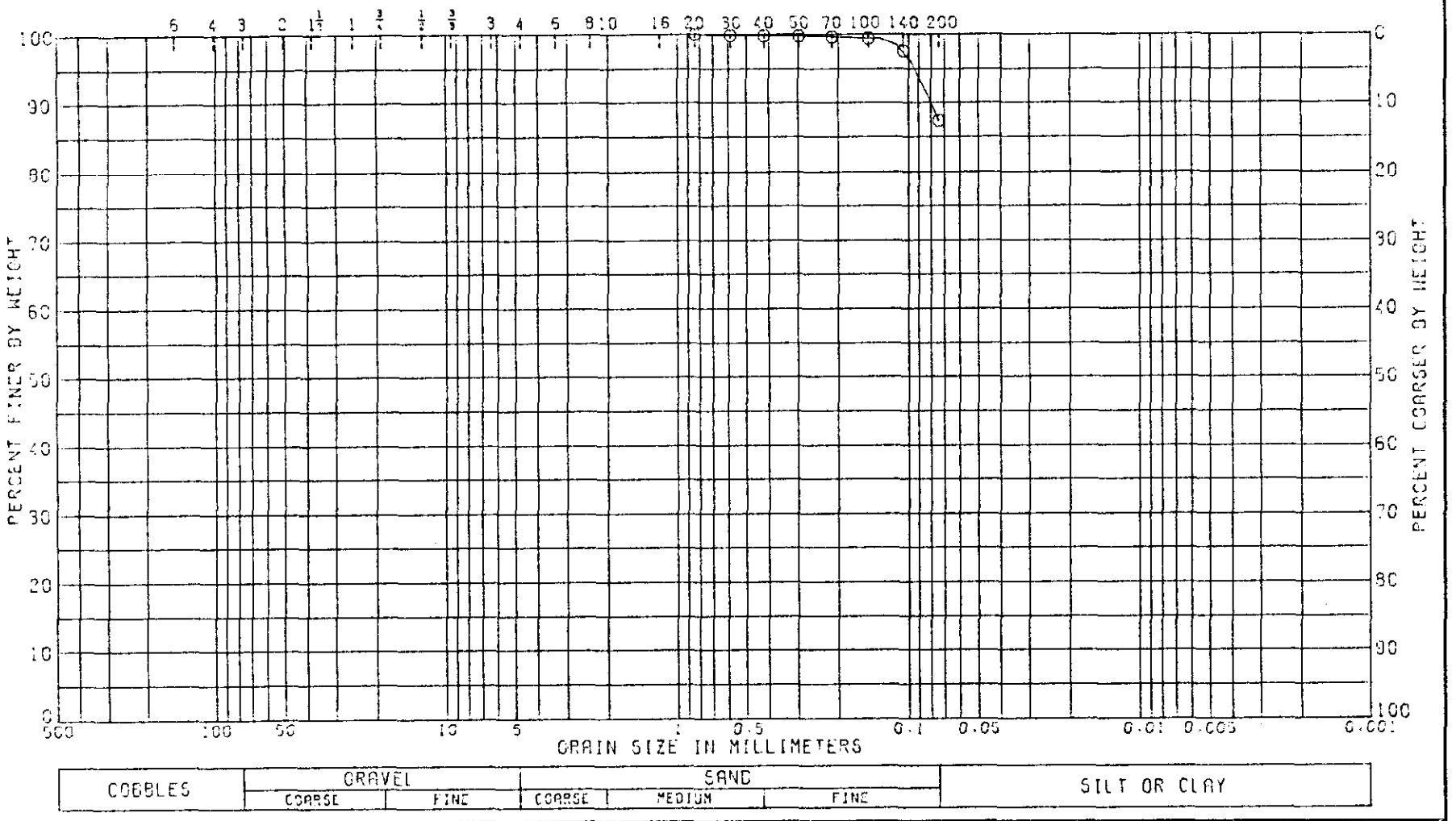
STILT (ML), GRAY: TRACE OF SAND

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO. 5-7-91 SAMPLE NO. 7

DEPTH/ELEV 30.0-32.07 DATE 31 MAR 92



LL	PL	PI	GS	NAT W.%	
22	18	4		21.1	

CLASSIFICATION

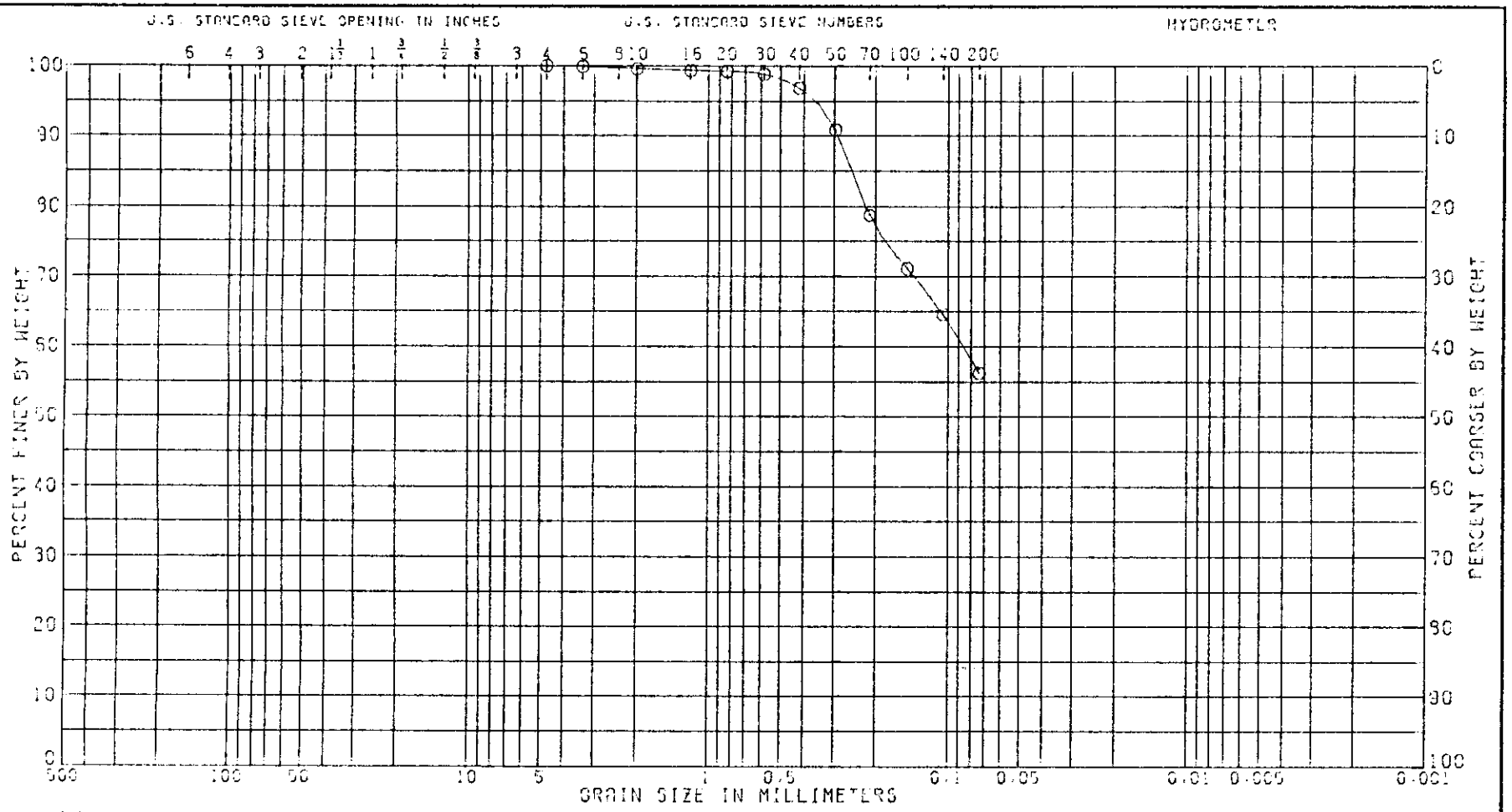
SANDY SILTY CLAY (CL-ML), BROWN

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO. 5-7-81 SAMPLE NO. 8

DEPTH/ELEV 35.0-37.08 DATE 12 MAR 82



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

LL	PL	PI	GS	NAT W.%
31	14	17		18.7

CLASSIFICATION

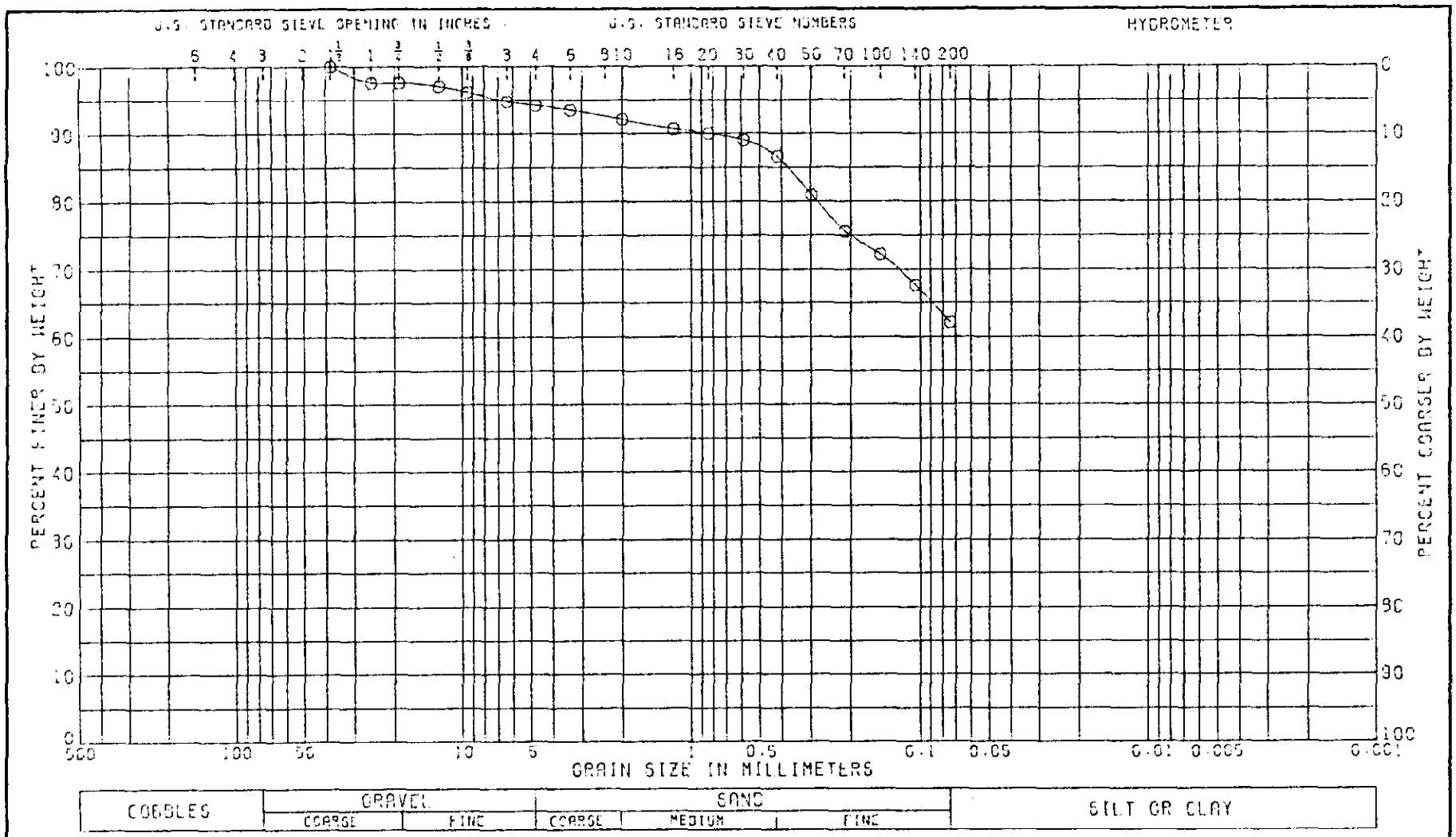
SANDY CLAY (CL), LIGHT BROWN

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO. 5-9-91 SAMPLE NO 1

DEPTH/ELEV 0.0-0.8 DATE 11 FEB 92



LL	PL	PI	OS	NAT W.%
29	16	13		19.8

CLASSIFICATION

SANDY CLAY (CL), DARK BROWN: WITH GRAVEL

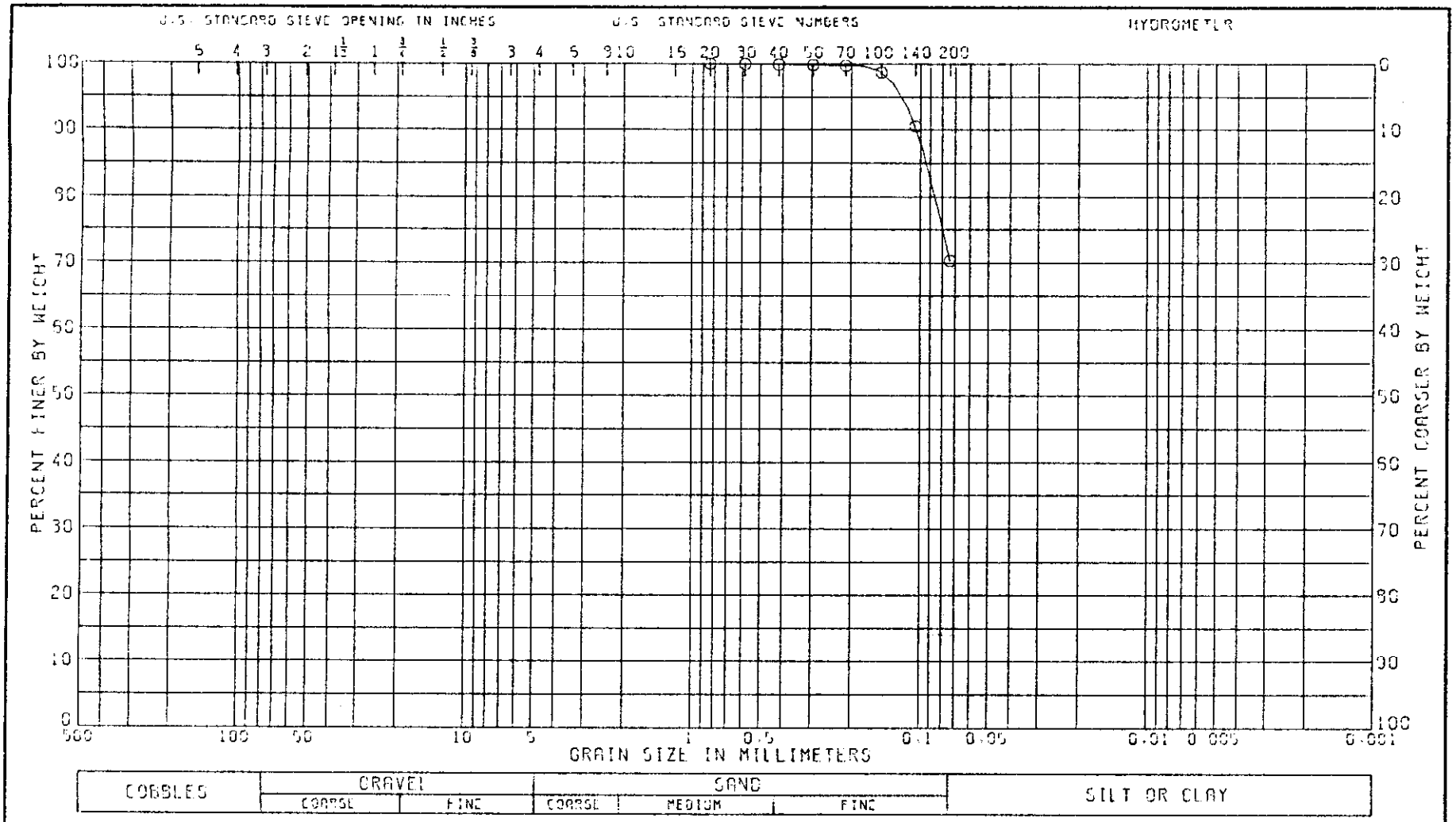
INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO. 5-8-81 SAMPLE NO 2

DEPTH/ELEV 5.0-7.08 DATE 12 MAR 82



LL	PL	PI	CS	NAT W.%
NP				23.1

CLASSIFICATION

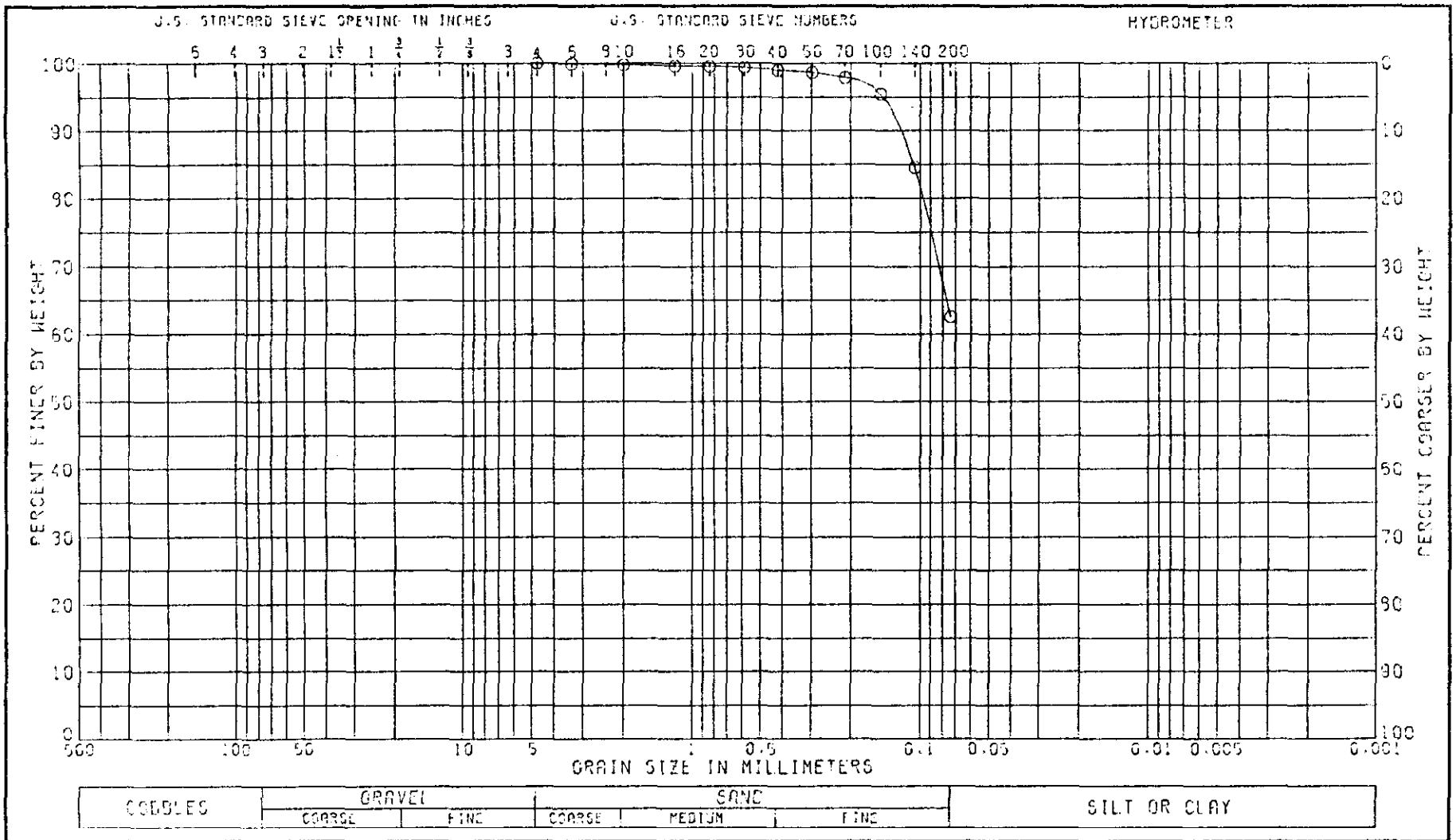
SANDY SILT (ML), GRAY

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO. 5-B-81 SAMPLE NO. 3

DEPTH/ELEV 10.0-12.15 DATE 31 MAR 82



LL	PL	PI	GS	NAT W.%
22	16	6		23.5

CLASSIFICATION

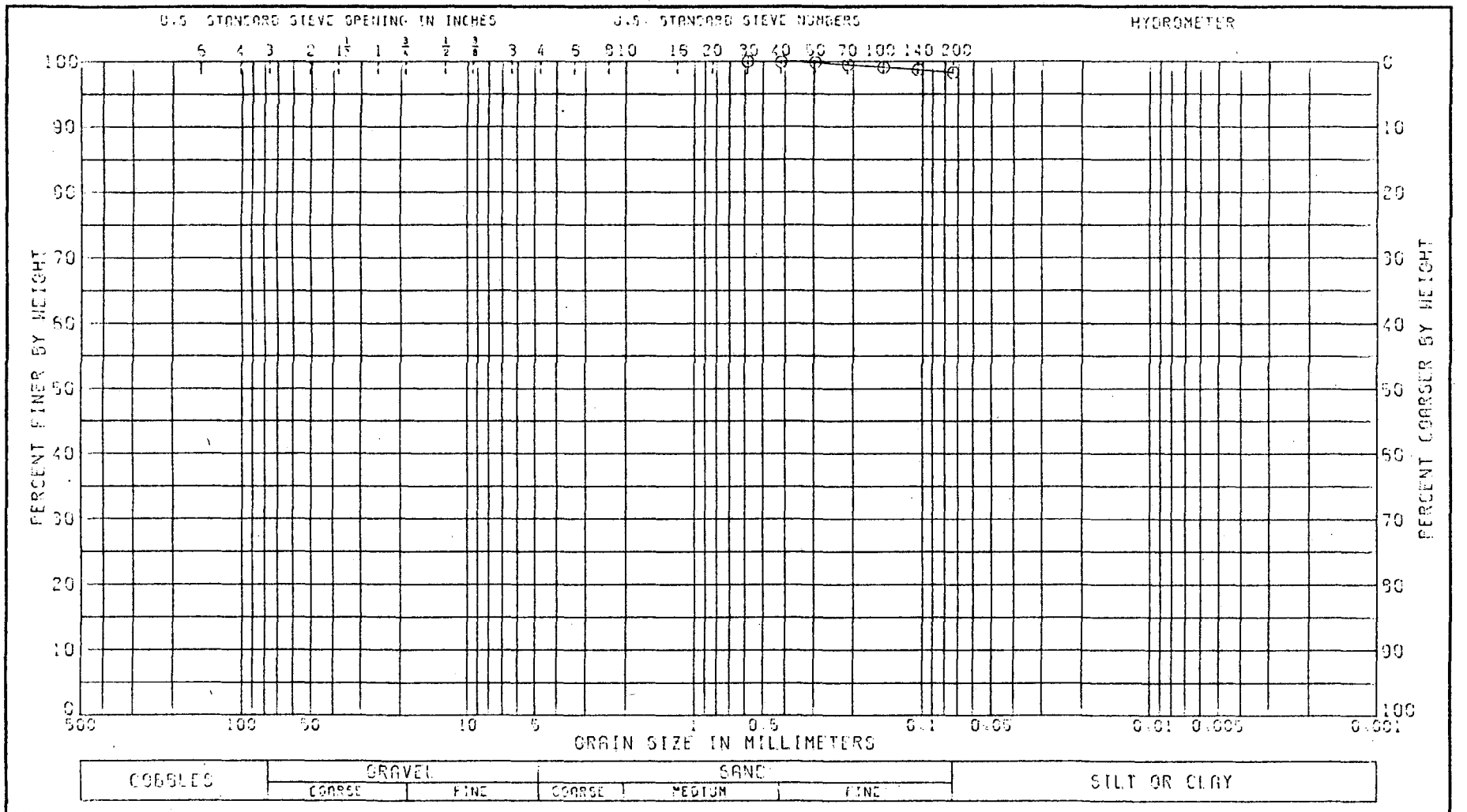
SANDY CLAYEY SILT (CL-ML), BROWN

GRADATION CURVE

PROJECT CRANE NWSC OLD BURNING GROUND

BORING NO. 5-8-81 SAMPLE NO. 4

DEPTH/ELEV 15.0-17.1 DATE 11 FEB 82



LL 42	PL 18	PI 24	GS	NAT W.% 21.0	

CLASSIFICATION

CLAY (CL), BROWN

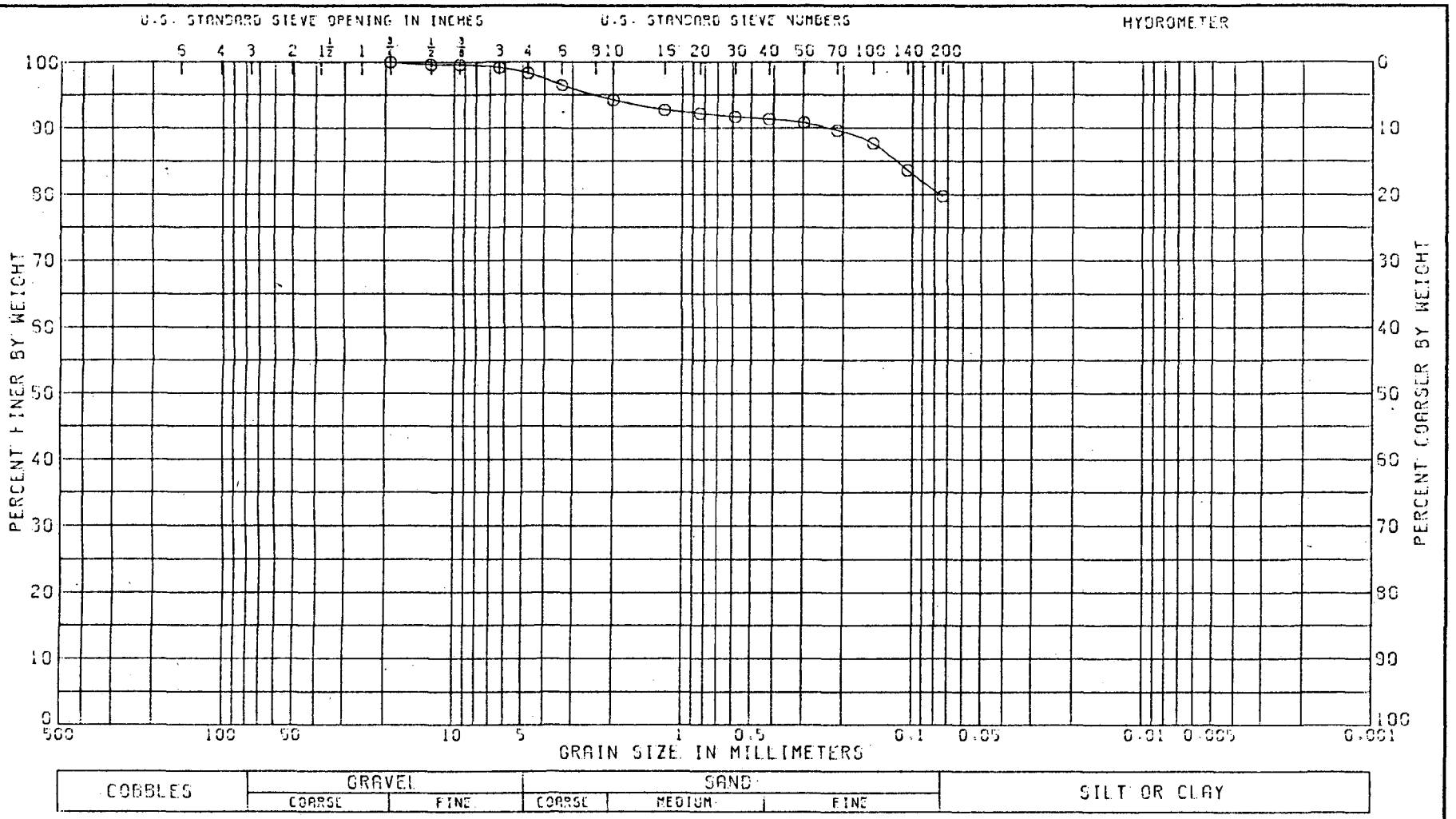
GRADATION CURVE

PROJECT CRANE NWSC

OLD BURNING GROUND

BORING NO. 6-18-81 SAMPLE NO 1

DEPTH/ELEV 0.0-2.17 DATE 26 FEB 82



LL	PL	PI	CS	NAT W.%
63	20	43		18.6

CLASSIFICATION

SANDY CLAY (CH), TAN

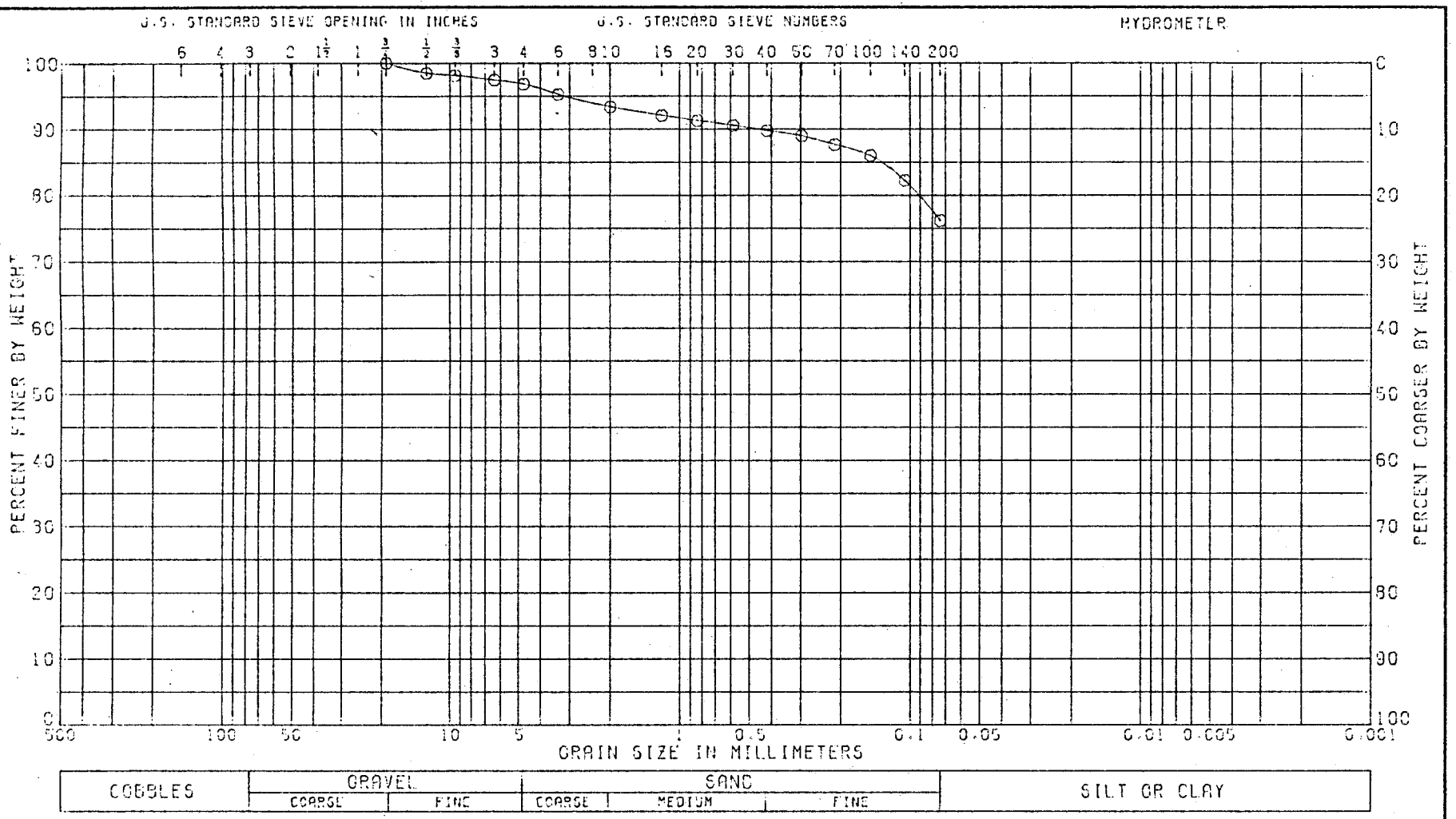
GRADATION CURVE

PROJECT CRANE NWSC

DEMOLITION AREA

BORING NO. 6-1A-81 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.21 DATE 31 MAR 82



LL	PL	PI	GS	NAT W.%
34	18	16		15.0

CLASSIFICATION

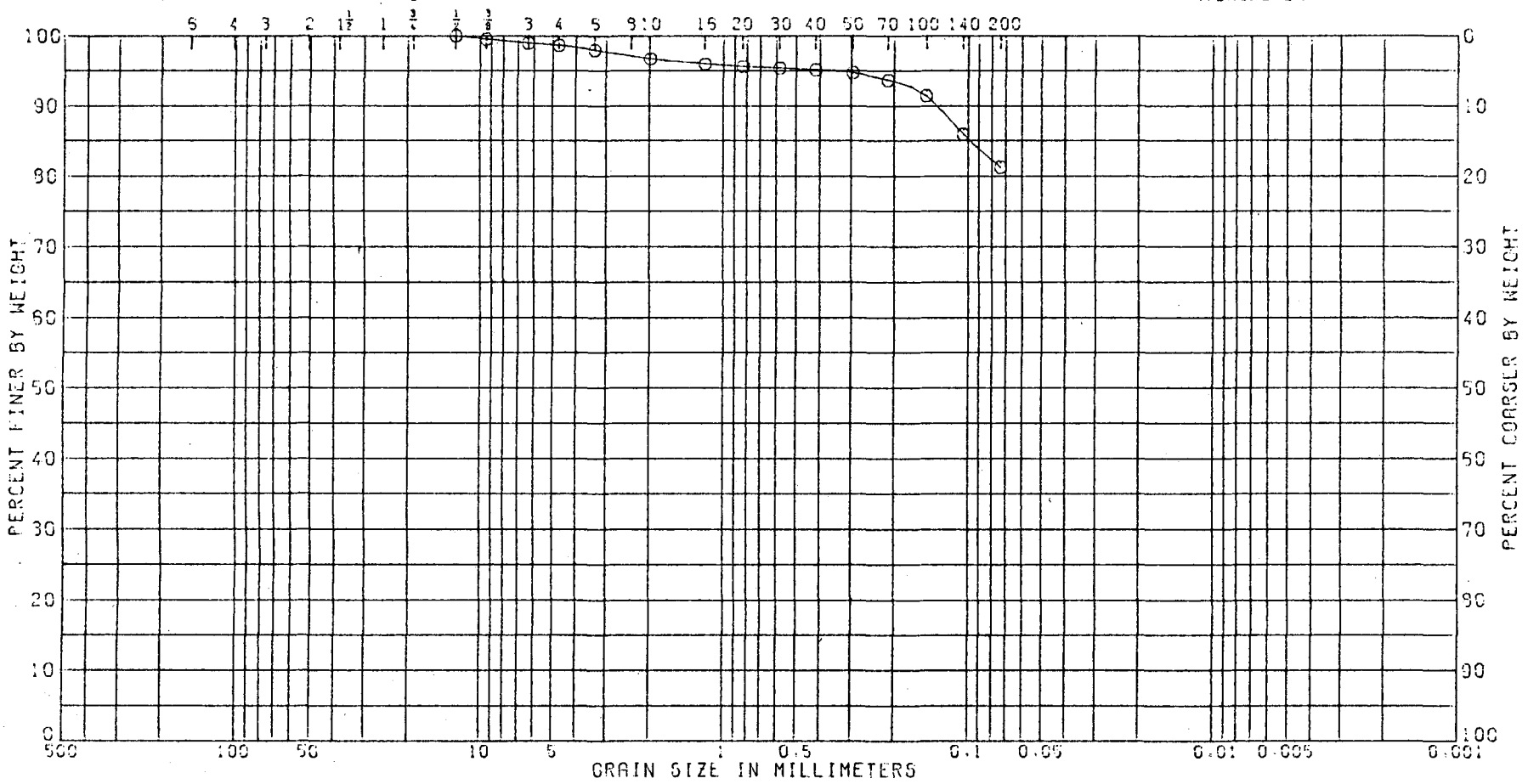
SANDY CLAY (CL), BROWN: TRACE OF GRAVEL

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. 6-18-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-1.14 DATE 12 MAR 82



LL 49	PL 16	PI 32	GS	NAT W.% 17.9

CLASSIFICATION

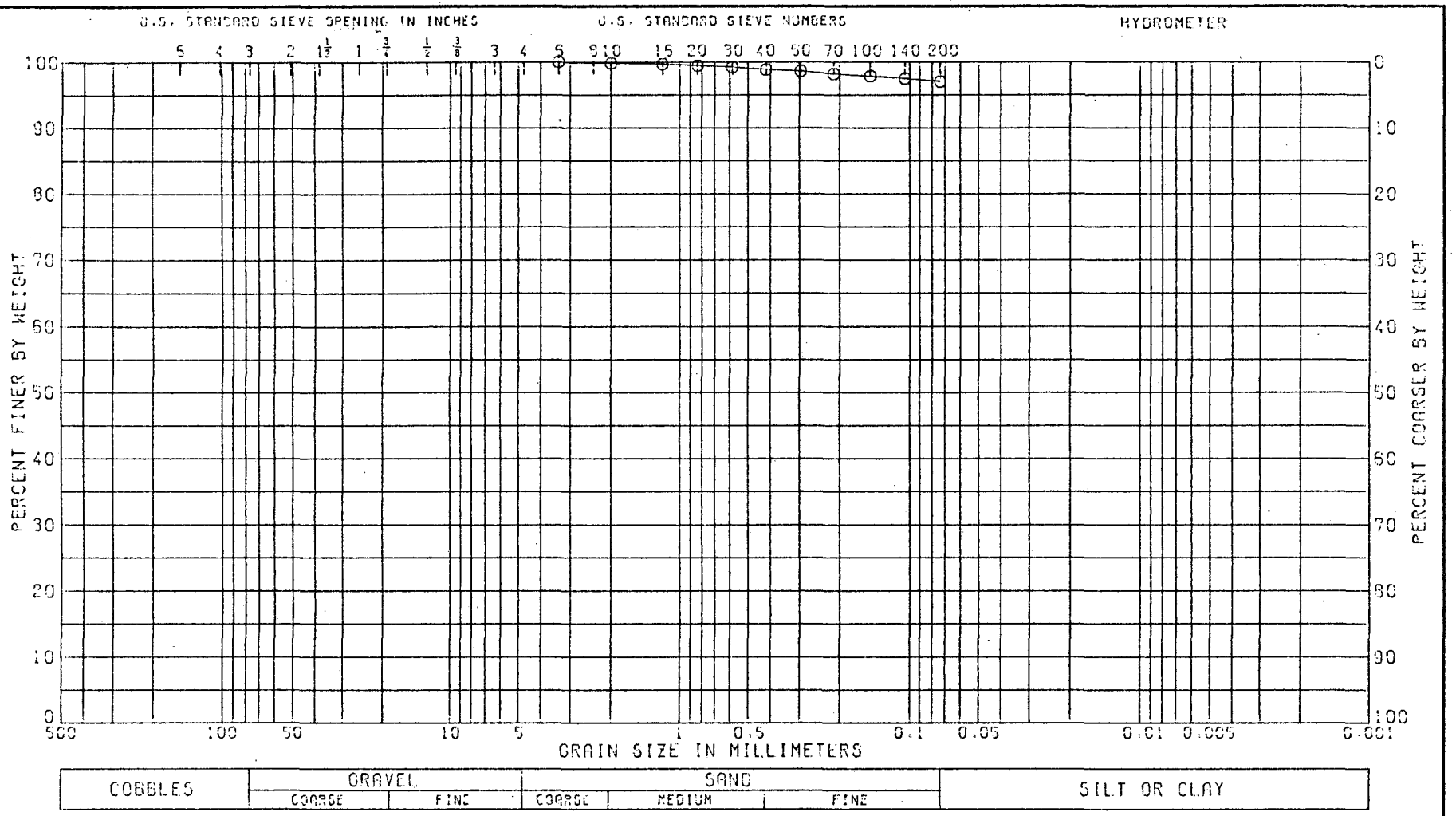
SANDY CLAY (CL), TAN

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. 6-16-81 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.14 DATE 11 FEB 82



LL	PL	PI	GS	NAT W.%
49	19	30		17.8

CLASSIFICATION

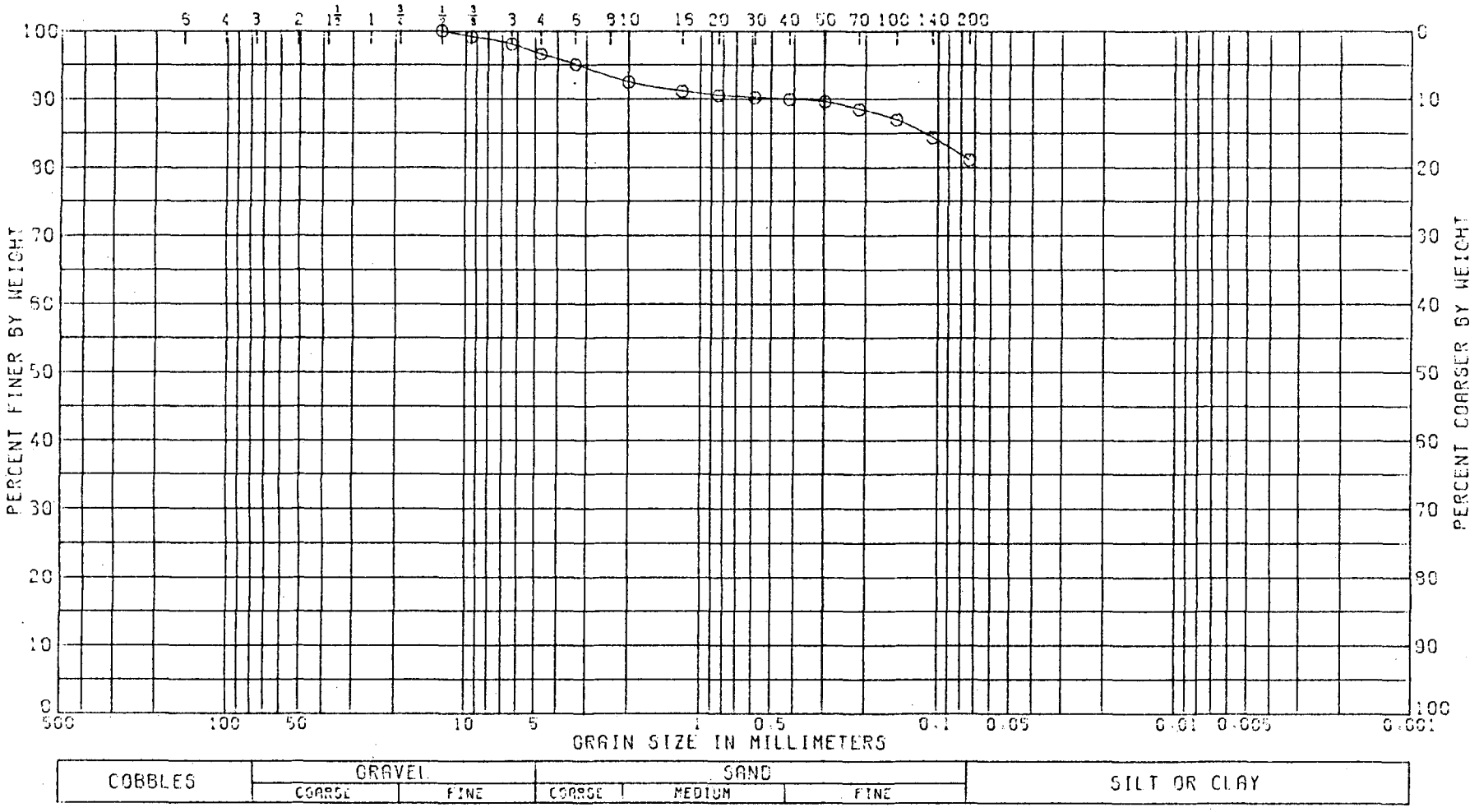
CLAY (CL), BROWN: TRACE OF SAND

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. 6-1C-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-1.34 DATE 11 FEB 82



LL 57	PL 19	PI 38	GS	NAT W.% 17.7

CLASSIFICATION

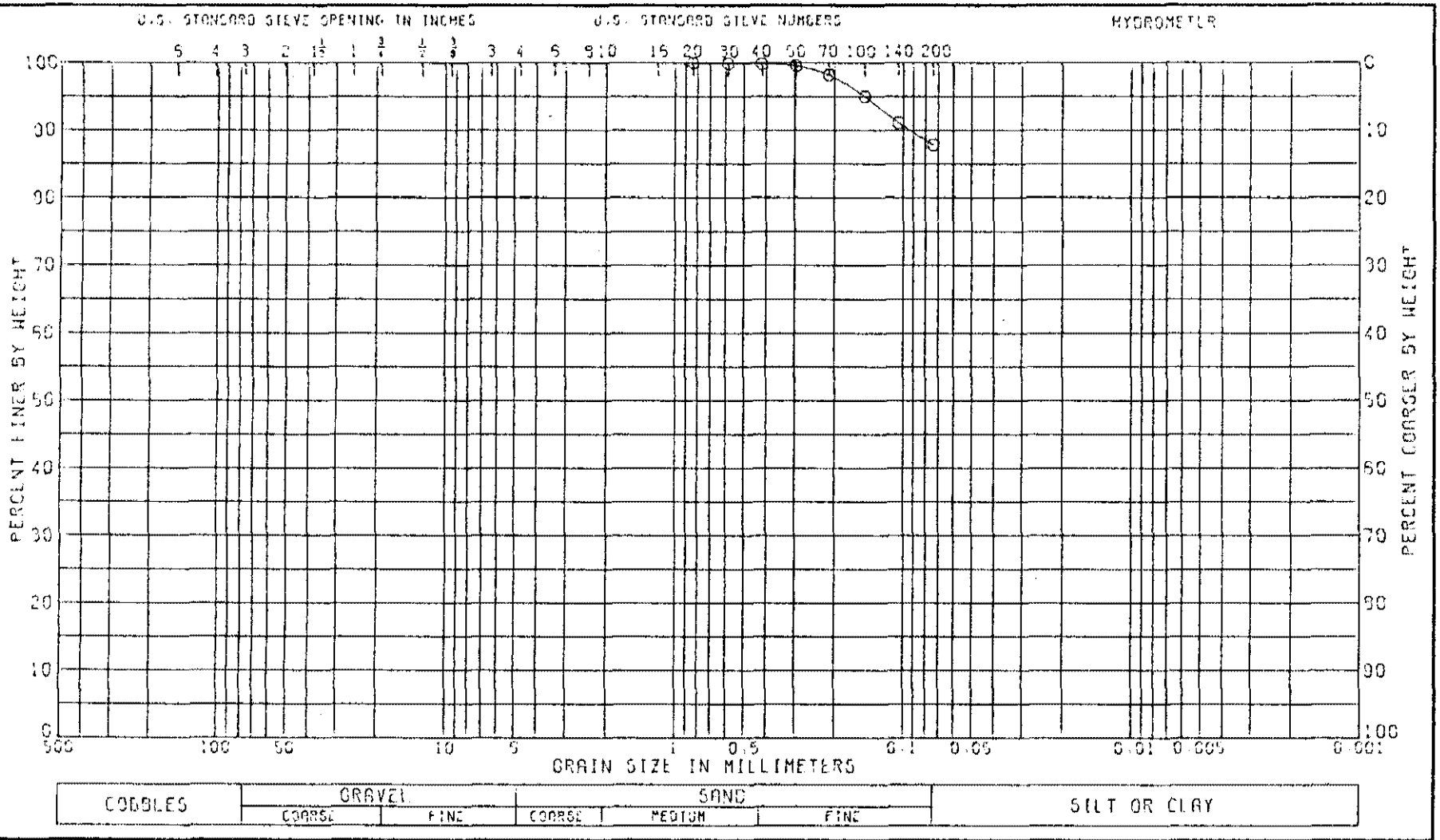
SANDY CLAY (CH), TAN: TRACE OF GRAVEL

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. 6-1C-81 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.25 DATE 11 FEB 82



LL	PL	PI	CC	NAT W.%
35	20	15		22.8

CLASSIFICATION

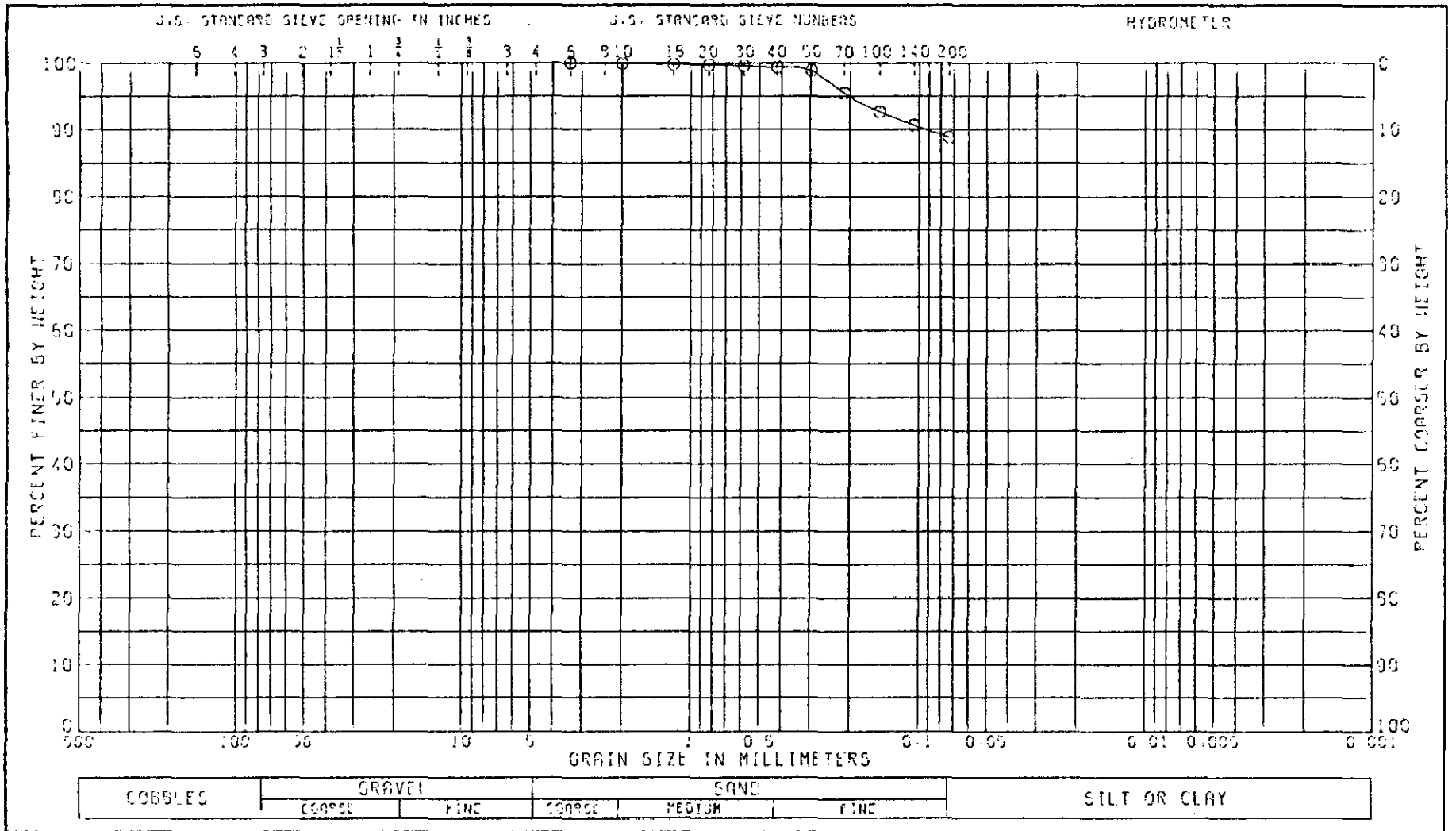
SANDY CLAY (CL), BROWN

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. 6-2-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-1.55 DATE 11 FEB 82



LL	PL	PI	CS	NAT W.%
35	19	16		26.8

CLASSIFICATION

CLAY (CL), BROWN; WITH SAND

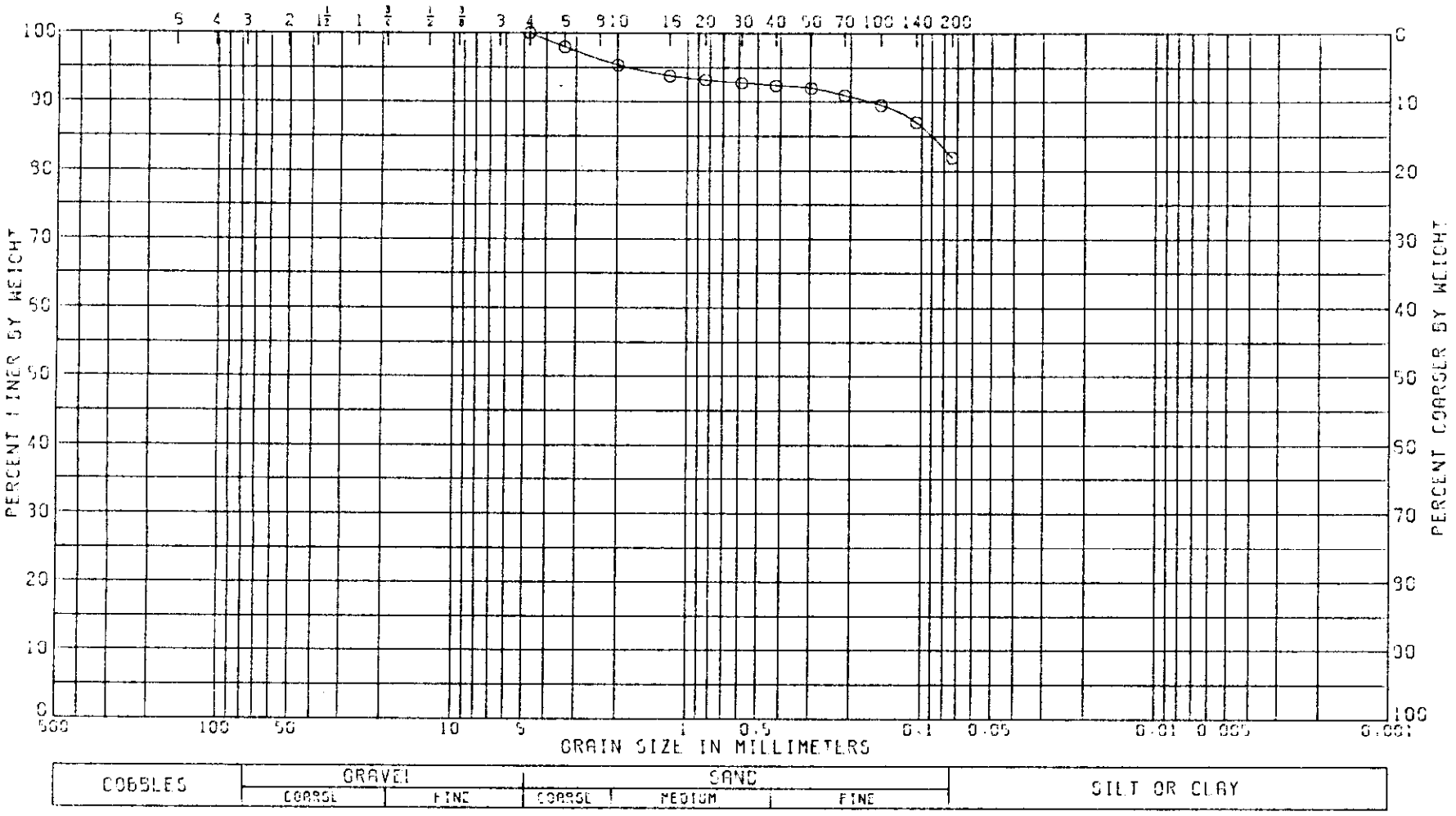
GRADATION CURVE

PROJECT CRANE NWSC

OLD BURNING GROUND

BORING NO 6-3--81 SAMPLE NO 1

DEPTH/ELEV 0.0-1.74 DATE 26 FEB 82



LL	PL	PI	CS	NAT W.%
44	18	26		15.6

CLASSIFICATION

SANDY CLAY (CL), BROWN

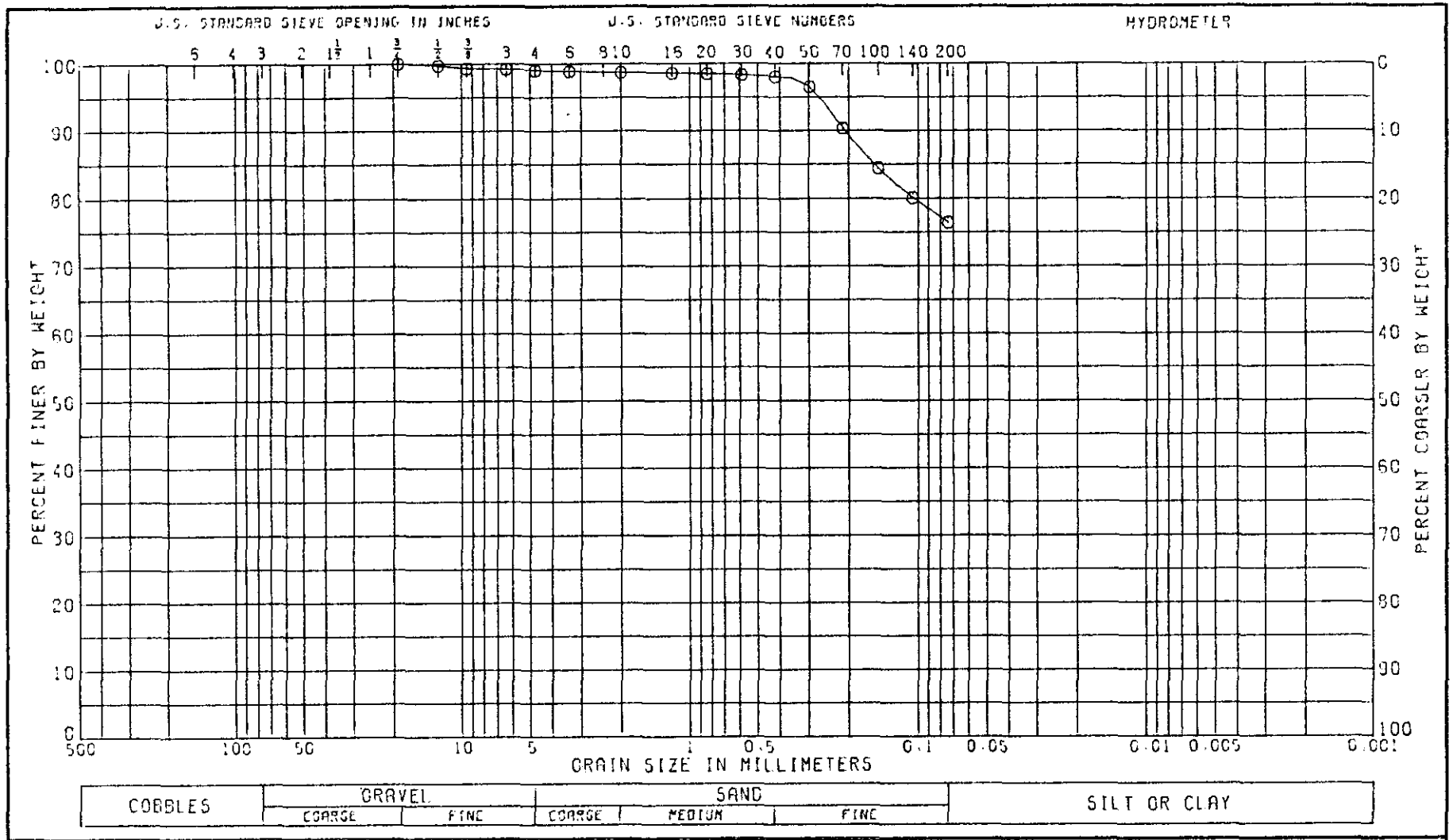
GRADATION CURVE

PROJECT CRANE NWSC

DEMOLITION AREA

BORING NO. 6-3-91 SAMPLE NO 2A

DEPTH/ELEV 5.0-5.3 DATE 31 MAR 92



LL	PL	PI	GS	NAT W.%
33	20	13		19.3

CLASSIFICATION

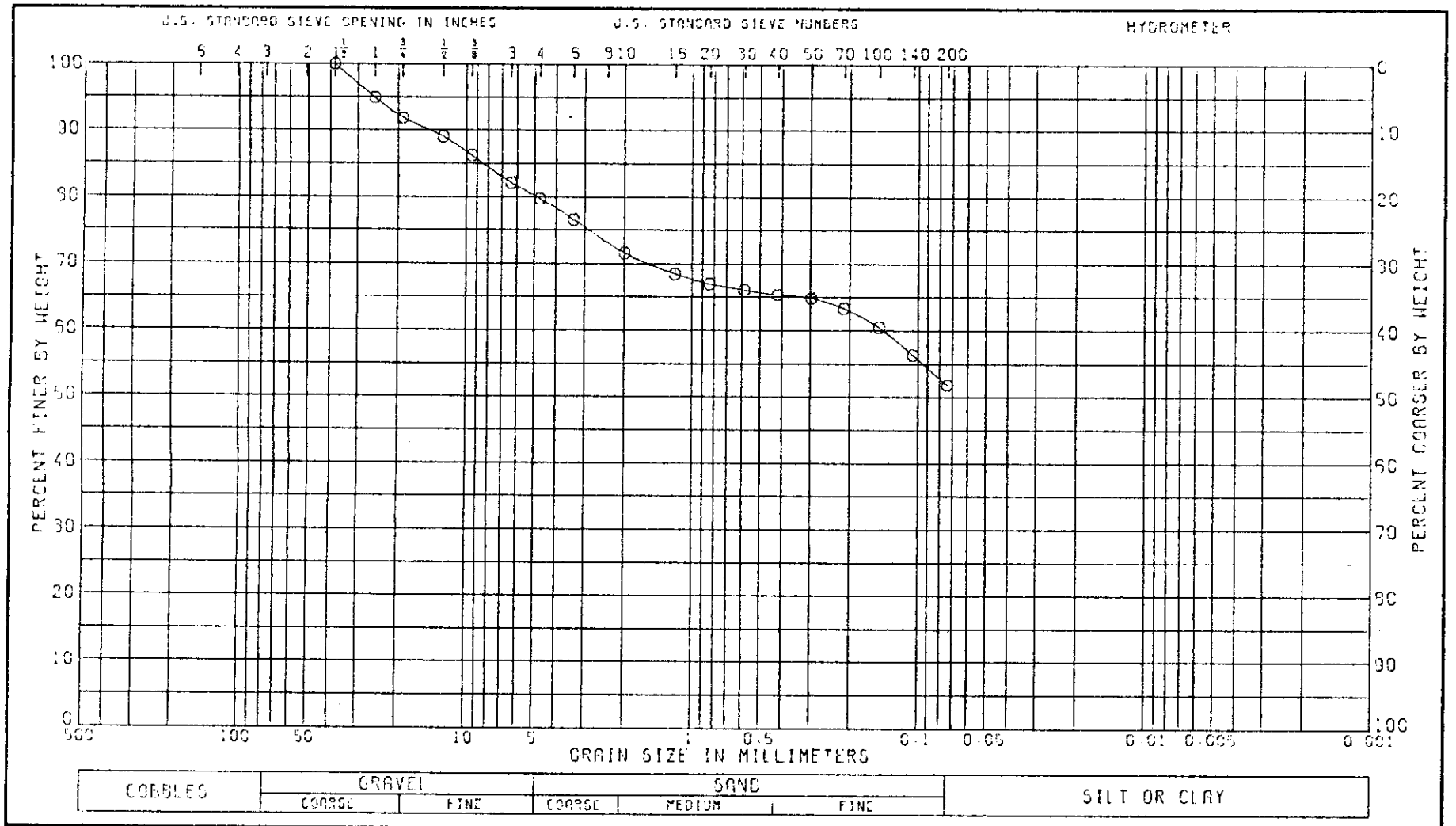
SANDY CLAY (CL), BROWN

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. 6-4-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-1.46 DATE 12 MAR 82



LL	PL	PI	CS	NAT W.%
35	17	18		9.1

CLASSIFICATION

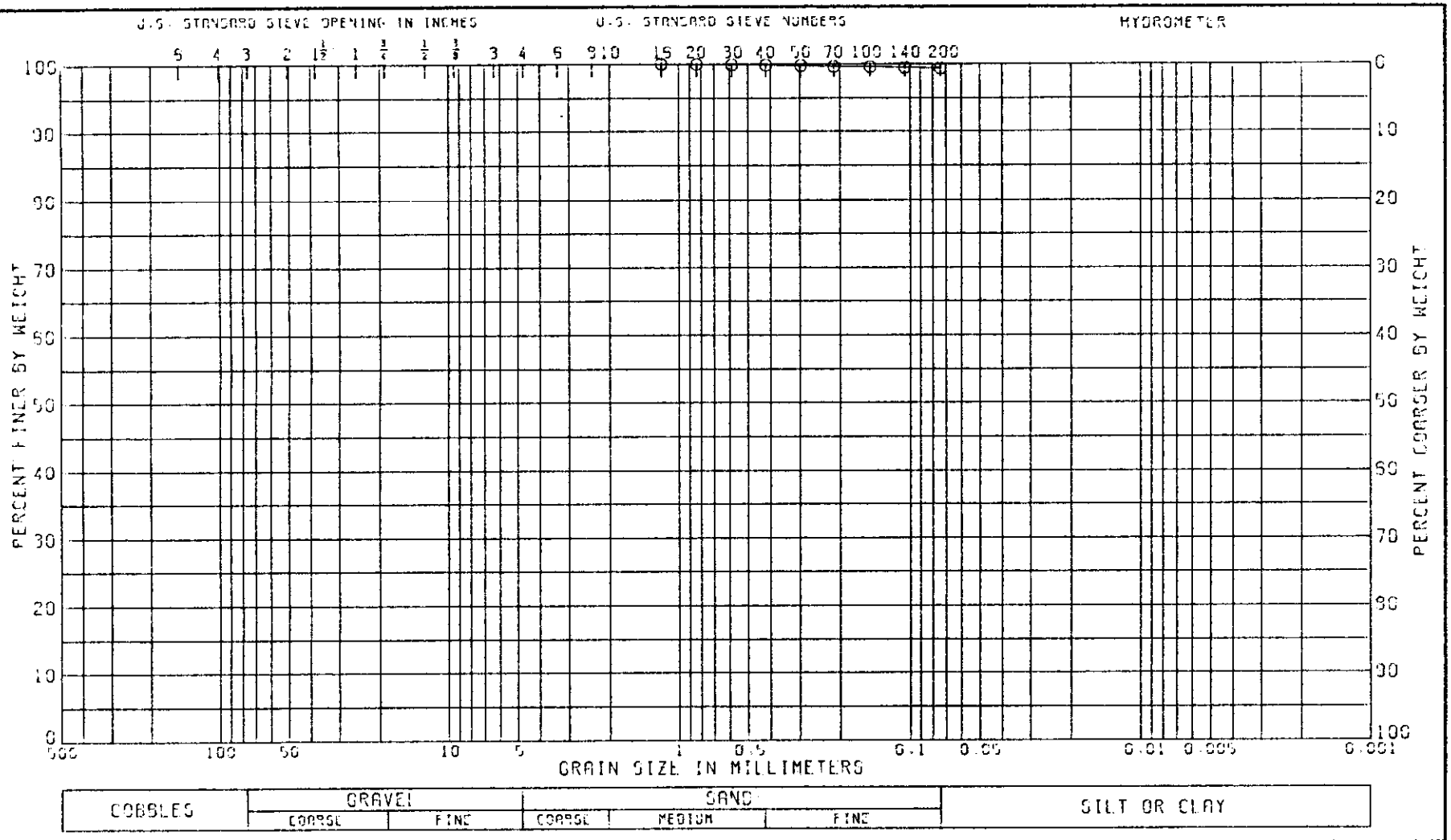
GRAVELLY SANDY CLAY (CL), BROWN
INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. 6-5-91 SAMPLE NO. 1

DEPTH/ELEV 0.0.-1.8 DATE 11 FEB 92



LL 44	PL 22	PI 22	CS	NAT W.% 16.0

CLASSIFICATION

CLAY (CL), GRAY

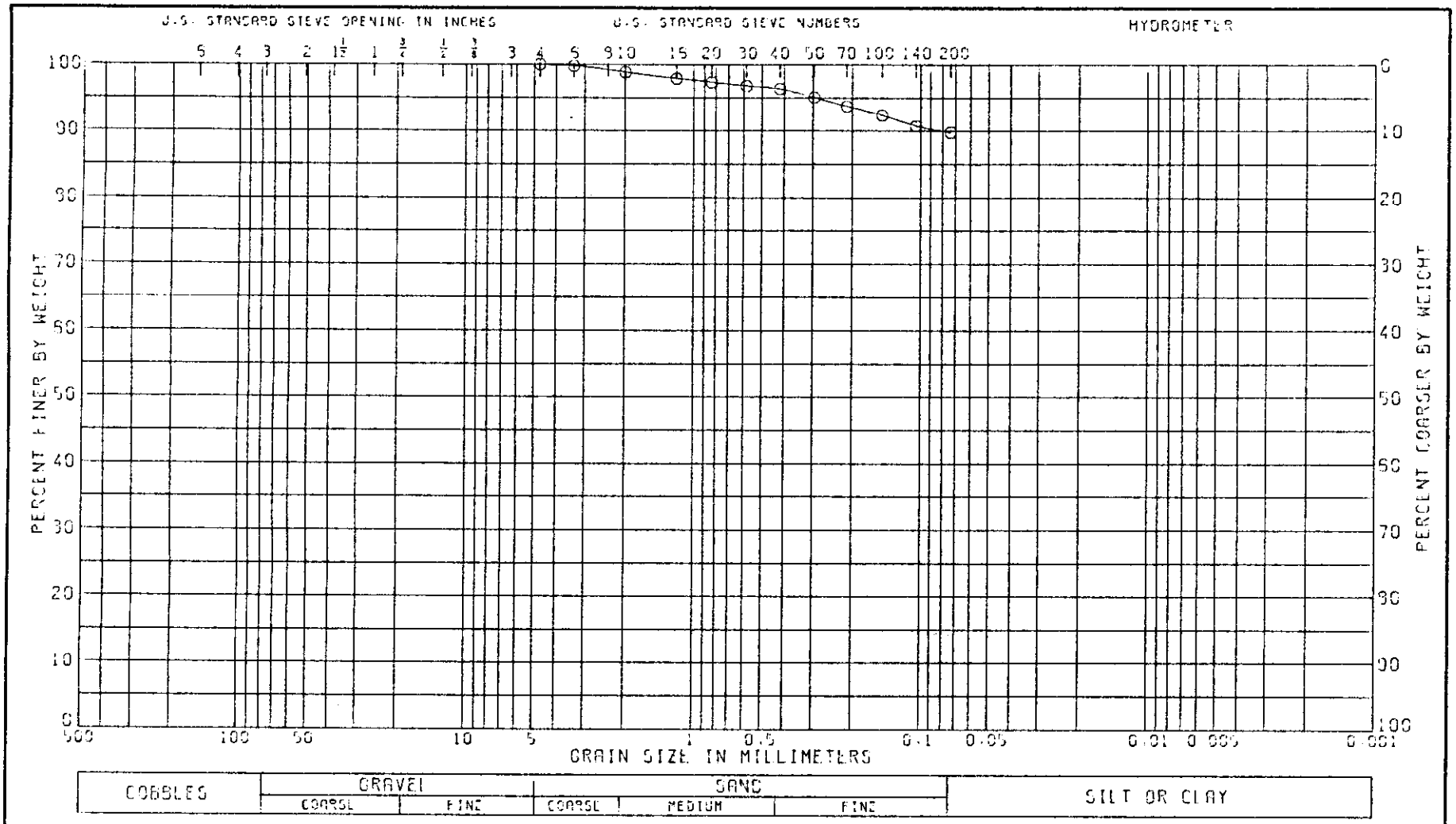
GRADATION CURVE

PROJECT CRANE NWSC

DEMOLITION AREA

BORING NO. 6-5-81 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.95 DATE 31 MAR 82



LL	PL	PI	CS	NAT W.%
40	16	24		14.1

CLASSIFICATION

CLAY (CL), BROWN: WITH SAND

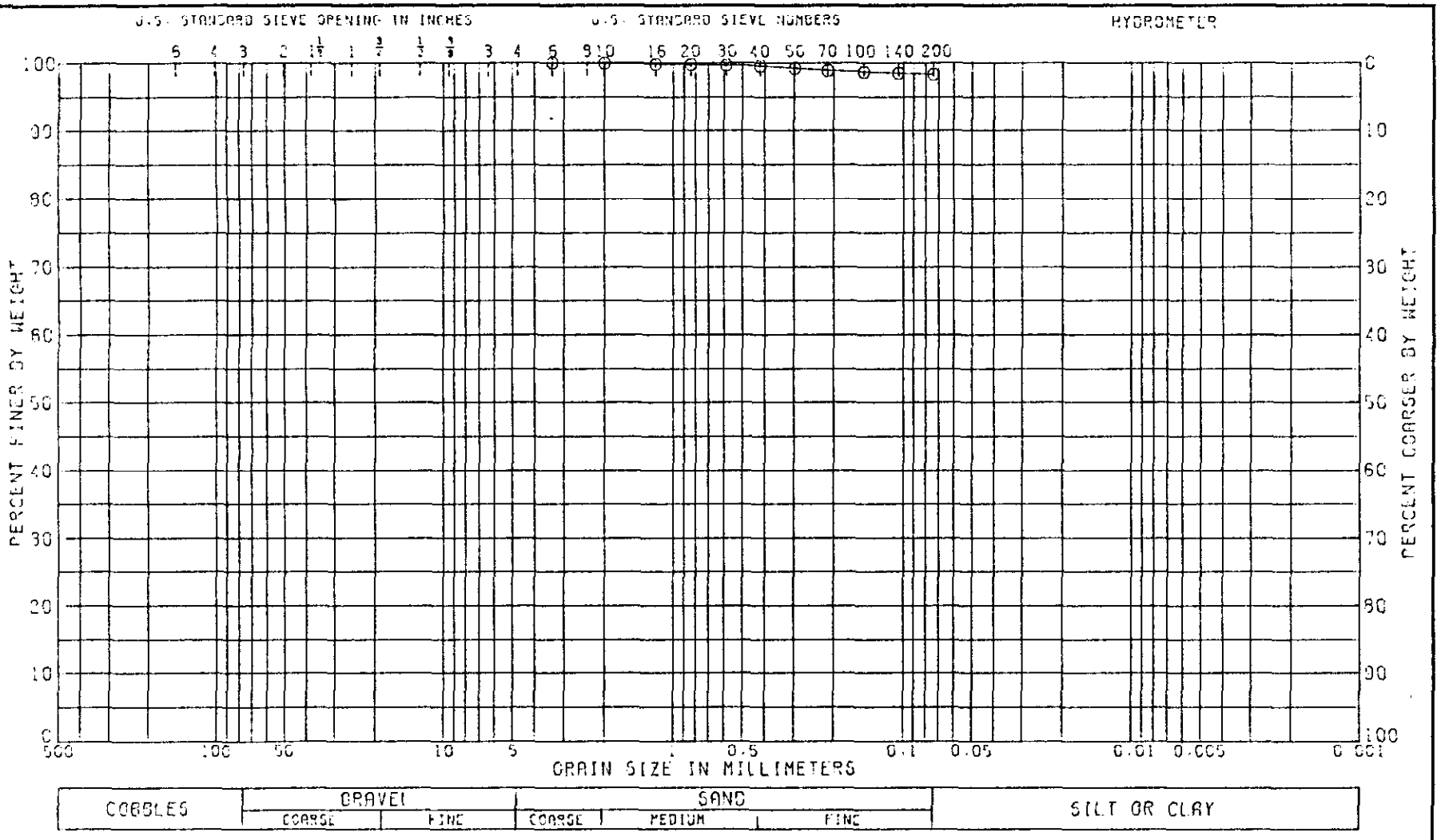
GRADATION CURVE

PROJECT CRANE NWSC

DEMOLITION AREA

BORING NO. 6-6-81 SAMPLE NO 1

DEPTH/ELEV 0.0-1.41 DATE 31 MAR 82



LL	PL	PI	GS	NAT W.%
43	17	26		14.5

CLASSIFICATION

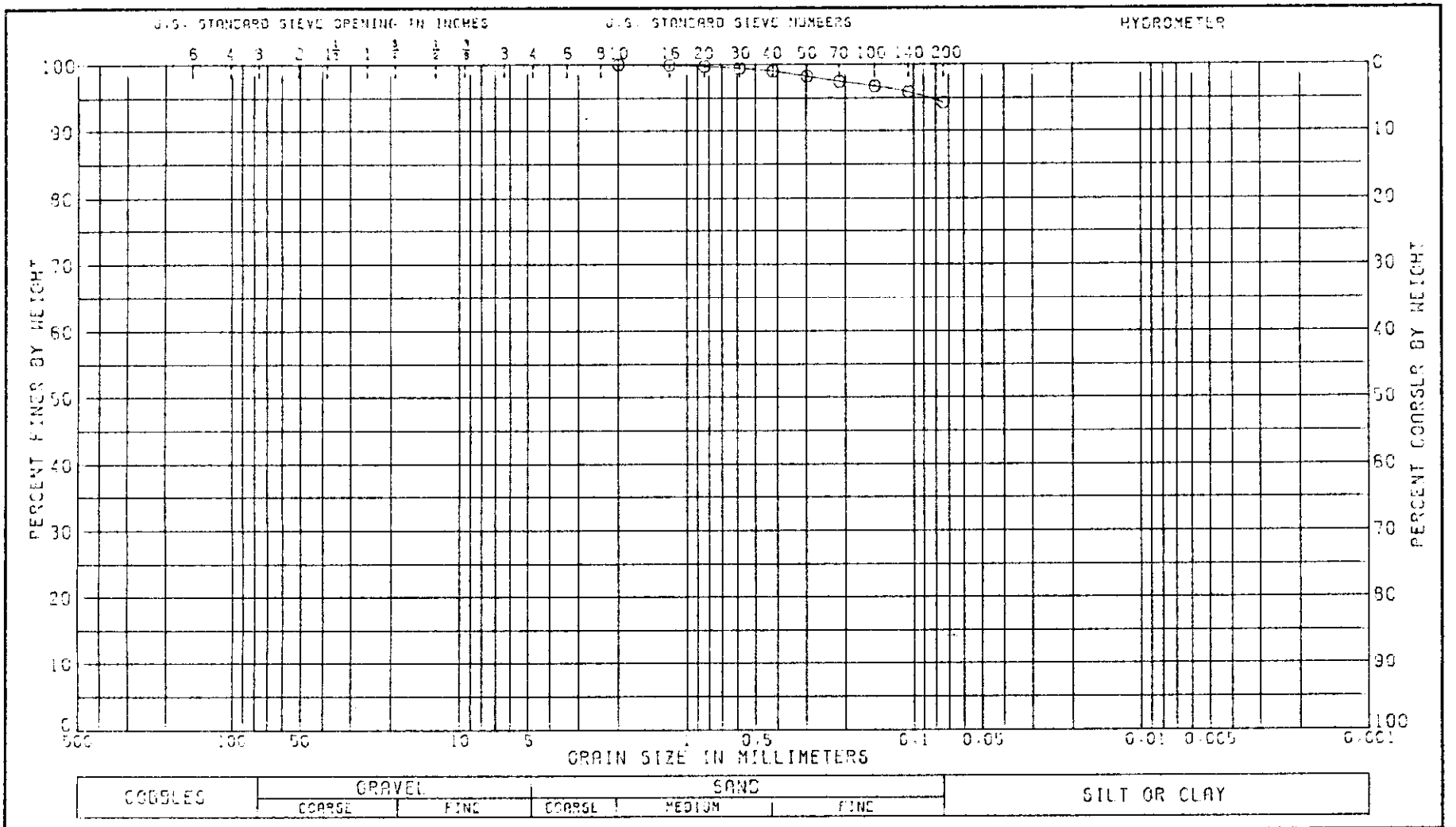
CLAY (CL), BROWN

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. 6-6-81 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.27 DATE 12 MAR 82



LL	PL	PI	GS	NAT W.%
45	22	23		14.9

CLASSIFICATION

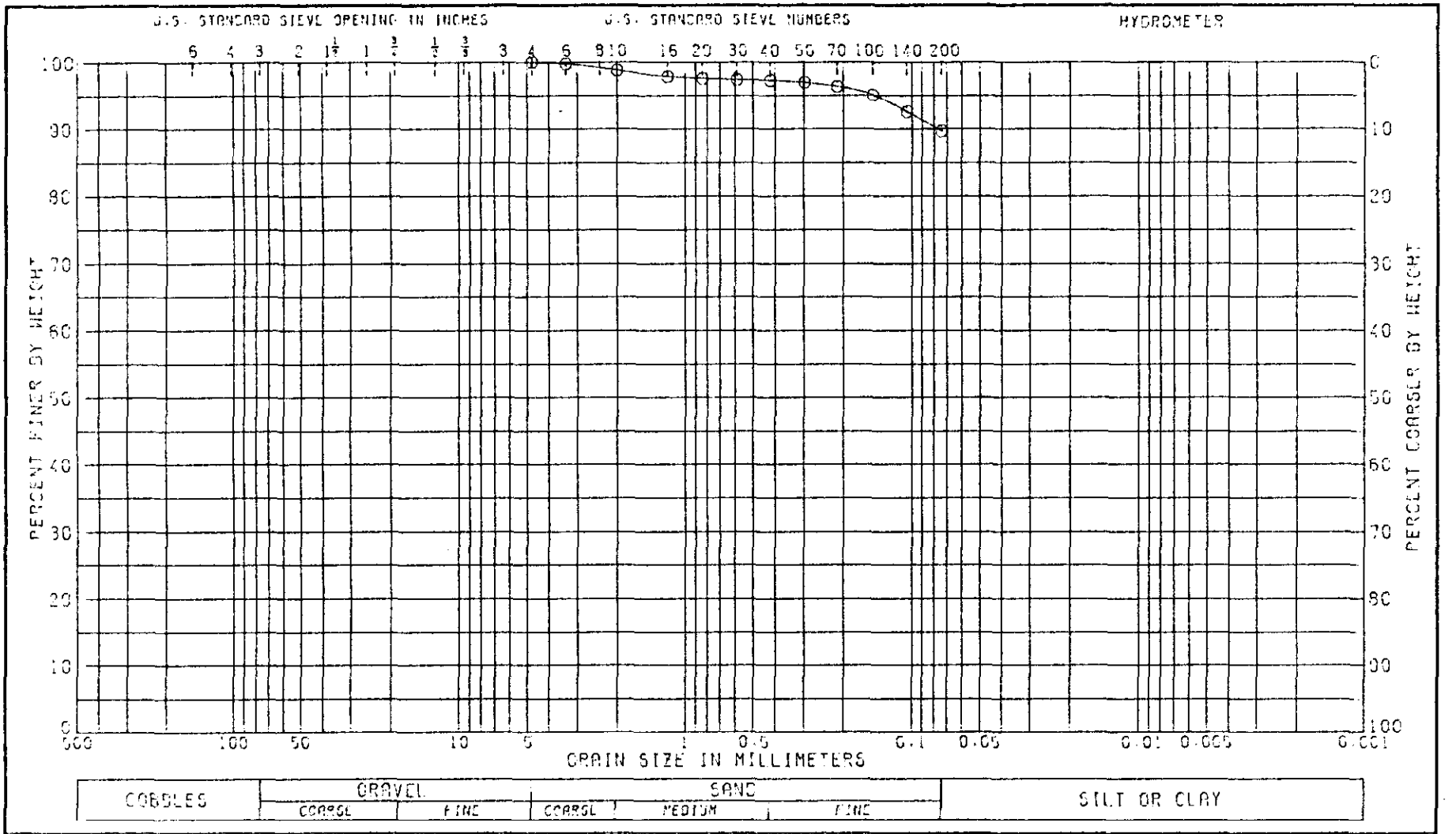
CLAY (CL), GRAYISH BROWN: WITH SAND

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. 6-6-81 SAMPLE NO. 3

DEPTH/ELEV 10.0-11.30 DATE 12 MAR 82



LL 46	PL 16	PI 30	GS	NAT W.% 16.3	

CLASSIFICATION

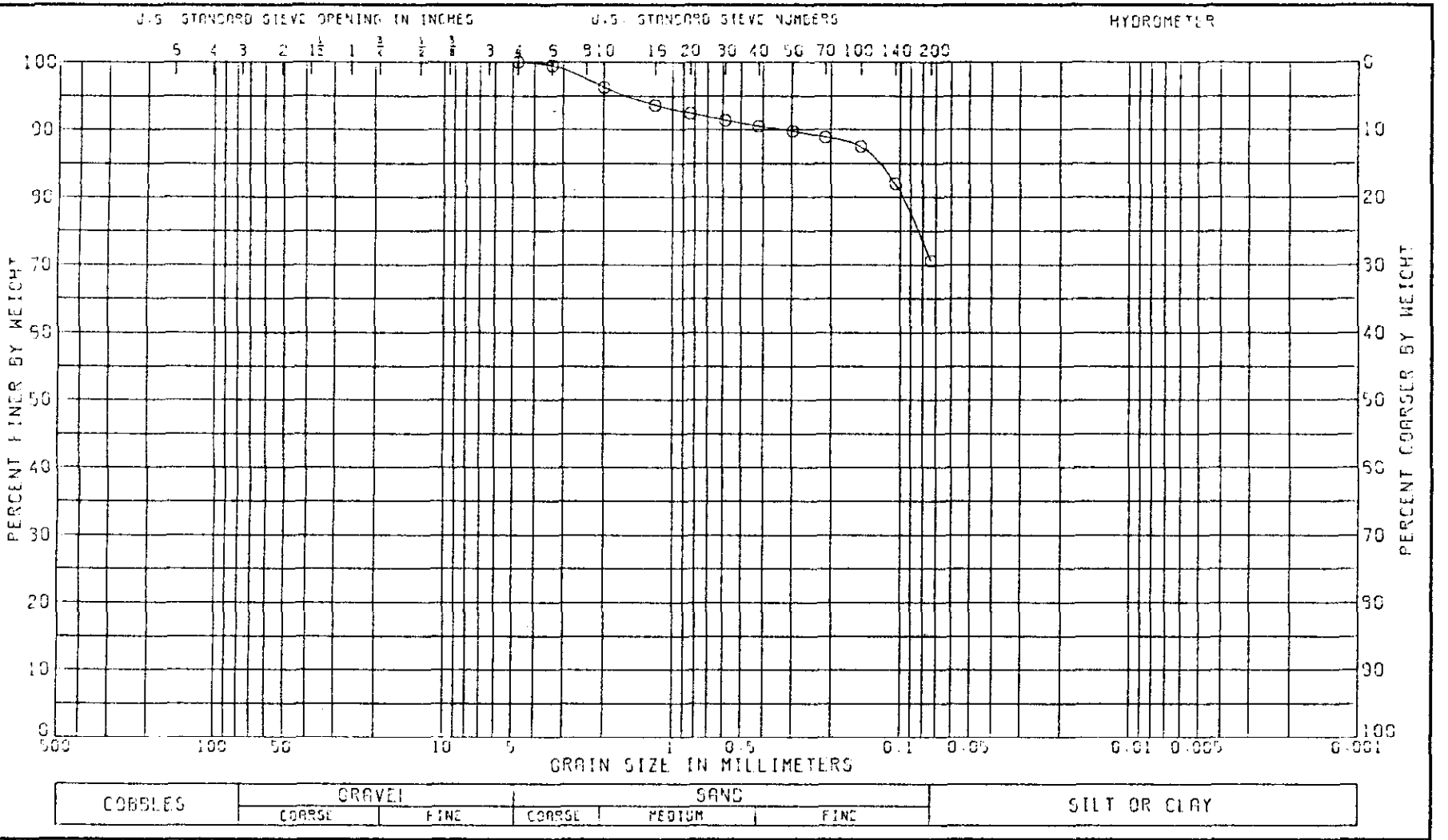
CLAY (CL), BROWN: WITH SAND

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. 6-7-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-2.22 DATE 12 MAR 82



LL	PL	PI	CS	NAT W.%
42	20	22		17.0

CLASSIFICATION

SANDY CLAY (CL), TAN

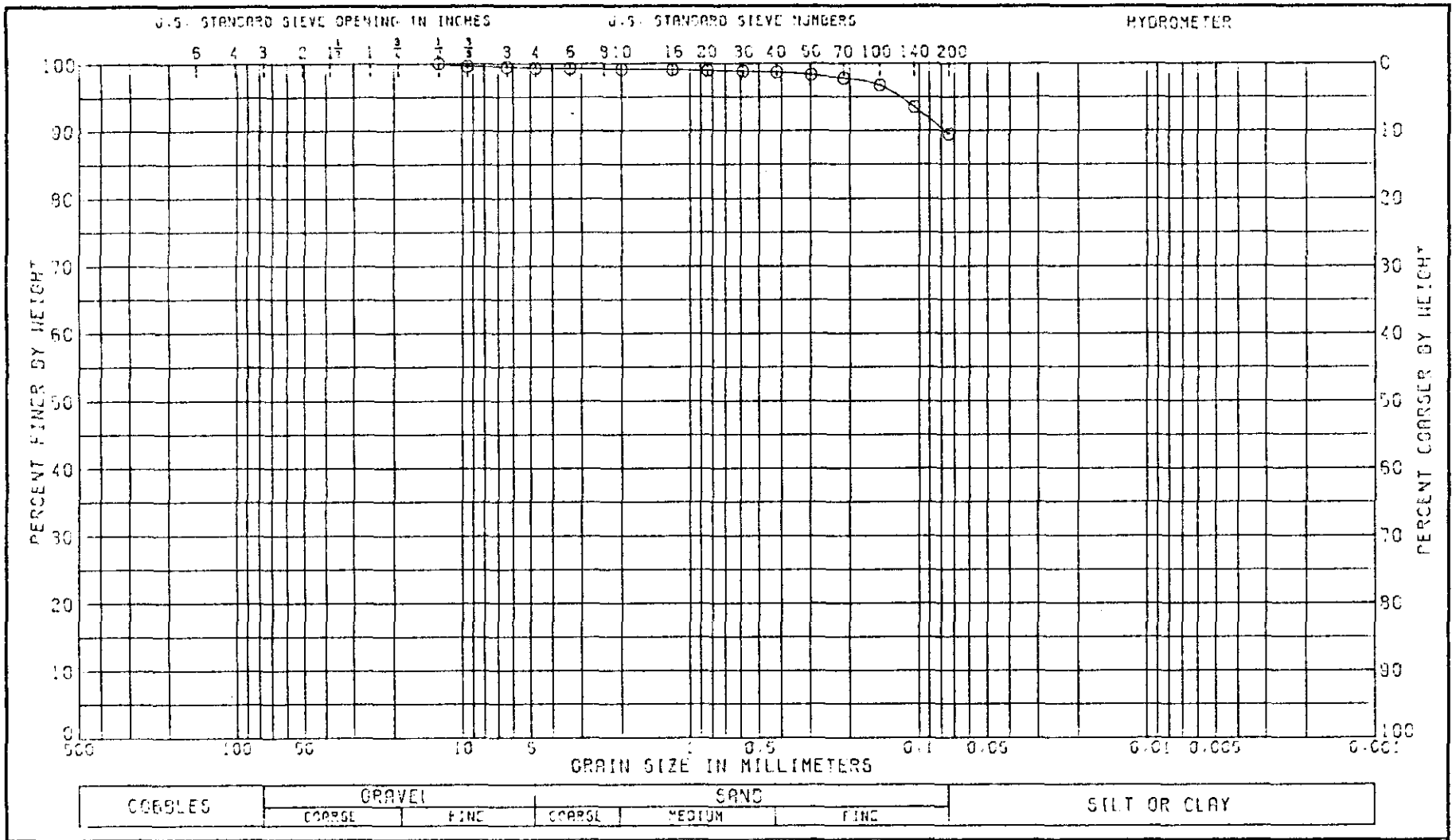
GRADATION CURVE

PROJECT CRANE NWSC

DEMOLITION AREA

BORING NO. 6-7-81 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.45 DATE 31 MAR 82



LL	PL	PI	GS	NAT W.%
36	21	15		21.5

CLASSIFICATION

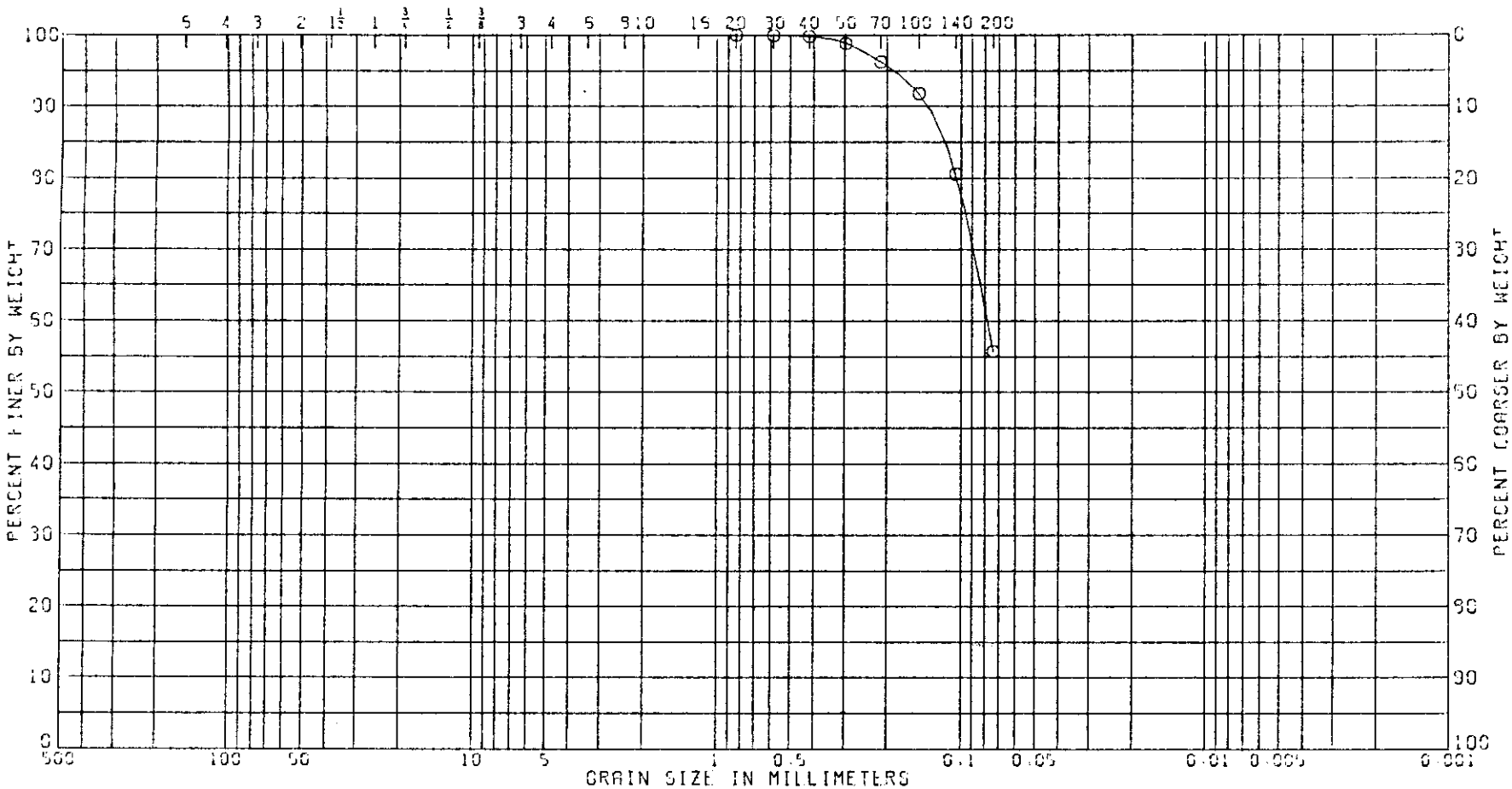
CLAY (CL), BROWN: WITH SAND

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. 6-8-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-1.55 DATE 12 MAR 82



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

LL	PL	PI	CS	NAT W.%	
25	15	10		10.8	

CLASSIFICATION

SANDY CLAY (CL), BROWN

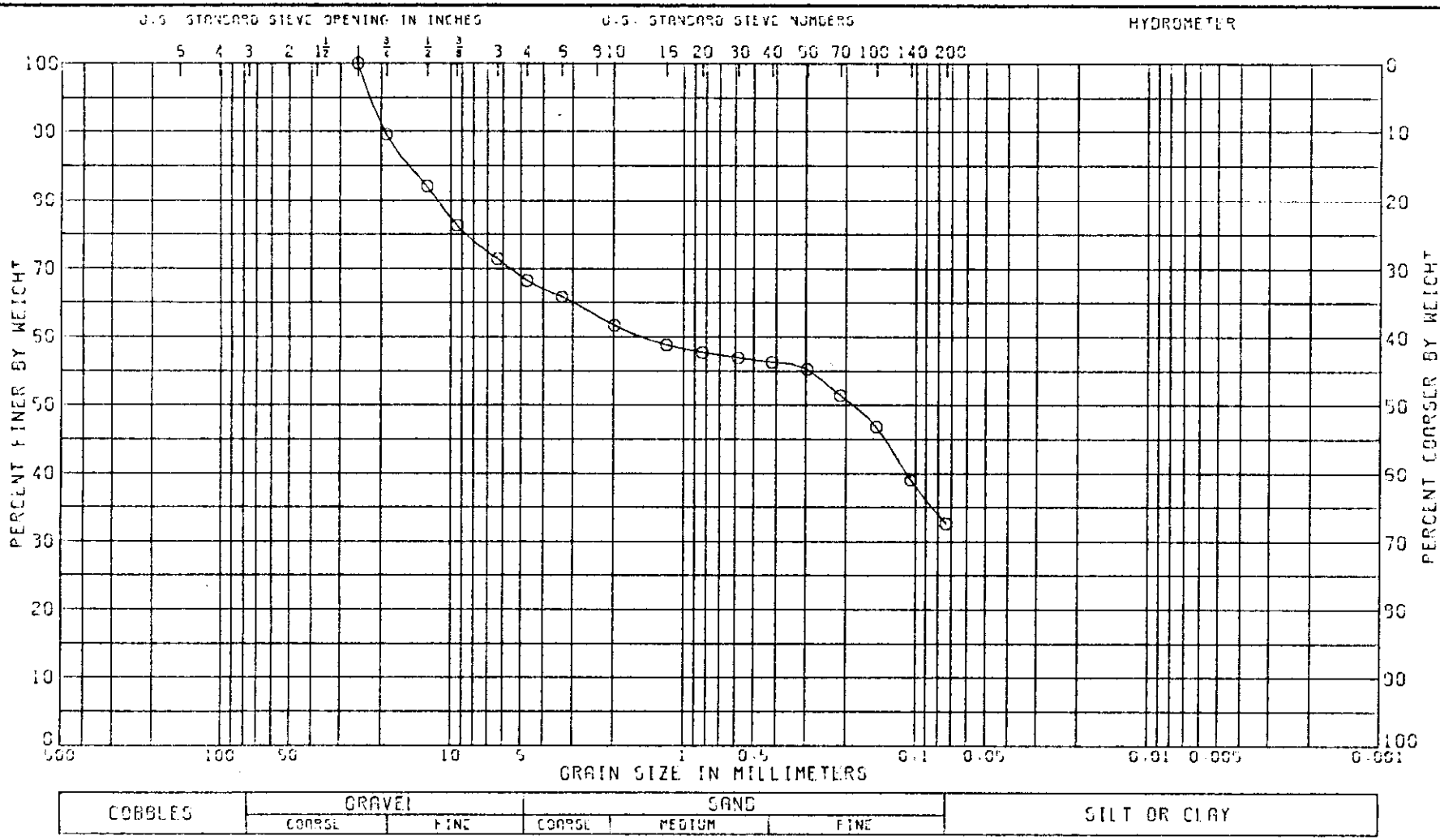
GRADATION CURVE

PROJECT CRANE NWSC

DEMOLITION AREA

BORING NO. 6-8-91 SAMPLE NO. 2

DEPTH/ELEV 5.0-5.00 DATE 31 MAR 92



LL	PL	PI	GS	NAT W.%	
30	13	17		7.4	

CLASSIFICATION

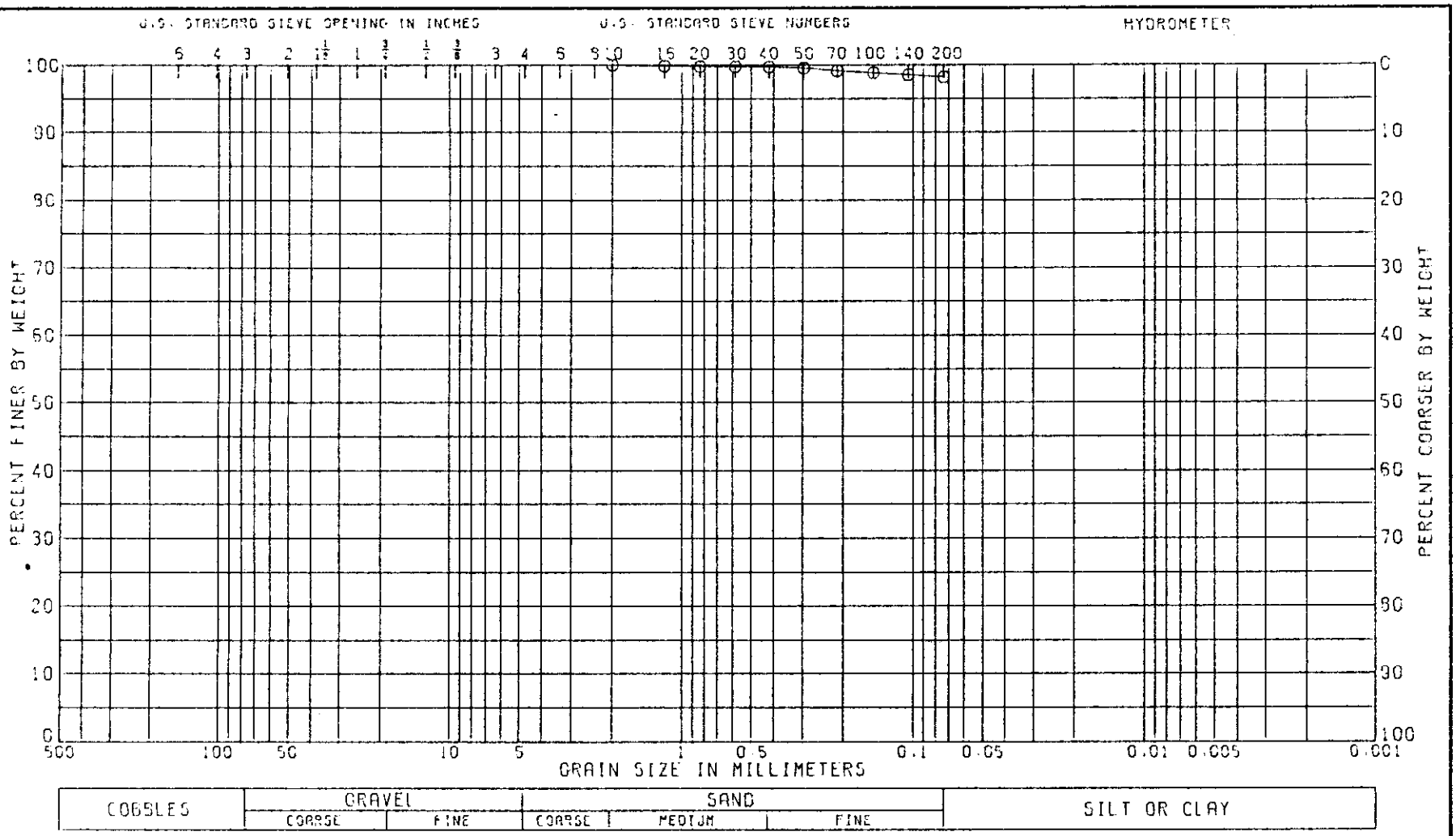
GRAVELLY CLAYEY SAND (SC), BROWN
INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

GRADATION CURVE

PROJECT CRANE NWSC
DEMOLITION AREA

BORING NO. 6-0-81 SAMPLE NO. 1A

DEPTH/ELEV 0.0-1.7 DATE 31 MAR 92



LL	PL	PI	CS	NAT W.%
41	19	22		14.8

CLASSIFICATION

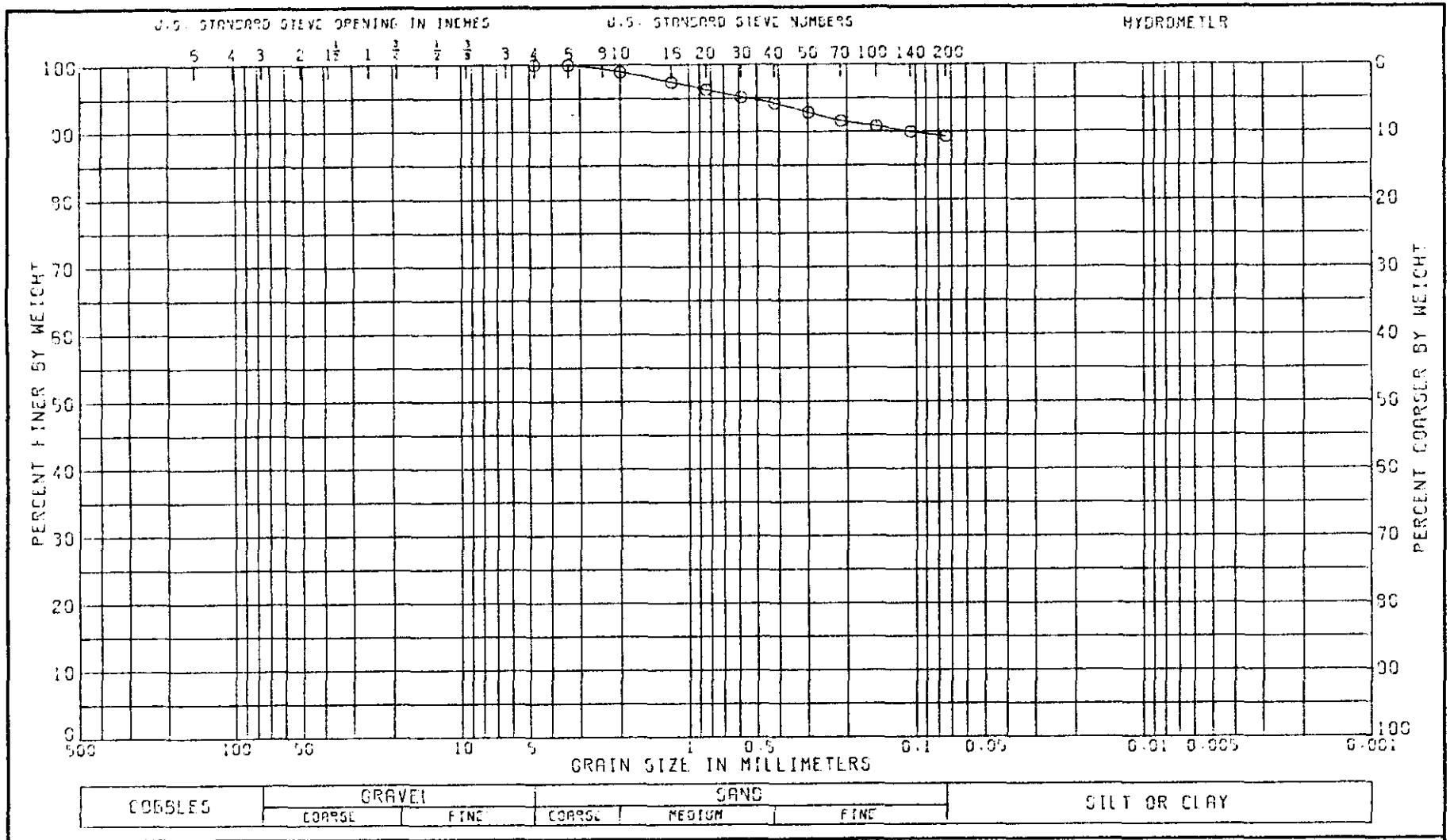
CLAY (CL) BROWN

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. S-10-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-2.08 DATE 12 MAR 82



LL	PL	PI	CS	NAT W.%
45	19	26		17.4

CLASSIFICATION

CLAY (CL), BROWN: WITH SAND

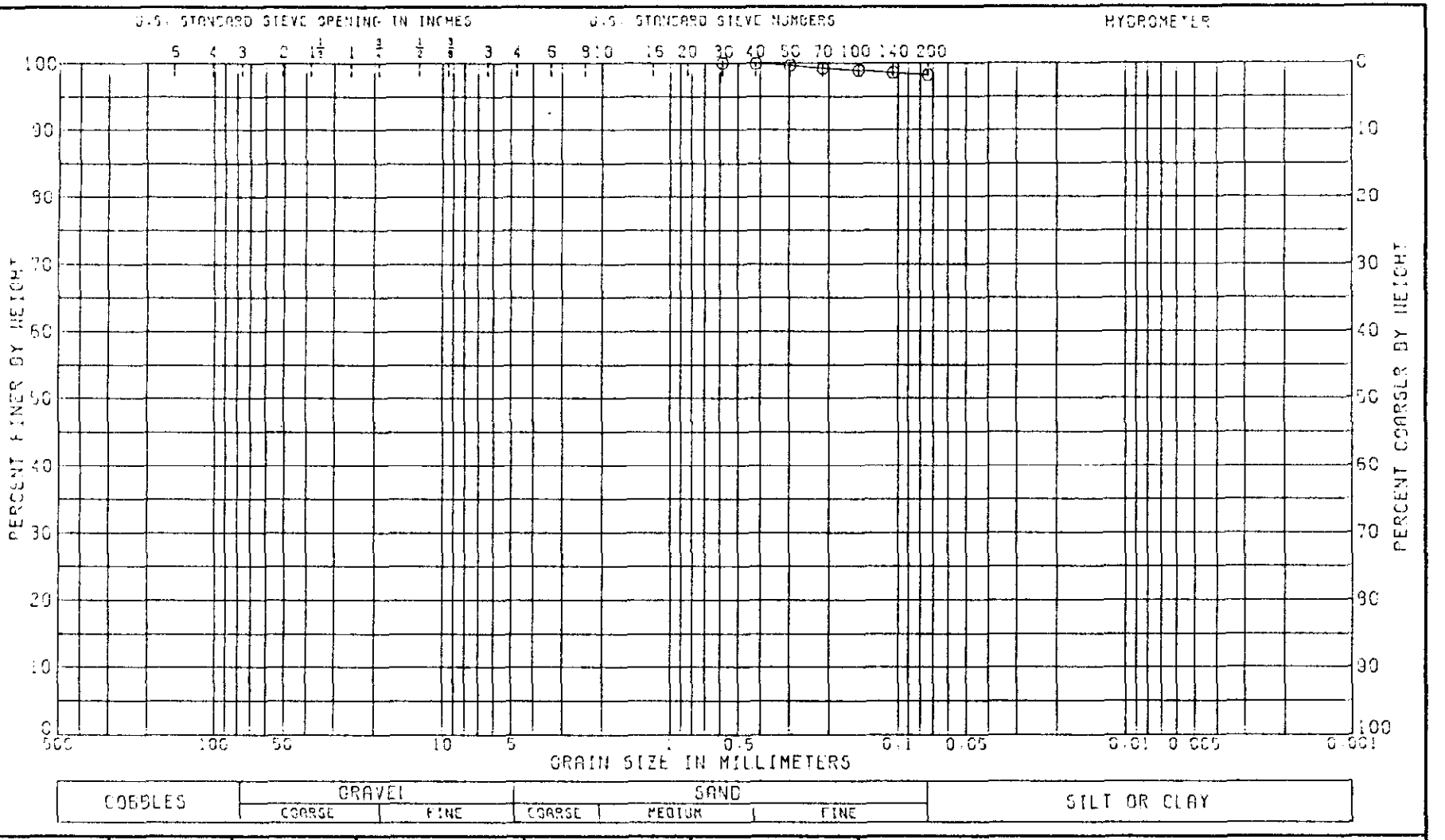
GRADATION CURVE

PROJECT CRANE NWSC

DEMOLITION AREA

BORING NO. S-10-91 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.00 DATE 31 MAR 92



LL	PL	PI	OS	NAT W.%	
47	25	22		20.8	

CLASSIFICATION

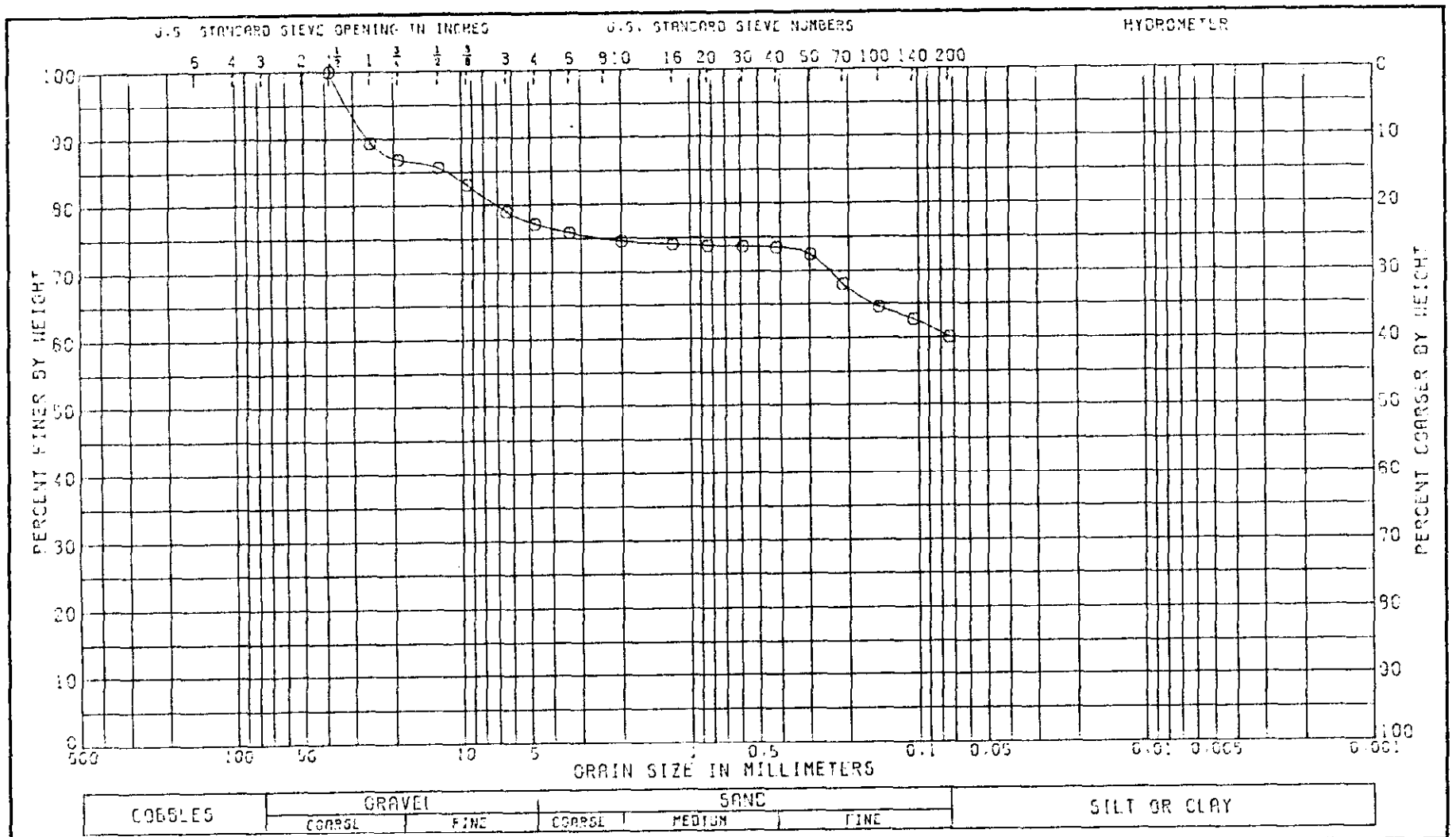
CLAY (CL), BROWN

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. 6-10-B1 SAMPLE NO 3

DEPTH/ELEV 10.0-11.49 DATE 12 MAR 92



LL	PL	PI	CS	NAT W.%	
32	18	14		13.0	

CLASSIFICATION

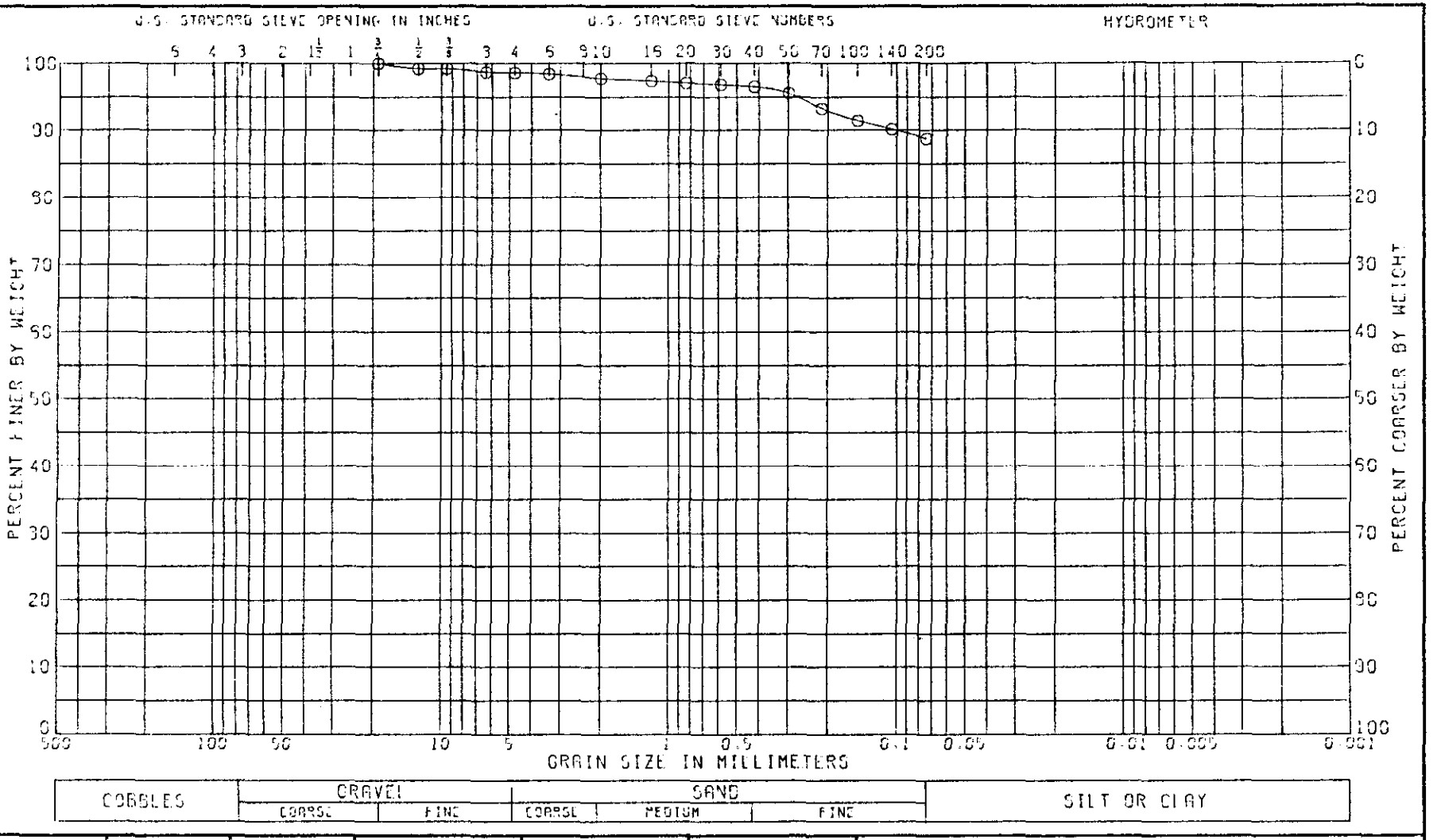
GRAVELLY SANDY CLAY (CL), BROWN
INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. 6-11-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-2.30 DATE 12 MAR 82



LL	PL	PI	CS	NAT W.%
36	19	17		22.0

CLASSIFICATION

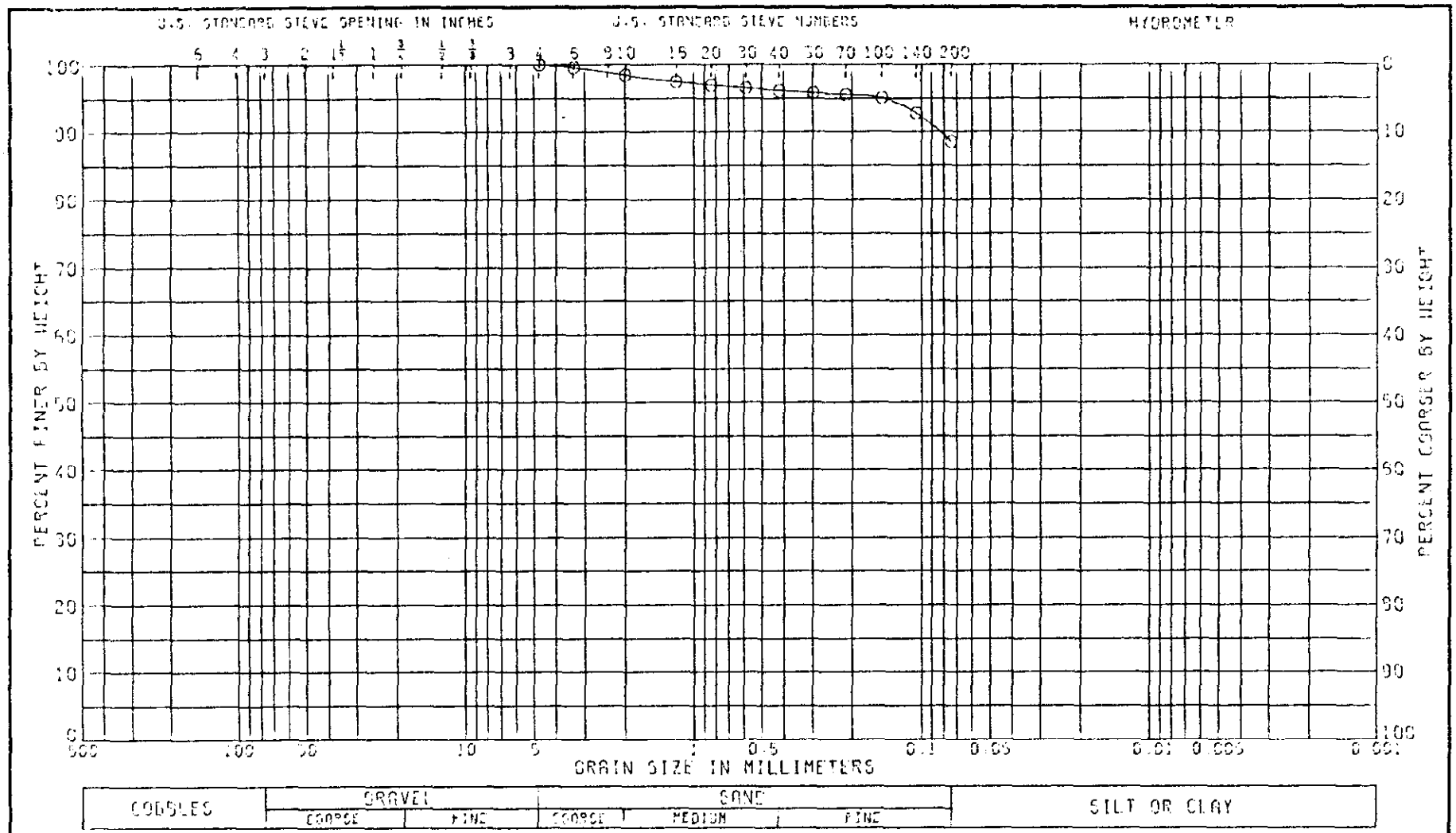
CLAY (CL), LIGHT BROWN: WITH SAND
INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

GRADATION CURVE

PROJECT CRANE NWSC
DEMOLITION AREA

BORING NO. 6-11-91 SAMPLE NO. 2

DEPTH/ELEV 5.0-5.71 DATE 31 MAR 92



LL	PL	PI	CC	NAT W.%
57	18	39		20.8

CLASSIFICATION

CLAY (CH), REDDISH BROWN: WITH SAND

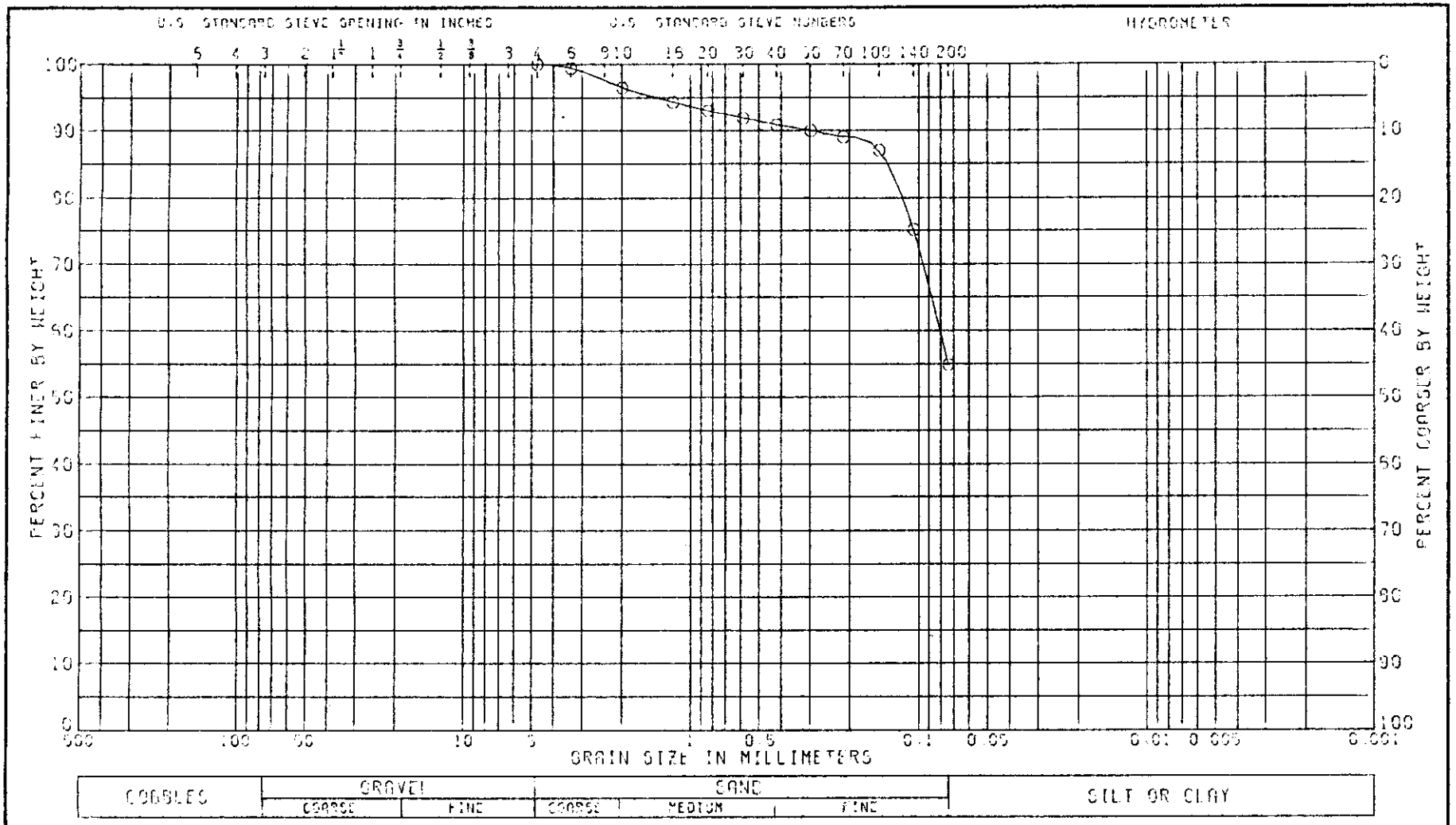
GRADATION CURVE

PROJECT CRANE NASC

OLD BURNING GROUND

BORING NO 6-12-81 SAMPLE NO 1

DEPTH/ELEV 1.10-2.20 DATE 26 FEB 82



LL 26	PL 12	PI 14	GS	NAT W.% 7.9	

CLASSIFICATION

SANDY CLAY (CL), GRAY

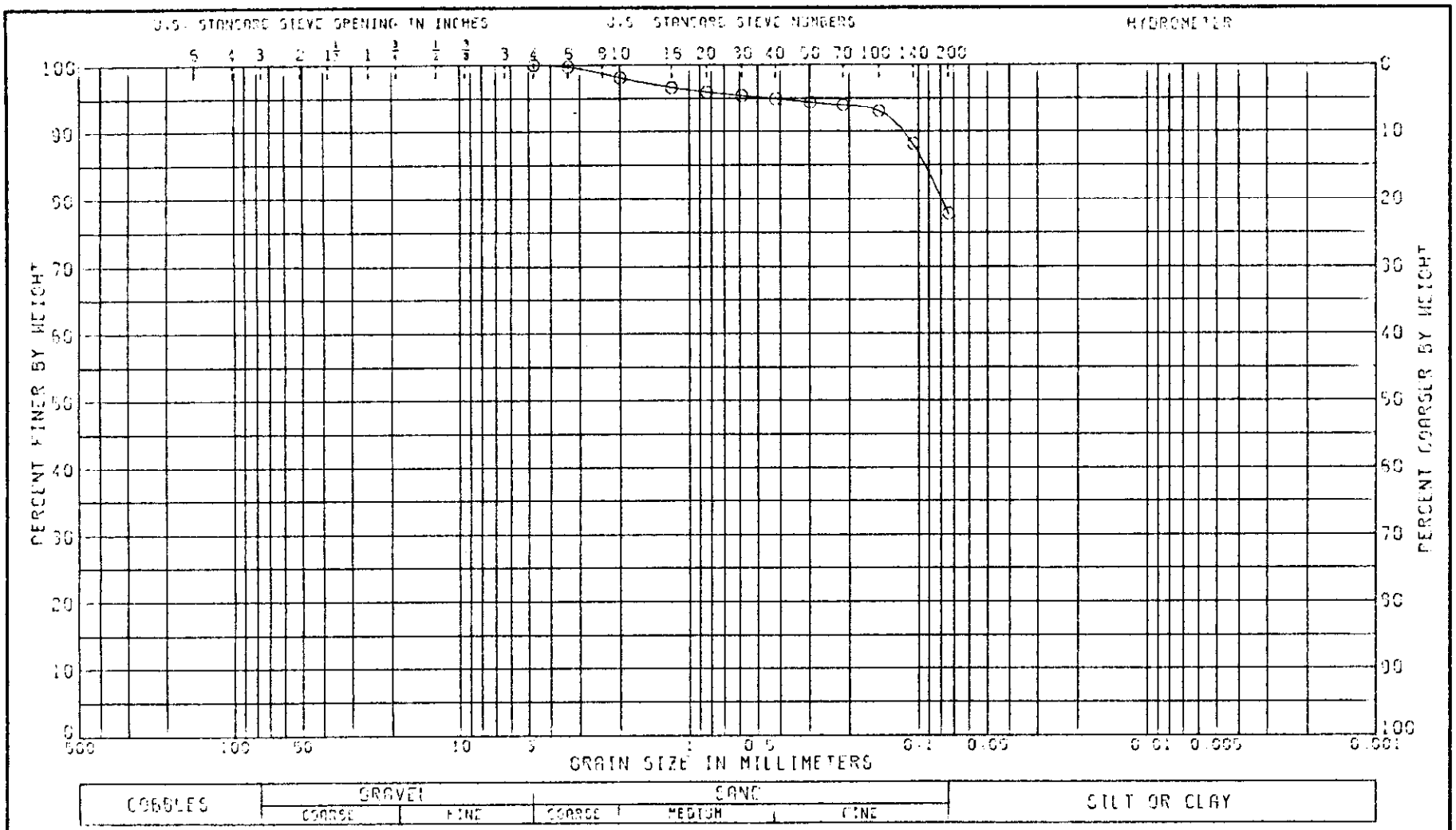
GRADATION CURVE

PROJECT CRANE NWSC

OLD BURNING GROUND

BORING NO. 6-12-81 SAMPLE NO 2

DEPTH/ELEV 5.0-6.14 DATE 26 FEB 82



LL	PL	PI	GS	NAT W.%
50	17	33		17.3

CLASSIFICATION

SANDY CLAY (CH) BROWN

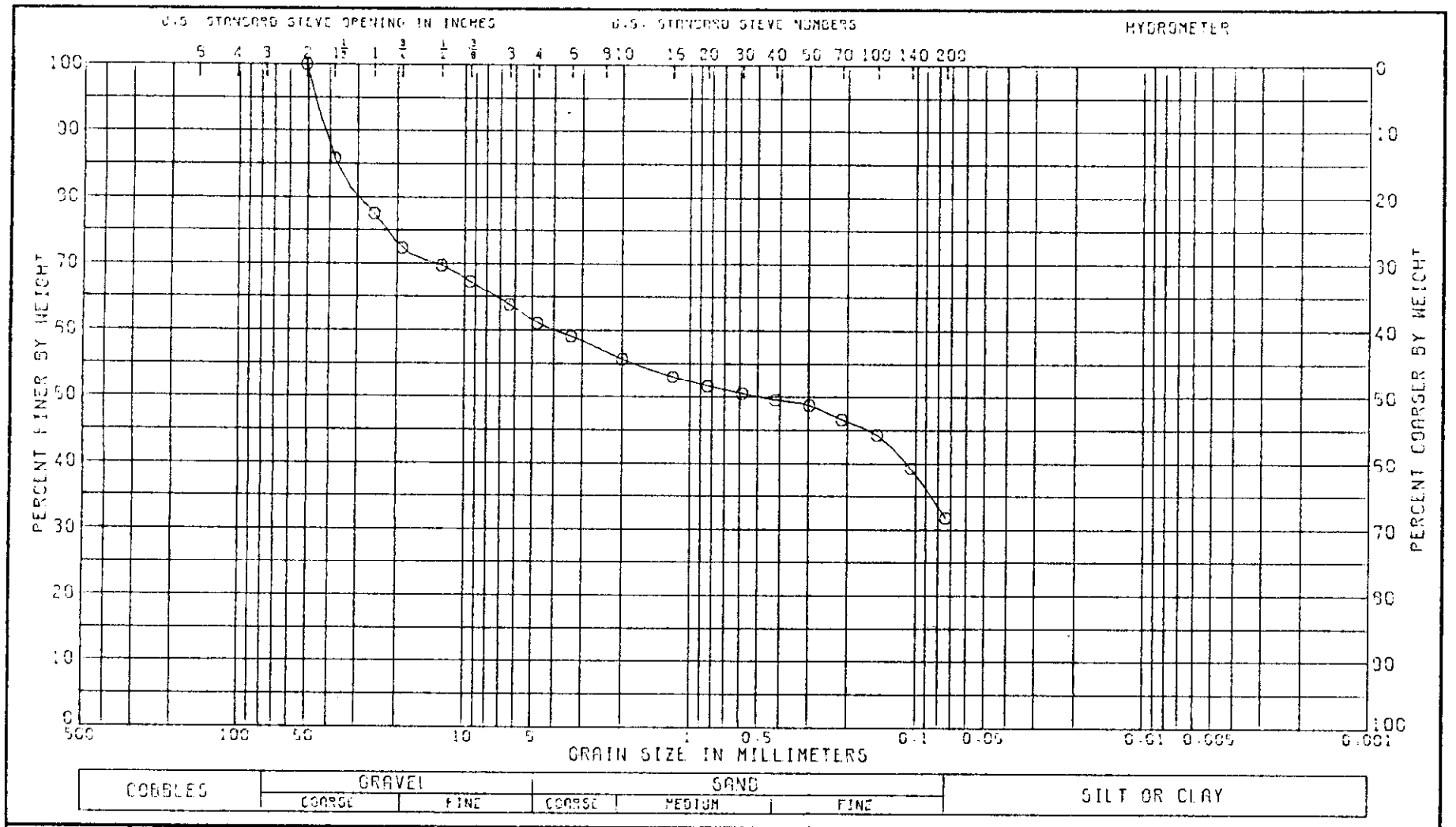
GRADATION CURVE

PROJECT CRANE NWSC

DEMOLITION AREA

BORING NO. 6-13-81 SAMPLE NO 1

DEPTH/ELEV 0.9-1.29 DATE 26 FEB 82



LL 27	PL 16	PI 11	GS	NAT W.% 15.8

CLASSIFICATION

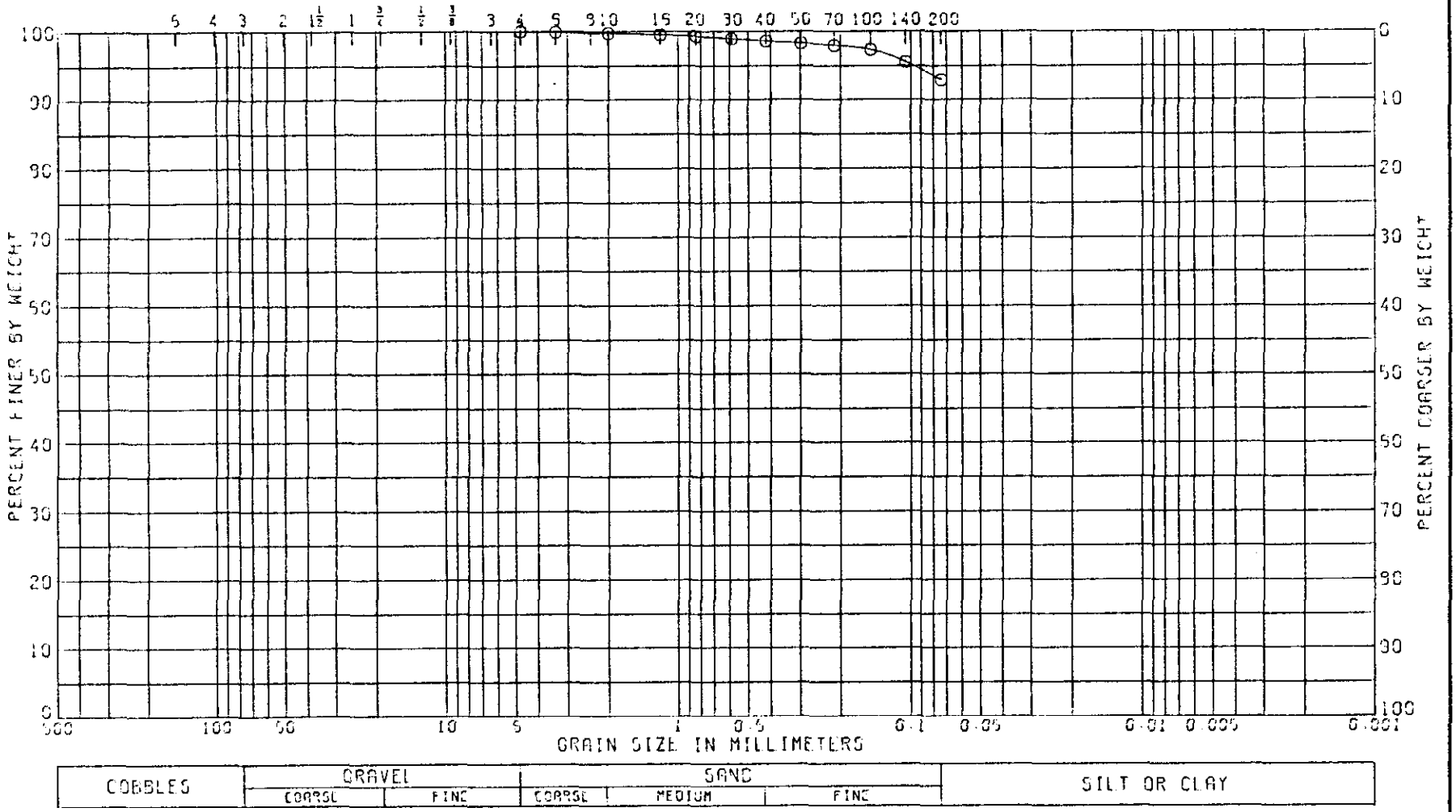
GRAVELLY CLAYEY SAND (SC), REDDISH BROWN
INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. S-14-B1 SAMPLE NO 1

DEPTH/ELEV 0.0-1.61 DATE 11 FEB 92



LL	PL	PI	CS	NAT W.%
28	19	9		24.0

CLASSIFICATION

CLAY (CL), BROWN: WITH SAND

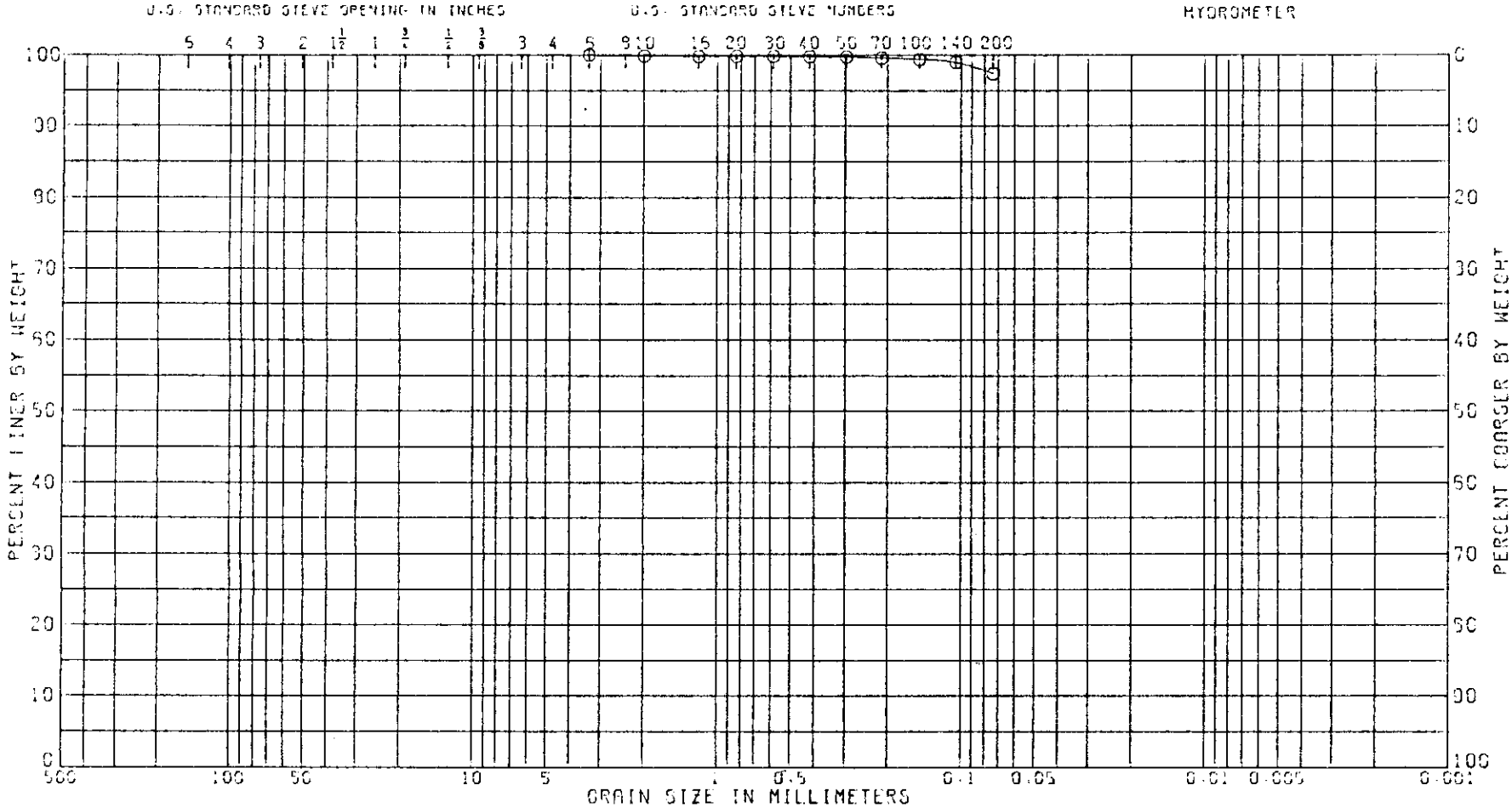
GRADATION CURVE

PROJECT CRANE NWSC

DEMOLITION AREA

BORING NO. 6-14-91 SAMPLE NO. 2

DEPTH/ELEV 5.0-7.06 DATE 31 MAR 92



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

LL 33	PL 18	PI 15	GS	NAT W.% 23.5	

CLASSIFICATION

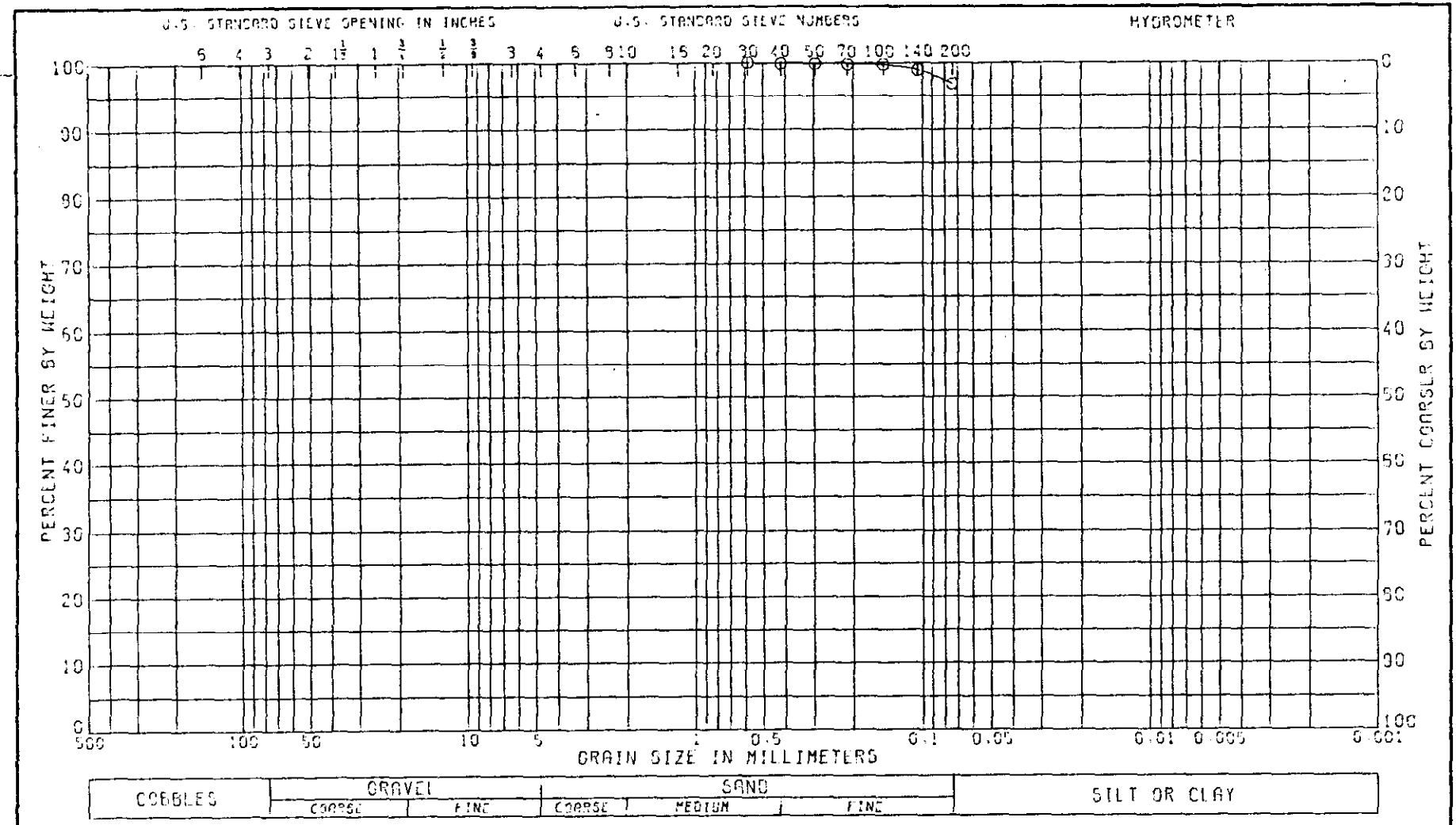
CLAY (CL), GRAY

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. S-14-81 SAMPLE NO. 3

DEPTH/ELEV 10.0-11.67 DATE 11 FEB 82



LL 61	PL 24	PI 37	GS	NAT W.% 33.3	

CLASSIFICATION

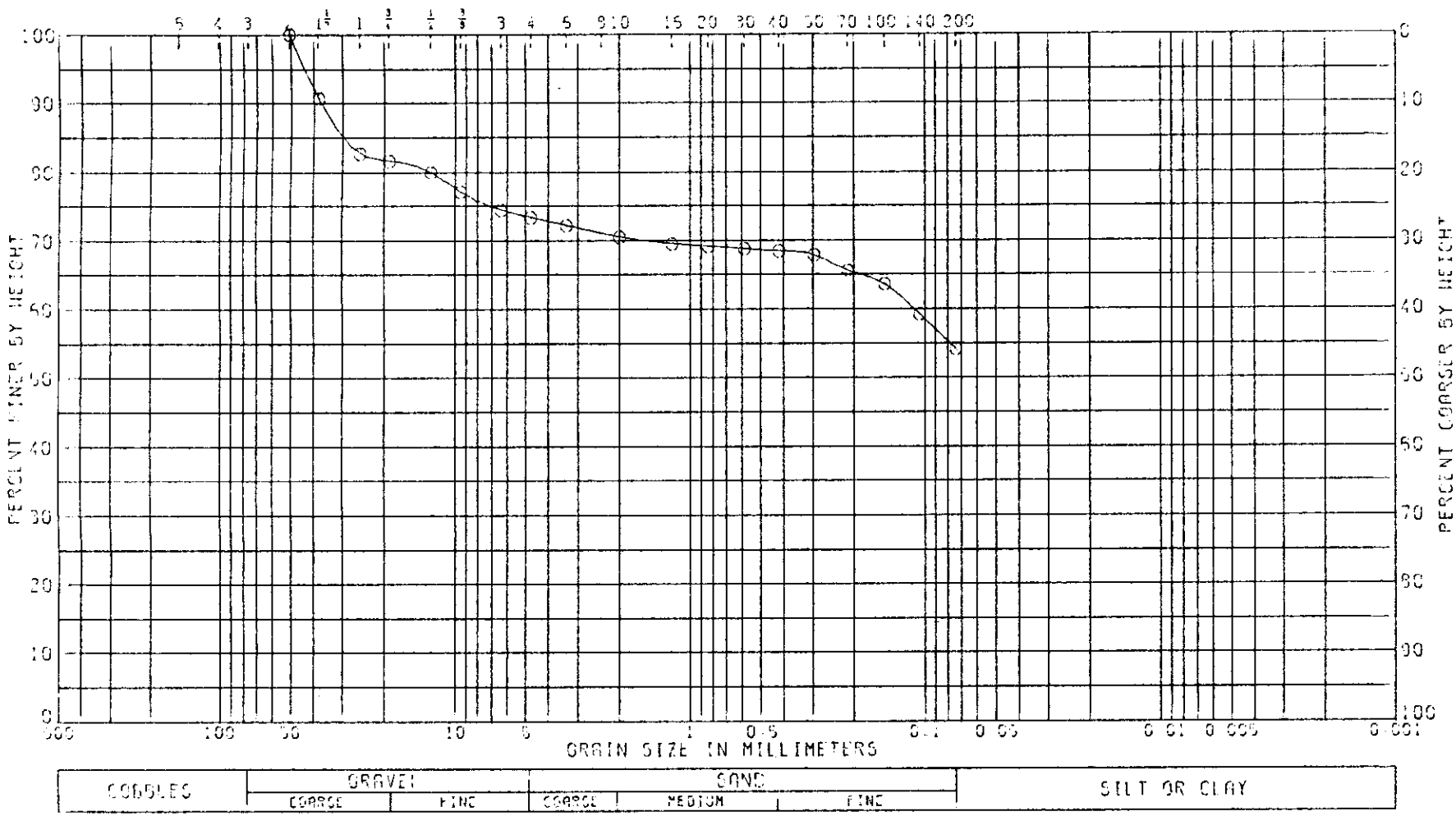
CLAY (CH), DARK BROWN

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. 6-14-81 SAMPLE NO. 4

DEPTH/ELEV 15.0-17.07 DATE 11 FEB 82



LL	PL	PI	CS	NAT W.%	
27	17	10		16.5	

CLASSIFICATION

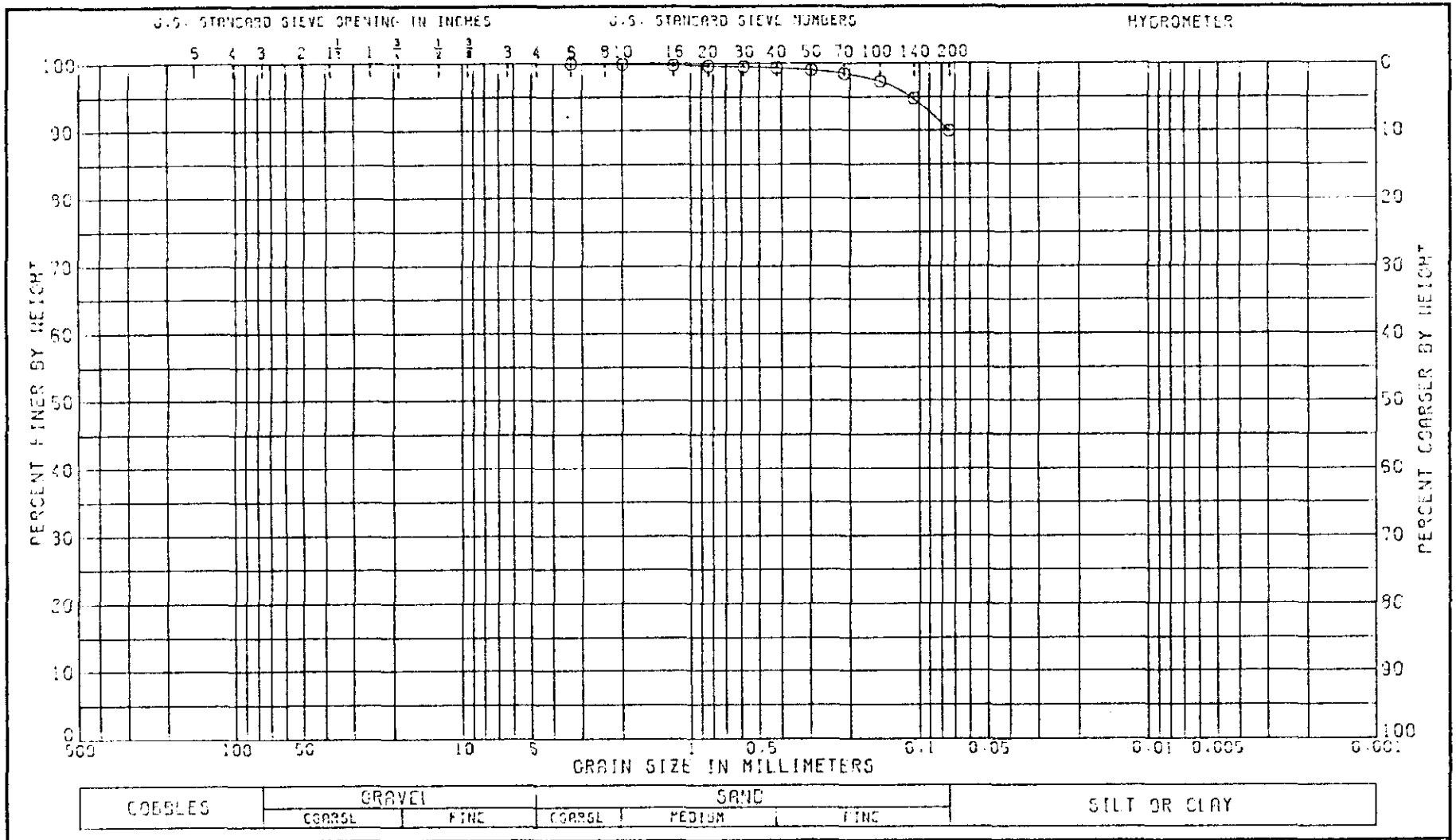
GRAVELLY SANDY CLAY (CL), BROWN
INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

GRADATION CURVE

PROJECT CRANE NWSC
OLD BURNING GROUND

BORING NO 6-15-91 SAMPLE NO 1

DEPTH/ELEV 0.0-1.35 DATE 26 FEB 92



LL	PL	PI	GS	NAT W.%
37	20	17		13.8

CLASSIFICATION

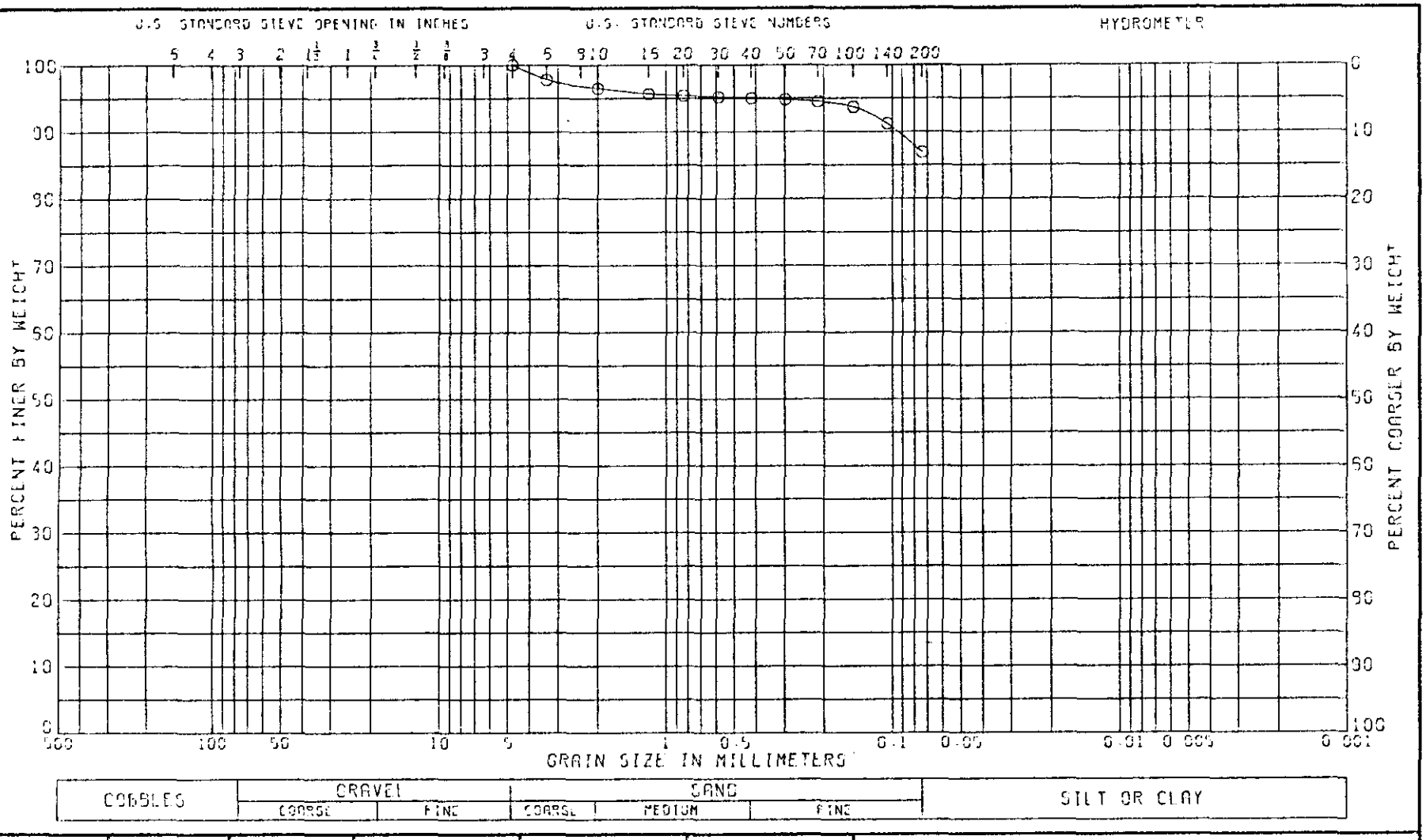
CLAY (CL), BROWN: WITH SAND

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. 6-18-81 SAMPLE NO 1

DEPTH/ELEV 0.0-1.37 DATE 12 MAR 92



LL	PL	PI	CS	NAT W.%
29	15	14		10.7

CLASSIFICATION

SANDY CLAY (CL), BROWN

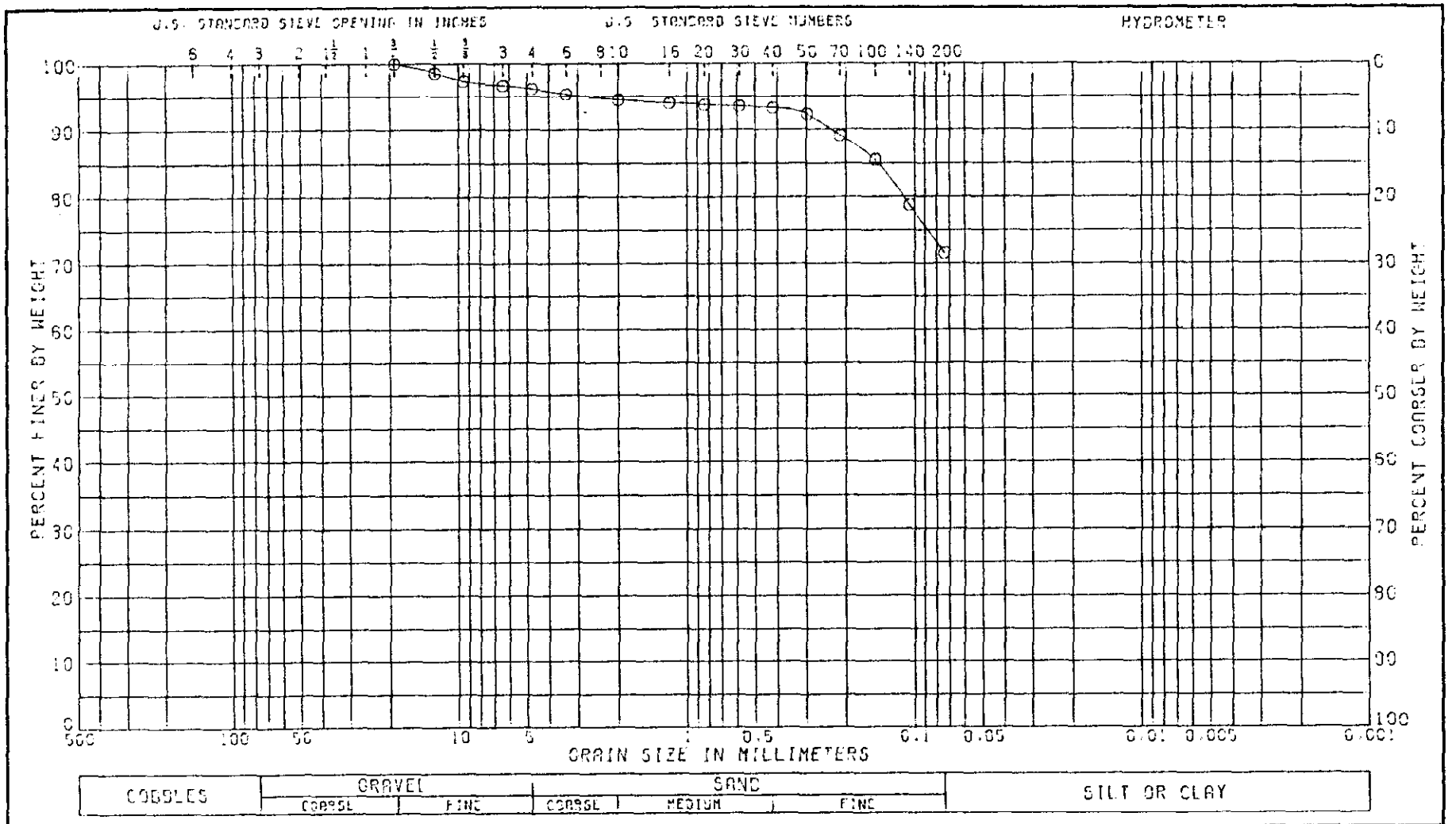
GRADATION CURVE

PROJECT CRANE NWSC

DEMOLITION AREA

BORING NO. 6-16-91 SAMPLE NO. 2A

DEPTH/ELEV 5.0-5.4 DATE 31 MAR 92



LL	PL	PI	GS	NAT W.%
28	17	11		22.7

CLASSIFICATION

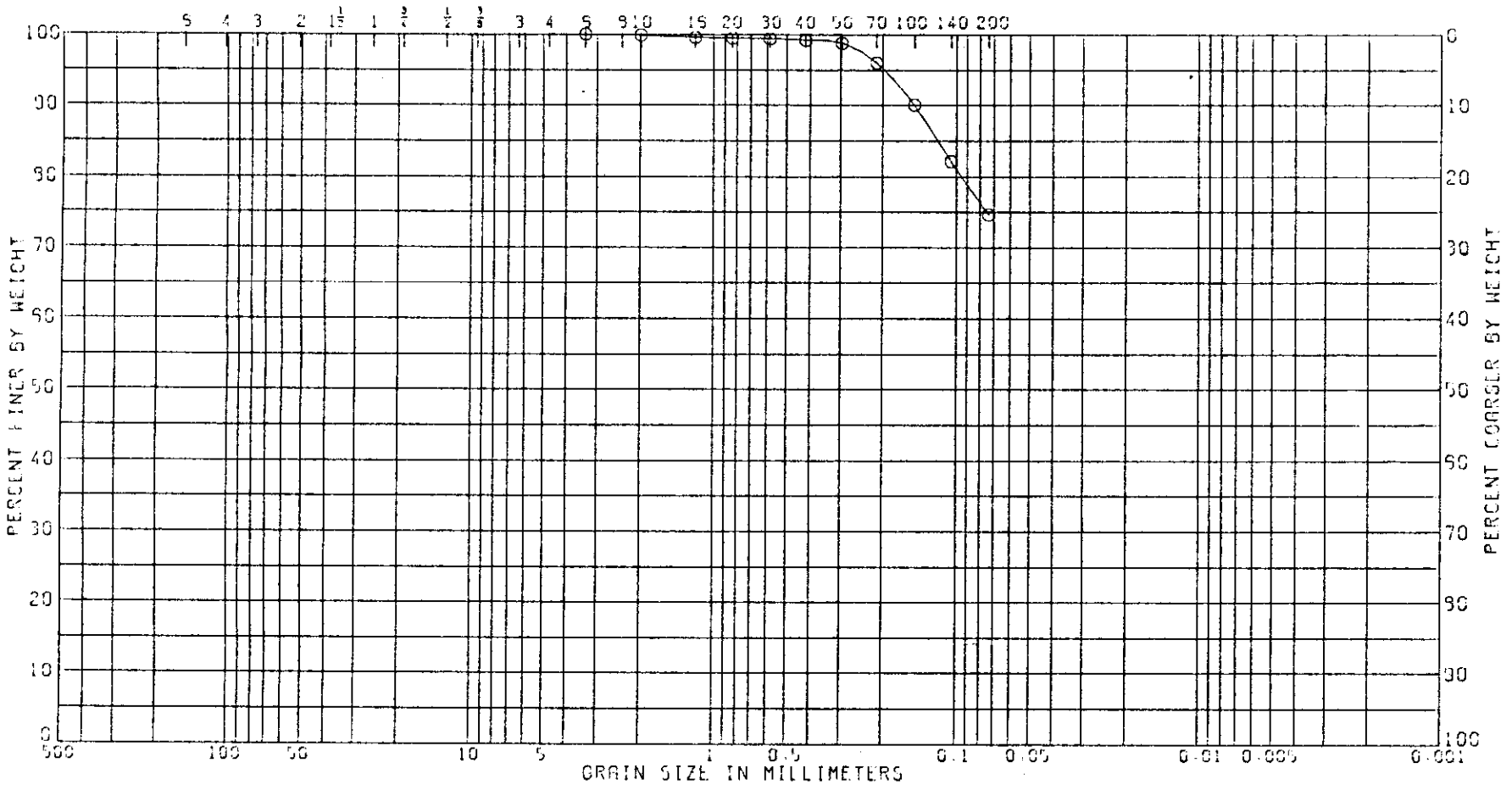
SANDY CLAY (CL), BROWN; TRACE OF GRAVEL

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. 6-17-91 SAMPLE NO. 1

DEPTH/ELEV 0.0-1.33 DATE 12 MAR 92



LL	PL	PI	CS	NAT W.%
35	18	17		15.0

CLASSIFICATION

SANDY CLAY (CL), TAN

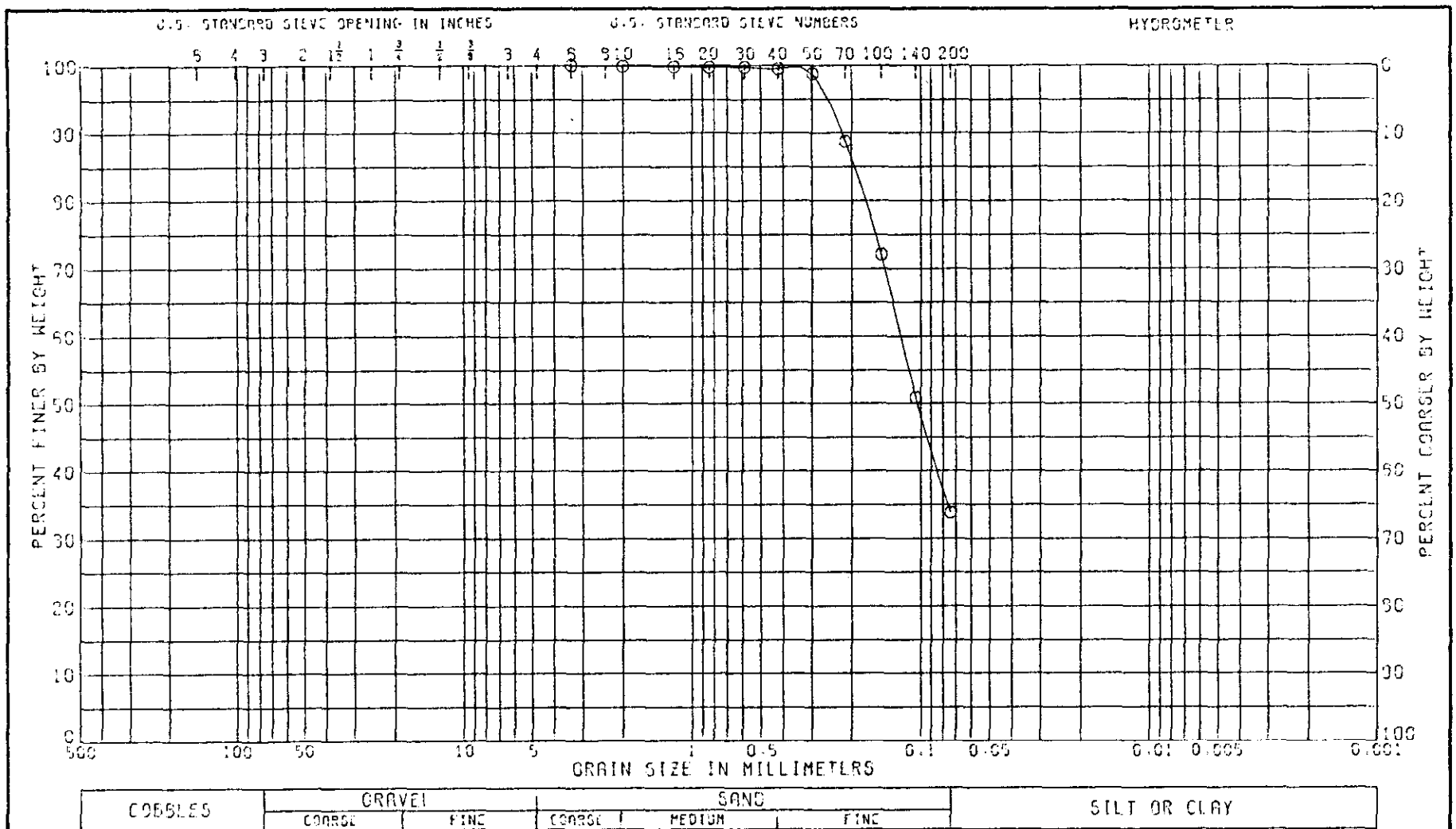
GRADATION CURVE

PROJECT CRANE NWSC

DEMOLITION AREA

BORING NO. 6-19-91 SAMPLE NO. 1

DEPTH/ELEV 0.0-1.53 DATE 31 MAR 92



LL	PL	PI	GS	NAT W.%
24	14	10		13.9

CLASSIFICATION

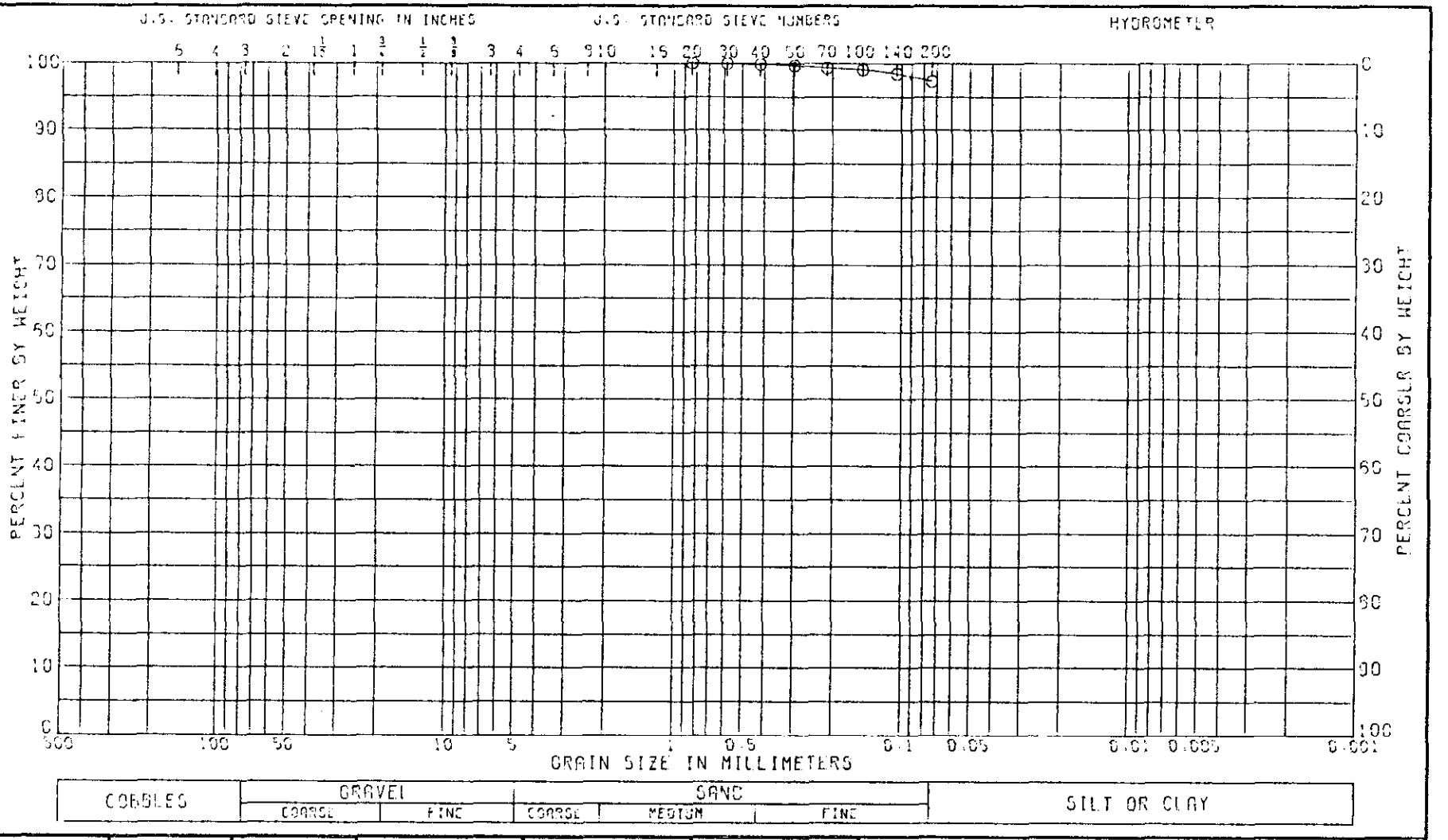
CLAYEY SAND (SC), BROWN

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. 6-18-91 SAMPLE NO. 2

DEPTH/ELEV 5.0-5.5S DATE 11 FEB 92



LL	PL	PI	CS	NAT W.%
42	18	24		23.2

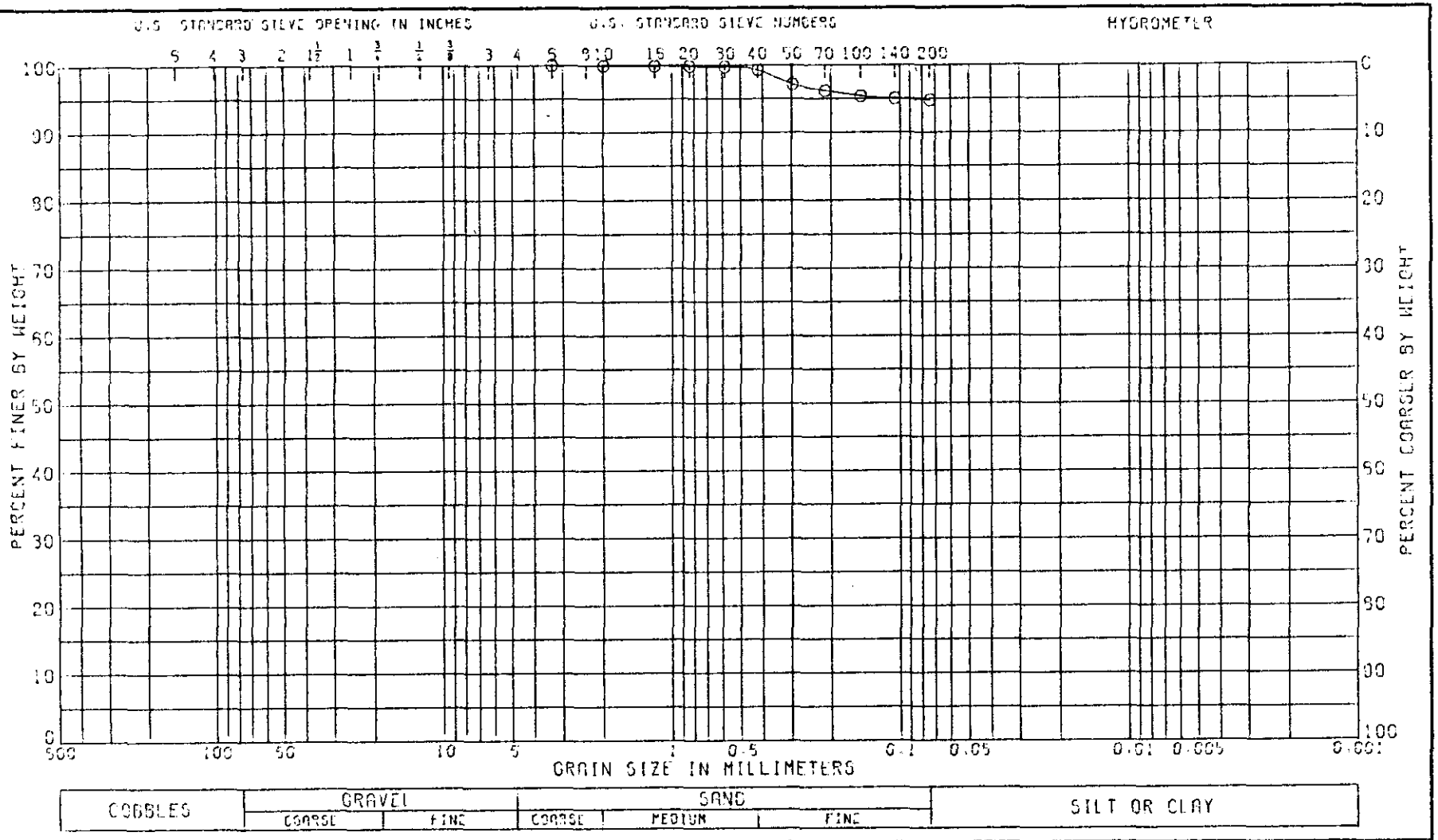
CLASSIFICATION
CLAY (CL), LIGHT BROWN

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. 6-10-91 SAMPLE NO. 1

DEPTH/ELEV 5.0-6.85 DATE 11 FEB 92



LL	PL	PI	CS	NAT W.%
44	17	27		25.2

CLASSIFICATION

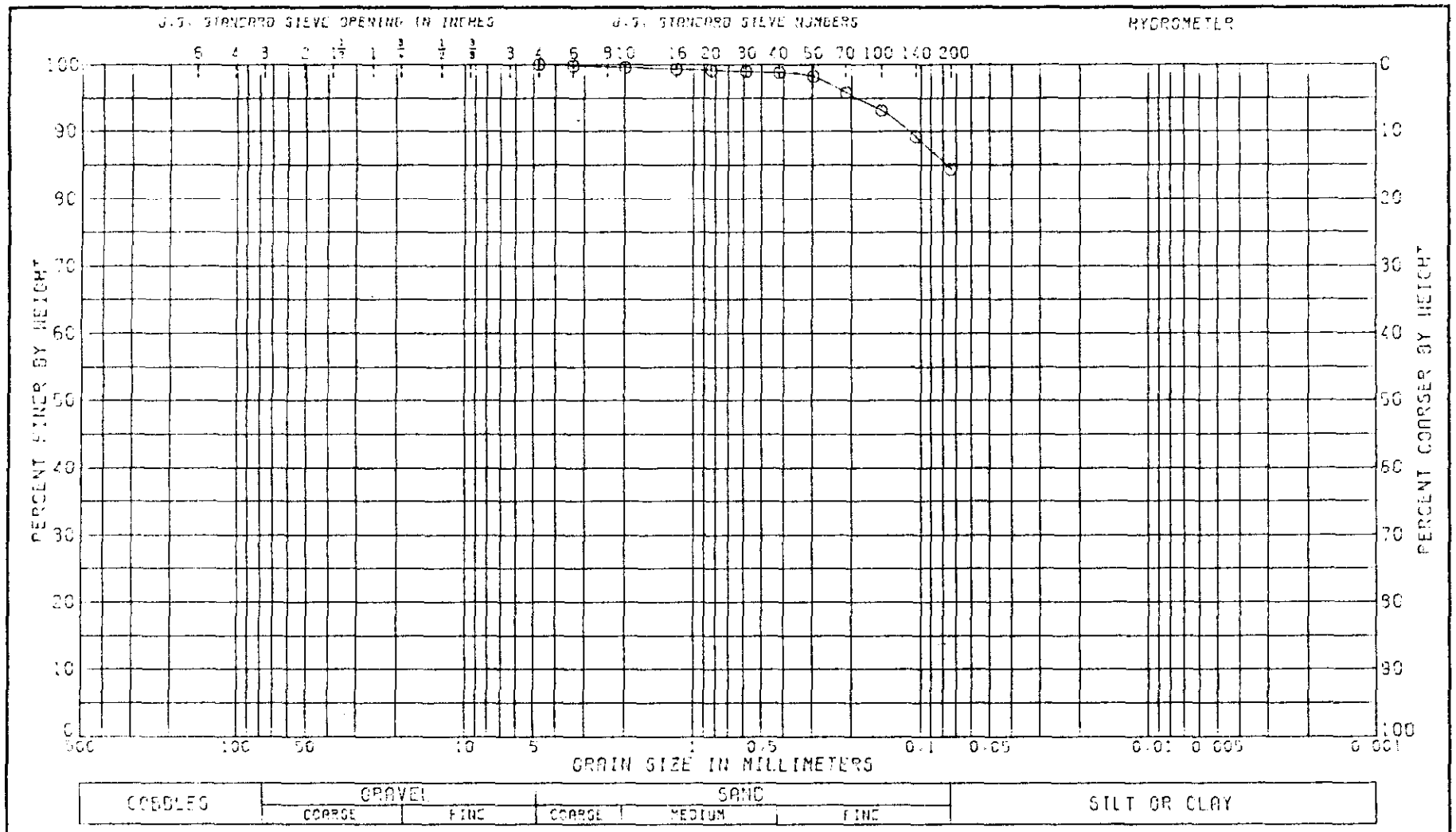
CLAY (CL), BROWNISH GRAY: WITH SAND

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. 6-10-91 SAMPLE NO. 2

DEPTH/ELEV 10.0-11.66 DATE 11 FEB 92



LL 27	PL 15	PI 12	GS	NAT W.% 19.1	

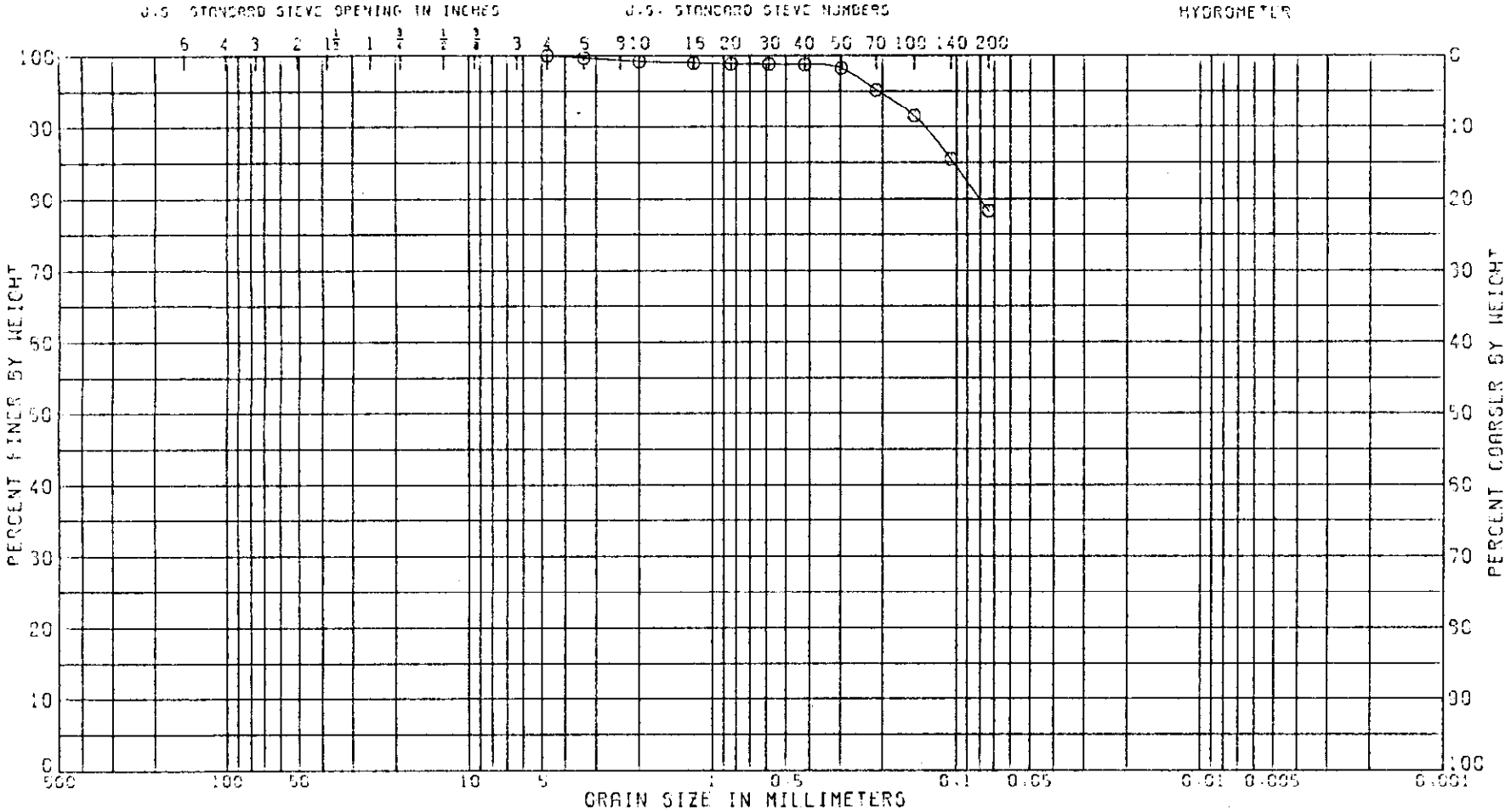
CLASSIFICATION
SANDY CLAY (CL), REDDISH BROWN

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. 6-20-81 SAMPLE NO 1

DEPTH/ELEV 0.0-1.78 DATE 05 FEB 82



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

LL	PL	PI	OS	NAT W.%	
35	14	21		18.9	

CLASSIFICATION

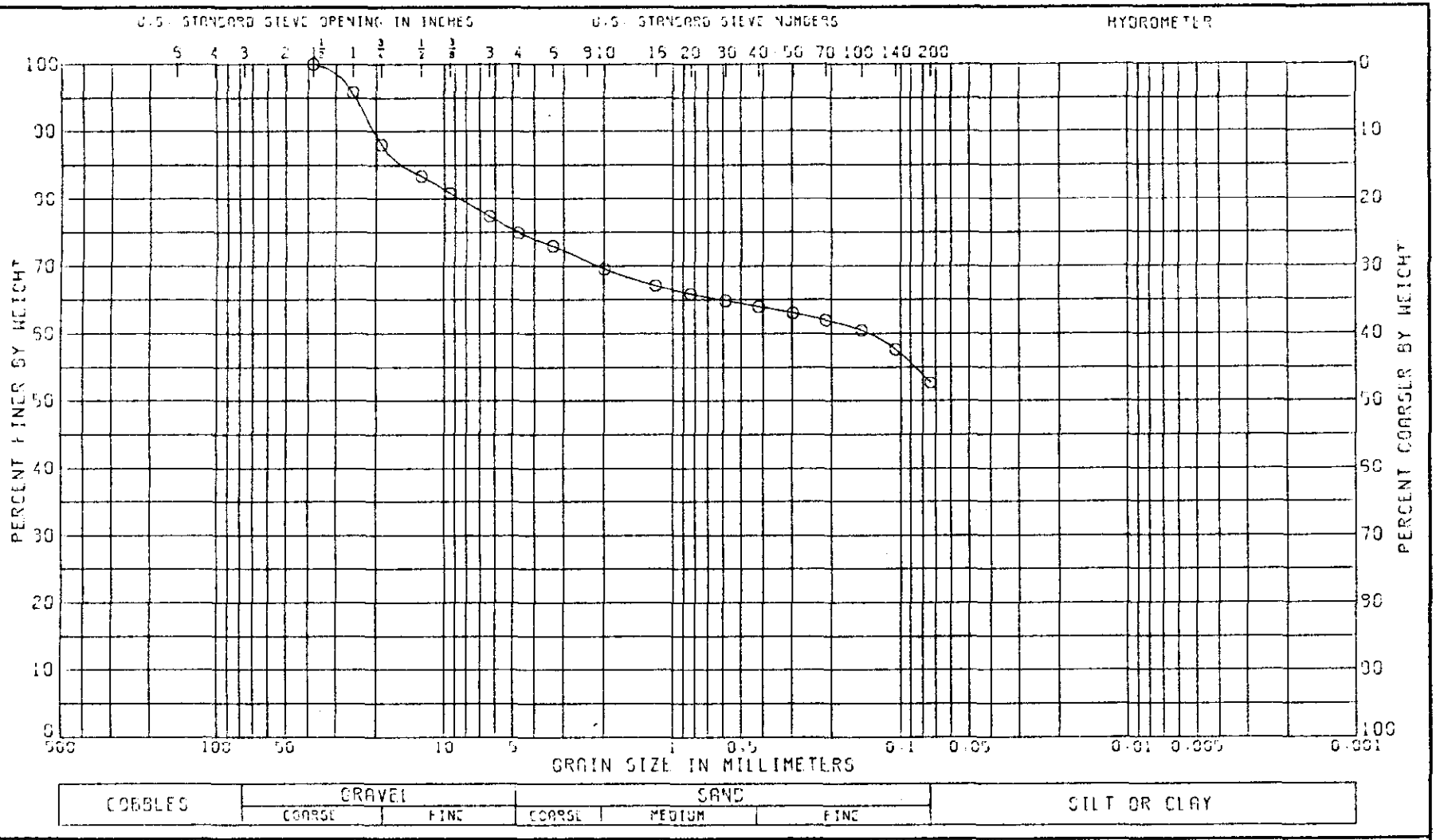
SANDY CLAY (CL), BROWN

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO. S-20-81 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.75 DATE 11 FEB 82



LL	PL	PI	CS	NAT W.%
40	16	24		11.8

CLASSIFICATION

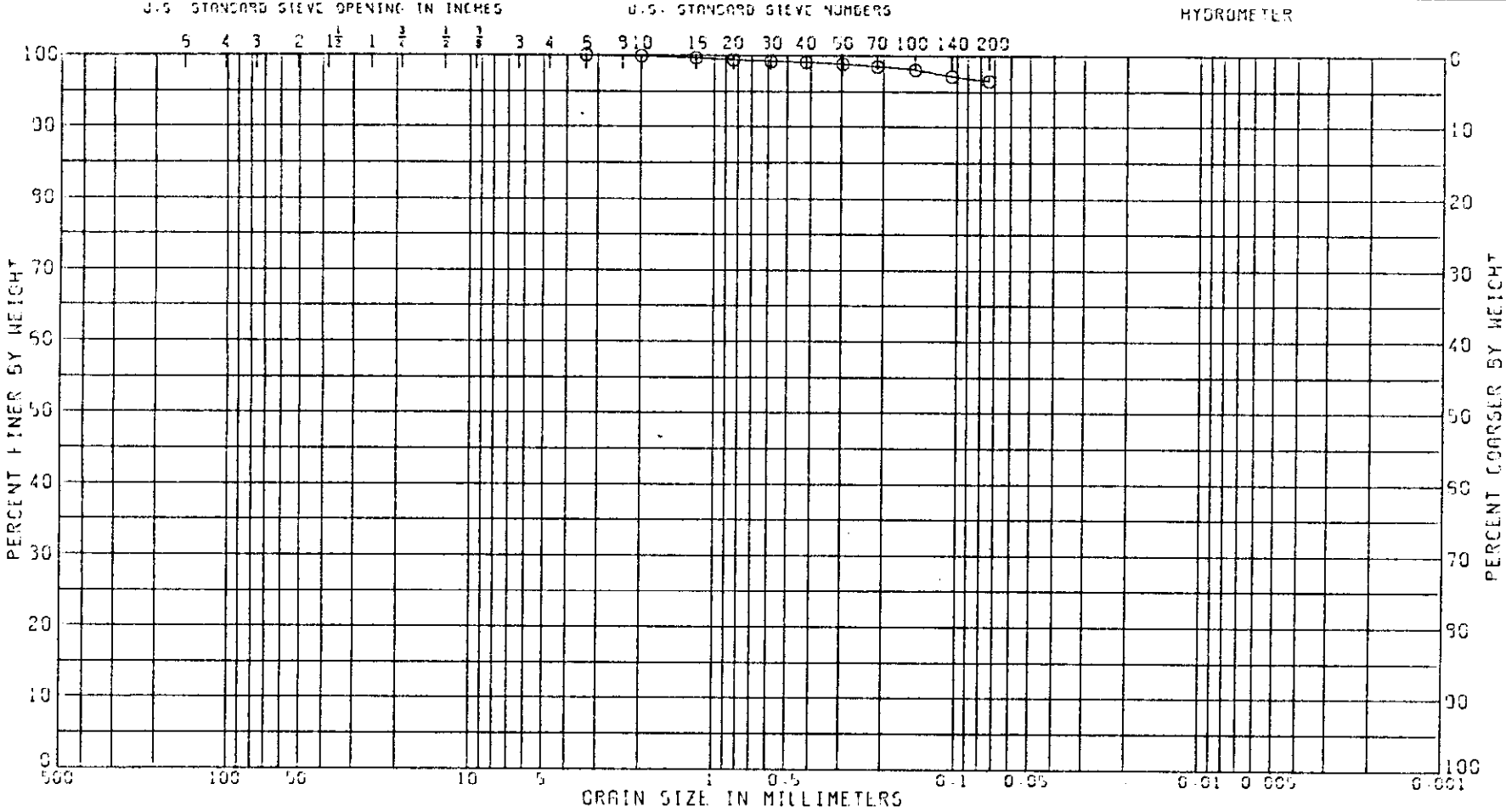
SANDY CLAYEY GRAVEL (GC), BROWN
INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

GRADATION CURVE

PROJECT CRANE NWSC
HWY-59 BURIAL GROUND

BORING NO. 7-1-91 SAMPLE NO. 1

DEPTH/ELEV 0.0-1.05 DATE 31 MAR 92



LL	PL	PI	CS	NAT W.%
42	19	23		15.7

CLASSIFICATION

CLAY (CL), TAN: TRACE OF SAND

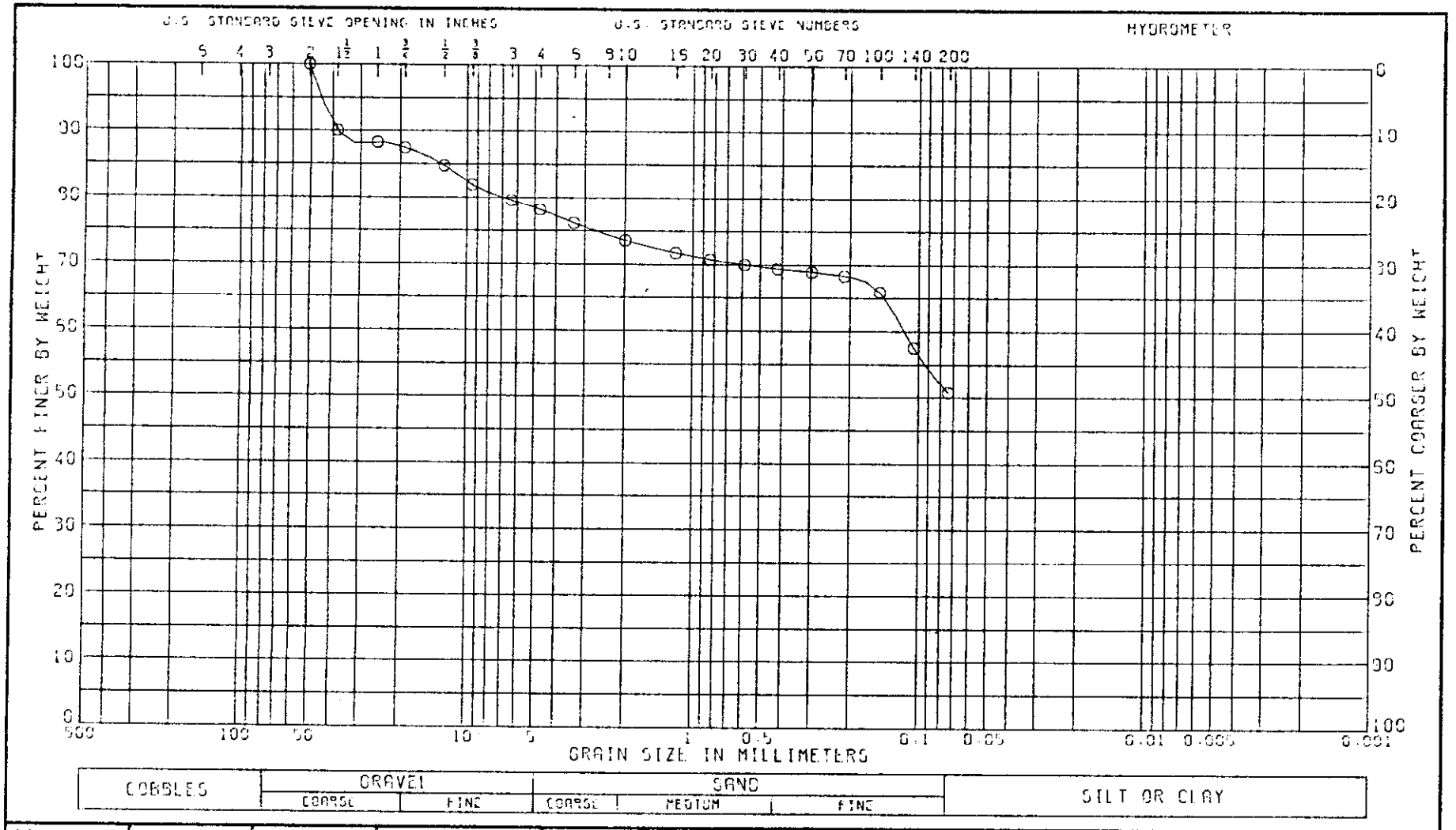
GRADATION CURVE

PROJECT CRANE NWSC

HWY-59 BURIAL GROUND

BORING NO. 7-1-81 SAMPLE NO. 2

DEPTH/ELEV 5.0-5.70 DATE 31 MAR 82



LL	PL	PI	CS	NAT W.%
35	16	19		12.2

CLASSIFICATION

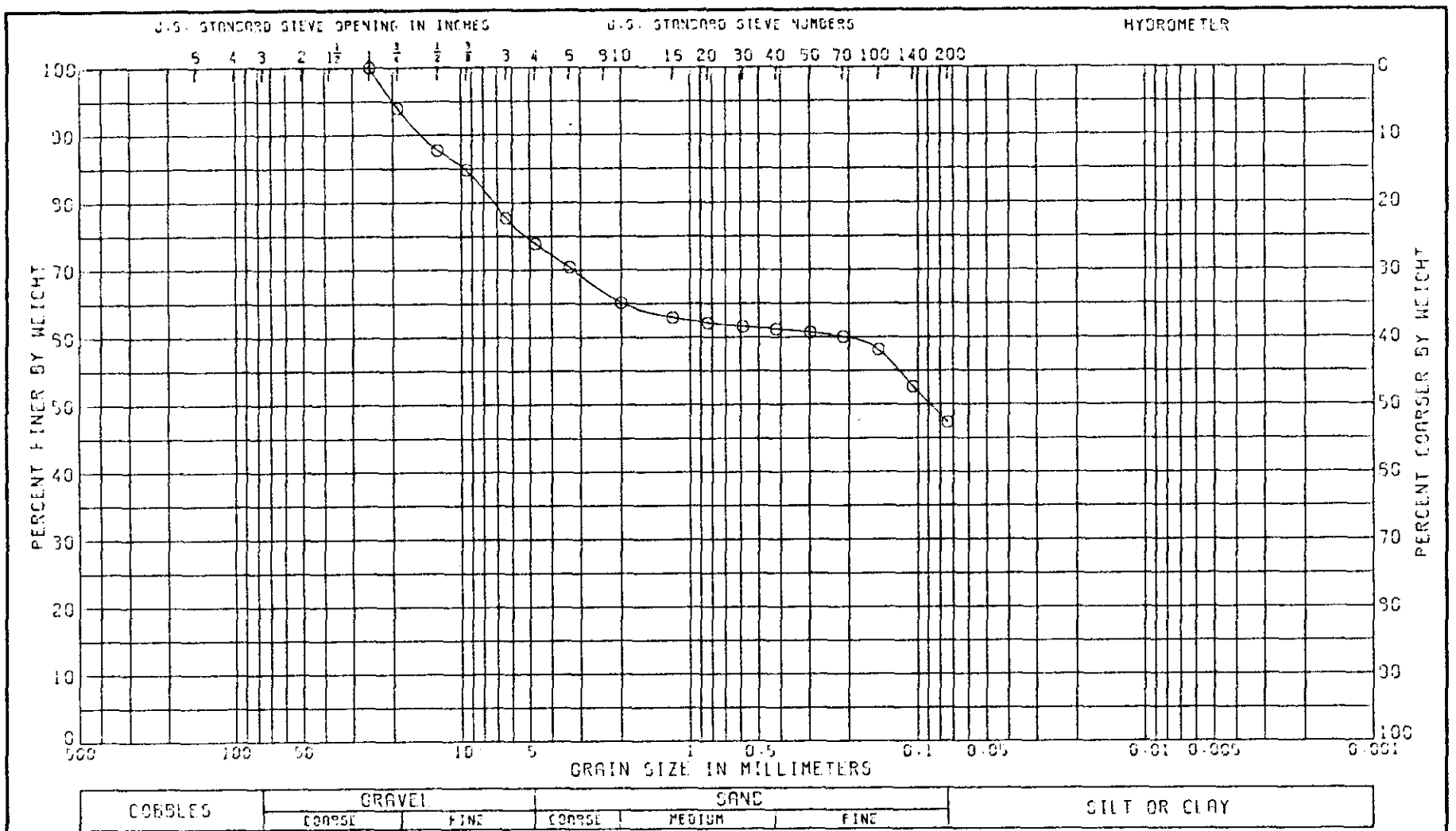
GRAVELLY SANDY CLAY (CL), GRAY
INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

GRADATION CURVE

PROJECT CRANE NWSC
HWY-59 BURIAL GROUND

BORING NO. 7-1-91 SAMPLE NO 3

DEPTH/ELEV 10.0-11.44 DATE 31 MAR 92



LL 30	PL 19	PI 14	CS	NAT W.% 8.2	

CLASSIFICATION

GRAVELLY CLAYEY SAND (SC), BROWN

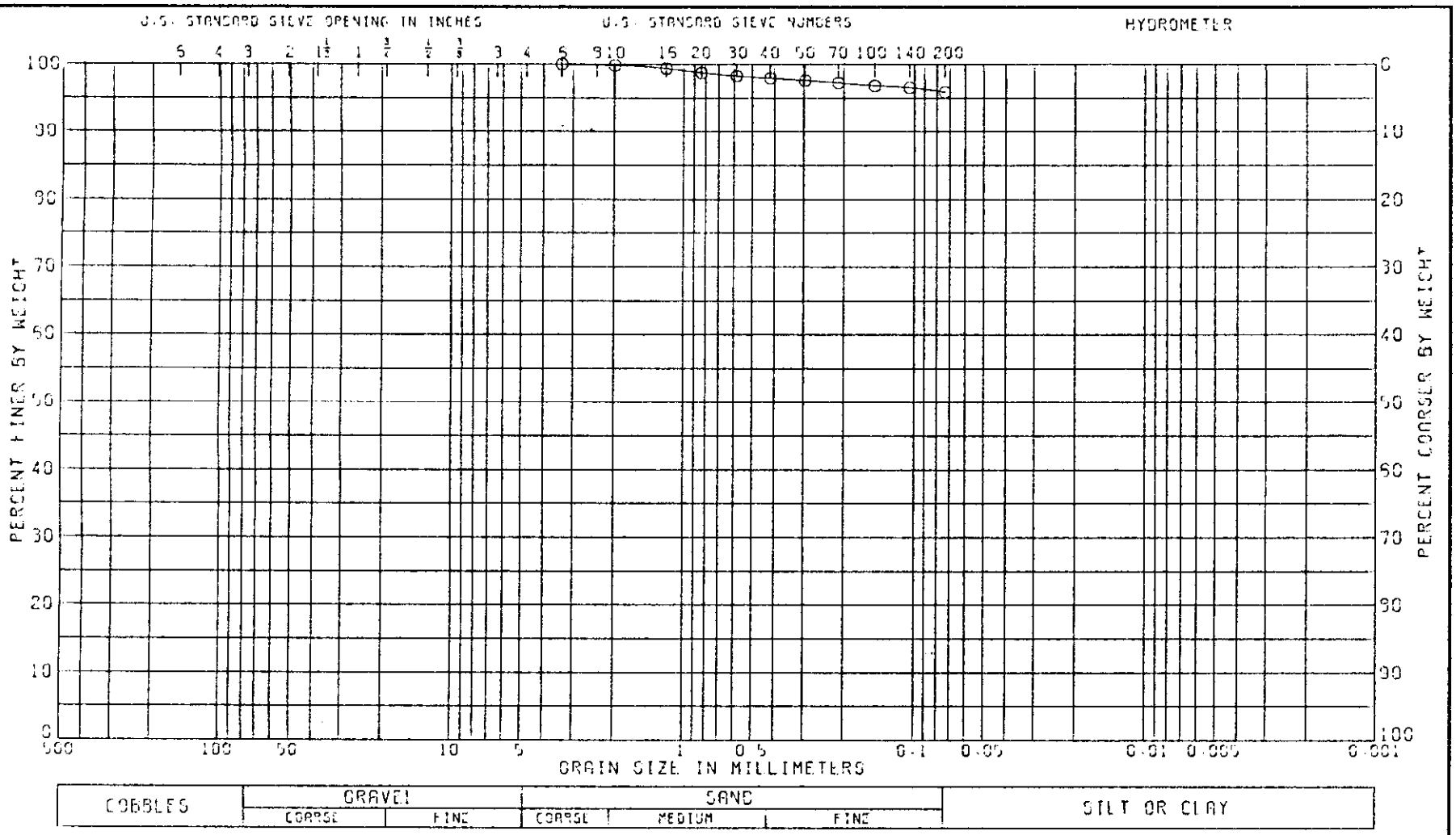
GRADATION CURVE

PROJECT CRANE NWSC

HWY-58 BURIAL GROUND

BORING NO. 7-2-91 SAMPLE NO. 1

DEPTH/ELEV 0.0-1.55 DATE 31 MAR 92



LL	PL	PI	CS	NAT W.%
47	22	25		16.1

CLASSIFICATION

CLAY (CL), BROWN: TRACE OF SAND

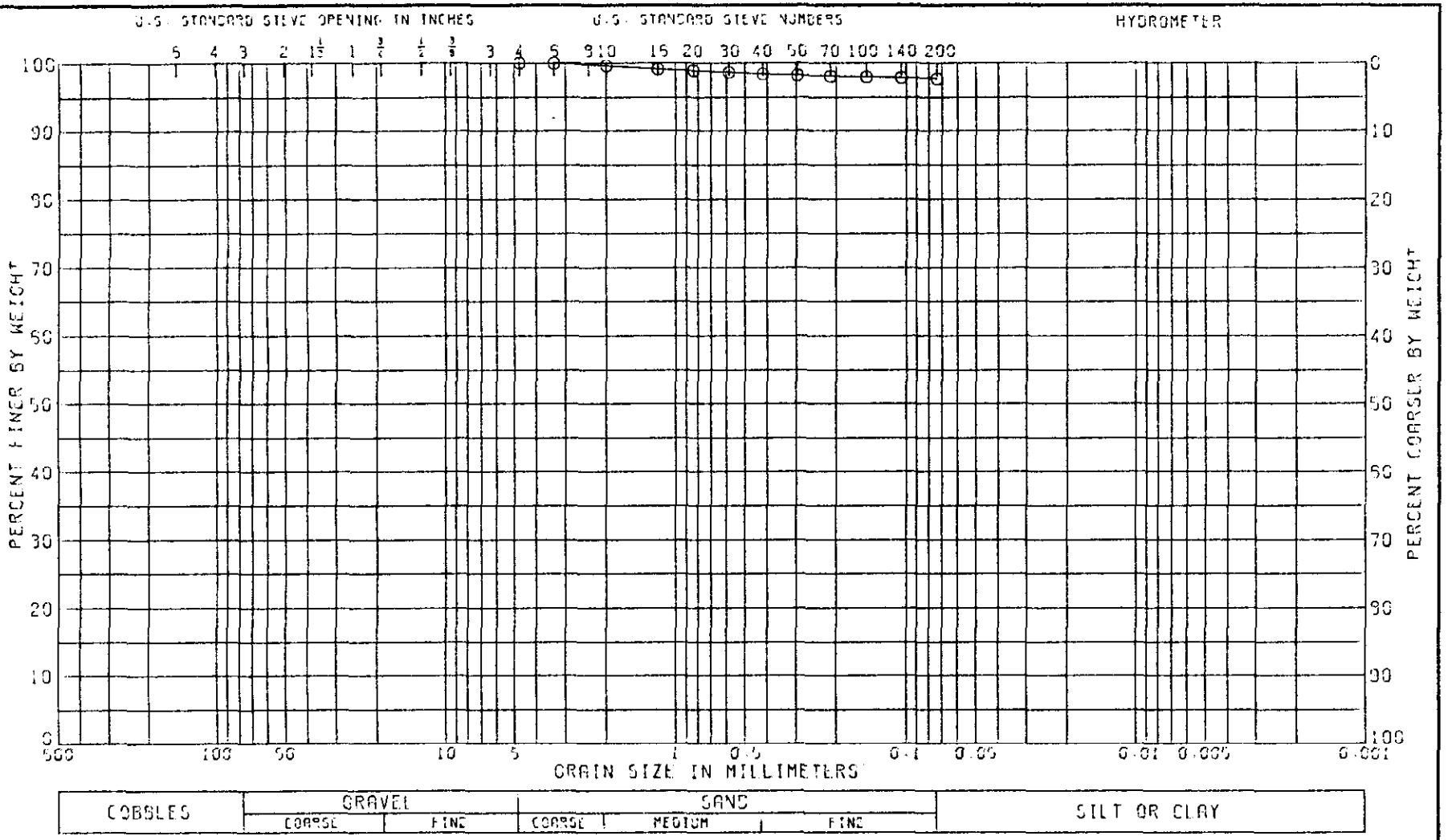
GRADATION CURVE

PROJECT CRANE NWSC

HWY-59 BURIAL GROUND

BORING NO. 7-2-91 SAMPLE NO. 2

DEPTH/ELEV 5.0-7.05 DATE 31 MAR 92



LL	PL	PI	CS	NAT W.%	
38	15	23		13.9	

CLASSIFICATION

CLAY (CL), GRAY

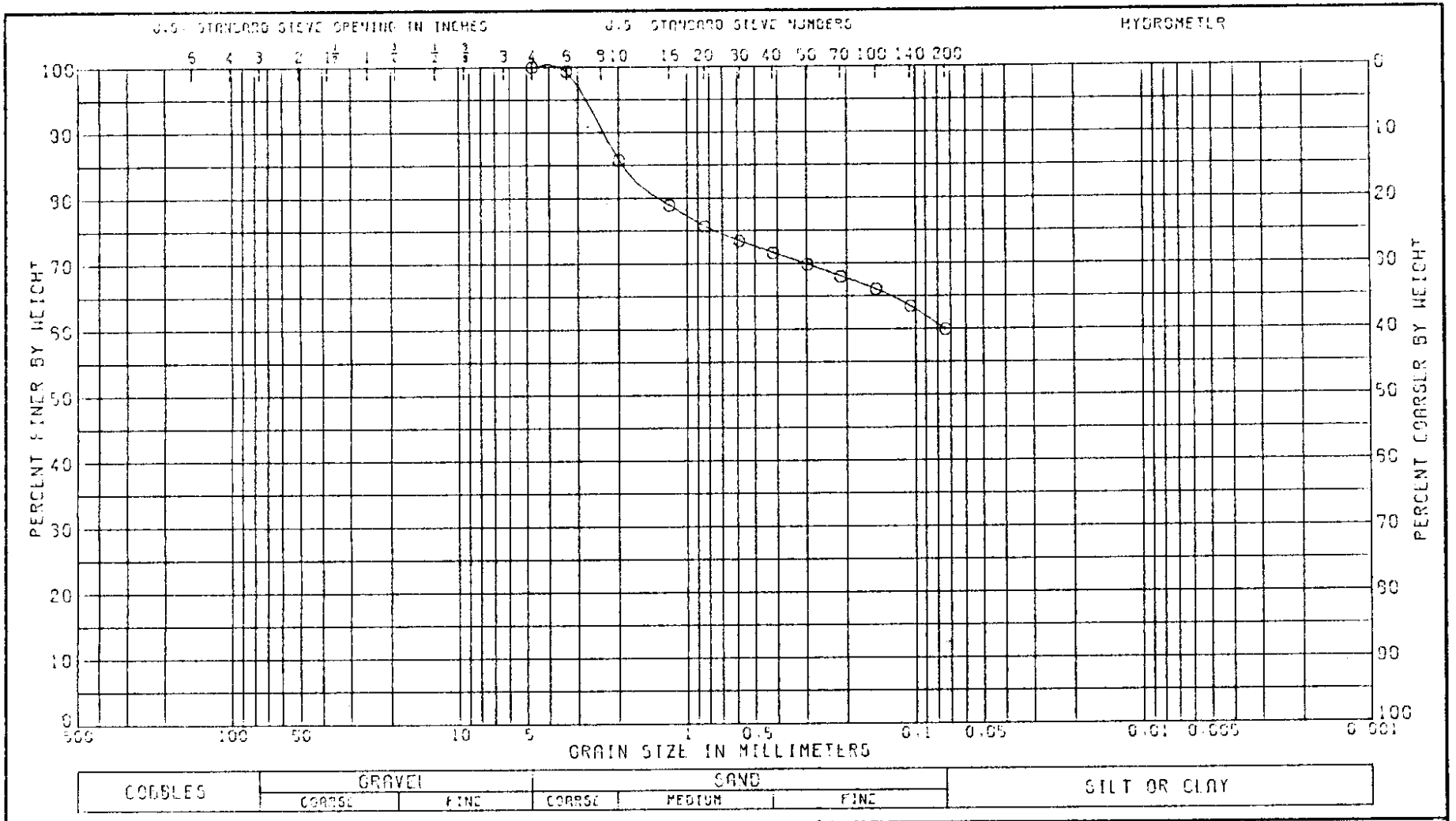
GRADATION CURVE

PROJECT CRANE NWSC

HWY-59 BURIAL GROUND

BORING NO. 7-2-91 SAMPLE NO. 39

DEPTH/ELEV 10.5-11.5 DATE 31 MAR 92



LL 35	PL 20	PI 15	CS	NAT W.% 12.1	

CLASSIFICATION

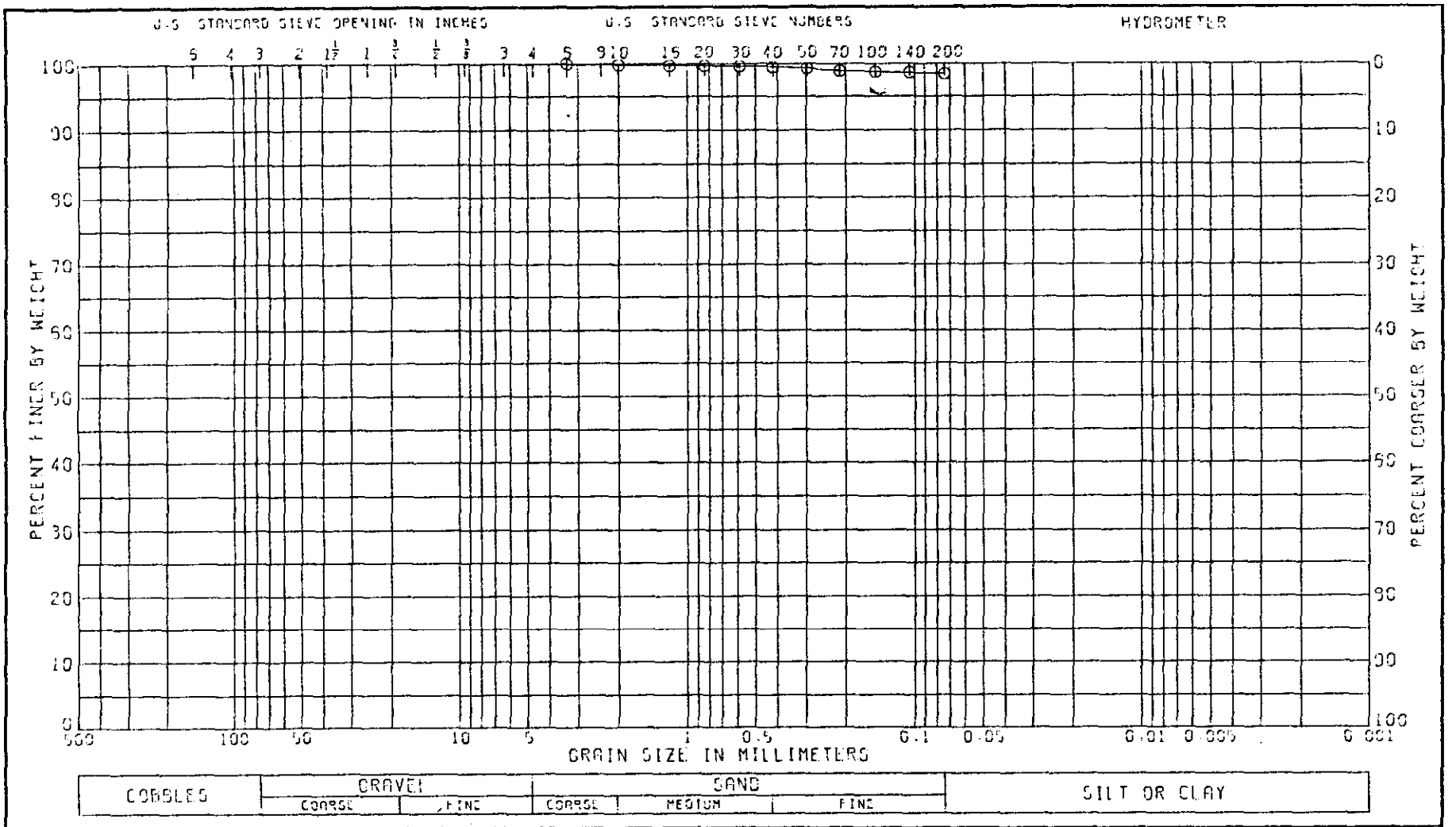
SANDY CLAY (CL), BROWN

GRADATION CURVE

PROJECT CRANE NWSC HWY 58 BURIAL GROUND

BORING NO. 7-3-91 SAMPLE NO 1

DEPTH/ELEV 0.0-1.77 DATE 11 FEB 92



LL	PL	PI	CS	NAT W.%
30	14	16		9.1

CLASSIFICATION

CLAY (CL), BROWN

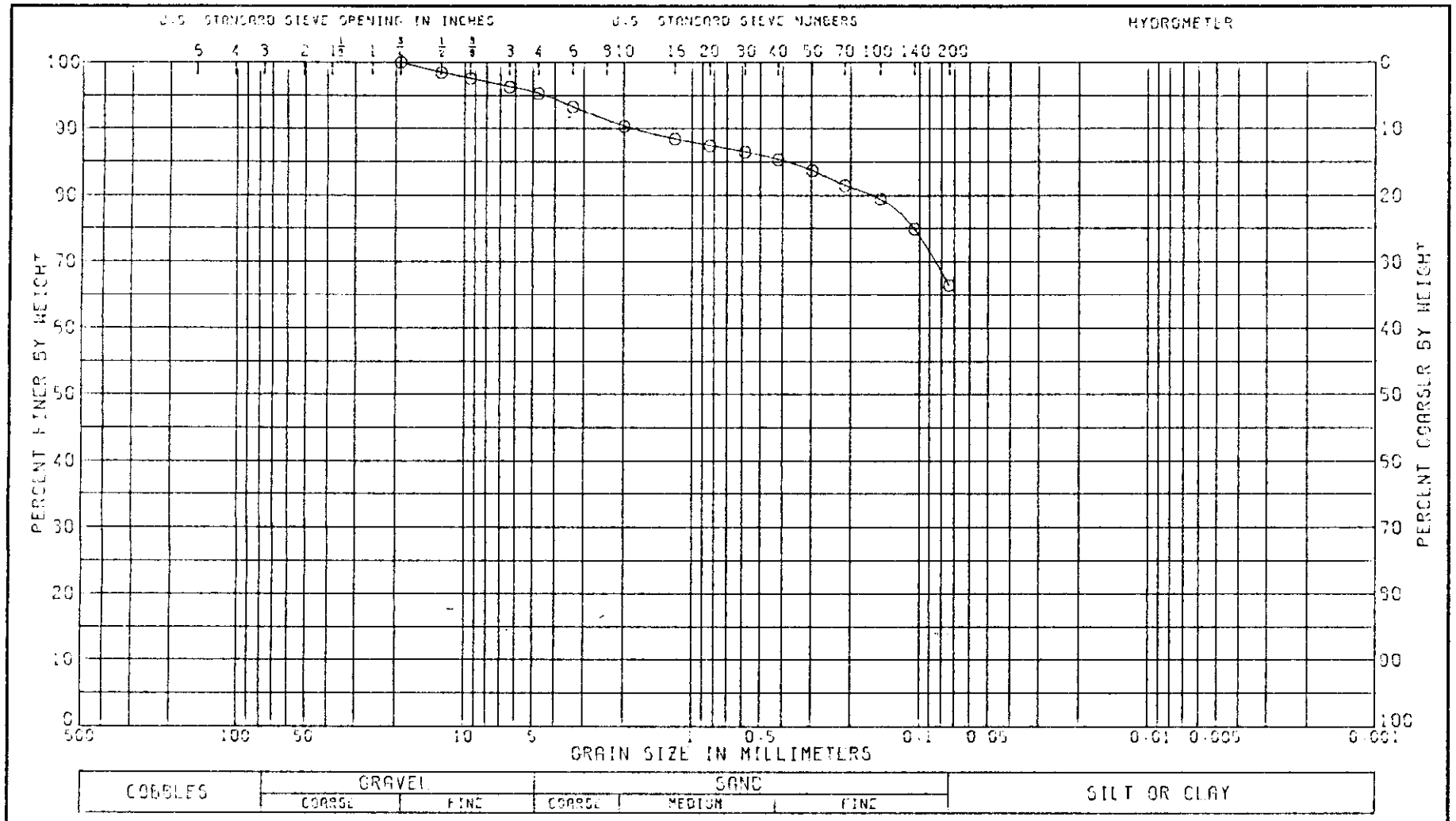
GRADATION CURVE

PROJECT CRANE NWSC

HWY-59 BURIAL GROUND

BORING NO. 7-3-91 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.14 DATE 31 MAR 92



LL 41	PL 16	PI 25	CS	NAT W.% 18.2

CLASSIFICATION

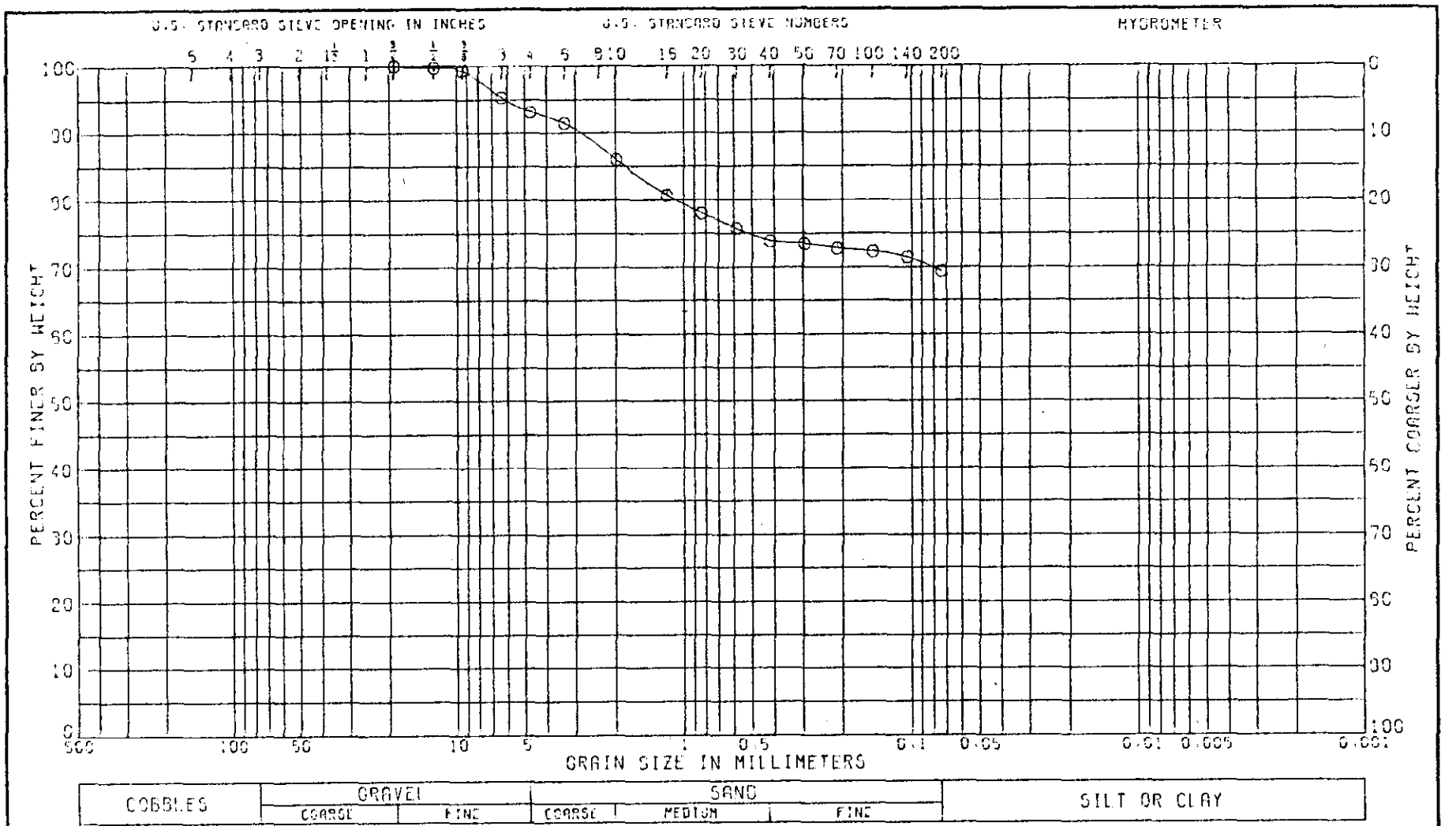
SANDY CLAY (CL), REDDISH BROWN: TRACE OF GRAVEL

GRADATION CURVE

PROJECT CRANE NWSC HWY 50 BURIAL GROUND

BORING NO. 7-5-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-0.05 DATE 11 FEB 82



LL	PL	PI	GS	NAT W.%
36	17	19		14.9

CLASSIFICATION

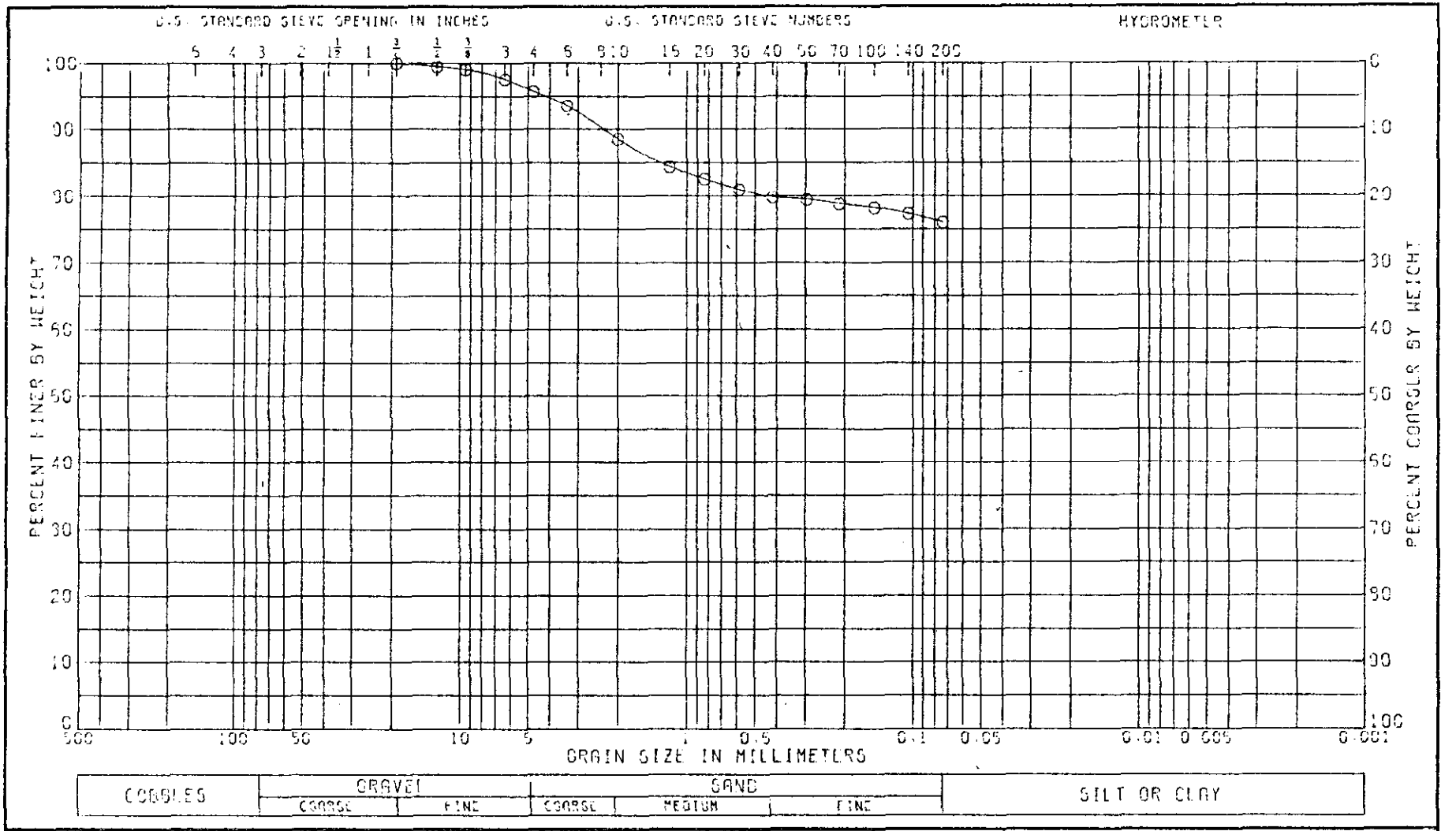
SANDY CLAY (CL), BROWN: WITH GRAVEL

GRADATION CURVE

PROJECT CRANE NWSC HWY 50 BURIAL GROUND

BORING NO. 7-5-81 SAMPLE NO. 2

DEPTH/ELEV 5.0-7.07 DATE 11 FEB 92



LL	PL	PI	GS	NAT W.%
37	18	19		17.2

CLASSIFICATION

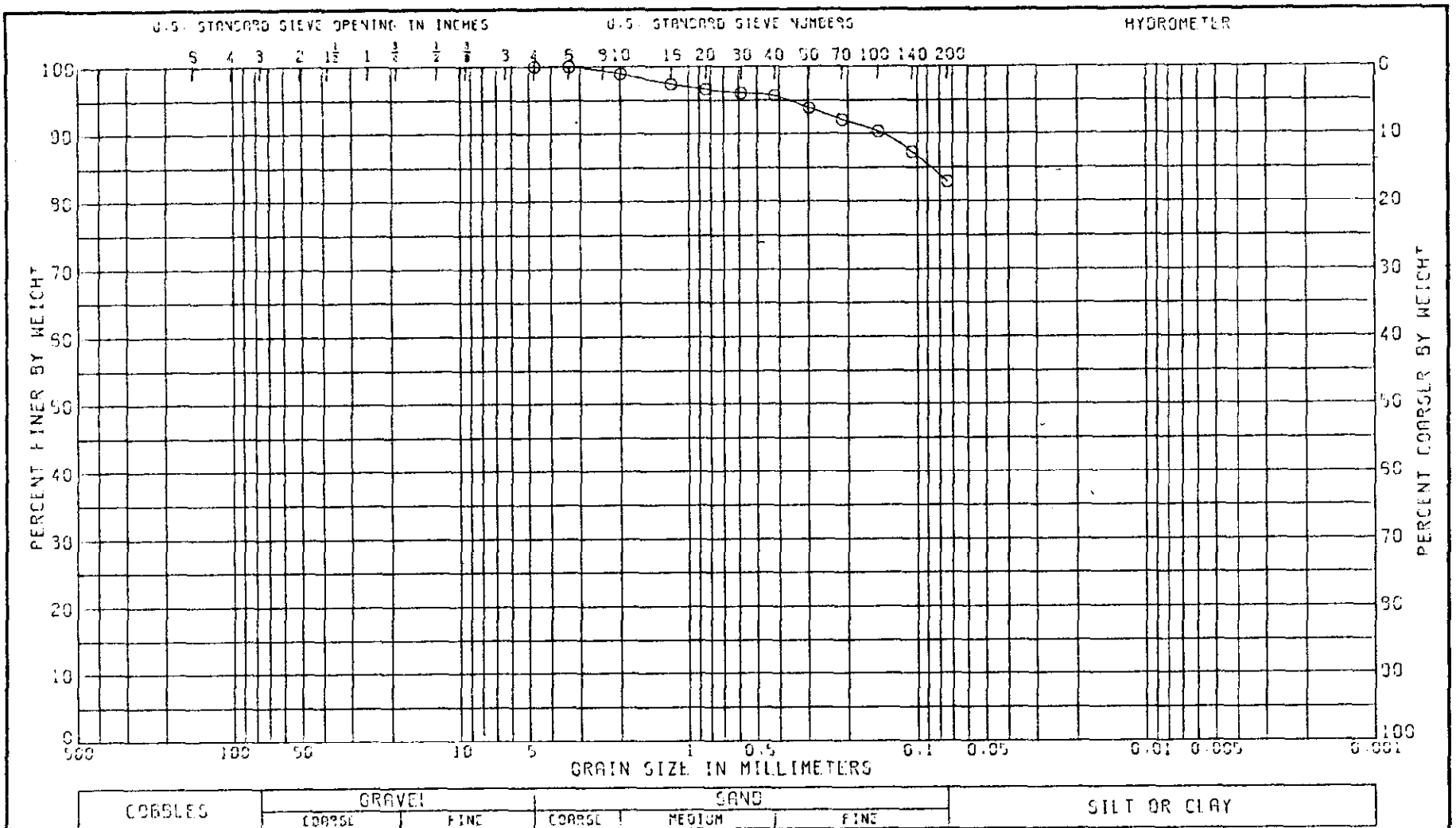
SANDY CLAY (CL), BROWN: TRACE OF GRAVEL

GRADATION CURVE

PROJECT CRANE NWSC HWY 59 BURIAL GROUND

BORING NO. 7-5-81 SAMPLE NO. 3

DEPTH/ELEV 10.0-11.39 DATE 11 FEB 82



LL 35	PL 19	PI 17	CS	NAT W.C. 18.1	

CLASSIFICATION

SANDY CLAY (CL), BROWN

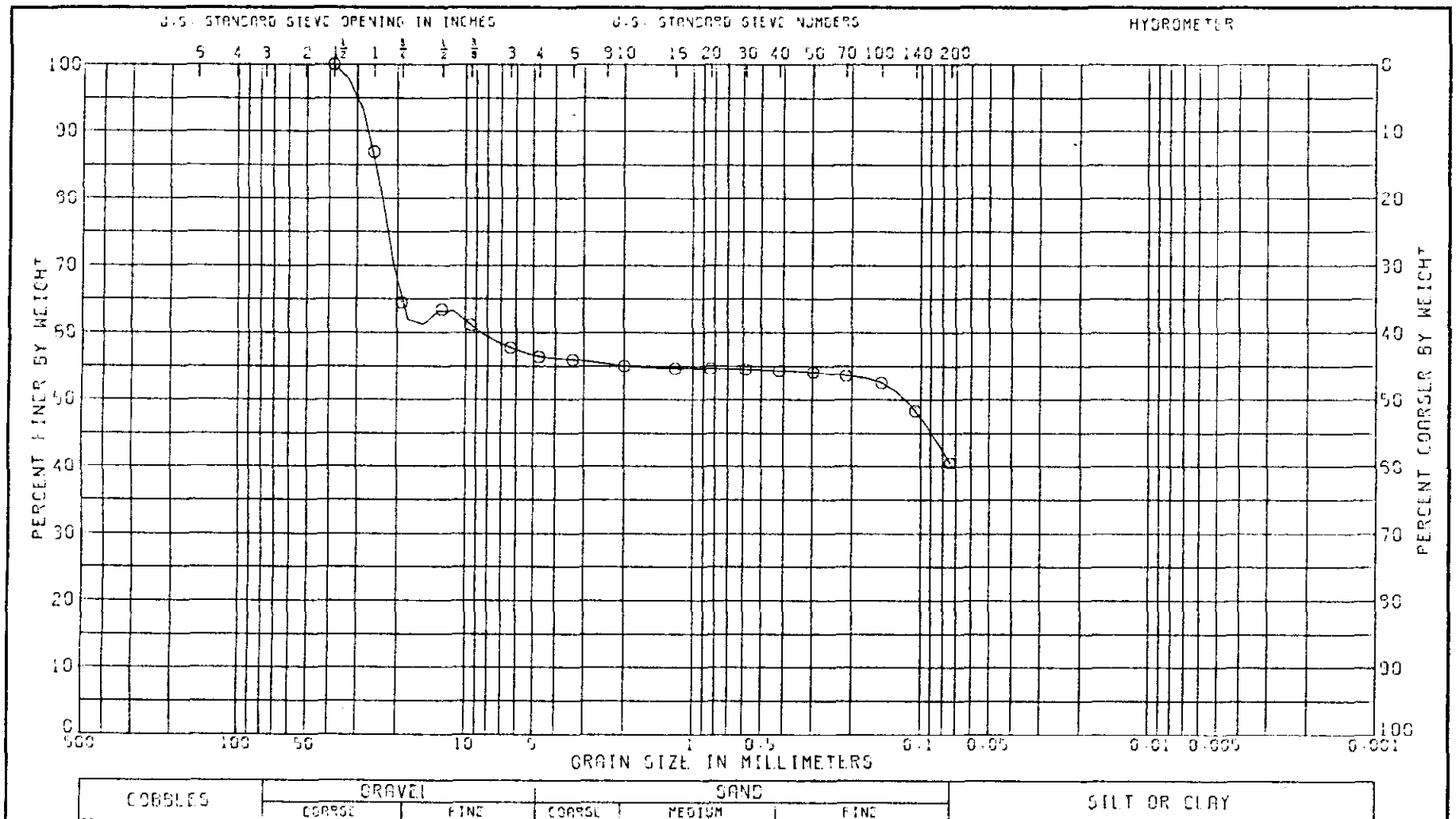
GRADATION CURVE

PROJECT CRANE NWSC

HWY-59 BURIAL GROUND

BORING NO. 7-5-81 SAMPLE NO. 4

DEPTH/ELEV 15.0-15.30 DATE 31 MAR 82



LL	PL	PI	CS	NAT W.%	
35	16	19		5.0	

CLASSIFICATION

SANDY CLAYEY GRAVEL (GC), TAN

INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

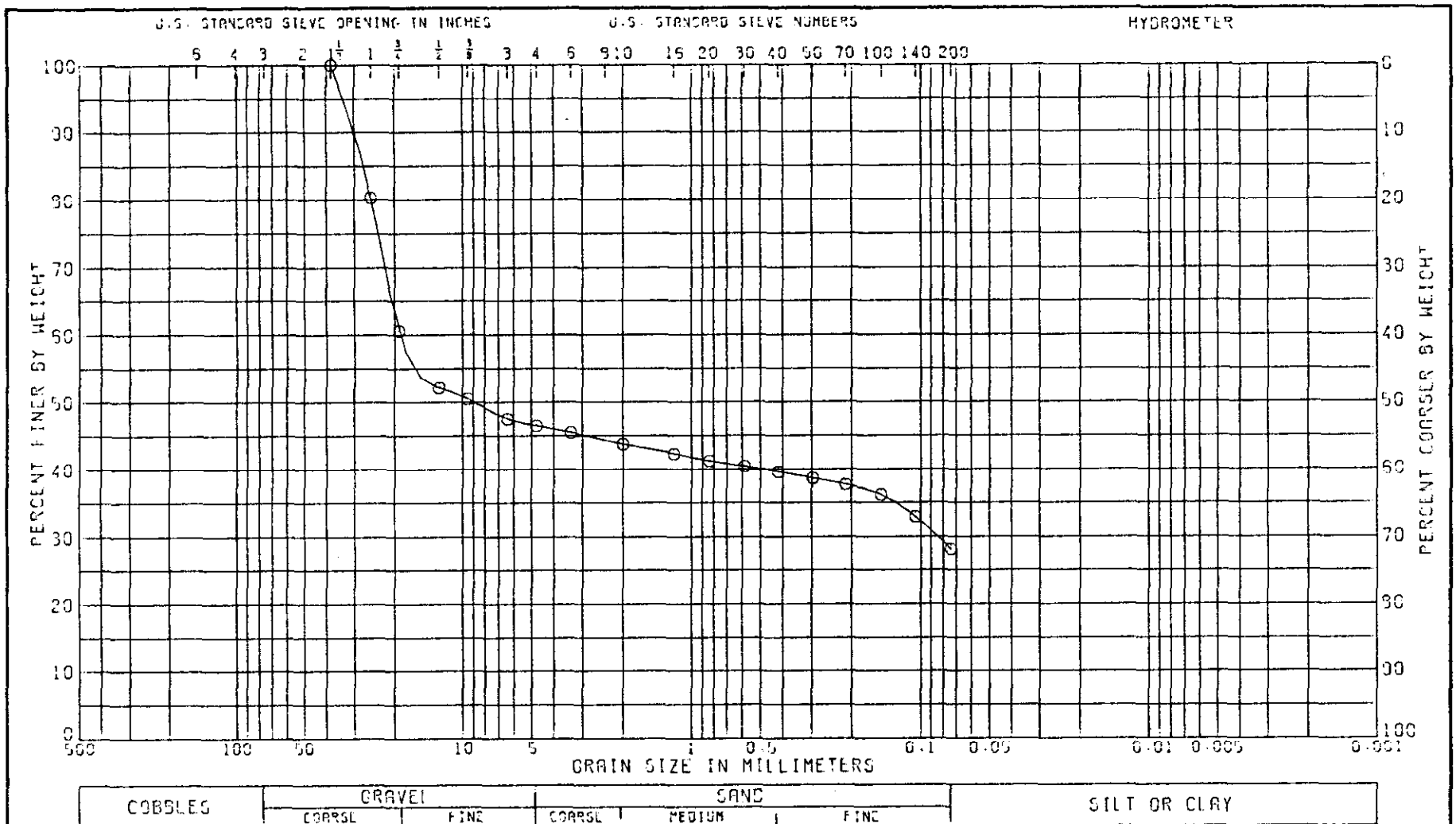
GRADATION CURVE

PROJECT CRANE NWSC

HWY-59 BURIAL GROUND

BORING NO. 9-1-91 SAMPLE NO. 1A

DEPTH/ELEV 0.0-0.7 DATE 31 MAR 92



LL 32	PL 15	PI 17	CS	NAT W.C. 9.1	

CLASSIFICATION

SANDY CLAYEY GRAVEL (GC), BROWN

INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

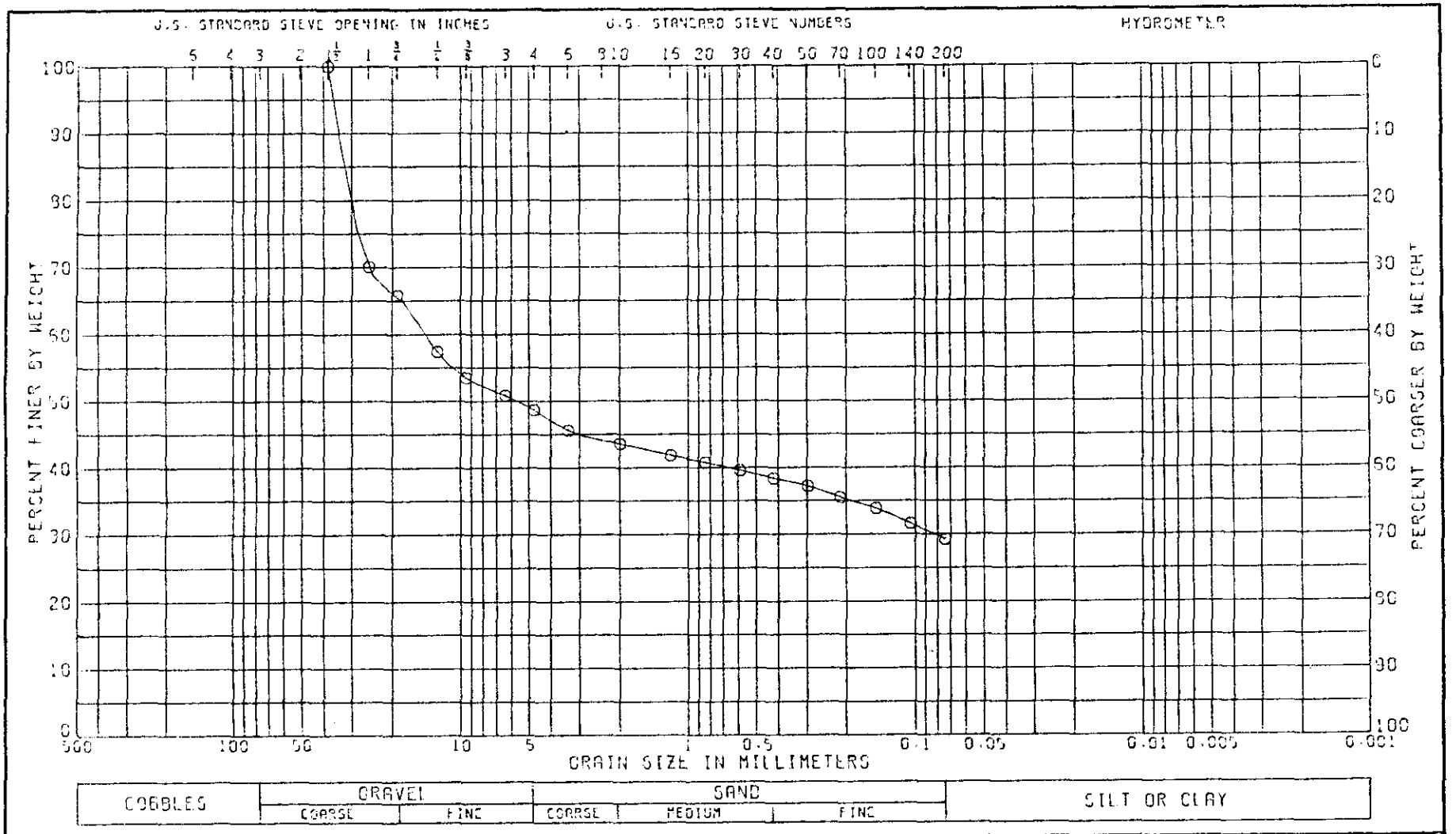
GRADATION CURVE

PROJECT CRANE NWSC HWY-59

OLD QUARRY BURIAL/BURNING GROUND

BORING NO. 8-4-91 SAMPLE NO. 1A

DEPTH/ELEV 0.0-0.8 DATE 12 APR 92



LL	PL	PI	CS	NAT W.Y
43	17	26		8.9

CLASSIFICATION

SANDY CLAYEY GRAVEL (GC), BROWN

INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

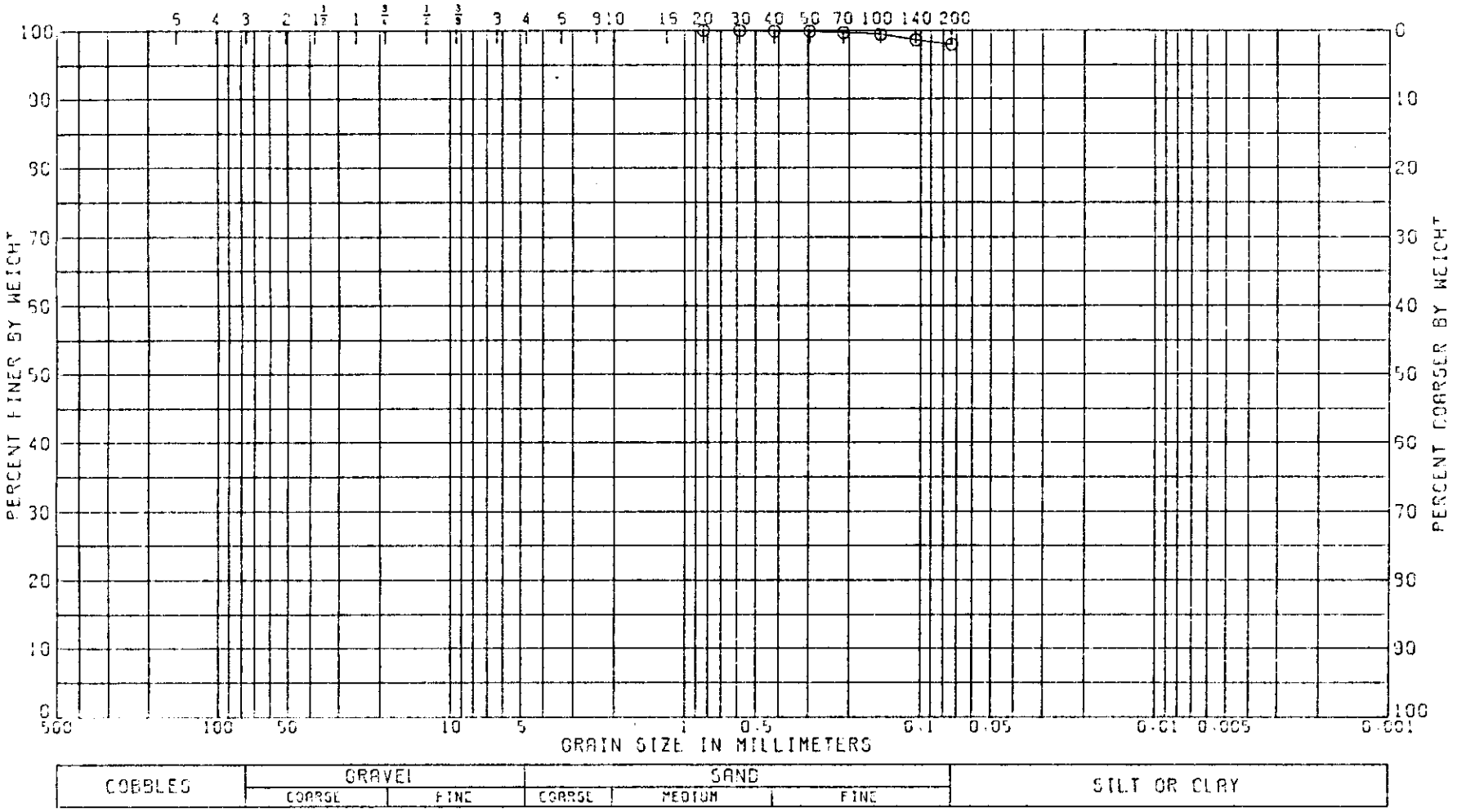
GRADATION CURVE

PROJECT CRANE NWSC HWY - 59

OLD QUARRY/BURNING GROUND

BORING NO. 9-5-91 SAMPLE NO 1

DEPTH/ELEV 0.0-0.94 DATE 31 MAR 92



LL	PL	PI	CS	NAT W.%
49	24	25		15.5

CLASSIFICATION

CLAY (CL), TAN

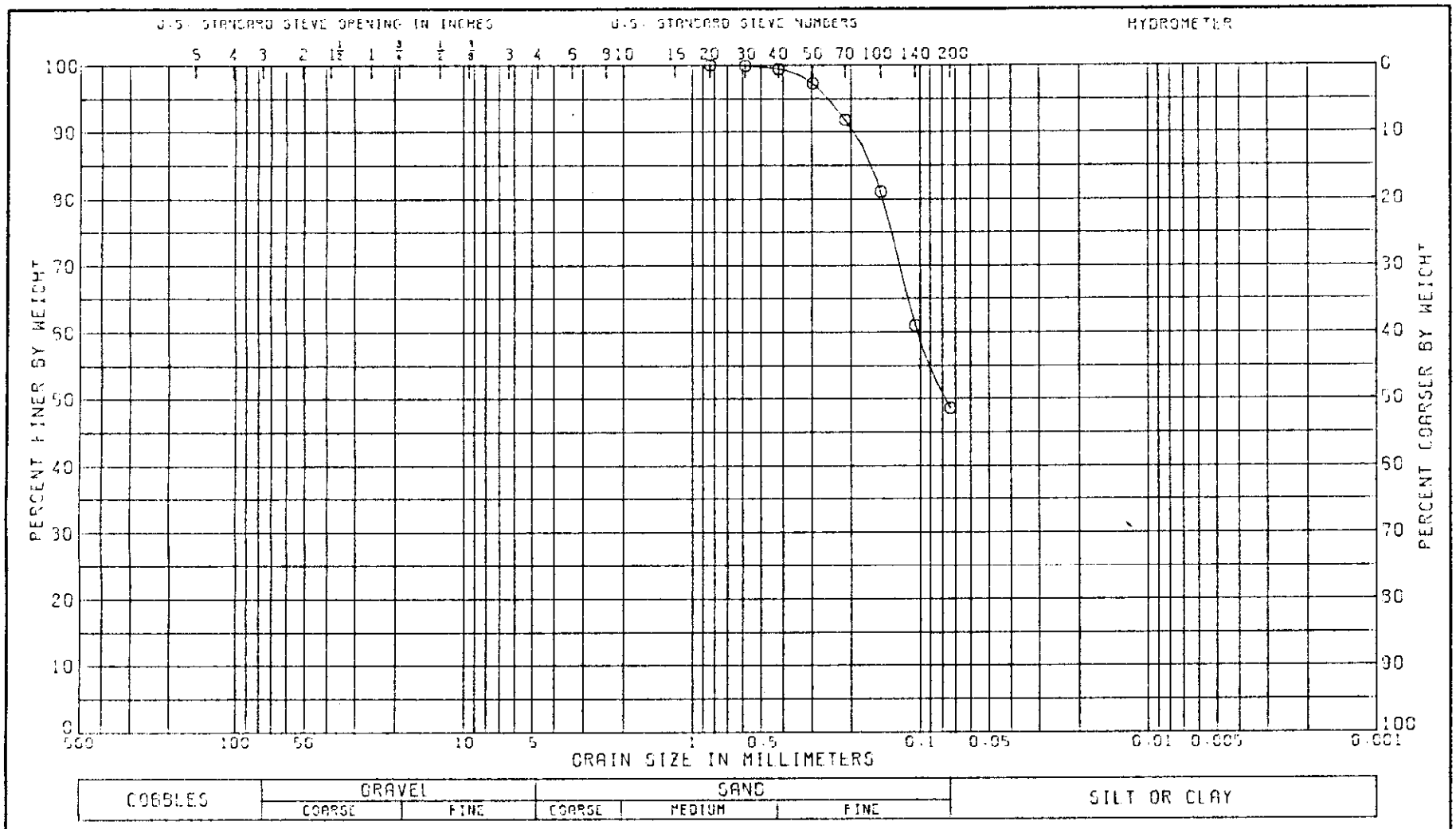
GRADATION CURVE

PROJECT CRANE NWSC HWY-45

PEST CONTROL BURIAL AREA

BORING NO. 9-1-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-0.5 DATE 31 MAR 82



LL	PL	PI	CS	NAT W.%
37	15	22		14.0

CLASSIFICATION

CLAYEY SAND (SC), BROWN

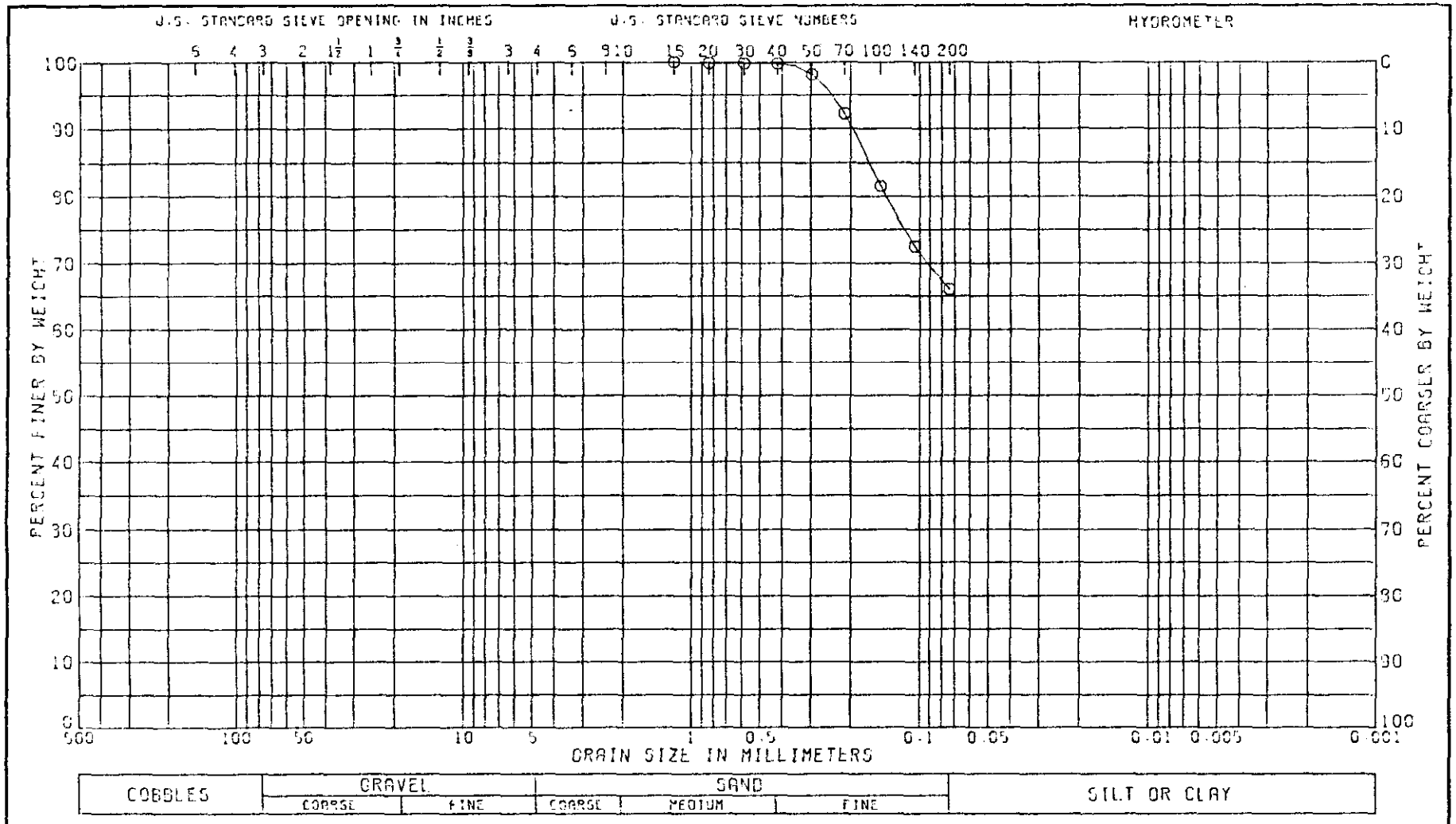
GRADATION CURVE

PROJECT CRANE NWSC HWY-45

PEST CONTROL BURIAL AREA

BORING NO. 9-1-91 SAMPLE NO. 2

DEPTH/ELEV 5.0-7.09 DATE 31 MAR 92



LL	PL	PI	CS	NAT W.C.	
32	19	13		13.3	

CLASSIFICATION

SANDY CLAY (CL), BROWN

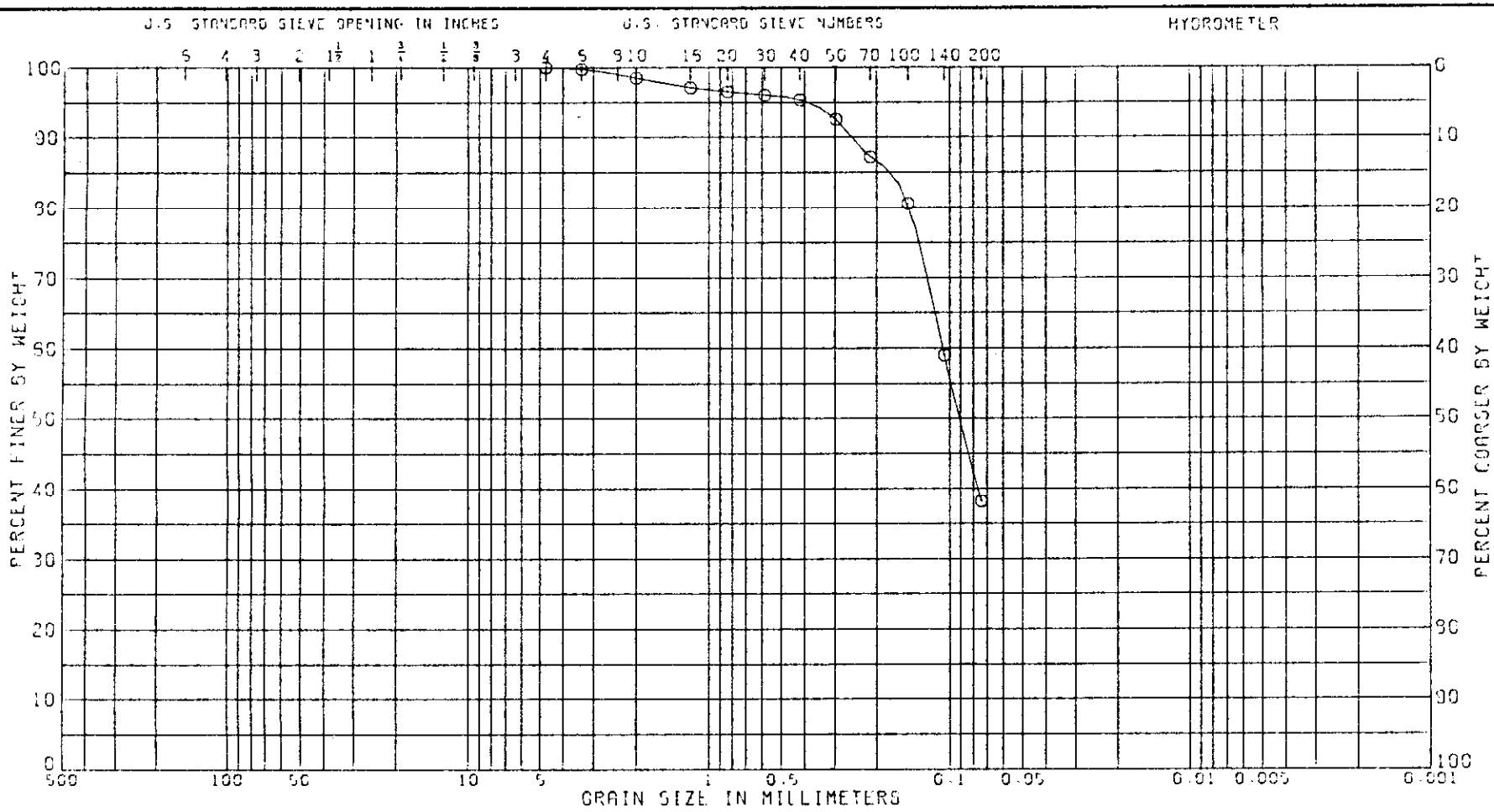
GRADATION CURVE

PROJECT CRANE NWSC HWY-45

PEST CONTROL BURIAL AREA

BORING NO. 9-1-91 SAMPLE NO. 3

DEPTH/ELEV 10.0-11.33 DATE 31 MAR 92



LL	PL	PI	CS	NAT W.%	
28	19	9		9.3	

CLASSIFICATION

CLAYEY SAND (SC), TAN

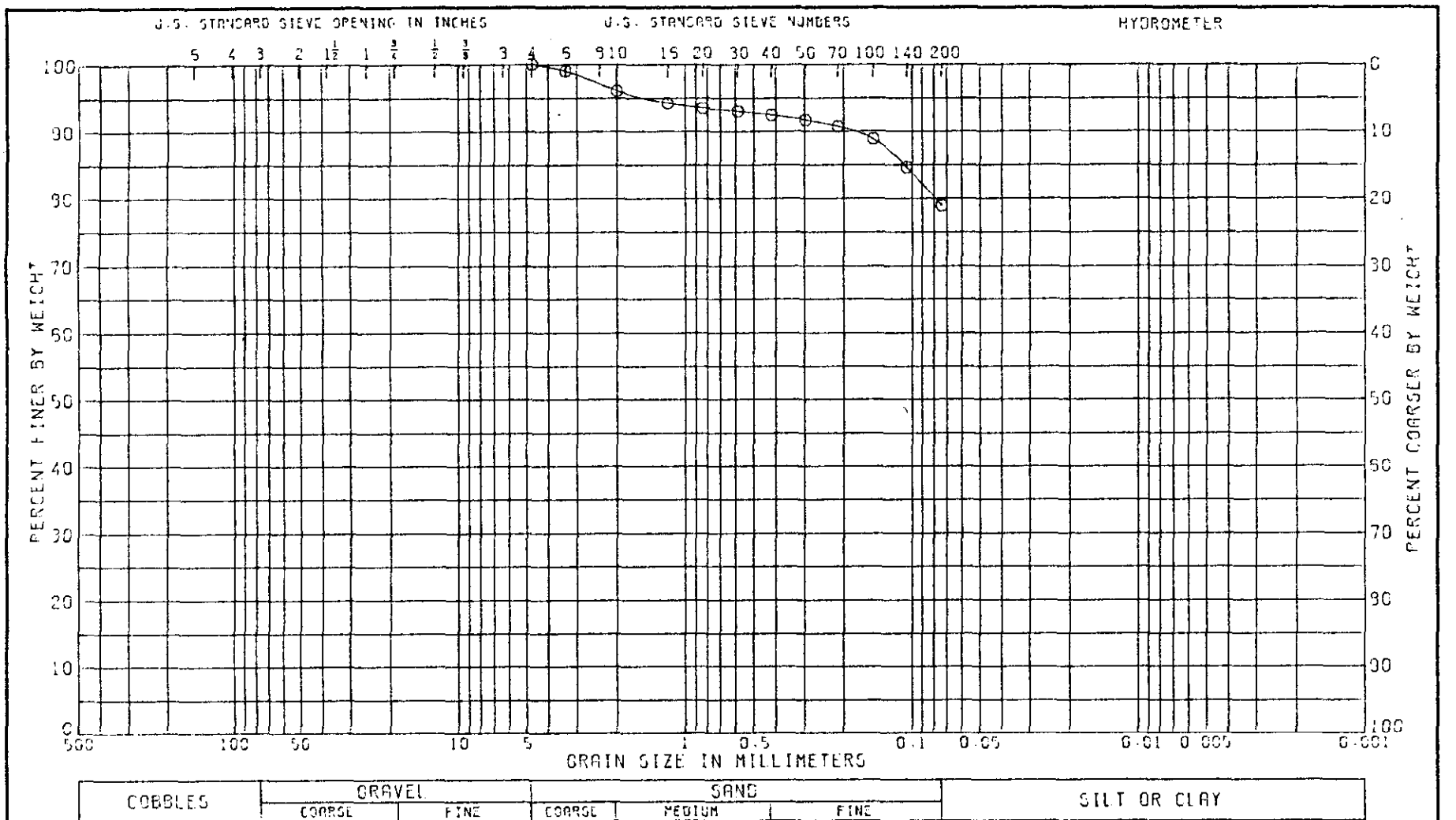
GRADATION CURVE

PROJECT CRANE NWSC HWY-45

PEST CONTROL BURIAL AREA

BORING NO. 0-2-91 SAMPLE NO 1

DEPTH/ELEV 0.0-2.28 DATE 31 MAR 92



LL	PL	PI	CS	NAT W.%
30	16	14		19.6

CLASSIFICATION

SANDY CLAY (CL), BROWN

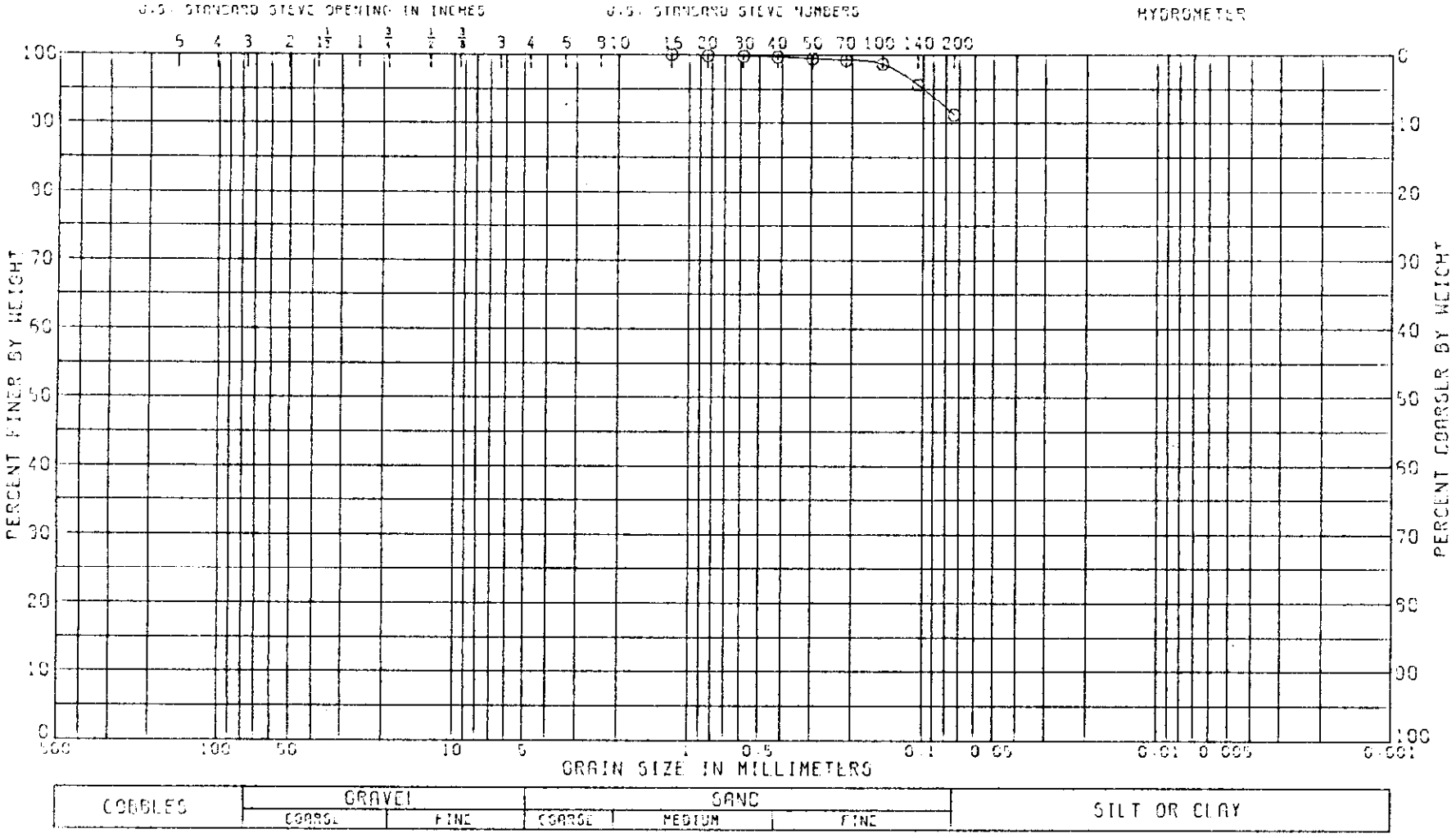
GRADATION CURVE

PROJECT CRANE NWSC HWY-45

PEST CONTROL BURIAL AREA

BORING NO. 9-2-91 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.16 DATE 31 MAR 92



LL	PL	PI	CS	NAT W.%
37	21	16		31.3

CLASSIFICATION

CLAY (CL), GRAY: WITH SAND

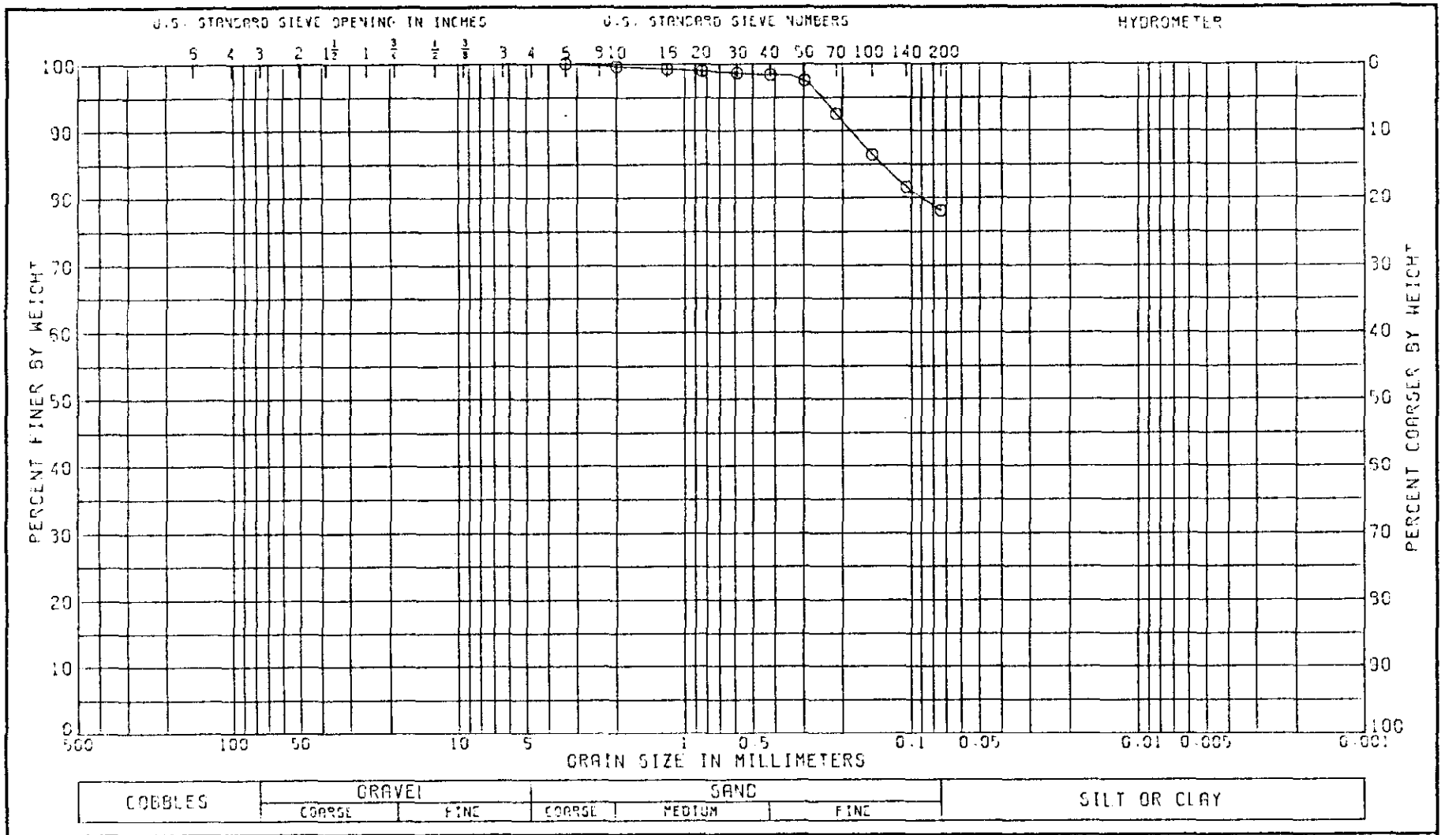
GRADATION CURVE

PROJECT CRANE NWSC HWY 45

PEST CONTROL BURRIL AREA

BORING NO. 9-2-81 SAMPLE NO 3

DEPTH/ELEV 10.0-12.00 DATE 11 FEB 82



LL	PL	PI	CS	NAT W.C.
35	17	18		16.7

CLASSIFICATION

SANDY CLAY (CL), BROWN

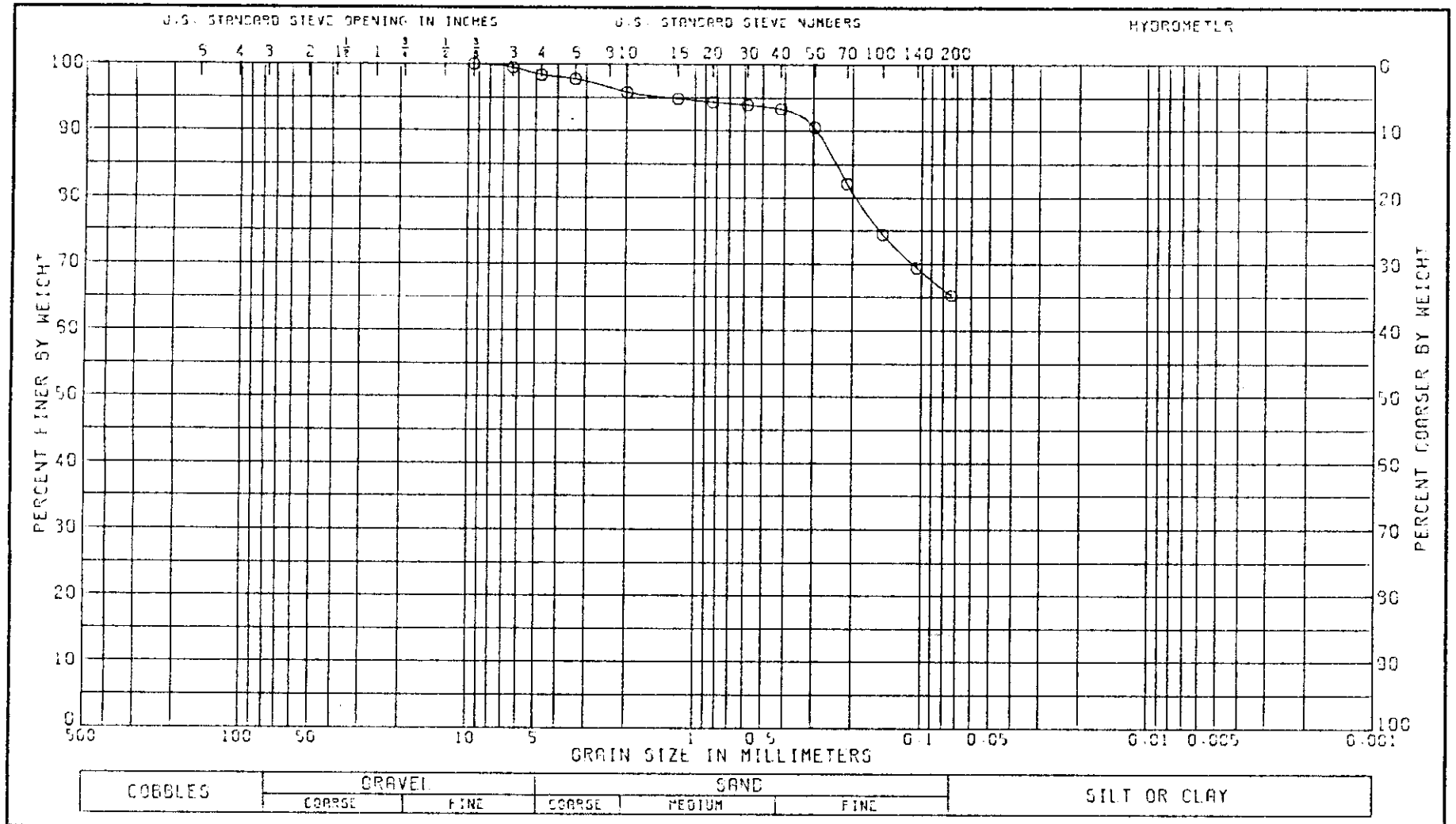
GRADATION CURVE

PROJECT CRANE NWSC HWY-45

PEST CONTROL BURIAL AREA

BORING NO. 9-3-91 SAMPLE NO. 1

DEPTH/ELEV 0.0-2.29 DATE 31 MAR 92



LL	PL	PI	CS	NAT W.%
26	15	11		21.9

CLASSIFICATION

SANDY CLAY (CL), BROWN

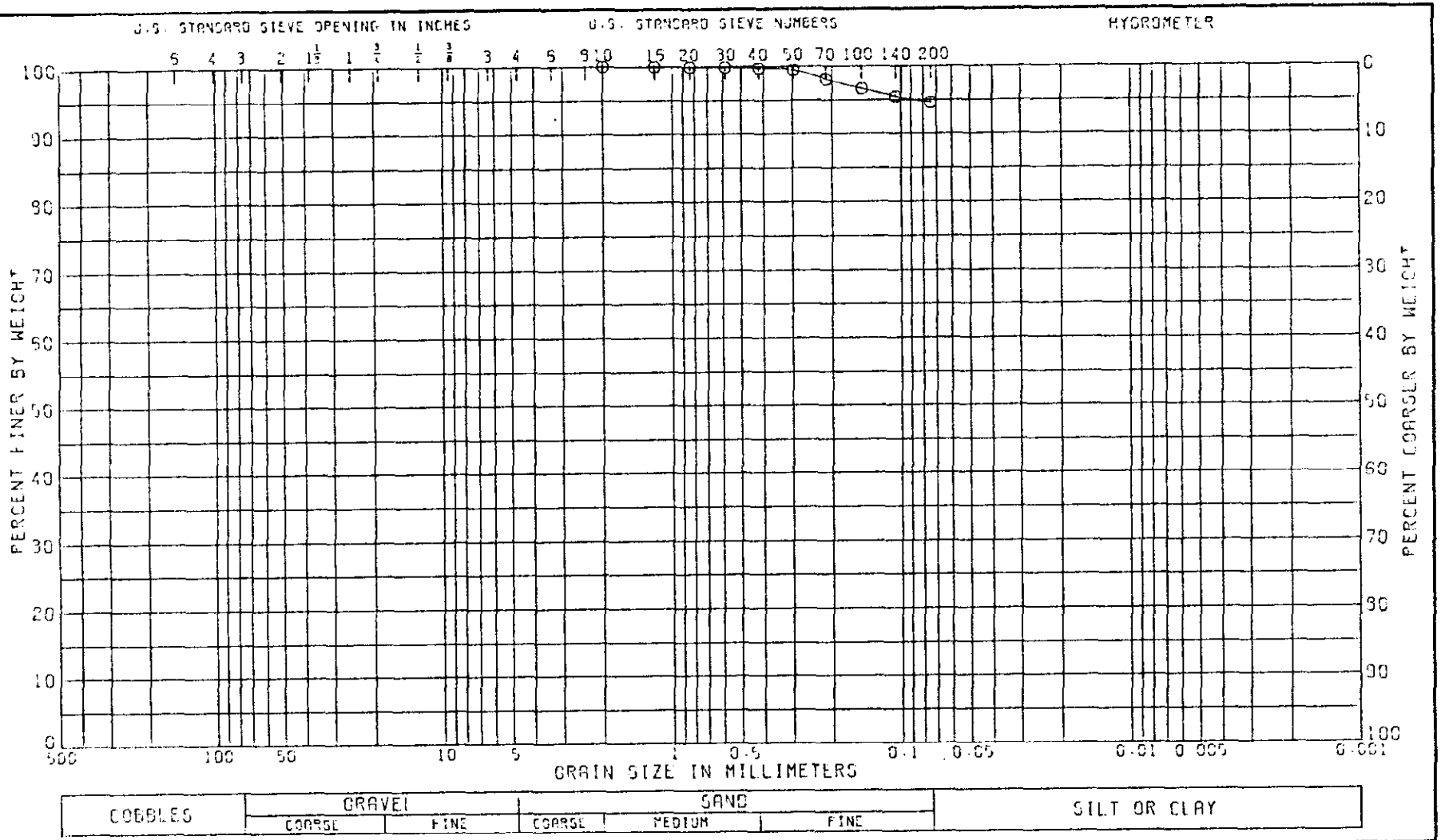
GRADATION CURVE

PROJECT CRANE NWSC HWY-45

PEST CONTROL BURIAL AREA

BORING NO. 0-3-81 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.40 DATE 31 MAR 82



LL	PL	PI	CS	NAT W.%
41	16	25		17.9

CLASSIFICATION

CLAY (CL), BROWN: WITH SAND

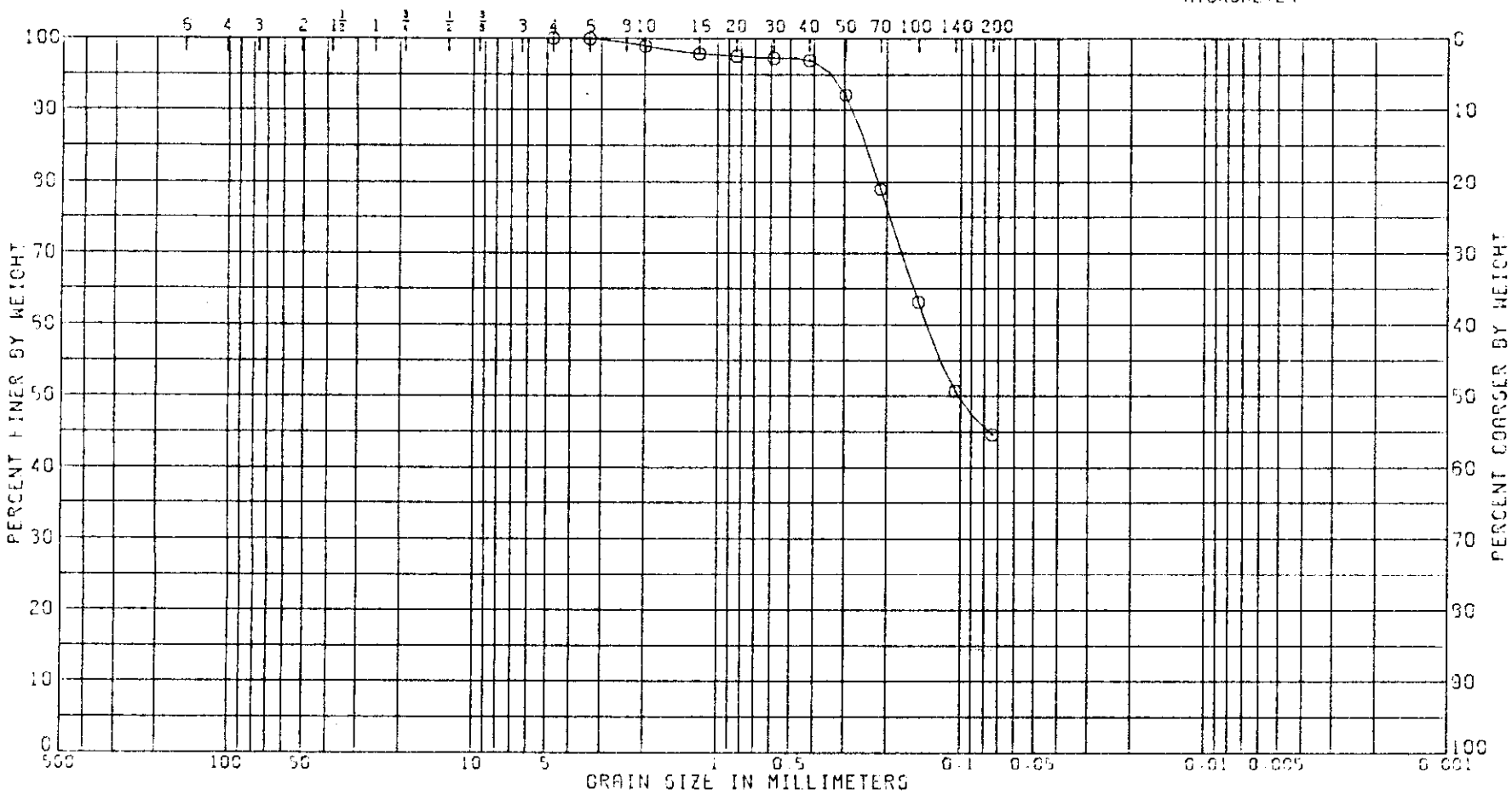
GRADATION CURVE

PROJECT CRANE NWSC HWY-45

PEST CONTROL BURIAL AREA

BORING NO. 9-4-91 SAMPLE NO 1

DEPTH/ELEV 0.0-2.15 DATE 31 MAR 92



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

LL	PL	PI	CS	NAT W.%	
35	18	17		8.1	

CLASSIFICATION

CLAYEY SAND (SC), TAN

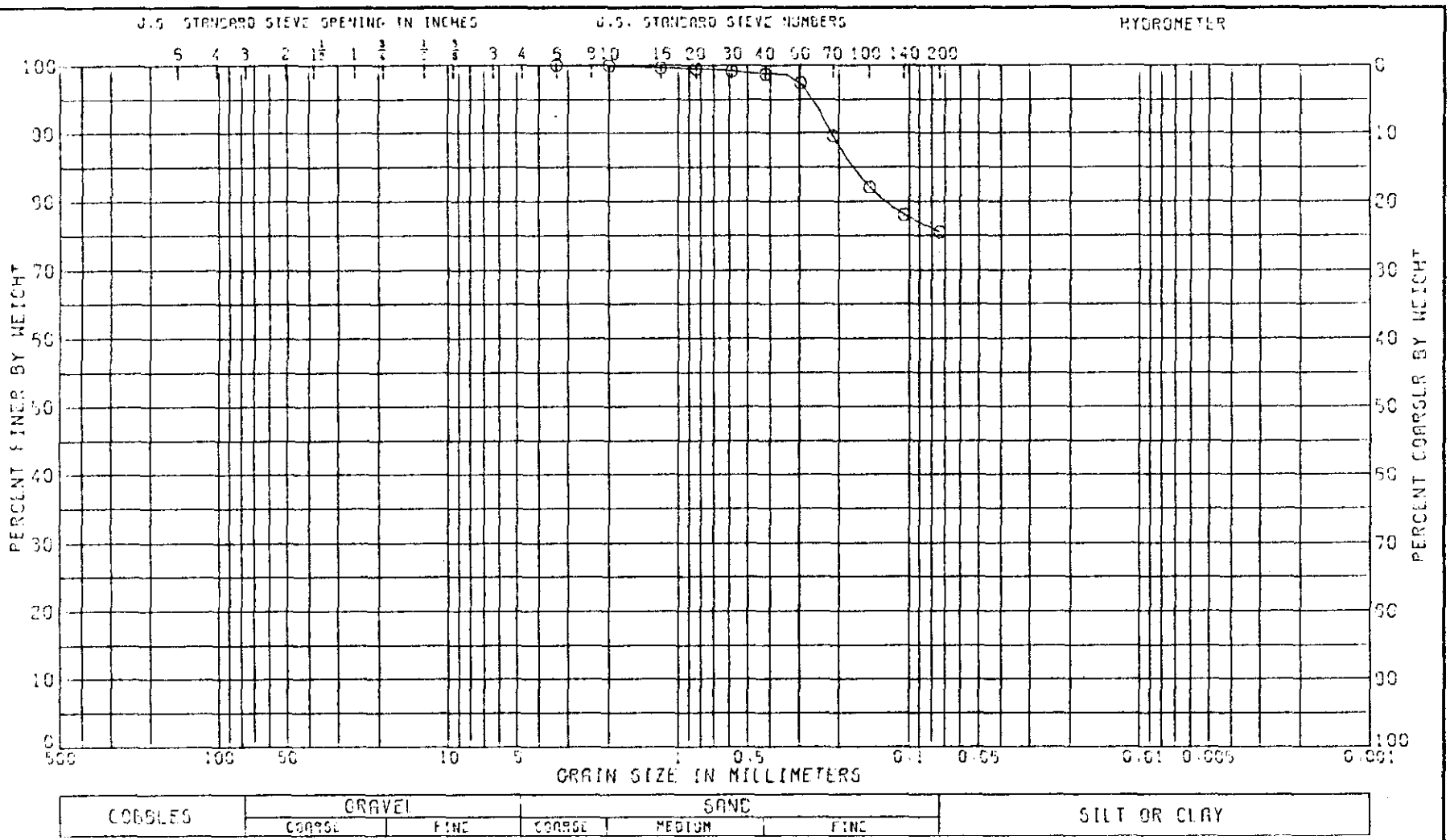
GRADATION CURVE

PROJECT CRANE NWSC HWY-45

PEST CONTROL BURIAL AREA

BORING NO. 9-4-81 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.43 DATE 31 MAR 92



LL	PL	PI	GS	NAT W.%
40	17	23		13.4

CLASSIFICATION

SANDY CLAY (CL), BROWN

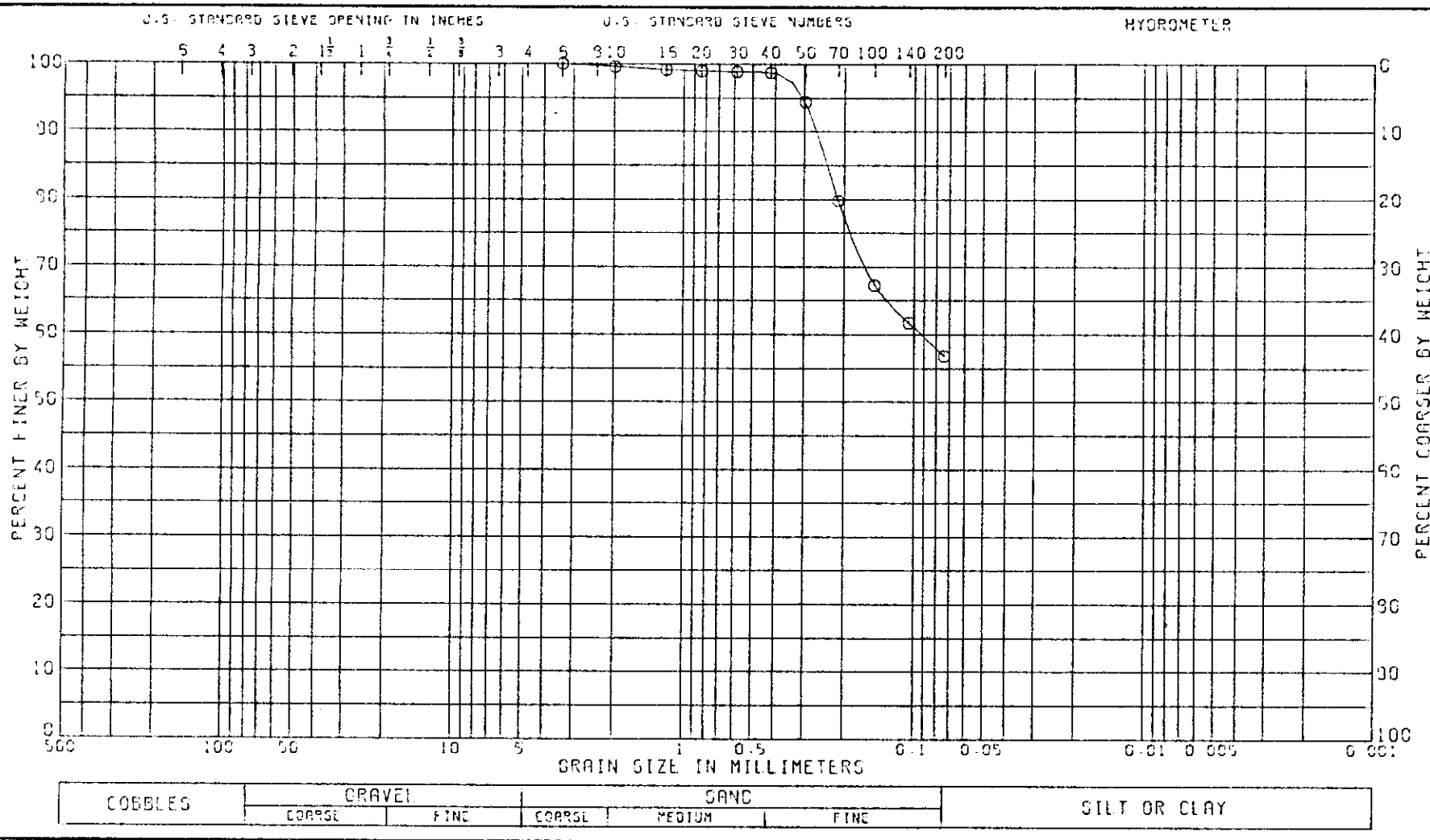
GRADATION CURVE

PROJECT CRANE NWSC HWY 45

PEST CONTROL BURAIL AREA

BORING NO. 9-5-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-1.54 DATE 11 FEB 92



LL	PL	PI	CS	NAT W.%	
34	17	17		10.2	

CLASSIFICATION

SANDY CLAY (CL) LIGHT BROWN

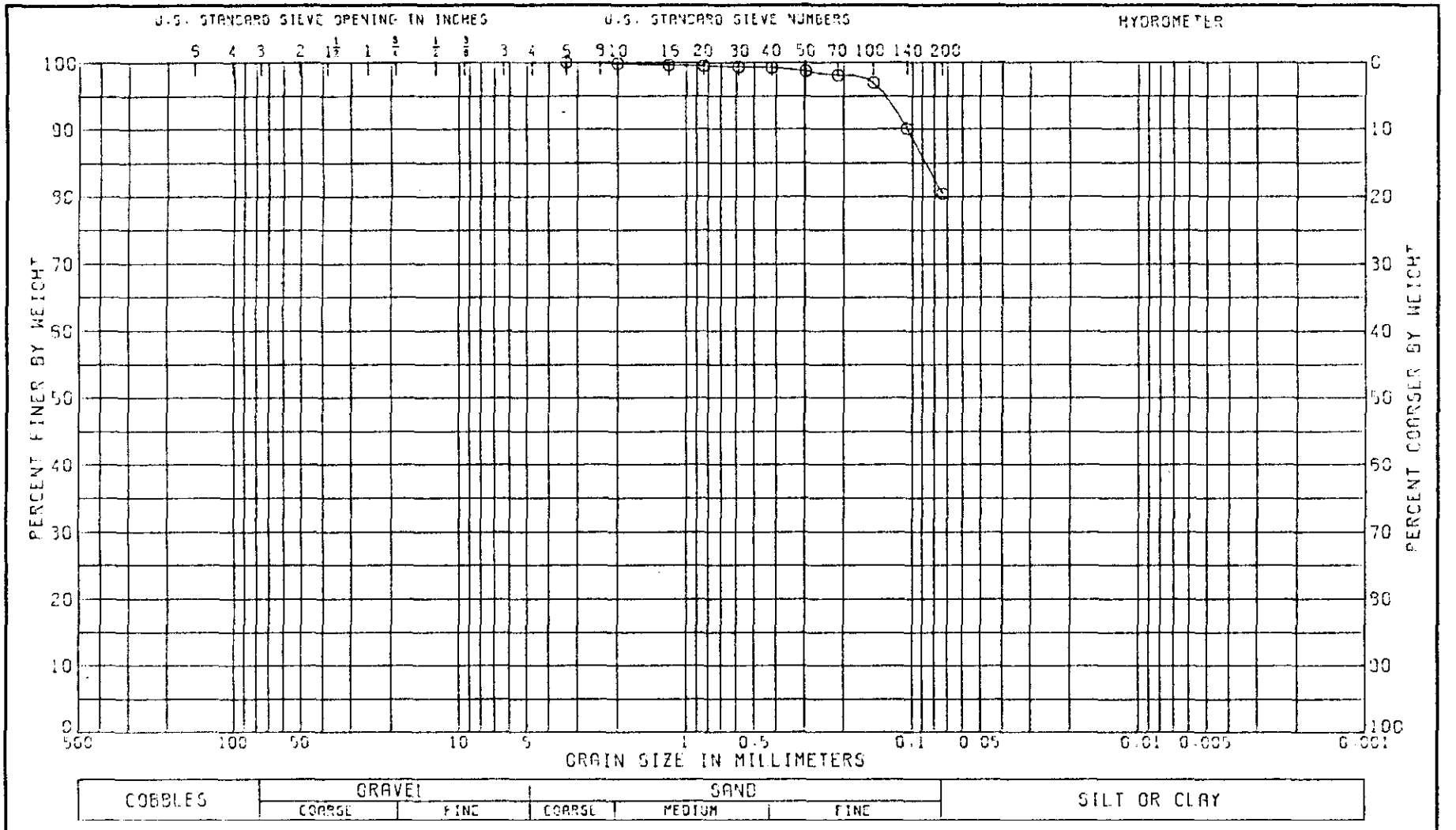
GRADATION CURVE

PROJECT CRANE NWSC HWY-45

PEST CONTROL BURIAL AREA

BORING NO. 9-5-91 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.17 DATE 31 MAR 92



LL	PL	PI	CS	NAT W.%
35	19	16		12.2

CLASSIFICATION

SANDY CLAY (CL), BROWN

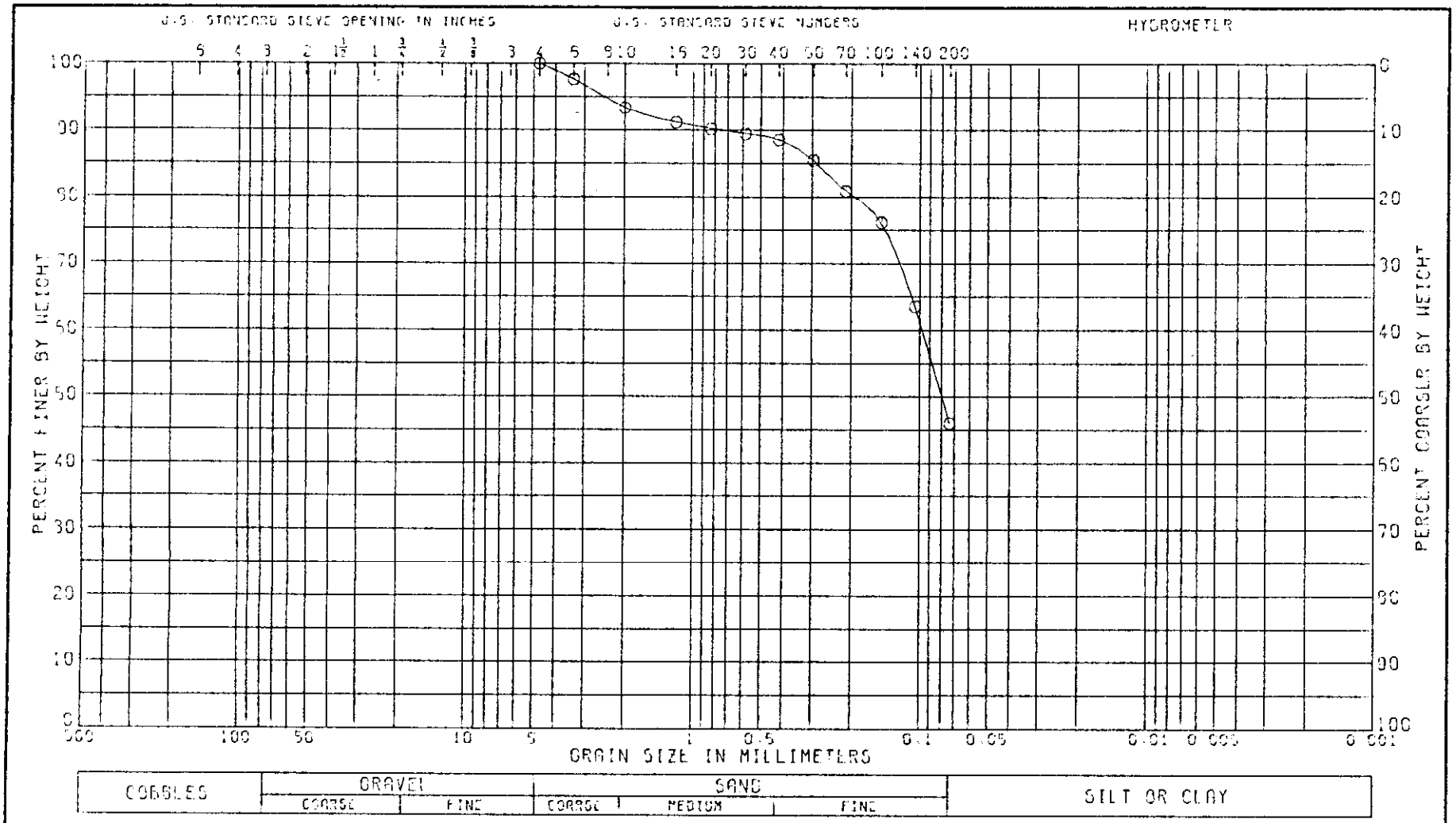
GRADATION CURVE

PROJECT CRANE NWSC HWY-45

PEST CONTROL BURIAL AREA

BORING NO. 9-6-91 SAMPLE NO. 1

DEPTH/ELEV 0.0-2.37 DATE 31 MAR 92



LL 39	PL 20	PI 19	CS	NAT W.% 13.0

CLASSIFICATION

CLAYEY SAND (SC), TAN

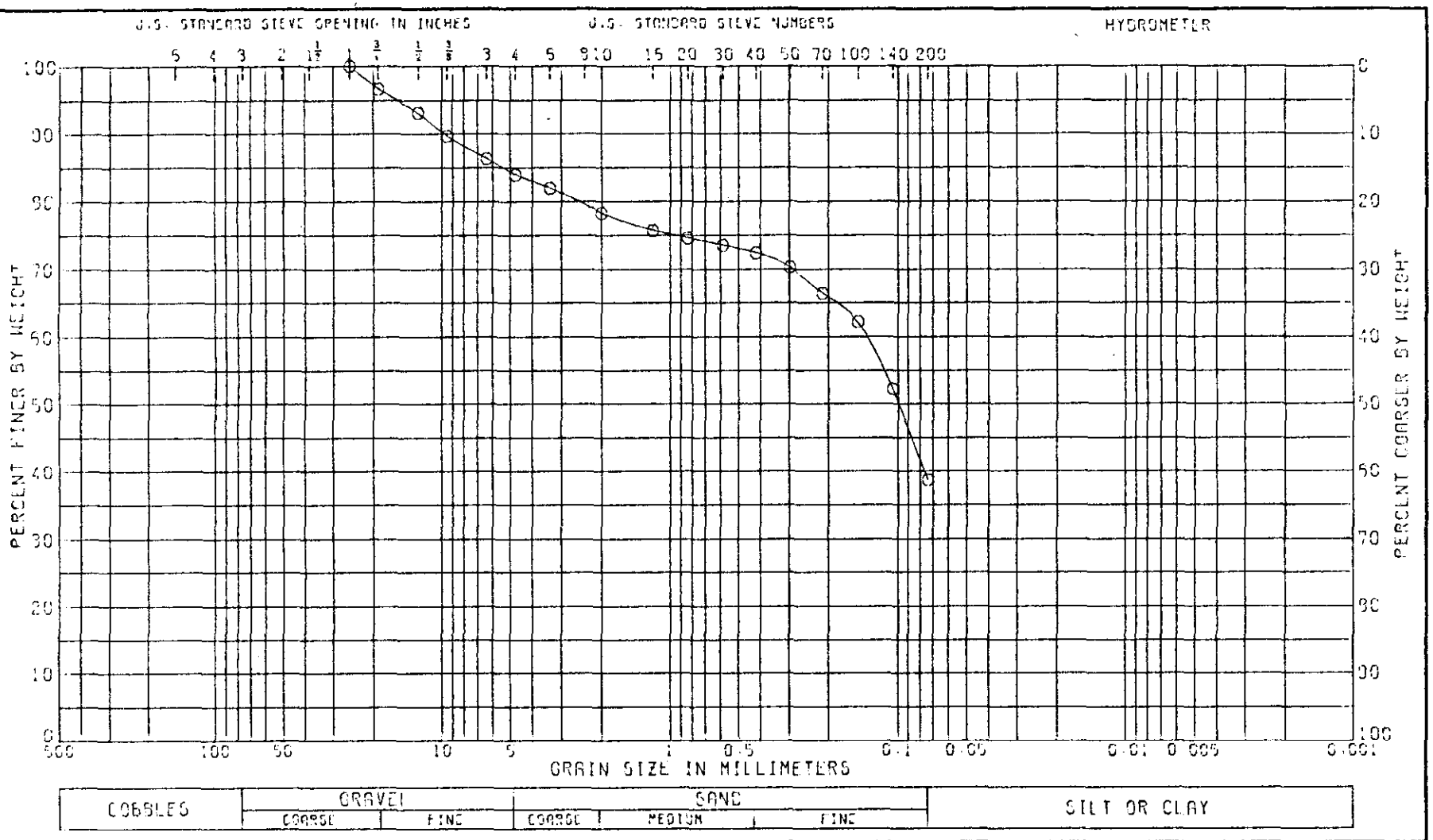
GRADATION CURVE

PROJECT CRANE NWSC HWY 45

PEST CONTROL BURRIL AREA

BORING NO. 9-7-91 SAMPLE NO 1

DEPTH/ELEV 0.0-1.59 DATE 11 FEB 92



LL	PL	PI	CS	NAT W.%
27	18	9		9.3

CLASSIFICATION

GRAVELLY CLAYEY SAND (SC), BROWN

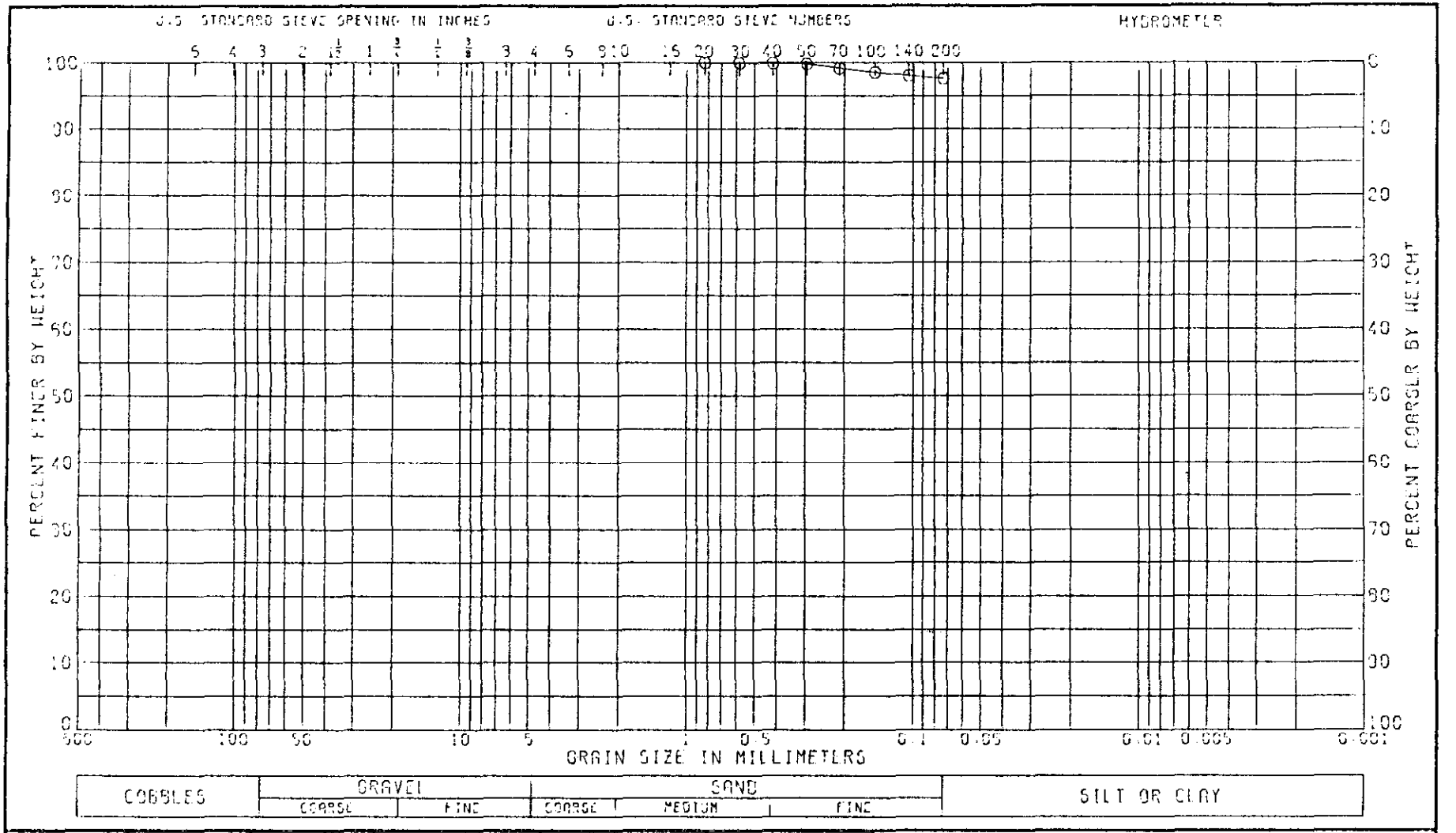
GRADATION CURVE

PROJECT CRANE NWSC HWY 45

PEST CONTROL BURRIL AREA

BORING NO. 9-7-91 SAMPLE NO. 2

DEPTH/ELEV 5.0-7.10 DATE 11 FEB 92



LL 45	PL 18	PI 27	OS	NAT W.% 19.9

CLASSIFICATION

CLAY (CL), REDDISH BROWN

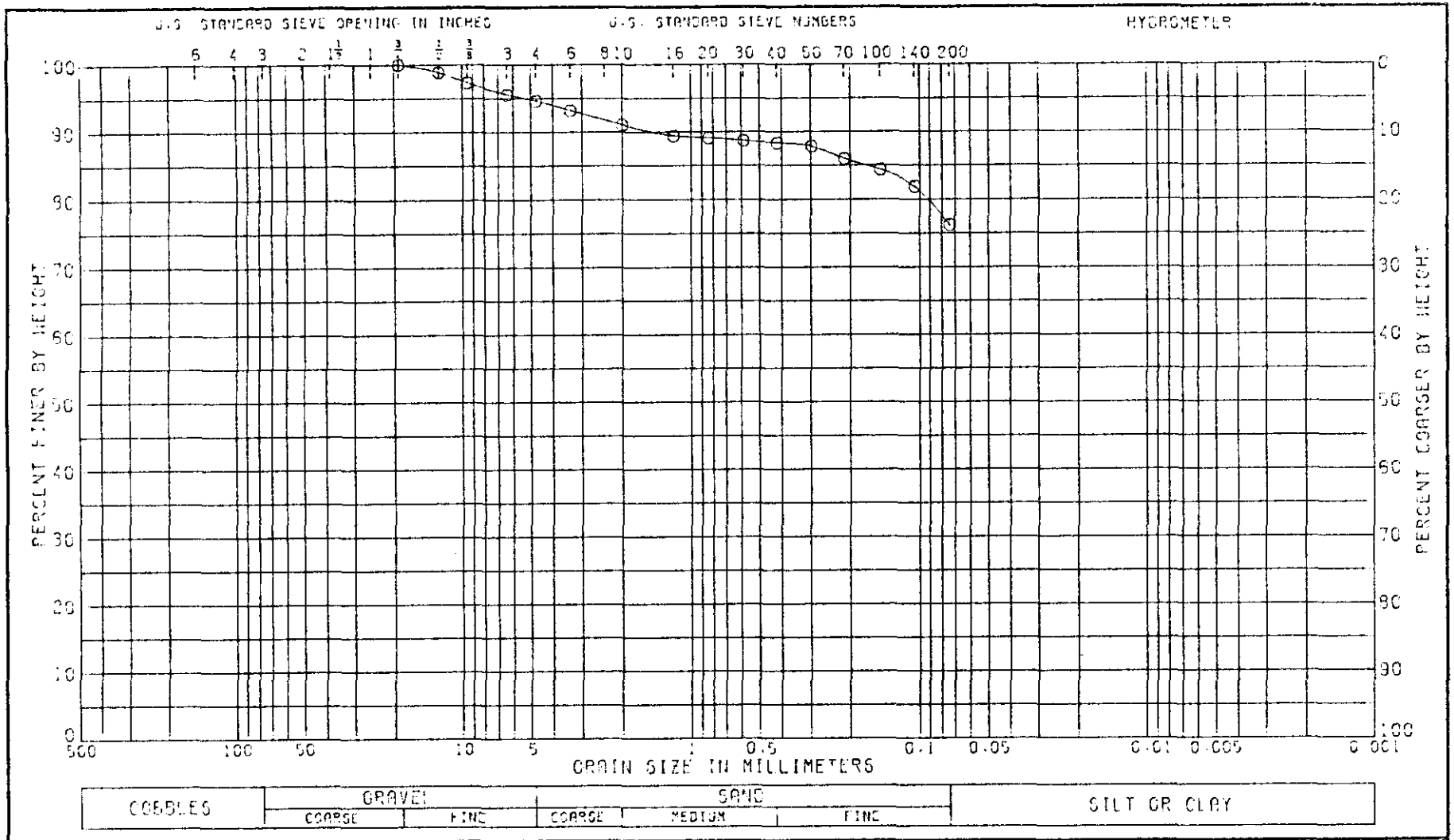
GRADATION CURVE

PROJECT CRANE NWSC HWY 45

PEST CONTROL BURRIL AREA

BORING NO. 3-B-81 SAMPLE NO 1

DEPTH/ELEV 0.0-1.30 DATE 11 FEB 82



LL	PL	PI	GS	NAT W.%
39	20	19		14.1

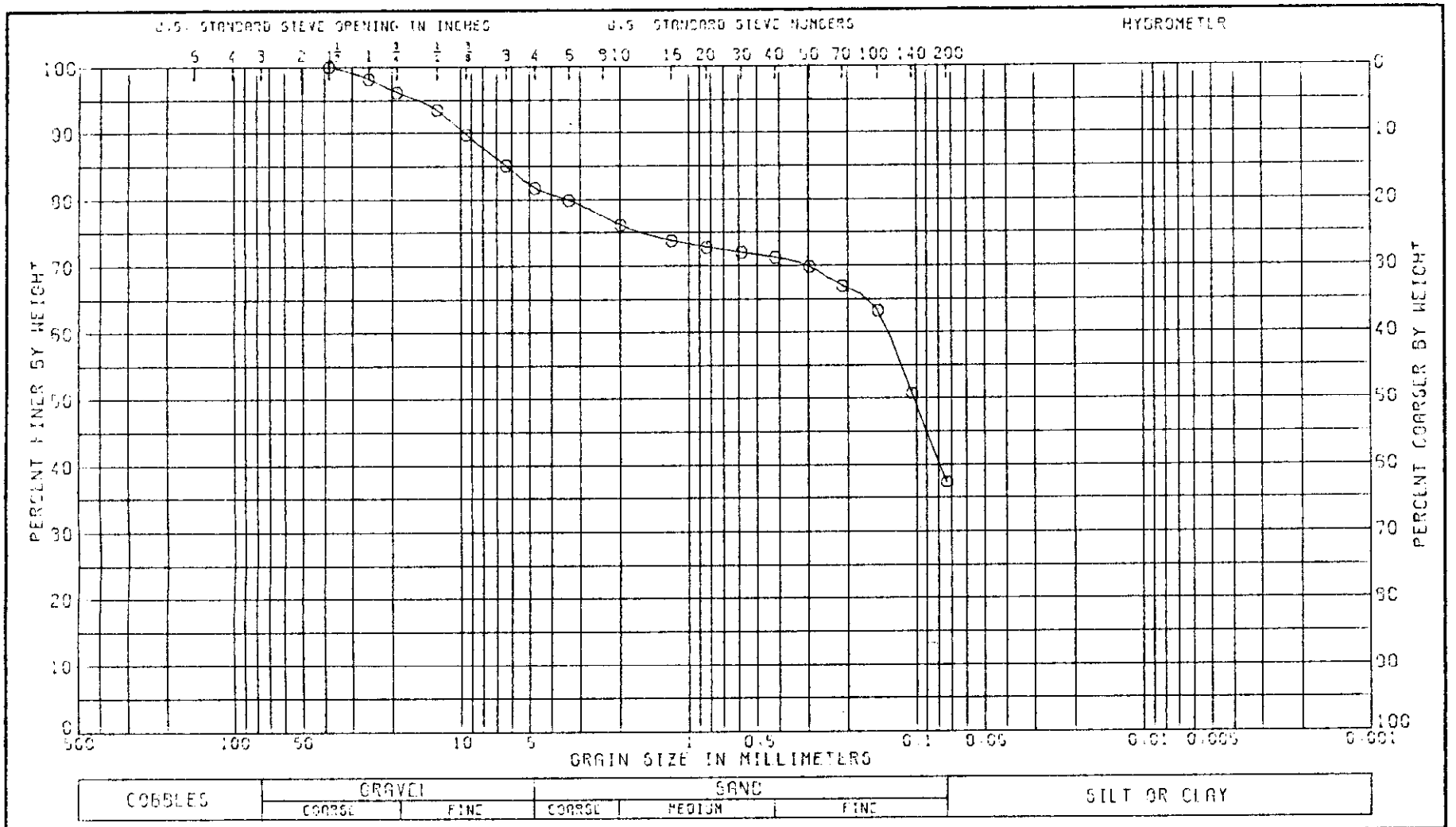
CLASSIFICATION
SANDY CLAY (CL), LIGHT BROWN, WITH GRAVEL

GRADATION CURVE

PROJECT CRANE NWSC DEMOLITION AREA

BORING NO 9-8-81 SAMPLE NO 2

DEPTH/ELEV 5.0-6.39 DATE 05 FEB 92



LL	PL	PI	OS	NAT W.%
23	16	13		12.9

CLASSIFICATION

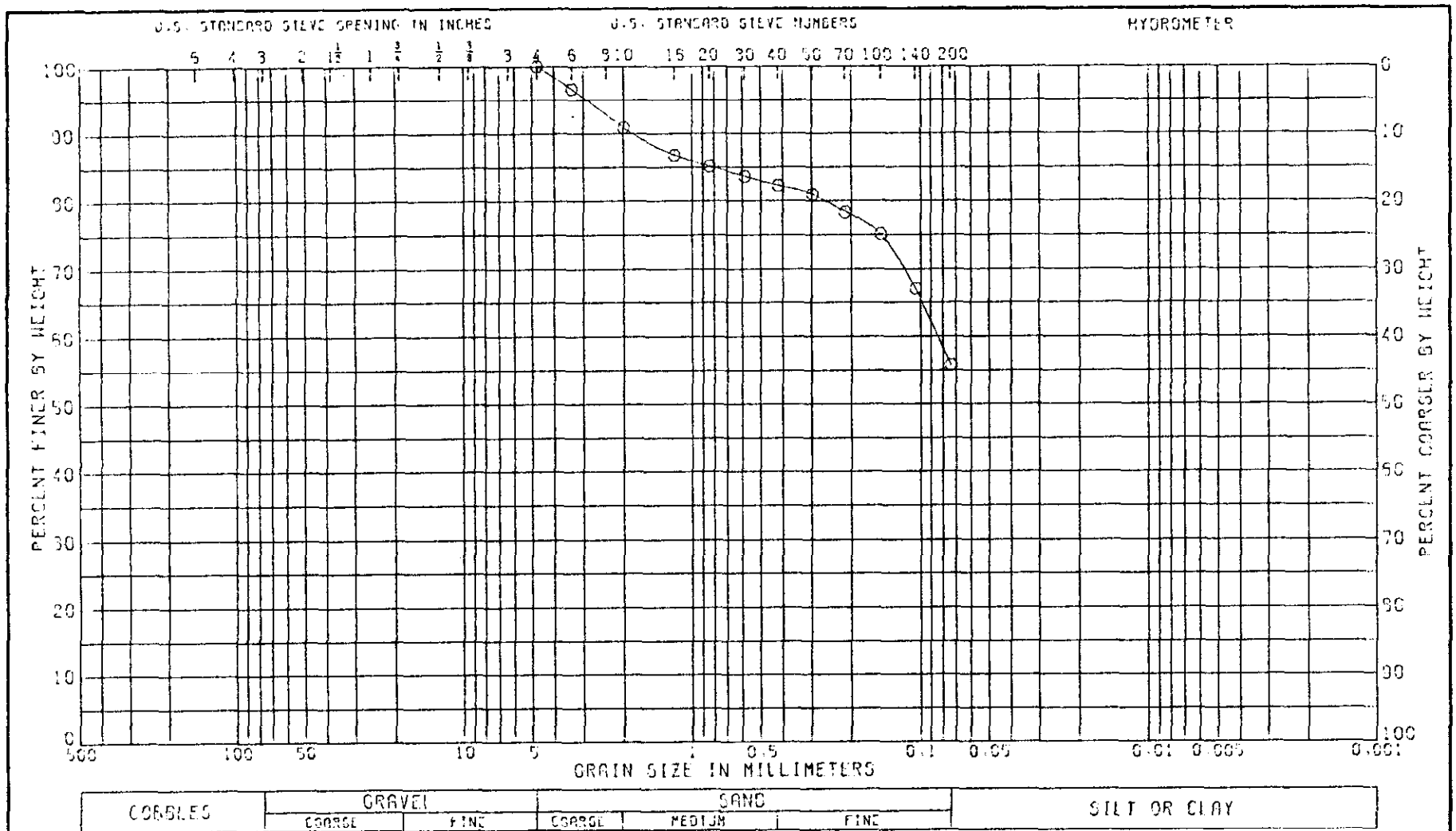
GRAVELLY CLAYEY SAND (SC), BROWN
INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

GRADATION CURVE

PROJECT CRANE NWSC HWY 45
PEST CONTROL BURAIL AREA

BORING NO. 9-9-91 SAMPLE NO 1

DEPTH/ELEV 0.0-1.75 DATE 11 FEB 92



LL	PL	PI	OS	NAT W.%	
34	20	14		18.2	

CLASSIFICATION

SANDY CLAY (CL), BROWN

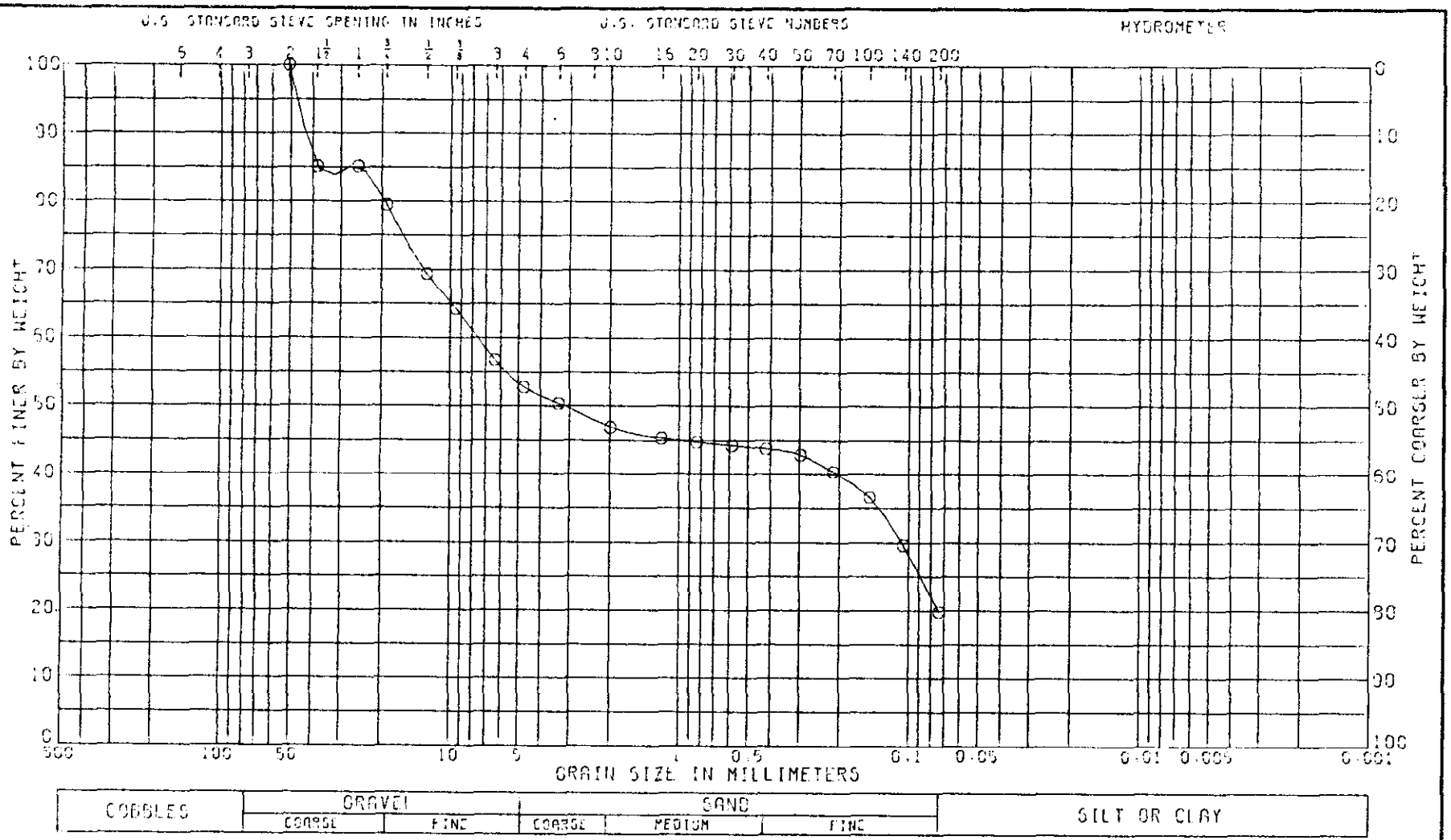
GRADATION CURVE

PROJECT CRANE NWSC HWY 45

PEST CONTROL BURRIL AREA

BORING NO. 9-9-91 SAMPLE NO. 2

DEPTH/ELEV 5.0 -6.28 DATE 11 FEB 92



LL	PL	PI	CS	NAT W.%	
NP				9.6	

CLASSIFICATION

SANDY SILTY GRAVEL (GM), BROWN

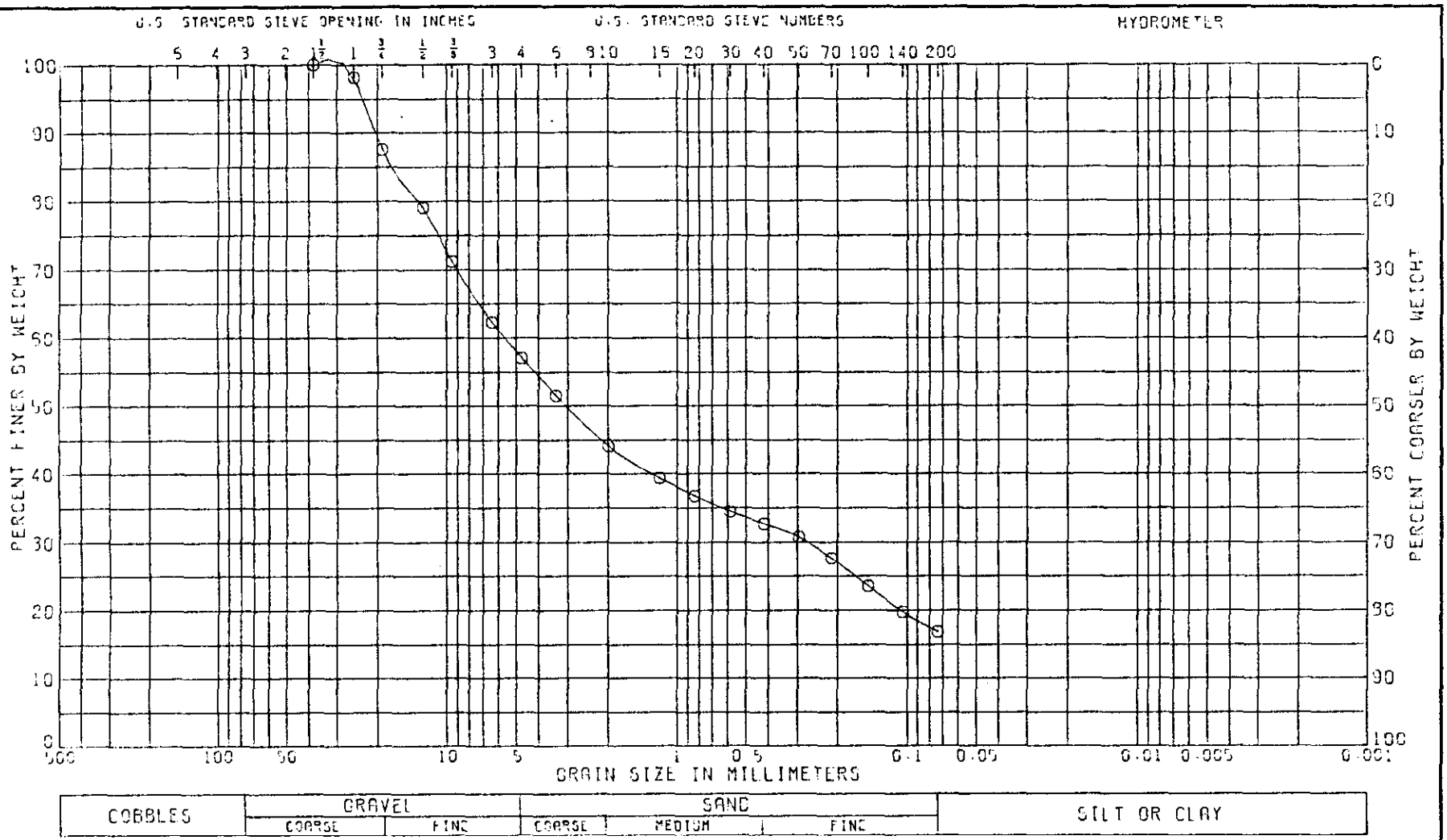
INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

GRADATION CURVE

PROJECT CRANE NWSC ROCKEYE NORTH DISCHARGE

BORING NO 10-1-91 SAMPLE NO 1

DEPTH/ELEV 0.0-1.94 DATE 11 FEB 82



LL	PL	PI	CS	NAT W.Y	
24	15	9		9.6	

CLASSIFICATION

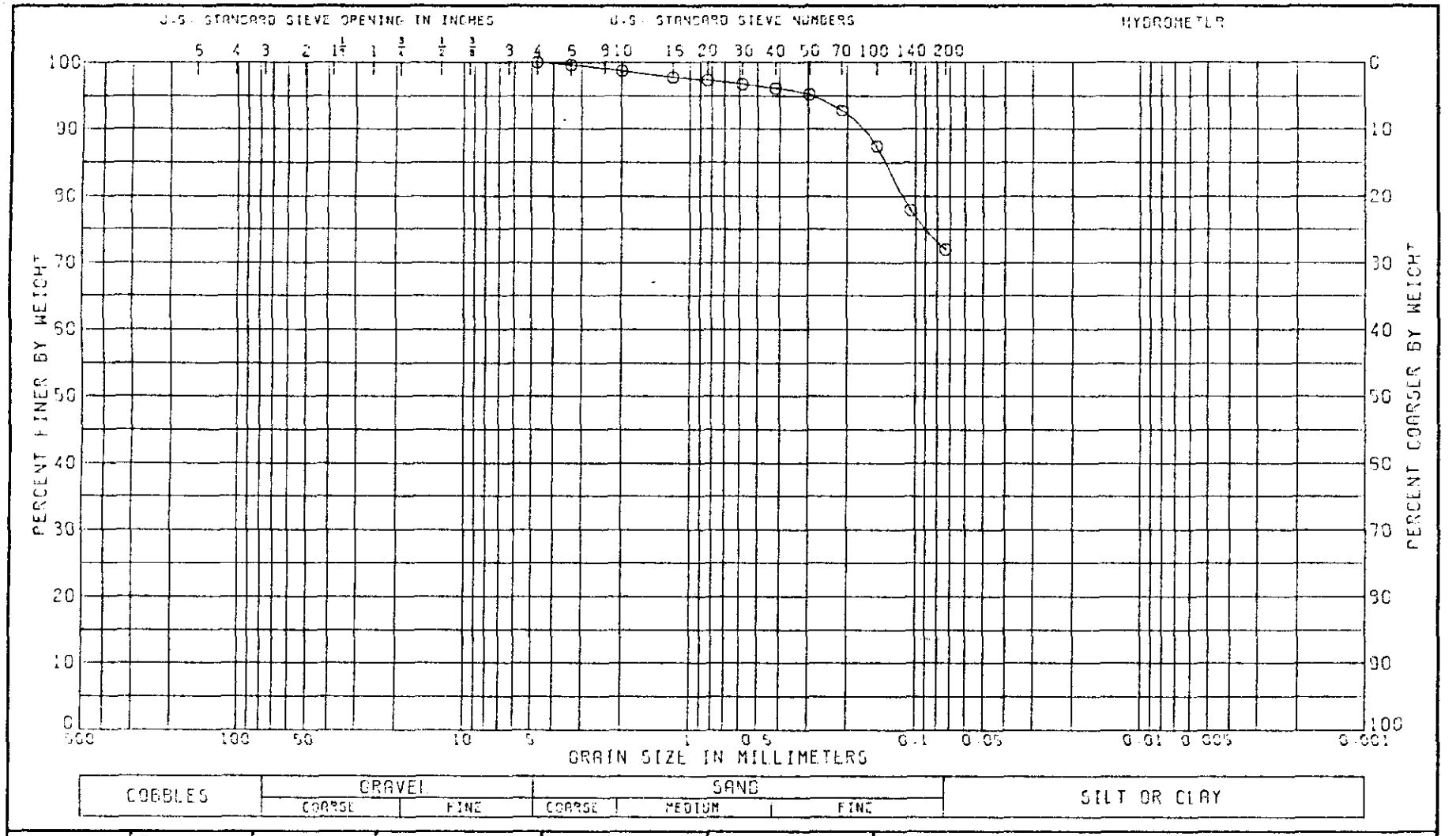
SANDY CLAYEY GRAVEL (GC), BROWN
INSUFFICIENT SAMPLE FOR ACCURATE GRADATION

GRADATION CURVE

PROJECT CRANE NWSC ROCKEYE NORTH DISCHARGE

BORING NO. 10-1-91 SAMPLE NO. 2

DEPTH/ELEV 5.0-6.15 DATE 31 MAR 82



LL	PL	PI	CS	NAT W.%
33	20	13		18.2

CLASSIFICATION

SANDY CLAY (CL), BROWN.

GRADATION CURVE

PROJECT CRANE NWSC ROCKEYE NORTH DISCHARGE

BORING NO. 10-2-81 SAMPLE NO. 1

DEPTH/ELEV 0.0-1.29 DATE 31 MAR 82