VOLUME III

FOUNDATION

FOUNDATION ANALYSIS

OVERVIEW OF VOLUME III

Volume III of the Engineering Report contains an analysis of the foundation soils underlying the encapsulation cell. The purpose of the analysis is to calculate the amount and rate of settlement that will occur at the cell foundation due to the weight of the cell and its contained waste materials. These settlement calculations are important because, if there were to be significant settlement at any point beneath the cell, such settlement could potentially cause breaks in the cell cover, leading to deterioration in cell performance.

The foundation settlement calculations in Volume III represent the work of some of the world's recognized authorities in the area of geotechnical engineering -- which is the study of how soils behave under stresses created by the construction of large structures such as buildings, bridges, dams and waste disposal facilities. The work on cell foundation analysis in Volume III was performed by Stearns Catalytic Corporation, and by Dr. Patrick Lucia, with review by Dr. Jorj O. Osterberg.

On the basis of extensive field investigation and laboratory testing described below, the geotechnical experts determined that total foundation settlement will be minimal. Substantially all such settlement will occur within a few years following completion of cell construction and will be less than five inches. The maximum differential settlement between any two points in the foundation will be less than three inches. Even at a point in time 1,000 years after construction the maximum total settlement will be less than eight inches and differential settlements will still be three inches or less. The experts have concluded from these results that total and differential settlements will be exceedingly small and will have no adverse effect on the performance of the cell cover, or any other component of the cell.

1. Field Investigations and Laboratory Tests

The geotechnical experts developed extensive data on soil characteristics at the West Chicago site through comprehensive field investigation. Some 64 soil borings were completed across the construction site. These borings were drilled in 1984 - 1986 and were reported in geotechnical logs attached to Volume III. The experts also reviewed data from earlier investigations of the foundation soils performed in 1980 and 1981.[*] Further soil data were developed through the excavation of three test pits at the site.

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[*] LETCO, February 16, 1981, Interim Report - Hydrologic Studies West Chicago Thorium Plant: Law Project No. 710022; STS, Inc., March 20, 1980, Preliminary Report for the Locations of Impermeable Clay Sources, West Chicago, Illinois - STS Job No. 214349; Dames and Moore, March 1981, Experimental Study of Rn-222 Release Characteristics of Tailings and Sediments at the Kerr-McGee West Chicago Facility.

In conjunction with the soil borings, extensive field and laboratory testing was performed. Field tests included standard penetration tests, torvane tests and pressure meter tests. Routine laboratory tests were performed on the soils samples in accordance with accepted geotechnical engineering practice. These included dry density, moisture content tests, atterberg limits tests, particle size analysis and specific gravity tests. Consolidation tests, unconfined compression tests, triaxial tests and permeability tests were performed on the undisturbed thin wall tube samples.

2. Characterization of the Foundation Soil Conditions

The foregoing field and laboratory tests provided the experts with a detailed profile of the foundation soil conditions at the site. The investigations enabled the type of soils, their thicknesses, distribution and their properties to be evaluated. The tests showed that the soil layers at the site are highly over consolidated due to the compression which occurred during an age when those soils were covered by glaciers. As a consequence of this historic condition of over consolidation, the experts expect little additional foundation soil settlement to result from the encapsulation cell because the weight of the cell is small in comparison with the previous loading due to the weight of glacial ice.

3. Timing of Foundation Settlements

Experience teaches that foundation settlement under a building or other heavy man-made structures will occur over time, with the greatest proportion of such settlement occurring immediately upon construction or within a short period of time thereafter, and with much smaller and gradually decreasing increments of settlement occurring in later years. On the basis of these accepted principles, the geotechnical experts calculated foundation settlement for the Lindsay facility cell in four time frames: (i) immediate settlement at the time the waste materials are laid down; (ii) additional settlement during the period up to the completion of the final cell cap; (iii) additional settlement over a 200-year period; and (iv) further settlement over a 1,000-year period.

4. Differential Foundation Settlements

The experts also considered the extent to which differential settlements can be expected to occur in the cell foundation. The possibility of such differential settlements is important because, if a discrete area of the foundation settles at a more rapid rate or to a greater extent than an adjacent area, the discontinuity between the two areas could theoretically cause a fracture in the structure above the foundation.

The experts calculated potential differential settlements at three points in the cell structure: (1) the toe of the clay "berm" or side of the cell (Point P); (2) the crest of the cell (Point Q); and (3) the center of the cell (Point R). These points were selected in order to reflect fully the range of loading conditions that the cell will exert on the foundation.

5. Results of Foundation Settlement Calculations

The results of the experts' foundation settlement calculations for the three representative points in the cell, and over the time periods of interest, are set forth at Table 3-2 of Volume III as follows:

SUMMARY OF FOUNDATION SETTLEMENTS

	Consolidation Settlement		Total Secondary Compression Settlements		Total Settlement
Point	Due to Cell Loads (inches)	Due to Final Cell and Cover Loads (inches)	at 200 yr. (inches)	at 1000 yr. (inches)	at 1000 yr. (inches)
P	0.6	2.0	1.7	2.3	4.9
Q	4.0	0.7	1.7	2.3	7.0
R	4.6	1.0	1.7	2.3	7.9

The experts concluded that these calculated settlements -- amounting to no more than a few inches -- are very small in relation to the size of the cell and will not affect its ability to perform its required functions. The experts thus concluded that any conceivable maximum settlements occurring in the foundation soils as a result of the disposal cell and final cover weights will have no deleterious impact on the performance of any of the cell components.

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FOUNDATION

3.0 EXECUTIVE SUMMARY

Construction of the disposal cell will result in settlements of the foundation soils at the West Chicago site. The magnitude and rate of these settlements will depend on the engineering properties of the foundation soils. To evaluate the effect of cell construction on the foundation an extensive field investigation and laboratory testing program was performed and a comprehensive foundation settlement analysis was performed.

The field exploration program included a large number of borings, extensive sampling and a number of in situ tests. The results of the program indicate that the site is underlain by alluvial and glacial soil deposits on top of dolomitic limestone bedrock. The total thickness of the foundation soils ranges from 72 to 96 feet. The foundation profile consists of six interbedded clayey and sandy layers. The clay layers are generally stiff to hard and the sand layers are generally dense to extremely dense.

The results of the laboratory testing program further identified the soils in terms of their index properties, along with strength, compressibility and permeability characteristics. The results of consolidation tests to determine the compressibility characteristics of the soils indicate that the soils have previously been loaded to stresses much greater than currently exist at the site due to overburden stresses. This result is consistent with the geologic history of the region, where glaciers have previously covered many of the existing sediments. The effect of the large stresses the site has previously experienced is to greatly reduce settlements due to construction of the cell.

The results of the analyses indicate that the maximum total foundation settlement within a few years following the completion of construction will be less than 5 inches. The maximum differential settlement between any two points in the foundation will be less than 3 inches. At 1000 years the maximum total settlement will be less than 8 inches and differential settlements will be 3 inches or less. The results of the analyses show that total and differential settlements will be very small and will have no deleterious impact on the performance of any cell components.

3.1 INTRODUCTION

The foundation soil deposits within the Disposal Site will experience deformations as a result of the construction of the disposal cell. These deformations are time-dependent and could have an influence on the performance of the different components of the disposal cell.

In order to address this important issue, an extensive field exploration and a laboratory testing program were performed, followed by a complete analysis of foundation settlement. The data obtained were complemented with available information from previous investigations including:

- LETCO, February 16, 1981, Interim Report - Hydrologic Studies West Chicago Thorium Plant: Law Project NO. 710022, 51 pages
- STS, Inc., March 20, 1980, Preliminary Report for the Locations of Impermeable Clay Sources, West Chicago, Illinois - STS Job No. 214349, 33 pages
- Dames and Moore, March 1981, Experimental Study of Rn-222 Release Characteristics of Tailings and Sediments at the Kerr-McGee West Chicago Facility, pp. 12-18.

Based on the extensive amounts of data obtained, the foundation soil profile was characterized and settlement analyses were performed. This volume of the report presents a summary of the data along with brief descriptions of the field and laboratory testing procedures, a description of the foundation geotechnical profile and a discussion of the method of analysis and the results. The effect of total settlements, differential settlements, and the rate at which settlements occur in the foundation are discussed along with their potential effect on the integrity of the different components of the disposal cell.

3.2 SURFACE CONDITIONS

The West Chicago Project area is on the southern limb of the most recent series of low terminal glacial moraine hills and is bounded by Kress Creek. The original topography of the Intermediate and Disposal Sites consisted of the gently rolling surface typical of the West Chicago area. Dumping, regrading and excavation have somewhat leveled the Intermediate Site and the northern two-thirds of the Disposal Site. The south one-third of the Disposal Site appears as original terrain except where two borrow pits and three ponds have been excavated.

Existing ground surface elevations for the Intermediate Site range from approximately 754 feet (above mean sea level) near the north end to approximately 740 feet near the south end (see Figure SK-203). Existing ground surface elevations for the Disposal Site (excluding the tailings pile) range from approximately 753 feet near the northeast corner to approximately 729 feet near the southwest corner. Existing site drainage flows generally southwest to the Elgin, Joliet & Eastern (EJ&E) Railroad embankment, then south along the toe of the embankment.

Major existing topographic features include:

- The EJ&E railroad embankment parallels the west property line, decreasing in height from 15 feet at the Disposal Site to less than 1 foot at the Factory Site.

- The Disposal Site features includes 5 ponds.

- Two gravel borrow pits which are present on the Disposal Site. One gravel borrow pit is in the southeast corner; the other is between Pond 4 and the railroad embankment.

3.3 FIELD EXPLORATION

3.3.1 GENERAL

A field exploration program was performed as part of this study in order to determine the foundation soil and groundwater conditions of the Disposal and Intermediate Sites. The field exploration consisted of the drilling of a total of 64 borings and excavation of three test pits. The borings were located in the Disposal Site and the Intermediate Site. Twelve of the borings had depths ranging from 47.5 feet to 90.2 feet and the remainder were shallower boreholes with depths ranging from 9.2 feet to 31.5 feet. The three test pits were located in the Disposal Site. Locations of borings and test pits are shown in sketch SK-203.

Soil samples were collected from the drill holes with split spoon and thin-wall tube sampling devices. Samples were photographed and classified in the field in accordance with the Unified Soil Classification System (USCS). Field tests performed concurrently with the drilling and sampling operation included:

- standard penetration tests
- hand-held penetration tests
- hand-held torvane tests
- pressure meter tests and
- thin-wall sampler driving pressure readings.

Groundwater levels were also recorded during drilling operations.

3.3.2 FIELD TESTS

The following sections describe the field tests carried out for this study and the rationale for each test.

3.3.2.1 Standard Penetration Test (SPT)

The Standard Penetration Test consists of recording the number of blows required to drive a split spoon sampler a distance of 12 inches into the soil after an initial penetration of 6 inches. The blow count is referred to as the "N" value. Test specifications are covered under ASTM Standard D1586. The test is most applicable to determine the compactness of granular soils and sometimes the consistency of fine grained soils.

3.3.2.2 Hand-Held Penetrometer and Torvane Tests

The hand-held penetrometer and torvane tests are generally used as an aid in obtaining uniform classification and a rapid approximation of shear

strength in cohesive, non-gravelly soils. In the penetrometer test, a prescribed penetration is achieved and the undrained compressive strength is read directly. In the torvane test a device is rotated in the cohesive soil and the shear strength is read directly.

3.3.2.3 Pressure Meter Test

The pressure meter test is an in situ lateral loading test carried out inside a borehole by means of a cylindrical probe. Lateral pressure is applied incrementally to the sides of the hole, the radial expansion is measured for each pressure increment, and the modulus of deformation is calculated.

3.3.2.4 Thin-Wall Sampler Driving Pressure

The pressure needed to drive a 3-inch O.D. thin-wall sampler into cohesive soils is measured in accordance with ASTM Standard D-1587. With the help of empirical correlations, pressure readings are used to determine the possible ranges of consistency and strength of the sampled soil.

3.4 LABORATORY TESTING

3.4.1 GENERAL

Representative samples of the soils encountered in the geotechnical borings were extruded and tested in an on-site geotechnical laboratory specially set up for this project. Laboratory tests performed on selected soil samples included determination of index properties such as dry density, moisture content, specific gravity, Atterberg limits, and grain size distribution. Index properties are used to classify soils, to group soils in major strata, to obtain estimates of structural properties, and ultimately to correlate the results of structural properties tests of a portion of a stratum with other portions of the stratum where only index property tests data are available.

In addition to the laboratory tests carried out to determine index properties of the soils, a number of tests were carried out on carefully selected undisturbed samples in order to determine the structural and engineering properties of the foundation soils. These tests included the following: strength tests such as unconfined compression tests, consolidated undrained, unconsolidated undrained and consolidated drained triaxial tests, consolidation tests and permeability tests.

The work described above was conducted in accordance with the Field Investigations and Laboratory Testing Guidance Manual (see Volume VIII). The summary geotechnical logs in Figures 3-1 to 3-12 present a graphical summary of some of the field and laboratory tests results. Logs of test pits are presented in Figures 3-13 to 3-20. In addition, all data collected for each borehole are presented in the composite logs, in Attachment 1 to Volume III.

3.4.2 LABORATORY TESTS

Complete tabulations of laboratory tests assignments and results are presented in the geotechnical laboratory testing report prepared by STS, July 19, 1985. Composite geotechnical logs include a summary of field and laboratory tests along with other important data. The following sections describe the assigned laboratory tests, and the rationale for each test.

3.4.2.1 Dry Density and Moisture Content Tests

The results of these tests determine the unit weight of solids and moisture content for in situ soil or compacted fills. Dry density is the weight of soil per unit volume. Moisture content is the ratio, expressed as a percentage, of weight of moisture to weight of dry solids. The results of these tests are used to determine total unit weights, dry densities and moisture contents of the soils.

3.4.2.2 Atterberg Limits

These moisture tests measure the consistency of a soil or fill material. The liquid limit (LL) is the maximum water content at which a remolded soil can have a measureable shear strength. The plastic limit (PL) is the water content at which the soil dries and begins to crumble when rolled into thin threads. The plasticity index (PI) is the numerical difference between LL and PL. These values are used to classify and identify soil, waste, and fill materials according to the Unified Soil Classification System (USCS).

3.4.2.3 Particle Size Analysis

In this test, U.S. standard sieve sizes are used in conjunction with U.S. Army Corps of Engineers standards to distinguish gravel, sand, silt and clay sizes and size distribution. The results of this test are used to classify and identify soils, wastes and fills according to the USCS.

3.4.2.4 Specific Gravity

Specific gravity of the soil is the ratio of the unit weight of soil particles to the unit weight of water. This test measures the mass weight of soil particles.

3.4.2.5 Consolidation Tests

This test measures the compressibility characteristics of a natural soil deposit, fill, or waste material. Preconsolidation pressures, virgin compression index, recompression index, and coefficients of primary and secondary consolidation are obtained from this test. Test results are used to calculate total settlement and time rate of settlement. This test can be performed on saturated or unsaturated materials.

3.4.2.6 Unconfined Compression (QU) Tests

This test measures the undrained total shear strength for use in stability analysis and soil identification. Undrained soil moduli may also be determined from this test.

3.4.2.7 Triaxial Unconsolidated Undrained (TUU) Tests

This test is similar to the QU test except that a confining pressure is applied to the soil sample when placed in a triaxial chamber. It determines the soil or fill total shear strength for initial construction conditions. The results are used to evaluate initial foundation stability or excavation stability.

3.4.2.8 Triaxial Consolidated Undrained (TCU) Tests

In this test, the soil is initially allowed to consolidate under the applied confining pressure. Total and effective shear strength of a soil or fill material can be determined from this test.

3.4.2.9 Triaxial Consolidated Drained (TCD) Tests

In this test the soil sample is allowed to drain freely so that no pore water pressures develop. This test measures long term effective strength properties of a soil or fill material.

3.4.2.10 Permeability Tests

These tests measure the ability of a soil or fill to permit flow of water, or any specified fluid, through the pores and voids within the soil.

3.5 SUBSURFACE CONDITIONS

3.5.1 FOUNDATION GEOTECHNICAL PROFILE

The West Chicago Project area is underlain by outwash and glacial soil deposits on top of dolomitic limestone bedrock. Man-made deposits such as stockpiled gravels, tailings, sludges, unclassified fills and rubble are scattered throughout the site. The thickness of the foundation soil deposits is rather constant throughout the Disposal and Intermediate Sites, ranging from approximately 72 to 96 feet. The generalized foundation soil profile consists of six interbedded clayey and sandy layers which generally coincide with the geologic strata described in Volume II. The geotechnical characterization of the foundation soil profile is based primarily on the engineering characteristics of the soil. The generalized soil profile results in individual soil layers that are nearly homogeneous in their compressibility properties. The uppermost layer has been identified as Clay-1, and is underlain by Sand-1, Clay-2, Sand-2, Clay-3 and Sand-3 layers. These soil layers have also been designated F to A stratum, respectively, in other volumes of

this report. Detailed geotechnical cross sections were generated on the basis of information collected during the field exploration program and for previous investigations and are presented in sketches SK-301 to SK-308. The ground water table in these cross sections corresponds to the maximum known levels (see Volume II). Following is a detailed description of each foundation soil layer.

3.5.1.1 Topsoil

Topsoil materials (CH-OL-OH) are predominantly composed of dark brown to black, organic, moist, moderately to highly plastic clays. The topsoil varies in thickness from 0.2 to 6.0 feet. The transition to the geotechnical layer below is sharp and distinct. This contact is an irregular surface that follows the trend of hills and swales.

3.5.1.2 Clay-1 Layer

This layer is the uppermost foundation stratum and generally correlates to the F stratum described in Volume II, Hydrogeology. The Clay-1 layer is composed of overconsolidated, uniform silty clay (CL) that is medium gray to mottled brown, firm to hard, moderately plastic, and contains trace amounts of gravel and sand. The upper portion of the Clay-1 layer frequently grades downward from clay to a nonplastic silt without change in color, moisture content, or strength. Large, linear, near-vertical, planar discontinuities occur within the Clay-1 layer. These 1/2 to 2-inch wide sealed discontinuities, or fissures, are filled with black clay loam soils that often completely penetrate the Clay-1 layer. The width of each observed fissure decreases from a maximum of 2 inches at the top of the clay to less than 1/8 inch at the bottom. These features were observed in Test Pit 242 near Pond 3.

The Clay-1 layer is present throughout the Disposal Site and Intermediate Site, either outcropping or covered with fill or topsoil, except in excavated ponds and borrow pits. This layer generally thickens in low areas and thins on top of high points which conform to the typical rolling terrain of the local area. Elsewhere, limited excavation has reduced or removed this clay layer. Maximum thicknesses to 5 feet occur in the northern part of the Disposal Site and the west half of the Intermediate Site. The mean thickness of the Clay-1 layer throughout these sites is 2.2 feet. Minimum thicknesses of 1 foot occur along high areas such as in the south end of the Disposal Site, in the vicinity of Pond 1, the former substation, and a small area north of Pond 3.

3.5.1.3 Sand-1 Layer

The Sand-1 layer, which generally correlates to the E stratum described in Volume II, Geology, is composed of subrounded to rounded sands and gravels which are generally gray and brownish gray, and dense to very dense.

The upper third of the Sand-1 layer consists of sands and gravels mixed with clay and silt. Relatively clean sands and gravels are present near Drillholes 331, 429, 434, and 499 in the north central end of the Disposal Site. The largest gravels within the upper third portion of Sand-1 layer occur as cobbles in the northeast (Drillhole 460) and southwest corners of the Disposal Site (Drillhole 27). The cleaner sands are present within the lower portions of the Sand-1 layer, especially near Drillholes 27, 340, 350, and 460.

The Sand-1 layer is present throughout the project site. Its thickness varies from 8 to 24 feet going from the west to the east side of the Disposal Site. This layer is thinnest in the southwest corner of the Disposal Site and thickest toward the northeast corner (see geotechnical Section 900N, sketch SK-302).

The transition from Sand-1 layer to Clay-2 layer is sharp and distinct, and is generally a flat surface with local channels in the northeast corner of the Disposal Site. The Sand-1 and Sand-2 layers come in contact with each other in the Intermediate Site.

3.5.1.4 Clay-2 Layer

The Clay-2 layer, which generally correlates to the D stratum described in Volume II, Geology, is composed of overconsolidated clays (CL) and silty clays (CL-ML) which become silts (ML) in the northeast corner of the Disposal Site. These clays are gray to dark gray, stiff to very stiff, and saturated. The lower portion of the Clay-2 layer includes silty sands and silty clays in areas near Drillhole 27. Trace amounts of sand and gravel were observed in this layer.

This layer has the most homogeneous composition when compared with the other 5 layers of the soil profile within the project area. The main exception to this homogeneity is the presence of laminated silts interbedded with gravelly silts in the northeast portion of the Disposal Site between Drillholes 350 and 460. These silts are very dense and saturated.

The Clay-2 layer is present everywhere beneath the Sand-1 layer except on a portion of the Intermediate Site where a wide channel deposit of sand and gravel cuts off the Clay-2 layer. (See Geotechnical Sections 500E and 900E, on sketches SK-304 and SK-305).

The thickness of this layer varies from 7 to 25 feet going from the west side to the east side of the Disposal Site. The Clay-2 layer becomes less than 5 feet thick beneath the west edge of the Intermediate Site. Where these two clay layers are joined there is no interbedded sand layer. The Clay-2 layer thickens to 15 feet beneath the tailings pile and pinches out the Sand-1 layer. (See Geotechnical Sections 100N and 500N, on sketch SK-301).

3.5.1.5 Sand-2 Layer

The Sand-2 layer, which generally correlates to the C stratum described in Volume II, Geology, consists predominantly of overconsolidated, saturated, dense to very dense, gray, silty sands (SM), and poorly graded sands (SP) throughout most of the Disposal Site. The Sand-2 layer becomes a sandy silt near Drillhole 27 and a gravelly sand near Drillholes 340 and 350 in the northwest portion of the Disposal Site. The lower half of the Sand-2 layer contains boulders and cobbles in the north central portion of the Disposal Site near Drillholes 340 and 350.

In the northern portion of the site the Sand-2 and Sand-3 layer are in contact as a result of the absence of the Clay-2 layer. The thickness of the Sand-2 layer on the Disposal Site varies from 2 to 18 feet. The Sand-2 layer thickness on the Intermediate Site varies from 28 to 45 feet from west to east. The greater thickness on the Intermediate Site is a result of the two upper sand layers in combination.

3.5.1.6 Clay-3 Layer

The Clay-3 layer, which generally correlates to the B stratum described in Volume II, Geology, consists of overconsolidated silty clays (CL) similar in composition to sampled portions of the Clay-2 layer, and silty to clayey sands (SM-SC). The silty clays (CL) are dark gray, saturated, very stiff to hard, and moderately plastic. Slightly plastic clayey silts are also present. This layer includes some sand, gravels, cobbles and boulders. The sandier portions of the Clay-3 layer occur in the south half of the Disposal Site near Drillhole 27 and 134. The Clay-3 layer occurs as the thickest clay layer throughout the Disposal and Intermediate Sites.

The thickness of the Clay-3 layer from south to north varies from 50 feet to 10 feet. The east-west thickness varies slightly. The Clay-3 layer is a massive clay with a few thin sand channels in the north half of Disposal Site and Intermediate Site.

3.5.1.7 Sand-3 Layer

The Sand-3 layer, which generally correlates to the A stratum described in Volume II, Geology, is composed of sands and coarse gravels (SP-GP) and weathered dolomitic and limestone cobbles and boulders above bedrock. The sands and gravels are light brown to gray, poor to well graded, very dense to extremely dense, and saturated. The weathered dolomitic, silty cobbles and gravels are gray, saturated, extremely dense and angular. These weathered gravels rest directly on dolomitic limestone bedrock.

The Sand-3 layer becomes a well defined sand unit in the northeast, south central and southwest portions of the Disposal Site. In these areas this layer is a well-graded sand (SW) that is light brownish gray, saturated, extremely dense and contains few gravels. Elsewhere the composition becomes increasingly silty and poorly sorted (SM-GM).

The Sand-3 layer is present throughout the Disposal Site and Intermediate Site. Its thickness varies from 6 to 18 feet. The thickest portion is beneath the north half of the Disposal Site.

3.5.2 GEOTECHNICAL CHARACTERIZATION OF THE FOUNDATION SOIL PROFILE

The geotechnical characterization of each foundation soil layer includes measured index properties, along with strength, compressibility and permeability characteristics. Physical data for each of the geotechnical layers were evaluated statistically where such an evaluation was appropriate. The results of this characterization were used for the geotechnical foundation settlement analysis. The summary of these data is presented in Table 3-1.

3.5.2.1 Index Properties

The index properties include moisture content, dry density, particle size distribution and Atterberg limits for each of the geotechnical layers.

Frequency distributions of moisture contents of the soil layers and fills are presented in Figures 3-21 to 3-33. Moisture content of the clay layers generally decreases with depth, and correspondingly the density of the clay layers generally increases with depth. The mean moisture content per clay layer ranges from 24.9% for the Clay-1 layer, to 15.0% for the Clay-3 layer. Moisture content for sand and gravel samples above the water table averages 7.8%. Moisture content for sands and gravels below the water table generally decreased with depth from an average of 11.9% for the Sand-1 layer to an average of 10.2% for the Sand-3 layer.

The frequency distributions of natural dry densities are shown in Figures 3-34 to 3-39. The figures show frequency distribution and the mean and standard deviation of the natural dry densities for each of the layers. The Clay-1 layer is the least dense and the Sand-3 layer is most dense. Mean dry densities range from 99.5 to 129.3 pcf. These dry densities have been obtained from strength, permeability and consolidation tests.

Plasticity charts, Figures 3-40 to 3-43, show a plot of plasticity index versus liquid limit for all the Atterberg test results for each clay layer. Mean plasticity index and liquid limit values are greatest in the Clay-1 layer. Index properties for all soil layers are summarized in Table 3-1.

The average percent gravel, sand, silt and clay varies between the geotechnical layers (see Figures 3-44 and 3-45). For example, the Clay-1 layer contains significantly more clay than the other two clay layers. The Sand-1 layer contains significantly more sampled gravel than the other two sand layers. The two lower sand layers contain cobbles and boulders which were not included in the sampled and tested data, but were observed during drilling.

TAB

IN SITU AND FILL MATERIA

MATERIAL	USCS	GRADATION (PER CENT) GRAVEL	SAND	SILT	CLAY	GRAIN SIZE (mm) D60	D30	D10	ATTERBERG LIMITS LL	PI	NATURAL DRY UNIT WT. (pcf)	NATURAL WATER CONTENT (%)
IN SITU FOUNDATION SOILS (Notes 1 and 3)												
TOPSOIL	OL-CL	4.7	11.1	48.4	34.8	0.028	0.004	<0.001	81.7	19.0	81.8	36.7
CLAY-1	CL-ML	2.3	11.8	50.9	35.0	0.020	0.003	<0.001	42.0	22.1	99.5	23.4
SAND-1	GP-SM	38.8	43.8	14.9	4.5	3.023	0.398	0.029	N P	N P	128.1	10.1
CLAY-2	CL-ML	4.5	19.2	48.6	27.7	0.034	0.007	<0.001	22.1	7.8	115.7	18.1
SAND-2	GM-SM	21.0	48.7	24.4	5.9	0.705	0.171	0.018	N P	N P	114.2	10.8
CLAY-3	CL-ML	8.1	31.6	31.2	29.1	0.071	0.007	<0.001	23.9	10.3	122.6	13.7
SAND-3	SM-SW	19.8	55.6	21.3	3.3	1.004	0.140	0.007	N P	N P	129.3	10.2
IN SITU WASTES (Notes 1 and 2)												
TAILINGS	ML	0	3.2	75.3	21.5	0.022	0.013	<0.001	48.8	5.2	84.0	51.4
SLUDGES	MH-CH	0.8	7.1	33.4	58.9	0.005	<0.001	<0.001	61.0	29.2	56.0	55.3
POND SEDS.	MH-CH	0	0.6	25.3	74.1	0.002	<0.001	<0.001	94.0	51.8	(35)	140.7
E SANDS	SM	35.2	45.9	14.9	4.0	4.50	0.800	0.100	N P	N P	128.1	9.5
CLAYS	CL-ML	2.3	11.8	50.9	35.0	0.020	0.003	<0.001	(42)	(22)	98.9	23.7
STABILIZED WASTE FILLS												
MIX ONE		17.0	23.0	33.7	26.3	0.017	0.008	<0.001	33	11	--	--
MIX TWO		0.9	5.7	45.0	48.4	0.010	<0.001	<0.001	37	13	--	--
MIX THREE		29.9	37.4	22.1	10.6	1.04	0.050	0.005	15	2	--	--

NOTES:

(1) Materials include foundation soils, in situ wastes, stabilized wastes and offsite borrow materials. Measured values represented as means; estimated values shown in parentheses.

(2) Values in parentheses for in situ materials are estimates.

(3) Cec = Compression Ratio $\left(\frac{Cc}{1+e_c}\right)$

Cer = Compression Ratio $\left(\frac{Cr}{1+e_o}\right)$

Pc = Preconsolidation pressure; Cv = Coefficient of primary consolidation
Ca = Coefficient of secondary compression; N P = Not Plastic

(4) ϕ and C are total friction angle and cohesion from triaxial consolidated undrained tests.
ϕ' and C' are effective friction angle and cohesion from triaxial consolidated undrained tests.
Su is undrained shear strength from unconfined compression tests.
S is degree of saturation ratio.

BLE 3 – 1

LS CHARACTERIZATION SUMMARY

	COMPRESSIBILITY				STRENGTH: TOTAL STRESS		STRENGTH: EFFECTIVE STRESS		STRENGTH: UNDRAINED STRENGTH	UNDRAINED SOILS MODULUS (ksf)	POISSON RATIO	SATURATION	PERMEABILITY	SPECIFIC GRAVITY
Cec	Cer	Pc (1000 psf)	Cv (ft^2/yr)	Ca	ϕ (deg)	C (ksf)	ϕ' (deg)	C' (ksf)	S_u (ksf)			S	(cm /sec)	
--	--	--	--	--	18.0°	0.12	34.2°	0.00	--	--	--	--	--	1.90–2.70
0.280	0.012	9–11	26	0.0016	23.9°	0.02	31°	0.00	3.60	901	0.33	0.7 to 1.0	10^{-5} to 10^{-7}	2.69
(0.001)	(0.001)	(9–11)	--	--	(30°)	--	(36°)	0.00	--	1848	(0.4)	1.0	--	2.74
0.080	0.011	9–11	67	0.0015	28.3°	0.00	33°	0.00	5.80	3600	0.50	1.0	--	2.73
(0.001)	(0.001)	(9–11)	--	--	(30°)	--	(32°)	0.00	--	1282	(0.4)	1.0	--	2.74
0.095	0.010	9–11	90	0.0011	17.5°	0.56	27.7°	0.00	6.80	4200	(0.5)	1.0	--	2.73
(0.001)	(0.001)	(9–11)	--	--	(30°)	--	(37°)	--	--	2400	(0.4)	1.0	--	(2.7)
--	--	--	--	--	--	--	--	--	--	--	--	--	--	(2.8)
--	--	--	--	--	--	--	--	--	--	--	--	--	--	(2.9)
--	--	--	--	--	--	--	--	--	--	--	--	--	--	(3.1)
--	--	--	--	--	--	--	--	--	--	--	--	--	--	(2.7)
--	--	--	--	--	--	--	--	--	--	--	--	--	--	(2.7)
0.11	0.01	--	84	0.0008	0°	1.3	--	--	--	--	--	0.7	--	2.8
0.17	0.02	--	63	0.0030	0°	1.3	--	--	--	--	--	0.9	--	2.8
0.04	0.004	--	841	0.0003	30°	--	35°	--	--	--	--	0.8	--	2.7

Figures 3-46 to 3-55 summarize the grain size distribution data. These figures include the mean and standard deviation of the percent of constituents for each geotechnical layer and fill material.

3.5.2.2 Strength Characteristics

Strength characteristics for soil layers have been measured by triaxial and unconfined compression tests. The triaxial tests include two consolidated drained (TCD), nine consolidated undrained (TCU) and six unconsolidated undrained (TUU) tests for foundation soil layers. These test results were analyzed to determine cohesion and friction angles for both effective and total stress conditions.

The unconfined compression strength tests include 11 tests from this foundation investigation and 17 tests from previous investigations. (KM drillholes in Law report, 1981). The onsite clay and sand layers generally possess high to very high strength (see Table 3-1).

3.5.2.3 Compressibility Characteristics

The compressibility of the foundation soil layers and clay fill has been measured in 22 consolidation tests. The laboratory test data selected for the analyses for each clay layer and clay fill are shown in Table 3-1. The compressibility parameters include the following:

- Initial void ratio (e_o)
- Primary compression index (C_c)
- Recompression index (C_{cr})
- Coefficient of consolidation (C_v)
- Coefficient of secondary compression (C_a).
- Preconsolidation stress (P_c).

The results of laboratory consolidation tests provide a relationship between void ratio and vertical stress from which the compressibility characteristics of the soil can be determined. A laboratory specimen sampled from some depth in the field is loaded vertically in a consolidation test. The corresponding change in height of the sample due to loading is a result of a decrease in void ratio. A soil sample will respond to a given load increment by a change in void ratio based on whether the soil has experienced loads of that magnitude in the past. If the sample is loaded at stresses less than the maximum stress the sample has experienced in the past, the resulting deformations will be proportional to the recompression index, C_r. If the sample is loaded at stresses equal to or greater than the maximum stress the sample has experienced in the past, the resulting deformations will be proportional

to the compression index, C_c. The value of C_r is typically about 10% of the value of C_c for a given soil, and correspondingly, settlements will be significantly less.

A natural soil deposit is said to be precompressed and consequently overconsolidated if it has been subjected in the past to pressure greater than its present overburden pressure. The excess pressure may have been caused by the weight of soil deposits that were later removed by a variety of processes like erosion, excavation, etc., by the weight of ice that later melted, or by dessication. Drainage of a soil as a result of evaporation from a surface exposed to the atmosphere is a process called, drainage by dessication. When a clay is dessicated, tension develops in the pore water, constituting the mechanical equivalent of consolidation under loading despite the fact that additional load is not applied.

The results of the field exploration and the laboratory testing programs indicate that all the soil layers have experienced larger stresses in the past than currently exist as a result of the overburden stresses. This result is consistent with the geologic history of the region, where glaciers have previously covered many of the existing sediments. The exact thickness of the glaciers is unknown but the magnitude of their thickness ranges in the thousands of feet. The previous stress history, due to glaciation, has resulted in overconsolidating the soils at the site. In addition, evidence of dessication cracks existing in the Clay-1 layer indicate that this phenomenon also contributed to overconsolidating this stratum. The stresses in the foundation due to the construction of the disposal cell will result in maximum stresses less than previously experienced at the site.

The results of index tests on the soil layers indicate that dry densities and water content values are consistent with soils that are overconsolidated. The high values of blow counts in Standard Penetration Tests in the sand layers are also consistent with highly overconsolidated soils.

The laboratory consolidation curves were corrected for sample disturbance and the maximum past pressures were determined for all samples. Based on the results of laboratory tests, preconsolidation stresses were estimated to range between 9,000 and 11,000 psf for the complete soil profile. Maximum past stresses, as shown on Figure 3-58, are much greater than stresses induced by present overburden pressures. A range of C_c and C_{cr} values was obtained from the reconstructed laboratory consolidation curves for each clay layer. The largest compression ratios per layer were used to calculate the maximum foundation settlements and are shown in Table 3-1. Test results indicate that the clay layers are relatively low in compressibility, and that compressibility decreases with depth.

3.5.2.4 Permeability Characteristics

The permeability of both undisturbed and disturbed samples of the Clay-1 layer and compacted clay fill has been measured by the falling head

method in a triaxial test cell (TCFH). Undisturbed (U) samples were subjected to a consolidation pressure of 6,000 psf during permeability testing, except as noted. The results of these tests presented in Table 3-1 indicate a range of in situ permeabilities. General trends of permeability for the Clay-1 layer materials range from 10^{-5} to 10^{-7} cm/sec for both undisturbed and remolded samples. Refer to Figures 3-56 and 3-57.

3.5.2.5 Piezometric Measurements

Ten piezometers were installed at locations shown on sketch SK-203. The depth of each piezometer is shown on the composite logs. A discussion of the data is presented in Volume II.

3.6 FOUNDATION SETTLEMENTS

3.6.1 GENERAL

When loads are applied to a soil deposit, there is a tendency for volumetric strain accompanied by vertical settlements. Thus, the total vertical deformation resulting in a soil deposit when a load is applied is called settlement. The settlement of cohesive soils has three components:

- Immediate settlement results as the load is applied and the soil structure adjusts elastically.
- Settlement occurring as a result of time-dependent primary consolidation as excess pore pressure generated in the pore water of the soil by the applied load is dissipated.
- Secondary compression occurs both during and after primary consolidation is complete and is controlled primarily by the composition and structure of the soil. For the clays at this site the secondary compression and its rate are very small compared to the primary consolidation.

The settlement of coarser grained granular soils subject to loads occurs primarily due to compression of the soil skeleton resulting from the rearrangement of particles. The magnitude of this settlement is usually insignificant for dense granular soils and the settlement occurs immediately upon application of the load.

3.6.2 ANALYSIS

The analysis of the volumetric strains and accompanying vertical settlements that take place when a soil deposit is loaded is simplified by the assumption that such strains occur only vertically. This assumption, usually referred to as one dimensional consolidation, is particularly applicable in this study where the foundation soils deformations will be vertical due to the large extension of the fill compared to the thickness of the foundation soils.

The soil profile characteristic of the foundation which was used for the settlement analyses is shown in Figure 3-58. It corresponds to the soil profile at location 750N, 500E (see sketch SK-305), which best represents the average thicknesses of the soil layers. The geotechnical characterization of the foundation indicated that soil layers are nearly homogeneous. On this basis, the statistical averages of index properties per layer were used in the analyses and are summarized in Table 3-1. Where backfilling is required within the foundation profile such as in the case of the existing ponds, the soils will be Sand-1 layer type material. The soils will be placed at densities consistent with the Sand-1 layer resulting in similar compressibility characteristics.

Groundwater surface elevation used in the analyses coincides with the top of the Clay-1 layer, and corresponds to the high groundwater surface at location 750N, 500E in the geotechnical cross section 500E shown in sketch SK-305.

The settlement of foundation soil layers was analyzed following standard practice methods as prescribed by Duncan and Buchignani (1976) and U.S. NAVFAC DM7.1 (1984). The laboratory consolidation curves were corrected for sample disturbance effects. Data obtained from those curves were evaluated by soil layer and a range of compressibility parameters for each layer was obtained. The most commonly used method to quantify the compressibility parameters is to obtain an average of the data per layer, provided that range of variation is not too large. However, in order to calculate conservative maximum settlements, the largest values of the range of compressibility parameters were selected for the analysis.

Settlements of coarse-grained soils like sands and gravels occur immediately after loading since settlements are not subject to gradual dissipation of pore water pressure. However, compressibility parameters for the Sand-1, 2 and 3 layers were assigned conservative values to reflect the presence of some clays and silts (see Table 3-1). Accordingly, these layers were included in the calculations of maximum consolidation settlements for completeness.

Three locations throughout the disposal cell foundation were selected for settlement calculations in order to fully reflect the range of loading conditions. These locations are: 1) the toe of the clay berm at Point P, 2) the crest of the disposal cell at Point Q, and 3) the center of the disposal cell at Point R, and are shown in Figures 3-58 and 3-59.

The disposal cell construction sequence described in Volume IX, was taken into consideration for the analysis. Construction of the disposal cell is based on a south to north waste placement procedure which will be carried out in several consecutive construction seasons. Settlement analyses were carried out on the basis of loads applied in two stages: 1) the disposal cell loads, which correspond to the weight of cell materials up to the temporary clay cap, and 2) the loads due to placement of the final cover.

As each layer of material is placed, stresses in the foundation increase, resulting in increased consolidation of the foundation soils. As a simplified assumption, the total disposal cell loads and final cover loads were assumed to be applied instantaneously, at the middle of each construction season, on the basis of three consecutive construction seasons for the disposal cell and one for the final cover. Although it is assumed that three construction seasons are required for construction, the maximum differential settlements in the foundation are independent of the rate and time required for construction. Thus this analysis places no constraint on the duration of construction.

The distribution of effective stress with depth depends on the unit weight of each type of soil in the foundation geotechnical profile, and on the location of the ground water table. Figure 3-58 shows the stress distributions prior to and after the load is applied in two stages, as well as the pre-consolidation pressures. It should be noted that the vertical distribution of incremental stresses in the foundation due to applied loads is constant for point R at the center of the cell, and varies with depth for points P and Q.

3.6.3 RESULTS

The results of the foundation deformation analysis include consolidation settlements resulting from the two loading stages and secondary compression settlements at 200 years and 1000 years after construction. Maximum calculated values for point P, Q and R are summarized in Table 3-2. The total immediate settlement that occurs due to rearrangement of particles was calculated to be 0.7 inch. This settlement occurs immediately upon application of the load and, consequently, cannot have any effect on the performance of the final cover, its value was excluded from Table 3-2. The maximum total and differential settlements throughout the foundation of the disposal are shown in Figure 3-59.

A calculated maximum total deformation of 7.9 inches occurs at the center of the cell. Observations of settlement in overconsolidated soils indicate that conventional consolidation theories overpredict actual settlements. Thus, foundation settlements experienced at the disposal cell are likely to be less than predicted by these analyses. However, total settlements alone have almost no effect on the disposal cell. The primary concern is the potential for differential settlements and the consequent deflections that they may induce on the different cell components. The maximum differential settlement gradient in the foundation within the central portion of the cell is 0.0025 ft/ft. Differential settlement gradients on the order of 0.05 ft/ft is required to have an impact on the performance of the clay cap. Therefore, the calculated maximum differential settlement gradient of 0.0025 ft/ft will have no significant impact on the performance of the cell components.

The rate of settlement depends on the soil properties and the thickness of the layer. Results of the consolidation time-rate analysis indicate that most of the settlement will take place during construction. Figure 3-60 shows curves that envelope the maximum calculated settlements at the central section of the cell and at the edges.

Table 3-2

SUMMARY OF FOUNDATION SETTLEMENTS

Point	Consolidation Settlement		Total Secondary Compression Settlements		Total Settlement
	Due to Cell loads (inches)	Due to Final Cell and cover loads (inches)	at 200 yr. (inches)	at 1000 yr. (inches)	at 1000 yr. (inches)
P	0.6	2.0	1.7	2.3	4.9
Q	4.0	0.7	1.7	2.3	7.0
R	4.6	1.0	1.7	2.3	7.9

The analysis shows that any conceivable maximum settlements occurring in the foundation soils as a result of the disposal cell and final cover weights will have no deleterious impact on the performance of any of the cell components.

VOLUME III REFERENCES

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2. Duncan, J.M., and Buchignani, A. L., 1976, An Engineering Manual for Settlement: Berkeley, CA, University of California, 94 pages.

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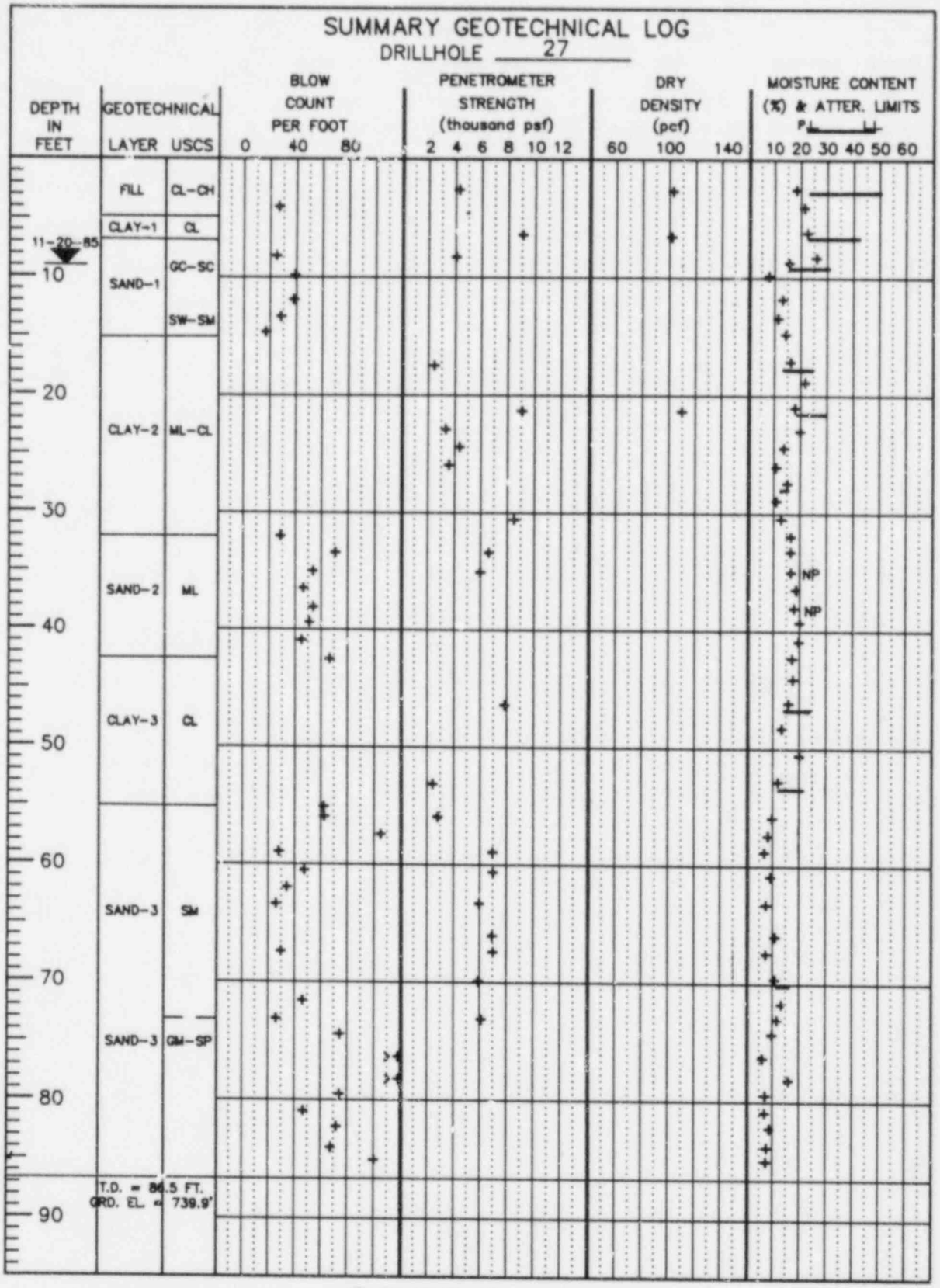

SUMMARY GEOTECHNICAL LOG
DRILLHOLE 27
DEPTH IN FEET
GEOTECHNICAL LAYER
USCS
BLOW COUNT PER FOOT
0 40 80
PENETROMETER STRENGTH (thousand psf)
2 4 6 8 10 12
DRY DENSITY (pcf)
60 100 140
MOISTURE CONTENT (%) & ATTER. LIMITS
P L
10 20 30 40 50 60
FILL
CL-CH
CLAY-1
CL
11-20-85
SAND-1
GC-SC
SW-SM
CLAY-2
ML-CL
SAND-2
ML
NP
NP
CLAY-3
CL
SAND-3
SM
SAND-3
GM-SP
10
20
30
40
50
60
70
80
90
T.D. = 86.5 FT.
GRD. EL. = 739.9'

FIGURE 3 – 1

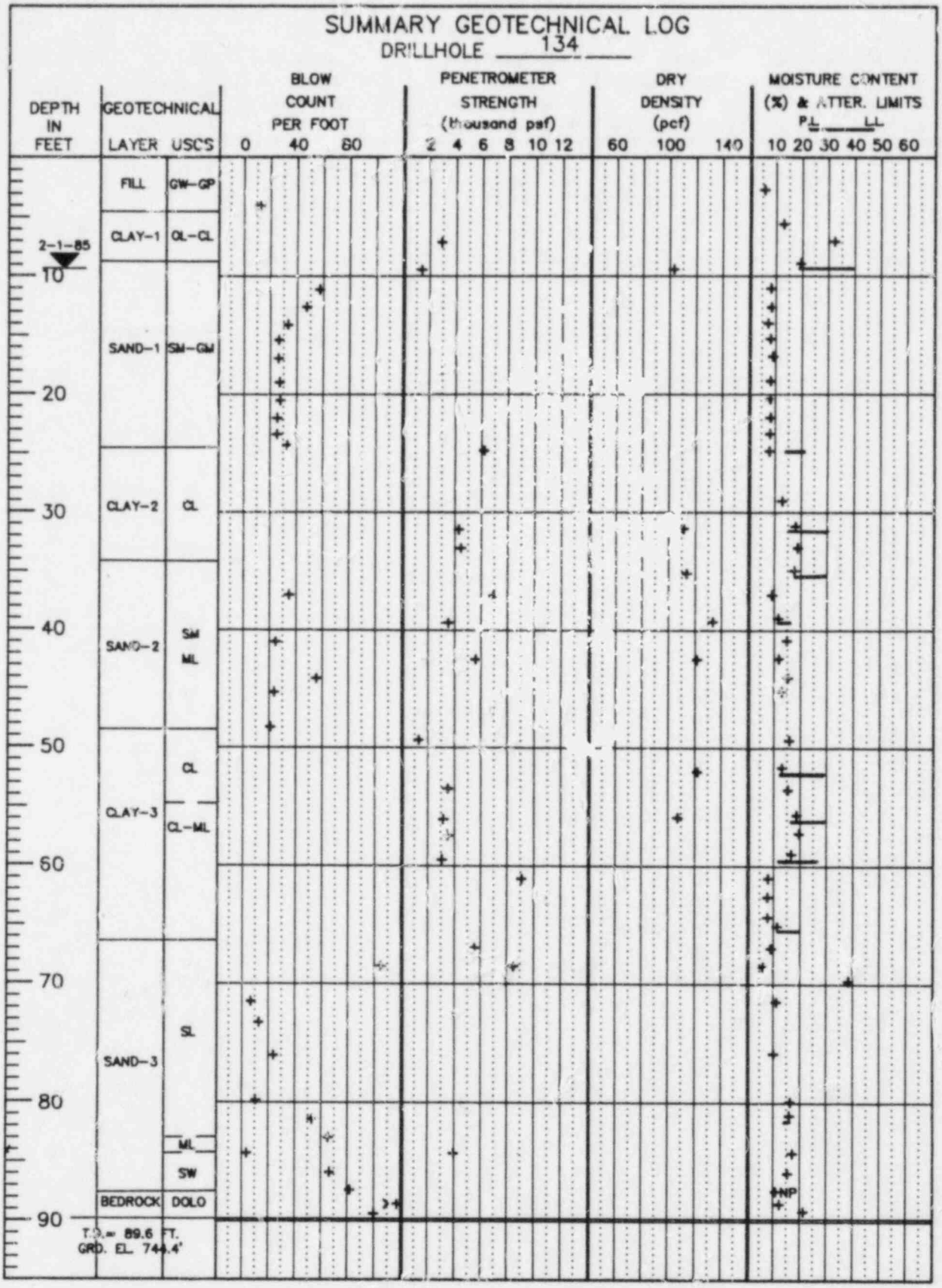

SUMMARY GEOTECHNICAL LOG
DRILLHOLE 134
DEPTH IN FEET
GEOTECHNICAL LAYER
USCS
BLOW COUNT PER FOOT
0 40 80
PENETROMETER STRENGTH (thousand psf)
2 4 6 8 10 12
DRY DENSITY (pcf)
60 100 140
MOISTURE CONTENT (%) & ATTER. LIMITS
PL LL
10 20 30 40 50 60
FILL
GW-GP
CLAY-1
OL-CL
2-1-85
SAND-1
SM-GM
CLAY-2
CL
SAND-2
SM
ML
CLAY-3
CL
CL-ML
SAND-3
SL
ML
SW
BEDROCK
DOLO
NP
10
20
30
40
50
60
70
80
90
T.D. = 89.6 FT.
GRD. EL. 744.4'

FIGURE 3 – 2

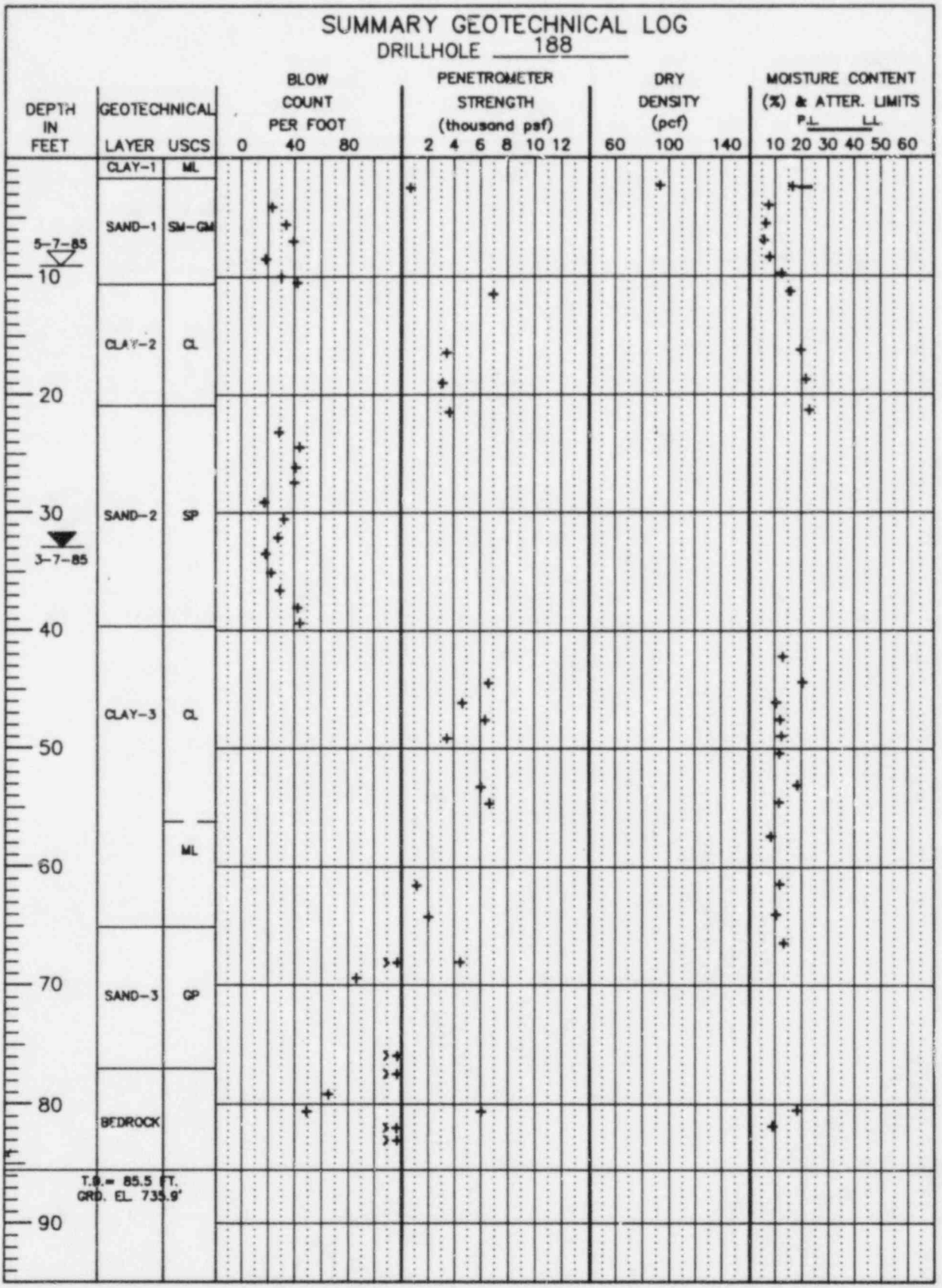

SUMMARY GEOTECHNICAL LOG
DRILLHOLE 188
DEPTH IN FEET
GEOTECHNICAL LAYER
USCS
BLOW COUNT PER FOOT
0 40 80
PENETROMETER STRENGTH (thousand psf)
2 4 6 8 10 12
DRY DENSITY (pcf)
60 100 140
MOISTURE CONTENT (%) & ATTER. LIMITS
PL LL
10 20 30 40 50 60
CLAY-1
ML
SAND-1
SM-GM
5-7-85
10
CLAY-2
CL
20
SAND-2
SP
30
3-7-85
40
CLAY-3
CL
50
ML
60
70
SAND-3
GP
80
BEDROCK
T.D.= 85.5 FT.
GRD. EL 735.9'
90

FIGURE 3 – 3

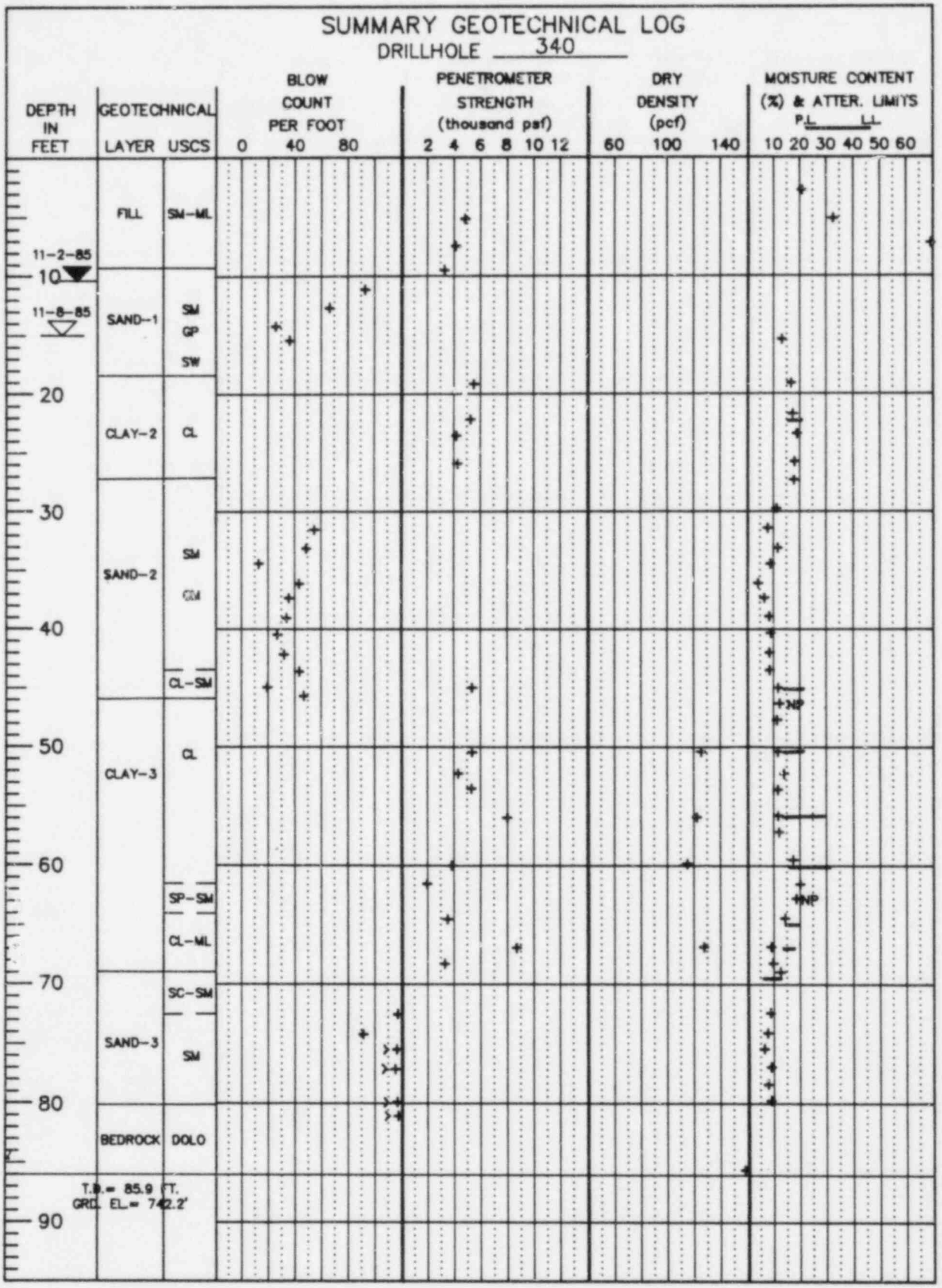

SUMMARY GEOTECHNICAL LOG
DRILLHOLE 340
DEPTH IN FEET
GEOTECHNICAL LAYER
USCS
BLOW COUNT PER FOOT
0 40 80
PENETROMETER STRENGTH (thousand psf)
2 4 6 8 10 12
DRY DENSITY (pcf)
60 100 140
MOISTURE CONTENT (%) & ATTER. LIMITS
P.L. L.L.
10 20 30 40 50 60
11-2-85
11-8-85
FILL
SM-ML
SAND-1
SM
GP
SW
CLAY-2
CL
SAND-2
SM
CL
CL-SM
CLAY-3
CL
SP-SM
CL-ML
SAND-3
SC-SM
SM
BEDROCK
DOLO
NP
T.D.= 85.9 FT.
GRD. EL.= 742.2'
10
20
30
40
50
60
70
80
90

FIGURE 3 – 4

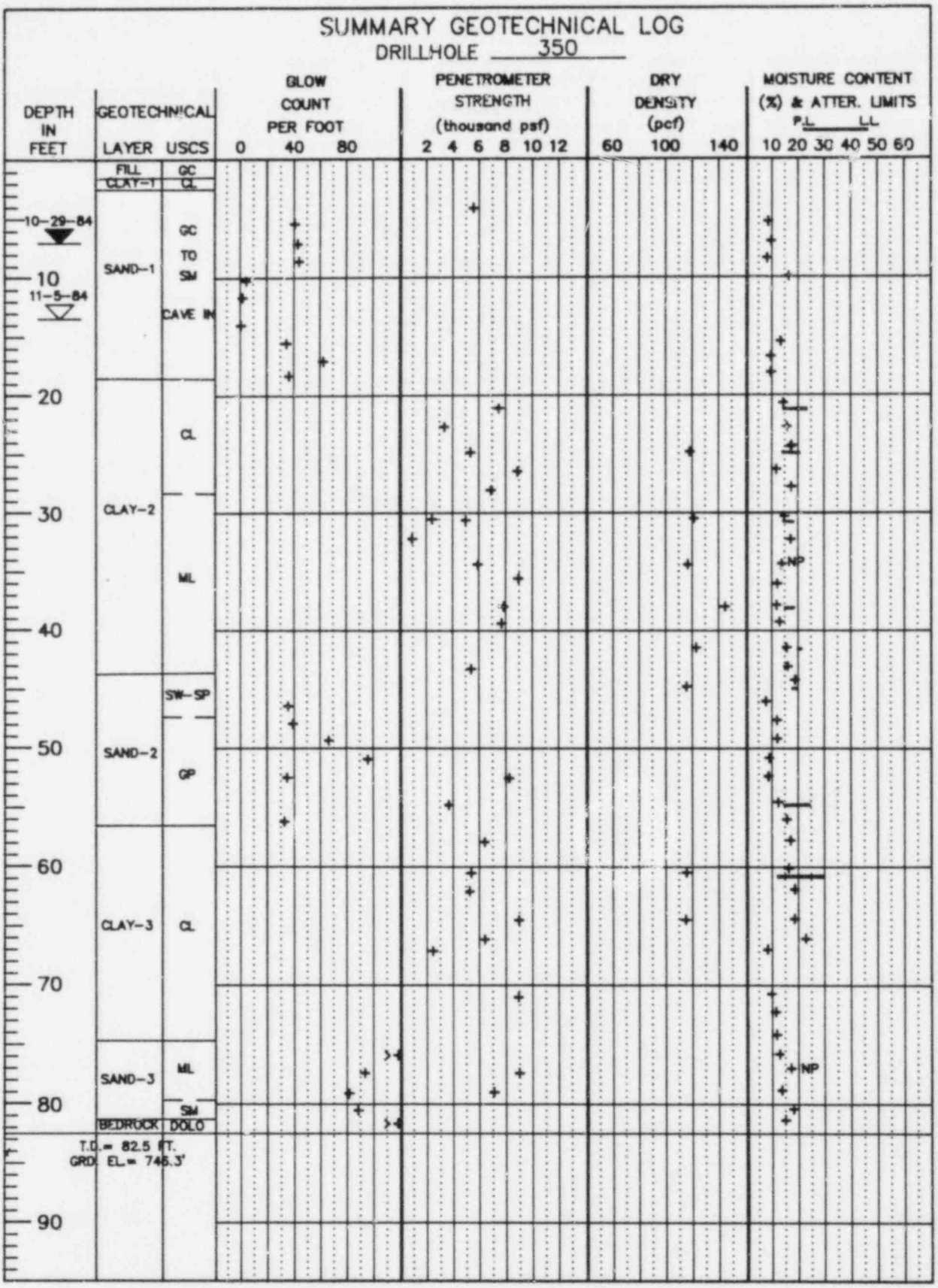

SUMMARY GEOTECHNICAL LOG
DRILLHOLE 350
DEPTH IN FEET
GEOTECHNICAL LAYER
USCS
BLOW COUNT PER FOOT
0 40 80
PENETROMETER STRENGTH (thousand psf)
2 4 6 8 10 12
DRY DENSITY (pcf)
60 100 140
MOISTURE CONTENT (%) & ATTER. LIMITS
PL LL
10 20 30 40 50 60
FILL
GC
CLAY-1
CL
10-29-84
GC
TO
SM
SAND-1
11-5-84
CAVE IN
10
20
CL
30
CLAY-2
ML
NP
40
50
SW-SP
SAND-2
GP
60
CLAY-3
CL
70
SAND-3
ML
NP
80
SM
BEDROCK
DOLO
T.D.= 82.5 FT.
GRD. EL.= 745.3'
90

FIGURE 3 – 5

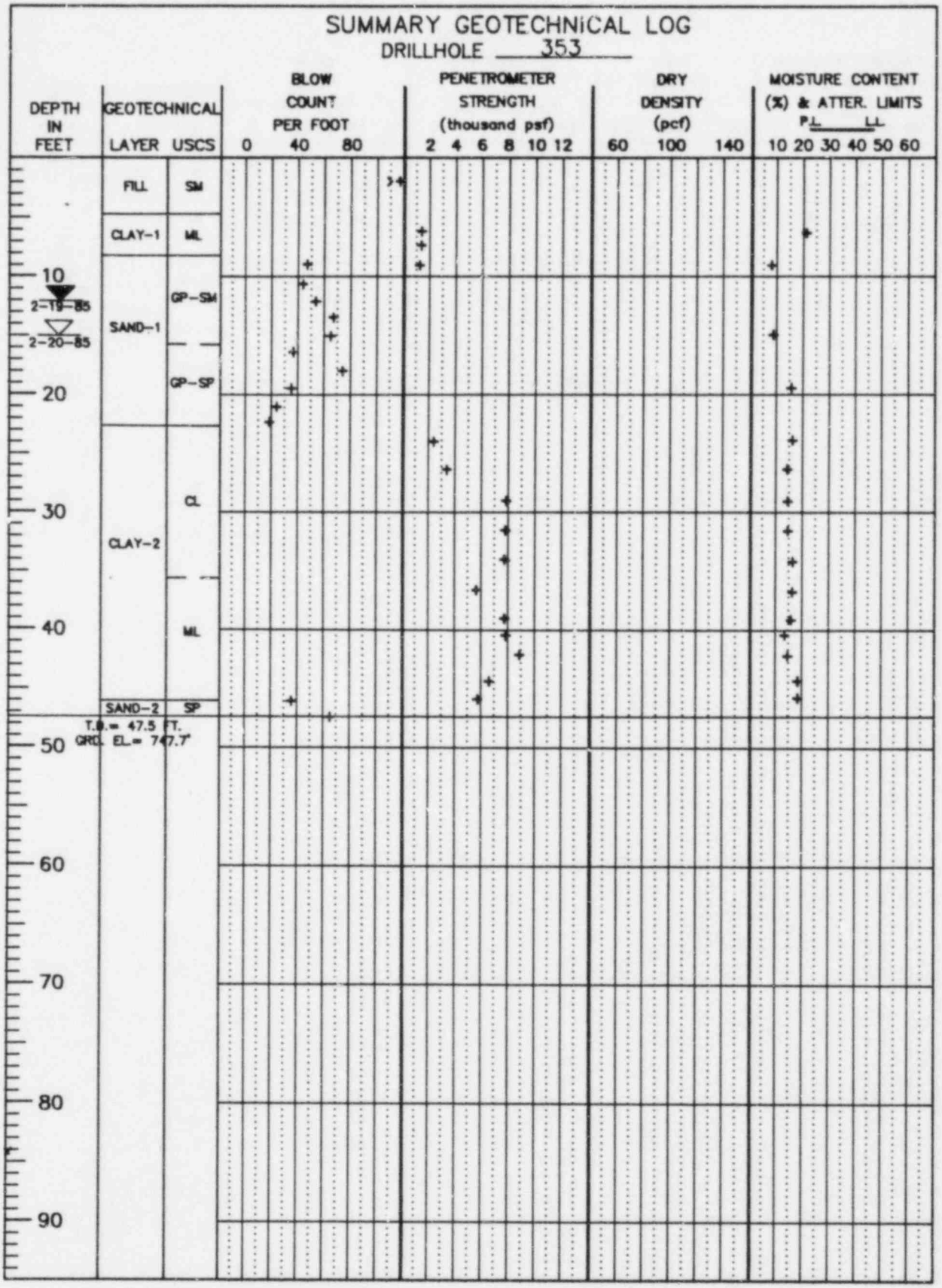

SUMMARY GEOTECHNICAL LOG
DRILLHOLE 353
DEPTH IN FEET
GEOTECHNICAL LAYER
USCS
BLOW COUNT PER FOOT
0 40 80
PENETROMETER STRENGTH (thousand psf)
2 4 6 8 10 12
DRY DENSITY (pcf)
60 100 140
MOISTURE CONTENT (%) & ATTER. LIMITS
P.L. L.L.
10 20 30 40 50 60
FILL
SM
CLAY-1
ML
SAND-1
GP-SM
GP-SP
CLAY-2
CL
ML
SAND-2
SP
2-19-85
2-20-85
T.D.= 47.5 FT.
GRD. EL.= 747.7'
10
20
30
40
50
60
70
80
90

FIGURE 3 – 6

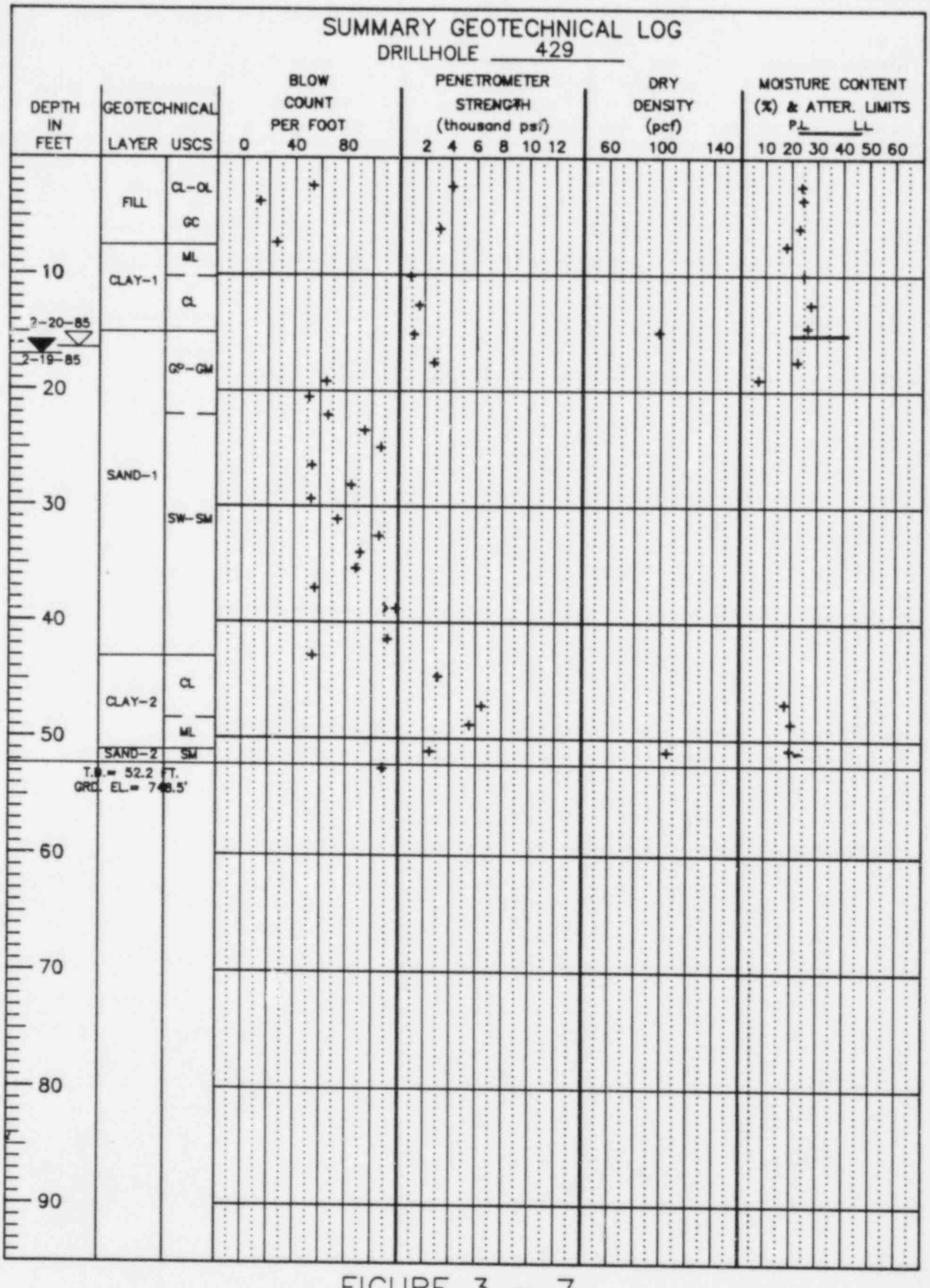

SUMMARY GEOTECHNICAL LOG
DRILLHOLE 429
DEPTH IN FEET
GEOTECHNICAL LAYER
USCS
BLOW COUNT PER FOOT
0 40 80
PENETROMETER STRENGTH (thousand psf)
2 4 6 8 10 12
DRY DENSITY (pcf)
60 100 140
MOISTURE CONTENT (%) & ATTER. LIMITS
PL LL
10 20 30 40 50 60
FILL
CL-OL
GC
CLAY-1
ML
CL
2-20-85
2-19-85
SAND-1
GP-GM
SW-SM
CLAY-2
CL
ML
SAND-2
SM
T.D.= 52.2 FT.
GRD. EL.= 748.5'
10
20
30
40
50
60
70
80
90

FIGURE 3 – 7

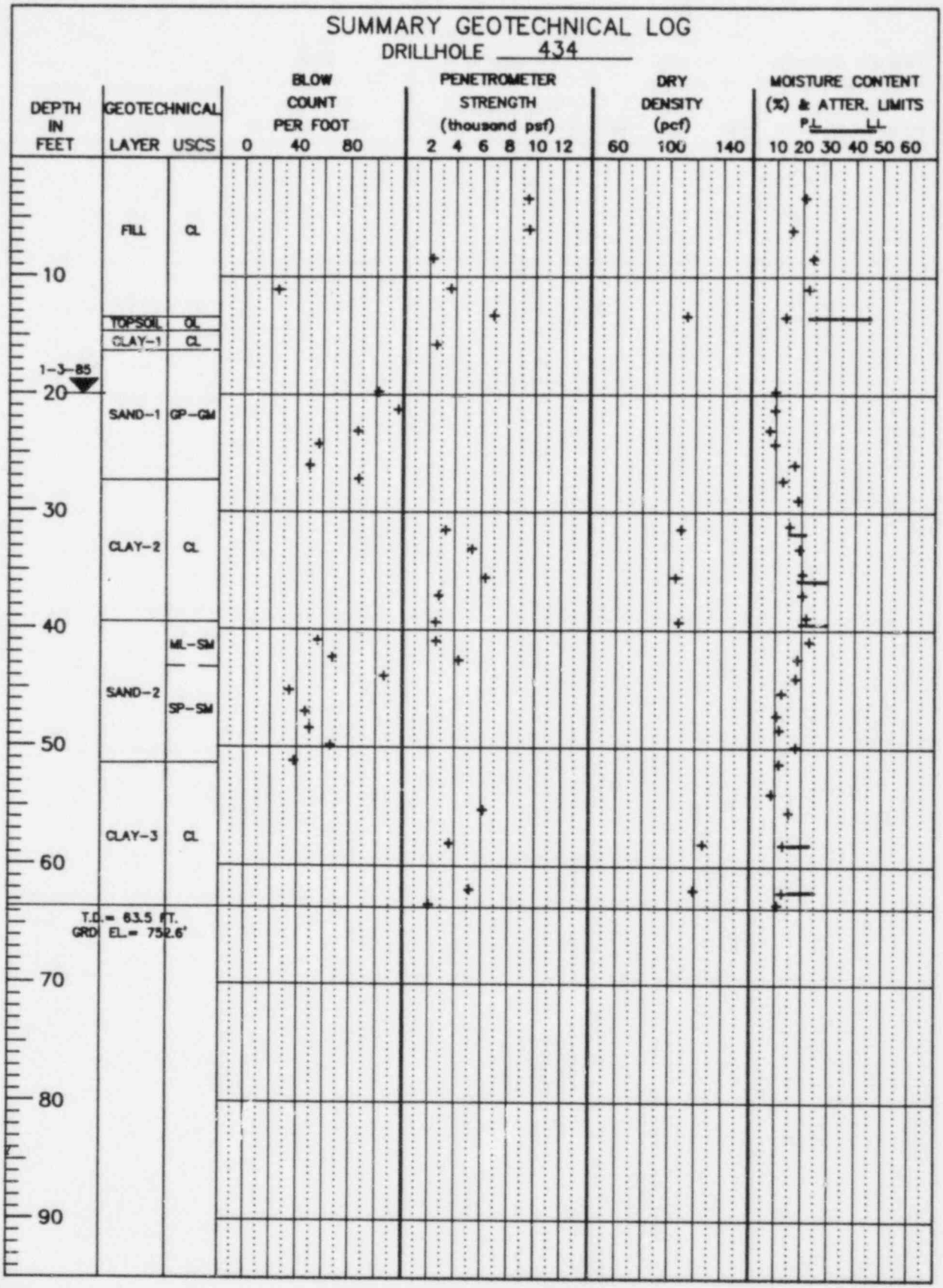

SUMMARY GEOTECHNICAL LOG
DRILLHOLE 434
DEPTH IN FEET
GEOTECHNICAL LAYER
USCS
BLOW COUNT PER FOOT
0 40 80
PENETROMETER STRENGTH (thousand psf)
2 4 6 8 10 12
DRY DENSITY (pcf)
60 100 140
MOISTURE CONTENT (%) & ATTER. LIMITS
PL LL
10 20 30 40 50 60
FILL
CL
TOPSOIL
OL
CLAY-1
CL
1-3-85
SAND-1
GP-GM
CLAY-2
CL
ML-SM
SAND-2
SP-SM
CLAY-3
CL
T.D. = 83.5 FT.
GRD EL. = 752.6'
10
20
30
40
50
60
70
80
90

FIGURE 3 – 8

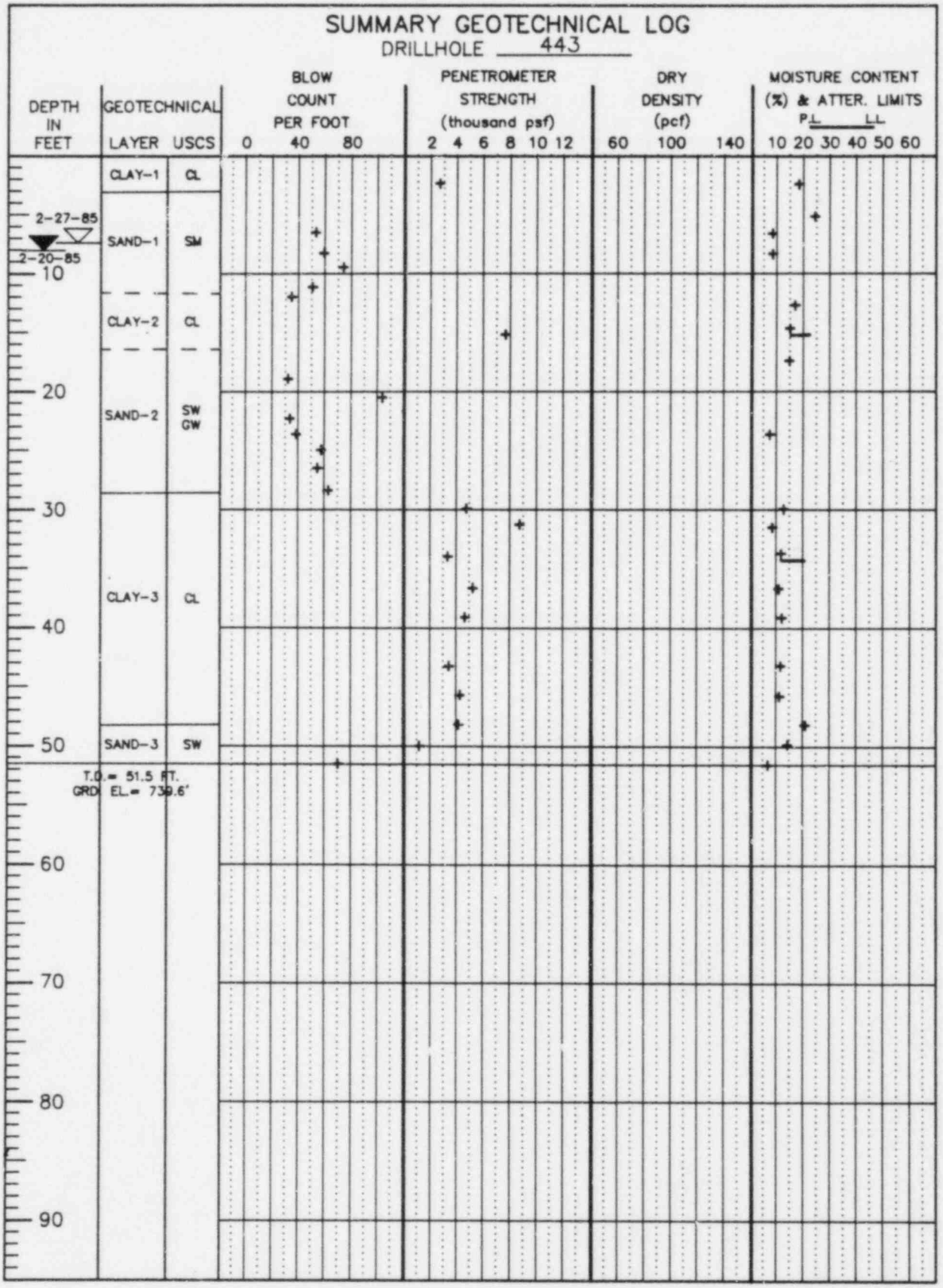

SUMMARY GEOTECHNICAL LOG
DRILLHOLE 443
DEPTH IN FEET
GEOTECHNICAL LAYER
USCS
BLOW COUNT PER FOOT
0 40 80
PENETROMETER STRENGTH (thousand psf)
2 4 6 8 10 12
DRY DENSITY (pcf)
60 100 140
MOISTURE CONTENT (%) & ATTER. LIMITS
P.L. L.L.
10 20 30 40 50 60
CLAY-1 CL
SAND-1 SM
CLAY-2 CL
SAND-2 SW GW
CLAY-3 CL
SAND-3 SW
2-27-85
2-20-85
10
20
30
40
50
60
70
80
90
T.D. = 51.5 FT.
GRD. EL. = 739.6'

FIGURE 3 – 9

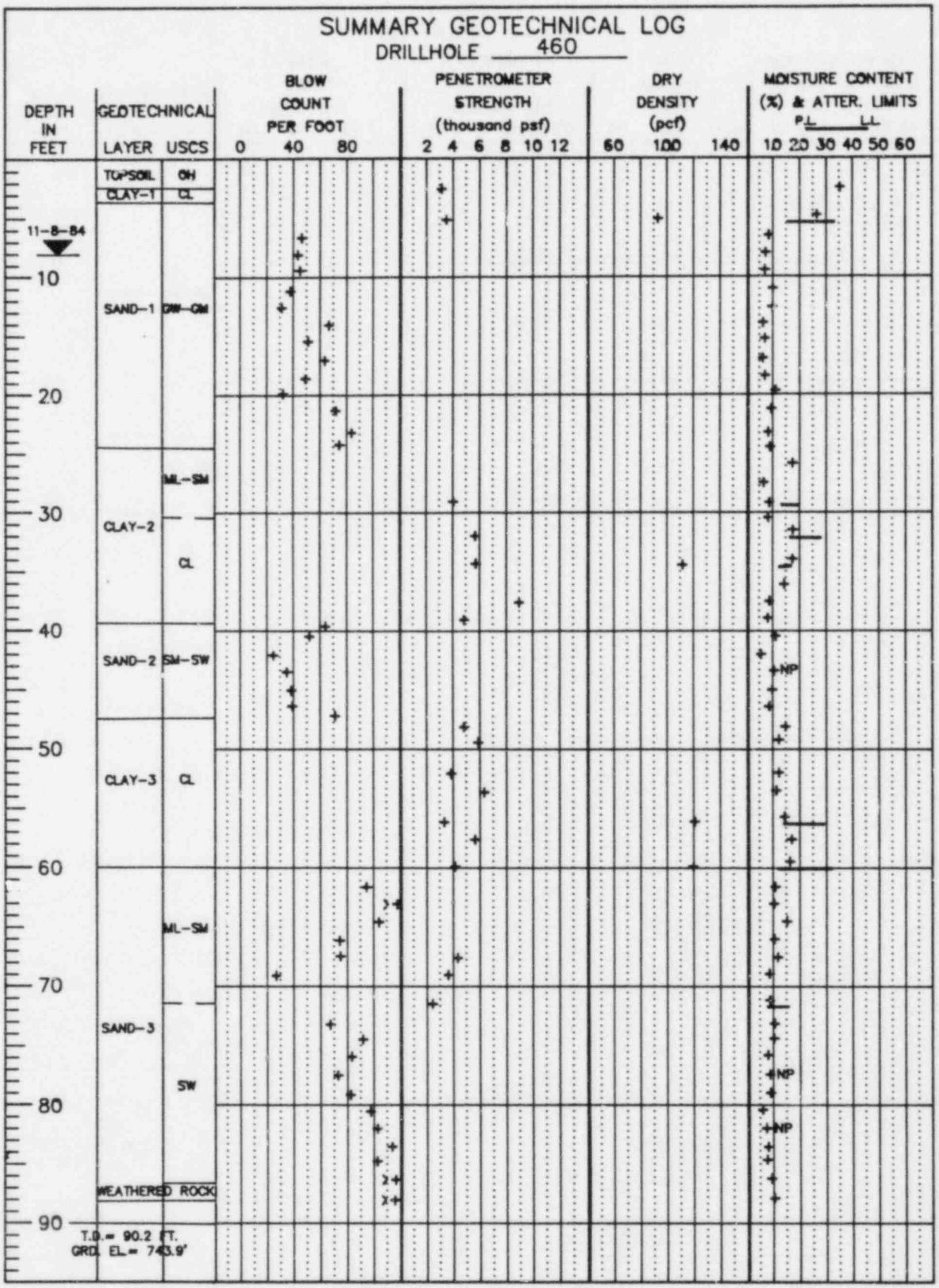

SUMMARY GEOTECHNICAL LOG
DRILLHOLE 460
DEPTH IN FEET
GEOTECHNICAL LAYER
USCS
BLOW COUNT PER FOOT
0 40 80
PENETROMETER STRENGTH (thousand psf)
2 4 6 8 10 12
DRY DENSITY (pcf)
60 100 140
MOISTURE CONTENT (%) & ATTER. LIMITS
PL LL
10 20 30 40 50 60
TOPSOIL
OH
CLAY-1
CL
11-8-84
SAND-1
SW-SM
ML-SM
CLAY-2
CL
SAND-2
SM-SW
CLAY-3
CL
ML-SM
SAND-3
SW
WEATHERED ROCK
NP
NP
NP
10
20
30
40
50
60
70
80
90
T.D.= 90.2 FT.
GRD. EL.= 743.9'

FIGURE 3 – 10

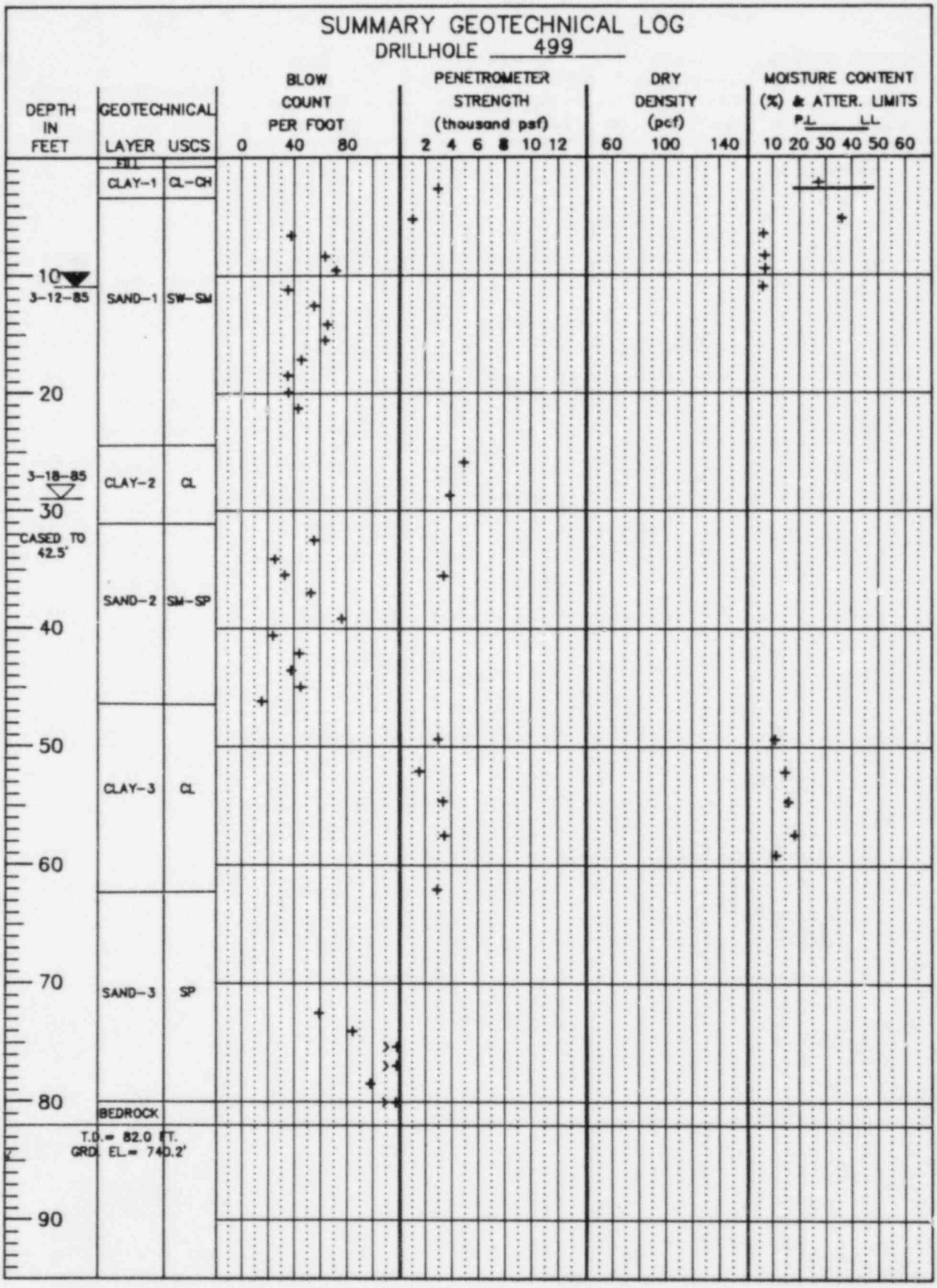

SUMMARY GEOTECHNICAL LOG
DRILLHOLE 499
DEPTH IN FEET
GEOTECHNICAL LAYER
USCS
BLOW COUNT PER FOOT
0 40 80
PENETROMETER STRENGTH (thousand psf)
2 4 6 8 10 12
DRY DENSITY (pcf)
60 100 140
MOISTURE CONTENT (%) & ATTER. LIMITS
PL LL
10 20 30 40 50 60
FILL
CLAY-1
CL-CH
SAND-1
SW-SM
CLAY-2
CL
SAND-2
SM-SP
CLAY-3
CL
SAND-3
SP
BEDROCK
10
20
30
40
50
60
70
80
90
3-12-85
3-18-85
CASED TO 42.5'
T.D. = 82.0 FT.
GRD. EL. = 740.2'

FIGURE 3 – 11

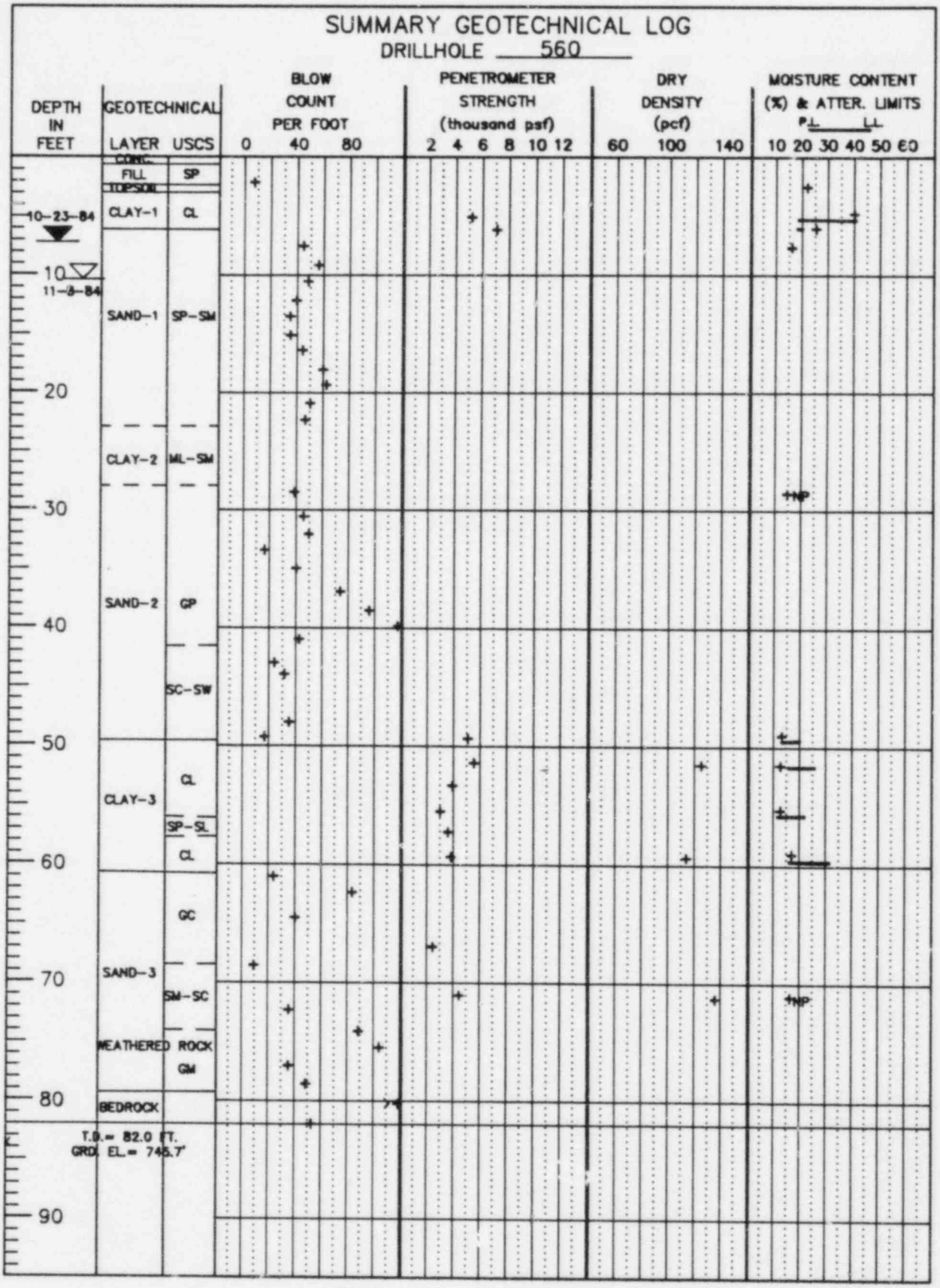
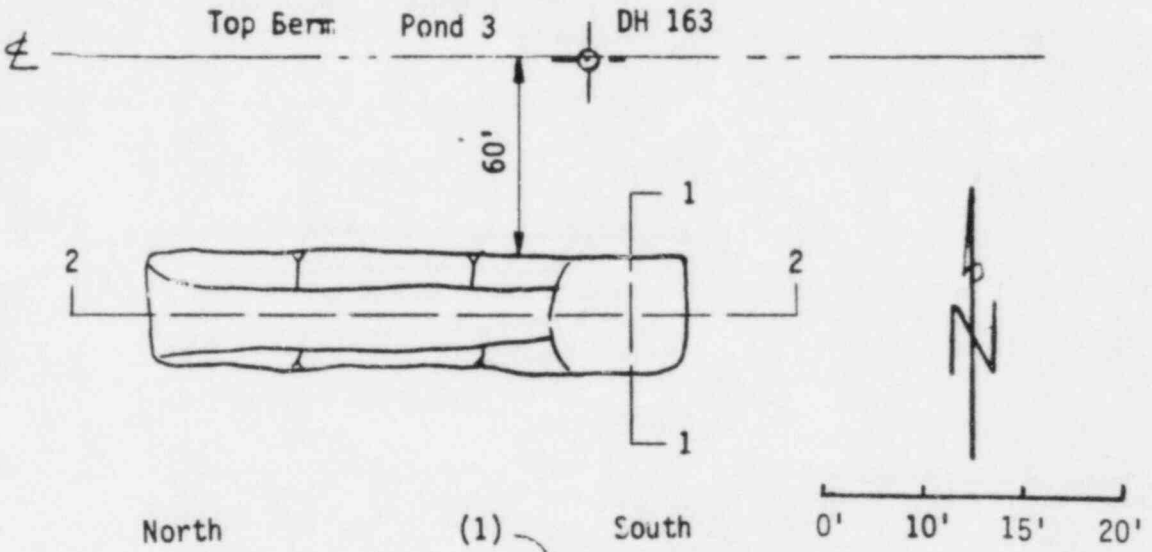

SUMMARY GEOTECHNICAL LOG
DRILLHOLE 560
DEPTH IN FEET
GEOTECHNICAL LAYER
USCS
BLOW COUNT PER FOOT
0 40 80
PENETROMETER STRENGTH (thousand psf)
2 4 6 8 10 12
DRY DENSITY (pcf)
60 100 140
MOISTURE CONTENT (%) & ATTER. LIMITS
PL LL
10 20 30 40 50 60
CONC.
FILL
TOPSOIL
SP
CLAY-1
CL
10-23-84
10
11-8-84
SAND-1
SP-SM
20
CLAY-2
ML-SM
NP
30
SAND-2
GP
40
SC-SW
50
CLAY-3
CL
SP-SL
CL
60
GC
SAND-3
SM-SC
70
WEATHERED ROCK
GM
80
BEDROCK
T.D.= 82.0 FT.
GRD. EL.= 745.7'
90

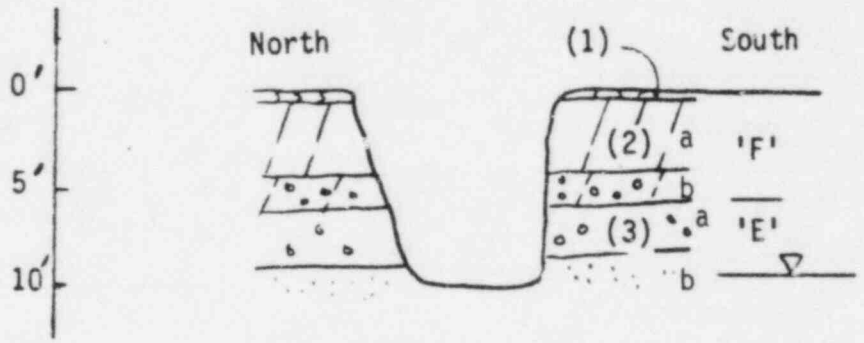
FIGURE 3 – 12

TESTPIT 121

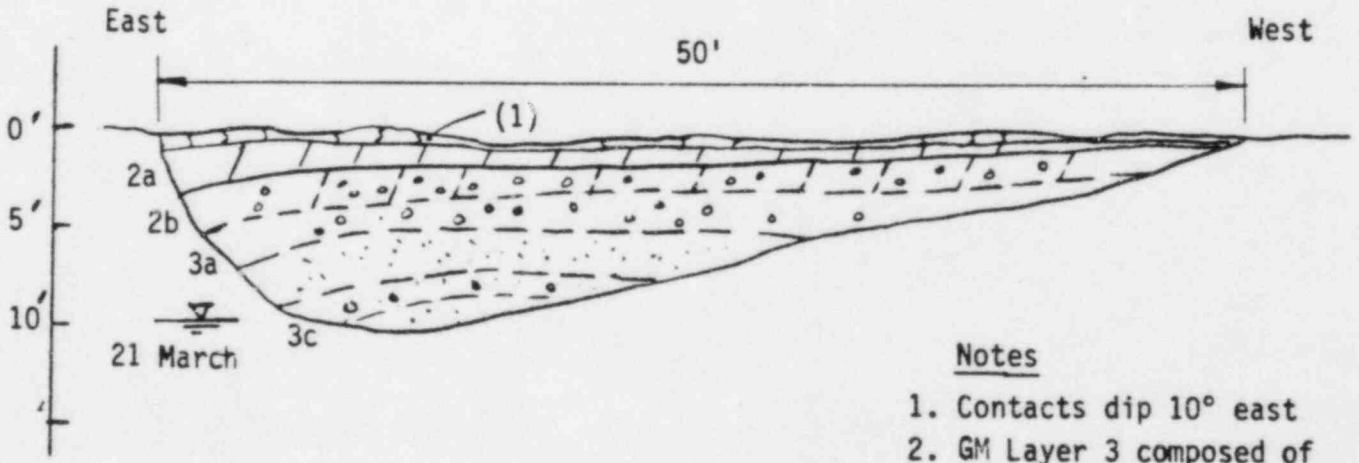
LOCATION AND SECTIONS

FIGURE NO. 3-13





Layer		Material	
1		Topsoil	OL
2a	'F'	Clay-1 Layer	CL
b		Clay-1 Layer	ML
3a	'E'	Sand-1 Layer	GM
b		Sand-1 Layer	GP
c		Sand-1 Layer	SW-GP SP



Notes

1. Contacts dip 10° east
2. GM Layer 3 composed of highly weathered gravels
3. Lower gravels unweathered stream alluvium
4. Backfilled and sealed off bentonite
5. Water level @ 10'
6. No unusual odors or visual contamination observed.

LOG OF TEST PIT 121

Sheet 1 of 1

Feature "F" STRATUM — Project WEST CHICAGO PROJECT — SOUTH POND 2

Coordinates N. 360 E. 820 — Ground Elevation 743 — Approx. Dimensions 10' x 50' x 15'

Depth to Water Level 10' — Method of Excavation D-988 — Date 7/20/85 — Logged by E.H. Wilson

CLASSIFICATION SYMBOL LETTER	GRAPHIC	DEPTH (FEET)	SIZE & TYPE OF SAMPLE TAKEN	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART – "UNIFIED SOIL CLASSIFICATION"; GIVE GEOLOGIC AND IN-PLACE DESCRIPTION)	STRENGTH PENE./ TORV. TSF	ESTIMATED PERCENTAGES BOULDERS	COBBLE	GRAVEL	SAND	FINES
OL		0.7		Topsoil - silty clay - very moist, very soft root zones, plastic, black to dk brown, low strength	PENE. 0.5					
CL		2	.1 BULK 1 .2	Clay ("F" STRATUM) very moist, mod. stiff to stiff, V. plastic, green gray with some mottling beneath topsoil horizon - no fractures as at edge of Pond 3	2.6 0 -2.20 - 2.25		0	1-3 (3")	10;	90
			BULK 2	Gradual transition to silts and silty clays	1.20					
ML		4.0	.4	SILT - lighter gray than clays - w/red oxid. stain- mod. stiff moist	1.50					
GM		4 5.5	.5	Silty GRAVELS- v. weathered v. dense mod. cemented igneous and limestone, moist uniform thickener of layer contacts follow ground line, brown gray ("E" STRATUM) weathered soil horizon			20	35	25	20
GP		6 6.5		GRAVELS - unweathered, orange grays igneous and limestone particles. V. dense, m. moist, sub-rounded alternates with sand beds. (alluvium)				50	45	5
SW-SP		8.1	.6	SANDS - well graded beds alternate with poorly graded beds 0.1' to 0.4' thick. Cross-bedded dense, mod. to slt. moist. (alluvium)			1-5	40	60	
GP		8 9.5	.7	GRAVELS - poorly graded v. dense, moist, red orange igneous materials - rounded alluvium.			10 (4")	50	40	
SP		10								

REMARKS:

Total depth of test pit 10.0 ft.
No contamination or radiation detected w/gamma counter
No unusual odors or colors.

NOTES: Record water test and density test data, if applicable, under remarks

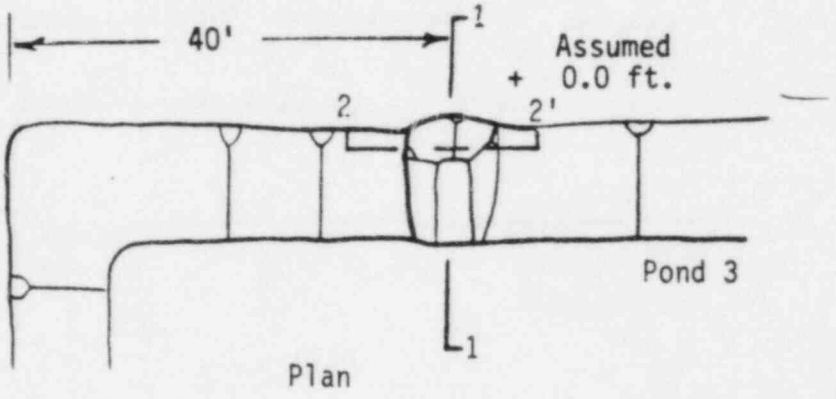
TP 121 SHT 1 OF 1

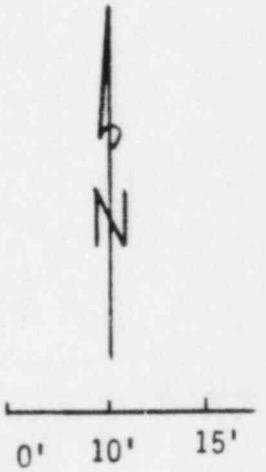
Figure 3-14

TEST PIT 242

LOCATION AND SECTIONS

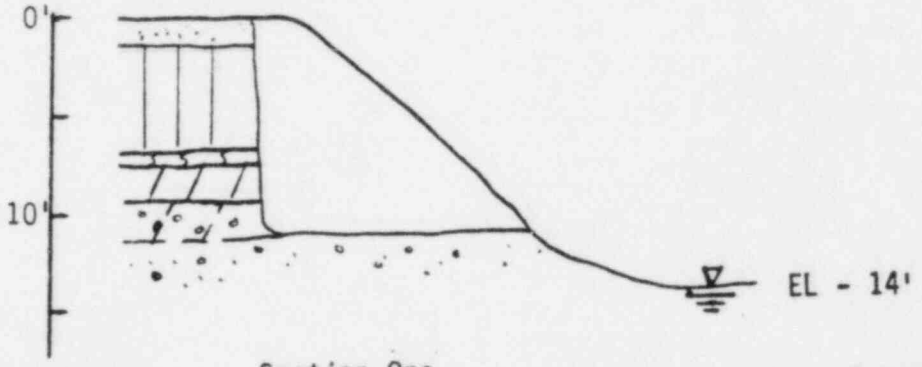
FIGURE 3-15



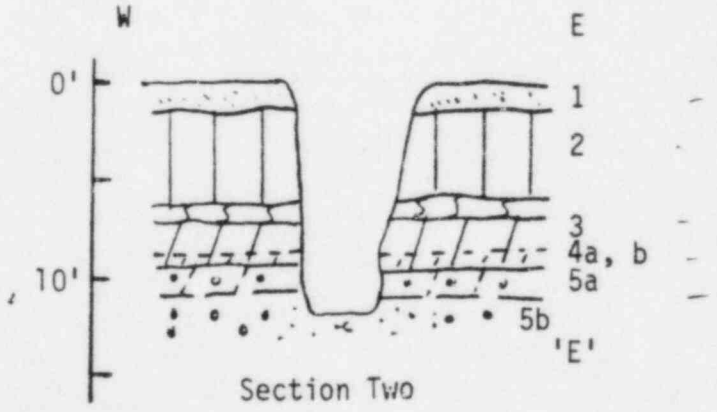


North

South



Section One



Section Two

Layer		Material
1		Sand fill
2		Clay fill
3		Topsoil
4a	'F'	Clay-1 Layer (CL)
b		Clay-1 Layer (ML)
5a	'E'	Sand-1 Layer (GM)
b		Sand-1 Layer (GW-SW)

LOG OF TEST PIT 242

Feature 'F' Stratum — Project West Chicago (North Edge Pond 3)
Coordinates N. 600 E. 750 — Ground Elevation 747' — Approx. Dimensions 12' x 15' x 10'
Depth to Water Level 14' — Method of Excavation JD-500 Backhoe — Date 3/20/85 — Logged by E. H. Wilson

CLASSIFICATION SYMBOL LETTER	GRAPHIC	DEPTH (FEET)	SIZE & TYPE OF SAMPLE TAKEN	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART – "UNIFIED SOIL CLASSIFICATION"; GIVE GEOLOGIC AND IN-PLACE DESCRIPTION)	STRENGTH PENE./ TORV. TSF	ESTIMATED PERCENTAGES BOULDERS	COBBLE	GRAVEL	SAND	FINES
Fill SW		0	.#1	FILL- Sand and gravels slt. moist dense top of north edge of Pond 3 embankment.			10 4"Ø	30	60	< 5
Fill CL		2	.#2	Fill - Clay v. stiff to hard, plastic slt. moist, brittle blacky structure patterns in clay; lt. gray brown with evidence of laminae. Red tile brick at base of this layer. evidence that this is fill.			1-3% 3"	1-3%	10-15	85
		4	.#3	Clay fill as above except with several vertical fractures - sealed with black topsoil fillings 0.1' to 0.01' wide pinched out at depth into 'F' stratum. This may be related to slope movement at pond edge.	3.25 2.75					
		6								
OL		7.2	.#4	TOPSOIL - Root Zone Black oxidized silty clay, slt moist v. hard plastic to slt plastic	4.5					
CL		8	.#5 Bulk .#6	'F' STRATUM CLAY - with little gravel some sand, moist v. stiff plastic, no structures, some intermittal wx gravels beneath topsoil layer, brown clays.	2.25			0-3" (2")	240%	85%
ML		10	Bulk 2							

REMARKS: W/near vertical fractures oriented perpendicular and oblique to edge of pond - some are parallel sealed tight w/black topsoil filling roots extend to bottom of clay layer.

NOTES: Record water test and density test data, if applicable, under remarks

TP 242 SHT 1 OF 2

Figure 3-16

LOG OF TEST PIT 242

Feature 'F' Stratum — Project West Chicago — North Edge Pond 3

Coordinates N. 600 E. 750 — Ground Elevation 747' — Approx. Dimensions 12' x 15' x 10'

Depth to Water Level 14' — Method of Excavation JD-500 Backhoe — Date 3/20/85 — Logged by E.H. Wilson

CLASSIFICATION SYMBOL LETTER	CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SIZE & TYPE OF SAMPLE TAKEN	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART – "UNIFIED SOIL CLASSIFICATION"; GIVE GEOLOGIC AND IN-PLACE DESCRIPTION)	STRENGTH PENE./ TORV. TSF	ESTIMATED PERCENTAGES BOULDERS	COBBLE	GRAVEL	SAND	FINES
GM		10	BULK #2 .7	SILT - Lower part of 'F' stratum changes to silt a lighter gray brown cross bedded up to clay seam above, slt plastic moist, hard	3.75					
GP		11.1	.8	'E' STRATUM, Silty gravels - v. dense, slt. moist. composed of highly weathered gravels igneous and limestone rounded mod. well cemented m. gray browns		0	20	40	30	8-10
		12		limonite stain follows root zones.						
		12.2	.9	GRAVELS - v' dense unweathered slt moist rounded igneous and limestone gravels and sands. Orange yellow with red brn limonite stain that results from weathering or leaching. No odors.		0	10	40	60	4%
		14		Total depth of Test pit 12.2 ft. Water level @ 14.5'						

REMARKS:
No radiation or contamination ovserved in field.

NOTES: Record water test and density test data, if applicable, under remarks

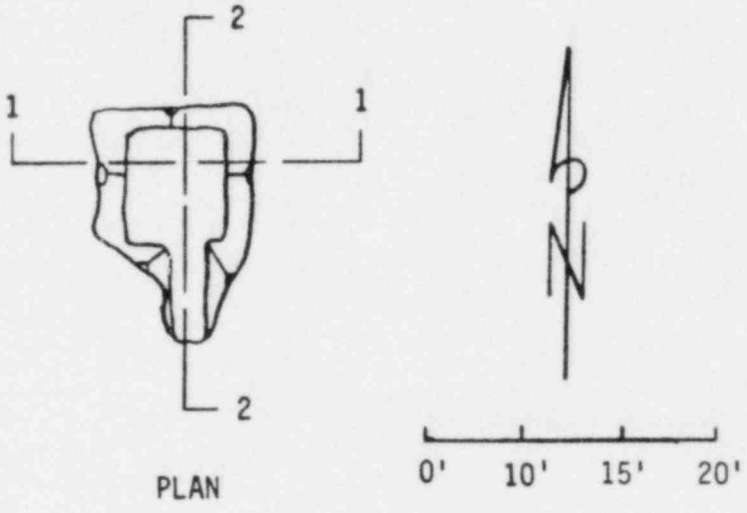
TP 242 SHT 2 OF 2

Figure 3-17

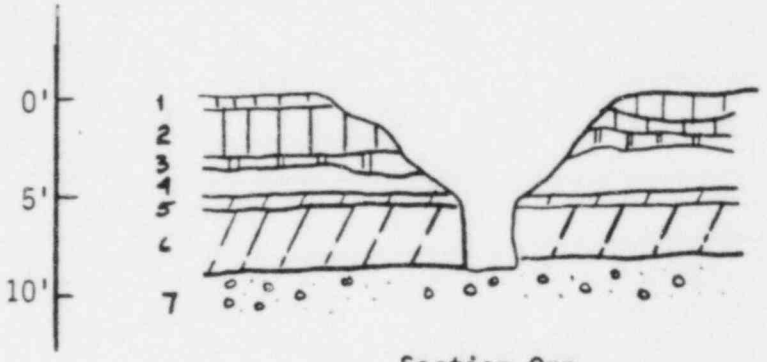
TEST PIT 366

LOCATION AND SECTION

FIGURE NO. 3-18

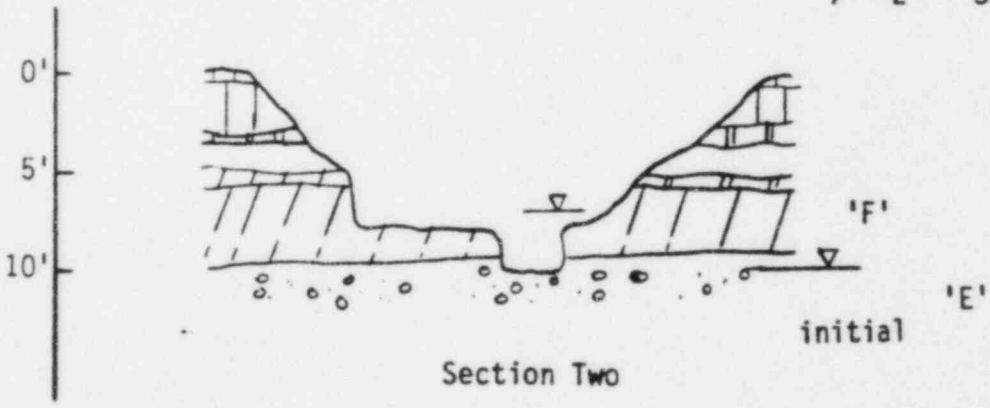


PLAN



Section One

Layer		Material
1		Ash fill
2		Trash Fill
3		Ash Clay Fill
4		Sludge & Pond Sediment
5		Topsoil - (OL)
6	'F'	Clay one layer (CL-ML)
7	'E'	Sand one layer (GM)



Section Two

Notes

1) Initial water level at base of 'F' or clay-1 layer, then rose to 8.8' 2 hours later.
2) Visual contamination observed in trash and pond sludges. But not observed in 'F' clay beneath.
3) Backfilled with clean clay fill and bentonite.

LOG OF TEST PIT 366

Feature 'F' Stratum — Project West Chicago

Coordinates N. 970 E. 360 — Ground Elevation 742' — Approx. Dimensions 11' x 50' x 30'

Depth to Water Level 80' — Method of Excavation Backhoe JD-500 — Date 3/21/85 — Logged by E.H. Wilson

CLASSIFICATION SYMBOL LETTER	GRAPHIC	DEPTH (FEET)	SIZE & TYPE OF SAMPLE TAKEN	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART – "UNIFIED SOIL CLASSIFICATION"; GIVE GEOLOGIC AND IN-PLACE DESCRIPTION)	STRENGTH PENE./ TORV. (TSF)	ESTIMATED PERCENTAGES BOULDERS	COBBLE	GRAVEL	SAND	FINES
Fill		0.	366-1	Ash - Black, very moist, soft						
Fill		2.	366-2	METAL TRASH, WOOD SCRAP Mixed w/clay and pink pond sediments, soft v. moist						
Fill			366-3	ASH AND POND SEDIMENTS. Black Ash, Pink sediments and clay - brown olive drab.						
Fill ML		4	366-4	SLUDGE - POND SEDIMENTS. Lt Pink Grays with orange & red ochre mottling w/o structures v. soft, moist, silty, high dilatancy, no plasticity, stiff.	-1.7					
					0.75-2.		0	0	0	100
OL			366-5	TOPSOIL - Dk brn, black & red ochre - oxidized iron altered to limonite, especially in lower half of topsoil layer.	-.2-1.2		0	0	2+	98
Roots CL		6	366-6 Bulk 1	CLAY-dk green gray moist to v. moist. stiff, with with little gravel near top (3" dia) weathered zone; orange-ochre mottling from topsoil horizon down approx. 0.6 ft, then good unaltered/unleached gray to brn gray clays;- plastic, high strength, some roots - 1/4" to 1/2" penetrate clay; old black top- soil fractures or root holes pene. upper ½ of clay; earthy odors; some rootholes contain red oxidized topsoil 8.8' silt - brn green gray - slt plasticity, brn green grays, slt plast., v moist to wet, stiff; Radiation - 1 mrem/hr; Gravels - silty-v dense, wet. Odors - no strong odors - most earthy. No slope failures.	1.2					
			366-7 Bulk 2		1.5		2%	2%	5-10	86
		8	366.8		.75-1.2					
ML		8.8			2.00					
ML		10								

REMARKS:

This is an old pond and land fill site located west of building 19. The pond was less than 3 ft. deep.

NOTES: Record water test and density test data, if applicable, under remarks

TP 366 SHT 1 OF 2

Figure 3-19

LOG OF TEST PIT 366

Feature 'F' Stratum Project West Chicao (Old Pond)

Coordinates N. 970 E. 360 Ground Elevation 742' Approx. Dimensions 11'x50'x30'

Depth to Water Level 8.8 Method of Excavation Backhoe - ID-500 Date 3/21/85 Logged by E.H. Wilson

CLASSIFICATION SYMBOL LETTER	CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SIZE & TYPE OF SAMPLE TAKEN	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART – "UNIFIED SOIL CLASSIFICATION"; GIVE GEOLOGIC AND IN-PLACE DESCRIPTION)	STRENGTH PENE./ TORV. TSF	ESTIMATED PERCENTAGES BOULDERS	COBBLE	GRAVEL	SAND	FINES
ML		10 10.7		Silts - Sandy gravelly - stiff, v. moist to wet brn green olive grays with limonite silty plastics, weathered cobbles.		0	1-3 rounded mx.	1-3	5	90
GM		12	TD-10-7'	GRAVELS - silty - v. dense max. size 4" Igneous and limestone weathered Total depth of testpit 10.7 ft.		0	10	40-50	30	20

REMARKS:

NOTES: Record water test and density test data, if applicable, under remarks

TP 366 SHT 2 OF 2

Figure 3-20

MOISTURE CONTENT

CLAY - 1 LAYER - FINE SOILS

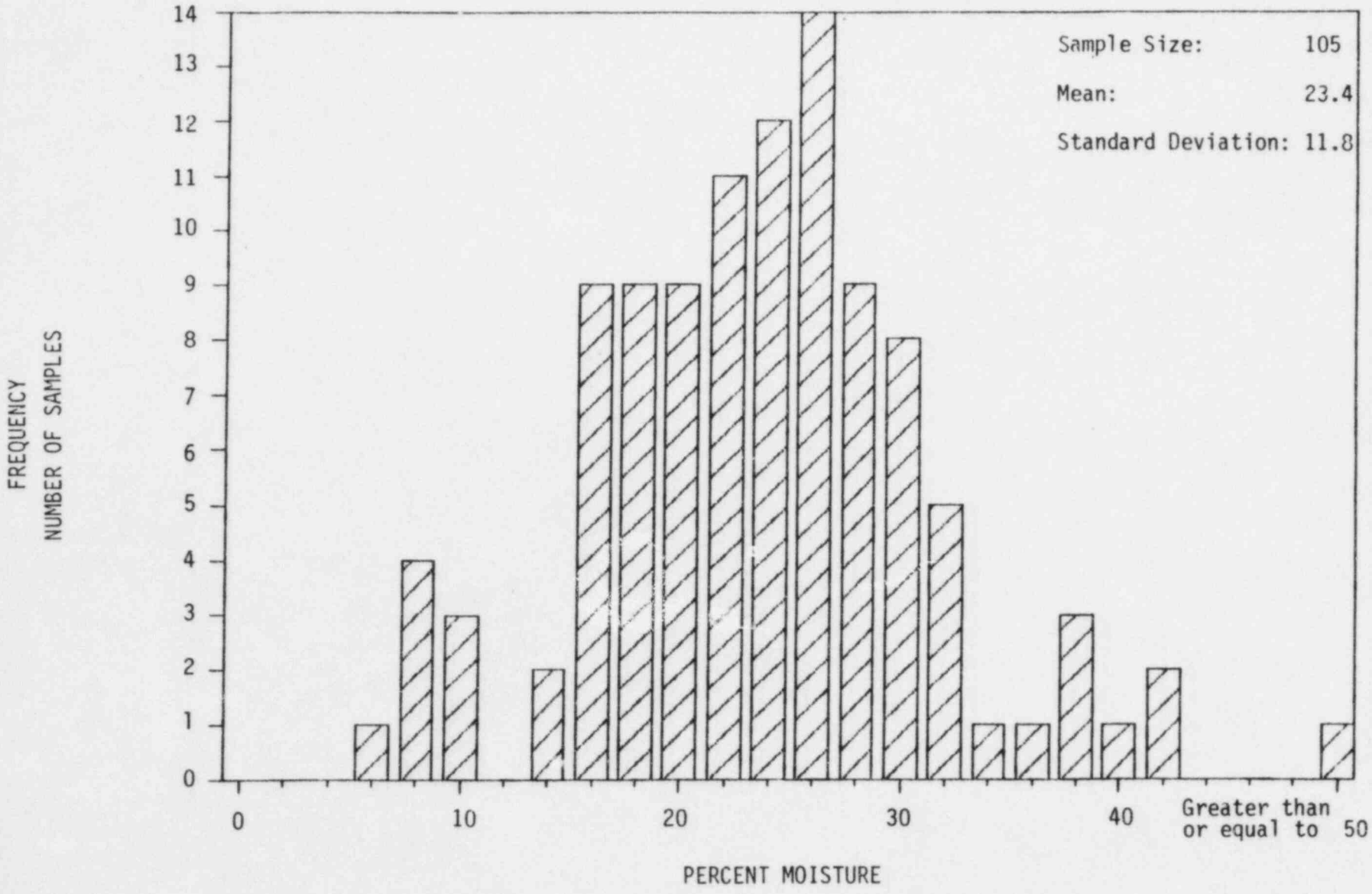


Figure 3-21

MOISTURE CONTENT

CLAY - 2 LAYER - FINE SOILS

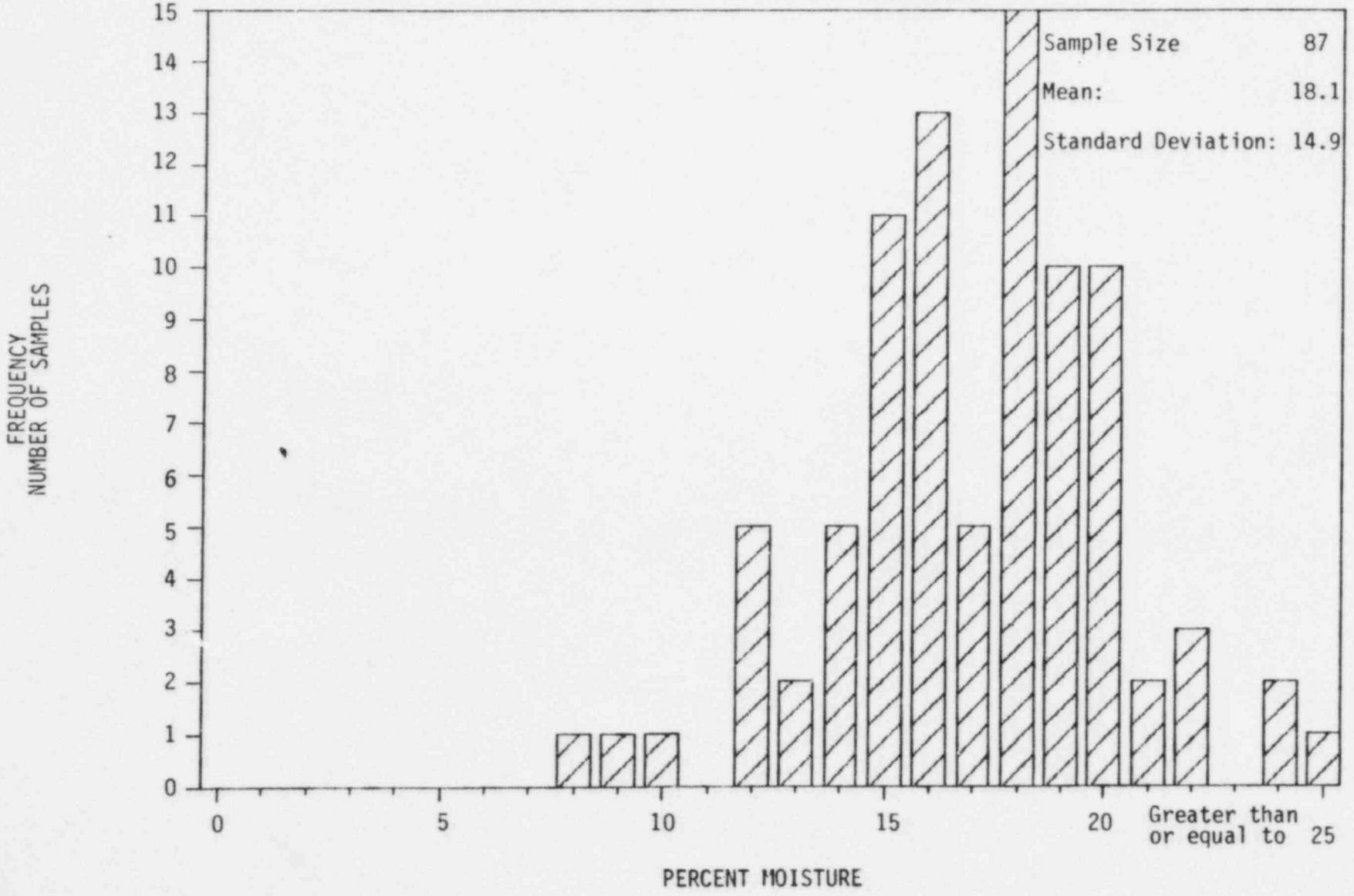


Figure 3-22

MOISTURE CONTENT

CLAY - 3 LAYER - FINE SOILS

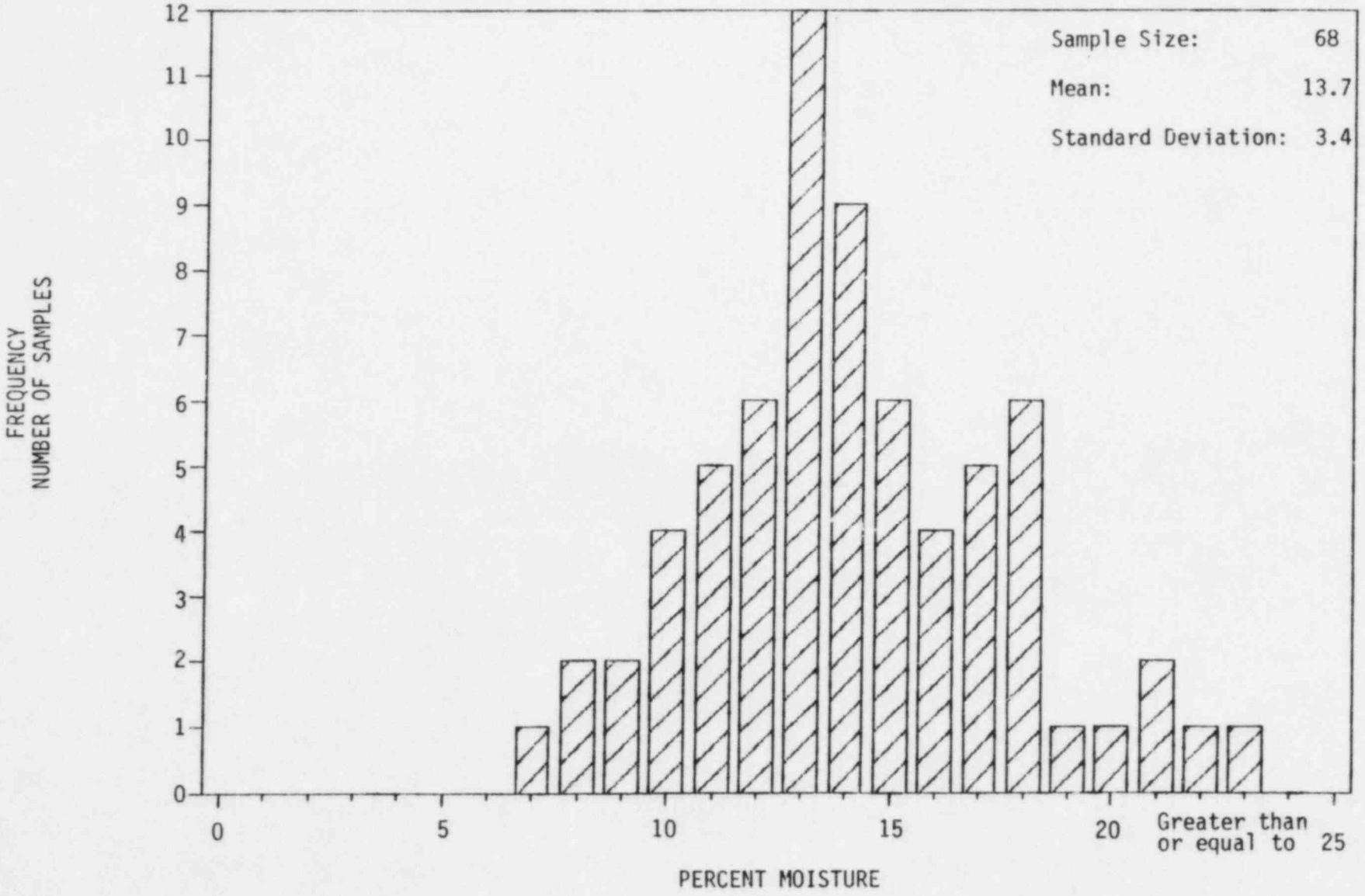


Figure 3-23

MOISTURE CONTENT

SAND & GRAVEL - 1 LAYER - COARSE SOILS - ABOVE WATER TABLE

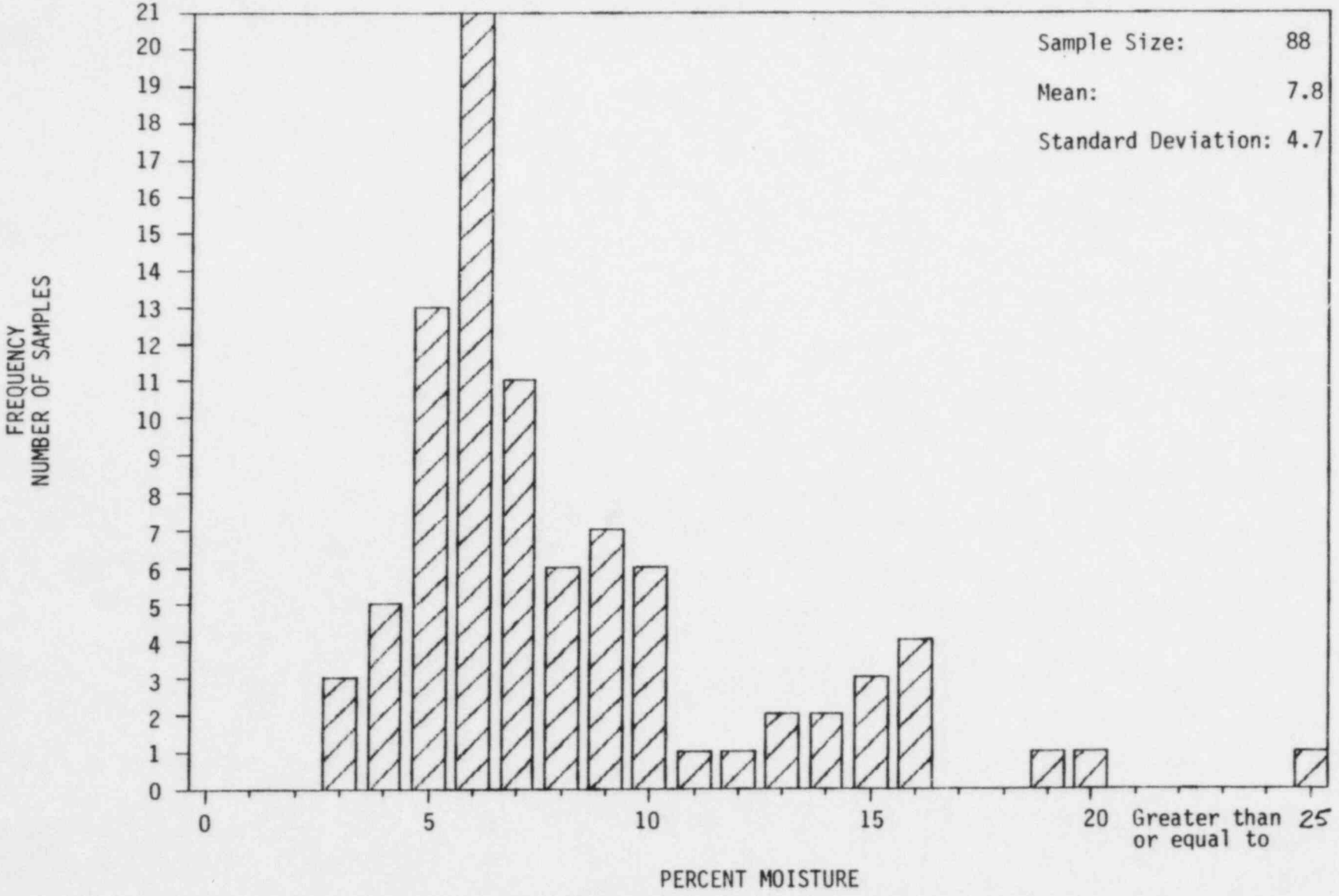


Figure 3-24

MOISTURE CONTENT

SAND & GRAVEL - 1 LAYER - COARSE SOILS - BELOW WATER TABLE

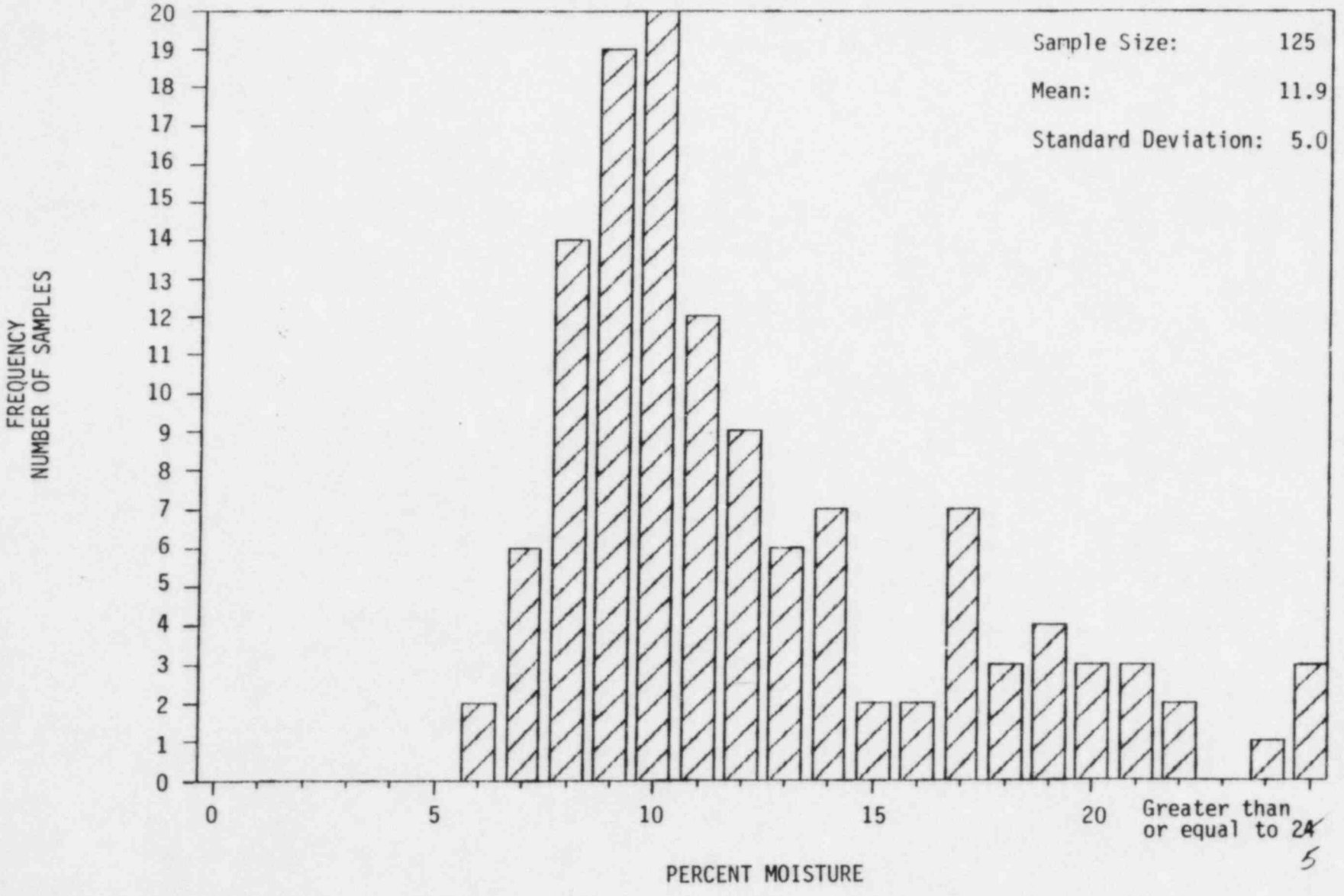


Figure 3-25

MOISTURE CONTENT

SAND & GRAVEL - 2 LAYER - COARSE SOILS

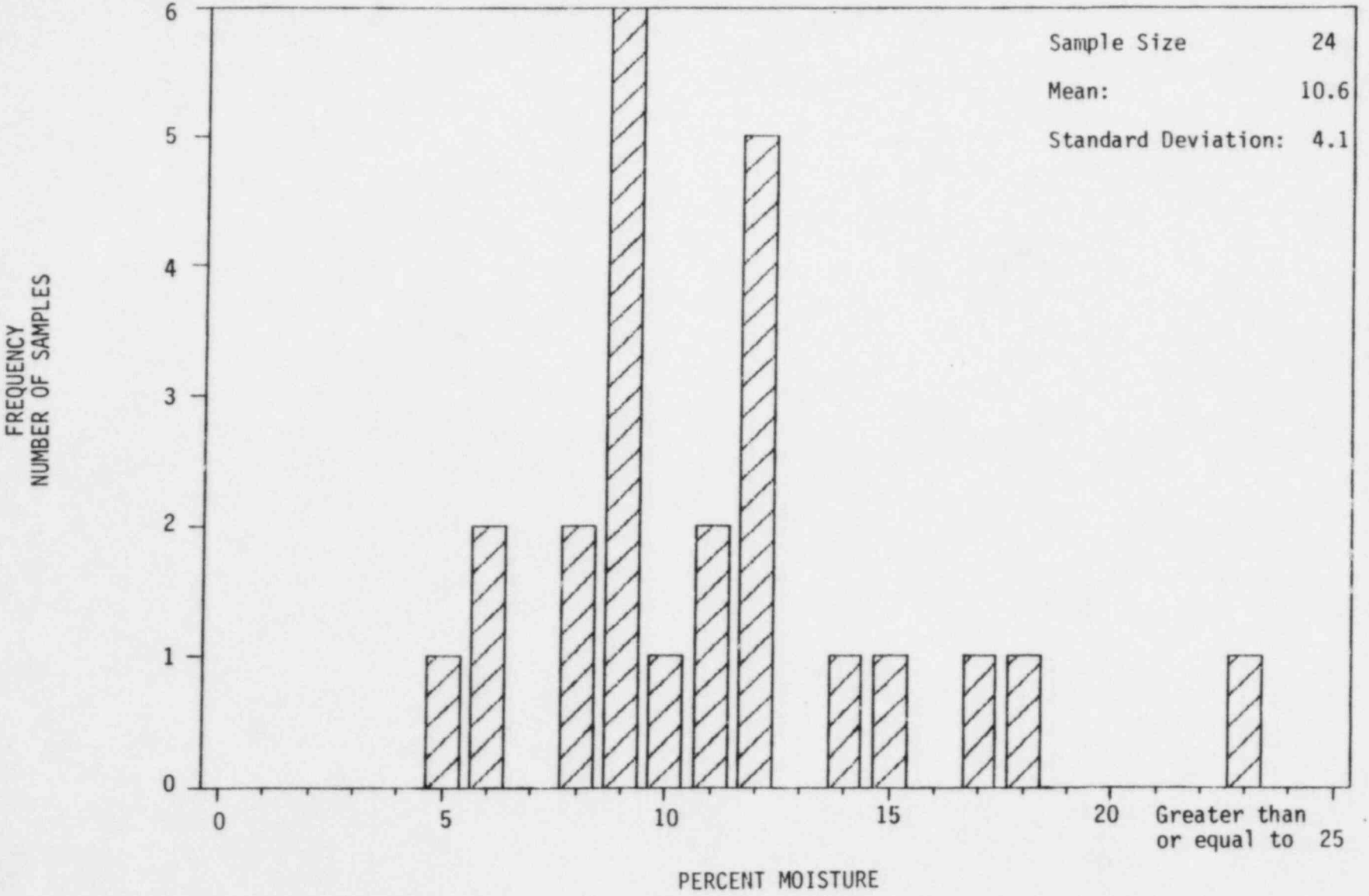


Figure 3-26

MOISTURE CONTENT

SAND & GRAVEL - 3 LAYER - COARSE SOILS

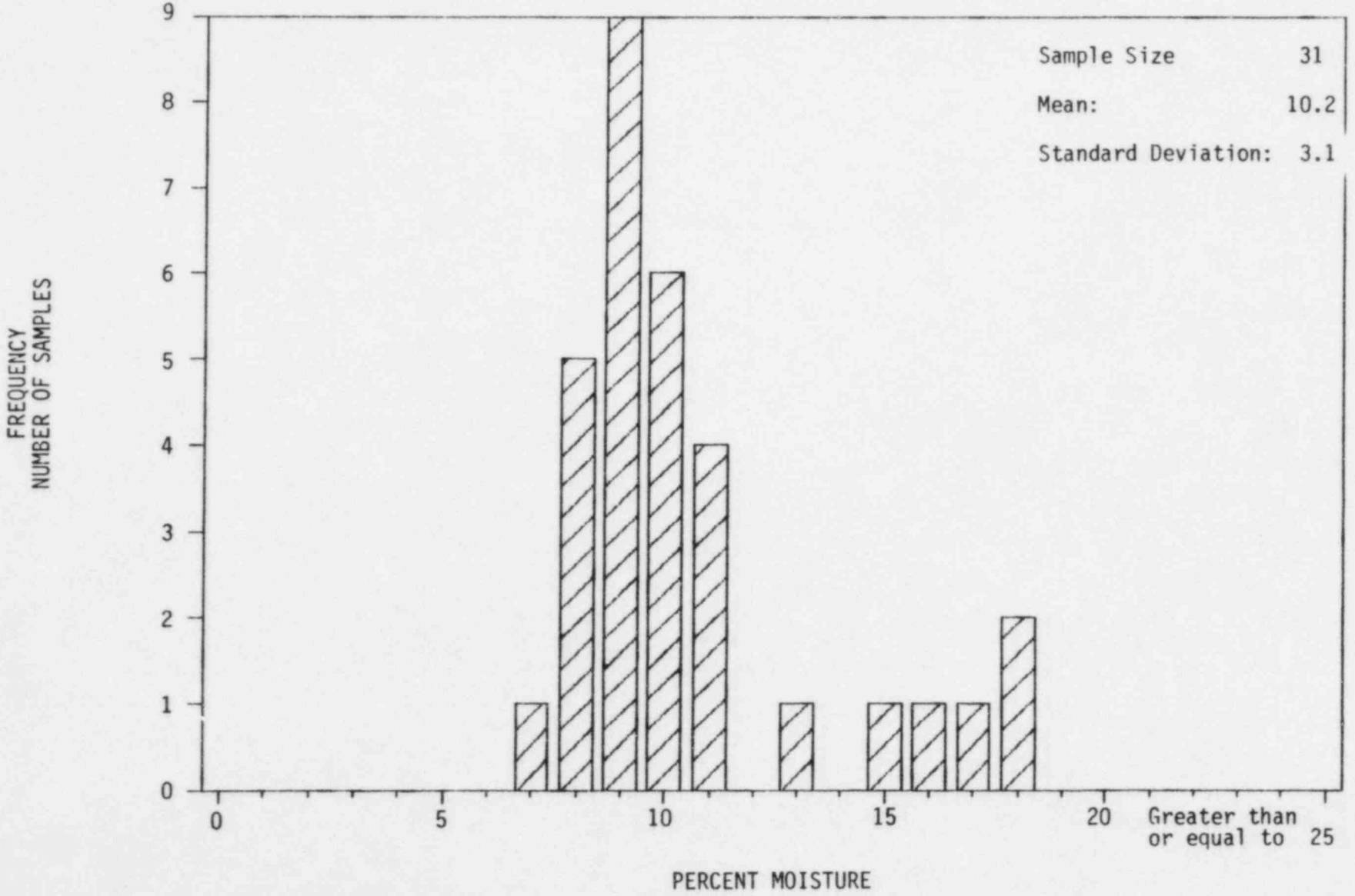


Figure 3-27

MOISTURE CONTENT

TOPSOIL–USC OL

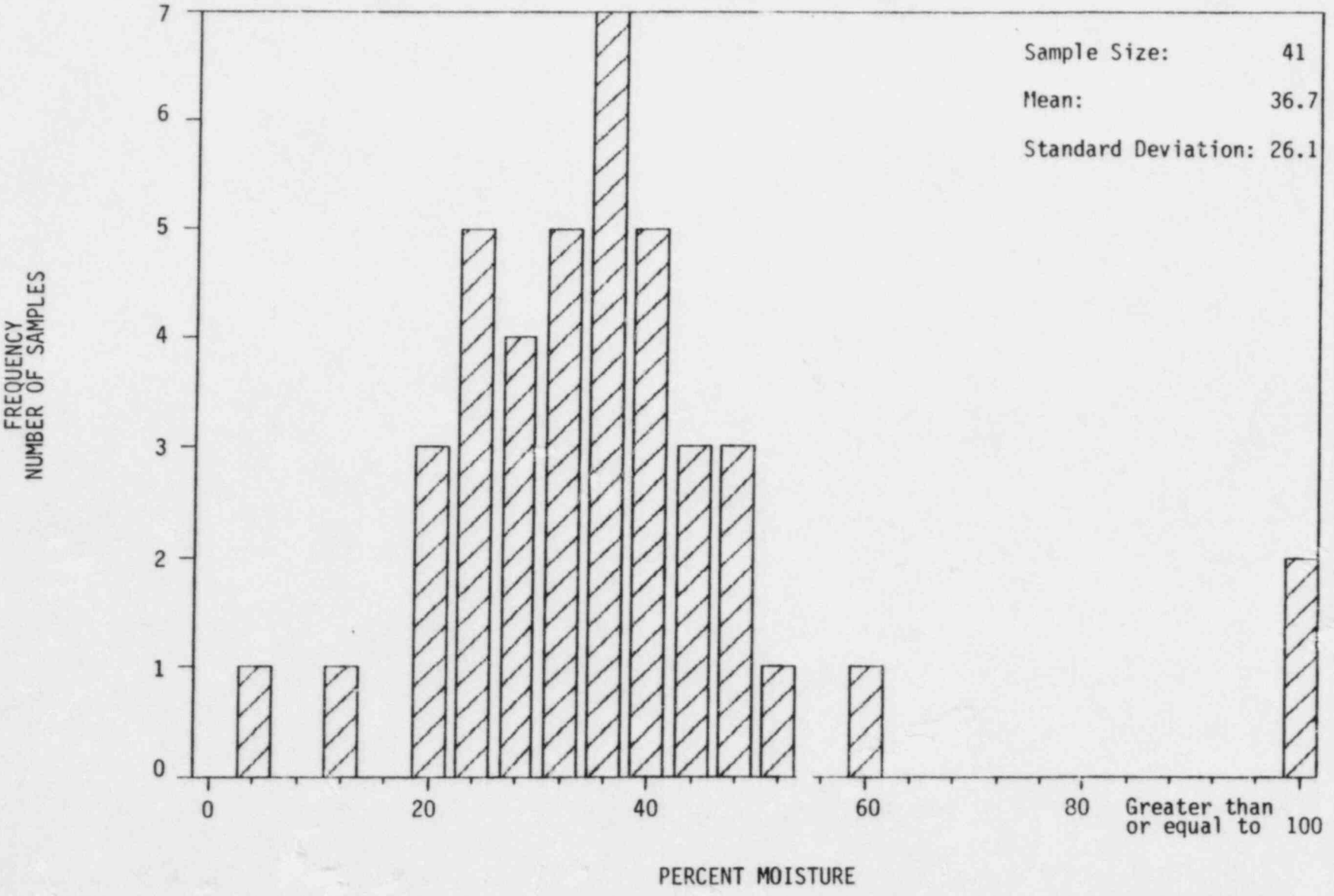


Figure 3-28

MOISTURE CONTENT

TAILINGS

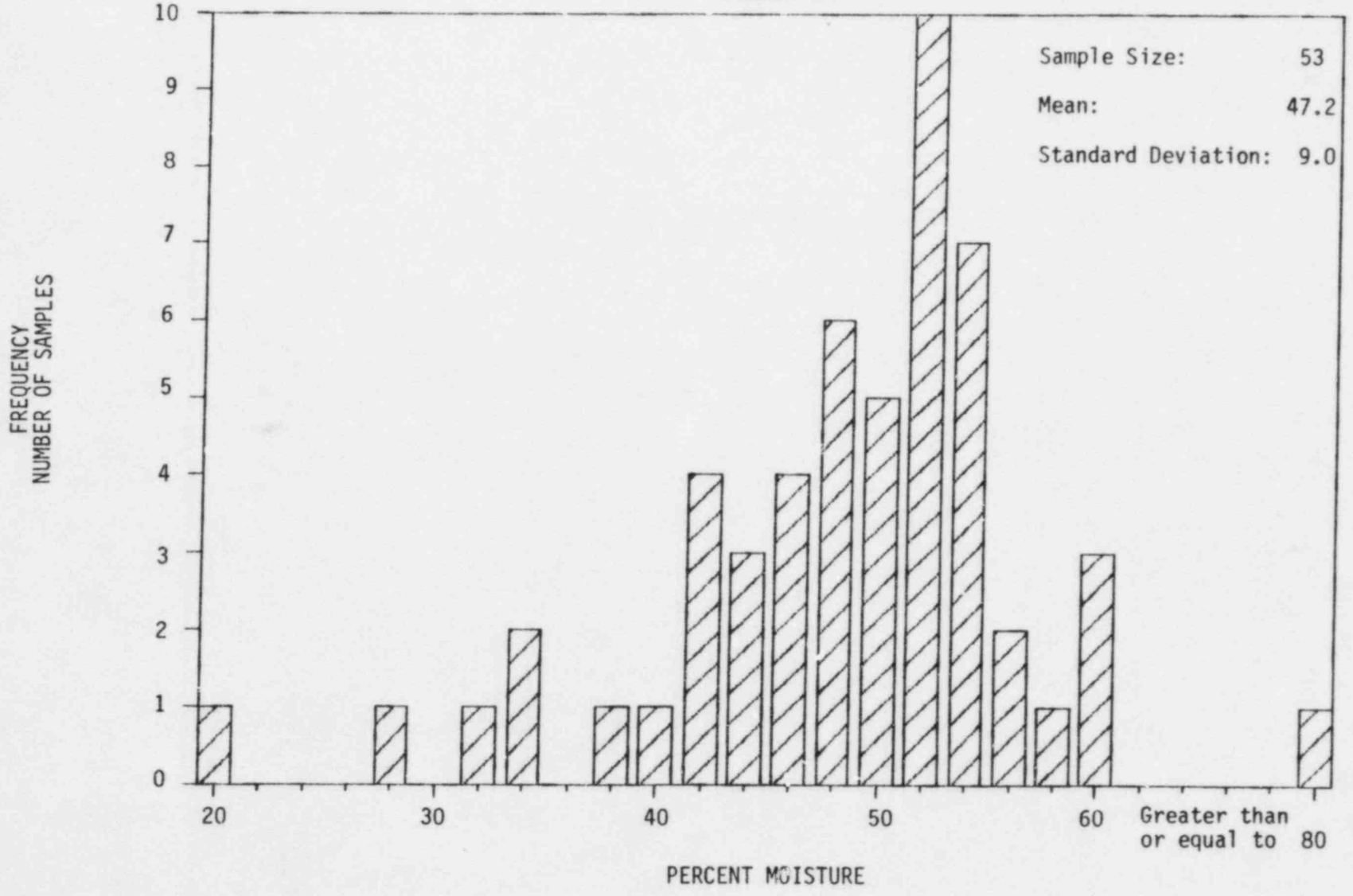


Figure 3-29

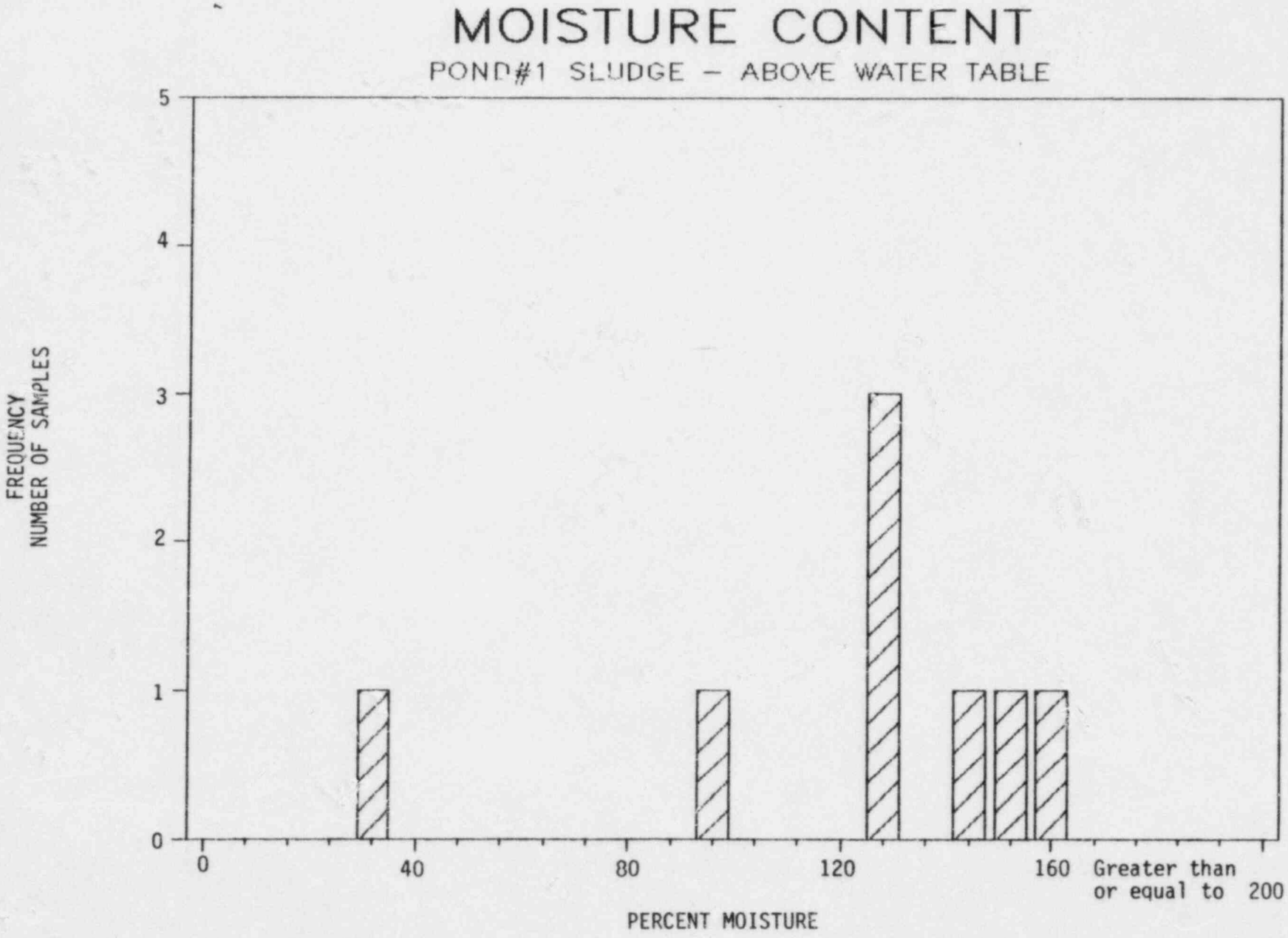

MOISTURE CONTENT
POND#1 SLUDGE – ABOVE WATER TABLE
FREQUENCY
NUMBER OF SAMPLES
5
4
3
2
1
0
0
40
80
120
160
Greater than
or equal to 200
PERCENT MOISTURE

Figure 3-30

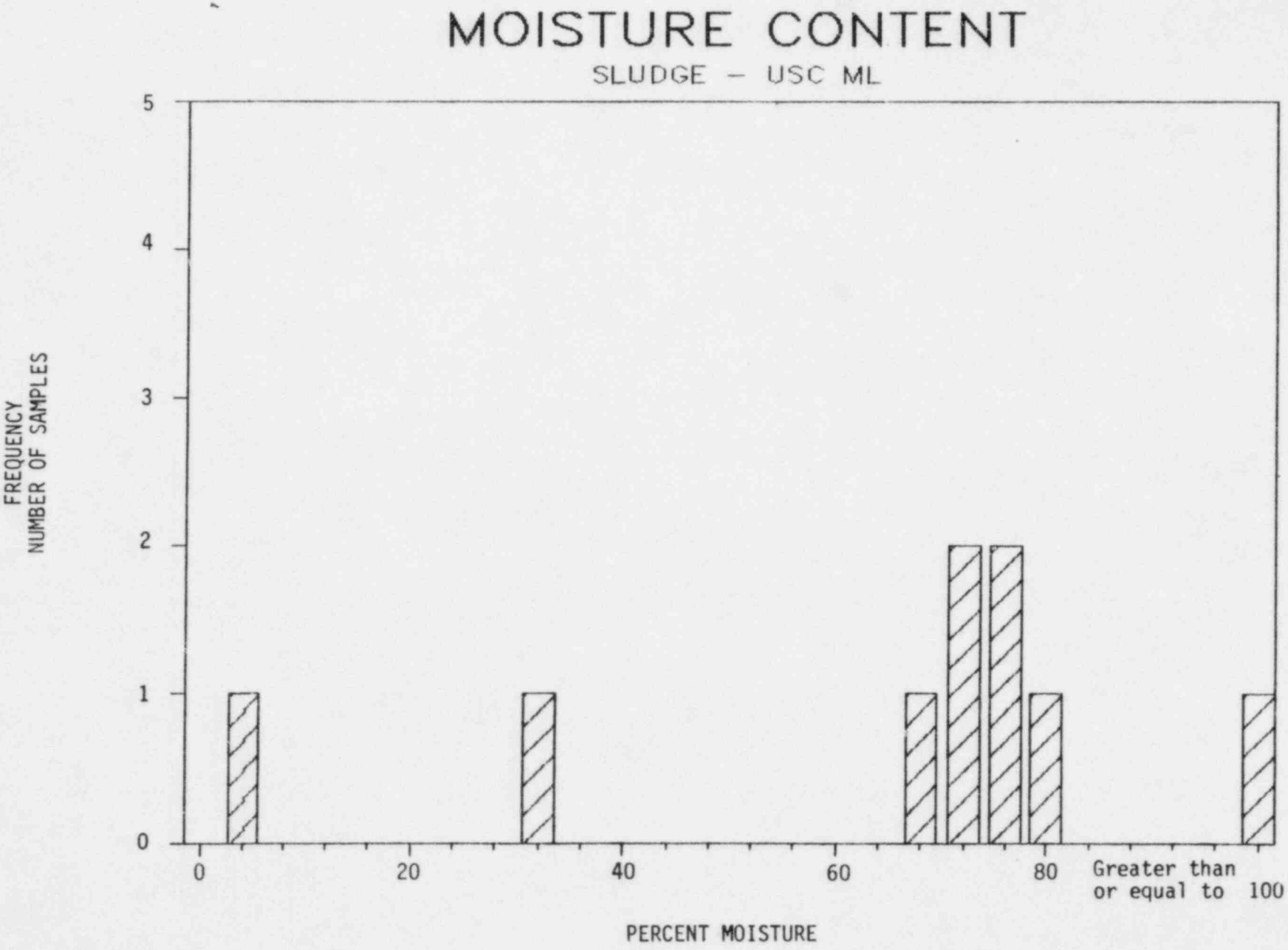

MOISTURE CONTENT
SLUDGE - USC ML
FREQUENCY
NUMBER OF SAMPLES
5
4
3
2
1
0
0
20
40
60
80
Greater than
or equal to 100
PERCENT MOISTURE

Figure 3-31

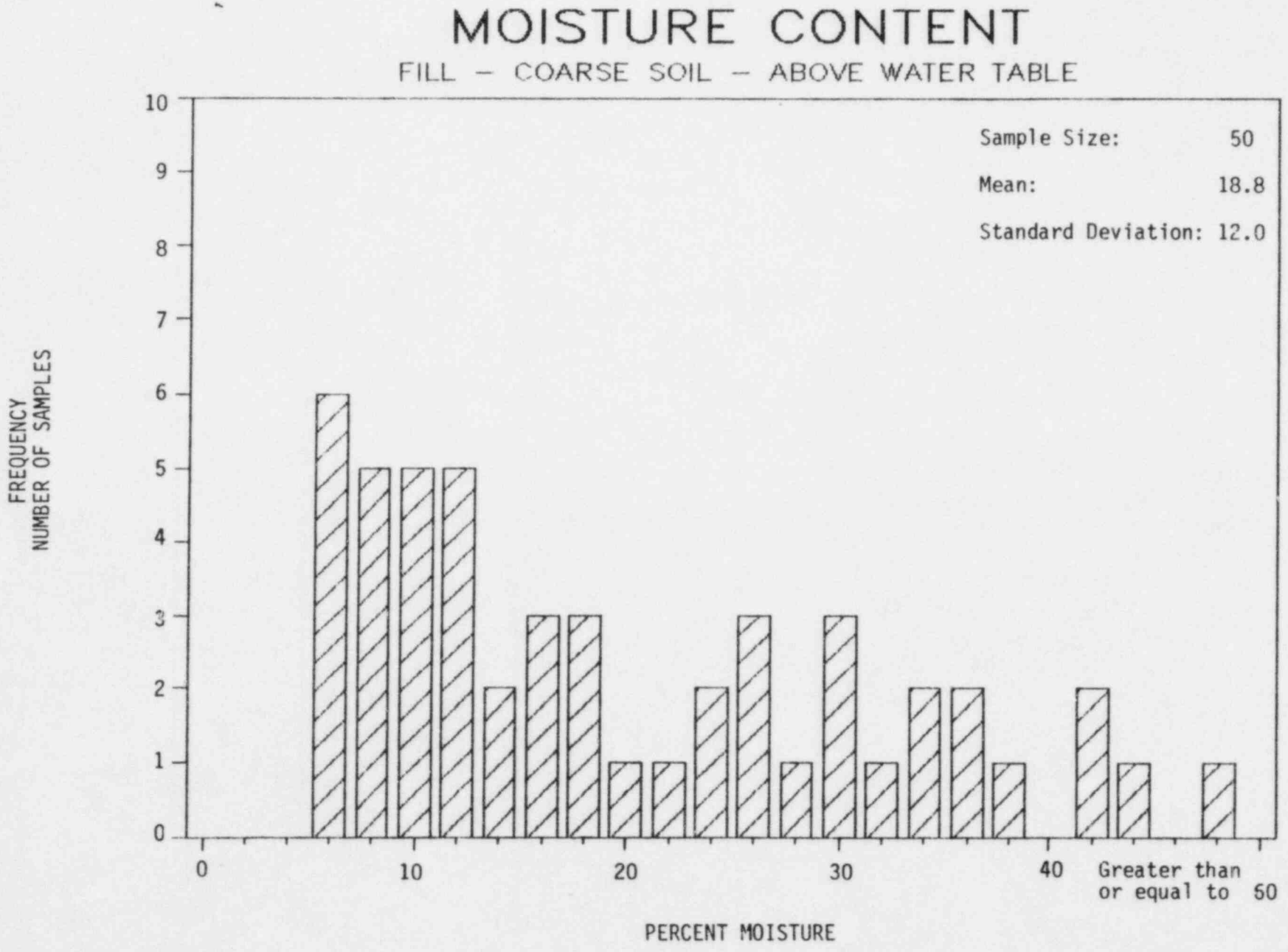

MOISTURE CONTENT
FILL - COARSE SOIL - ABOVE WATER TABLE
Sample Size: 50
Mean: 18.8
Standard Deviation: 12.0
FREQUENCY
NUMBER OF SAMPLES
0
1
2
3
4
5
6
7
8
9
10
0
10
20
30
40
Greater than
or equal to 50
PERCENT MOISTURE

Figure 3-32

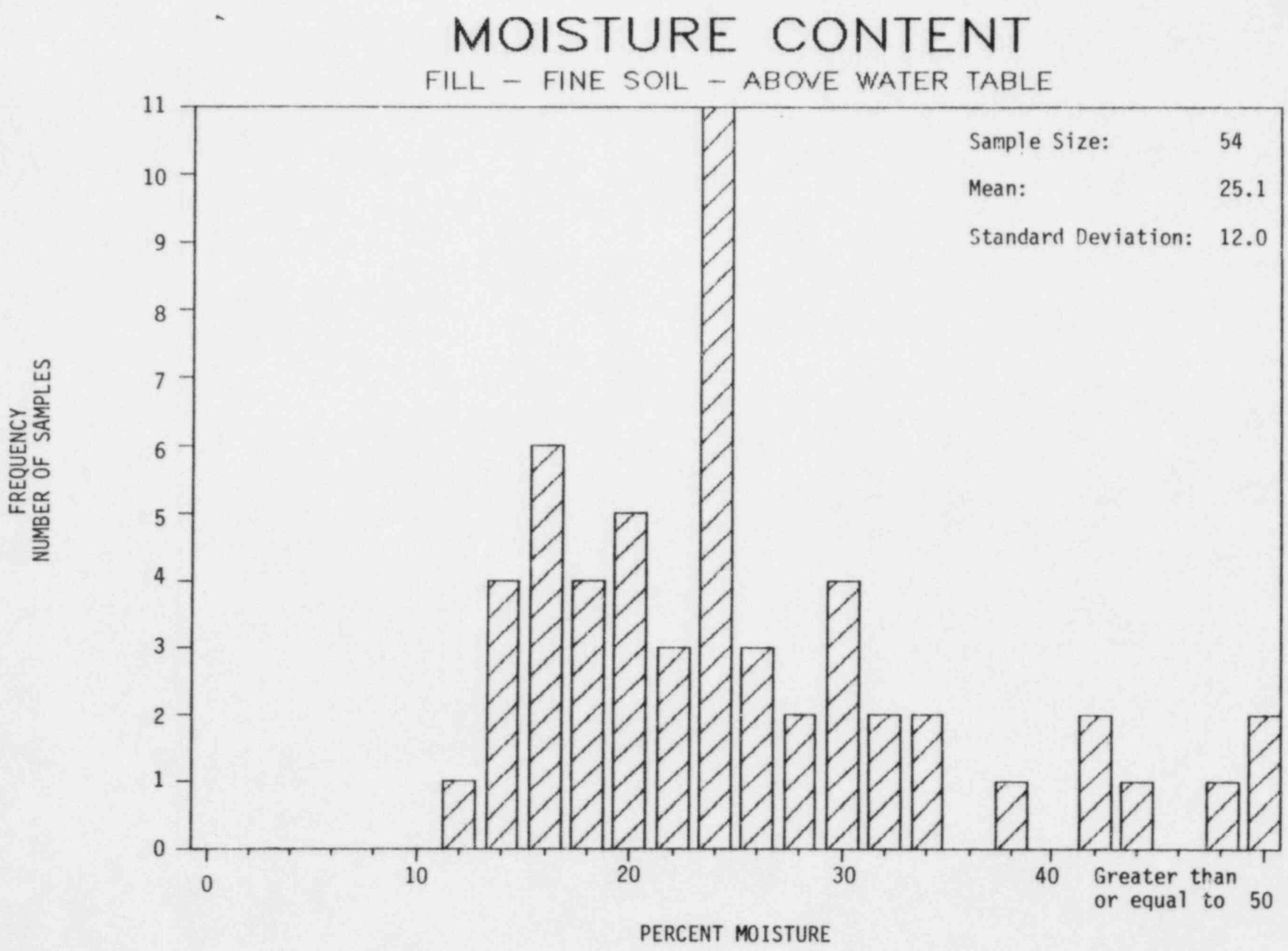

MOISTURE CONTENT
FILL – FINE SOIL – ABOVE WATER TABLE
Sample Size: 54
Mean: 25.1
Standard Deviation: 12.0
FREQUENCY
NUMBER OF SAMPLES
0
1
2
3
4
5
6
7
8
9
10
11
0
10
20
30
40
Greater than
or equal to 50
PERCENT MOISTURE

Figure 3-33

NATURAL DRY DENSITIES

CLAY - 1 LAYER - FINE SOILS

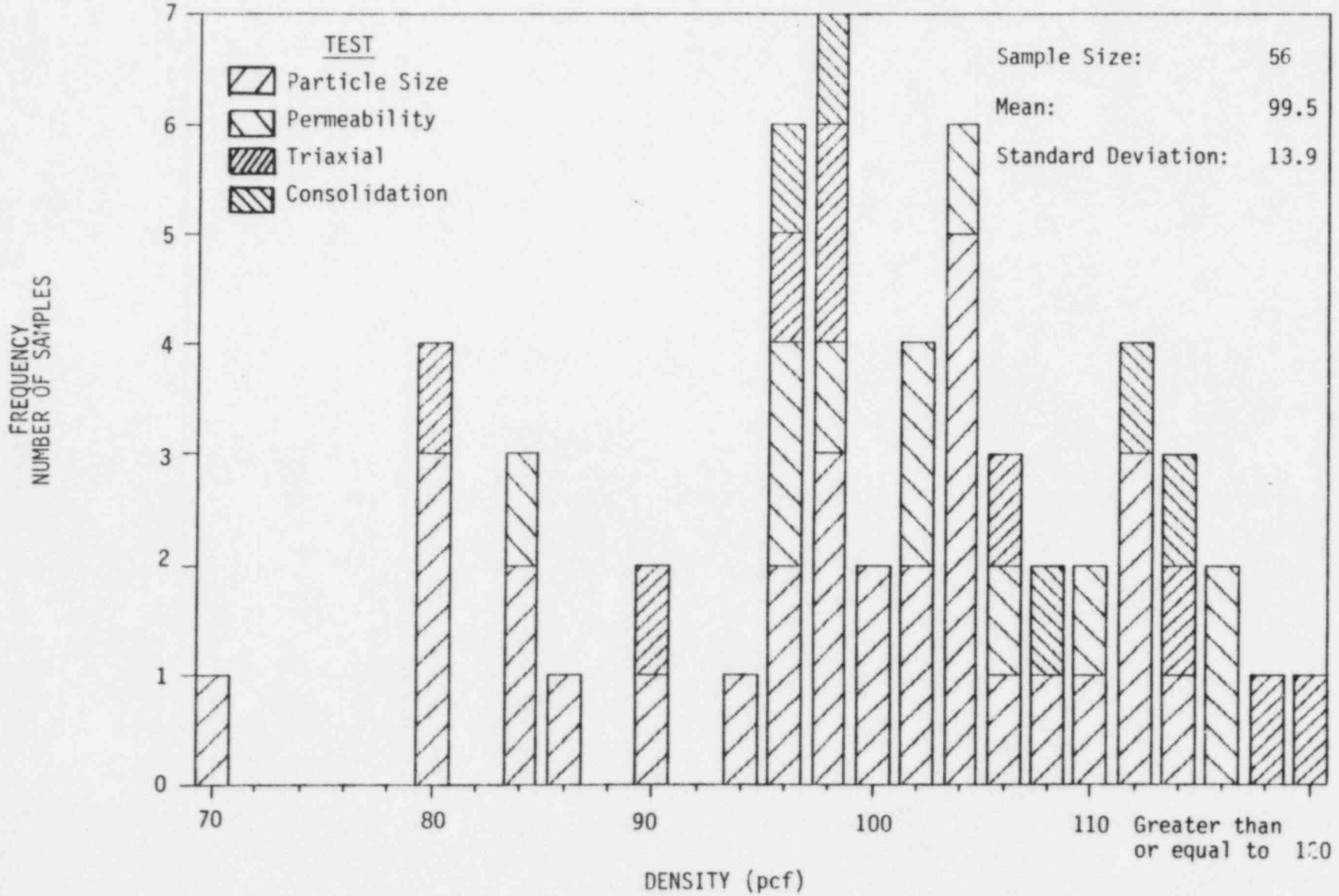


Figure 3-34

NATURAL DRY DENSITIES

CLAY - 2 LAYER - FINE SOILS

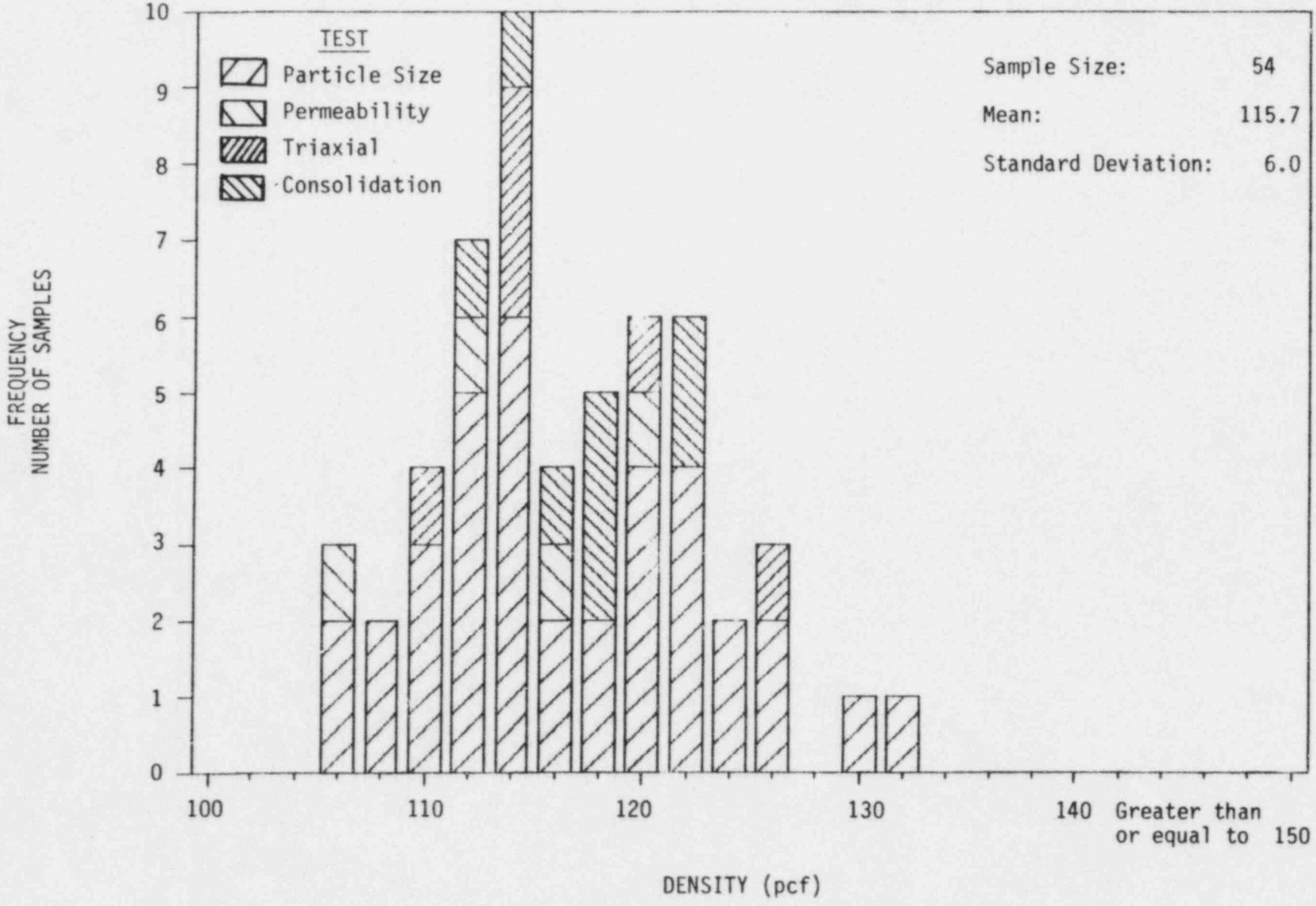


Figure 3-35

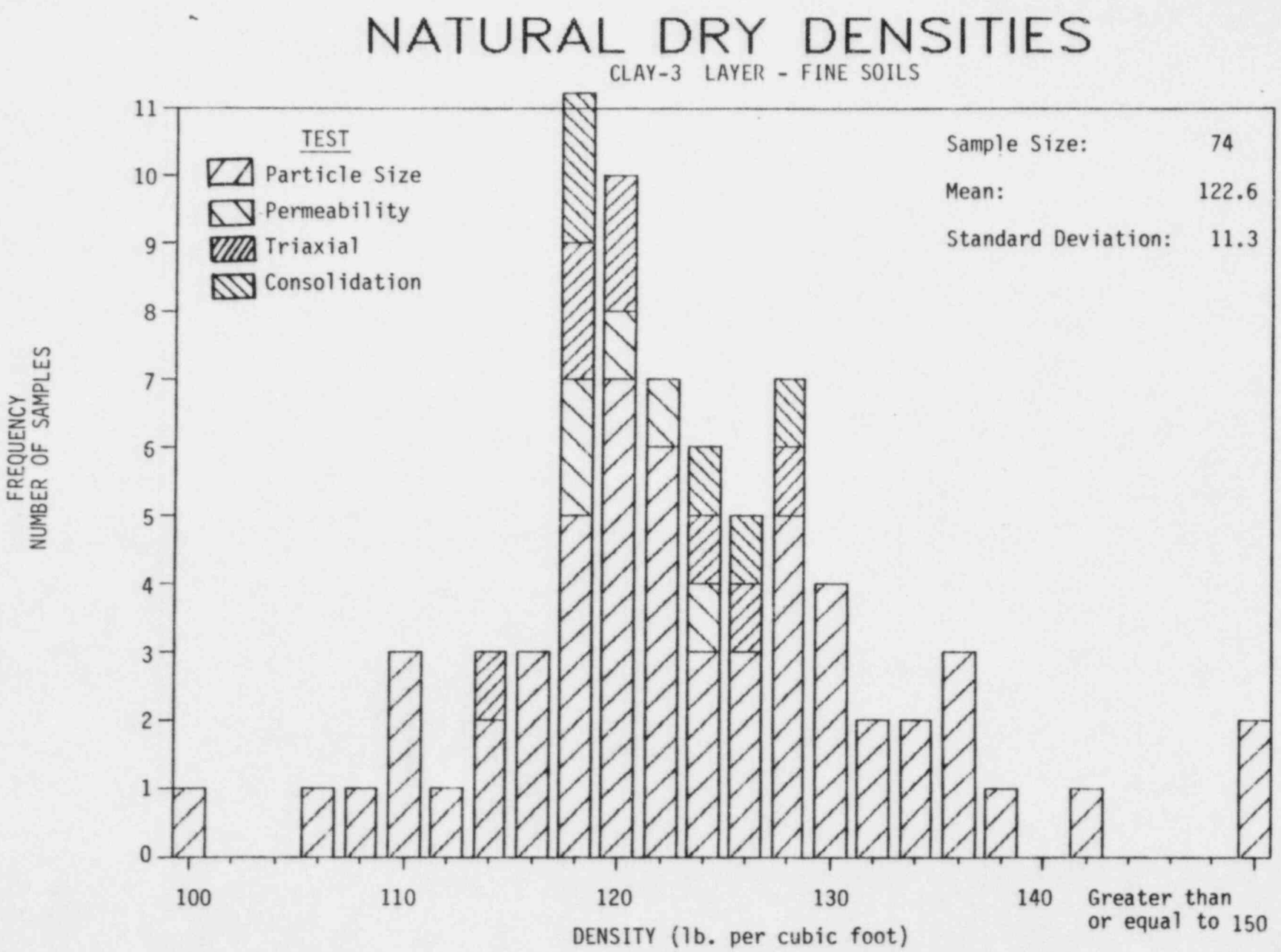

NATURAL DRY DENSITIES
CLAY-3 LAYER - FINE SOILS
TEST
Particle Size
Permeability
Triaxial
Consolidation
Sample Size: 74
Mean: 122.6
Standard Deviation: 11.3
FREQUENCY
NUMBER OF SAMPLES
0
1
2
3
4
5
6
7
8
9
10
11
100
110
120
130
140
Greater than
or equal to 150
DENSITY (lb. per cubic foot)

Figure 3-36

NATURAL DRY DENSITIES

SAND & GRAVEL - 1 LAYER - COARSE SOILS

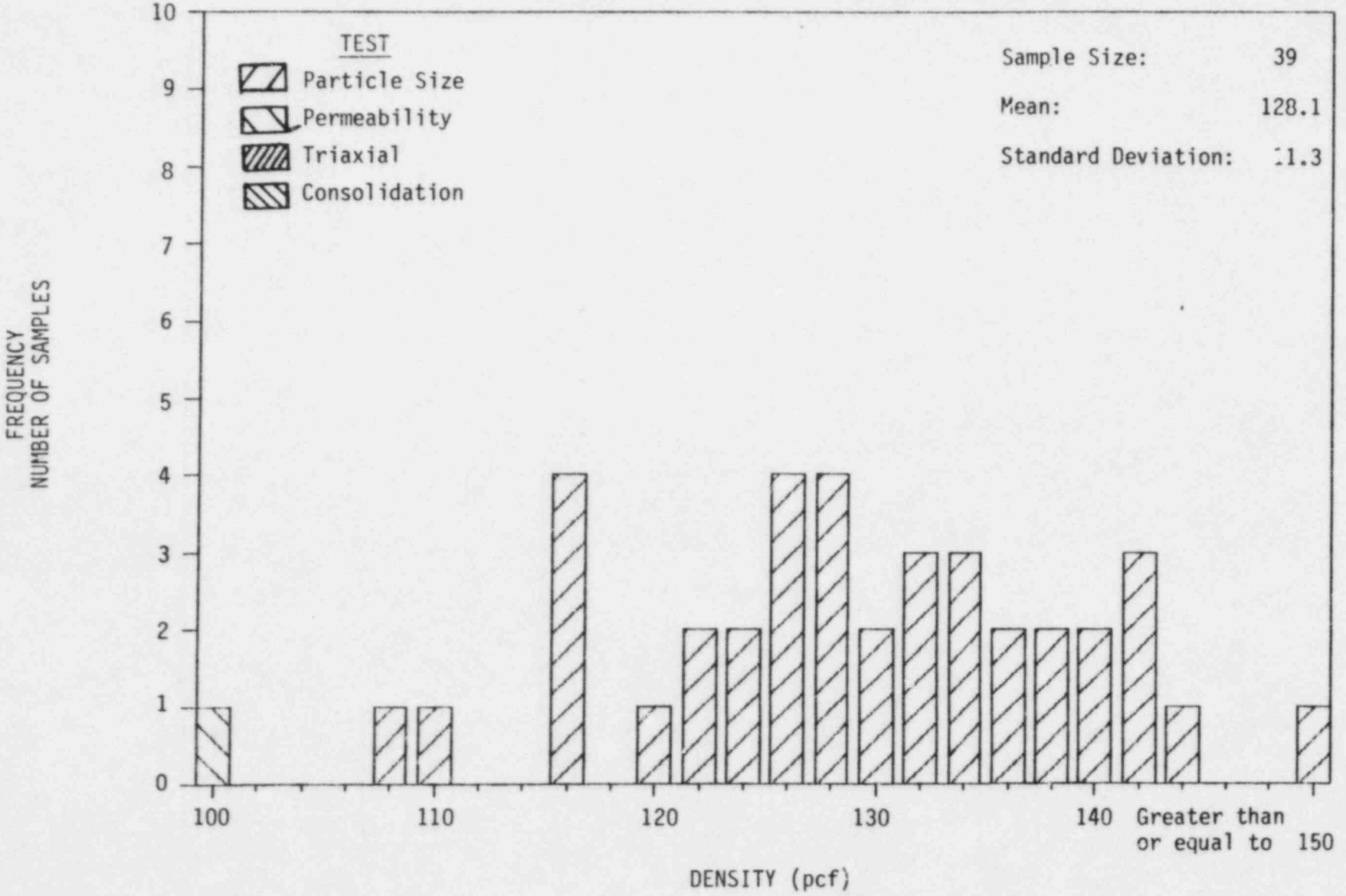


Figure 3-37

NATURAL DRY DENSITIES

SAND & GRAVEL - 2 LAYER - COARSE SOILS

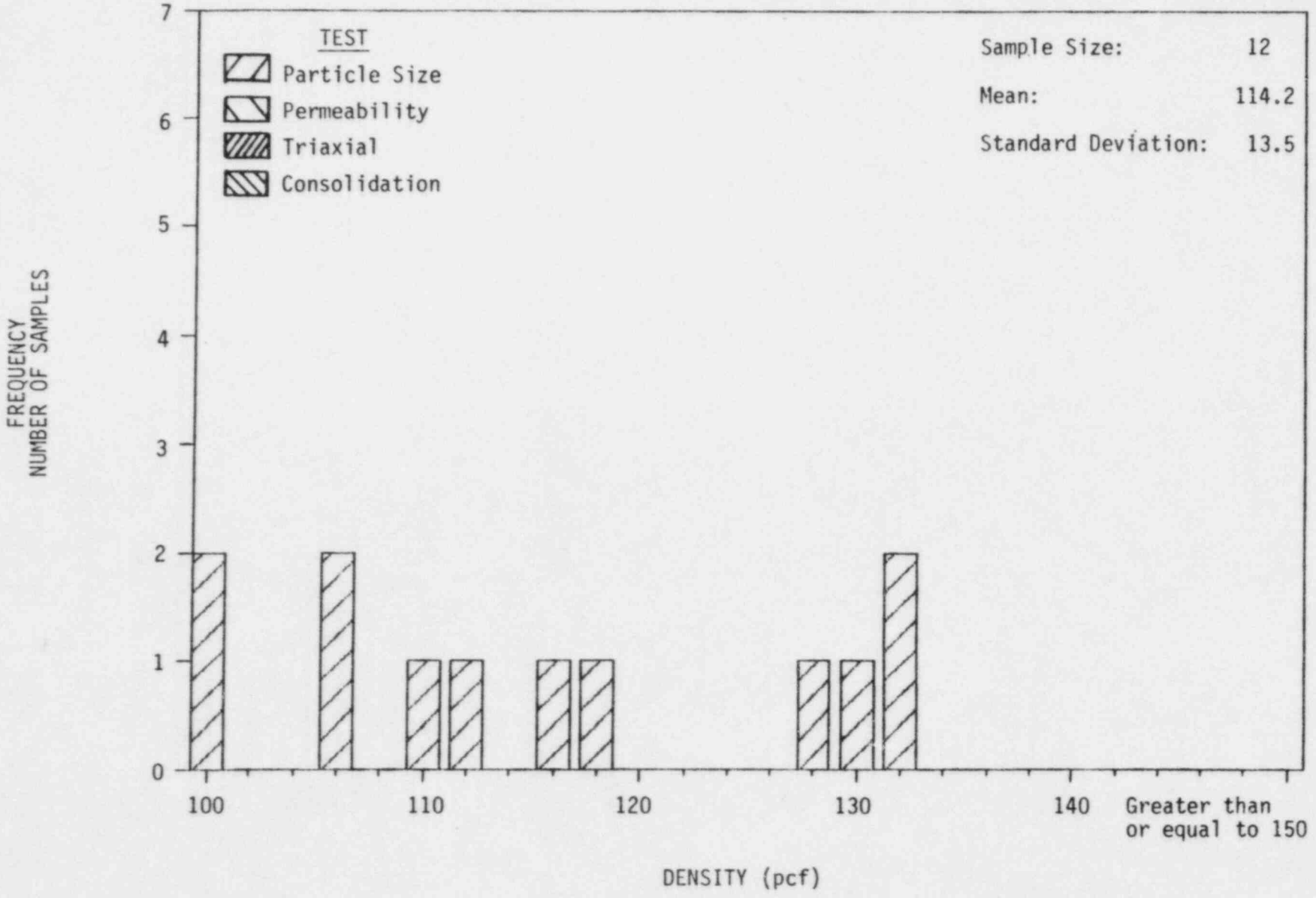


Figure 3-38

NATURAL DRY DENSITIES

SAND & GRAVEL - 3 LAYER - COARSE SOILS

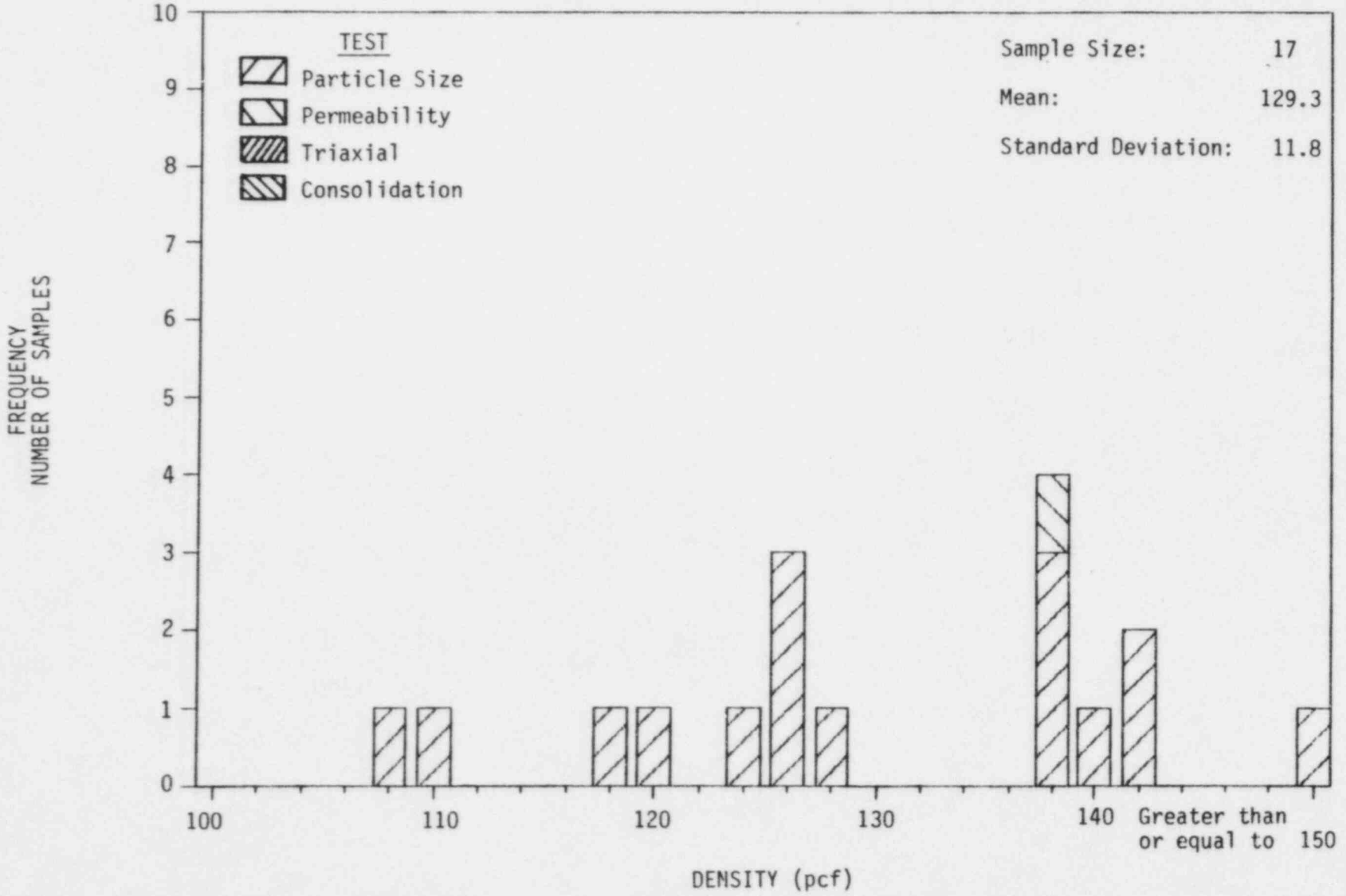


Figure 3-39

PLASTICITY CHART

CLAY-1 LAYER

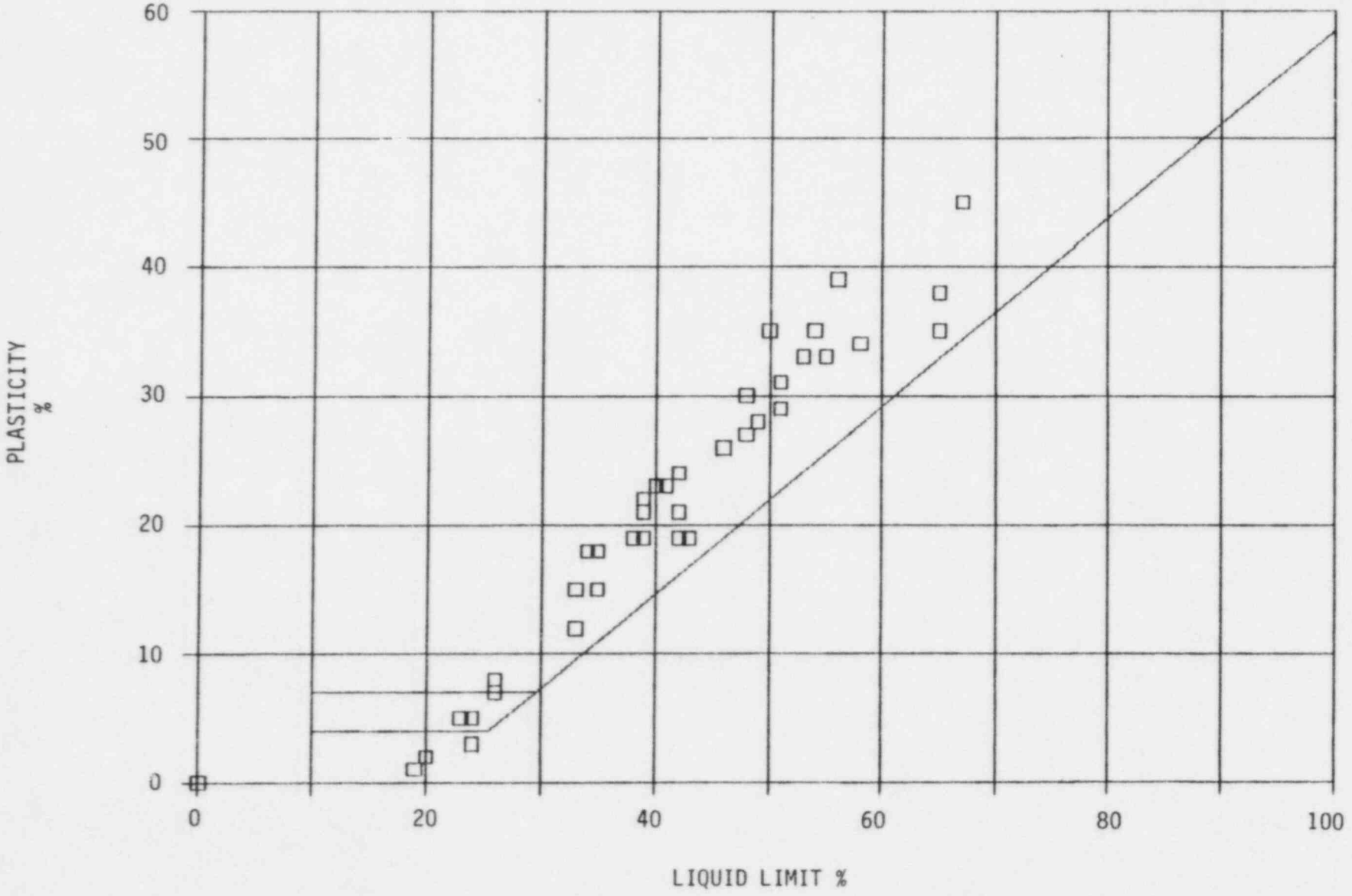


Figure 3-40

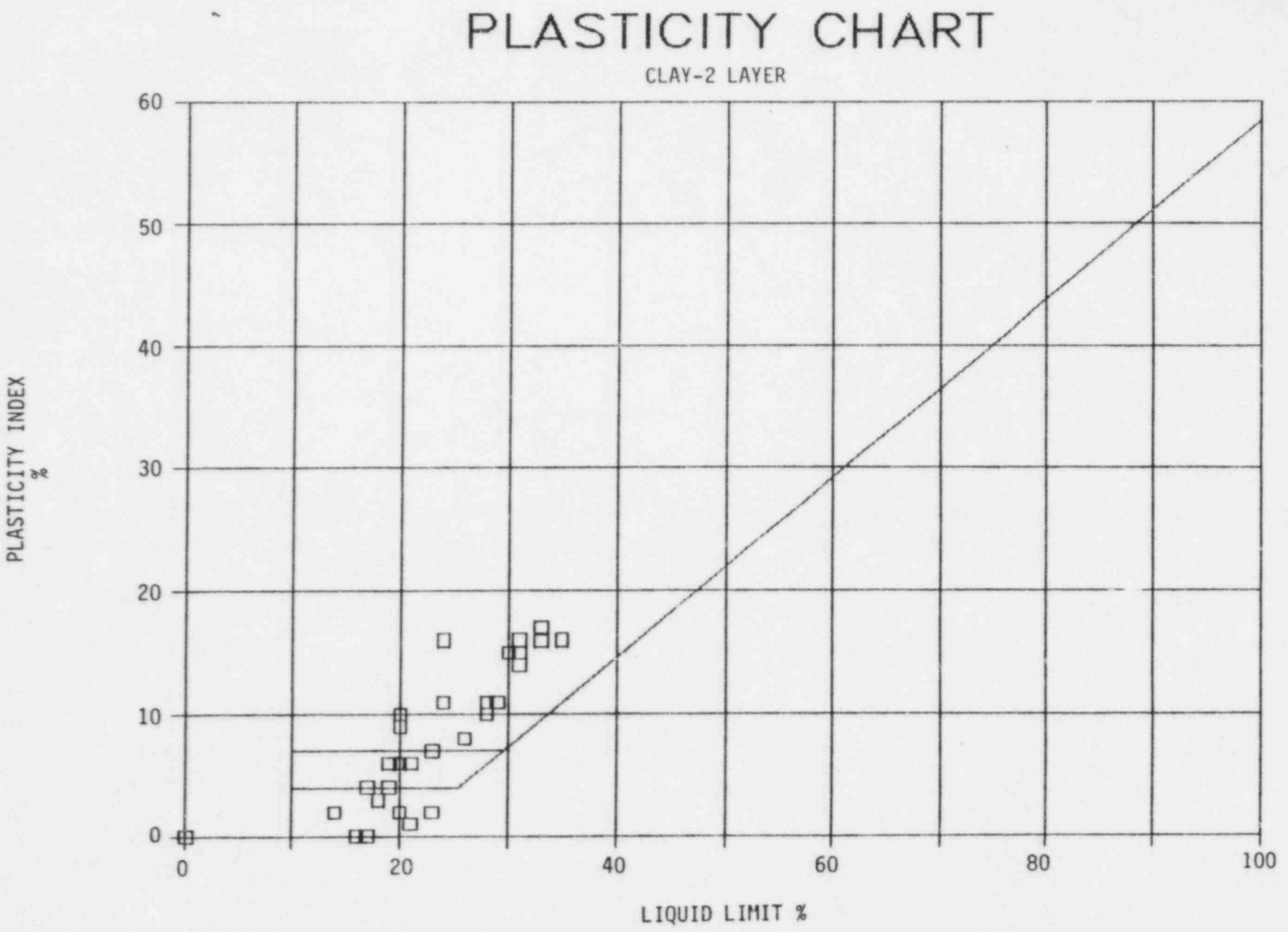

PLASTICITY CHART
CLAY-2 LAYER
PLASTICITY INDEX
%
60
50
40
30
20
10
0
0
20
40
60
80
100
LIQUID LIMIT %

Figure 3-41

PLASTICITY CHART

CLAY-3 LAYER

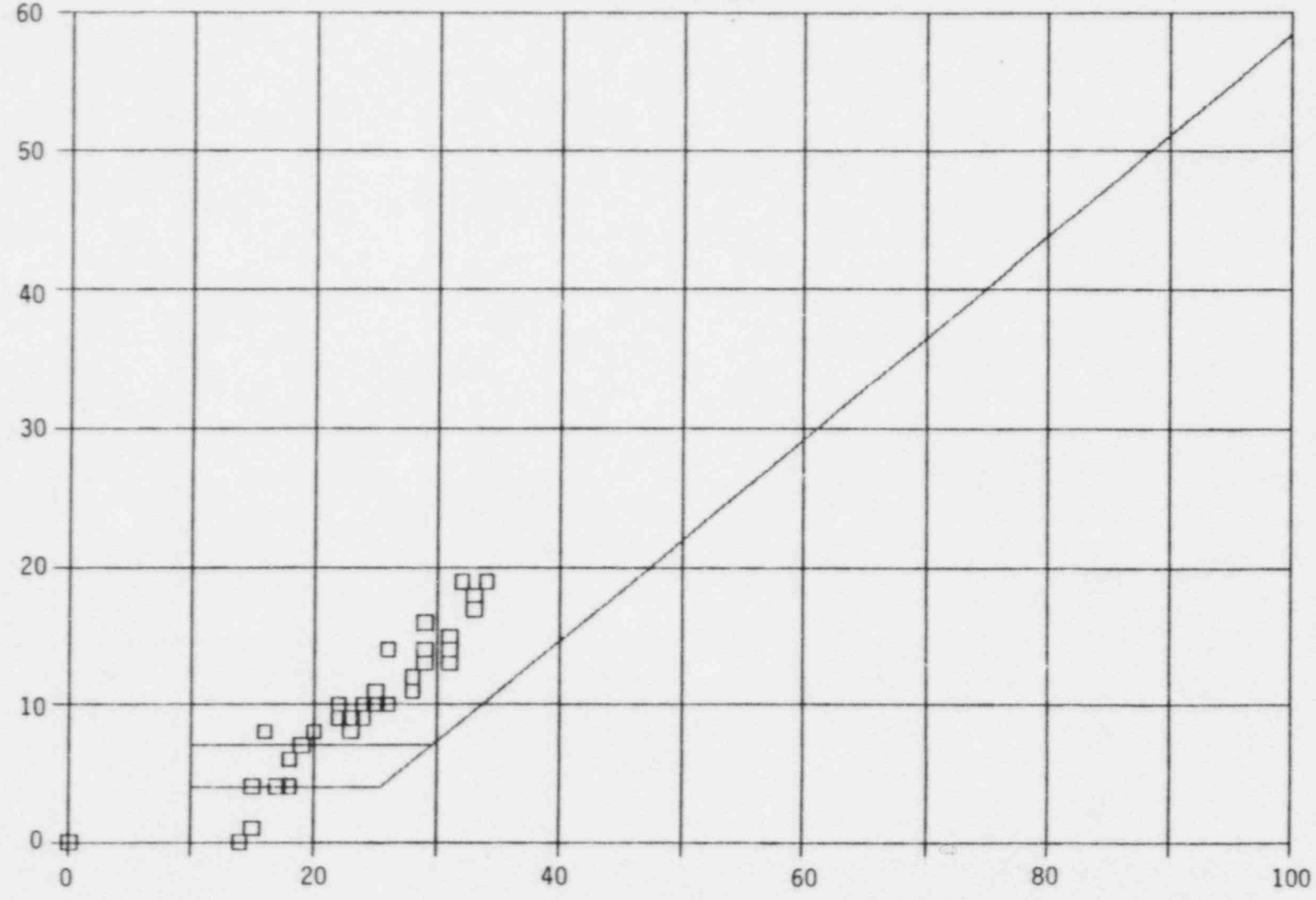


Figure 3-42

PLASTICITY CHART

ALL SAND AND GRAVEL LAYERS

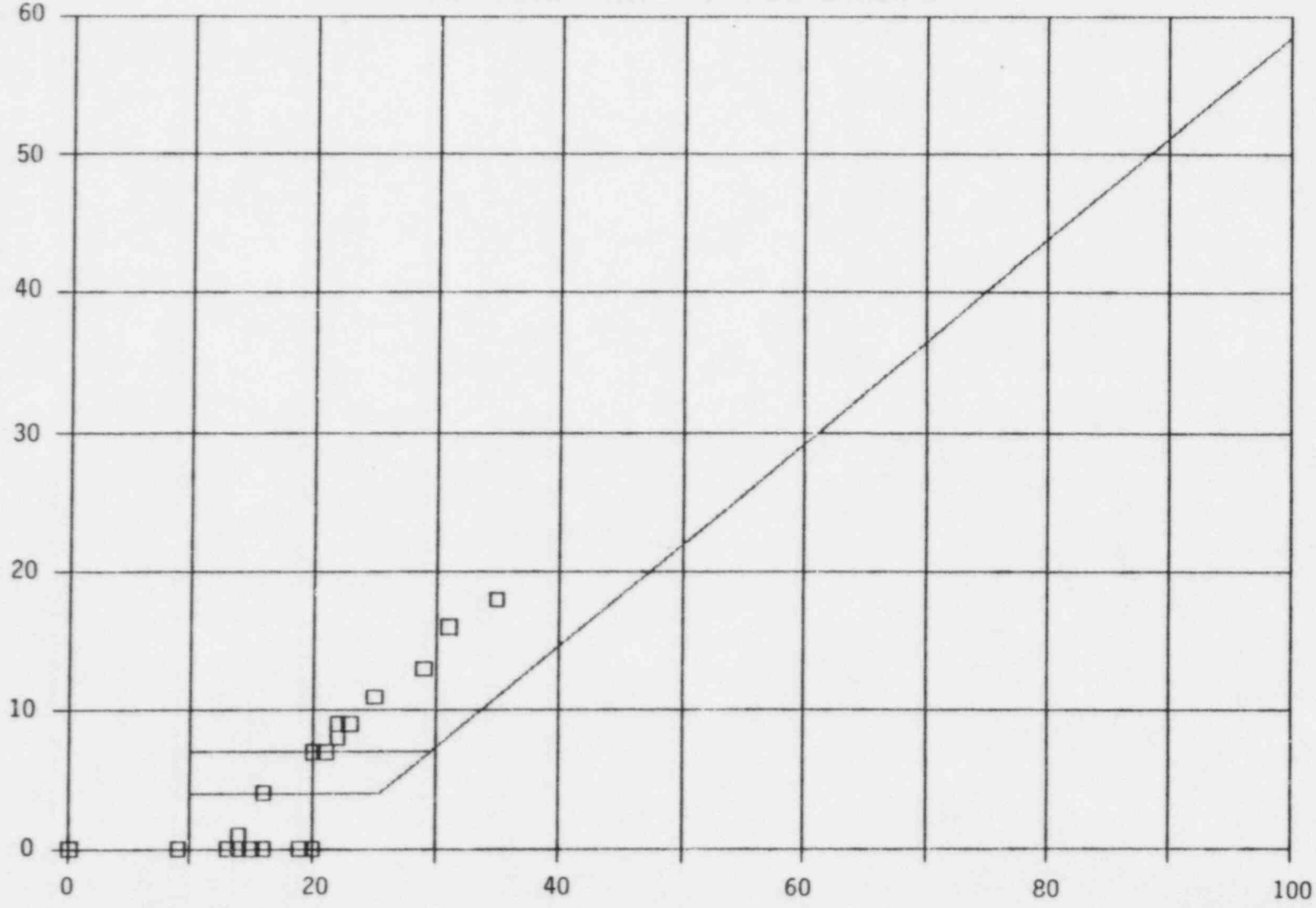


Figure 3-43

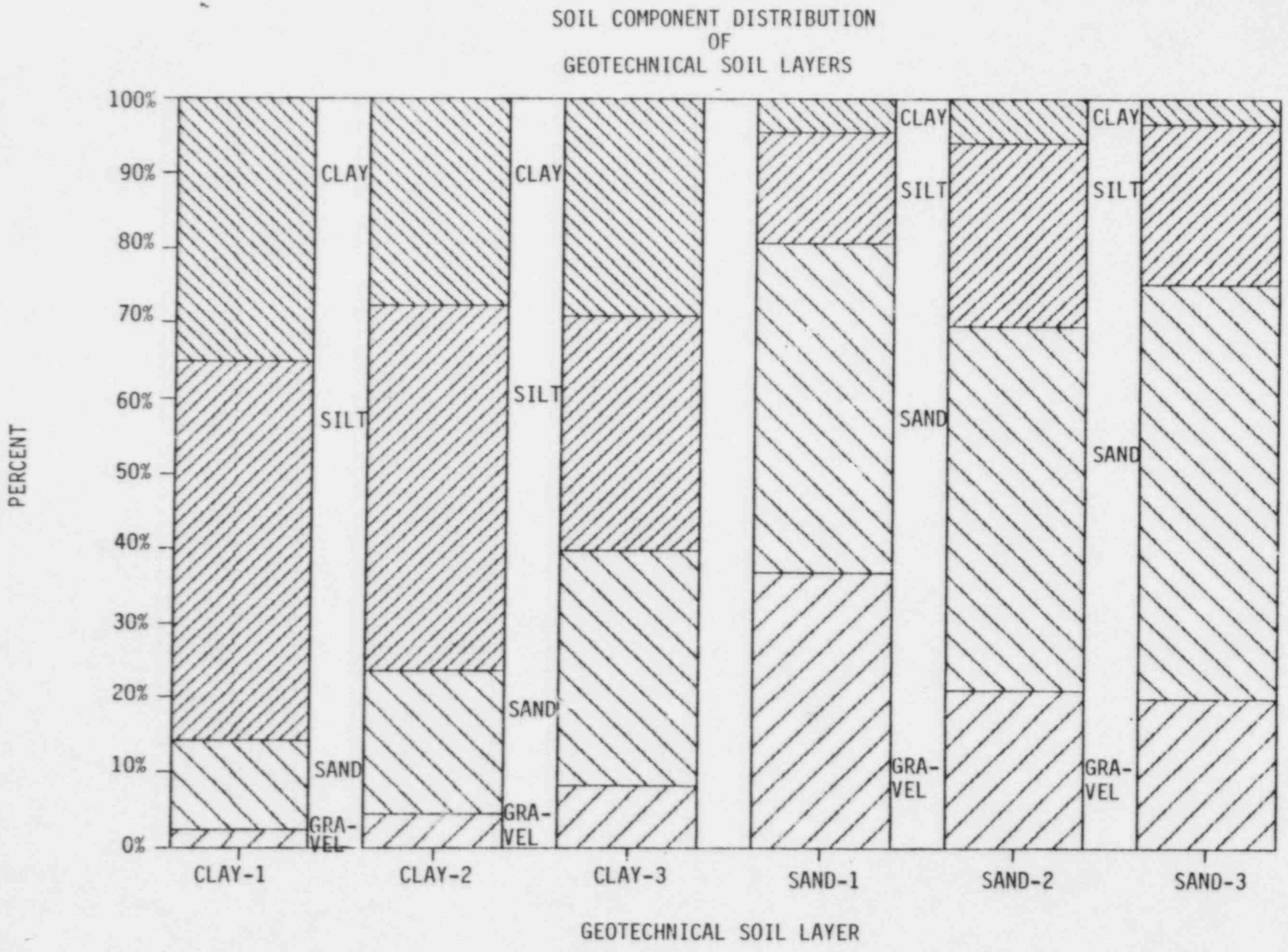

SOIL COMPONENT DISTRIBUTION
OF
GEOTECHNICAL SOIL LAYERS
PERCENT
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
CLAY
SILT
SAND
GRA-
VEL
CLAY-1
CLAY-2
CLAY-3
SAND-1
SAND-2
SAND-3
GEOTECHNICAL SOIL LAYER

Figure 3-44

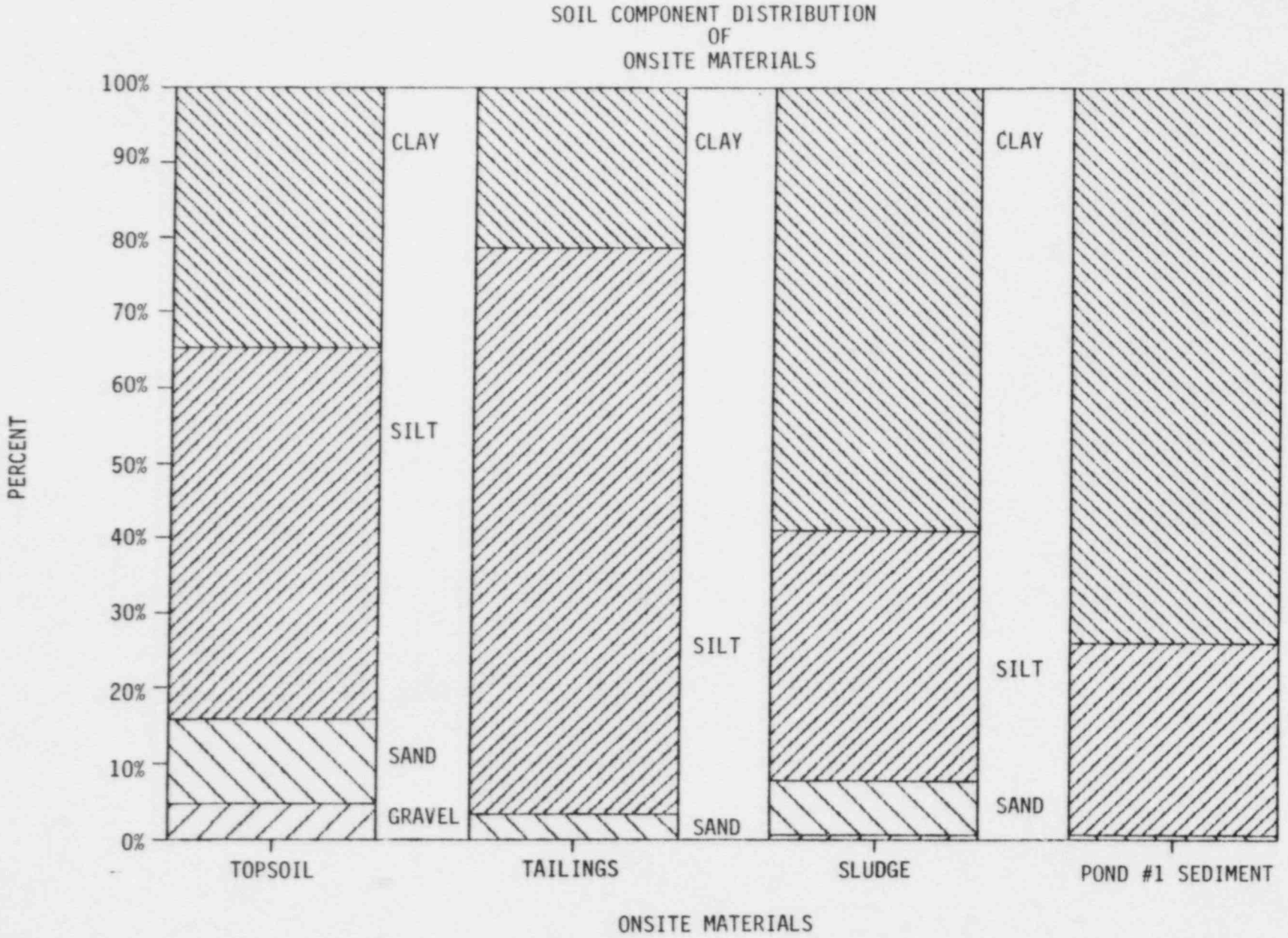
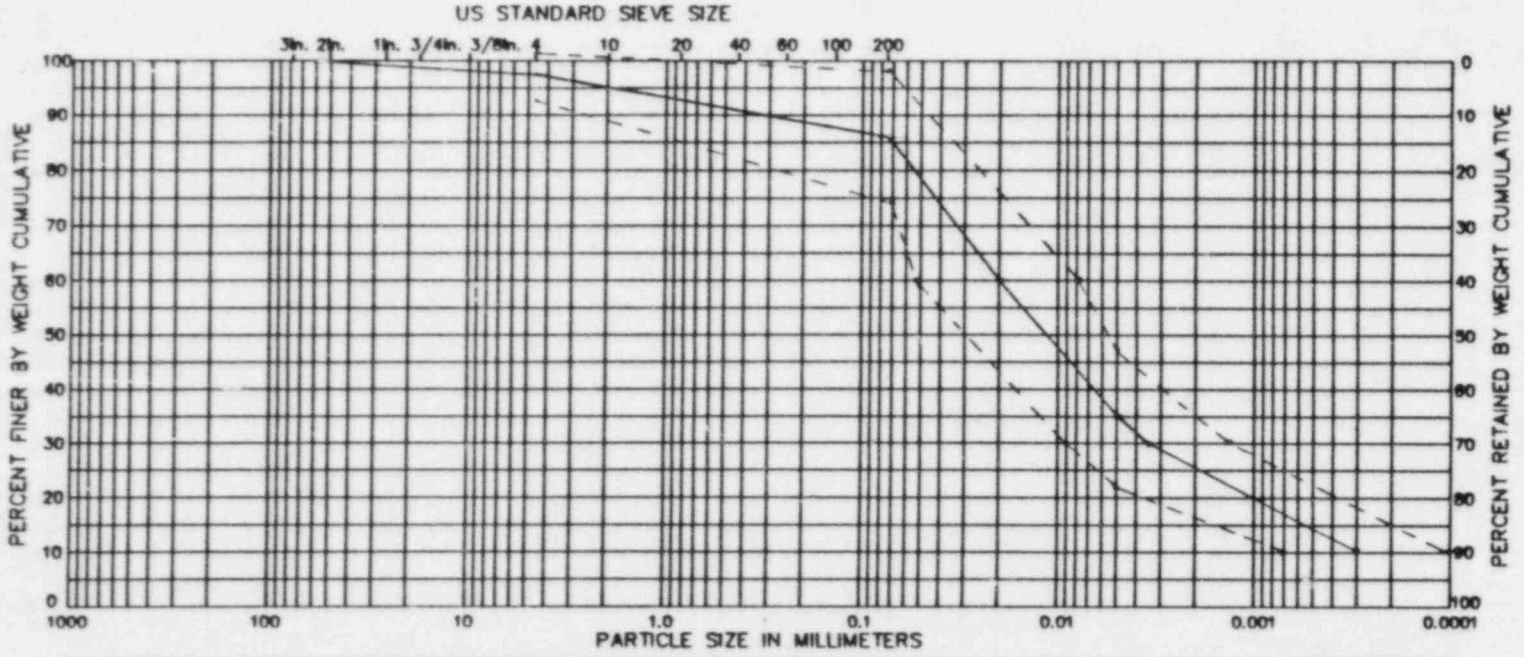

SOIL COMPONENT DISTRIBUTION
OF
ONSITE MATERIALS
PERCENT
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
CLAY
SILT
SAND
GRAVEL
CLAY
SILT
SAND
CLAY
SILT
SAND
TOPSOIL
TAILINGS
SLUDGE
POND #1 SEDIMENT
ONSITE MATERIALS

Figure 3-45

PARTICLE SIZE ANALYSIS



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

——— Mean

----- Standard Deviation

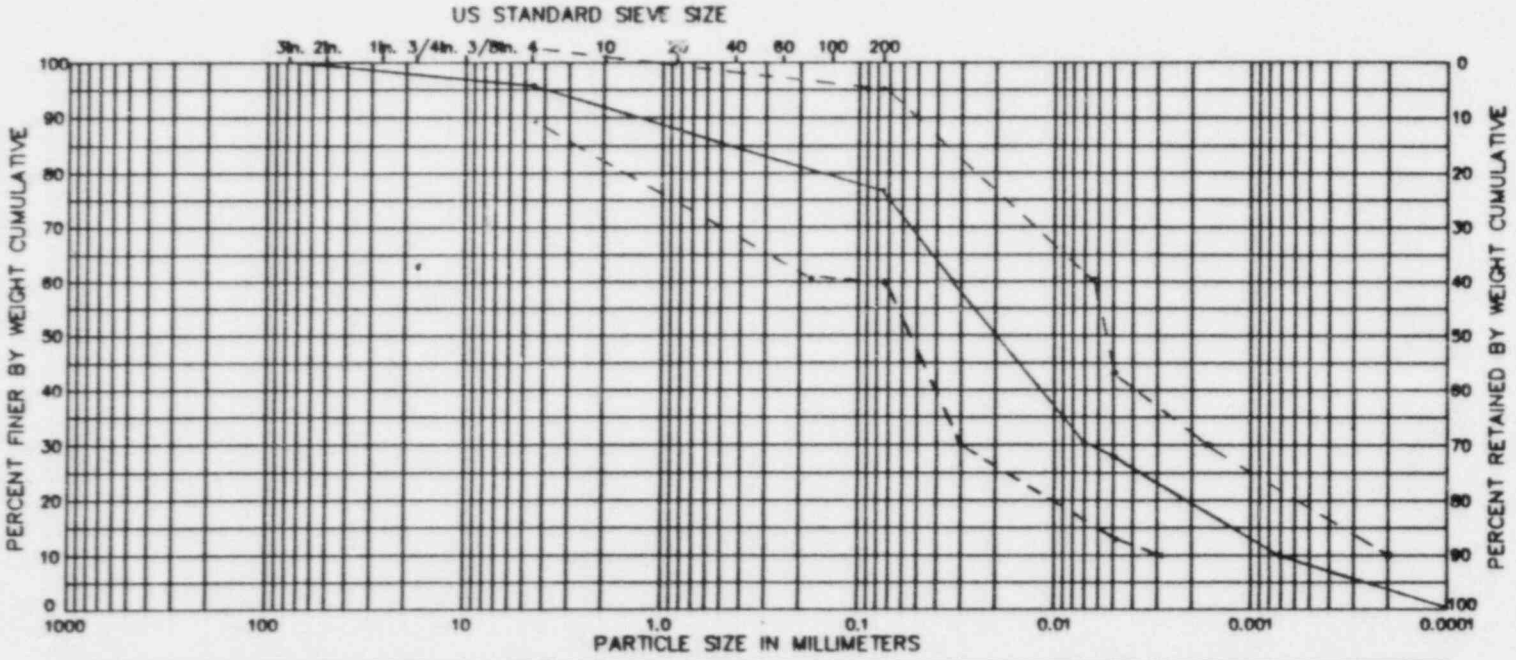
Number of Samples n=39

DRILLHOLE: All	DEPTH:	LL: 42.0	PL: 20.9	PI: 22.1	CC: 3.5	CU: 99.4
SOIL DESCRIPTION: Clay - 1 Layer				CLASSIFICATION:		

KERR McGEE CHEMICAL CORP.	WEST CHICAGO PROJECT GEOTECHNICAL INVESTIGATION	Stearns Catalytic

Figure 3-46

PARTICLE SIZE ANALYSIS



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

——— Mean

----- Standard Deviation

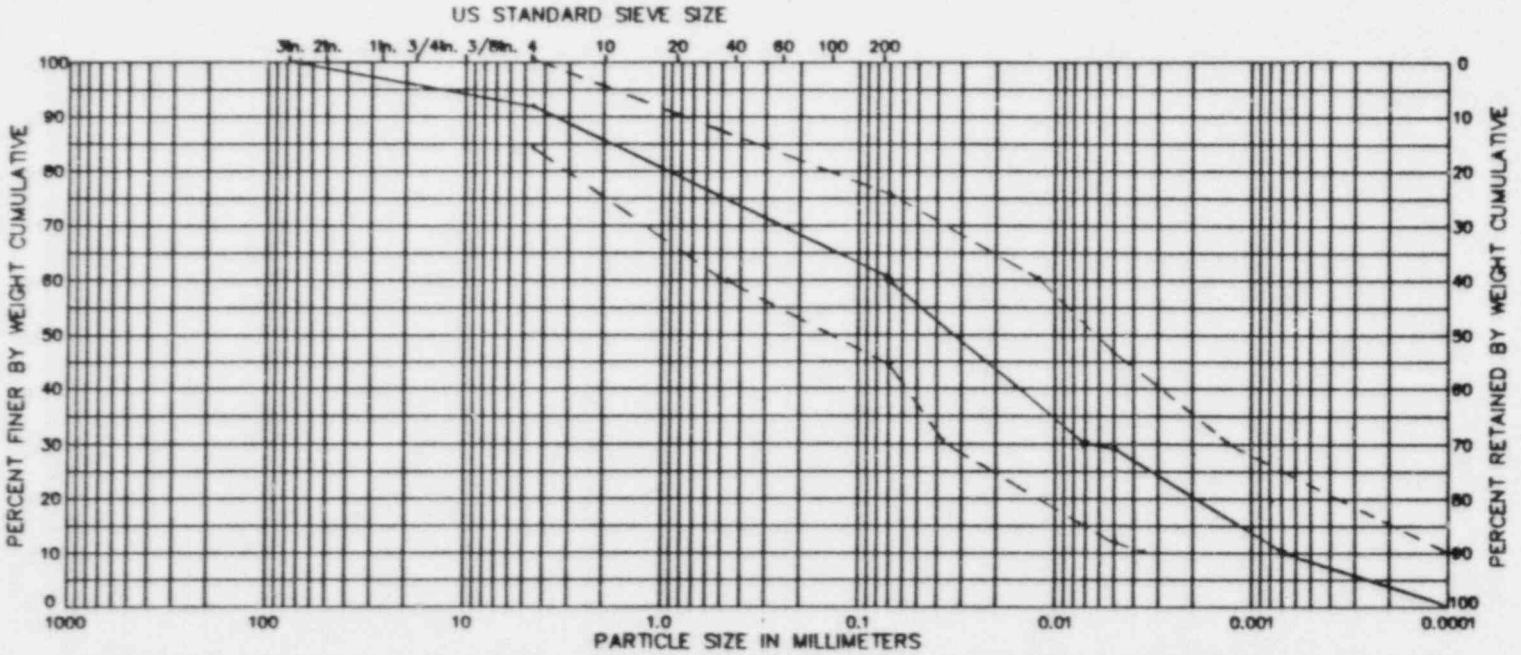
DRILLHOLE: A11	DEPTH:	LL: 22.1	PL: 14.3	PI: 7.8	CC: 30.3	CU: 192.9
SOIL DESCRIPTION: Clay - 2 Layer				CLASSIFICATION:		

Number of samples n=43

KERR McGEE CHEMICAL CORP.	WEST CHICAGO PROJECT GEOTECHNICAL INVESTIGATION	Stearns Catalytic

Figure 3-47

PARTICLE SIZE ANALYSIS



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

——— Mean

----- Standard Deviation

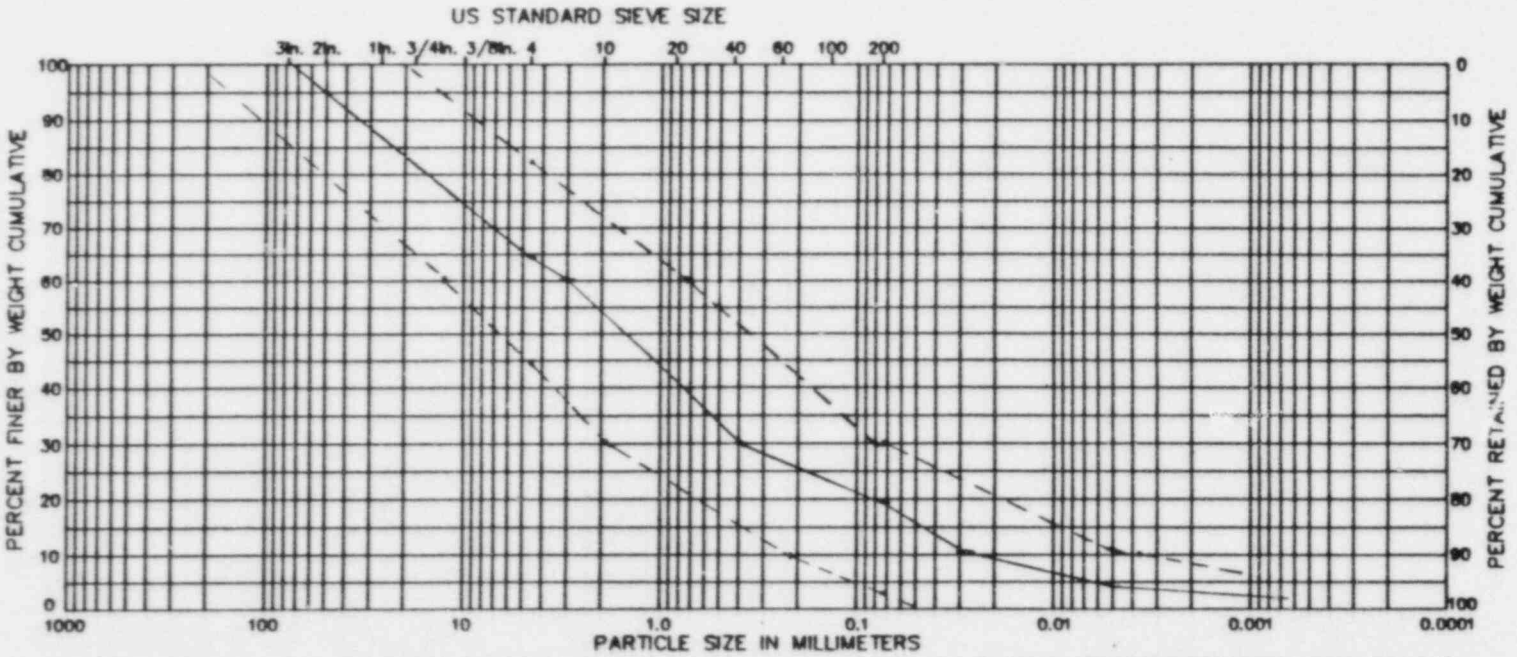
Number of Samples n=47

DRILLHOLE: All	DEPTH:	LL: 23.9	PL: 13.6	PI: 10.3	CC: 2.9	CU: 488.5
SOIL DESCRIPTION: Clay - 3 Layer				CLASSIFICATION:		

KERR McGEE CHEMICAL CORP.	WEST CHICAGO PROJECT GEOTECHNICAL INVESTIGATION	Stearns Catalytic

Figure 3-48

PARTICLE SIZE ANALYSIS



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

——— Mean

----- Standard Deviation

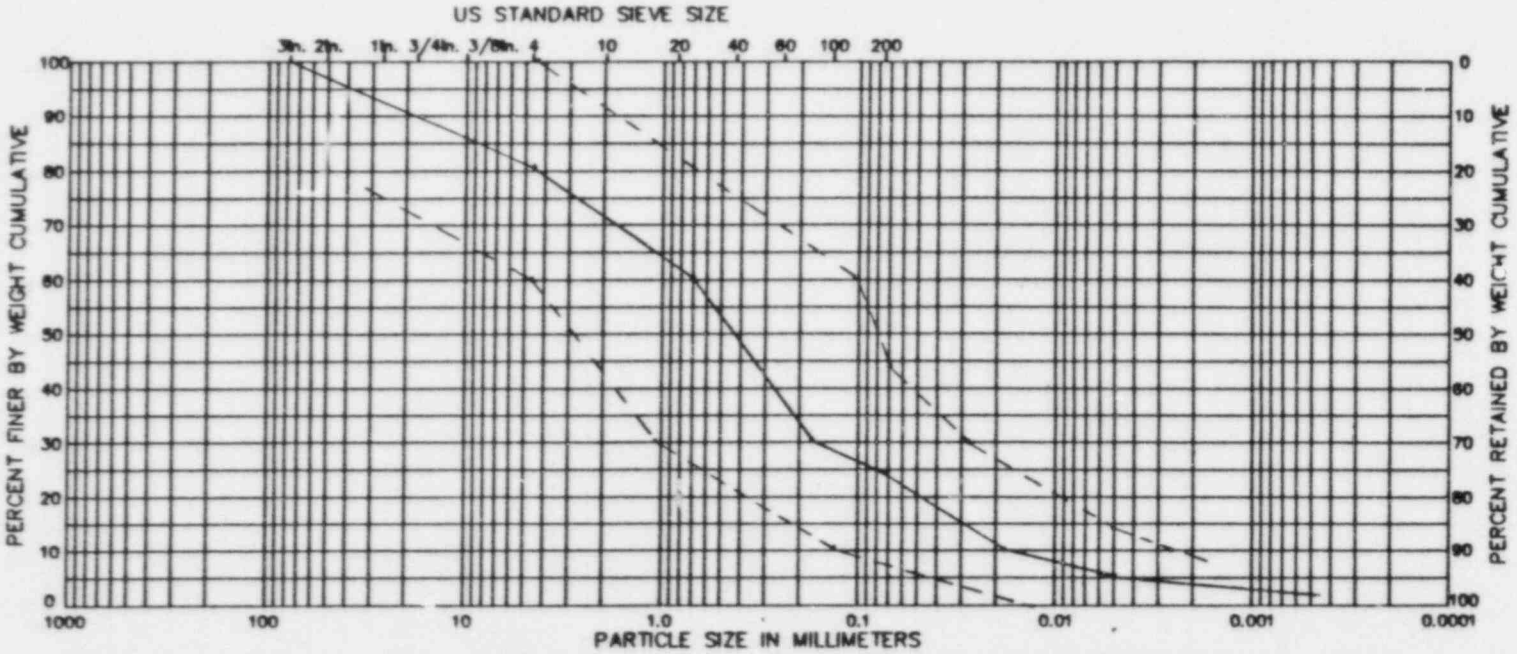
DRILLHOLE: All	DEPTH:	LL: 18.1	PL: 12.7	PI: 5.4	CC: 3.3	CU: 594.8	
SOIL DESCRIPTION: Sand and Gravel - 1 Layer				CLASSIFICATION:			

Number of Samples
n=73

KERR McGEE CHEMICAL CORP.	WEST CHICAGO PROJECT GEOTECHNICAL INVESTIGATION	Stearns Catalytic

Figure 3-49

PARTICLE SIZE ANALYSIS



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

——— Mean

----- Standard Deviation

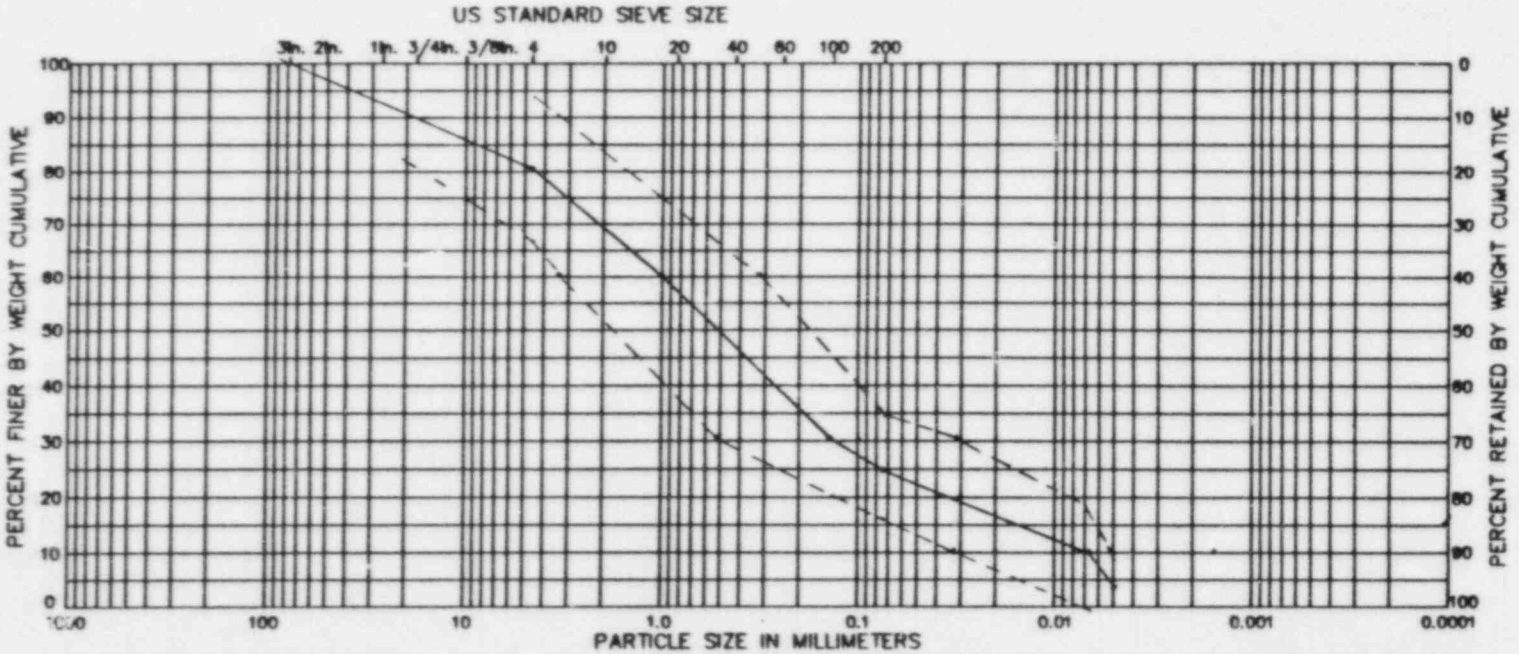
DRILLHOLE: A11	DEPTH:	LL: 15.9	PL: 14.0	PI: 1.9	CC: 10.2	CU: 77.3
SOIL DESCRIPTION: Sand and Gravel - 2 Layer				CLASSIFICATION: —		

Number of Samples n=17

KERR McGEE CHEMICAL CORP.	WEST CHICAGO PROJECT GEOTECHNICAL INVESTIGATION	Stearns Catalytic

Figure 3-50

PARTICLE SIZE ANALYSIS



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

——— Mean

——— Standard Deviation

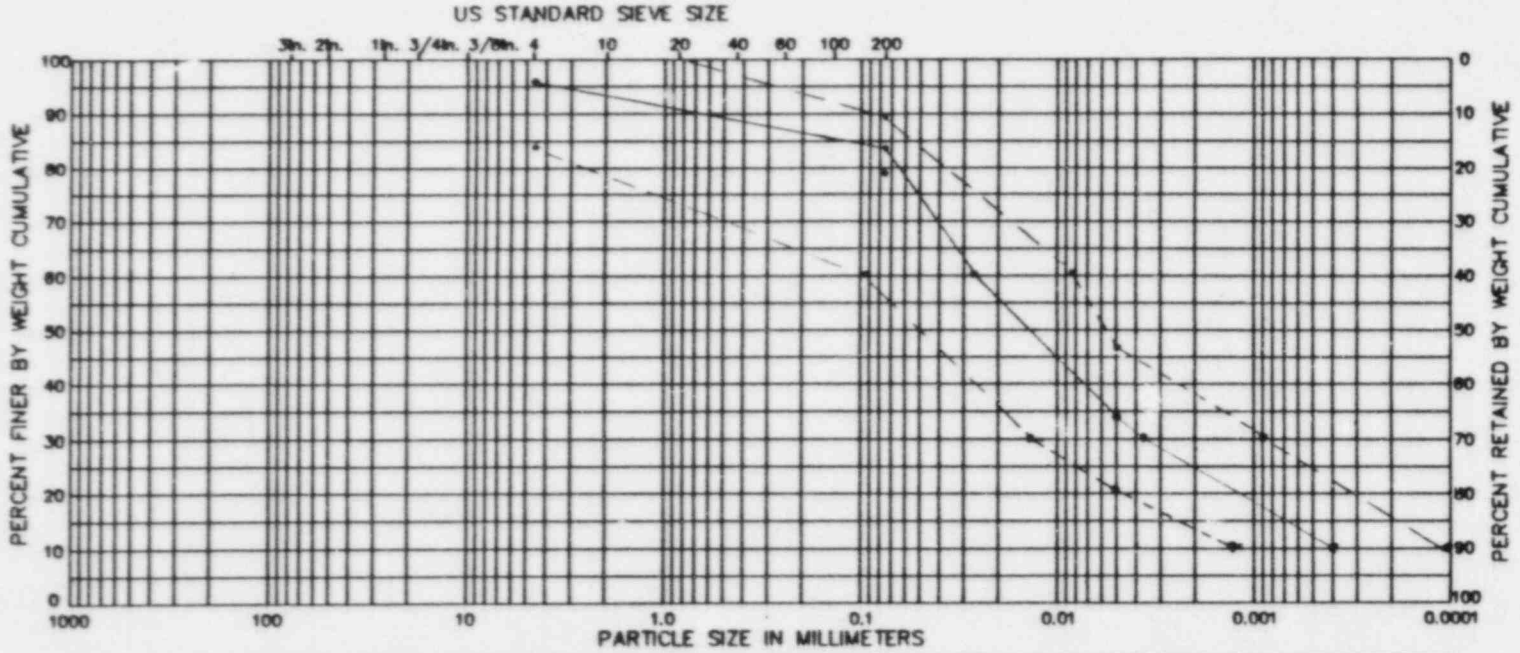
DRILLHOLE: All	DEPTH:	LL: 13.6	PL: 13.4	PI: 0.2	CC: 6.3	CU: 548.3
SOIL DESCRIPTION: Sand and Gravel - 3 Layer				CLASSIFICATION: --		

Number of Samples n=19

KERR McGEE CHEMICAL CORP.	WEST CHICAGO PROJECT GEOTECHNICAL INVESTIGATION	Stearns Catalytic

Figure 3-51

PARTICLE SIZE ANALYSIS



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

——— Mean

——— Standard Deviation

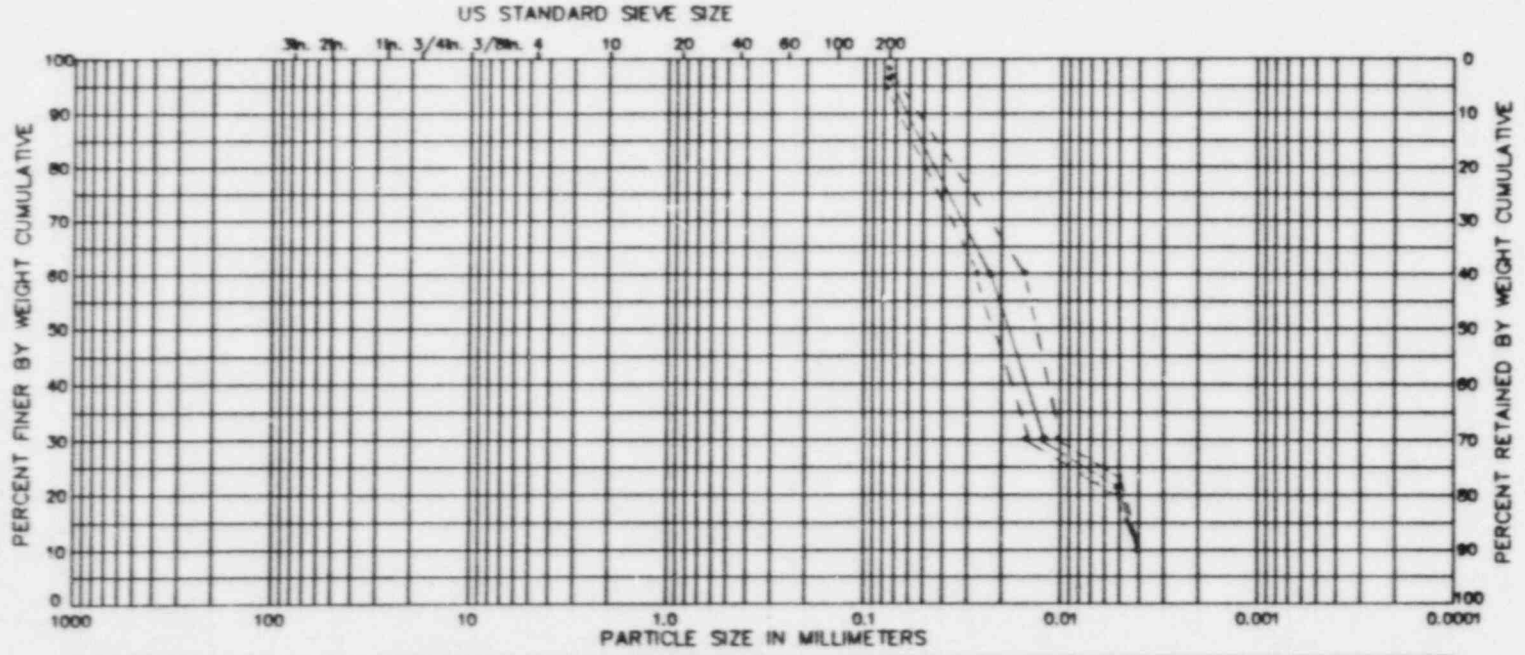
DRILLHOLE: A11	DEPTH:	LL: 81.7	PL: 62.7	PI: 19.0	CC: 7.0	CU: 175.0
SOIL DESCRIPTION: Topsoil				CLASSIFICATION:		

Number of Samples
n=7

KERR McGEE CHEMICAL CORP.	WEST CHICAGO PROJECT GEOTECHNICAL INVESTIGATION	Stearns Catalytic

Figure 3-52

PARTICLE SIZE ANALYSIS



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

——— Mean

----- Standard Deviation

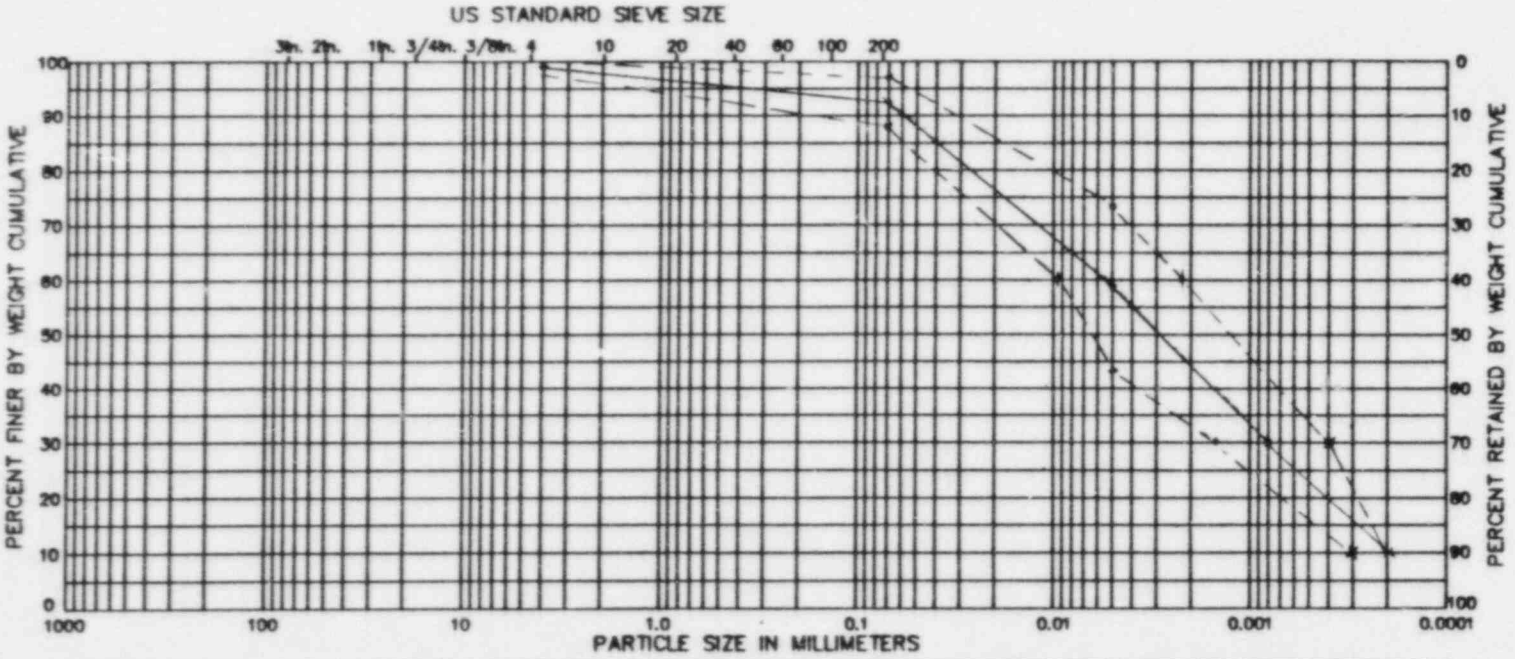
DRILLHOLE: All	DEPTH:	LL: 48.6	PL: 43.4	PI: 5.2	CC: 19.3	CU: 53.6	
SOIL DESCRIPTION: Tails,				CLASSIFICATION:			

Number of Samples n=5

KERR McGEE CHEMICAL CORP.	WEST CHICAGO PROJECT GEOTECHNICAL INVESTIGATION	Stearns Catalyt

Figure 3-53

PARTICLE SIZE ANALYSIS



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

DRILLHOLE: All	DEPTH:	LL: 61.0	PL: 31.8	PI: 29.2	CC: 0.8	CU: 25.2
SOIL DESCRIPTION: Sludge,				CLASSIFICATION:		

_____ Mean

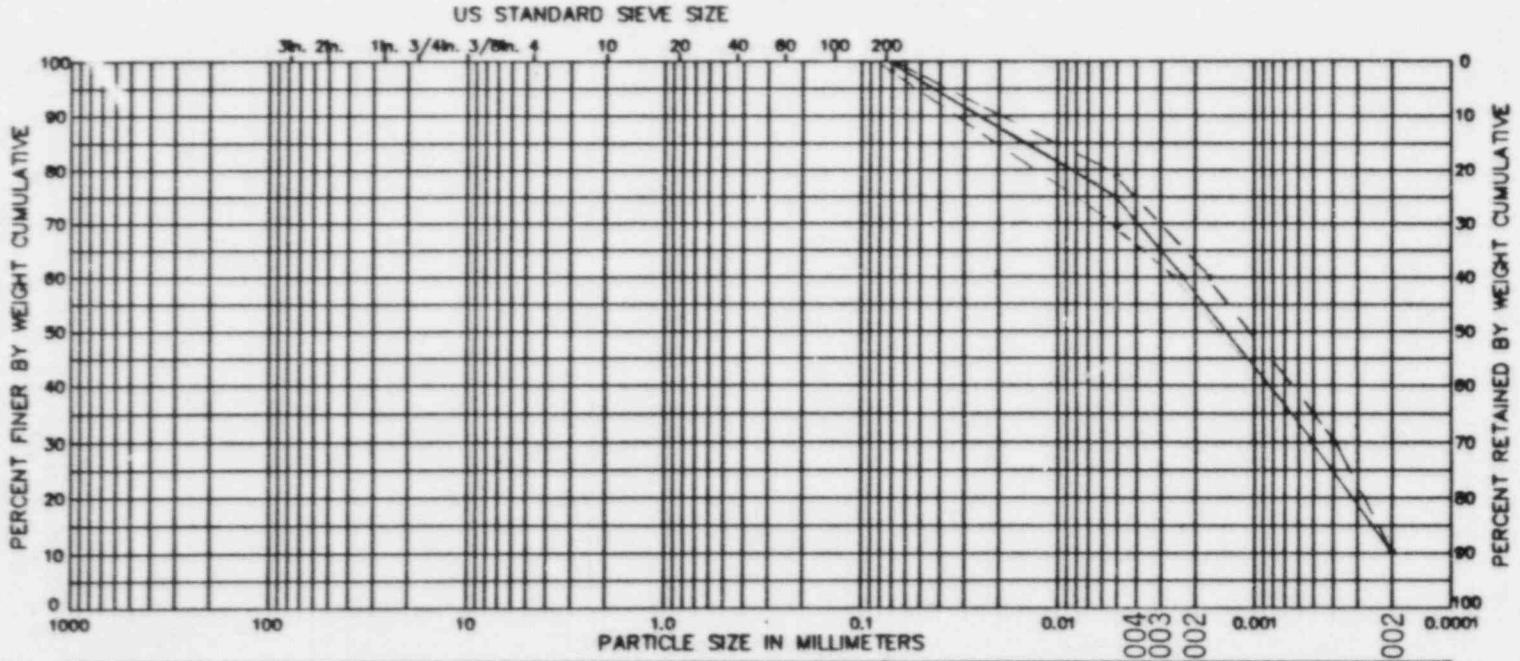
----- Standard Deviation

Number of Samples n=5

KERR McGEE CHEMICAL CORP.	WEST CHICAGO PROJECT GEOTECHNICAL INVESTIGATION	Stearns Catalytic

Figure 3-54

PARTICLE SIZE ANALYSIS



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

——— Mean

----- Standard Deviation

DRILLHOLE: A11	DEPTH:	LL: 94.0	PL: 42.2	PI: 51.8	CC: 0.6	CU: 13.2
SOIL DESCRIPTION: Pond #1,				CLASSIFICATION:		

Number of Samples n=5

KERR McGEE CHEMICAL CORP.	WEST CHICAGO PROJECT GEOTECHNICAL INVESTIGATION	Stearns Catalytic

Figure 3-55

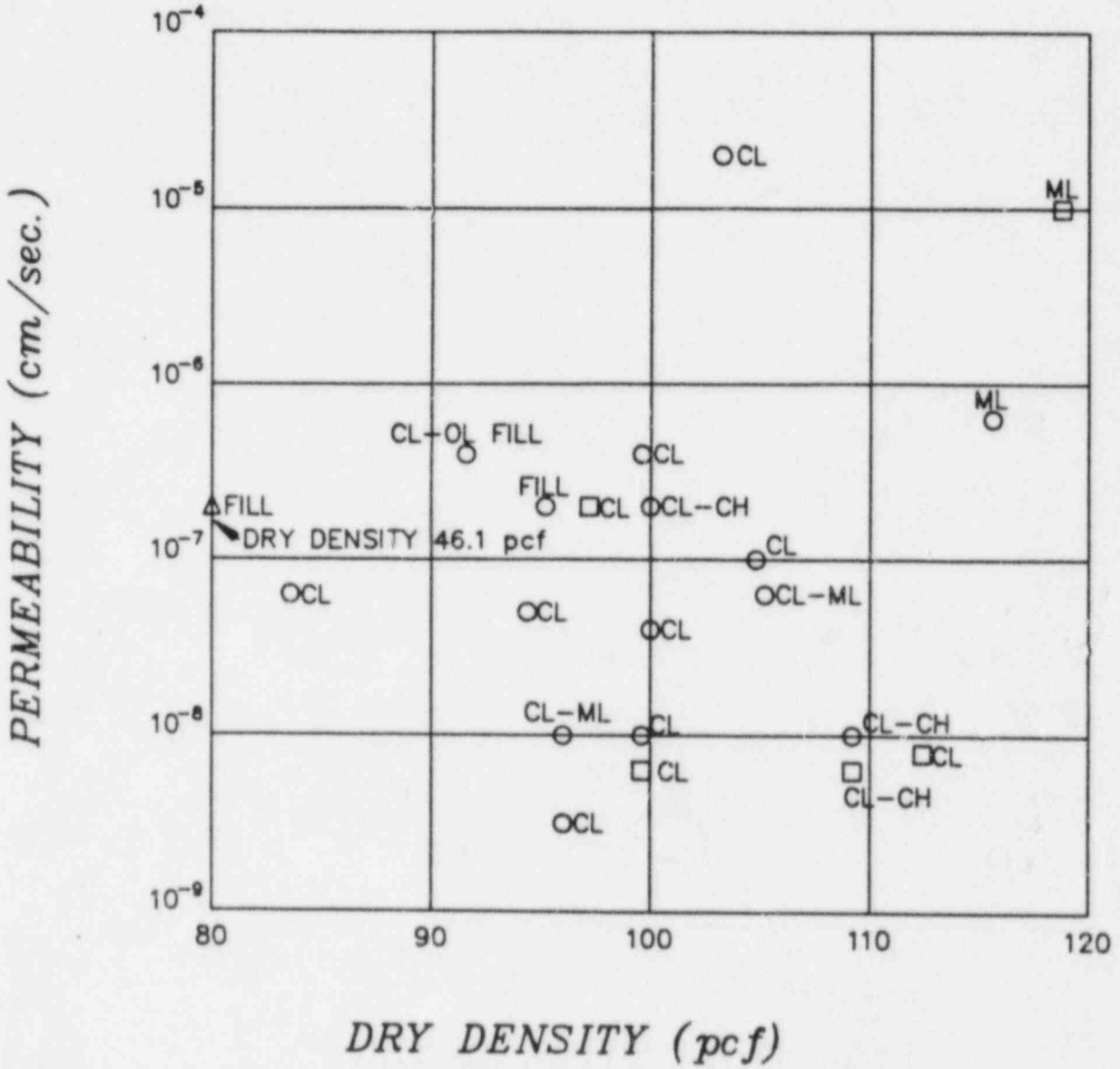
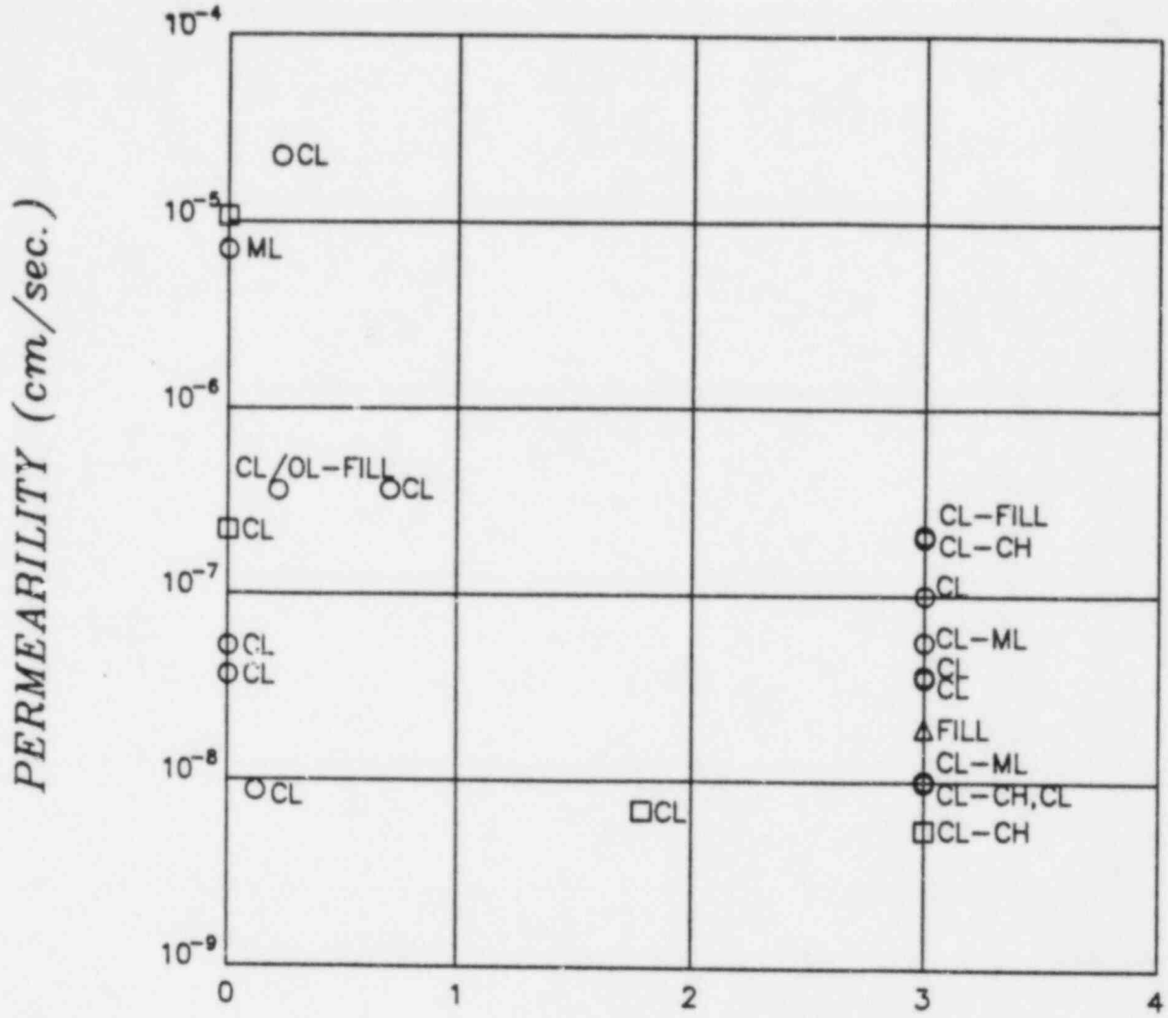


Figure 3-56

PERMEABILITY vs. DRY DENSITY
CLAY-1 LAYER

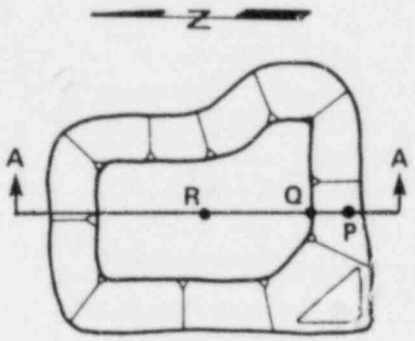


LEGEND

○ = UNDISTURBED
□ = REMOLDED
△ = DISTURBED

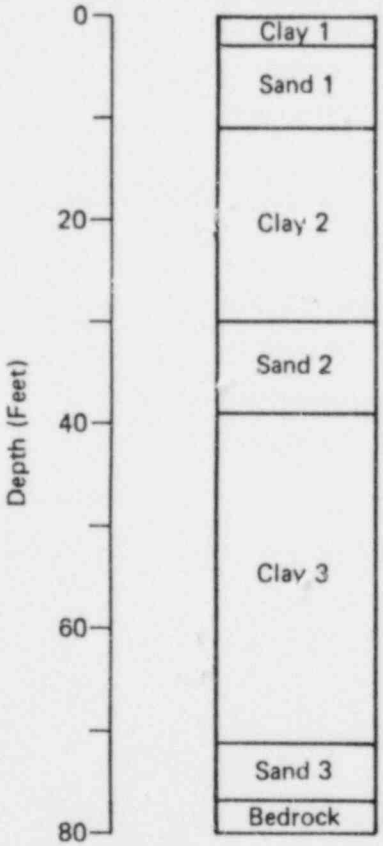
Figure 3-57

PERMEABILITY vs. CONFINING PRESSURE
CLAY-1 LAYER



Not to Scale

Typical Soil Profile

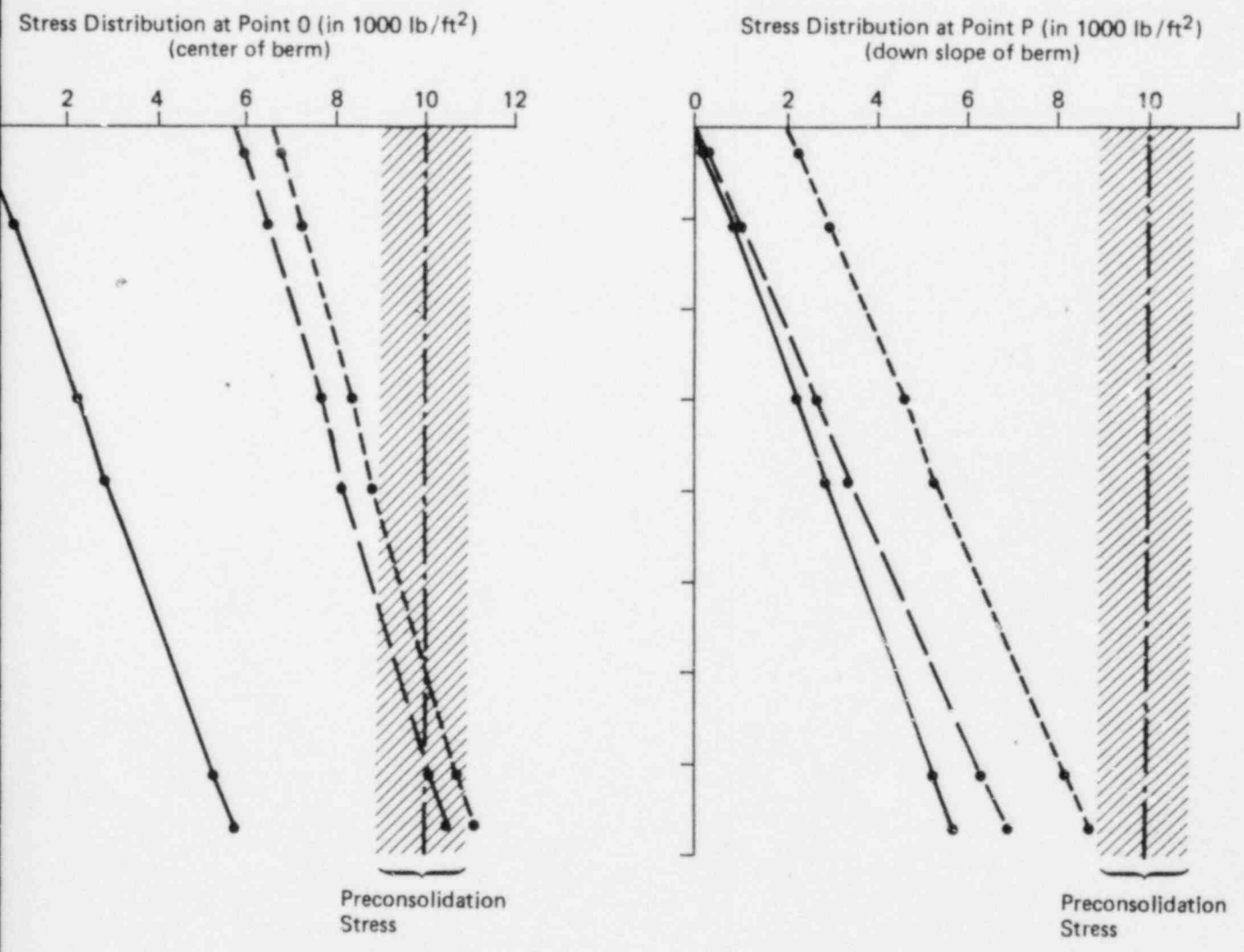


Stress Distribution at Point R (in 1000 lb/ft^2)
(center of cell)

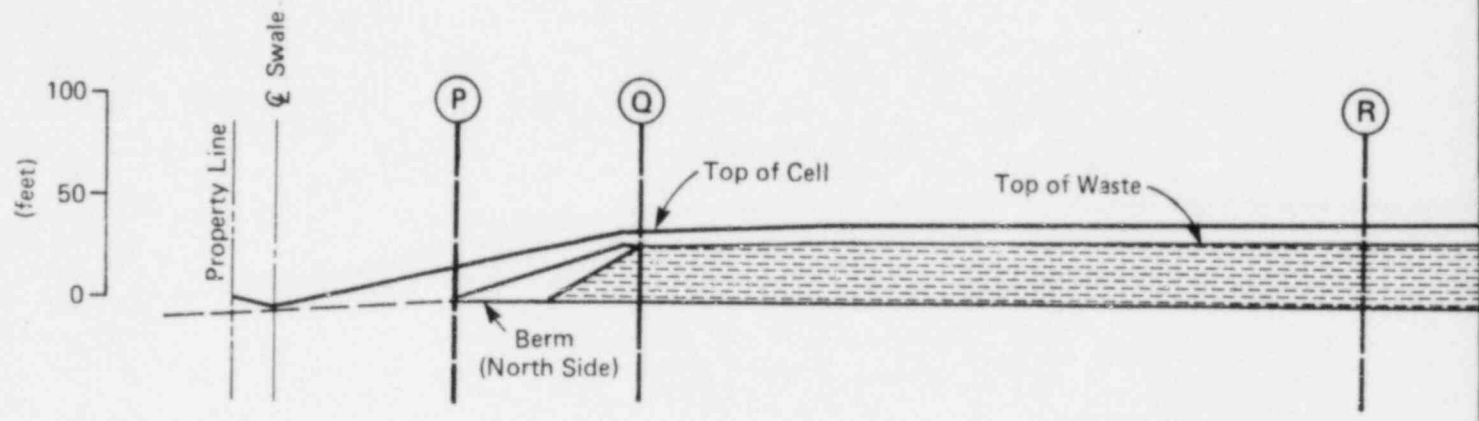
Figure 3-58. STRESS DISTRIBUT

EXPLANATION

- Inital Effective Overburden Stress
- Stress After Cell Construction
- Stress After Placement of Final Cover
- Preconsolidation Stress

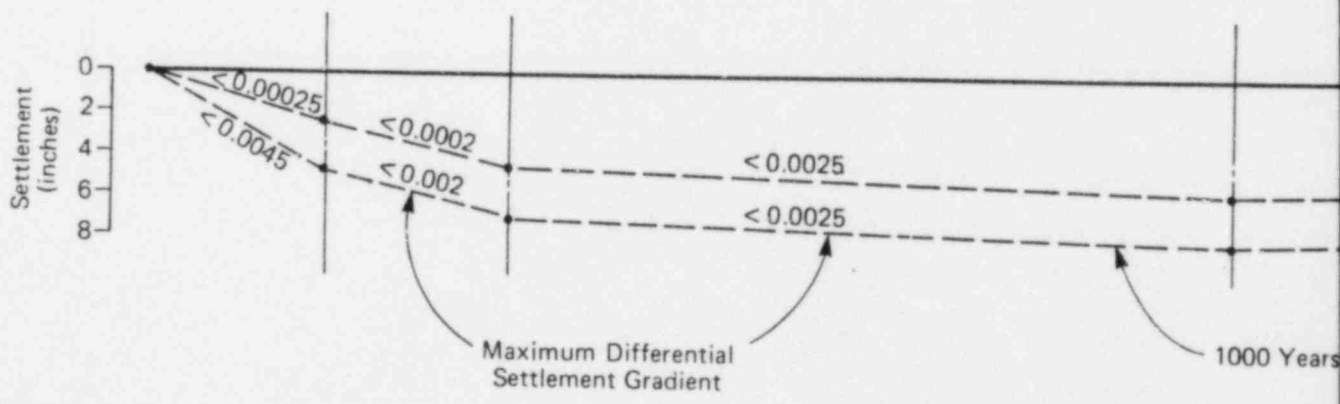


ONS IN CELL FOUNDATION



SECTION
Looking East -

Equal Horizontal and



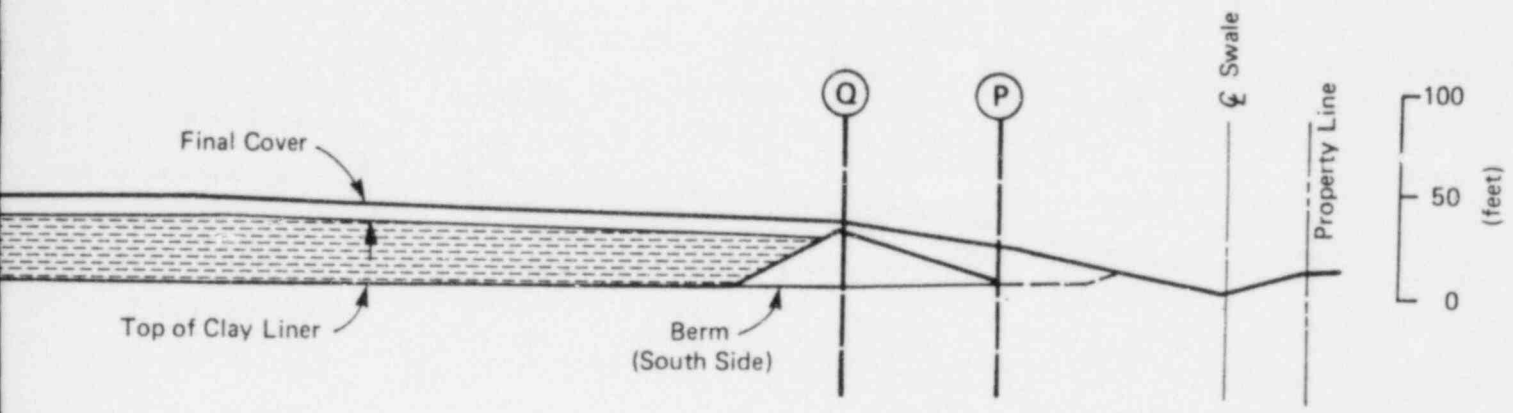
TOTAL CALCULATED MAXIMU

(Vertical Scale is e

0 1

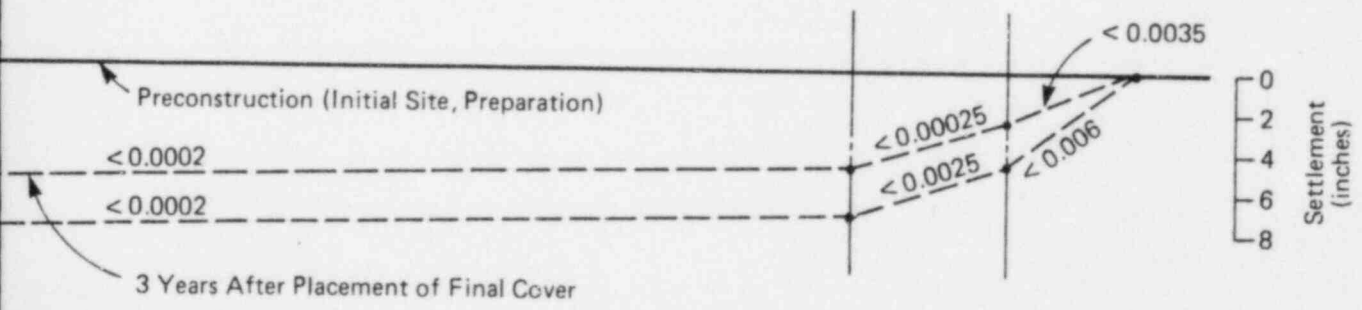
Horizonta

Figure 3-59. PROFILE OF MAXIM



A-A
Line E550

Vertical Scales



After Placement of Final Cover

M FOUNDATION SETTLEMENTS
agerated 150 times)

00 200 Feet

Scale Only

UM FOUNDATION SETTLEMENTS

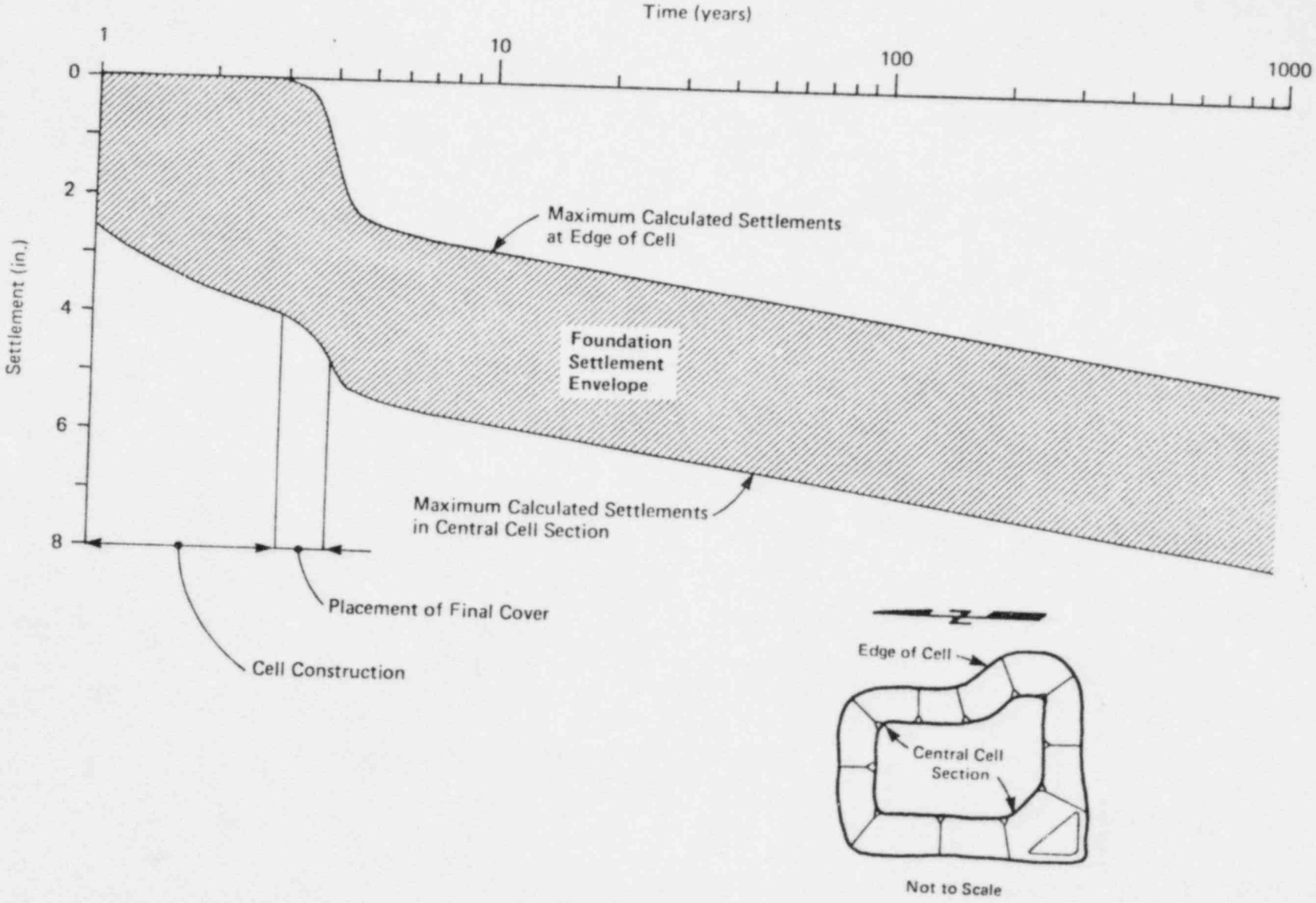
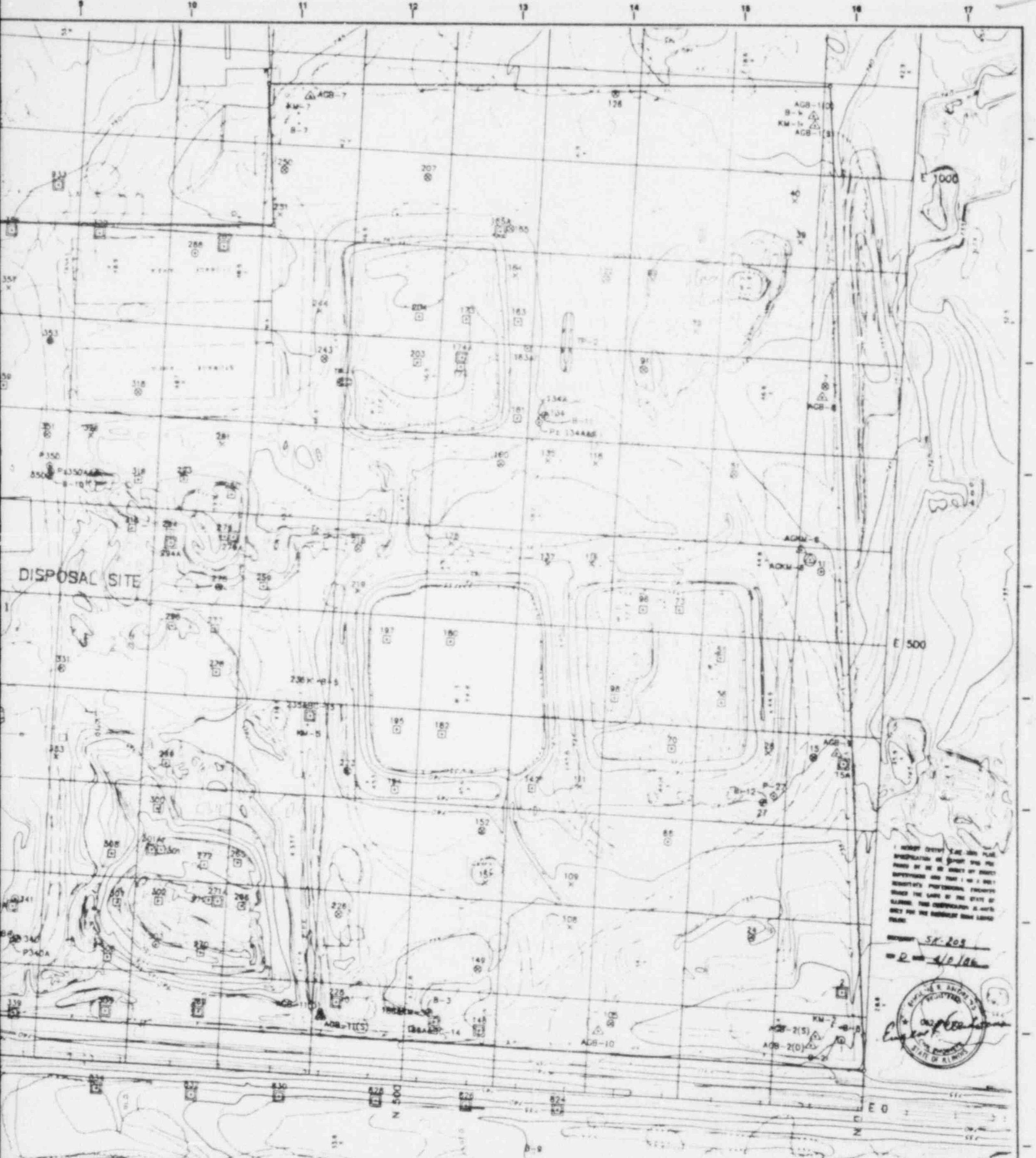


Figure 3-60. CALCULATED RANGE OF MAXIMUM FOUNDATION SETTLEMENTS



REFERENCE DRAWINGS	PRINT RECORD				
	DATE				
	FOR	F8		F8	APD
	REVISED		B	C	D
	CUSTOMER	3		3	
	FIELD				
	INTRA CO				
	ILL ATTY GEN		4		

ENG. RECORD		
DRAWN	MT	
CHECKED	DB	
MECH CK		
STRUCT CK		
ELECT CK		
PIPING CK		
INSTR CK		
CIVIL CK		
GEOTECH CK	EHW	

DRAWING STATUS	
ISSUE	DATE
PRELIMINARY	
FOR COMMENTS AND/OR APPROVAL	
APPROVED FOR CONSTRUCTION LKS-134	
REVISED & APPROVED FOR CONSTRUCTION	

NOT APPROVED FOR CONSTRUCTION UNLESS SIGNED & DATED. DESTROY ALL PRINTS BEARING EARLIER DATE & OR REVISION NO.

WASTE STABILIZATION SITE CIVIL (GEOTECHNICAL) FIELD INVESTIGATION DRILL HOLE LOCATIONS

KERR McGEE CHEMICAL CORPORATION

WEST CHICAGO PROJECT

Stearns Catalytic — STEARNS CATALYTIC CORPORATION

SCALE 1"=60'

DWG NO. SK-203

SHEET NO. 1 OF 2

ORDER NO. C-27972

REV D

8604240475-04

TI
APERTURE
CARD

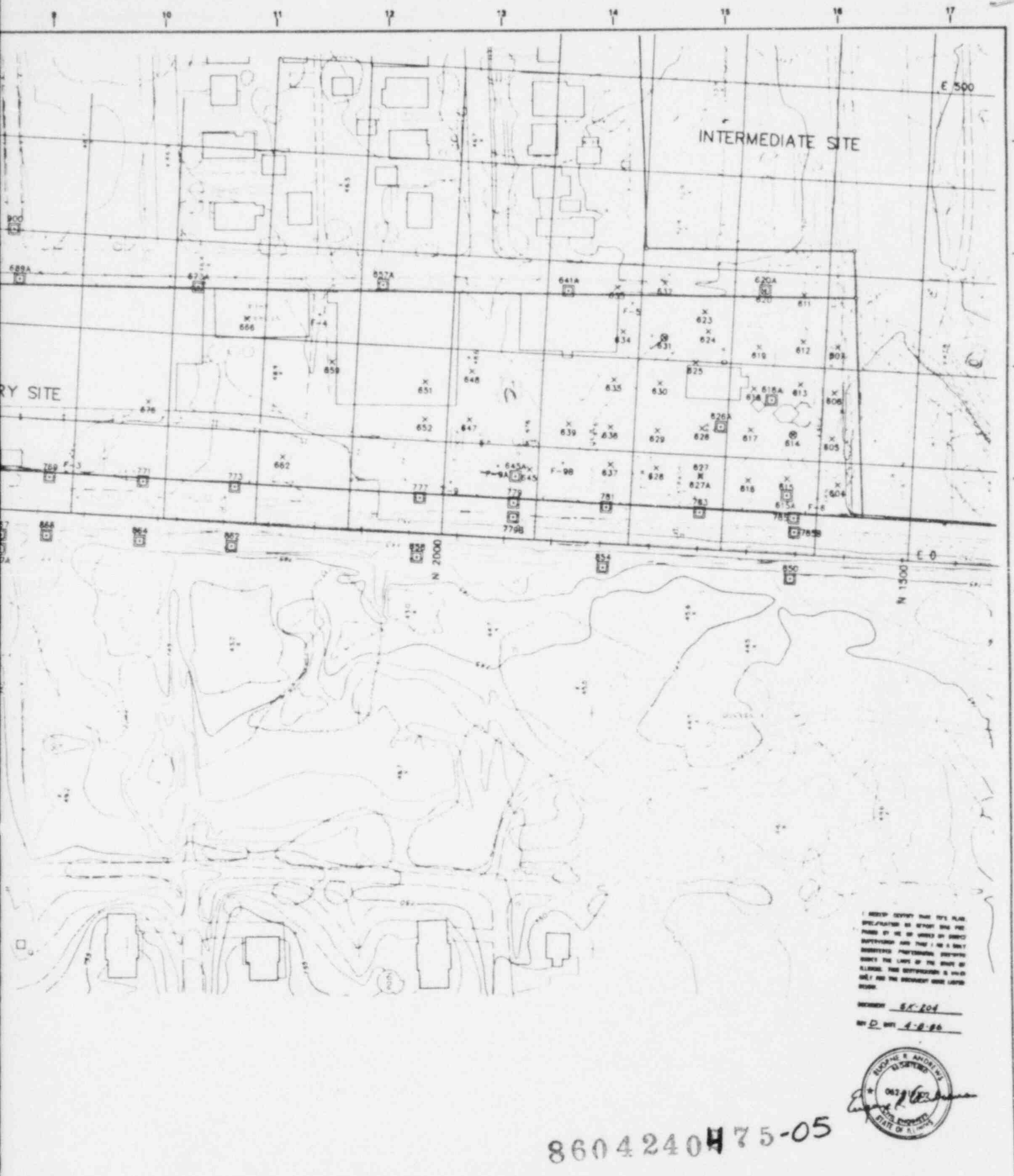
Also Available On
Aperture Card

LEGEND

NOTE: THE FOLLOWING TASK ASSIGNMENTS ARE IN ACCORDANCE WITH TABLE 4 OF THE FIELD INVESTIGATION & LABORATORY TESTING GUIDANCE MANUAL. THIS NOTE DOES NOT APPLY TO WELLS & BORINGS BY THE ILLINOIS STATE AG OFFICE.

- TASK 5, 'F' STRATUM (MAPPING ONLY)
- TASK 5,8,9
- TASK 8 (GEOTECHNICAL)
- TASK 8,9
- TASK 7,9,10 OR 7,9,11
- TASK 5,7,9,10 OR 5,7,9,11
- TASK 5,6,8,9
- TASK 6,8,9
- PREVIOUS INVESTIGATIONS
- PRESSURE METER AND/OR PIEZOMETER
- FROST BORING
- TEST PIT
- PHASE II TASK 8,13 OR 13
- WELLS & BORINGS BY ILLINOIS STATE AG OFFICE
- WELLS & BORINGS ABANDONED BY ILLINOIS STATE AG OFFICE

NO	REVISIONS	DATE	BY	CHD	APPD	NO	REF
B	REVISED SYMBOLS	[illegible]	WAF	RFP	[illegible]		
C	ADDED PHASE II & A.G. HOLES	[illegible]	MAN	RFF	[illegible]		
D	ADDED PE STAMP	[illegible]	ERM	RFP	[illegible]		



8604240475-05

PRINT RECORD				
DATE				
FOR	FA		FA	AP'D
REVISED		B	C	D
CUSTOMER	3		3	3
FIELD				
INTRA CO				
ILL ATTY GEN		6		

ENG. RECORD		
DRAWN	HF	
CHECKED	DB	

DRAWING STATUS

APPROVED FOR CONSTRUCTION: LKS-134

REVISED & APPROVED FOR CONSTRUCTION

WASTE STABILIZATION SITE
CIVIL (GEOTECHNICAL)
FIELD INVESTIGATION
DRILL HOLE LOCATIONS

KERR McGEE CHEMICAL CORPORATION

WEST CHICAGO PROJECT

SCALE 1" = 60'

Stearns Catalytic

DWG NO SK-204

SHEET NO 2 OF 2

ORDER NO C-27972

REV D

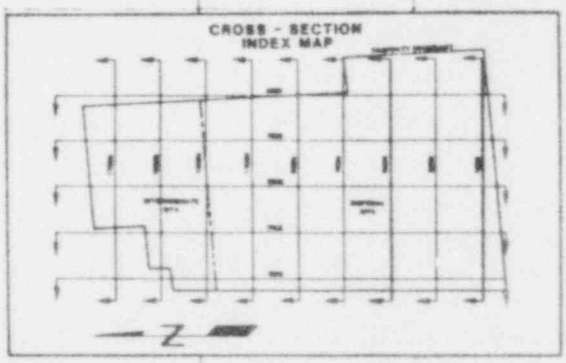
WEST

RAILROAD EMBANKMENT

POND 4

WATER SURFACE

CROSS - SECTION INDEX MAP



WEST

RAILROAD EMBANKMENT

WATER SURFACE

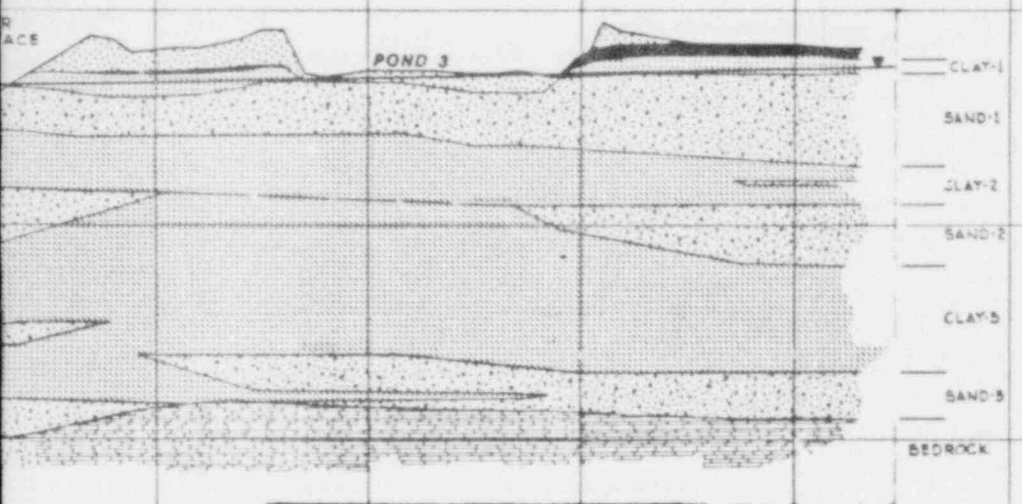
VERTICAL SCALE IN FEET

0 50

HORIZONTAL SCALE IN FEET

0 100 200

REVISIONS						
ADDED PE STAMP						



KING NORTH
500 N

LEGEND

FILL. INCLUDES DISTURBED SOIL, BERM MATERIALS, ROADWAY BASE MATERIALS, POND SEDIMENTS, TAILINGS, SCRAP, AND IN-PLACE CONCRETE PADS.

TOPSOIL, NATIVE UNDISTURBED; LOCATED AT THE SURFACE AND BELOW FILL MATERIALS.

FINE-GRAINED MATERIALS, PREDOMINANTLY CLAY AND SILT SIZED. COMMONLY INCLUDES LAYERS OF FINE-GRAINED SAND AND LATERAL GRADATIONS TO COARSER MATERIALS OVER SHORT LATERAL INTERVALS. INCLUDES, FROM UPPER TO LOWER, THE CL1, CL2 AND CL3 GEOTECHNICAL UNITS.

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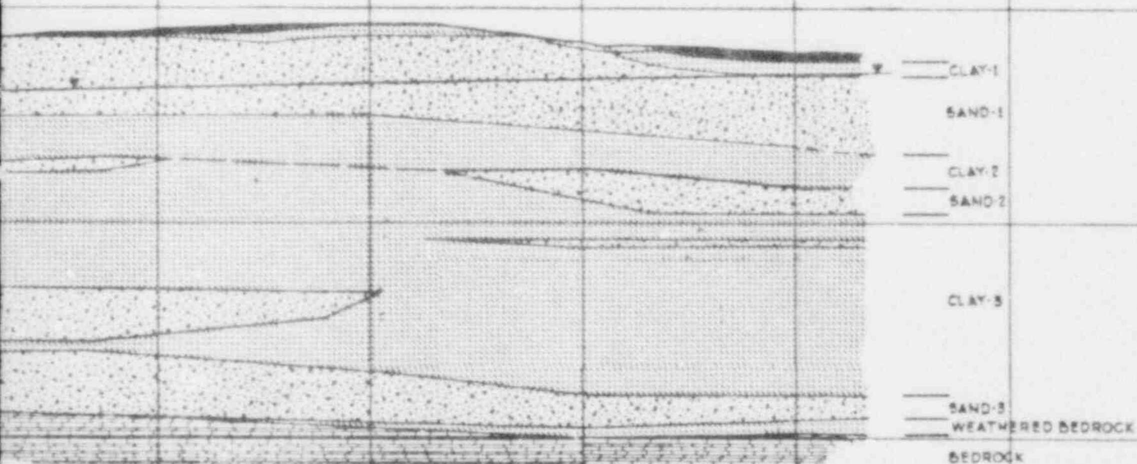
BEDROCK, SILURIAN DOLOMITE.

TI APERTURE CARD

Also Available On Aperture Card



KING NORTH
100 N

600 750 900 1050 1200 1350 1500

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF ILLINOIS. THIS CERTIFICATION IS MADE ONLY FOR THE DOCUMENT HERE NOTED BELOW.

DRAWING SK-301

REV C DATE 4-8-86

EUGENE R. ANDREWS REGISTERED 062-019192 PROFESSIONAL ENGINEER STATE OF ILLINOIS

HIGH WATER SURFACE PER J.L. GRANT & ASSOC., INC.

REFERENCE DRAWINGS	PRINT RECORD					
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ENG. RECORD		
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CHECKED	[illegible]	[illegible]
MECH. CK		
STRUCT. CK		
ELECT. CK		
PIPING CK		
INSTR. CK		
CIVIL CK		

DRAWING STATUS	
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PRELIMINARY	
FOR COMMENTS AND/OR APPROVAL	[illegible]
APPROVED FOR CONSTRUCTION LKS 134	4/8/86
REVISED & APPROVED FOR CONSTRUCTION	

WASTE STABILIZATION SITE
CIVIL
DEEP GEOTECHNICAL CROSS SECTIONS

KERR McGEE CHEMICAL CORPORATION

WEST CHICAGO PROJECT

SCALE AS SHOWN

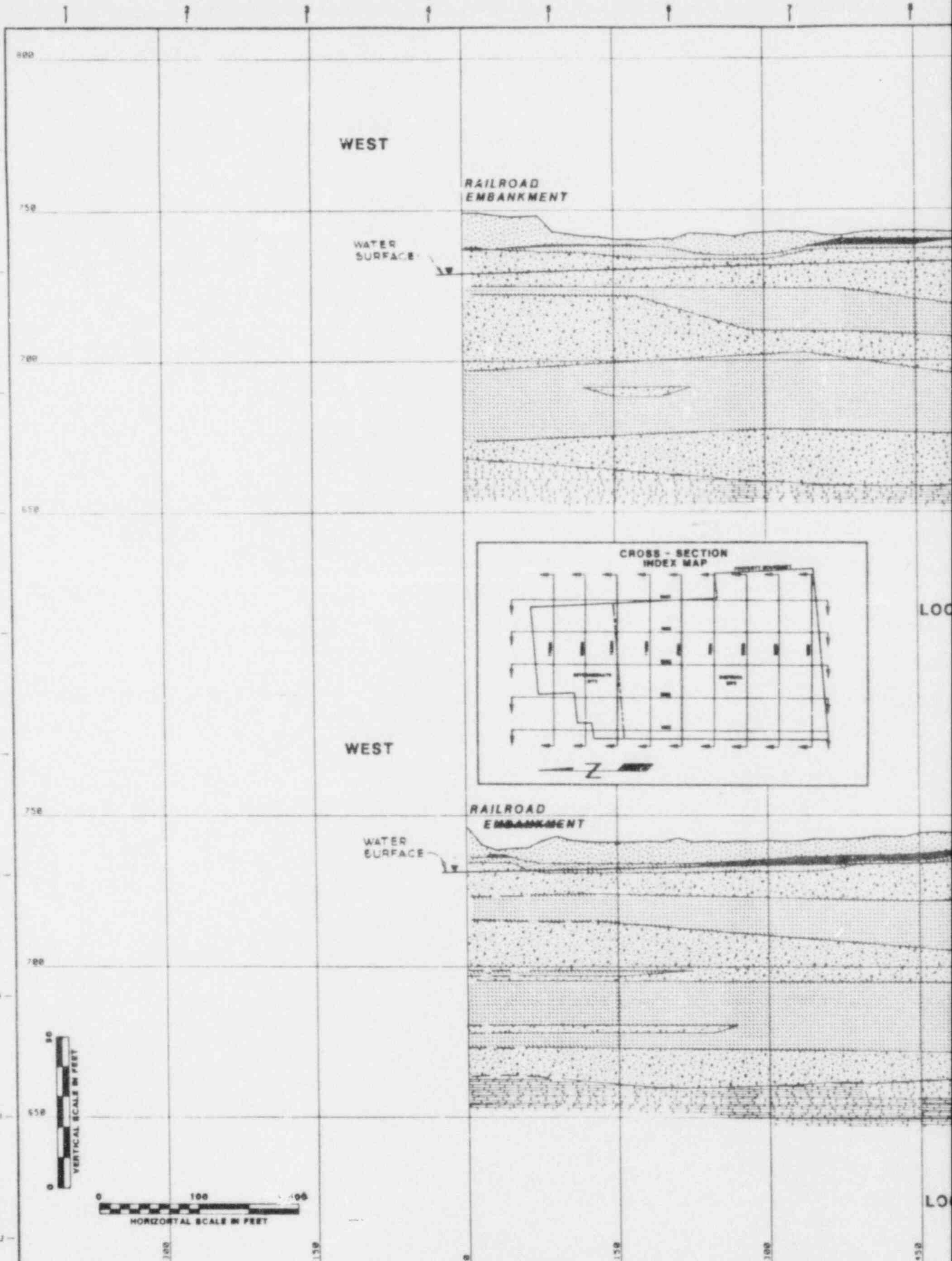
Stearns Catalytic

ORDER NO. C-27979

DWG NO. SK-301

REV. C

8604240475-06



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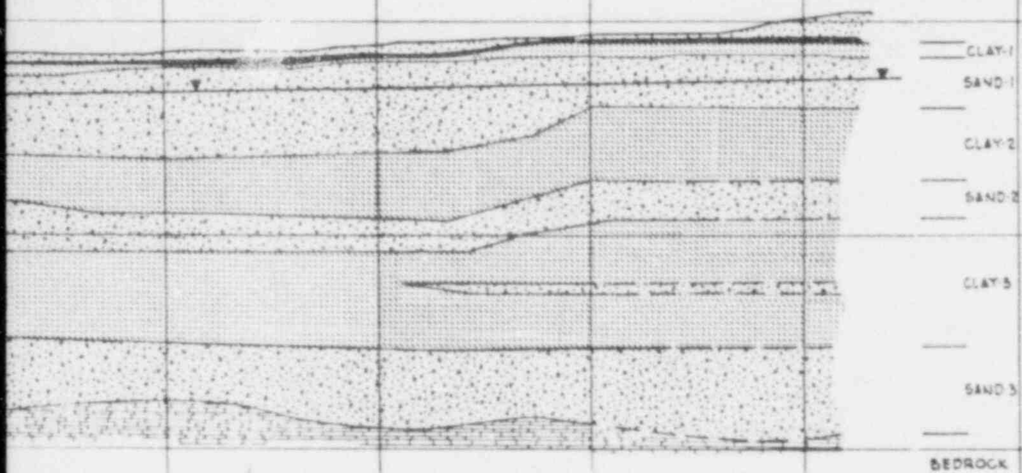

LOOKING NORTH
1300 N

LEGEND

FILL: INCLUDES DISTURBED SOIL, BERM MATERIALS, ROADWAY BASE MATERIALS, POND SEDIMENTS, TAILINGS, SCRAP, AND IN-PLACE CONCRETE PADS.

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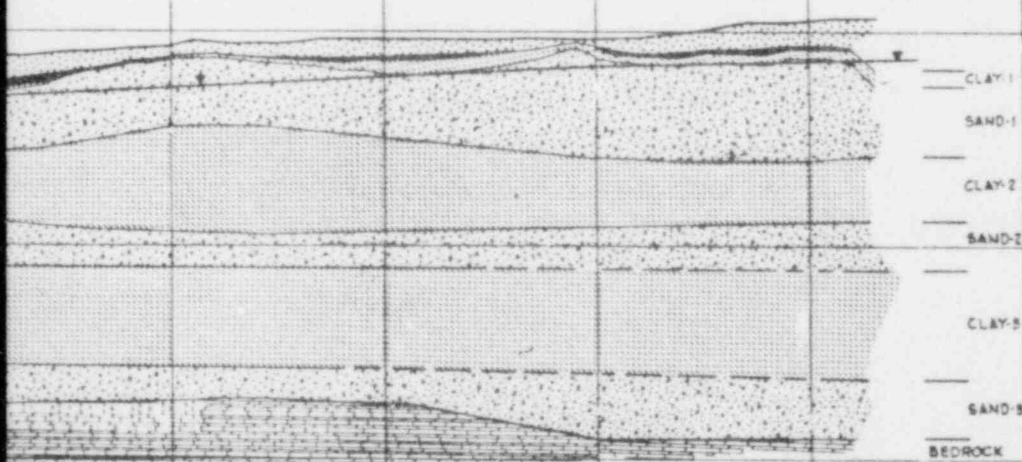
BEDROCK: SILURIAN DOLOMITE.

TI
APERTURE
CARD

Also Available On
Aperture Card

EAST



LOOKING NORTH
900 N

HIGH WATER SURFACE PER
J. L. GRANT & ASSOC., INC.

WASTE STABILIZATION SITE
CIVIL
DEEP GEOTECHNICAL CROSS SECTIONS

KERR McGEE CHEMICAL CORPORATION

WEST CHICAGO PROJECT

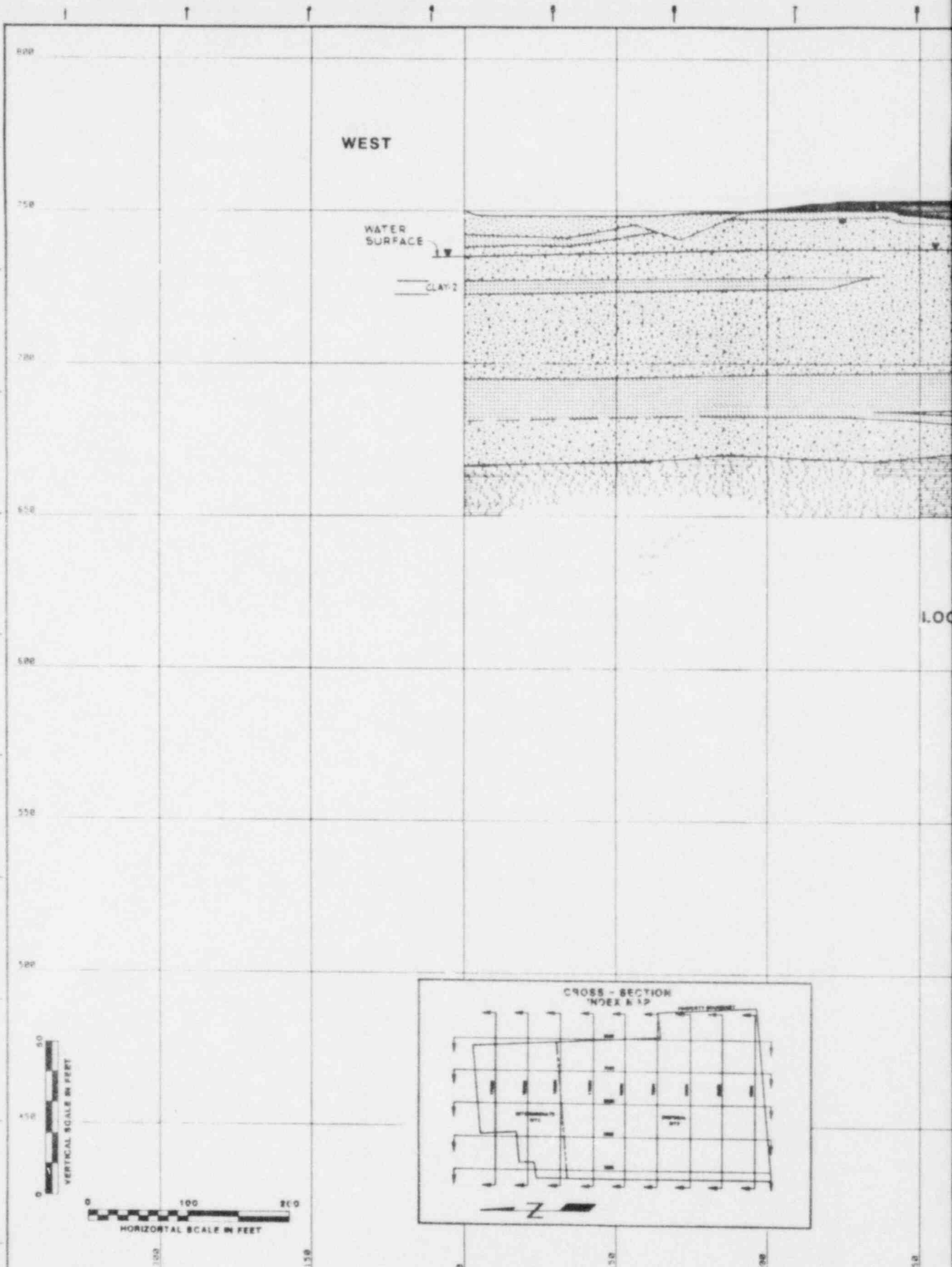
SCALE: AS SHOWN

Stearns Catalytic

ORDER NO. C-27873

REV. C

8604240475-07



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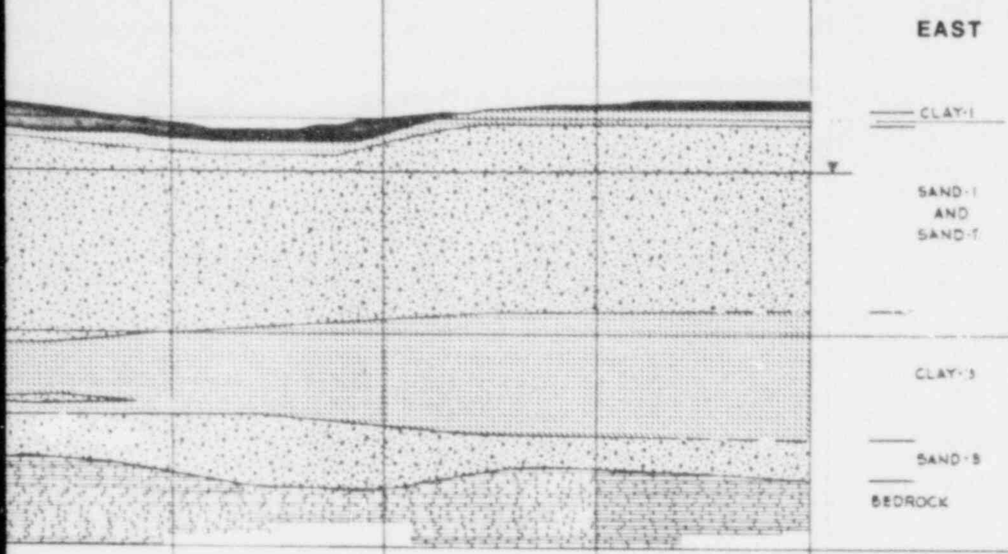

OKING NORTH
1700 N

TI
APERTURE
CARD

Also Available On
Aperture Card

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DOCUMENT: SK-303

REV: C DATE: 4-8-86

EUGENE R. AMDAHL
REGISTERED
062-
PROFESSIONAL ENGINEER
STATE OF ILLINOIS

LEGEND

FILL: INCLUDES DISTURBED SOIL, BERM MATERIALS, ROADWAY BASE MATERIALS, POND SEDIMENTS, TAILINGS, SCRAP, AND IN-PLACE CONCRETE PADS.

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BEDROCK: SILURIAN DOLOMITE

HIGH WATER SURFACE PER J.L. GRANT & ASSOC., INC.

600 750 900 1050 1200 1350 1500

REFERENCE DRAWINGS	PRINT RECORD					
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	FIELD					
	INTRA CO					
	ILL. ATTY GEN.		3		6	

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STRUCT. CK		
ELECT. CK		
PIPING CK		
INSTR. CK		
CIVIL CK		
	EHW	

DRAWING STATUS	
ISSUED	DATE
PRELIMINARY	
FOR COMMENTS AND/OR APPROVAL	
APPROVED FOR CONSTRUCTION	
REVISED & APPROVED FOR CONSTRUCTION	

NOT APPROVED FOR CONSTRUCTION UNLESS SIGNED & DATED. DESTROY ALL PRINTS BEARING EARLIER DATE & OR REVISION NO.

WASTE STABILIZATION SITE
CIVIL
DEEP GEOTECHNICAL CROSS SECTIONS

KERR McGEE CHEMICAL CORPORATION

WEST CHICAGO PROJECT

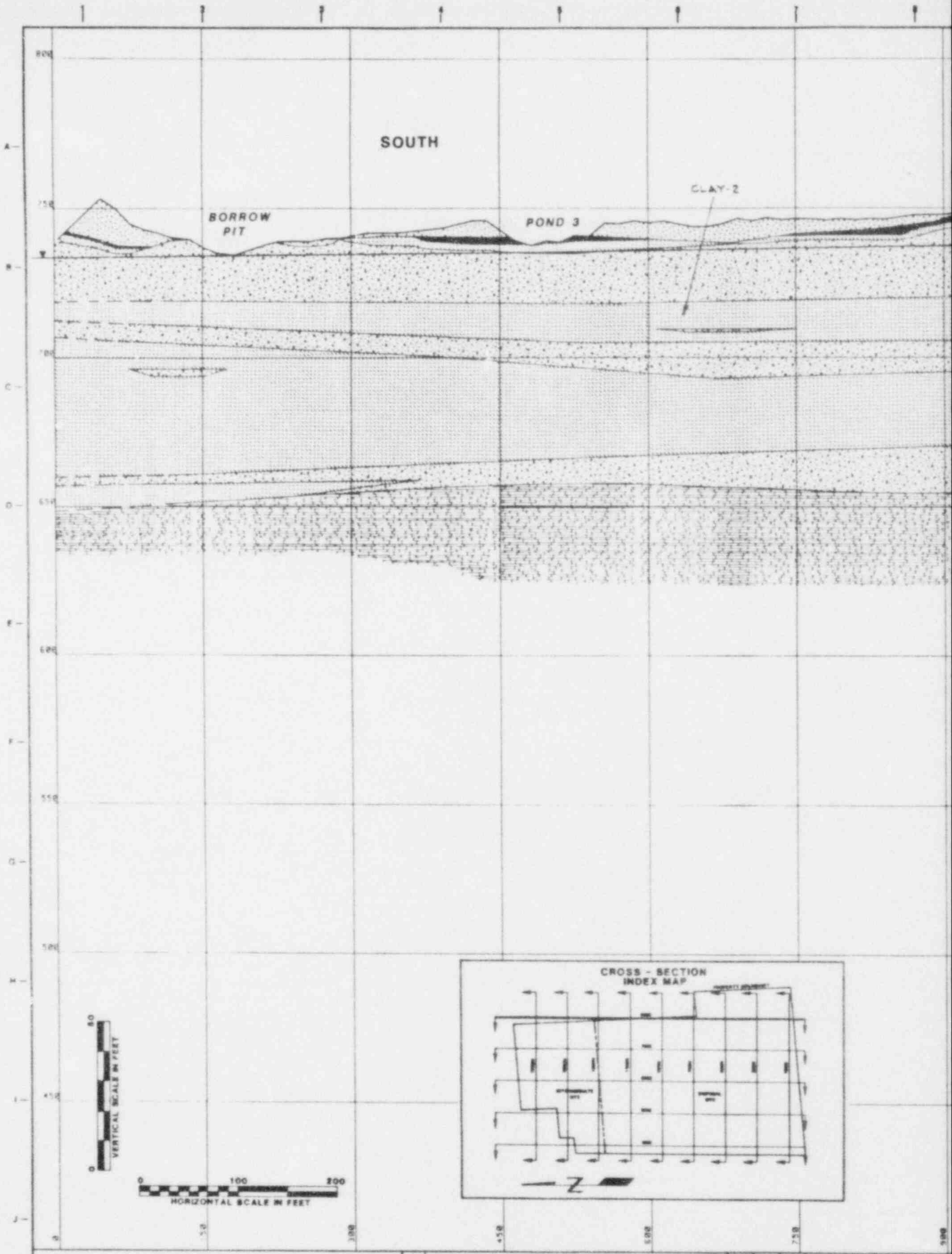
SCALE: AS SHOWN

Stearns Catalytic

DWG NO: SK-303

ORDER NO: C-27072

8604240475-08



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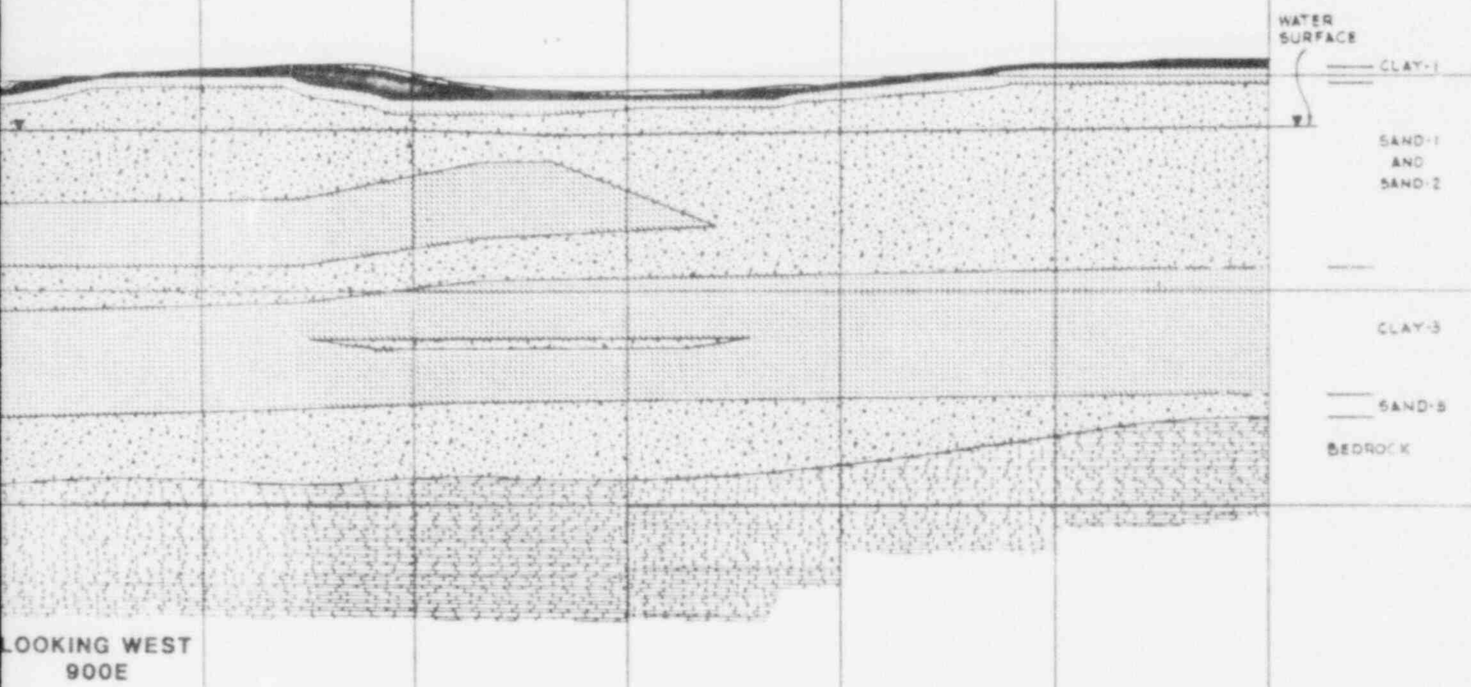

TI APERTURE CARD

Also Available On Aperture Card

LEGEND

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BEDROCK. SILURIAN DOLOMITE.

HIGH WATER SURFACE PER J.L. GRANT & ASSOC., INC.

WASTE STABILIZATION SITE
CIVIL
DEEP GEOTECHNICAL CROSS SECTIONS

KERR McGEE CHEMICAL CORPORATION

WEST CHICAGO PROJECT

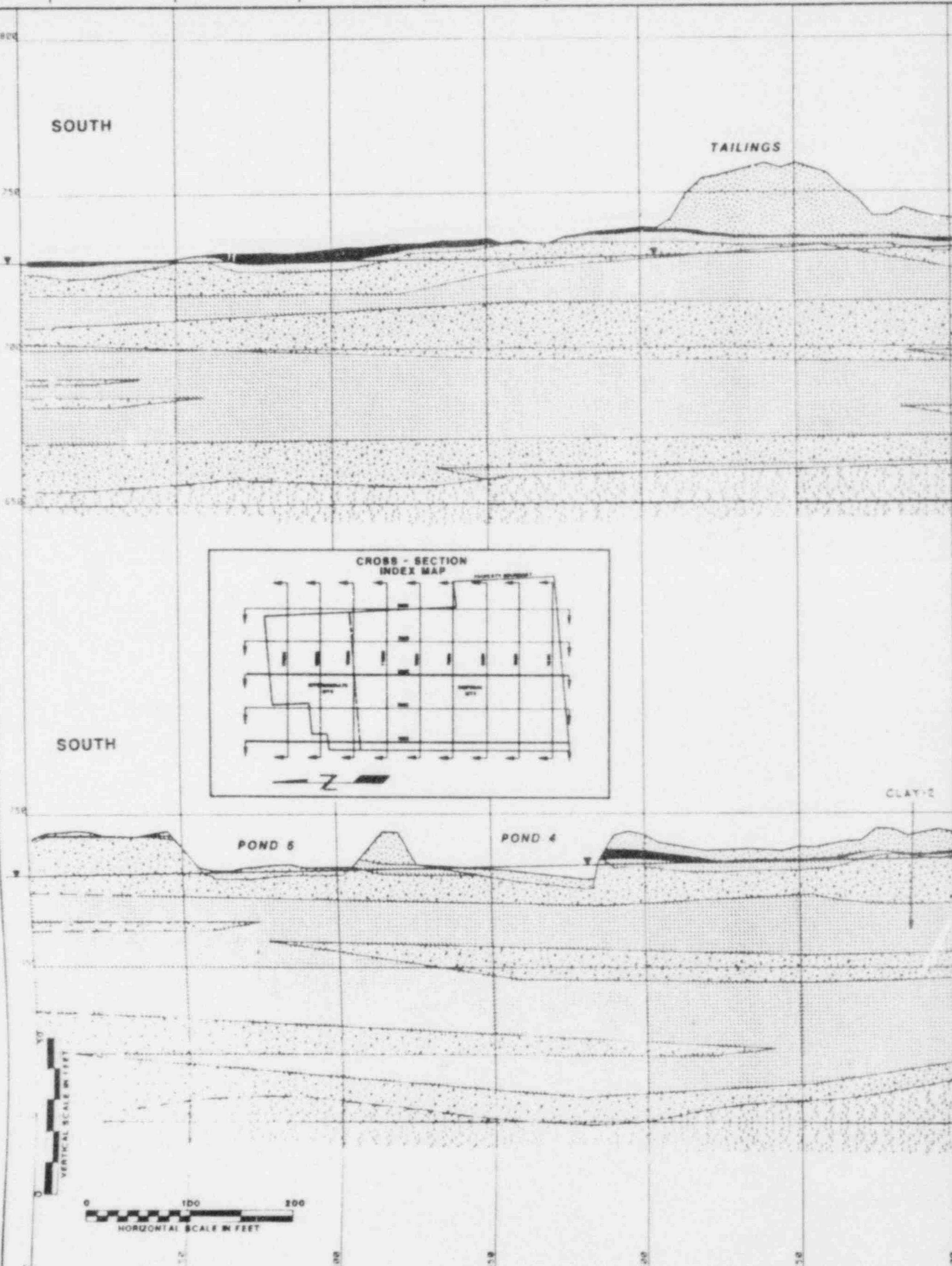
Stearns Catalytic

SCALE: AS SHOWN

ORDER NO. C-27972

DWG NO. SK-004

8604240475-09



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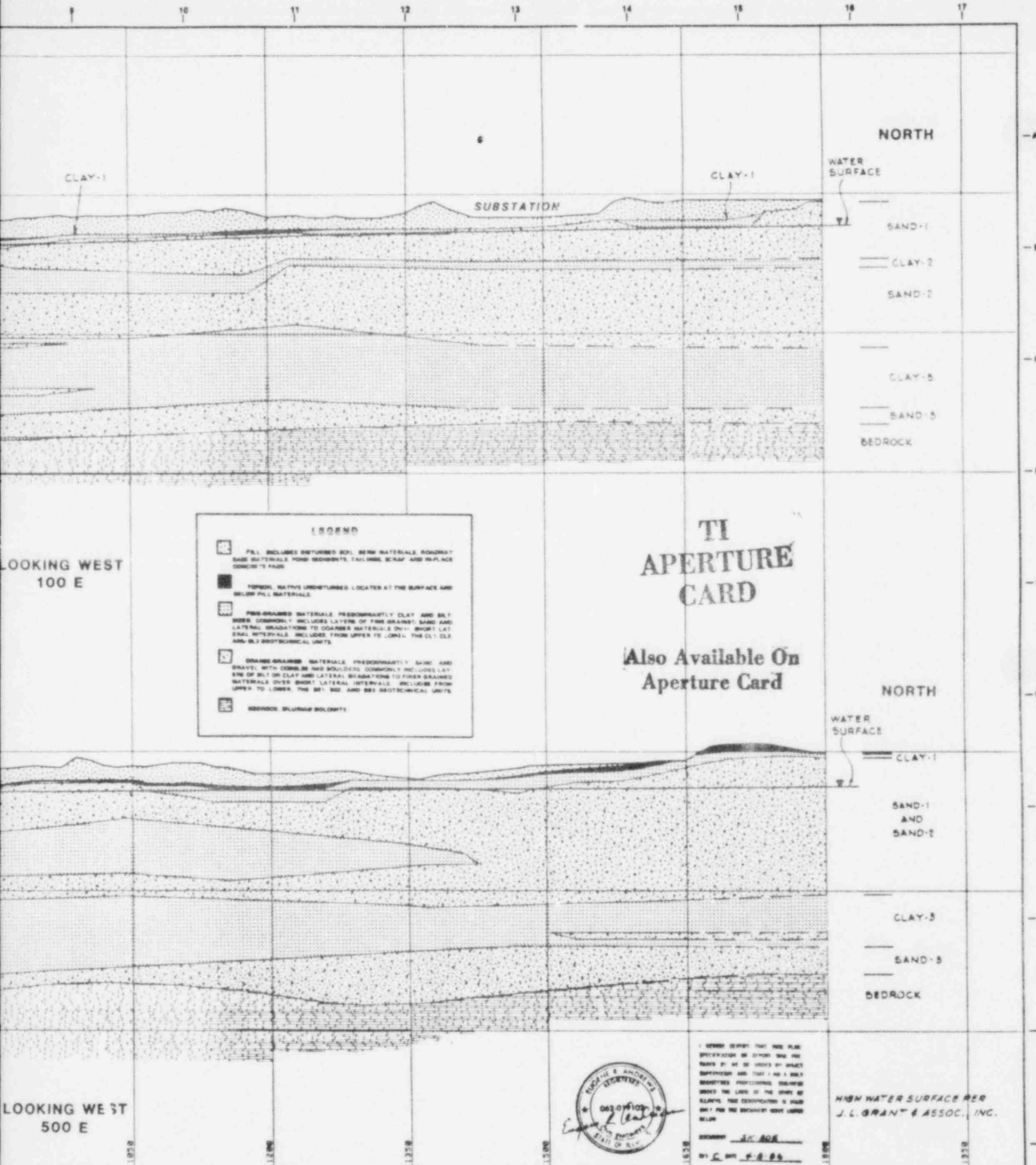


TI APERTURE CARD

Also Available On Aperture Card

REFERENCE DRAWINGS	PRINT RECORD	ENG. RECORD	DRAWING STATUS
	DATE / FOR / REVISED / CUSTOMER / FIELD / INTRA CO. / LL ATTY & RM	DRAWN / CHECKED / MECH. CR / STRUCT. CR / ELECT. CR / PIPING CR / INSTR. CR / CIVIL CR	PRELIMINARY / FOR COMMENTS AND/OR APPROVAL / APPROVED FOR CONSTRUCTION / REVISED & APPROVED FOR CONSTRUCTION

WASTE STABILIZATION SITE
CIVIL
DEEP GEOTECHNICAL CROSS SECTIONS

KERR McGEE CHEMICAL CORPORATION

WEST CHICAGO PROJECT

SCALE		ORDER NO.	DWG NO.	REV
AS SHOWN	Stearns Catalytic	C-27978	SK-808	C

DOCUMENT SK-808

BY C DATE 4-8-86

8604240475-10

WEST

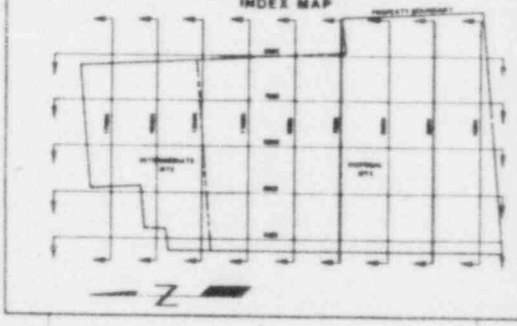
TAILINGS

RAILROAD EMBANKMENT

CLAY-1

LOO

CROSS - SECTION INDEX MAP



WEST

RAILROAD EMBANKMENT

POND 5

CLAY-1

LOO

VERTICAL SCALE IN FEET

0 100 200

HORIZONTAL SCALE IN FEET

REVISIONS	DATE	BY	CHK'D	APP'D	NO.
ADDED PE STAMP					

SOFT SEDIMENT PILE

EAST

KING NORTH
700 N

LEGEND

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BEDROCK: SILURIAN DOLOMITE

EAST

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Also Available On Aperture Card

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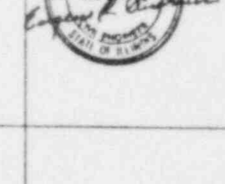
DOCUMENT SK-306

REV C DATE 4-8-86



BORROW PIT

KING NORTH
300 N

600 | 750 | 900 | 1050 | 1200 | 1350 | 1500

REFERENCE DRAWINGS	PRINT RECORD					
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	FIELD					
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ENG. RECORD		
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ELECT CK		
PIPING CK		
INSTR CK		
CIVIL CK		

DRAWING STATUS	
ISSUED	DATE
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FOR COMMENTS AND/OR APPROVAL	
APPROVED FOR CONSTRUCTION	
CKS-184	
REVISED & APPROVED FOR CONSTRUCTION	

WASTE STABILIZATION SITE
CIVIL
SHALLOW GEOTECHNICAL CROSS SECTIONS

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT

SCALE AS SHOWN

Stearns Catalytic

ORDER NO. C-37072

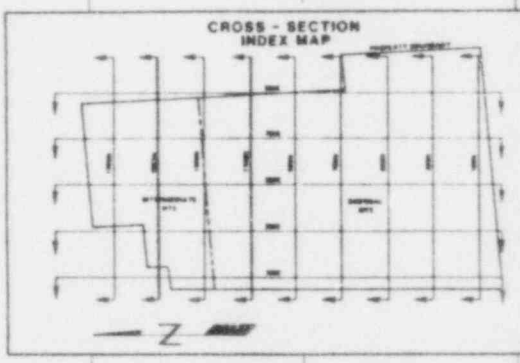
DWG. NO. SK-306

8604240475-11

WEST

RAILROAD EMBANKMENT

CROSS - SECTION INDEX MAP



WEST

RAILROAD EMBANKMENT

POND 2

CLAY-1

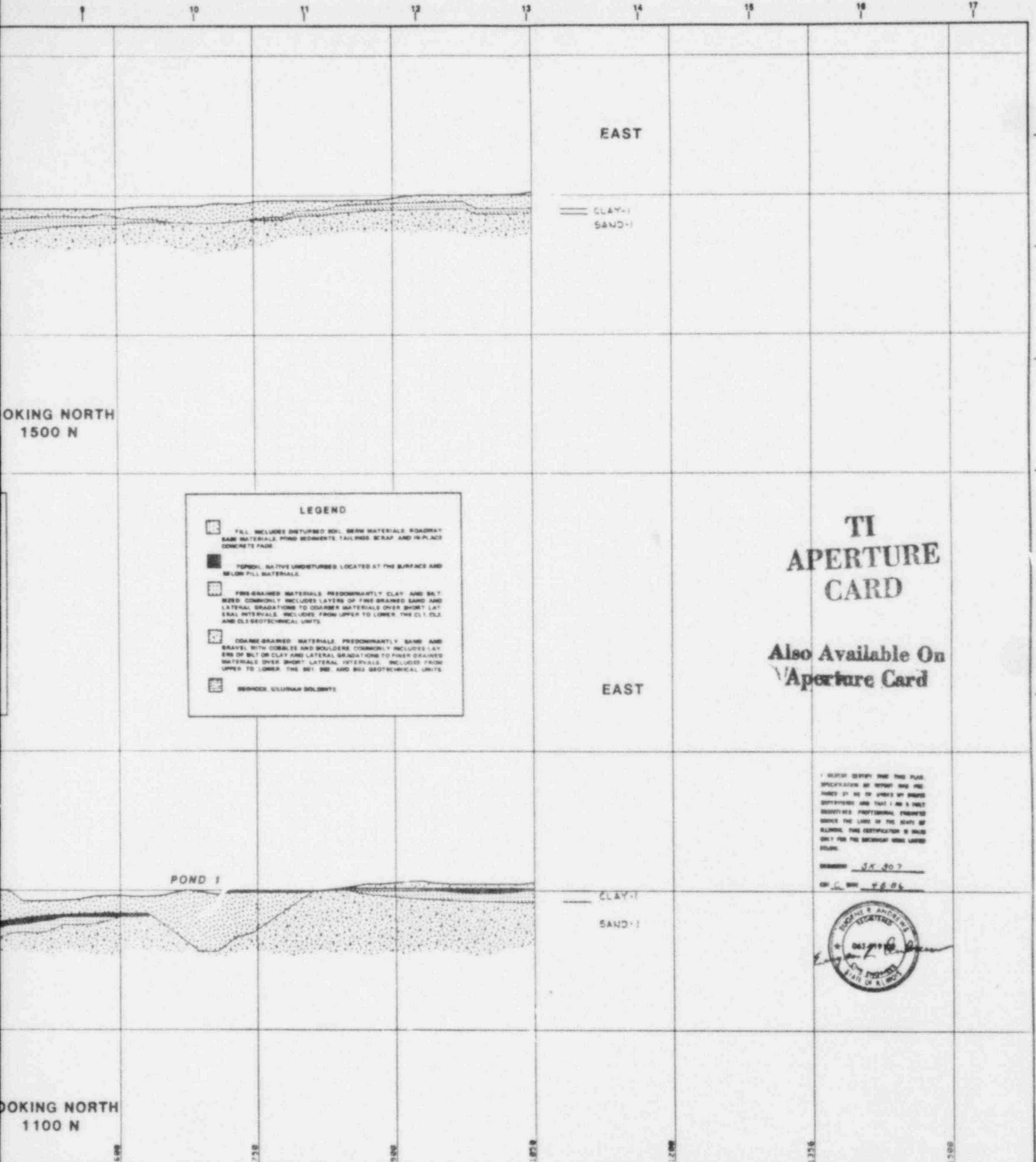
VERTICAL SCALE IN FEET

0 50

HORIZONTAL SCALE IN FEET

0 100 200

NO	REVISIONS	DATE	BY	CHKD	APP'D	NO
C	ADDED P.E. STAMP	9/86	ERH	PFP		



9
10
11
12
13
14
15
16
17
EAST
CLAY-I
SAND-I
OKING NORTH
1500 N
LEGEND
FILL: INCLUDES DISTURBED SOIL, BERM MATERIALS, ROADWAY BASE MATERIALS, POND SEDIMENTS, TAILINGS, SCRAP, AND IN-PLACE CONCRETE PADS.
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BEDROCK: SILURIAN DOLOMITE
EAST
TI
APERTURE
CARD
Also Available On
Aperture Card
POND 1
CLAY-I
SAND-I
SK-307
OKING NORTH
1100 N

REFERENCE DRAWINGS	PRINT RECORD					
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	FIELD					
	INTRA CO					
	ILL ATT GEN		3		4	

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ELECT. CK		
PIPING CK		
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CIVIL CK		
	EHW	

DRAWING STATUS	
ISSUED	DATE
PRELIMINARY	
FOR COMMENTS AND/OR APPROVAL	
APPROVED FOR CONSTRUCTION LKS-134	4/8/86
REVISED & APPROVED FOR CONSTRUCTION	

NOT APPROVED FOR CONSTRUCTION UNLESS SIGNED & DATED. DESTROY ALL PRINTS BEARING EARLIER DATE & OR REVISION NO.

WASTE STABILIZATION SITE
CIVIL
SHALLOW GEOTECHNICAL CROSS SECTIONS

KERR McGEE CHEMICAL CORPORATION

WEST CHICAGO PROJECT

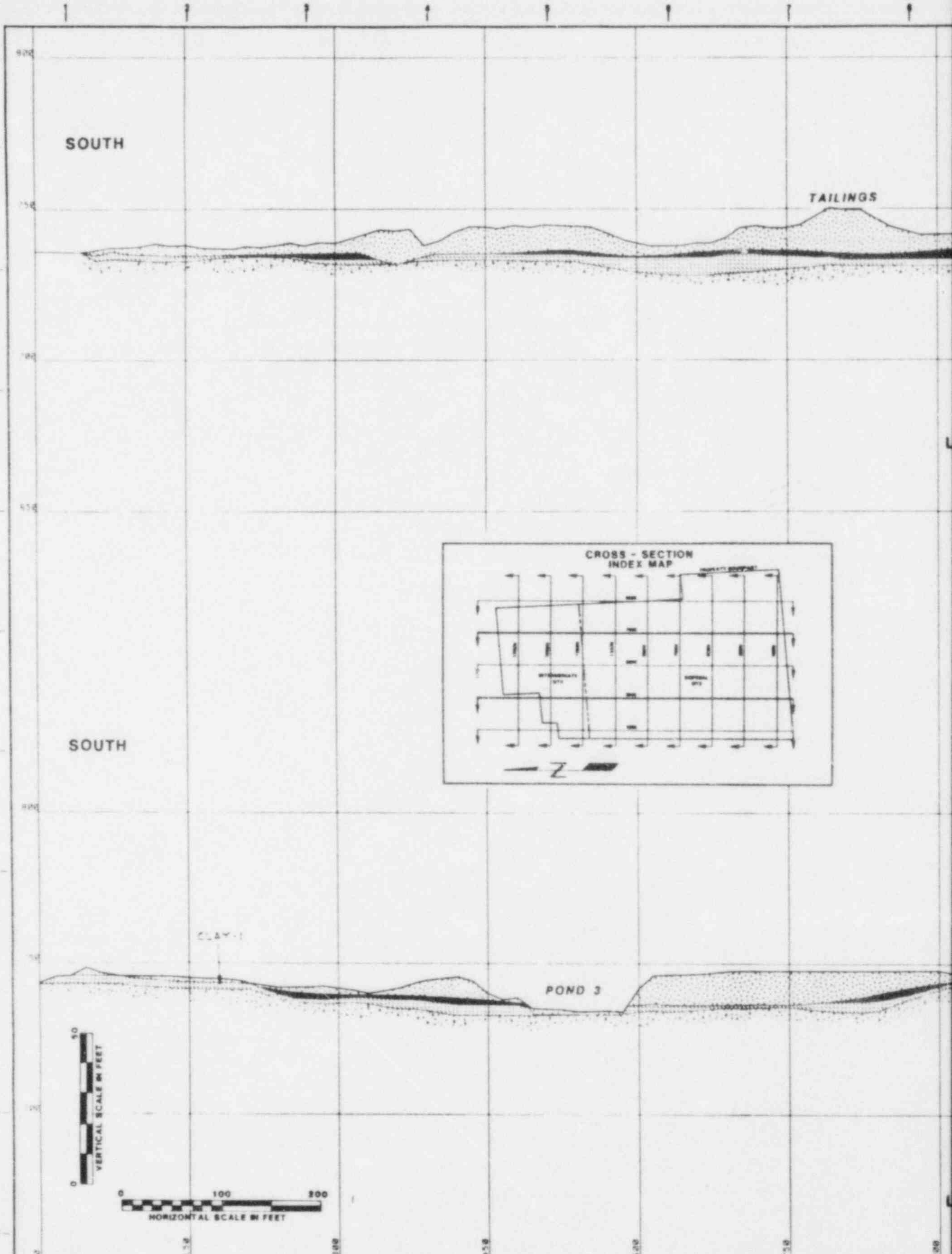
SCALE: AS SHOWN

Stearns Catalytic

ORDER NO. C-27972

DWG NO. SK-307

8604240475-12



NO	REVISIONS	DATE	BY	CH'D	APP'D
C	ADDED P.E. STAMP	[illegible]	EPA	RFP	[illegible]

OOKING WEST
300 E

LEGEND

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BEDROCK. SILURIAN DOLOMITE.

TI
APERTURE
CARD

Also Available On
Aperture Card

OOKING WEST
700 E

DRAWING SK-308
REV C DATE 8-8-86

WASTE STABILIZATION SITE
CIVIL
SHALLOW GEOTECHNICAL CROSS SECTIONS

KERR McGEE CHEMICAL CORPORATION

WEST CHICAGO PROJECT

SCALE: AS SHOWN

Stearns Catalytic

ORDER NO C-27872

DWG. NO SK-308

8604240475 -13

3.7 COMPOSITE GEOTECHNICAL LOGS

The composite geotechnical logs contain information on soil sampling and identification, geologic strata, field and laboratory tests, and general subsurface conditions. The following sections provide definitions and clarifications for nomenclature used on the logs.

Parentheses - The parentheses that enclose symbols in the (USC) column of the geotechnical portion of the composite log indicate that the soil sample was identified on the basis of Description of Soils, Visual-Manual Procedure (ASTM D-2488), and on the field drillhole log. Where the USC symbol is shown without parentheses, the soil sample was identified on the basis of Classification of Soils for Engineering Purposes (ASTM D-2487), which includes laboratory test results and visual identification.

Blow Count and Sampler Push Pressure - In the first column under FIELD DATA, headed BLOW CT. or PSI, the units are:

BLOW CT. The blow count is the number of blows (N) required to drive a 2-inch O.D. sample tube 12 inches. For example, 33 blows/12 inches, or as shown on the composite logs, 33/12. These tests were performed in accordance with Penetration Test and Split Barrel Sampling of Soils (ASTM D-1586).

PSI Pressure, in pounds per square inch, required to push a 3-inch O.D. thin-wall steel sample tube through the sample interval; in accordance with Thin-Walled Tube Sampling of Soils (ASTM D-1587).

Torvane and Penetrometer Tests - Torvane and penetrometer strength tests are shown under FIELD DATA. The torvane test measures shear strength, and the penetrometer measures unconfined compressive strength.

Order of Samples - On the composite log for Drillhole 513, samples appear to be out of order; that is, Sample 8 is posted between Samples 3 and 4. This is because the sampled interval between Samples 3 and 4 was lost during drilling. The hole was redrilled at an offset distance of less than 10 feet. The second drillhole was sampled within the same interval where the samples were lost in the first drillhole. That sample was numbered Sample 8. Sample 8 is shown in its correct position on the composite log for Drillhole 513.

Soil Type Changes - The change in major and minor soil types are shown on the graphic log with horizontal lines, or without lines where change is gradational. The horizontal lines on the graphic log that extend to the right, through the narrative description portion of the log, are for major soil type changes. Minor soil type changes are shown as gradational, without lines, or as noted in the soil description.

Static Water Level - The "S.W.L." posted at the end of each composite log under the description column, refers to static water level. The static water level is the water level measured in the drillhole on the date indicated. The S.W.L. values are posted with reference to measurement from ground level.

Caving - Caving of a drillhole is indicated at the bottom of the log. Caving is the collapse of the drillhole walls.

Maximum Particle Size - Maximum particle sizes are shown in parentheses in the gravel or cobble columns. These estimated dimensions are for large particles found in the sample. The units shown on the logs are in inches.

Other Notations Used - Definitions of other notations and abbreviations used on the composite logs are given as follow:

Cc	Virgin Compression Index for consolidation test
Em	Shear Moduli for pressuremeter tests
Eu	Undrained Soil Modulus
Pc (CONSOL.)	Preconsolidation Pressure in ksf for consolidation test
Pl	Limit Pressure for pressuremeter tests
USC	Unified Soil Classification
Cr	Recompression Index for consolidation test
Ø,C	Friction Angle and Cohesion for total stress conditions
Ø',C'	Friction Angle and Cohesion for effective stress conditions
DIST.	Disturbed Sample - soil sample disturbed by consolidation test or extrusion
UNDIST.	Undisturbed Sample - all soil sample undisturbed except as noted on test record
SLOUGH	Loose cuttings, soil of undefined source, or crushed cobble if blow count is very high for gravelly soils at corresponding depths
LL	Liquid Limit in percent water content
PL	Plastic Limit in percent water content
PI	Plasticity Index in percent water content
PCF	Density in pounds per cubic foot
KSF	Pressure in thousands (K) of pounds per square foot
KSC	Pressure in kilograms per square centimeter (1 KSC = 2.048 KSF)
NP	Not plastic
NA	Not available.

DH27-1

GEOTECHNICAL LOG

Sheet 1 of 3

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM ①	USC	FIELD DATA: BLOW CT. (N) OR PSI	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER P_L (KSF)	PRESS. METER E_M (KSF)
1	STU				FILL, SANDY CLAY, CL-CH, YELLOWISH BROWN, 10YR 5/4, MOIST, VERY STIFF - SOME ORGANIC CLAY, OH, TOPSOIL, DARK RED BROWN, 5YR 3/2, MOIST, VERY STIFF.	FILL	CL-CH	300	4.2			
2	SSA				... BECOMES SILTY GRAVEL, MOTTLED BROWN 10YR 4/3, MOIST, MED. DENSE.		(OH)	24/12				
			5'		5.0							
3	STU				SILTY CLAY, CL, MOTTLED BROWN 10YR 4/3, MOIST, HARD.	F	CL	700	9.0			
					6.9							
4	SSA				CLAYEY GRAVEL, GC-SC, LITTLE SAND, DARK GRAYISH BROWN 10YR 4/2 TO DARK YELLOW BROWN 10YR 4/6, WET, DENSE.	E	(CL) (GC)	22/12	4.0			
5	ST		9.0 ▼				SC	1200				
6	SSA		10'				(SC)	40/12				
7	SSA				... GRADING TO SAND, SW-SM, CLEAN SAND AND SILTY SAND LAYERS, LIGHT GREY 5Y 6/1, SATURATED, MEDIUM DENSE.		(SW-SM)	40/12				
8	SSA						(SW)	27/12			48.6	398
9	J		15'		15.0		-	15/12				
10	ST				CLAYEY SILT, ML-CL, TRACE SAND, GRAY TO DARK GRAY 10YR 4/1 - 5/1, SATURATED, STIFF TO VERY STIFF, INTER-BEDDED CLAY LAYERS.	D	CL	650	2.1	2.0		
11	SSA						(ML)	28/12		2.0		
			20'		19.5							
12	STU				... BECOMES SILTY CLAY, CL, TRACE GRAVEL & SAND WITH OCCASIONAL COBBLES, GRAY 2.5Y 5/1.		CL	675	9.0	2.0	23.8	272
13	SSA						(CL)	75/12	3.2			
14	SSA				... BECOMES SANDY CL[illegible], SOME SILT, DARK GRAY 5Y 4/1.		(CL)	20/12	4.2			
15	SSA		25'				(SC-CL)	12/12	3.6			
					26.7							
16	SSA				SILTY SAND, SM, FINE, SOME SILT, POORLY GRADED, GRAY 5Y 5/1, MOIST, DENSE.		(CL) SM	45/12				
17	SSA				... BECOMES SAND AND GRAVEL, SW-SM, POORLY GRADED, VERY DENSE.		(ML) (SW-SM)	67/12				
					29.6							
18	SSA		30'		SILTY CLAY, CL, TRACE GRAVEL, TRACE SAND, GRAY 10YR 5/1, MOIST, HARD.		(SW-SM) (CL)	31/12	8.5			
					32.0							
19	SSA				SANDY SILT, ML, TRACE CLAY, LOW PLASTICITY, GRAY 10YR 5/1, SATURATED, LAMINATIONS OF FINE SAND, CARBONATES, VERY STIFF.	C	(ML)	70/12	6.5	5.0		
20	SSA		35'				ML	51/12	6.0		43.4	458

FORM F042685

LABORATORY DATA ③

(%) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
18.3	103	2.70	50	23	27	0	2 (3/4")	12	47	39	1×10^{-8} 6×10^{-9} REMOLDED		P_c = 4.8 KSC Cc = 0.240 Cr = 0.024
21.7							(1/2")					TCUM	TIP OF SHELBY TUBE BENT ON SAMPLE 3
22.1	101.0	2.66	42	23	19		27	21	30	22	7×10^{-9} 3×10^{-8}	ϕ = 17.9° ϕ' = 34.2° C = 0.06 KSC C' = 0.03 KSC	CONSOL. Pc = 4.8 KSC Cc = 0.195 Cr = 0.020
25.7													
15.2		2.78	29	16	13		27 (2")	33	29	11			BENT TUBE DISTURBED SAMPLE
8.0							(1-1/2")						
12.8							(1")						PRESSURE METER TEST 11.0 - 13.5 FT.
10.9							(1-1/8")						
14.0						(+12")							ENTIRE SAMPLE IS SLOUGH
16.2		2.73	24	13	11	(+3")	1	8	50	41			
21.7						(+3")							PRESSURE METER TEST 19.5 - 22.0 FT.
17.8	110	2.75	28	18	10	(+3")	2 (1-1/2")	4	44	50	2×10^{-8} REMOLDED		CONSOL. Pc = 4.8 KSC Cc = 0.112 Cr = 0.0??
20.1						(+3")							COBBLE
14.3						(+3")							
11.3						(+3")							
15.5		2.73	14	12	2		3	60 (1-1/2")	30	7			
11.8								(1-1/2")					
13.7								(1-1/4")					
17.3							(+12")						NO SAMPLE RECOVERED - COBBLES
17.3								(FINE)					
17.7		–	19	21	NP		0	19 (FINE)	75	6			PRESSURE METER TEST 34.5 - 37.0 FT.

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (HIGH ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (HIGH ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. UNCONFINED COMPRESSION
- T.C.U. TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = [illegible]
- DOLO[illegible] (BEDROCK)
- WATER-TA[illegible] (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 11-15-84 TO 11-20-84
COORDINATES N 124 E 323
GROUND ELEV. 739.9

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 27

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV.	
CHK'D. BY: REP	DATE: 10-1-85		
APP'D. BY: EHW	SHT. NO. 1 OF 3		
ORDER NO. 27972	Stearns Catalytic	DWG. NO.	

11/AT

DH27-2

GEOTECHNICAL LOG

Sheet 2 of 3

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM (1)	USC	FIELD DATA: BLOW CT. (N) OR PSI	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER P_L (KSF)	PRESS. METER E_M (KSF)
21	SSA				SANDY SILT (CONT'D) . . . WET.		(ML)	45/12			43.4	458
22	SSA						ML	51/12				
23	SSA					C	(ML)	49/12				
24	SSA		40'				(ML)	42/12				
25	SSA						(ML)	63/12				
26	J		42.5		SILTY CLAY, CL, TRACE SAND, TRACE GRAVEL, DARK GRAY 10YR 4/1, MOIST, HARD.		–	42/12				
27	ST		45'				(CL)	700	8.0	5.0		
28	J				. . . BECOMES VERY STIFF AT 46.5 FEET.		(CL)	32/12				
29	J		50'			B	(CL)	NR			27.4	364
30	SSA				. . . BOULDERS @ 52'.		(CL)	150/3				
31	ST				. . . BECOMES VERY HARD AT 52.0 FEET.		CL	1200	2.4			
							CL ML	61/12				
32	SSA		55'				(CL) (ML)	61/12	2.9			
33	SSA		55.5		SILTY SAND, SM, SOME SILT, LITTLE GRAVEL, LITTLE CLAY, POORLY GRADED, LIGHT BROWN GRAY 2.5Y 6/2, SATURATED, DENSE.		(GM) (SM)	105/12				
34	SSA				. . . COBBLES @ 56.5 FT.		(SM-ML)	28/12	7.0			
35	SSA		60'		. . . BECOMES GRAYISH BROWN 10YR 5/2. . . . BECOMES DENSE AT 59 FEET.		(SM)	47/12	7.0			
							–	32/12				
36	SSA						(SM)	26/12	6.0			
37	J		65'				(SM)	700	7.0			
38	SSA						(SM)	29/12	7.0			
39	ST		70'		. . . GRADES TO SILTY CLAY, CL, 67.5 FT., TO 70.0 FT., SOME SAND, LITTLE GRAVEL, GRAY 10YR 5/1, MOIST, VERY STIFF.		(SC-SM)	300 1200	6.0			

FORM F042685

LABORATORY DATA ③

(%) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
19.5								(FINE)					PRESSURE METER TEST 34.5 - 37.0 FT.
18.3		2.76	20	22	NP		0	16 (FINE)	76	8			
20.0								(MED)					
20.1								(FINE)					
17.5							(1/4")						
18.0							(1/2")						ENTIRE SAMPLE SLOUGH
16.3		2.76	24	14	10		25	24	27	24			
14.3													MUCH SLOUGH
20.5													BENT TUBE PRESSURE METER TEST 47.5 - 50.0 FT. MUCH SLOUGH
													CASING ADVANCED TO 47.5 FT.
12.0		2.72	22	12	10		10	27	27	36			REFUSAL
NR													TUBE BENT
10.3							(1-1/4")						
9.3						(+3")							
8.2							(1-1/4")						
9.5													
8.3							(1")						
11.5						(3")							TUBE BENT
8.8													
11.7		2.74	16	12	4		17 1-1/8"	56	13	14			BENT TUBE SAMPLE DISTURBED DURING EXTRUSTION

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (HIGH ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (HIGH ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) W = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 11-15-84 TO 11-20-84
COORDINATES N 124 E 323
GROUND ELEV. 739.9

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 27

DRAWN BY MPW/WP	SCALE: 1" = 4'	REV. 1
CHK'D. BY RFP	DATE: 10-1-85	
APP'D. BY EHN	SHT. NO. 2 OF 3	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH27-3

GEOTECHNICAL LOG

Sheet 3 of 3

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM (1)	USC	FIELD DATA: BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER P_L (KSF)	PRESS. METER EM (KSF)
40	J				SILTY SAND, (CONT'D) MEDIUM DENSE AT 70.0 FEET.	B	(SM)	46/12				
41	SSA						(SM)	26/12	6.2			
			73.3		... LAYER OF SILTY CLAY, CL, 73.0 TO 73.3.							
42	SSA				SILTY GRAVEL AND SAND, GM-SM, LITTLE SILT, WELL GRADED, CARBONATE GRAYISH BROWN 10YR 5/2, SATURATED, EXTREMELY DENSE...	A	(CL) (GM)	76/12				
			75'		... BOULDERS @ 74.5 FT.							
43	SSA				... LAYER OF SILTY FINE SAND, SP-SM, 76.2 FT. TO 78.0 FT.		(SM) (SP-SM)	122/12				
44	SSA						(SP-SM)	140/6"				
45	SSA				... COARSE GRAVEL AND COBBLES 78.0 TO 85.4 FT. LIGHT GRAY 10YR 7/1, VERY DENSE.		(GM)	74/12				
			80'									
46	SSA						(SM)	47/12				
47	SSA				... BECOMES VERY DENSE AT 81.0 FEET.		(GM)	72/12				
48	SSA						(GM)	69/12				
49	SSA		84.5				(GM)	100/0				
			85'		BEDROCK, DOLOMITIC LIMESTONE, WEATHERED, YELLOWISH BROWN.	R						
50	J							NR				
								100/0"				
			90'		TOTAL DEPTH = 86.5 FEET			NEARBY "E" STRATUM WELL B-12 SWL SLOTTED CASING FROM 5.8 FT. TO 20.7				

4" STEEL CASING TO 47.5 FT.
NO CAVING OR SWL RECORDS AVAILABLE

SAMPLES COLLECTED

SSA	35
ST	5
STU	3
J	7
TOTAL	50

FORM F042685

LABORATORY DATA ③

(3) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY (2)	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
14.2							(1")						
12.5							(3/4")						
10.7							(3/8") (1-1/2")						
													DRILL-NO SAMPLE
7.1					NP		17 (1-1/4")	68	13	2			
16.4									(FINE)				
8.8							(+1-1/2")						ROCK FRAGMENTED
7.8							(+1-1/2") 30	39	31				ROCK FRAGMENTED
9.8							(+1-1/2")						ROCK FRAGMENTED
9.0							(+1-1/2")						ROCK FRAGMENTED
8.7							(+1-1/2")						ROCK FRAGMENTED
													DRILL CUTTINGS
10.75 T.													REFUSAL

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 11-15-84 TO 11-20-84
COORDINATES N 124 E 323
GROUND ELEV. 739.9

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 27

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 3 OF 3	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH134-1

GEOTECHNICAL LOG

Sheet 1 of 3

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM ①	USC	FIELD DATA: BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER P_L (KSF)	PRESS. METER E_M (KSF)
1	STU				FILL, SILTY GRAVEL, GW-GP, POORLY GRADED, SOME SAND, LITTLE CLAY, YELLOWISH BROWN, 10YR 5/6, DRY TO WET, LOOSE, STRATIFIED.	FILL	GP GM	300				
2	SSA						–	13/12				
3	SSA		5'		4.5 ORGANIC SILT, OL, (TOPSOIL), SOME GRAVEL, SOME SAND, MEDIUM PLASTICITY, DARK BROWN, 2.5Y 5/2,	F	(OL)	17/12				
4	SSA				6.0 ORGANIC ODOR, MOIST TO WET, FIRM.		(CL)	7/12	3.0	1.0		
5	STU		9.5 ▼		SILTY CLAY, CL, TRACE GRAVEL, TRACE SAND, MEDIUM TO HIGH PLASTICITY, GRAYISH BROWN, 2.5Y 5/2, MOIST, SOFT, BLOCKY. 8.7		CL	350	1.4			
6	SSA		10'		SILTY SAND, SM, LITTLE GRAVEL, POORLY GRADED, GRAYISH BROWN, 10YR 5/2, MOIST TO WET, LOOSE TO DENSE.	E	SM	59/12				
7	SSA				... BECOMES SILTY GRAVEL AND SILTY SAND, GW-SW, POORLY GRADED, PALE BROWN, 10YR 6/3, SATURATED, LOOSE TO DENSE, FINE SAND IS QUARTZ AND FELDSPAR, OTHER SIZES ARE CARBONATE.		GW-SW	48/12				
8	J				... BECOMES SILTY GRAVEL, GW-GM, WELL-GRADED, LIGHT YELLOWISH BROWN, 10YR 6/4, SATURATED, MEDIUM DENSE.		–	34/12				
9	SSA		15'				GW-GM	29/12			42.6	292
10	SSA						GP-GM	28/12				
					... COLOR BECOMES YELLOW BROWN 17-20 FEET, CHANGES TO PALE BROWN 10YR 6/3.		–					
11	SSA						GW	29/12				
12	SSA		20'		... COARSE GRAVEL 19.2 TO 19.8 FEET, MEDIUM DENSE.		SP-SM	29/12				
13	SSA						(GW)	28/12				
14	SSA				... FINE QUARTZ SAND HOSTING PYRITE.		(SP)	27/12				
15	SSA				... COARSE GRAVEL AT 24.0 FEET, MEDIUM DENSE.		GC-SC	33/12	6.2	3.0		
			25'		24.3 SILTY CLAY, CL, TRACE SAND, TRACE GRAVEL, MEDIUM PLASTICITY, DARK GRAY, 10YR 4/1, MOIST, STIFF.	D	–	1200				
16	J						–	47/12				
17	STU		30'		... BECOMES CLAY, CL, SOME SILT, TRACE SAND, LOW PLASTICITY, DARK GRAY, 5Y 4/1, MOIST, VERY DENSE.		CL	300	4.2	3.0	26.2	164
18	SSA				... TRACE GRAVEL, TRACE SAND, DARK GRAY 10YR 4/1.		CL	36/12	4.4	4.0		
19	STU		35'		34.1 SILTY SAND AND CLAYEY SILT, SM-SC, LITTLE GRAVEL WELL GRADED, DARK GRAY, 10YR 4/1, MOIST, STIFF.	C	CL	650				

(Continued)

FORM F042685

4

LABORATORY DATA ③

③ MOISTURE	DRY DENSITY (PCF)	② SPECIFIC GRAVITY	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
5.1 5.5							68	24	8				
							(1.75")						
13.5							(1.0")						
31.1												TCUM	GRAVEL IN TIP OF TUBE
18.9	105.5	2.72	39	18	21		(2.5")	7	58	35	4×10^{-7}	$\phi = 24.5°$ $\phi' = 33.4°$ C = 0.0 KSC C' = 0.01 KSC	CONSOLIDATION PC = 4.8 KSC Cc = 0.138 Cr = 0.014
8.0					NP		(1.5") 35	48	11	6			
8.0					NP		(1.5") 45	45	5	5			
7.5													SLOUGH ENTIRE SAMPLE 12.5 - 14.0 FT.
8.0							(1.25") 56	35	9				PRESSURE METER
9.4							(1.5") 53	40	7				TEST 14.7 - 17.2 FT.
8.7													
8.7							36 (1.3")	56	8				NON-REPRESENTATIVE GRADATION SAMPLE
8.5							(1.35")						
8.1							(1.75")						
8.6			21	14	7		38 (0.8")	36	14	12			
							100	64					
12.8							(0.7")					TCUM	SLOUGH 27.5 TO 29.0 FEET
17.6	112.9	2.73	30	15	15		1 (0.25")	5	43	51	1×10^{-8}	$\phi = 25.4°$ $\phi' = 32.2°$ C = 0.0 KSC C' = 0.0 KSC	CONSOLIDATION PC = 4.8 KSC Cc = 0.135 Cr = 0.014
18.8							(1.0")						PRESSURE METER TEST 29.5 - 32.0 FT.
17.5	114.2	2.70	28	18	10		2 (1.25")	7	41	50	5×10^{-9} REMOLDED		CONSOLIDATION Pc = 4.8 KSC Cc = 0.125 Cr = 0.013

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.

② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS

③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 11-21-84
COORDINATES N 382 E 726
GROUND ELEV. 744.4

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 134

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHN	SHT. NO. 1 OF 3	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH134-2

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 2 of 3)	STRATUM (1)	USC	BLOW CT. (N) OR PSI	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER P_L (KSF)	PRESS. METER E_M (KSF)
					(Continued)							
20	SSA				...SILTY SAND, VERY DENSE.		-	36/12	7.0			
21	STU						SM-SC	600	3.6			
22	SSA		40'	40.2	CLAYEY SILT, ML, SOME SAND, LITTLE GRAVEL, LOW TO MEDIUM PLASTICITY, DARK GRAY, 10YR 4/1, MOIST, STIFF.		(SM)	26/12				
23	STU						ML	1200	5.7			
24	J				...COBBLE		-	77/12				
25	SSA		45'			C	ML	24/12				
26	J				...LOOSE GRAVELS		-	200				
27	SSA			48.5	SILTY CLAY, CL, LITTLE SAND, LITTLE GRAVEL, MEDIUM PLASTICITY, DARK GRAY, 5YR 4/1, MOIST, STIFF.		ML	20/12	1.3	0.6		
28	STU		50'				CL	1200				
29	SSA				...THIN ORGANIC SHALE STRATUM, DARK GRAY, 7.5 YR N4 AT 52.9 FEET.		(CL)	56/12	3.4	3.0		
30	STU		55'	54.8	...DARK GRAY 10YR 4/1. CLAYS AND SANDY CLAYS, CL-ML, SOME SAND, LITTLE GRAVEL, INTERBEDDED, MEDIUM PLASTICITY, DARK GRAY, 10YR 4/1, MOIST, FIRM.		CL	750	3.1			
31	SSA						(SC)	24/12	3.4	3.0		
32	STU				...INTERBEDDED SANDY SILTS AND CLAYS, VERY HARD, FINE SAND, QUARTZ AND FELDSPAR.		CL	1200	3.0	2.4		
33	SSA		60'			B	(SM)	47/12	9.0	5.0		
34	SSA						SC	172/12				
35	SSA				...COARSE GRAVEL 63.1 TO 63.3 FEET, CARBONATE.		(SM)	124/12				
36	SSA		65'				ML-CL	130/12				
37	SSA			66.5	CLAYEY SAND, SC, LITTLE GRAVEL, TRACE SILT, POORLY GRADED, GRAY, 10YR 5/1, MOIST TO WET, VERY DENSE.		(SM)	130/12	5.5			
					(Continued)							

FORM F042685

LABORATORY DATA ③

% MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
9.8													
10.7	130.4		16	12	4		(1.85") 14	41	26	19			
14.8							(0.3") (0.25")						
12.0	122.9						(0.45")						BOTTOM OF TUBE BENT, SLOUGH 42.5 TO 44.4 FEET
15.2							(1.3")						POOR RECOVERY HIT COBBLE
13.4							(0.4")						
NO RECOVERY							(3")						NO RECOVERY - SAMPLER TUBE BLOCKED WITH GRAVEL
15.6							(1.4")						
13.2	122.3	2.69	28	17	11		0	35	28	37	5×10^{-8} REMOLDED		TIP OF SAMPLE TUBE BENT CONSOLIDATION Pc = 4.8 KSC Cc = 0.110 Cr = 0.011
15.2													
17.8	109.8		28	16	12		7	22	26	45	4×10^{-8}		
19.4													
16.9		2.71	26	12	14		1	17	30	52			
8.3													
8.1													
8.5													
11.6		2.78	19	12	7		2	22	56	20			
9.0													

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (HIGH ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (HIGH ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 11-21-84
COORDINATES N 382 E 726
GROUND ELEV. 744.4

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 134

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 2 OF 3	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

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DH134-3

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 3 of 3)	STRATUM ①	USC	FIELD DATA: BLOW CT. (②) OR PSI	FIELD DATA: PENE-TROMETER (KSF)	FIELD DATA: TORVANE (KSF)	FIELD DATA: PRESS. METER PL (KSF)	FIELD DATA: PRESS. METER EM (KSF)
38	SSA				CLAYEY SAND, SC, VERY DENSE (CONTINUED)		(SC)	105/12	8.5			
39	J				... GRAVELS, CLAYEY (GC)		–					
40	SSA		70'		... CARBONATE COBBLES, LOOSE		–	9/12		2.0		
					... CARBONATE COBBLES, MEDIUM DENSE		–	12/12				
41	J		75'			B	(SC)	25				
42	J						(SC)	11/6				
43	SSA		80'		... BECOME SILTY, HARD, VERY DENSE		ML	53/12				
44	SSA						–	67/12				
45	SSA			83.1	SILTY SAND, SM, AND CLAYEY SILT, ML, POORLY GRADED, GRAYISH BROWN, 10YR 5/2 TO BROWN, 7.5YR 5/2, WET TO SATURATED, LOOSE TO FIRM.		(SP) (SM)	6/12	4.0			
46	SSA		85'	85.4	GRAVELLY SAND, SW, WELL GRADED, GRAY 10YR 5/1 TO LIGHT BROWNISH GRAY, 10YR 6/2, SATURATED, HARD, SILTY FROM 86.0 TO 86.3 FEET.	A	(ML)	69/12				
47	SSA						SM	82/12				
48	SSA			87.9			(SP)	125/12				
49	J				LIMESTONE	R	–	100/0				
			90'									

TOTAL DEPTH = 89.6 FEET

NO CAVING RECORDED AT ABANDONMENT 2-1-85
S.W.L. = 10.1 FEET 2-1-85

SAMPLES COLLECTED

SSA	34
STU (3-IN-DIA)	9
J	6
TOTAL	49

NEARBY "E" STRATUM WELL B-11 SWL = 12.60
SLOTTED CASING FROM 5.17 FT. TO 25.0 FT.

PIEZOMETER	SLOTTED CASING DEPTH	SW
PZ-134A	30.1 FT. TO 32.0 FT.	16.4
PZ-134B	37.1 FT. TO 39.0 FT.	20.6

FORM F042685

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LABORATORY DATA ③

③ MOISTURE	DRY DENSITY (PCF)	② SPECIFIC GRAVITY	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
7.2													
38.5													BOULDER (WASH-CUT SAMPLE)
11.5													SLOUGH 70 TO 71.5 FEET
10.6													
15.2													
15.6			15	14	1			43	43	14			
NS													NO SAMPLE
17.4													
15.0													
10.9			15	16	NP		28	41	25	6			
12.6													
20.6													(WASH-CUT SAMPLE)

1 FT.
7 FT.

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 11-21-84
COORDINATES N 382 E 726
GROUND ELEV. 744.4

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 134

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APPD. BY: EHM	SHT. NO. 3 OF 3	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

6

DH188-1

GEOTECHNICAL LOG

Sheet 1 of 3

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM ①	USC	FIELD DATA: BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PP PRESS. METER (KSF)	EM (KSF)
			0.4		ORGANIC SILTY CLAY, (TOPSOIL) OL, BLACK 10YR 2/1, MOIST, SOFT.	F	(OL) ML-CL					
1	ST		1.4		GRAVELLY SILT, ML, SOME SAND, TRACE CLAY, LIGHT OLIVE BROWN, 2.5Y 5/6, MOIST, SOFT.			800	0.8			
2	SSA				SILTY SAND AND GRAVEL, SM-GM, LITTLE SILT, LIGHT YELLOWISH BROWN, 2.5Y 6/4, MOIST, MEDIUM DENSE.		(SM)	24/12				
3	SSA		5'			E	(SM)	34/12				
4	SSA						(GM)	40/12				
5	SSA		8.5 ▽				(SM)	20/12				
6	SSA		10'		... BECOMES TRACE SILT, POORLY GRADED, SATURATED, LIGHT BROWNISH GRAY, 2.5Y 6/2.		(SP)	31/12				
			10.4				(GP) (CL)					
7	SSA				SILTY CLAY, CL, TRACE SAND, GRAY, 10YR 5/1, MOIST, VERY STIFF.			44/12	7.0	5.0		
8	J						(CL)	800				
					... BECOMES DARK GRAY, 5Y 4/1 AT 14.0 FEET.							
9	STU		15'			D	(CL)	350	3.6	2.2		
10	STU						(CL)	600	3.2	2.0		
					... BECOMES CLAYEY SILT, ML, AT 19.0 FEET, LITTLE CLAY, OLIVE GRAY, 5Y 5/2, LAMINATED, WET, STIFF.							
11	STU		20'				(ML)	1200	3.8	1.7		
			21.0		GRAVELLY SAND, SP, POORLY GRADED, TRACE SILT, DARK GRAY, 5Y 4/1, SATURATED, DENSE.							
12	SSA						(GW)	30/12				
13	SSA						(SP-SM)	45/12				
14	SSA		25'				(SW-SM)	42/12				
15	SSA						(GP)	41/12				
					... BECOMES LESS GRAVELLY, MEDIUM DENSE.							
16	SSA					C	(SP-SM)	19/12				
17	SSA		30'				(SW-SM)	32/12				
18	SSA						(SP)	29/12				
19	SSA		32.8 ▽				(SP-SM)	20/12				
20	SSA						(SP-SM)	22/12				
			35'									

FORM F042685

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
17.4	96.1		24	19	5		32 (1-1/2")	17	41	10	2×10^{-8}	TUU $\phi = 0.0°$ C = 0.49 KSC	BENT TUBE
7.5							(1-1/2")						
6.5							(1-1/2")						
5.5							(1-1/2")						
							(1-1/2")						
13.2													0.28 FEET SLOUGH
16.0							(1-1/4")						
MOIST													POOR RECOVERY SET 4" STEEL CASING TO 12.5 FT.
19.6													0.41 FEET SLOUGH
21.4													0.2 FEET SLOUGH
23.4													
SAT							(1-1/2")						
SAT							(1-1/2")						
SAT							(1-1/2")						
SAT							(5/8")						ADVANCE CASING TO 27.5 FT.
SAT							(5/8")						
SAT							(5/8")						
SAT													0.15 FEET SLOUGH ADVANCE CASING TO 32.0 FT.
SAT							(5/8")						POOR RECOVERY 0.25 FEET SLOUGH
SAT							(5/8")						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 2-28-85
COORDINATES N 473 E 75
GROUND ELEV. 735.9

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 188

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHN	SHT. NO. 1 OF 3	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH188-2

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 2 of 3)	STRATUM ①	USC	BLOW CT. (N) OR PSI	PENE-TROMETER (KSF)	TORVANE (KSF)	P PRESS. METER (KSF)	E METER (KSF)
21	SSA		35′				(SW)	30/12				
22	SSA					C	(SW-SM)	43/12				
23	SSA				... BECOMES SILTY SAND, SM, AT 38.0 FEET, OLIVE GRAY, 5Y 4/2.		(SM)	46/12				
					39.5							
24	ST		40′		SILTY CLAY, CL, TRACE SAND, TRACE GRAVEL, DARK GRAY, 5Y 4/1, MOIST, VERY STIFF.		(CL)	1200				
25	STU				... BECOMES DARK GRAYISH BROWN, 2.5Y 4/2, AT 44.0 FT.		(CL)	1200	6.7	3.1		
26	SSA		45′				(CL)	62/12	4.8			
27	SSA						(CL)	93/12	6.3			
28	SSA						(CL)	67/12	3.5			
29	SSA		50′		... BECOMES SANDY, GRAY, 5Y 6/1, SATURATED, DENSE, AT 49.0 FEET.		(SC)	55/12				
30	STU				... BECOMES SILTY CLAY, AT 50.5 FEET, TRACE SAND AND GRAVEL, DARK GRAY, 5Y 4/1, MOIST, VERY STIFF.	B	(CL)	1200	6.0	3.0		
31	SSA						(CL)	49/12	6.5			
32	SSA		55′		... LITTLE SAND, LITTLE GRAVEL.		(CL)	125/6				
					... BOULDER 55 TO 56 FEET.							
					56.0							
33	SSA				SANDY SILT, ML, LITTLE CLAY, LITTLE GRAVEL, OLIVE, 5Y 5/3, WET.		(ML)	66/12				
34	SSA				... BECOMES SANDY AT 57.5 FEET, GRAY 5Y 5/1, SATURATED.		(SM)	30/12				
35	ST		60′		... BECOMES SANDY SILT, TRACE GRAVEL, SOME CLAY, GRAY, 10YR 5/1, SATURATED, FIRM.		(ML)	800	1.0			
36	ST				... BECOMES STIFF 61.5 FEET.		(ML)	900	2.0			
37	ST		65′		... BECOMES SILTY CLAY, CL, SOME SAND, LITTLE GRAVEL, GRAY, 10YR 5/1, WET, MEDIUM STIFF AT 64.0 FEET.		CL SC	1200				
					65.0 SANDY GRAVEL, GP, LIGHT GRAY, 5Y 7/1, SATURATED, VERY DENSE.							
38	SSA				... BOULDER AT 65.5 TO 66.5 FEET. ... 67.0 TO 68.0 FEET BECOMES SILTY CLAY, DARK GRAY BROWN, 10YR 4/2, MOIST, VERY STIFF.	A	(GW-GP) (CL)	123/12	4.4			
39	SSA				... BECOMES SAND AT 68.0 FEET, GRAY, 5Y 5/1, SATURATED, EXTREMELY DENSE.		(SP)	88/12				
			70′									

FORM F042685

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LABORATORY DATA ③

③ MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
SAT							(1-1/2")						
SAT							(5/8")						ADVANCED CASING TO 37.5 FT.
SAT													POOR RECOVERY
13.9							(2-1/8")						TUBE BENT, SAMPLE DISTURBED
20.4							(5/8")						
10.4							(5/8")						
12.0							(1-1/2")						
12.7							(7/8")						
12.2							(1-1/2")						
18.4							(1-3/8")						
12.2							(3/4")						
MOIST							(1")						
–													NO SAMPLE BOULDER
8.8							(3/4")						0.3 FEET SLOUGH POOR RECOVERY
SAT													POSSIBLY ALL SLOUGH POOR RECOVERY
11.0							(1-3/8")						BENT TUBE DISTURBED SAMPLE 0.3 FEET SLOUGH
10.5							(1-1/2")						BENT TUBE SAMPLE DISTURBED 0.2 FEET SLOUGH
13.1							(1-1/8")						BENT TUBE SAMPLE DISTURBED
SAT							(1-1/2")						
SAT													ADVANCED CASING TO 55 FT.

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (THIN WALL SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (THIN WALL SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY-WASH
DATE DRILLED 2-28-85
COORDINATES N 473 E 75
GROUND ELEV. 735.9

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 188

DRAWN BY MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY REP	DATE: 10-1-85	
APP'D. BY EHW	SHT. NO. 2 OF 3	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

8

DH188-3

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 3 of 3)	STRATUM (1)	USC	BLOW CT. (N) OR PSI	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER P (KSF)	PRESS. METER EM (KSF)
40	SSA		70'		...BECOMES GRAVELLY SAND AT 69.5 FEET, VERY DENSE.	A	(SP)	124/12				
41	SSA				...BECOMES GRAYISH BROWN, 2.5Y 5/2, SATURATED, EXTREMELY DENSE.		(SP)	163/12				
42	SSA				...BOULDER AT 72.0 TO 73.0 FEET. ...BECOMES SANDY GRAVEL, VERY DENSE.		(GW-GP)	66/12				
43	SSA		75'		...BECOMES SANDY SILT, DENSE, GRAY BROWN, 2.5Y 5/2.		(ML)	50/12	6.0			
44	SSA				...BECOMES SILTY SAND, EXTREMELY DENSE.		(SM)	158/12				
45	SSA		77.0		BEDROCK: DOLOMITE	R		200/6				
46	J		80'									
			85'									
			90'		TOTAL DEPTH = 85.5 FEET 4 IN. STEEL CASING SET TO 70.0 FEET STATIC WATER LEVEL = 5.5 FEET, ON 3-7-85, 0.5 HOURS AFTER COMPLETION STATIC WATER LEVEL = 32.8 FEET ON 3-7-85, 12.0 HOURS AFTER COMPLETION. NO CAVING RECORDED 3-7-85 SAMPLES COLLECTED SSA 34 ST 5 STU 5 J 2 TOTAL 46							

FORM F043585

LABORATORY DATA ③

(%) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
SAT							(1-1/2")						
SAT							(1-1/2")						TOP 0.5 FT. GRAVEL POSSIBLE SLOUGH
SAT							(1-1/2")						ADVANCED CASING TO 65.0 FT.
17.3													ADVANCED CASING TO 70.0 FT.
9.1							(1-1/2")						
SAT							(1-1/2")						DOLOMITE
SAT													DRILL CUTTINGS FROM BEDROCK

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (HSN ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (HSN ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 2-28-85
COORDINATES N 473 E 75
GROUND ELEV. 735.9

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 188

DRAWN BY MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY RFP	DATE: 10-1-85	
APP'D. BY EHW	SHT. NO. 3 OF 3	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH340-1

GEOTECHNICAL LOG

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 3)	STRATUM ①	USC	FIELD DATA: BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER P_f (KSF)	PRESS. METER E_M (KSF)	
1	J				FILL - ORGANIC SILT (OL), SOME GRAVEL, LITTLE SAND, GRAVEL TO 2", BLACK N 2/0, MOIST, SOFT.	FILL	(OL)	275					20
2	STU		5'		... SILTY SAND (SM), 3" TO 5" COBBLE, BLACK N2/0, MOIST.		(SM) (GC)	325	5.0	2.0			33
3	STU				... PIECES OF CONCRETE & BRICK, VERY DARK GRAY N 3/0. ... CLAYEY SILT (ML), LITTLE SAND, TRACE GRAVEL, GRAY 10 YR 5/1, MOTTLED WITH STRONG BROWN 7.5 YR 4/6. ... BLACK SEAM (THIN).		(GC) (ML)	325	4.2	2.0			72
4	STU				... GLASS FRAGMENT @ 8.2 FT.		(ML) (GM)	650	3.6	2.0	41/ 340A	1022/ 340A	M
5	SSA		10' 10.5	9.5	SILTY SAND (SM), LITTLE GRAVEL, WELL GRADED ANGULAR TO ROUNDED CARBONATE GRAVELS, GRAY 10YR 5/6, MOIST, EXTREMELY DENSE.	E	(SM)	95/12			12.2/ 340	82/ 340	M
6	SSA				... GRADES TO GRAVELLY SAND, LITTLE SILT, LIGHT OLIVE BROWN 2.5 Y 5/4 TO DARK YELLOWISH BROWN 10YR 4/4, SATURATED.		(SM)	68/12					M W
7	SSA				... GRADES TO SANDY GRAVEL (GP), SOME SILT, POORLY GRADED, LIGHT BROWNISH GRAY 2.5Y 6/2, MEDIUM DENSE.		(GM)	28/12					W
8	SSA		15 15.0		... COBBLE OR COARSE GRAVEL. ... SAND (SW), LAYER, 14.2'-14.7', GRAYISH BROWN 10YR 5/2, TRACE OF BLACK HYDROCARBON, PUTRID ODOR, DENSE.		(GP) (SW) (GP)	38/12			108	920	13
9	STU							375					
10	SSA		18.2		SILTY CLAY (CL), TRACE SAND, TRACE GRAVEL, GRAY 10YR 5/1, MOIST, VERY STIFF.	D	(CL)	34/12	5.8	2.0			16
11	STU		20'				(CL)	325	5.4	2.0			17
12	SSA				... LITTLE GRAVEL.		(CL)	16/12	4.2	2.0			15
13	STU		25'				(CL)	200	4.4	2.0			16
14	SSA		27.2				(CL)	46/12					17
15	STU //				SILTY SAND (SM), SOME SILT, TRACE TO LITTLE GRAVEL, POORLY GRADED, DARK GRAYISH BROWN 10YR 4/2, SATURATED, VERY DENSE.		(SM)	1200					17
16	SSA		30'		... COBBLES OR COARSE GRAVEL.		GM	56/12					8
17	SSA				... INTERBEDDED GRAVEL (GM), DARK GRAY 10YR 4/1, DENSE.		ML	50/12					17
18	J					C		12/12					9
19	SSA		35'		... COBBLES OR COARSE GRAVEL.		(GP)	43/12			57.2	342	4

FORM F047685

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LABORATORY DATA ③

MOISTURE %	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
.9							(2)						PUSH ON ROCK TUBE BENT
.7						(3)							
.9							(1-3/8) (1-1/2)						
DIST							(2-1/4)						REFUSAL @ 9.5 FT. PRESSUREMETER TESTS 7.5 - 10.0 FT.
DIST							(1)						AND 7.75 - 10.25 FT. SET 6" CASING TO
DIST-ET							(1-1/2)						11.0 FT.
ET							(1-1/2)						PRESSURE METER TEST 13.0 - 15.5 FT.
.8						EST. (3)	(1/2)						
													PITCHER SAMPLER USED ONLY SLOUGH RECOVERED
.6							(3/4)						
.2	116.1	2.74	21	16	5		0 (7/8)	4	51	45	REMOLDED 5×10^{-9}		CONSOLIDATION Pc = 4.8 KSC Cc = 0.125 Cr = 0.013
.1							(3/4)						
.6	108.6						(2-3/8)						KO TEST
.0							(1-1/2)						
.9							(1/2)						TUBE BENT
.0							41 (3/4)	34	25				
.9							21 (2)	39	36	14			PRESSUREMETER
.3													TEST 34.0 - 36.5 FT. SLOUGH
.9						EST (3)							SLOUGH COBBLE

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 11-2-84 TO 11-8-84
COORDINATES N 925 E 127
GROUND ELEV. 742.2

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 340

DRAWN BY MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY RFP	DATE: 10-1-85	
APP'D. BY EHW	SHT. NO. 1 OF 3	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

10

DH340-2

GEOTECHNICAL LOG

FIELD DATA

Sheet 2 of 3

SAMPLE NO.	SAMPLE TYPE	DEPTHS & GRD. WATER	DESCRIPTION	STRATUM (1)	USC	BLOW CT. (N) OR PSI	PENETROMETER (KSF)	TORVANE (KSF)	PRESS. METER PL (KSF)	PRESS. METER EM (KSF)	MOISTURE
			... COBBLES AND COARSE GRAVEL (CONT'D).	C							
20	SSA		... GRADES TO GRAVELLY SAND, SOME GRAVEL, LITTLE SILT, GRAYISH BROWN 10YR 5/2.		GW-GM	36/12					5.9
21	SSA				(SW-(SM)	34/12					8.4
22	SSA	40'	... GRADES TO GRAVEL AND SAND, POORLY GRADED.		(SW-SM)	28/12					8.3
23	SSA		... INCREASING GRAVEL, GRAY 7.5YR 5/0.		GP-SP	31/12					8.3
24	SSA	43.5			(SM)	44/12					8.2
25	SSA	45' / 45.3	SILTY CLAY AND SAND (CL), TRACE GRAVEL, VERY DARK GRAY 10YR 3/1, MOIST, STIFF.		CL	20/12	5.4	2.0			12.5
26	SSA	47.0	SILTY SAND (SM), TRACE GRAVEL, POORLY GRADED, DARK GRAY 5YR 4/1, WET, DENSE. ... COBBLES OR COARSE GRAVEL.		SM	44/12					13.4
27	SSA		SILTY CLAY (CL), SOME SAND, TRACE GRAVEL, DARK GRAY 10YR 4/1, MOIST, STIFF, HOMOGENEOUS.	B	(SM)-(CL)	37/12					11.
28	STU	50'			CL	600	5.4	2.0			12.5
29	SSA				(CL)	48/12	4.2				14.
30	SSA		... DARK GRAYISH BROWN 10YR 4/2.		(CL)	25/12	5.2				12.
31	STU	55'			CL	650	8.0	2.0			12.
32	J		... COBBLES OR COARSE GRAVEL. ... GRAY 10YR 5/1, SOFT TO FIRM.		(CL)	21/12					16.
											15.
33	STU	60'			CL	375	4.0	2.0			16.
34	SSA	61.5			SM	30/12	2.0	2.0			19.
35	J		SILTY SAND (SP-SM), POORLY GRADED, LITTLE SAND, LIGHT OLIVE BROWN 2.5Y 5/4, SATURATED, DENSE.		SP-SM	1200					18.
36	SSA	64.0			(CL-ML)	46/12	3.6				14.
37	STU	65'	SILTY CLAY (CL-ML), TRACE SAND, TRACE GRAVEL, DARK GRAY 5YR 4/1, MOIST, VERY STIFF TO HARD, HOMOGENEOUS.		CL-ML	1200	8.8				9.4
38	SSA		... LITTLE GRAVEL, SOME SAND. ... SOME GRAVEL.		(ML)	22/12	3.4				8.8
39	STU	69.0			SC-SM	1200					12.
		70'	SILTY SAND (SC-SM), WITH INTERBEDDED COARSE GRAVELS AND COBBLES (GP), POORLY GRADED, BROWN 10YR 5/3.								

- CONTINUED, SHEET 3 -

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FORM F042685

LABORATORY DATA ③

MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
						EST. (3)	59 (3/4)	32	-9-				
							(1-1/2)						SET 4" CASING TO 37.5 FT.
							(1-1/4)						
							47 (1")	43	-10-				
							(1-1/2)						
		2.72	22	14	8		8	(40) 37	(29) 32	23			
		2.73	14	16	NP		9 (1")	68 (73)	18 (13)	5			
							(1-1/4)						ADVANCED CASING 46.5 FT.
	126.7	2.74	23	14	9		5 (2")	(33) 28	(32) 37	30	4×10^{-8} REMOLDED		CONSOLIDATION Pc = 4.8 KSC Cc = 0.078 Cr = 0.008
							(3/4)						ADVANCED CASING TO 48.0 FT.
							(3/4)						
	121.1		29	13	16		4 (1-7/8)	24	25	47			
							(1-3/4)						COBBLE - BENT TIP - POOR RECOVERY
	118.1							19	33	48		TCUM $\phi = 18.8°$ $\phi' = 29.3°$ C = 0.07 KSC C' = 0.08 KSC	CONSOLIDATION Pc - 4.8 KSC Cc = 0.149 Cr = 0.015
	117.3	2.74	31	16	15		(5/8)				1×10^{-8}		
							21 (1")	58	16	5			
		2.66	14	17	NP			90	6	4			TUBE BADLY DAMAGED
		2.78	18	14	4			21	49	30			
	127.9		17	13	4		4 (1")	40	36	20		Qu = 2.0 KSC	
							(1")						
			18	12	6		13 (2-3/8)	41	23	23			TUBE BENT TIP
													NO SAMPLE BOULDER

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (HIGH ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (HIGH ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 11-2-84 TO 11-8-84
COORDINATES N 925 E 127
GROUND ELEV. 742.2

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 340

DRAWN BY MFW/WF	SCALE: 1" = 4'	REV.
CHK'D. BY RFP	DATE: 10-1-85	1
APP'D. BY EHN	SHT. NO. 2 OF 3	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH340-3

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM (1)	USC	FIELD DATA: BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER P_L (KSF)	PRESS. METER E_M (KSF)
					Sheet 3 of 3							
					- CONTINUED FROM SHEET 2 -							
40	SSA				... SATURATED, EXTREMELY DENSE.		(SM)	120/12				
			72.8		WEATHERED BEDROCK, CHIPS FROM COBBLES AND BOULDERS, LIGHT GRAY 10YR 7/1, SATURATED, EXTREMELY DENSE.							
41	SSA						(GM)	90/12				
42	SSA		75'				(GP)	190/12				
43	SSA				... INTERBEDDED SILTY SANDS (SM), TRACE TO LITTLE GRAVEL, GRAYISH BROWN, 2.5Y 5/2, SATURATED, EXTREMELY DENSE.	A	(SM)	161/12				
44	SSA						(GP)	139/12				
45	SSA		80'				(ML)	150/12				
			80.0		DOLOMITIC LIMESTONE, LIGHT GRAY 10YR 7/1, DRY, EXTREMELY DENSE.			125/0				
46			85'			R						
			85.9		TOTAL DEPTH = 85.9 FEET							
					SWL = 12.1 FEET ON 2-6-85 NO CAVING NOTED ON 2-6-85							
					SAMPLES COLLECTED							
			90'		SSA 29 STU 11 J 5 DIAMOND CORE 1 BOX TOTAL 46							
					4" ϕ STEEL CASING TO 46.5'							

NEARBY "E" STRATUM WELL B-13 SWL =
SLOTTED CASING FROM 5.0 FT. TO 20.0

PIEZOMETER SLOTTED CASING DEPTH

PZ-340A 22.1 FT. TO 24.0 FT.
PZ-340B 34.1 FT. TO 36.0 FT.

FORM F042685

LABORATORY DATA ③

(3) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
1							(5/8)						
2							(1-1/2)						
7						EST. (3)							ROCK FRAGMENTS
3							(1-1/2)						ROCK FRAGMENTS WATER LOSS 800 GALS.
7						EST. (3)							ROCK FRAGMENTS
0							(1)						
													REFUSAL @ 80 FT. - NO SAMPLE - DRILL TO 80.9 FT. - DIAMOND CORE FROM 80.9 FT. TO 85.9 FT.
	158.2	2.56											
9.83 T. SWL 10.31 0.36													

LEGEND

SAMPLE TYPE

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STRENGTH TESTING

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- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
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SYMBOLS

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- SAND
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- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 11-2-84 TO 11-8-84
COORDINATES N 925 E 127
GROUND ELEV. 742.2

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 340

DRAWN BY MPW/BF	SCALE: 1" = 4'	REV. 1
CHK'D. BY RFP	DATE: 10-1-85	
APP'D. BY [illegible]	SHT. NO. 3 OF 3	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH350-1

GEOTECHNICAL LOG

Sheet 1 of 3

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM ①	USC	FIELD DATA: BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
					FILL, GC, (ROAD BASE), GRAVELS AND CLAY.	FILL	(GC)					
			1.7									
1	STU		2.5		CLAY, CL, SILTY WITH TRACE GRAVEL, DARK BROWN, 10YR 4/3, STIFF TO HARD, MOIST, MOD. PLASTICITY.	F	(CL)	300	5.7			
2	SSA		5'		CLAYEY GRAVELS, GC, POORLY GRADED, LITTLE SAND, LIGHT YELLOW BROWN, 10YR 6/4, DENSE, MOIST.		(GC)	40/12				
3	SSA		7.0 ▽		... GRAVELS, GP, AND SANDS SP-SM, BROWN YELLOW, 10YR 6/8 TO YELLOW 10YR 7/6, DENSE, POORLY CEMENTED, MOIST TO WET, STRATIFIED, SUBROUNDED LIMESTONE GRAVEL.		SP-SM	43/12				
4	SSA						(GP)	44/12				
5	SSA		10'		... SANDS, SM, FINE, SILTY, LOOSE, SATURATED, NO RECOVERY.	E	(SP)	5/12				
							–	2/12				
			13.4 ▽				–	0/12	DRILL ROD & SAMPLER AD		100.6	570
6	SSA		15'		... GRAVEL, GP & GM, SANDS SP-SM, CLAYEY, SILTY, SUBROUNDED, LIGHT YELLOW BROWN, 2.5Y 6/4 TO OLIVE YELLOW 2.5Y 6/6, VERY DENSE, SATURATED.		(SC)	34/12				
7	SSA						SP-SM	62/12				
8	SSA						GM-SM	38/12				
			18.5									
9	STU		20'		CLAY, CL, AND SILT, ML, LENSES INTERBEDDED, LITTLE GRAVEL, DARK GRAY, 10YR 4/1, VERY STIFF, MOIST, PLASTIC TO NONPLASTIC SOILS.		ML-CL	325	7.6	2.0		
10	SSA						(CL)	24/12	3.5	1.0		
11	STU						ML-CL	NR	5.4	2.0		
12	SSA		25'		... SILT, ML, CONTENT INCREASES WITH DEPTH.		(CL-ML)	57/12	9.0	2.0	23.8	156
13	SSA					D	(CL)	30/12	7.0	2.0		
			28.5									
14	STU		30'		CLAYEY SILT, ML, VERY STIFF, MOIST.		ML-CL	60	6.0 TO 2.3	1.8	23.8	114
15	SSA				... BECOMES CLAYEY, CL, WET, FIRM FROM 30.5' TO 32.0'.		(CL-ML)	8/12	1.0			
			32.0									
16	STU				CLAYEY SILT, ML, TRACE SAND, 5YR 5/1, GRAY, EARTHY ODOR, SATURATED, INTERBEDDED SILTY SEAMS, LIGHT GRAY 5YR 7/1.		ML	625	6.0	2.0	49.2	190
			34.2									
17	SSA		35'		CLAYEY SILT, CL-ML, MOIST, HARD, GRAY 10YR 5/1.		(CL-ML)	40/12	9.0	2.0		

FORM F042585

12

LABORATORY DATA ③

MOISTURE ③	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
													NO SAMPLE
(MOIST)							(1-1/2")						BENT TUBE - COBBLES
9.2						(+3")							
10.2							33 (1")	60	4	(3)			BENTONITE USED TO STABILIZE HOLE
8.0							(4")		FINE				
16.4							(1/2")						
							ESTIMATED (FINE)						NO SAMPLE
ANCE W/O HAMMER DROPPING							ESTIMATED (FINE)						NO SAMPLE FINE SANDS CAVE-IN UNDER HYDROSTATIC PRESSURE
13.7						(+3")							PRESSURE METER TEST 12.7 - 15.2 FT.
9.9						(+3")	41	51	5	(3)			WATER LOSSES AFTER CASED TO 14'
10.0						(3")	45 (1")	43	10	(2)			
14.0			23	16	7		16 (1/4")	12	40	32			POOR RECOVERY
15.4							(1-1/4")						
17.8	118.6	2.69	21	15	6		3 (2")	11	48	38	3×10^{-8}	TCUM $\phi = 25.0°$ $\phi' = 31.5°$ C = 0.10 KSC C' = 0.15 KSC	CONSOLIDATION Pc = 4.8 KSC Cc = 0.097 Cr = 0.010 TIP TUBE BENT
11.6						(3")							PRESSURE METER TEST 24.5 - 27.0 FT.
17.4						–	–	(FINE)					CONSOLIDATION Pc = 4.8 KSC
15.0	121.1	2.69	19	15	4	–	0	16 (FINE)	55	29	UNDIST 5×10^{-7} DIST 2×10^{-8}	TCUM $\phi = 30.9°$ $\phi' = 36.0°$ C = 0.0 KSC C' = 0.03 KSC	Cc = 0.094 Cr = 0.009 Ko TEST PRESSURE METER TEST 28.0 - 30.5 FT.
17.5						–	–	(FINE)					
14.7	117.3	2.73	17	17	NP			13 (FINE)	(65) 68	(22) 19			PRESSURE METER TEST 33.5 - 36.0 FT.
13.0								(FINE)					

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 10-29-84 TO 11-2-84
COORDINATES N 918 E 628
GROUND ELEV. 746.3

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 350

DRAWN BY MPW/WF | SCALE: 1" = 4' | REV. 1
CHK'D. BY RFD | DATE: 10-1-85
APP'D. BY EHW | SHT. NO. 1 OF 3
ORDER NO. 27972 | Stearns Catalytic | DWG. NO.

DH350-2

GEOTECHNICAL LOG

SAMPLE NO.	SAMPLE TYPE	DEPTHS & GRD. WATER	DESCRIPTION (Sheet 2 of 3)	STRATUM (1)	USC	FIELD DATA: BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER PL (KSF)	PRESS. METER EM (KSF)
18	STU		CLAYEY SILT AND SILTY CLAY, CL-ML, DARK GRAY, 10YR 4/1, HARD, MOIST.	D	ML	600	8.0	2.0+		
19	SSA	39.5		D	(CL-ML)	41/12	8.0	2.0+		
20	STU	40'	SILT, ML, VERY STIFF, MOIST, GRAY, 10YR 5/1.	D	ML	750				
21	SSA			D	(ML)	27/12	5.6			
22	STU	43.8	... TRACE GRAVEL	D	ML	700		1.0		
23	SSA	45'	SAND, SW-SP, WELL GRADED TO POORLY GRADED, GRAVELLY, BOULDERY AT DEPTH WITH SILTY LENSES, DENSE, SATURATED.	C	(SP)	35/12			72.6	228
24	SSA	47.5		C	SP-SM	39/12				
25	SSA		GRAVELS, GP, WITH SAND AND CLAY, BOULDERS AND COBBLES.	C	SM	67/12				
26	SSA	50'		C	SW	97/12				
27	SSA		... GRAVELLY SAND, GRAY 5YR 5/1, SATURATED, VERY DENSE.	B	SM	34/12	8.2	2.0+		
28	STU	55'	... GRAVELLY CLAY, WITH SILT, GRAY, 5YR 5/1, MOIST.	B	CL		3.7			
29	SSA	56.5	... BOULDER	B	–	33/12				
30	SSA		SILTY CLAY, CL, TRACE GRAVEL, TRACE SAND, DARK GRAY, 5YR 4/1, HARD PLASTIC, MOIST.	B	(CL)	41/12	6.7	2.0+		
31	STU	60'		B	CL	600	5.4	2.0+		
32	SSA			B	(CL)	46/12	5.4	2.0+		
33	STU			B	CL	450	9.0	2.0+	39.0	400
34	SSA	65'	... GRAY, 5YR 5/1.	B	(CL)	162/12	6.4	2.0+		
35	SSA		... GRAY BROWN, 2.5YR 5/2, DRY.	B	(CL)	50/12	2.4	2.0+		
			... LIMESTONE BOULDER, SOFT LAYERS FROM 68.0' TO 69.5', NO RECOVERY.	B	–	700				
36	SSA			B		12/12				
37	SSA	70'		B	(CL)	21/12	9.0			

FORM F042685

13

LABORATORY DATA ③

(3) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY (2)	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
12.2	124.2		18	15	3		– (3/4")	17	59	24			
13.5							–	(FINE)					
15.4	121.7		21	20	1		–	5	74	21	4×10^{-7}		
15.9							(3/4")	(FINE)					
17.7	115.6	2.75	20	18	2		– (1/2")	15	70	15	4×10^{-7}	TCUM $\phi = 36.0°$ $\phi' = 36.9°$ C = 0.0 KSC C' = 0.0 KSC	CONSOLIDATION Pc = 4.8 KSC Cc = 0.074 Cr = 0.007 TIP TUBE BENT
7.5													COBBLE
11.8							10 (3/4")	79	8	3			PRESSURE METER TEST 45.5 - 48.0 FT.
11.7						(+3")							
8.2						(+12")							
8.0							(1-1/2")						
12.5			24	15	9	(12")	6	27	33	34			CLAY SAMPLE GOUGED BY COBBLE END OF SAMPLE TUBE BENT
15.7						(+12")							SLOUGH OR CRUSHED COBBLE
16.7							(3/4")						
16.1	116.1		29	13	16		1 (1-1/2")	22	29	48			
17.8							(1/3")						
17.3	116.2	2.72	31	17	14		10 (1-1/2")	14	29	47	1×10^{-7}	TCU $\phi = 22.8°$ $\phi' = 33.4°$ C = 0.19 KSC C' = 0.20	PRESSURE METER TEST 61.5 - 64.0 FT.
23.0						(+3")							SLOUGH - CRUSHED COBBLE
8.0							(3/4")						SLOUGH - CRUSHED COBBLE
						(+12")							NO SAMPLE BENT TUBE - COBBLE
													SLOUGH CRUSHED BOULDER
9.8							(7/8")						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 10-29-84 TO 11-2-84
COORDINATES N 918 E 678
GROUND ELEV. 746.3

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 350

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: REP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 2 OF 3	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH350-3

GEOTECHNICAL LOG

Sheet 3 of 3

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM (1)	USC	FIELD DATA: BLOW CT. OR PSI (N)	FIELD DATA: PENE-TROMETER (KSF)	FIELD DATA: TORVANE (KSF)	FIELD DATA: PRESS. METER P_L (KSF)	FIELD DATA: PRESS. METER E_M (KSF)
38	SSA				SILTY CLAY, CL, DARK GRAY, 10YR 4/1, MOIST, HARD.		(CL)	65/12				
39	SSA				...GRAVELLY, VERY HARD, SLIGHTLY MOIST.	B	(CL)	57/12				
40	SSA		75'	74.8	SILT, ML, CLAY, CL, AND SAND, SP, LENSES INTERBEDDED DARK GRAY, 10YR 4/1 TO GRAYISH BROWN, 10YR 5/2, VERY HARD.		(CL-ML)	122/12				
41	SSA						SM	94/12	9.0	2.0		
42	SSA					A	(CL-ML)	82/12	7.0	2.0		
43	SSA		80'	79.8			(CL-ML)	89/12				
44	SSA				SANDS, SM, POORLY GRADED, GRAYISH BROWN, 10YR 5/2, SATURATED, EXTREMELY DENSE.		SM	147/9				
45	J			81.5	BEDROCK, DOLOMITIC LIMESTONE.	R	–					
			85'									

TOTAL DEPTH = 82.5 FEET

NO CAVING REPORTED 11-5-84

SAMPLES COLLECTED

SSA, 1.5 IN.	33
STU, 3.0 IN.	11
J	1
TOTAL	45

4-IN STEEL CASING FROM 0-17.5 FEET
STATIC WATER LEVEL = 13.4 FEET, 11-5-84

NEARBY "E" STRATUM WELL B-10 SWL =
SLOTTED CASING FROM 5.5 FT. TO 20.5 F

PIEZOMETER SLOTTED CASING DEPTH

PZ-350A 35.2 FT. TO 37.1 FT.
PZ-350B 46.1 FT. TO 48.0 FT.

FORM FO47685

14

LABORATORY DATA ③

① MOISTURE	DRY (PCF) DENSITY	② SPECIFIC GRAVITY	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
10.3						(+3")							CRUSHED COBBLES 72.5 TO 73.0 FT
													NO SAMPLE
11.6						(+3")							CRUSHED COBBLES
13.4							–	–	90	10			
17.4			15	16	NP		1	67	24	8			
14.3							–	10 (FINE)					
17.7							–	10 (FINE)					
14.7							4	82	8	(6)			
MOIST													
12.18 SWL 20.10 20.87													

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (HIGH ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (HIGH ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 10-29-84 TO 11-2-84
COORDINATES N 918 E 628
GROUND ELEV. 746.3

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 350

DRAWN BY MPW/WF	SCALE: 1" = 4'	REV.	
CHK'D. BY WFF	DATE: 10-1-85	1	
APP'D. BY EHW	SHT. NO. 3 OF 3		
DRWG NO. 27972	Stearns Catalytic	DWG. NO.	

DH353-1

GEOTECHNICAL LOG

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 2)	STRATUM ①	USC	FIELD DATA: BLOW CT. (N) OR PSI	PENE-TROMETER (KSF)	TORVANE (KSF)	PP PRESS. METER (KSF)	EM (KSF)
1	SSA				FILL, CRUSHED STONE ROAD BASE TO 1.5 FT. SILTY SAND, SM, WITH TRACE GRAVEL, YELLOW BROWN 10YR 5/8, SATURATED, VERY DENSE, MAY BE FROZEN.	FILL	(SM)	125/6				
2	SSA		4.5 5'		CLAYEY SILT, ML, NO PLASTICITY, GRAY BROWN, 2.5Y 5/2, MOIST, FIRM.	F	(ML-CL)	9/12	1.4			
3	ST				...BECOMES GRAVELLY SILT, TRACE GRAVEL.	F	(ML)	1200	1.4	1.0		
4	SSA		7.9		SILTY GRAVEL AND SAND, GM-SM, LITTLE SILT, YELLOW BROWN 10YR 5/4, SATURATED, MEDIUM DENSE SAND AND GRAVEL PARTICLES ARE CARBONATES.	E	(ML) (SM)	46/12	1.4			
5	SSA		10'			E	(GM)	42/12				
6	SSA		12.0 ▽		...BECOMES TRACE SILT, POORLY GRADED, GP-SP.	E	(GP-GM)	51/12				
7	SSA				...BECOMES DENSE.	E	(GP-GM)	68/12				
8	SSA		14.8 ▽ 15'			E	(SW-SM)	64/12				
9	SSA		15.7		...BECOMES DENSE.	E	(GP-GM)	34/12				
10	SSA				GRAVELLY SAND, SP, POORLY GRADED, SOME GRAVEL, TRACE SILT, LIGHT OLIVE BROWN 2.5Y 5/6, SATURATED, DENSE, SAND AND GRAVEL PARTICLES ARE CARBONATES.	E	(SP)	74/12				
11	SSA				...BECOMES SP-SM, LITTLE SILT.	E	(SP-SM)	32/12				
12	SSA		20'			E	(SP-SM)	22/12				
13	SSA		22.5			E	(SM)	9/12				
14	SSA				SILTY CLAY, CL, TRACE SAND, GRAY 10YR 5/1, MOIST, STIFF.	D	(CL)	16/12	2.4			
15	ST		25'		...TRACE GRAVEL.	D	(CL)	375	3.6	1.4		
16	STU				...HARD.	D	(CL)	500	8.0	4.0		
17	STU		30'			D	(CL)	1200	8.0	4.2		
18	STU					D	(CL)	1200	8.0	4.2		
			35'									

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FORM FG2565

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
													NO SAMPLE, FROZEN
AT.							(5/8)						REFUSAL @ 2.0 FT.
													NO SAMPLE NO RECOVERY
0.95													TOP POSSIBLE SLOUGH
AT.													TUBE-END BENT
.92							(7/8)						
AT.							(1-3/4)						SET CASING TO 10 FT.
AT.							(1-1/4)						
AT.							(1-1/2)						
.58							(1-1/8)						
AT.							(1-1/2)						
AT.							(5/8)						ADVANCE CASING TO 20 FT.
5.93							(3/4)						
AT.							(5/8)						ADVANCE CASING TO 24 FT.
AT.							(5/8)						BENT TUBE
5.73													
5.2							(1-3/8)						
5.41							(5/8)						
5.21							(5/8)						
6.72							(1)						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 2-13-85
COORDINATES N 925 E 774
GROUND ELEV. 747.7

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 353

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 1 OF 2	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

16

DH353-2

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 2 of 2)	STRATUM	USC	FIELD DATA: BLOW CT. (N) OR PSI	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER P_L (KSF)	PRESS. METER E_M (KSF)
			35'		...BECOMES DARK GRAY 5Y 4/1.		(CL)	1200	6.0			
19	ST		35.3		CLAYEY SILT, ML, GRAY 5Y 5/1, MOIST, VERY STIFF TO HARD.		(ML)					
20	STU					D	(CL) (ML)	1200	8.0	2.8		
21	SSA		40'		...BECOMES SILT WITH LITTLE CLAY.		(ML)	50/12	8.0			
22	SSA						(ML)	51/12	9.0			
23	STU				...BECOMES SILT WITH NO CLAY, LITTLE SAND, WET.		(ML)	1200	6.8	1.0		
24	SSA		45'				(ML)	36/12	6.0			
25	SSA		46.0		SAND, SP, FINE, POORLY GRADED, GRAY 5Y 5/1, SATURATED, DENSE.	C	(SP)	63/12				
			50'		TOTAL DEPTH = 47.5 FT. CASING SET TO 24 FT. SWL = 14.8 FT., 2-15-85 NO CAVING REPORTED - 2-15-85 SAMPLES COLLECTED SSA 14 ST 3 STU 8 TOTAL 25							

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FORM F042585

LABORATORY DATA ③

(%) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
													BENT TUBE
16.5													
15.97													
13.51													
14.70													
													0.8 FEET SLOUGH
17.60													
18.06													
SAT'													

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 2-13-85
COORDINATES N 925 E 774
GROUND ELEV. 747.7

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 353

DRAWN BY MPW/WF	SCALE: 1" = 4'	REV.
CHK'D. BY RFP	DATE: 10-1-85	1
APP'D. BY EHN	SHT. NO. 2 OF 2	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH429-1

GEOTECHNICAL LOG

Sheet 1 of 2

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM ①	USC	FIELD DATA: BLOW CT. (N) OR PSI	PENE-TROMETER (KSF)	TORVANE (KSF)	P_L PRESS. METER (KSF)	E_M (KSF)
			0.5		FILL, CRUSHED ROCK, ROADBASE MATERIAL.							
1	SSA				FILL, SILTY CLAY, CL, LITTLE SAND AND GRAVEL, DARK GRAYISH BROWN 2.5Y 4/2, WET, STIFF.	FILL	(CL)	53/12	4.0			
2	SSA				... BECOMES SILTY CLAY OL, (TOPSOIL), LITTLE SAND AND GRAVEL, DARK BROWN 10YR 3/3, MOIST, STIFF, SOME ORGANIC MATERIAL.		(CL)	12/12				
3	ST		5'		... BECOMES SANDY GRAVEL, GC, SOME CLAY, LITTLE SILT, POORLY GRADED, DARK GRAY BROWN, 2.5Y 4/2, DRY, MEDIUM DENSE.		(CL) (GC)	350	3.0	1.30		
4	SSA						(GM) (SC)	26/12				
			7.5		GRAVELLY SILT, ML, LITTLE SAND, LITTLE CLAY, LIGHT OLIVE GRAY, 5Y 6/2, WET, SOFT.							
5	STU						(ML)	150	0.8	0.52		
			10'		... BECOMES SILTY CLAY, CL, @ 10 FEET, TRACE SAND, DARK GRAY, 5Y 4/1, MOIST, FIRM.	F						
6	STU						(CL)	100	1.4	1.0		
7	STU		15'		... @ 15 FEET BECOMES SILT, TRACE SAND, TRACE GRAVEL, OLIVE GRAY, 5Y 5/2, MOIST, STIFF, STRATIFIED.		CL	150	1.0			
			15.7									
			17.0 16.8 ▽									
8	STU				SANDY GRAVEL, GP-GM, LITTLE SILT, LIGHT OLIVE BROWN, 2.5Y 5/6, MOIST, DENSE.		(ML)	1000	2.6	0.90		
9	SSA				... BECOMES SATURATED @ 17.0 FT. ... BOULDER @ 18.0 FEET.		(GP-GM)	62/12				
10	SSA		20'		... COARSE GRAVEL 19.0 TO 43.0 FEET, LIGHT YELLOW BROWN 2.5Y 6/4, CARBONATE.		(GW-GM)	50/12				
11	SSA						(GW)	65/12				
12	SSA				... BECOMES GRAVELLY SAND, SW-SM, TRACE SILT, VERY DENSE @ 22.0 FEET, LIGHT YELLOW BROWN 2.5Y 6/4.		(SW-SM)	92/12				
13	SSA		25'				(SW-SM)	105/12				
14	SSA				... BECOMES DENSE @ 25.0 FEET, LIGHT OLIVE BROWN 2.5Y 5/6.	E	(SW-SM)	51/12				
15	SSA				... FINE SAND 27.1 TO 27.5 FEET.		(SW-SM)	83/12				
16	SSA				... BECOMES PALE OLIVE 5Y 6/4, @ 28.0 FEET.		(SW-SM)	51/12				
17	SSA		30'				(SW)	72/12				
18	SSA				... BECOMES VERY DENSE @ 31.0 FEET, OLIVE GRAY 5Y 5/2.		(SW)	102/12				
19	SSA						(SW)	90/12				
20	SSA		35'				(SP)	89/12				

FORM F047685

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LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75.mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
2.84								(5/8)					
2.63								(1)					
2.36								(1-1/2)					TUBE BENT
7.23								(1-1/2)					SET CASING TO 7.5 FEET
4.30								(1-1/2)					0.2 FEET SLOUGH POOR RECOVERY
6.12													
5.3	97.53		42	18	24			3	62	34		TUU $\phi = 0.0°$ C = 0.33 KSC	
1.5								(1-1/4)					
.2								(1-1/2)					
AT.								(1-1/2)					
AT.								(1-1/2)					
AT.								(1-1/2)					
AT.								(1-1/2)					CASING ADVANCED TO 25 FT.
AT.								(1-1/2)					
AT.								(5/8)					
AT.								(1-1/2)					
AT.								(1-1/2)					
AT.								(1-1/2)					
AT.								(3/4)					
AT.								(3/4)					POOR RECOVERY

LEGEND

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- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 2-15-85
COORDINATES N 1174 E 626
GROUND ELEV. 748.5

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 429

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 1 OF 2	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

18

DH429-2

GEOTECHNICAL LOG

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 2 of 2)	STRATUM ①	USC	FIELD DATA: BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
					...GRAVELLY SAND, DENSE.							
21	SSA						(SW)	56/12				
					...BECOMES EXTREMELY DENSE.		(SW-SM)					
22	SSA							140/12				
					...BECOMES SANDY GRAVEL, GW-GM, LITTLE SILT, LIGHT YELLOW BROWN, 2.5Y 6/4, EXTREMELY DENSE.	E	(GW-GM)					
23	SSA		40'					236/12				
					...BECOMES VERY DENSE @ 40.0 FEET.		(GW-GM)					
24	SSA				...BECOMES GRAVELLY SAND, SC, SOME CLAY, LITTLE SILT, DARK GRAY, N 4/0, DENSE.			110/12				
25	SSA						(SC)	52/12				
				43.0	SILTY CLAY, CL, LITTLE SAND, DARK GRAY 5Y 4/1, MOIST, STIFF.		(CL)	52/12	3.0			
26	SSA		45'		...TRACE GRAVEL 44.5 FEET, MOIST, VERY STIFF.							
27	STU				...TRACE SAND 47.0 FEET, MOIST, VERY STIFF.	D	(CL)	900	6.2	2.0		
28	SSA						(CL)	57/12	5.4			
				48.5	SILT, ML, TRACE CLAY, GRAY, 5Y 5/1, WET, STIFF.							
29	STU		50'				ML	1200	2.2			
				51.0	GRAVELLY SAND, SM, LITTLE SILT, TRACE CLAY, GRAY, 5Y 5/1, SATURATED, VERY DENSE.	C						
30	SSA						(SM)	106/12				
				52.5	TOTAL DEPTH = 52.5 FEET							
			55'		NO CAVING NOTED BY 2-20-85 STATIC WATER LEVEL = 16.1 FEET - 2-19-85 STATIC WATER LEVEL = 16.8 FEET - 2-20-85 4-INCH-DIAMETER STEEL CASING TO 38.5 FEET.							
					SAMPLES COLLECTED SSA (1.5 IN. DIA.) 23 ST (3.0 IN. DIA.) 1 STU (3.0 IN. DIA.) 6 TOTAL 30							

FORM F042685

LABORATORY DATA ③

③ MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
AT.							(1-1/2)						
AT.							(7/8)						CASING ADVANCED TO 38.5 FT.
AT.							(1-1/2)						
AT.							(1-1/2)						
AT.							(5/8)						SAMPLE POSSIBLY SLOUGH
OIST													DISTURBED SAMPLE
6.79							(5/8)						0.15 FEET SLOUGH POOR RECOVERY
9.38													
9.2 8.6	105.1 (PERM)		23	21	2		-0	0	81	19	9×10^{-7}	TUU $\phi = 0.0°$ C = 1.23 KSC	
OIST							(1-1/8)						

LEGEND

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SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 2-15-85
COORDINATES N 1174 E 626
GROUND ELEV. 748.5

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 429

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 2 OF 2	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH434-1

GEOTECHNICAL LOG

Sheet 1 of 2

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM (1)	USC	FIELD DATA: BLOW CT. (N) OR PSI	FIELD DATA: PENE-TROMETER (KSF)	FIELD DATA: TORVANE (KSF)	FIELD DATA: PRESS. METER P (KSF)	FIELD DATA: PRESS. METER EM (KSF)
					FILL, SILTY CLAY, CL, LITTLE SAND, LITTLE GRAVEL, BLACK, 5Y 2.5/1 MOIST, EXTREMELY HARD.							
1	STU						(CL)	300	>9.0	3.2		
2	STU		5′				(CL)	375	>9.0			
3	STU				...FILL BECOMES FIRM.	FILL	(CL)	300	2.0	1.1		
4	STU		10′				(CL)	225	3.3	1.50		
5	STU						SC	175	6.5			
				13.8								
6	STU		15′	14.4	ORGANIC SILTY CLAY (TOPSOIL), OL, SOME GRAVEL, BLACK 10YR 2/1, MOIST, DENSE.		(SM-OL-CL)	350	2.2	2.0	9.6	60
					SILTY CLAY, CL, DARK GRAYISH BROWN, 10YR 4/2, MOIST STIFF TO FIRM.	F						
				16.3	...TRACE OF COBBLE AT 16.3′.							
7	STU				...BECOMES SATURATED.		OL-CL	450				
8	SSA				SANDY GRAVEL, GP-GM, POORLY GRADED, TRACE SILT, YELLOWISH BROWN, 10YR 5/6, SATURATED, EXTREMELY DENSE, WITH SEAM OF SAND, POORLY GRADED, AT 24.5 FEET, 0.3 FEET THICK.		(GP-GM)	100/12				
			20.0									
9	SSA		20′				(GP)	115/12				
10	SSA					E	(GP)	84/12				
11	SSA				...BECOMES VERY DENSE.		(GP)	54/12				
12	SSA		25′		...BECOMES DENSE.		(SP)	48/12				
13	SSA				...BECOMES EXTREMELY DENSE.		/GP)	85/12				
				27.5								
14	J				SILTY CLAY, CL, LITTLE GRAVEL, TRACE SAND, GRAY, 10YR 6/1, MOIST, STIFF TO HARD.		(CL)	40/12				
15	STU		30′		...BECOMES TRACE GRAVEL.		CL-ML	350	3.0	3.0	30.8	166
16	SSA					D	CL	41/12	5.0			
17	STU				...WITH SMALL SAND POCKETS AT 33.2 FEET.		CL	600	6.0	5.0		
			35′									

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FORM F042585

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
													NO SAMPLE (FROST)
OIST) 0.02							(1-1/2")						SAMPLE NO. 1-4 AND 6-7 "USC" BY KMCC
OIST) 5.03							(1-1/2")						
OIST) 3.42							(1-3/8")						
OIST) 2.38							(1-1/2")						
OIST) 2.8	111.3		45	23	22		10 (1-7/8")	45	25	20			
OIST)													PRESSURE METER TEST 14.0 - 16.5 FT.
SAT)													COBBLES POOR RECOVERY
SAT) .9							(1-1/2")						
SAT) .2							(2-3/8")						
SAT) .3							71 (1-1/2")	24	-5-				
SAT) 0.0							(1-1/2")						
SAT) 8.9													
SAT) 2.9							(1-7/8")						
WET) 8.1							(3/8")						POOR RECOVERY
OIST) 5.4	109.4		21	15	6		5 (1-1/4")	19	43	33			TUBE END BENT PRESSURE METER TEST 29.5 - 32.0 FT.
OIST) 8.0							(5/8")						
OIST) 9.9	105.3		28	18	10		1 (2")	3	42	54			TUBE GOUGED BY COBBLE ENTIRE LENGTH

LEGEND

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② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 1-3-85
COORDINATES N 1146 E 382
GROUND ELEV. 752.6

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 434

DRAWN BY MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY REP	DATE: 10-1-85	
APP'D. BY EHN	SHT. NO. 1 OF 2	
ORDER NO. 2797.2	Stearns Catalytic	DWG. NO.

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DH434-2

GEOTECHNICAL LOG

Sheet 2 of 2

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM (1)	USC	FIELD DATA: BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	P PRESS. METER (KSF)	E METER (KSF)
18	SSA					D	(CL)	27/12	2.6			
19	STU						CL	350	2.4	2.0		
			39.5									
20	SSA		40′		SILT, ML, TRACE CLAY, GRAY, 10YR 6/1, SATURATED, INTERBEDDED WITH SILTY SAND, SM, LITTLE SILT, HARD TO VERY HARD		(ML)	56/12	2.4			
21	SSA						(ML) (SP-SM)	67/12	4.0			
			43.0									
22	SSA				SAND AND GRAVEL, SP-SM, POORLY GRADED, TRACE SILT, LIGHT GRAY, 10YR 7/1, SATURATED, DENSE, WITH LAYER OF SILTY CLAY AT 44.5 FT. TO 45.8 FT. AND LAYERS OF POORLY GRADED SAND, SP, AND SILTY SAND, SM.	C	(ML) (SM)	105/12				
23	SSA		45′				(SP-SM)	32/12				
24	SSA						(SP-SM)	44/12				
25	SSA						(GP)	47/12				
26	SSA				... BECOMES VERY DENSE.		SM	65/12				
			50′									
27	SSA				... BECOMES DENSE.		GW	37/12				
			51.5									
28	STU				SILTY CLAY, CL, TRACE GRAVEL, TRACE SAND, GRAY, 10YR 6/1, WET, VERY STIFF.	B		375				
29	SSA		55′				(CL)	22/12	6.0			
30	STU				... GRADES TO LITTLE GRAVEL, SOME SAND.		CL	450	3.4		23.4	126
								11/12				
31	STU		60′		... COBBLE.		CL	500	5.0			
32	SSA				... BECOMES VERY HARD.		(CL)	62/12	2.0			
			65′									

TOTAL DEPTH = 63.5 FEET.

NO CAVING, 1-30-85 NO S.W.L. MEASURED

SAMPLES COLLECTED

SSA	18
STU	13
J	1
TOTAL	32

PIEZOMETER	SLOTTED CASING DEPTH
PZ-434A	22.1 TO 24.0
PZ-434B	32.1 TO 34.0
PZ-434C	58.1 TO 58.0

FORM F042685

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
(WET) 19.6								(5/8")					
MOIST 21.2	107.3		29.	18	11		0	4 (1/4")	42	54			
(SAT) 23.3													
(SAT) 18.3													
(SAT) 17.3								(1-1/4")					
(SAT) 12.0								(1-1/2")					
(SAT) 10.4								(7/8")					
(SAT) 11.4								(1-1/2")					
(SAT) 17.0					NON PLASTIC		1	85 (1-1/2")	11	3			
(SAT) 11.3								(1-1/2")					
(SAT) 8.2													SLOUGH
(WET) 14.8								(1/4")					PRESSURE METER TEST 54.75 - 57.25 FT.
MOIST 13.7	126.0		23	15	8		10	26 (2")	33	31			
													NO SAMPLE
MOIST 13.2	120.4		25	15	10		17	23 (1-1/4")	26	34			BENT TUBE
MOIST 11.3								(1-1/4")					STEEL CASING SET TO 26.0 FT.
SWL 17.05 15.99 15.85													

LEGEND

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- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
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- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

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- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 1-3-85
COORDINATES N 1146 E 382
GROUND ELEV. 752.6

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 434

DRAWN BY MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY RFP	DATE: 10-1-85	
APP'D. BY EHW	SHT. NO. 2 OF 2	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH443-1

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 2)	STRATUM ①	USC	BLOW CT. (N) OR PSI	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER P_L (KSF)	PRESS. METER E_M (KSF)	
1	ST				SILTY CLAY, CL, LITTLE SAND, LITTLE GRAVEL, TRACE OF ORGANICS, ROOTS, VERY DARK GRAYISH BROWN 2.5Y 3/2, MOIST, FIRM.	F							
					... BECOMES SANDY SILT, ML, @ 2.5 FT., TRACE CLAY, SOME SAND, DARK YELLOW BROWN, 2.5Y 4/2.		(CL)	300	2.8	1.2			1
			3.1										
2	ST		5'		GRAVELLY SAND, SM, SOME GRAVEL, LITTLE SILT, POORLY GRADED, GRAYISH BROWN 2.5Y 5/2, WET, VERY DENSE. ROCK MATERIAL IS CARBONATE.		(ML)	150					
3	SSA						(SM)						
			7.0				(SM)	52/12					6
			7.6 ▽		... BECOMES PALE OLIVE 5Y 6/4, SATURATED.								
4	SSA						(SM)	60/12					6
					... TRACE SILT BELOW 8.0 FT.		(SW-SM)	75/12					5
5	SSA												
			10'										
6	SSA						(SP)	50/12					6
					... GRADES TO GRAVEL AND SAND, GP.		(GP)						
7	SSA		11.8				(CL)	35/12		3.2			1
					SILTY CLAY, CL, TRACE GRAVEL, TRACE SAND, DARK GRAY 5Y 4/1, MOIST, STIFF, ROCK MATERIAL IS SHALE AND CARBONATE.								
8	STU		15'			E	ML-CL	600	7.8				1
			16.5				(CL)						
9	J				GRAVELLY SAND, SW, SOME GRAVEL, TRACE SILT, WELL GRADED, GRAY 5Y 5/1, SATURATED.			1200					1
10	SSA						(SW)	32/12					6
					... LARGE GRAVEL, EXTREMELY DENSE.		(SM-SP)	105/12					6
11	SSA		20'										
					... BELOW 19.7 FEET GRADES TO SANDY GRAVEL, GW, SOME SAND DENSE.		(GW)	34/12					6
12	SSA						(GW) (SM)	40/12					7
13	SSA				... BECOMES VERY DENSE, ROCK FRAGMENTS ANGULAR.								
14	SSA		25'				(GM)	59/12		2.0			6
15	SSA /J						(GM)	57/12					6
16	SSA						(GM)	62/12					6
			28.9				(SW-SP) (CL)	43/12	5.0				1
17	SSA		30'		SILTY CLAY, CL, SOME SAND, TRACE GRAVEL DARK GRAY 5Y 4/1, MOIST, STIFF, HARD TO VERY HARD.								
18	SSA					B	(CL)	69/12	8.8	3.0			6
					... TRACE SAND, ROCK MATERIAL IS CARBONATE AND SHALE.								
19	STU						CL	800	3.4				1
			35'										

FORM F042685

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
9.2							(1-5/8)						SAMPLE DISTURBED, TUBE BENT.
4.5							(1-1/2)						SAMPLE DISTURBED, TUBE BENT.
.5							(1-1/2)						
.8							(1-1/2)						SET 4" STEEL CASING TO 7.5 FT.
AT.							(1-1/2)						
AT.							(7/8)						
7.1							(1-1/2)						ADVANCE CASING TO 12.5 FT.
5.2			23	16	7		12 (1-1/2)	13	43	32			POOR RECOVERY
5.1							(2-1/8)						POOR RECOVERY
AT.							(1")						
AT.							(1-1/2)						
AT.							(1-1/2)						
.6							(1-1/2)						
AT.							(1-1/2)						ADVANCE CASING TO 25 FT. ENTIRE SAMP. SLOUGH
AT.							(1-1/4)						ADVANCE CASING TO 27 FT. NO SAMPLE
AT.							(1-1/4)						
4.3													ADVANCE CASING TO 30 FT.
.4							(5/8)						
2.7			22	13	9		7 (1-1/2)	24	39	30		TUU $\phi = 0.0°$ C = 0.97 KSC	V. MINOR DISTURBANCE OF SAMPLE.

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 2-20-85 TO 2-21-85
COORDINATES N 1235 E 173
GROUND ELEV. 739.6

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 443

DRAWN BY MPW/WF | SCALE 1" = 4' | REV. 1
CHK'D. BY RFP | DATE 10-1-85
APP'D. BY EJW | SHT. NO. 1 OF 2
ORDER NO. 27972 | Stearns Catalytic | DWG. NO.

DH443-2

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 2 of 2)	STRATUM ①	USC	BLOW CT. (N) OR PSI	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
20	STU		35'		SILTY CLAY, CL, (CONT'D).		(CL)	1200	5.2	2.4		
21	STU				... LITTLE GRAVEL, LITTLE SAND.		(CL)	1200	4.2	2.0		
			40'					750				
22	STU				... CARBONATE AND SHALE ROCK MATERIAL.	B	(CL)	750	3.6	2.4		
23	STU		45'				(CL)	750	4.4	2.6		
24	STU						(CL)	800	4.2	2.4		
25	STU		48.5 50'		GRADES TO GRAVELLY SAND, SW, LITTLE GRAVEL, TRACE SILT, WELL GRADED, GRAY 5Y 5/1, SATURATED, VERY DENSE WITH LENSES OF CLAYEY SAND, SC, AND CLAYEY GRAVEL.	A	(CL) (CL) (SW-SM)	1200	1.2	5.0		
26	SSA						(SW-SM) (GC)	71/12				
			55'		TOTAL DEPTH = 51.5 FT. SWL = 7.6 FT., 2-22-85, 16 HRS AFTER BOREHOLE COMPLETION 4" STEEL CASING SET TO 30 FT. NO CAVING REPORTED - 2-22-85 SAMPLES COLLECTED SSA 14 STU 8 ST 2 J 2 TOTAL 26							

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FORM FO42685

LABORATORY DATA ③

③ MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
2.4							(3/8)						
3.5							(1-3/4)						0.21 FT. SLOUGH
													NO SAMPLE
3.4													
3.1							(2)						
1.2							(2)						
5.65							(5/8)						
.2							(1-1/2)						

LEGEND

SAMPLE TYPE

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- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (MOD ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGUR CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.

② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS

③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 2-20-85 TO 2-21-85
COORDINATES N 1235 E 173
GROUND ELEV. 739.6

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 443

DRAWN BY MPW/WF	SCALE: 1" = 4'		REV. 1
CHK'D. BY RFP	DATE: 10-1-85		
APP'D. BY EHW	SHT. NO. 2 OF 2		
ORDER NO. 27972	Stearns Catalytic	DWG. NO.	

DH460-1

GEOTECHNICAL LOG

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 3)	STRATUM ①	USC	FIELD DATA: BLOW CT. (N) OR PSI	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER P_L (KSF)	PRESS. METER E_M (KSF)	
1	STU				ORGANIC SILTY CLAY (OH), TOPSOIL, TRACE SAND, BLACK N 2.5/0, ORGANIC ODOR, MOIST, STIFF.	F	(OH)	50	3.4				36
			2.5										
			3.5		SILTY CLAY (CL), TRACE SAND, GRAYISH BROWN 2.5Y 5/3 MOIST, STIFF.		CL	600	3.8	2.0			
2	STU		5'		SANDY GRAVEL (GW-GM), TRACE TO SOME SILT, SOME INTERBEDDED SILTY SAND, (SM), LAYERS, SOME COBBLE, (GP), LAYERS, WELL TO POORLY GRADED, LT. GRAY, 2.5Y 7/2, MOIST TO WET, DENSE.		(GM)						2
3	SSA						(GM-SM)	48/12					9
4	SSA		8.0 ▽				(GM-SM)	45/12					7
5	SSA				... YELLOW 10YR 7/6, SATURATED.		(GM-GW)	46/12					7
6	SSA		10'				(SW)	39/12					10
7	SSA				... BROWNISH YELLOW 10YR 6/6. ... BECOMES VERY DENSE @ 12.5 FEET.		(SM)	31/12					10
8	SSA						GW-GM	69/12			112	556	6
9	SSA		15'		... GRADES TO SILTY SAND (SW-SM), TRACE TO SOME GRAVEL, WELL GRADED WITH INTERBEDDED POORLY GRADED SAND LAYERS, LT. YELLOWISH BROWN, 10YR 6/4, SATURATED, VERY DENSE.	E	(SM)	51/12					7
10	SSA						(SW)	65/12					6
11	SSA						(SW)	50/12					7
12	SSA		20'		ALTERNATING THIN LAYERS OF REDDISH BROWN 2.5YR 4/4 AND YELLOWISH BROWN 10YR 5/4.		SW-SM	32/12					11
13	SSA		20.5 21.5		... POORLY GRADED FINE SAND LAYER, STRONG BROWN 7.5 YR 5/6, TO LT. YELLOWISH BROWN, 2.5 Y 6/4.		(SW)	74/12					9
14	SSA				... BECOMES EXTREMELY DENSE @ 21.5 FEET.		(SW)	86/12					
15	SSA		24.5				(SW)	77/12			140	868	9
16	SSA		25'		SANDY SILT (ML-SM), TRACE TO LITTLE GRAVEL, SOME INTERBEDDED SILTY SAND (SM-ML), LAYERS, GRAY 10YR 5/1 TO GRAYISH BROWN 10YR 5/2, SATURATED, HARD.		ML	44/12					17
17	SSA				... SOME GRAVEL, GRAY N5/0, 26.3' - 27.8'.		SM	60/12					7
18	SSA				... GRAY 10YR 6/1, TRACE GRAVEL, LITTLE SAND.		ML	42/12	4.1				9
19	SSA		30'		... NATURAL WOOD FRAGMENTS, INCREASING CLAY, VERY STIFF @ 27.5 FEET.		SM-SC	21/12					9
20	SSA		30.5		... BECOMES CLAY (CL) AND SILTY CLAY (CL-CM), TRACE SAND, GRAY 10YR 4/1, MOIST.	D	CL	27/12	6.0				17
21	STU				... GRADES TO CLAYEY SILT (ML-CL), TRACE SAND AND GRAVEL, 5Y 5/1, GRAY, VERY STIFF.		ML-CL	900	6.0	2.0			18
22	SSA		35'		... INCREASING SAND AND GRAVEL.		(CL-ML)	77/12					14

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FORM #042685

LABORATORY DATA ③

MOISTURE %	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
.1													
.2	96.5	2.66	34	16	18		(1-3/4)	8	61	31	REMOLDED 4×10^{-9}		CONSOLIDATION Pc = 4.8 KSC Cc = 0.293 Cr = 0.029 TIP BENT
							(3/4)						BOULDERS
							24 (1-1/4)	59	14	3			
							(1-3/4)						
.4							(1-3/4)						COBBLES
.0							(1-1/2)						
							(3/4) 55	36	8	1			PRESSUREMETER TEST 12.5 - 15.0 FT.
							(1-1/4)						
							(1-1/2)						
							(1-3/4)						
.3							27 (3/4)	62	8	3			
							(1-1/8)						
							(7/8)						
							(5/8)						PRESSUREMETER TEST 22.2 - 24.7 FT.
.3								36	59	5			
							(1-3/8) 22	52	22	4			
			20	14	6		5	20	61	14			
							(7/8) 14	49	22	15			
.6			28	17	11		2	14	40	44		TCUM	
.2	111.7	2.76	17	13	4			16	73	11		$\phi = 33.0°$ C = 0.52 KSC	CONSOLIDATION Pc = 4.8 KSC Cc = 0.034 Cr = 0.003 TIP BENT
.6							(3/4)						

LEGEND

SAMPLE TYPE

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- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 11-8-84 TO 11-14-84
COORDINATES N 1281 E 789
GROUND ELEV. 743.9

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 460

DRAWN BY MPW/WF	SCALE 1" = 4'	REV. 1
CHK'D. BY RFP	DATE 10-1-85	
APP'D. BY EHW	SHT. NO. 1 OF 3	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH460-2

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 2 of 3)	STRATUM (1)	USC	BLOW CT. (N) OR PSI	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)	
					- CONTINUED FROM SHEET 1 -								
23	SSA				... COBBLE. ... SOME GRAVEL, DARK GRAY 10YR 4/1, HARD TO VERY STIFF.	D	(GC-GM)	61/12	9.0	2.0	63	386	9.7
24	SSA						(GM)	65/12	5.0				9.1
25	SSA		40' 39.7		SILTY SAND (SM-SW), TRACE TO SOME GRAVEL, TRACE CLAY, WELL GRADED, VERY DARK GRAY N 3/0, SATURATED, MED. DENSE.	C	(GM)	52/12					11
26	SSA						(GW-GM)	26/12					5.5
27	SSA				... DENSE.		SM	36/12					11
28	SSA		45'				(SM)	39/12					10
29	SSA				... GRAY 10YR 5/1.		SW-(GM)	40/12					8.5
30	SSA		47.1		SILTY CLAY (CL), TRACE SAND, TRACE GRAVEL, VERY DARK GRAY 10YR 3/1, MOIST, HARD.	B	(GM)	73/12	5.0	2.0			15
31	SSA				... TRACE WOOD FRAGMENTS.		(CL)	47/12	6.0	2.0			13
32	J		50'		... COBBLES.			750	4.0				12
33	SSA				... 3" BAND OF BROWN 7.5YR 4/2.		(CL)	127/12	6.5	2.0			12
34	STU		55'				CL	625	3.5	2.0			15
35	SSA				... BROWN 7.5 YR 4/2.		(CL)	38/12	5.8	2.0			17
36	STU		60' 60.0		... DARK GRAY 10YR 4/1.		CL	1200	4.1	2.0			16
37	SSA				SANDY SILT (ML) AND SILTY SAND (SM), TRACE TO LITTLE GRAVEL, TRACE CLAY, DARK GRAY 10YR 4/1, TO REDDISH BROWN 5YR 5/4, WET, VERY HARD.		(SM) (ML)	96/12					12
38	SSA				... LIGHT YELLOWISH BROWN 2.5Y 6/4, EXTREMELY DENSE.		ML	142/12					12
39	SSA				... GRAYISH BROWN 2.5Y 5/2, POOR GRADED LENSE OF SAND @ 63.0 FEET.		SM	106/12					15
40	SSA		65'		... BECOMES VERY DENSE @ 64.5 FEET.		(SM)	76/12					10
41	SSA				... BECOMES SANDY SILT (ML) @ 66.8'. ... DARK GRAYISH BROWN 10YR 4/2.		(SM-ML)	79/12	4.5				12
42	SSA				... BECOMES MEDIUM DENSE @ 67.5 FEET.		(ML)	28/12	3.8				9.5
			70'										

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FORM F042485

LABORATORY DATA ③

MOISTURE %	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (sol.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
													BOULDER
							(1/2)						PRESSUREMETER TEST 35.6 - 38.1 FT.
							(1-1/4)						
8							(1-1/2)						
							(1-1/2)						
0			13	20	NP		28 (3/4)	60	9	3			
3							(1)						
							34 (1-1/2)	55	8	3			
3							(1-1/2)						70% OF SAMPLE IS SLOUGH
0							(7/8)						
8													SLOUGH
3							(5/8)						50% OF SAMPLE IS SLOUGH
2	119.8 121.1	2.75	29	15	14		4 (1-1/4)	21	31	44	6×10^{-9} 5×10^{-8} REMOLDED	Qu = 3.6 KSC	CONSOLIDATION Pc = 4.8 KSC Cc = 0.145 Cr = 0.015
4							(1-1/2)						CONSOLIDATION Pc = 4.8 KSC Cc = 0.132 Cr = 0.013
8	119.8	2.72	32	13	19		6 (1-1/8)	20	30	44		Qu = 4.2 KSC	TUBE SLIGHTLY BENT
1							(1-1/2)						
1			15	14	1		11 (1-1/2)	36	48	5			
2							(1/4)						
3							(1)						
5							(3/4)						
							(3/4)						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (MOD ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (MOD ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
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STRENGTH TESTING

- U.C. UNCONFINED COMPRESSION
- T.C.U. TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 11-8-84 TO 11-14-84
COORDINATES N 1281 E 789
GROUND ELEV. 743.9

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 460

DRAWN BY MPW/WF	SCALE: 1" = 4'	REV. 1	
CHK'D. BY REP	DATE: 10-1-85		
APP'D. BY EHW	SHT. NO. 2 OF 3		
ORDER NO. 27972	Stearns Catalytic	DWG. NO.	

DH460-3

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 3 of 3)	STRATUM ①	USC	② BLOW CT. OR PSI	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER P_L (KSF)	PRESS. METER E_M (KSF)
					- CONTINUED FROM SHEET 2 -							
43	STU		70' 71.5		...DARK GRAY 10YR 4/1.	B	SM-SC	1200	2.7			
44	SSA				SAND (SW), TRACE SILT, TRACE TO LITTLE FINE GRAVELS, WELL GRADED, LIGHT BROWNISH GRAY 2.5Y 6/2, SATURATED, EXTREMELY DENSE.	A	(SW)	69/12			101.4	1008
45	SSA						(SW)	91/12				
46	SSA		75'		...BECOMES GRAVELLY 75.7 - 77.0 FEET.		(SW)	84/12				
47	SSA						SP-SM	74/12				
48	SSA						(SW)	83/12				
49	SSA		80'				(SW)	99/12				
50	SSA						(SW)	103/12				
51	SSA						(SW)	114/12				
52	SSA		85'				(SW)	103/12				
53	SSA						SW-SM	179/12				
54	SSA		86.9 88.0		...WEATHERED BEDROCK.		(SP)	242/12				
55	J		90' 90.2		DOLOMITE BEDROCK, MASSIVE.	R						

TOTAL DEPTH = 90.2

NO STATIC WATER LEVEL TAKEN

SAMPLES COLLECTED

SSA	47
STU	6
JAR	2
TOTAL	55

4" ØSTEEL CASING TO 52.5 FEET.

PIEZOMETER SLOTTED CASING DEPTH

PZ-460A 35.7 FT TO 37.6 FT.

25

FORM F043688

LABORATORY DATA ③

(3) MOISTURE	DRY (PCF) DENSITY	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
9.8		2.74	16	8	8		10 (1)	45	32	13			TIP BENT
0.2							(1-1/2)						PRESSUREMETER
0.6													TEST 71.8 - 74.3 FT.
9.0							(1-1/2)						
9.6			16	20	NP		26 (1-1/2)	63	8	3			
9.6							(3/4)						
3.7							(1)						27% SAMPLE IS SLOUGH
3.3							(3/4)						
3.6							(5/8)						
3.7							(1/2)						
0.0			9	20	NP		3 (1/2)	87	7	3			
1.0							(3/4)						LARGE GRAVEL & COBBLES.
													CUTTING CHIPS
NR													
SWL 7.22													

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 11-8-84 TO 11-14-84
COORDINATES N 1281 E 789
GROUND ELEV. 743.9

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 480

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHN	SHT. NO. 3 OF 3	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH499-1

GEOTECHNICAL LOG

FIELD DATA

NO.	TYPE	SAMPLE % RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 3)	STRATUM (1)	USC	BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PP PRESS. METER (KSF)	EM (KSF)
			0.5		FILL, OL, (TOPSOIL), BLACK, 10YR 2/1, MOIST, STIFF.	FILL						
1	STU				SILTY CLAY, CL-CH, TRACE SAND, TRACE GRAVEL, GRAYISH BROWN 10YR 5/2, MOIST, STIFF, HOMOGENEOUS.	F	CL-CH	500	3.0	3.0		
			3.3									
2	STU				GRAVELLY SAND, SW-SM, WELL GRADED, SOME GRAVEL, TRACE SILT, PALY YELLOW, 2.5Y 7/4, WET, VERY DENSE, GRAVEL MATERIAL IS CARBONATE.		(CL	1200	1.0			
			5'									
3	SSA				... BECOMES GRAVEL AND SAND, GW-GM, LIGHT YELLOWISH BROWN, 2.5Y 6/4.		(SW-SM)	57/12				
4	SSA						(GW-GM)	62/12				
5	SSA						(GW-GM)	71/12				
6	SSA		10' 11.0		... BECOMES SATURATED		(GW-GM)	35/12				
7	SSA				... POORLY GRADED, OLIVE, 5Y 5/3		(GP-GM)	55/12				
8	SSA				... OLIVE GRAY, 5Y 4/2	E	(GP)	63/12				
9	SSA		15'		... LIGHT OLIVE GRAY, 5Y 6/2		(GP-GM)	61/12				
10	SSA				... BECOMES DENSE		(SW-SM)	45/12				
11	SSA				... BECOMES GRAVELLY SAND, SOME GRAVEL, TRACE SILT, OLIVE GRAY, 5Y 5/2		(SP) (SW)	34/12				
12	SSA						(SP)	36/12				
13	SSA		20'				(SW) (SM)	41/12				
								800				
			24.5									
14	SSA		25'		SILTY CLAY, CL, TRACE SAND, TRACE GRAVEL, GRAY, 10YR 5/1, MOIST, VERY STIFF		(CL)	41/12	5.0			
15	J					D	(CL)	800	4.0			
16	J		29.2 30'				(CL)	1200				
			31.0									
17	SSA				GRAVELLY SAND, SM TO SP, SOME SILT TO TRACE SILT, POORLY GRADED, OLIVE GRAY, 5Y 5/2, SATURATED, DENSE, GRAVEL MATERIALS IS CARBONATE.		(SM)	54/12				
18	SSA					C	(SP)	25/12				
19	SSA		35'		... LAYER OF SILTY CLAY, CL, DARK GRAY, 5Y 4/1 AT 34.0 FT. 1-IN. THICK.		(CL)	31/12	3.6			

FORM F042685

26

LABORATORY DATA ③

(X) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
26.8	83.6		48	18	30		(1-1/2")		48	52	6×10^{-8}	TUU $\phi = 0.0°$ C = 0.68 KSC	
36.1							(1-1/2")						
5.89							(1-1/2")						
6.84							(1-1/2")						
6.68							(1-1/2")						
5.41							(1-1/2")						
SAT							(1-1/4")						
SAT							(1-1/4")						
SAT							(1-1/8")						POOR RECOVERY
SAT							(1-1/2")						
SAT							(7/8")						
SAT							(5/8")						POOR RECOVERY
SAT							(1-1/2")						
													DRILL - NO SAMPLE
													PUSHED SHELBY TUBE NO RECOVERY
MOIST							(5/8")						POOR RECOVERY - PLACE IN JAR
MOIST							(5/8")						POOR RECOVERY - PLACE IN JAR
MOIST													CASING SET TO 31 FT POOR RECOVERY
SAT							(5/8")						
SAT							(5/8")						SAMPLE POSSIBLY ALL WASH CUTTINGS
MOIST							(5/8")						POOR RECOVERY

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 3-12-85
COORDINATES N 1374 E 525
GROUND ELEV. 740.2

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 499

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 1 OF 3	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH499-2

GEOTECHNICAL LOG

Sheet 2 of 3

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM ①	USC	FIELD DATA: BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER P (KSF)	PRESS. METER EM (KSF)
20	SSA				GRAVELLY SAND (CONTINUED)			51/12				
					... LITTLE GRAVEL, DARK GRAY, 5Y 4/1, BECOMES VERY DENSE.							
21	SSA				... BECOMES STRATIFIED WITH SEAMS OF COARSE, MEDIUM AND FINE-GRAINED SAND.		(SP)	77/12				
22	SSA		40′		... BECOMES MEDIUM DENSE AT 39.0 FEET.		(SP)	24/12				
23	SSA				... SOME GRAVEL, BECOMES DENSE AT 40.5 FEET.	C	(SP)	41/12				
24	SSA				... BECOMES WELL GRADED SAND.		(SW)	37/12				
25	SSA		45′				(SW)	43/12				
								16/12				
				46.5	SILTY CLAY, CL, TRACE SAND, TRACE GRAVEL, GRAY, 10YR 5/1, MOIST, STIFF.		(CL)	22/12				
26	J											
27	SSA				... BECOMES GRAYISH BROWN, 2.5 YR 5/2.		(CL)	40/12	3.0	2.2		
28	STU		50′		... BECOMES DARK GRAY, 5Y 4/1.		(CL)	800	1.6	1.0		
29	ST						(CL)	850	3.4	2.6		
						B						
30	STU		55′				(CL)	1200	3.5	1.9		
31	SSA						(CL)	24/12				
32	SSA		60′		... BECOMES SILTY SAND, SM, AT 59.3 FEET, OLIVE GRAY, 5Y, 5/2, SATURATED, STRATIFIED.		(CL) (SM)	64/12				
33	SSA				... BECOMES SANDY CLAY, CL, AT 60.5 FEET, GRAYISH BROWN, 2.5Y 5/2, MOIST.		(CL)	50/12	3.0			
34	SSA			62.1	GRAVELLY SAND, SP, FINE, LITTLE GRAVEL, POORLY GRADED, CARBONATES, OLIVE GRAY, 5Y 5/2, SATURATED, VERY DENSE.		(CL) (SP)	59/12				
35	SSA		65′				(SP)	76/12				
36	SSA				... GRADES TO SAND, SP, NO GRAVEL, TRACE SILT, GRAY, 5Y 5/1.		(SP)	53/12				
37	SSA					A	(SP)	70/12				
38	SSA						(SP)	71/12				
39	SSA		70′		... TRACE GRAVEL, 69.5 TO 71.0 FEET, BECOMES EXTREMELY DENSE.		(SP)	86/12				

FORM 1042655

27

LABORATORY DATA ③

MOISTURE ③	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
													ADVANCE CASING TO 37 FT. NO RECOVERY
													DRILL - NO SAMPLE
SAT							(7/8")						
SAT							(5/8")						
SAT							(7/8")						
SAT							(1-1/2")						
SAT							(1-1/2")						ADVANCE CASING TO 42.5 FT.
MOIST							(1")						POOR RECOVERY PLACE IN JAR
11.31													
14.84													
16.00							(3")						DISTURBED SAMPLE
													DRILL - NO SAMPLE
17.89							(1-3/4")						
11.53							(1")						
SAT							(5/8")						
MOIST							(1-1/2")						
WET - SAT							(5/8")						
SAT							(5/8")						
SAT													
SAT													
SAT													
SAT							(5/8")						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 3-12-85
COORDINATES N 1374 E 5/5
GROUND ELEV. 740.2

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 499

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 2 OF 3	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

28

DH499-3

GEOTECHNICAL LOG

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 3 of 3)	STRATUM ①	USC	FIELD DATA: BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
40	SSA						(SP)	59/12				
41	SSA				...EXTREMELY DENSE.		(SP)	85/12				
42	SSA		75				(SP)	159/12				
43	SSA					A	(SP)	154/12				
44	SSA						(SP)	109/12				
45	SSA						(SP)	157/12				
			80	80.0								
46	J				DOLOMITE (BEDROCK), CALCAREOUS, LIGHT GRAY, 5Y 7/2	R						
			85		TOTAL DEPTH = 82.0 FEET.							

S.W.L. = 0.0 FT. (GROUND SURFACE) 3-13-85
S.W.L. = 2.6 FT. 3-14-85
CASING TO 42.5 FT. 3-14-85
S.W.L. = 3.1 FT. 3-15-85
S.W.L. = 29.2 FT. 3-18-85
NO CAVING REPORTED 3-18-85

SAMPLES COLLECTED

SSA	37
STU	4
ST	1
J	4
TOTAL	46

NOTE: SAMPLE NO. 20 PRODUCED ZERO RECOVERY, THEREFORE IS NOT INCLUDED IN THE ABOVE LIST.

FORM F042685

LABORATORY DATA ③

(3) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
SAT													
SAT													
SAT													TOP 0.25 FEET POSSIBLE SLOUGH
SAT													
SAT													
SAT													
SAT													DRILL CUTTINGS HARD DRILLING

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 3-12-85
COORDINATES N 1374 E 525
GROUND ELEV. 740.2

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 499

DRAWN BY MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY RFP	DATE: 10-1-85	
APP'D. BY EHW	SHT. NO. 3 OF 3	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH509A-1

GEOTECHNICAL LOG

Sheet 1 of 3

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM (1)	USC	FIELD DATA: BLOW CT. OR PSI (N)	FIELD DATA: PENE-TROMETER (KSF)	FIELD DATA: TORVANE (KSF)	FIELD DATA: PL PRESS. METER (KSF)	FIELD DATA: EM PRESS. METER (KSF)	MOISTURE (%)
1	STU				GRAVELLY SAND, SM, SOME GRAVEL, LITTLE SILT, POORLY GRADED, LIGHT YELLOWISH BROWN, 2.5Y 6/4, WET, DENSE, GRAVEL COMPOSITION IS CARBONATE.		(SM)	1200					7.0
2	SSA						(SM)	52/12					MC
			5' 5.5 ▼		... TRACE SILT, SATURATED BELOW 5.0 FT.								
3	SSA						(SW)	28/12					6.9
					... LIGHT OLIVE BROWN, 2.5Y 5/4.								
4	SSA						(SW)	40/12					SA
					... INTERBEDDED LAYERS OF SILT.								
			10'		... VERY DENSE.								
5	SSA						(SW) (SP)	51/12					SA
					... BECOMES FINE SAND, SP, AT 11.1 FT.								
					... GRAYISH BROWN, 2.5Y 5/2.								
6	SSA						(SP)	21/12					SA
			13.7		GRAVELLY SILT, ML, LITTLE SAND, TRACE CLAY, GRAY, 5Y 5/1, STIFF.								
			15'			E							
7	STU		16.5		SANDY GRAVEL, GP, TRACE SILT, SOME SAND, POORLY GRADED, LIGHT OLIVE GRAY, 5Y2 6/2, SATURATED, VERY DENSE CARBONATE GRAVEL.		(ML)	1200	2.4	1.0			19
8	SSA						(GP)	85/12					SA
			20'		... STRATIFIED SANDY INTERVAL.								
9	SSA						(GW)	76/12					SA
					... BECOMES GRAVELLY SAND, SW, WELL GRADED SOME GRAVEL, DARK GRAY, 5Y 4/1, SATURATED.								
10	SSA						(SW-SM)	56/12					SA
			25'										
								58/12					
					... LITTLE SILT, VERY DARK GRAY, 5Y 3/1.								
11	SSA						(SM)	46/12					SA
			30'		... BECOMES SANDY GRAVEL, GW-GM, TRACE SILT, WELL GRADED, LIGHT OLIVE GRAY, 5Y 6/2.								
12	SSA						(GW)	60/12					SA
13	SSA						(GW-GM)	77/12					SA
			35'										

FORM FG4.2565

29

LABORATORY DATA ③

MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
							(1-1/2)						SAMPLING PROGRAM NOT CONTINUOUS
IST							(1-1/2)						
1							(1-3/8)						
.							(1")						
.							(1-1/8)						SET 4" CASING TO 12.5 FT.
.													
5							(3")						
.							(1-1/2)						
.							(1-1/2)						
.							(1-1/2)						ADVANCE CASING TO 25 FT.
							(1-1/2)						
.							(1-1/2)						
.							(1-1/2)						
.							(1-1/2)						ADVANCE CASING TO 30 FT.

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (HIGH ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (HIGH ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 3-19-85
COORDINATES N 1419 E 81
GROUND ELEV. 739.9

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 509A

DRAWN BY MPW/WF	SCALE: 1" = 4'	REV.
CHK'D. BY RFP	DATE: 10-1-85	1
APP'D. BY EHW	SHT. NO. 1 OF 3	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

30

DH509A-2

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 2 of 3)	STRATUM ①	USC	FIELD DATA: BLOW CT. OR PSI (N)	PENETROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
14	SSA		35′		... BECOMES GRAVELLY SAND, SP, @ 35 FT. GRAY 5Y 5/1, DENSE, SUBANGULAR CARBONATE GRAVEL.	E	(SP)	45/12				
15	SSA						(SW)	40/12				
16	SSA		40′		... BECOMES SANDY GRAVEL, GW, @ 40 FT. WELL GRADED, GRAY 5Y 6/1.		(GW)	40/12				
17	SSA		43.2				(GW) (CL)	126/12		1.4		
18	STU		45′		SILTY CLAY, CL, TRACE SAND, DARK GRAY, 5Y 4/1, SATURATED WET, MEDIUM FIRM.	B	(CL)	1200	1.4	0.8		
19	STU		50′		... TRACE GRAVEL, MOIST. ... BECOMES VERY STIFF BELOW 50 FT.		(CL)	800	1.0	0.8		
20	SSA						(CL)	71/12	6.2	2.8		
21	STU		55′		... BECOMES GRAYISH BROWN 2.5Y 5/2 AT 55.0 FT., MOIST TO WET, VERY STIFF.		(CL)	800	5.2	3.0		
22	SSA				... BECOMES SANDY CLAY AT 57.5 FT., SOME SILT, GRAY BROWN, 2.5Y 5/2, WET, STIFF.		(CL)	39/12	5.0			
23	SSA		60′				(CL)	36/12	3.2			
24	SSA						(CL)	22/12				
25	SSA		65′		... TRACE GRAVEL, HARD AT 65 TO 66.0 FT.		(CL)	96/12	9.0			
26	SSA		66.5		SANDY GRAVEL, GP-GM, TRACE SILT, POORLY GRADED, LIGHT GRAY, 5Y 7/2, SATURATED, VERY DENSE, ANGULAR ROCK FRAGMENTS ARE CARBONATE.	A	(GP-GM)	68/12				
			70′									

FORM FO42685

30

LABORATORY DATA ③

③ MOISTURE	DRY DENSITY (PCF)	② SPECIFIC GRAVITY	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
SAT.							(5/8)						
SAT.							(3/8)						ADVANCE CASING TO 37 FT.
SAT.							(1-1/2)						
							(1-1/2)						ADVANCE CASING TO 45.0 FT.
15.07							(1-1/2)						TIP OF SAMPLE TUBE BENT. ADVANCE CASING TO 47.5 FT.
17.15													
16.67													
11.21							(1-1/2)						
11.42							(5/8)						
9.89													
WET													
9.99							(1)						
SAT.							(1-1/2)						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 3-19-85
COORDINATES N 1419 E 81
GROUND ELEV. 739.9

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 509A

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 2 OF 3	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

H509A-3

GEOTECHNICAL LOG

Sheet 3 of 3

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM ①	USC	FIELD DATA: BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
27	SSA		70'		... BECOMES SAND, SP, @ 70 FT., FINE TO MEDIUM GRADED, OLIVE GRAY, 5Y 5/2, SATURATED, DENSE.	A	(SP)	45/12				
28	SSA		72.5		BEDROCK, DOLOMITIC LIMESTONE.	R		150/6				
29	J		75'									
			80'		TOTAL DEPTH = 75.0 FEET 4-IN. DIAMETER STEEL CASING SET TO 47.6 FT. NO STATIC WATER LEVEL TAKEN NO CAVING NOTED AT ABANDONMENT ON 3-21-85 SAMPLES COLLECTED SS 23 ST 5 JAR 1 TOTAL 29							

FORM F042685

31

LABORATORY DATA ③

③ MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
SAT													
													NO SAMPLE
							(1-1/2")						BEDROCK
													ROCK CUTTINGS

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 3-19-85
COORDINATES N 1419 E 81
GROUND ELEV. 739.9

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 509A

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EJW	SHT. NO. 3 OF 3	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH560-1

GEOTECHNICAL LOG

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 3)	STRATUM ①	USC	FIELD DATA: BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER P_L (KSF)	PRESS. METER E_M (KSF)
1A	J		0.3		CONCRETE SLAB							
1B	SSA		2.3		FILL, BASE COARSE, FINE SANDS, GRAVELLY DARK GRAY BROWN, 2.5 Y 4/2, WET, LOOSE.	FILL	(SW)	6/12				
2	STU		2.5		ORGANIC CLAY, OL, (TOPSOIL), BLACK CLAY, CL, SILTY, TRACE GRAVEL AND SAND WITH ROOTS, BROWN, 7.5YR 5/6 TO OLIVE GRAY, 5/2, MOIST FIRM TO STIFF.	F	(OL) CL	150	5.0	1.4		
3	STU		5′		... GRADES TO SILT, ML, SANDY, LIGHT GRAY, 2.5Y 7/2, STIFF, VERY MOIST.		ML	200	7.0			
4	SSA		6.2		SILTY SAND, SP-SM, AND SILTY GRAVELS, GP-GM, LAYERS, FINE TO COARSE GRAVELS, OLIVE, 5/ 4/3 TO LIGHT OLIVE BROWN, 2.5Y 5/4, MOIST TO WET.	E	(GW)	41/12				
5	SSA		7.7 ▽				SM	53/12				
6	SSA		10′ 10.45 ▽				(SM)	47/12				
7	SSA				... BROWN YELLOW, 10YR 6/6 WITH LESS SILT, SATURATED.		SM	39/12				
8	SSA						(GP)	32/12				
9	SSA		15′		... LIGHT YELLOW BROWN, 2.5Y 6/4.		SP-SM	33/12				
10	SSA				... COBBLE.		(GP)	41/12				
11	SSA				... BECOMES VERY DENSE AT 16.7 FEET.		SP-SM	59/12				
12	SSA				... GRADING TO WELL GRADED FINE SAND LAYER (SW)		SW-GW	60/12				
13	SSA		20′		... GRAVELLY SAND LAYER SILTY		SW-SC	49/12				
14	SSA				... BECOMES DENSE AT 19.7 FEET.		(GM)	45/12				
15	SSA		23.0		... GRAVELLY - COBBLES (DOLOMITE)		SM	32/12				
16	SSA		25′ 25.0		SILT, ML, AND SAND, SM, TRACE GRAVEL, BROWN 10YR 5/3 AND BLACK, 2.5Y 2/0, SAND AND SILT LAMINAE, HARD WET.		SW-SC	20/12				
17	SSA				SANDS, SM, FINE TO MEDIUM, VERY SILTY LIGHT GRAY, 10YR 7/1, DENSE, SATURATED		SM	37/12				
18	SSA		28.0		GRAVELS, GP, FINE TO COURSE, SANDY GRAY, 10YR 7/1, DENSE, SATURATED.		SM	37/12				
19	SSA		30′		... BOULDER		(GC)	43/12				
20	SSA				... BOULDER		(GP)	48/12				
21	SSA						GP	14/12				
22	SSA		35′				(GC)	39/12				

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FORM F042585

LABORATORY DATA ③

(%) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (sol.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
21.3													NO SAMPLE
40.7							(3/4)						
25.1	100.5	2.76	41	18	23		2 (3/8)	4	63	31	5×10^{-8}	TCD $\phi' = 32.2°$ $C' = 0.02$ KSC	
15.2	116.1	2.72	20	18	2		3 (1/2)	41	44	12	7×10^{-6}	TCUM $\phi = 26.8°$ $\phi' = 33.0°$ $C = 0.06$ KSC $C' = 0.07$ KSC	NUMBER STAMPED ON
WATER TABLE							(FINE)						TUBE AFTER SAMPLE TAKEN.
97.7' SAT							35 (FINE)	48	12	5			
SAT.							(COARS)						PLASTIC TUBE LINER CRACKED
SAT.						(+3)	22 (MED)	59	19				
SAT.						(+3)	(COARS)						
SAT.							41 (COARS)	49	10				PLASTIC TUBE LINER CRACKED.
SAT.						(+12)	COARS						SLOUGH
SAT.						(+3)	42	47	11				SLOUGH 16.7 TO 17.0'
SAT.							(COARS)						SLOUGH 19.7 TO 20.0'
SAT.						(+3)	28	62	10				
SAT.						(+3)							SLOUGH 21.2 TO 21.9'
SAT.					NP		6 (FINE)	70	21	3			
SAT.							31 (MED)	62	7				
SAT.							6 (FINE)	73	14	7			
SAT.			14	14	NP	(+3)	24	57	15	4			PLASTIC TUBE LINER CRACKED
SAT.						(+3)							SLOUGH 29.2' TO 29.7'
SAT.						(+3)							SLOUGH
SAT.							74 (COARS)	24	2				
SAT.						(+3)	51	32	17				

LEGEND

SAMPLE TYPE

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- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 10-23-84 TO 10-26-84
COORDINATES N 1575 E 524
GROUND ELEV. 745.7

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 560

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV.
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 1 OF 3	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH560-2

GEOTECHNICAL LOG

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 2 of 3)	STRATUM ①	USC	FIELD DATA: BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
23	SSA				... BECOMES EXTREMELY DENSE AT 36.7 FEET.		(GP)	72/12				
24	SSA				GRAVELS, GP-GC		(GP)	94/12				
25	SSA				... BOULDER, LIMESTONE		(GC)	118/12				
26	SSA		40'				(GC) SC)	40/12				
27	SSA			41.5	SAND, SC-SW, CLAYEY, LITTLE MEDIUM GRAVEL, ROUNDED, GRAY, 10YR 5/1 TO DARK GRAY, 10YR 4/1, SATURATED, MEDIUM DENSE, SANDS FINE TO COARSE DOLOMITE AND LIMESTONE GRAVELS.	E	SW-SC	22/12				
28	SSA						(SC)	30/12				
			45'				–					
							–					
29	SSA						SW-SC	33/12				
30	SSA						SC-SM	17/12	5.0	2.0		
31	STU		50'	49.8	CLAY, CL, VERY SILTY, SOME MEDIUM GRAVELS, SANDY GRAY, 10YR 5/1, MOIST, HARD.		CL	150	5.4			
32	SSA						CL	34/12	3.9	2.0		
33	ST		55'				CL	300	3.0			
34	SSA				... SAND, SP-SC, LAYER LESS THAN 2 FEET THICK.	B	SP-SM	23/12	3.5	2.0		
35	STU						CL	300	3.8	1.6		
36	SSA		60'				CL	23/12				
37	J SSA			60.8	GRAVELS, GC-GM, BOULDERY, SILTY AND CLAYEY, GRAY, 10YR 5/1, EXTREMELY DENSE, SATURATED.		GM	83/12				
							–					
38	SSA			63.5			(ML)	39/12				
39	ST		65'		... BOULDER, DOLOMITIC.	A	SM	375	2.4	0.8		
								9/12				

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FORM F047685

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
SAT.													
SAT.						(+3)	(+3)						BOULDER OR COBBLE FRAGMENTS IN SAMPLE, SLOUGH
SAT.						(+3)							
SAT.													SEVERAL
SAT.							12 (MED)	71	7	---			HOLE CAVE-INS
SAT.							20 (FINE)						SLOUGH 42.7' TO 42.8'
SAT.													NO SAMPLE - DRILLING ERROR
SAT.													NO RECOVERY - HOLE CAVE-IN, SAT. SANDS.
SAT.							32 FINE	57	11	---			
SAT.			20	13	7		11 (1-1/2)	75	10	4			
13.1 13.5	124.2	2.74	26	16	10		7	24	35	34	2×10^{-8}	Qu = 4.6 KSC	CONSOLIDATION Pc = 4.8 KSC Cc = 0.120 Cr = 0.012
---							8 (1-1/2)	25	67	---			
12.8			22	12	10		9 (7/8)	34	29	28			TUBE BENT, USED MUD TO STABILIZE HOLE.
---							8 (FINE)	83	9	---			PLASTIC SAMPLE TUBE CRACKED IN MIDDLE
17.3	113.2	2.71	33	16	17		2 (2-3/4)	14	30	54		Qu = 2.5 KSC	
							9 (FINE)	31	60	---			
SAT.						(+12)	48	36	8	8			SLOUGH
---							(1-1/2)						NO SAMPLE - DRILL THRU LG GRAVEL, COBBLES
16.8	NO TEST DIST.	2.76	14	13	1	(+12)	5 (1-1/4)	48	32	15			BENT TUBE SAMPLE DISTURBED

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 10-23-84 TO 10-26-84
COORDINATES N 1575 E 524
GROUND ELEV. 745.7

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 560

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: REP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 2 OF 3	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

34

DH560-3

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 3 of 3)	STRATUM (1)	USC	BLOW CT. (N) OR PSI	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER P (KSF)	PRESS. METER E (KSF)
40	STU		68.5 70'		SANDS, SM-SC, FINE TO MEDIUM GRAVELS, CLAYEY AND SILTY, GRAY, 10YR 5/1, SATURATED, DENSE, GRADING COARSER DOWNWARDS.		SM	150	4.2	2.0		
41	J SSA						SM	34/12				
42	SSA						SM	88/12				
43	SSA		74.0 75'		GRAVELS, GM-GP, SATURATED, LIGHT GRAY, 10YR 5/1, EXTREMELY DENSE.	A	SM	102/12				
44	SSA				...BOULDERY FROM 77.0 TO 79.5 FEET, WEATHERED DOLOMITES		(SC)	35/12				
45	SSA						(SP)	48/12				
46	SSA		79.5 80'		BEDROCK, DOLOMITE/LIMESTONE		–	181/12				
47	J					R	–	50/0				

TOTAL DEPTH = 82.0 FEET

NO CAVING REPORTED

SAMPLES COLLECTED

SSA	34
ST	2
STU	7
J	4
TOTAL	47

4-IN-DIA STEEL CASING 0 TO 52.5 FEET.
S.W.L. = 10.45 FEET 11-8-84

34

FORM FOA2685

LABORATORY DATA ③

③ MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
6.8	136.4	2.76	14	14	NP		15 (2-1/2)	44	27	14		Qu = 1.9 KSC	LOST 1 FT. SAMPLE AS TUBE CLEARED TOP OF HOLE.
AT.							8	65	15	12			
VET							11	76	8	5			
VET							25/59	58/31	17/7	-/3			
VET							59 (FINE)	31	7	3			
VET						(+3)	(1-1/2)						SLOUGH 77.0' TO 77.3'
VET						(-12)							
AT.							4	89	7				

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) W = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 10-23-84 TO 10-26-84
COORDINATES N 1575 E 524
GROUND ELEV. 745.7

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 560

DRAWN BY: MPW/WE	SCALE: 1" = 4'	REV.
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 3 OF 3	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH1

GEOTECHNICAL LOG

Sheet 1 of 1

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM ①	USC	FIELD DATA: BLOW CT. (N) OR PSI	FIELD DATA: PENE-TROMETER (KSF)	FIELD DATA: TORVANE (KSF)	FIELD DATA: PL PRESS. METER (KSF)	FIELD DATA: EM (KSF)
			0.8		FILL, CL, SILTY CLAY, TRACES OF SAND AND GRAVEL.	FILL						
1	ST				SILTY CLAY, CL, LITTLE GRAVEL, TRACE SAND, TRACE ORGANIC, GRAY, 5/1 TO 3.4' CHANGING TO LIGHT OLIVE BROWN, 2.5Y 4/4 AT APPROXIMATELY 4.0'; MOIST, FIRM.	F	(CL)	550	2.9			
2	ST						(CL)	500				
3	SS		4.7 4.2 ▽ 5'		SANDY GRAVEL, GW-GM, SOME SAND, LITTLE SILT, LIMESTONE AND IGNEOUS, GRAYISH BROWN, 2.5Y 5/2, TO OLIVE, 5Y 5/3, SATURATED, DENSE.		(GW-GM)	82/12	0.4			
4	SS		6.5 ▼ 7.1				(GP)	45/12				
5	SS				SILTY CLAY,CL, TRACE GRAVEL, TRACE SAND, LOW PLASTICITY, DARK GRAY, 10YR 4/1, MOIST, VERY STIFF.		(CL)	33/12	4.3	1.8		
6	SS		10' 9.9			E	(CL)	33/12	4.0			
7	SS				SANDY GRAVEL, GM, SOME SAND, LITTLE SILT, LITTLE CLAY, GRAY, 10YR 5/1, WET DENSE.		(GM)	60/12				
			15'		TOTAL DEPTH = 11.5 FEET CAVED 6.1 FEET 3/20/85 S.W.L. 4.7 FEET 3/18/85 SAMPLES COLLECTED SS 5 ST 2 TOTAL 7							

35

FORM FG4368

LABORATORY DATA ③

(%) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
MOIST							(1-5/8")						DENTED TUBE
MOIST													BENT TUBE
6.6													
SAT							(2")						
17.1													
MOIST													
WET							(2")						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (MOD ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (MOD ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 3-18-85
COORDINATES N 26 E 74
GROUND ELEV. 729.7

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 1

DRAWN BY MPW/WE	SCALE 1" = 4'	REV. 1
CHK'D. BY REP	DATE 10-1-85	
APP'D. BY EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH7

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM (1)	USC	BLOW CT. (N) OR PSI	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
1	ST				SILTY CLAY, CL, DARK YELLOW BROWN, 10YR 4/4, MOIST, FIRM TO STIFF.	F	(CL)	200 - 300	2.4	1.8		
2	ST		2.8		SANDY GRAVEL, GP-GM, POORLY GRADED, TRACE SILT, YELLOW BROWN 10YR 5/6, MOIST, DENSE.		(CL-GC)	200	2.4	1.6		
3	SS		5'				(GP-GM)	71/12				
4	SS						(SM GW-GM)	79/12				
5	SS						(GM)	81/12				
6	SS				...WET		(GP-GM)	48/12				
7	SS		10'			E	(SM)	56/12				
8	SS		13.8				(GW)	44/12				
9	SS		14.0 ▽		...SATURATED		(SP)	53/12				
10	SS		15' 15.5		SILT, ML, NO PLASTICITY, GRAYISH BROWN 2.5Y 5/2, SATURATED, HARD.		(GP-GM-ML)	40/12				
11	SS		17.0		SANDY GRAVEL, GM, LITTLE SILT, SOME SAND, YELLOW BROWN 10YR 4/6, SATURATED, MEDIUM DENSE.		(GM)	57/12				
12	SS		18.3		SAND, SP, TRACE SILT, GRAY BROWN 2.5Y 5/2, MED. DENSE.		(GM-SP)	35/12				
			20'		TOTAL DEPTH = 19.0 FEET CAVED TO 13.0 (3/13/85) SWL 13.8 (3/6/85) SAMPLES COLLECTED ST 2 SS 10 TOTAL 12							

36

FORM FD4285

LABORATORY DATA ③

(%) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
25.5													
29.0							(1-1/2")						
6.4							(1-1/2")						
MOIST							(1-3/4")						
MOIST							(1-1/4")						
8.3							(1-1/4")						
WET							(1-1/4")						
WET							(2-3/8")						
WET							(1")						
WET							(1-1/4")						
WET							(1-1/2")						
22.3							(5/8")						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD SOLID AUGER
DATE DRILLED 3-5-85
COORDINATES N 82 E 774
GROUND ELEV. 746.2

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 7

DRAWN BY: MPW/WJF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EdW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH11

GEOTECHNICAL LOG

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM ①	USC	FIELD DATA: BLOW CT. OR PSI (N)	FIELD DATA: PENE-TROMETER (KSF)	FIELD DATA: TORVANE (KSF)	FIELD DATA: PL PRESS. METER (KSF)	FIELD DATA: EM (KSF)
1	ST		0.5		GRAVELLY CLAY, GC-CL, SOME SILT, LITTLE SAND, DARK BROWN, 10YR 4/3, MOIST, STIFF.	F	(GC-SM)	200	4.4			
			1.5		GRAVELLY SAND, SM, SOME SILT, TRACE CLAY, DARK BROWN, 10YR 4/3, MOIST, MEDIUM DENSE.		(GM) (SM)					
2	SS							44/12				
3	SS				... BECOMES SANDY, GRAVELS, GP, MEDIUM DENSE.		(GP-GM)	44/12				
			4.5									
			4.8		... SILTY SAND, SM, MEDIUM DENSE.							
4	SS		5'		SANDY GRAVEL, GP-GM, TRACE OF SILT, BROWNISH YELLOW, 10YR 6/6, MOIST, MEDIUM DENSE.		(GP-GM)	50/12				
5	SS		7.1			E	(GW-GM)	44/12				
			8.4 8.1									
6	SS				... SILTY SAND, SM, MEDIUM DENSE, MOIST.		(SP-SM) (GP)	55/12				
7	SS		10'		SANDY GRAVEL, GP-GM, TRACE TO LITTLE SILT, POORLY GRADED, LT. YELLOW BROWN, 2.5Y 6/4, TO 8.7 FT., VERY DARK BROWN, 10YR 2/2, BELOW 8.7 FT., WET, VERY DENSE.		(GM)	88/12				
			11.5									
8	SS				... SOME COBBLES @ 12.5 FT.		(GW-GM)	67/12				
			12.7									
9	SS				SILTY CLAY, CL, TRACE SAND, LITTLE GRAVEL, LOW PLASTICITY, DARK GRAY, 10YR 4/1, WET TO MOIST, HARD.		(GW-GM) (CL)	98/12				
10	SS		15'		... SOME COBBLES @ 14.5 FT.	D	(CL)	77/12				
11	SS						(CL)	46/12	2.6			
			20'		TOTAL DEPTH = 16.5 FT. CAVED TO 7.7 FT. 3/13/85 SWL 8.4 FT. 3/7/85 SAMPLES COLLECTED ST 1 SS 10 (ONE SLOUGH) TOTAL 11							

37

FORM F042685

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
MOIST			35	17	18	35% (1-3/8")	18%	22%	25%				
MOSIT						(2-3/4")							
6.30						(1-3/8")							
MOIST						(1-3/8")							
9.93						(2")							
MOIST						(1-3/8")							
WET						(1-5/8")							
WET						(2-1/4")							
WET						(2-1/8")							COBBLES
MOIST													SLOUGH
14.8						(1-1/2")							

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (HIGH ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (HIGH ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. UNCONFINED COMPRESSION
- T.C.U. TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 3-6-85
COORDINATES N 75 E 575
GROUND ELEV. 743.5

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 11

DRAWN BY: MPW / WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFF	DATE: 10-1-85	
APP'D. BY: EJW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH15

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM ①	USC	FIELD DATA: BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER P_L (KSF)	PRESS. METER E_M (KSF)
1	ST				SILTY CLAY, CL, TRACE SAND AND TRACE GRAVEL TO SOME SAND AND SOME GRAVEL, MEDIUM TO LOW PLASTICITY, DK. YELLOW BROWN 10YR 4/4, MOIST, VERY STIFF.	F	(CL)	200	4.0	3.0		
2	ST		5' 4.8				CL	400	3.0	1.6		
3	SS				SILTY GRAVEL, GM, LITTLE SAND, LITTLE SILT, TRACE CLAY, YELLOWISH BROWN 10YR 5/8, MOIST, MED DENSE	E	(GM)	43/12				
			6.5		...GRADES TO...							
4	SS				SILTY SAND, SM, TRACE TO SOME SILT, LITTLE GRAVEL, YELLOWISH BROWN 10YR 4/6, MOIST, MED DENSE, WITH LAYERS OF WELL GRADED SAND		(SW)	44/12				
5	SS		9.5 9.2		...WET		(SM)	29/12				
			10'									
6	SS						(SM)	35/12				
			11.8		...TRACE SILT							
7	SS						(SW)	34/12	4.2	2.5		
8	J				SILTY CLAY, CL, TRACE SAND AND GRAVEL, MEDIUM PLASTICITY, GRAY 10YR 5/1, MOIST, STIFF		(CL)		0.8			
			15'		TOTAL DEPTH = 14.0 FT.							

CAVED TO 8.8 FT 3/13/85
SWL = 9.2 FT 3/8/85

SAMPLES COLLECTED

ST 2
SS 5
J 1

8 TOTAL

38

FORM F042685

LABORATORY DATA ③

(3) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY (2)	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
24.0							(3/4")						
19.8	103.6		39	17	22		7 (1-3/8")	16	43	34	2×10^{-5}		
MOIST							(2-1/4")						
7.31							(1")						
WET							(3/4")						
WET							(2")						
6.8 16.8							(1-1/2")						
MOIST							(1/2")						AUGER SAMPLE

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD SOLID AUGER
DATE DRILLED 3-6-85
COORDINATES N 72 E 374
GROUND ELEV. 739.8

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 15

DRAWN BY: MPW/WP	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RPP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH24

GEOTECHNICAL LOG

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM ①	USC	FIELD DATA: BLOW CT. (N) OR PSI	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
			0.7		ORGANIC SILTY CLAY, OL, (TOPSOIL), SOME SILT, TRACE SAND, BLACK N 2/0. NO ODOR, MOIST, FIRM.		(OL)					
1	ST				SILTY CLAY, CH, TRACE SAND, TRACE GRAVEL, OLIVE BROWN, 2.5Y 4/4, MOIST, STIFF.	F	(CH)	600	2.8			
			2.5									
2	ST				. . . GRADES TO GRAVELLY SILT, ML, LITTLE GRAVEL, LITTLE SAND, LIGHT BROWNISH GRAY, 2.5Y 6/2.		(ML)	700	2.3			
			3.5									
3	SS				GRAVEL AND SAND, GW-GM, WELL GRADED, LITTLE SILT, LIGHT BROWNISH GRAY, 2.5Y 6/2, MOIST, MEDIUM DENSE.		(GW-GM)	44/12	1.2			
			5'									
4	SS						(GW-GM)	44/12				
			7.5 ▼									
5	SS				. . . WET AT 7.5' AND LIGHT YELLOWISH BROWN, 2.5Y 6/4.	E	(GW-GM)	32/12				
6	SS				. . . BECOMES FINER BELOW 9.0'.		(GM)	28/12				
			10'									
7	SS						(SP-SM)	43/12				
			11.5									
8	SS				SAND, SP-SM, POORLY GRADED, TRACE SILT, GRAYISH BROWN, 2.5Y 5/2, SATURATED, DENSE.		(SW) (SP-SM)	60/12				

TOTAL DEPTH = 12.5 FT.

CAVED TO 5.0 FT. 3-21-85
CAVED TO 4.9 FT. 3-27-85
NO SWL RECORDED - BOREHOLE COLLAPSED

SAMPLES COLLECTED

ST	2
SS	6
TOTAL	8

39

FORM F042685

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
15.0	61.2						3	7	54	36			
36.9	84.8		65	30	35		(5/8")						
14.36							(1-3/8")						
MOIST							(1-3/8")						
5.12							(1-7/8")						
WET							(2")						
SAT.							(3")						
9.11							(1-3/8")						
SAT.							(2-1/2")						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 3-20-85
COORDINATES N 129 E 178
GROUND ELEV. 732.1

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 24

DRAWN BY MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY RFP	DATE: 10-1-85	
APP'D. BY EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

40

DH51

GEOTECHNICAL LOG

FIELD DATA

NO.	TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM ①	USC	BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER P (KSF)	PRESS. METER EM (KSF)
1	ST				SILTY CLAY, CL, TRACE SAND, TRACE GRAVEL, LOW PLASTICITY, DARK YELLOWISH BROWN 10YR 4/4, MOIST, VERY STIFF . . . BECOMES GRAVELLY @ 1.0 FT, LITTLE GRAVEL, . . . BECOMES ALL FINES @ 1.8 FT, NO SAND OR GRAVEL TO 2.4'	F	(CL)	NR	1.2	1.2		
2	ST			2.4			(CL)	NR	4.3	2.65		
3	SS				CLAYEY GRAVEL, GC, LITTLE SAND, LITTLE SILT, POORLY GRADED, DARK YELLOW BROWN 10YR 4/4, MOIST, MED. DENSE BECOMES STRONG BROWN 7.5YR 5/8 @ 3.0'		(GC)	97/12				
4	SS		5'	5.5			(GC) (SP)	48/12				
				6.0	SAND, SP, POORLY GRADED, SOME GRAVEL, TRACE SILT, TRACE CLAY, STRONG BROWN, 7.5YR 5/8, MOIST, DENSE.							
5	SS				GRAVELLY SAND, SP, TRACE SILT, TRACE CLAY, POORLY GRADED, YELLOWISH BROWN, 10YR 5/6, MOIST, DENSE.		(SP)	67/12				
6	SS						(SP)	45/12				
7	SS		10'			E	(SP)	56/12				
8	SS		11.1 ▽ 11.5		. . . SATURATED		(SW)	62/12				
9	SS				. . . GRADES TO . . .		(SW)	45/12				
10	SS			13.5	SILTY GRAVEL, GM, SOME SAND, SOME SILT, WELL GRADED LIGHT OLIVE BROWN 2.5Y 5/4, SATURATED, DENSE.		(GM)	47/12				
11	SS		15'				(GM)	64/12				

TOTAL DEPTH = 16.5 FT.

CAVED TO 10.7 FEET (3/20/85)
SWL = 11.1 (3/7/85)

SAMPLES COLLECTED

SS 9
ST 2

TOTAL 11

1/0

FORM F042585

LABORATORY DATA ③

(3) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY (2)	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
MOIST							(1/2")						REFUSAL @ 1.0FT. BENT TUBE
23.4							(1-1/8")						
MOIST							(3")						BLOW COUNT HIGH- DUE TO COBBLES
MOIST							(2")						
4.5							(2")						
MOIST							(1-1/2")						
MOIST							(3/4")						
WET							(1-1/2")						
16.1													
WET							(2")						
WET							(2");						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD SOLID AUGER
DATE DRILLED 3-5-85
COORDINATES N 175 E 674
GROUND ELEV. 743.9

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 51

DRAWN BY: MPW/WF	SCALE: 1" = 4"	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EKW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Steams Catalytic	DWG. NO.

DH68

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM (1)	USC	BLOW CT. (N) OR PSI	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER P_L (KSF)	PRESS. METER E_M (KSF)
			0.4		ORGANIC SILTY CLAY, OL, (TOPSOIL), LOW PLASTICITY, VERY DARK GRAYISH BROWN 10YR 3/2, MOIST, STIFF.	F	(OL)					
1	ST		0.9		SILTY CLAY, CL, LOW PLASTICITY, DARK YELLOWISH BROWN, 10YR 4/4, MOIST, VERY STIFF.		(CL)		3.2			
2	SS				SILTY SAND AND GRAVEL, SM-GM, SOME SILT, BROWNISH YELLOW, 10YR 6/6, MOIST, VERY DENSE.		(SM)	23/12				
3	SS		4.2 ▽		...GRAVEL INCREASING AT 3.0'.		(SM-GM)	100/12				
			5'		...COBBLES OR BOULDERS AT 5.0'.			211/12				
					...GRADES TO...							
4	SS		7.5 ▽		SANDY GRAVEL, GM-GW, SOME SAND, LITTLE SILT, WELL GRADED, BROWNISH YELLOW 10YR 6/6, MOIST, DENSE.	E	(GM)	65/12				
5	SS				...LIGHT GRAY 10YR 7/2, TRACE SILT, SATURATED.		(GW)	40/12				
6	SS		10'		...MED AND FINE GRAVEL, POORLY GRADED.		(GP-GM)	41/12				
7	SS						(GP-GM)	61/12				
			14.0		SILTY CLAY, CL, TRACE SAND, LOW PLASTICITY, GRAY 10YR 5/1, MOIST, VERY STIFF.	D						
			15'									
8	SS		18.1		GRAVELLY SAND, SP-SM, LITTLE SILT, POORLY GRADED, GRAY 10YR 5/1, SATURATED, VERY DENSE.		(CL) (SP-SM)	91/12	4.2			
			20'		TOTAL DEPTH = 19.0 FT.							
					CAVED TO 8.3 FT. 3/27/85							
					SWL = 4.3 FT. 3/27/85							
					SAMPLES COLLECTED							
					ST 1							
					SS 7							
					TOTAL 8							

41

FORM F042685

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .003mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
29.52													
MOIST WET							(1-1/2")						
MOIST							(3")						
MOIST+													COBBLES NO SAMPLE
SAT. 5.07							(3")						
SAT.							(2-1/2")						
SAT.							(1-1/4")						
SAT.							(1-1/4")						SLOUGH
													NO SAMPLE DRILL
19.32 SAT.							(1-3/8")						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 3-25-85
COORDINATES N 225 E 275
GROUND ELEV. 735.4

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 68

DRAWN BY MPW/WF	SCALE 1" = 4'	REV.
CHK'D. BY RFP	DATE 10-1-85	1
APP'D. BY EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalyt	DWG. NO.

DH81

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM	USC	FIELD DATA: BLOW CT. OR PSI (N)	FIELD DATA: PENE-TROMETER (KSF)	FIELD DATA: TORVANE (KSF)	FIELD DATA: PL PRESS. METER (KSF)	FIELD DATA: EM (KSF)
1	SS		0.6		FILL, CLAYEY GRAVEL, GC, SOME CLAY AND SILT, TRACE SAND, BROWNISH YELLOW, 10YR 6/6, MOIST, MEDIUM DENSE.	FILL	GC (SM)	32/12				
2	SS				SILTY GRAVEL AND SAND, GM-SM, LITTLE SILT, TRACE CLAY, YELLOWISH BROWN, 10YR 5/8, MOIST, MED. DENSE.		(GM)	53/12				
3	SS						(SM)	40/12				
4	SS		5'		...GRADES TO...		(GM)	39/12				
5	SS		6.0		GRAVELLY SAND, SP-SM, TRACE SILT, LIGHT GRAY, 10YR 7/2, MOIST, MEDIUM DENSE.		(SP-SM)	35/12				
6	SS		7.5		GRAVEL AND SAND, GP-SP, TRACE SILT, POORLY GRADED, LIGHT GRAY, 10YR 7/2, MOIST TO WET, MEDIUM DENSE.	E	(GP-GM)	43/12				
7	SS		9.5 ▼ 10'		SAND, SP, FINE, POORLY GRADED, TRACE FINES, LIGHT GRAY, 10YR 7/2, SATURATED, MEDIUM DENSE.		(GP) (SP)	33/12				
8	SS						(SP)	32/12				
9	SS		13.2		...GRADES TO...		(SP)	43/12				
10	SS		15'		SAND AND GRAVEL, SP-GP, POORLY GRADED, TRACE FINES, LIGHT YELLOWISH BROWN 2.5Y 6/4, SATURATED, MEDIUM DENSE.		(GP) (SP-GP)	30/12				
11	J		15.5		SILTY CLAY, ML-CL, LITTLE SAND, LITTLE GRAVEL, GRAY 10YR 5/1, SATURATED TO WET, STIFF	D	(ML-CL)	NR	2.0			

TOTAL DEPTH = 17.0 FT.

CAVED 8FT. 1-25-85
CAVED 6.2 FT. 2-11-85
NO SWL RECORDED - BOREHOLE COLLAPSED

SAMPLES COLLECTED

SS	10
J	1
TOTAL	11

42

FORM F042685

LABORATORY DATA ③

③ MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (sol.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
WET							(1-7/8")						
MOIST							(3")						
MOIST							(2-3/8")						
MOIST-DRY							(2-3/8")						
DRY							(1-1/2")						
DRY-MOIST							(1-1/2")						
WET							(1-1/4")						
SAT.							(1/4")						
SAT.							(7/8")						
SAT.							(7/8")						
													NO SAMPLE
SAT.							(1-1/4")						AUGER SAMPLE

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 1-25-85
COORDINATES N 224 E 925
GROUND ELEV. 740.7

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 81

DRAWN BY: MPW/WF	SCALE: 1" = 4'		REV. 1
CHK'D. BY: RFP	DATE: 10-1-85		
APP'D. BY: EHW	SHT. NO. 1 OF 1		
ORDER NO. 27972	Stearns Catalytic	DWG. NO.	

DH91

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION Sheet 1 of 1	STRATUM ①	USC	FIELD DATA: BLOW CT. OR PSI (N)	FIELD DATA: PENE-TROMETER (KSF)	FIELD DATA: TORVANE (KSF)	FIELD DATA: PRESS. METER Pf (KSF)	FIELD DATA: PRESS. METER EM (KSF)
					FILL, (SILTY SAND), SM, WITH SOME GRAVEL, TRACE ROOTS, TRACE CLAY, DARK YELLOWISH BROWN, 10YR 4/6, EARTHY ODOR, MOIST, MEDIUM DENSE.	FILL	(SM)	23/12				
1	SS		1.9 2.2		SILTY CLAY, CL, LITTLE GRAVEL, TRACE SAND, DARK YELLOWISH BROWN, 10YR 4/4, MOIST, STIFF.		(SM) (CL) (SW)	25/12	2.0			
2	SS		3.6 ▽ 5.0 ▼		GRAVELLY SAND, SW-SM, WELL GRADED, TRACE SILT TO LITTLE SILT, LIGHT YELLOWISH BROWN 10YR 6/4, EARTHY ODOR, MOIST, MEDIUM DENSE.		(SW-SM)	33/12				
3	SS		5'		...BECOMES SATURATED @ 5.6'.		(SM-SW)	22/12				
4	SS		6.0		...GRAVELLY	E	(GP)	18/12				
5	SS						(GP)	24/12				
6	SS		10'				(SP-SW)	28/12				
7	SS						(SP)	19/12				
8	SS		12.7 13.5		...GRADES TO... VERY FINE SAND, SP, LOW PLASTICITY, BROWN 10YR 5/3 SATURATED, MEDIUM DENSE.	D	(SP)	38/12				
9	J				SILTY CLAY, CL, TRACE SAND, TRACE GRAVEL, LOW PLASTICITY, DARK GRAY, 10YR 4/1, MOIST, STIFF.		(CL)	N.R.	3.0	1.0		
			15'									
					TOTAL DEPTH - 14.5 FT.							
					CAVED TO 3.1 FT. 2-11-85 SWL = 3.6 FT. (?) 1-30-85							
					SAMPLES COLLECTED SS 8 J 1 TOTAL 9							
			20'									

43

FORM F042685

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
MOIST													NO RECOVERY
7.11							(1-1/4")						
MOIST							(1-1/4")						
9.96						(3-5/8")							
SAT.							(1-7/8")						
SAT.							(7/8")						
10.37							(1-1/2")						
SAT.							(5/8")						
SAT.													
MOIST													AUGER SAMPLE

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 1-29-85
COORDINATES N 279 E 781
GROUND ELEV. 736.0

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 91

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: CHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH105

GEOTECHNICAL LOG

Sheet 1 of 1

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM (1)	USC	FIELD DATA: BLOW CT. (N) OR PSI	FIELD DATA: PENE-TROMETER (KSF)	FIELD DATA: TORVANE (KSF)	FIELD DATA: PL PRESS. METER (KSF)	FIELD DATA: EM (KSF)
1	ST				ORGANIC SILTY CLAY, OL, (TOPSOIL), LOW PLASTICITY, BLACK, 10YR 2/1, NO ODOR, MOIST, STIFF.	F	(OL)	550	2.9	1.9		
			2.9		SILTY CLAY, OL-CL, TRACE SAND, LOW PLASTICITY, OLIVE GRAY, 5Y 4/2, MOIST, STIFF.							
2	ST		5' 5.4				(OL-CL)	450	3.05	0.9		
3	ST		5.0		GRAVELLY SILT, ML, SOME SAND, LOW PLASTICITY, OLIVE 5Y 5/3, MOIST, FIRM.		(ML)	700	1.9			
			7.0 7.0									
4	SS				SANDY GRAVEL, GW-GM, WELL GRADED, TRACE SILT, PALE BROWN 10YR 6/3, MOIST, WET BELOW 7.0 FT., DENSE.	E	(GW-GM)	59/12				
5	SS						(GW-GM)	59/12				
6	SS		10'				(GW-GM)	51/12				
7	SS						(SW)	38/12				
			15'		TOTAL DEPTH = 12.0 FT CAVED TO 5.7 FEET 3-20-85 SWL = 5.4 FEET 3-20-85 SAMPLES COLLECTED SS 4 ST 3 TOTAL 7							

FORM F047685

44

LABORATORY DATA ③

(3) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
40.93													
31.45													
14.25							(1-1/2")						
MOIST							(3")						
9.27							(3")						
SAT.							(2-1/4")						
SAT.							(1-1/2")						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. UNCONFINED COMPRESSION
- T.C.U. TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 3-18-85
COORDINATES N 276 E 76
GROUND ELEV. 731.0

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 105

DRAWN BY MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY RFP	DATE: 10-1-85	
APP'D. BY EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

75

DH122

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM (1)	USC	FIELD DATA: BLOW CT. (N) OR PSI	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER P (KSF)	PRESS. METER EM (KSF)
1	J		0.5		FILL (SILTY SAND AND GRAVEL), GM-SM, TRACE CLAY, DK. YELLOWISH BROWN, 10YR 4/4, MOIST.	FILL	GM-SM					
2	ST				SILTY CLAY, CL-CH, TRACE SAND, MEDIUM PLASTICITY, OLIVE BROWN, 2.5Y 4/4, MOIST, VERY STIFF.	F	(CL-CH)	300	4.5	1.25		
			4.3		...BECOMES STRONG BROWN, 7.5Y 5/8 @ 3.5 FT.		CL-CH					
3	ST		5'		SILTY SAND, SM, LITTLE GRAVEL, TRACE CLAY, STRONG BROWN, 7.5YR 4/6, WET.		(SM)	200				
4	SS				SILTY GRAVEL AND SAND, GM-SM, LITTLE SILT, BRN. YELLOW 10YR 6/6, MOIST, MED. DENSE.		(GM)	43/12				
5	SS				...INTERBEDDED WELL GRADED SANDS AND GRAVELS, SW-GW, AND POORLY GRADED SANDS AND GRAVELS, SP-GP.		(GW-GM)	52/12				
6	SS		10'		—	E	(SW)	39/12				
7	SS		11.5 ▼				(SW) (GW)	42/12				
8	SS				...SATURATED SAND		(SP-SW)	27/12				
9	SS				...GRAVELLY SANDS		(SW-SM)	28/12				
10	SS		15'				(GP-SP)	40/12				
			20'		TOTAL DEPTH = 16.0 FT. CAVED TO 9.3 FT. 2/25/85 SWL = 11.5 FT.(?) 2/21/85 SAMPLES COLLECTED ST 2 SS 7 J 1 TOTAL 10							

45

FORM FOM7685

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
MOIST							(1")						FROZEN GROUND
20.2													
15.6 23.1	102.3 100.1- PERM		50	15	35		2 (5/8")	22	34	42	2×10^{-7}		
MOIST							(2-1/8")						
8.8							(2-1/8")						
MOIST													
MOIST							(7/8")						
MOIST							(1-3/4")						
SAT.							(1-1/4")						
19.4 SAT.							(1-3/4")						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 2-20-85
COORDINATES N 325 E 876
GROUND ELEV. 742.2

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 122

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH126

GEOTECHNICAL LOG

FIELD DATA

NO.	TYPE	SAMPLE % RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM ①	USC	BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PR PRESS. METER (KSF)	EM (KSF)
1	ST				ORGANIC SILT (TOPSOIL), OL, TRACE CLAY, TRACE SAND, TRACE ROOTS, LOW PLASTICITY, BLACK, 10YR 2/1, MOIST, FIRM TO VERY STIFF.	F	(OL)	200	1.4			
2	ST		4.0 ▽ 3.1		SILTY CLAY, CL, GRADING TO SILT, ML, MEDIUM TO LOW PLASTICITY, OLIVE GRAY 5Y 5/2, MOIST, HARD.		(OL) (CL) (ML)	200	6.8 8.3			
3	SS		4.7		SANDY GRAVEL, GP-GW, POORLY GRADED, TRACE SILT, PALE BROWN 10YR 6/3, MOIST, VERY DENSE, NO ODORS, SUBROUNDED CARBONATE GRAVELS.	E	(ML) (SM)	108/12				
4	SS		5'				(GP-GM)	117/12				
5	SS						(GW-GM)	111/12				
6	SS		9.8 ▽ 10'				(GW-GM)	86/12				
7	SS		10.0		...GRAVELLY SAND, SP-SW, POORLY GRADED TO WELL GRADED, TRACE FINES, LIGHT OLIVE BROWN 2.5Y 5/4 SATURATED, DENSE.		(SP) (SW)	55/12				
8	SS		11.5		...SANDY GRAVEL, GR-GW, POORLY GRADED TO WELL GRADED, TRACE FINES, LIGHT OLIVE BROWN 2.5Y 5/4, SATURATED, MEDIUM DENSE.		(GP)	41/12				
9	SS						(GW)	48/12				
10	SS		14.5 15'		...SAND, SP, FINE, LIGHT OLIVE BROWN 2.5Y 5/4, SATURATED, MEDIUM DENSE.		(SP) (GP-GW)	42/12				
11	SS		15.4		...SANDY GRAVEL, SP-GM, LIGHT OLIVE BROWN 2.5Y 5/4, SATURATED, MEDIUM DENSE TO VERY DENSE BELOW 17.5'.		(GW)	36/12				
12	SS				...BECOMES MEDIUM DENSE @ 19.0'.		(GP)	105/12				
13	SS		20'				(SP-SM)	38/12				
14	SS				...BECOMES LIGHT BROWN GRAY 2.5Y 6/2 @ 22.0'.		(GP)	49/12				
15	SS		23.5				(GW)	32/12				
16	ST		25'		SILTY CLAY, CL, TRACE GRAVEL, TRACE SAND, MEDIUM PLASTICITY, DARK GRAY 10YR 4/1, SATURATED, VERY STIFF, WEAK HCL REACTION.	D	(CL)	250	5.4	2.6		
			30'		TOTAL DEPTH = 26.0 FT. CAVED to 5.9 FT (3/11/85) SWL TO 4.0 FT. (2/26/85) SWL TO 4.9 FT. (3/11/85) SAMPLES COLLECTED ST 3 SS 13 TOTAL 16							

46

FORM FO42685

LABORATORY DATA ③

(3) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
37.2	76.1												
18.2	110.4												
18.3	112.4											U.C. = 3.2 KSC	
MOIST							(1-3/4)						
3.24													
DRY-MOIST						(3")							
DRY-MOIST							(2-3/8)						
10.68							(1-1/4)						
SAT.							(2-3/8)						
SAT.							(1-3/4)						
SAT.							(2-3/8)						
SAT.							(2-3/8)						
SAT.							(1-1/2)						
SAT.							(7/8")						
SAT.							(1-1/2)						
SAT.							(2-5/8)						
15.48							(2-3/8)						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 2-21-85
COORDINATES N 326 E 1076
GROUND ELEV. 739.9

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 126

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV.
CHK'D. BY: REP	DATE: 10-1-85	1
APP'D. BY: EW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

47

DH149

GEOTECHNICAL LOG

FIELD DATA

NO.	TYPE	SAMPLE % RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM (1)	USC	BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER PL (KSF)	PRESS. METER EM (KSF)
					CLAYEY SILT, ML, LITTLE GRAVEL, LITTLE SAND, SOME TO LITTLE CLAY, LOW TO NO PLASTICITY, OLIVE GRAY 5Y 4/2, MOIST, STIFF.	F	(ML)					
1	ST		1.6		SILTY GRAVEL AND SAND, GM, SOME SILT, YELLOW BROWN 10YR 5/4, MOIST, MEDIUM DENSE.			700	2.4			
2	SS						(GM)	46/12				
3	SS		5.0 4.3 5.5 ▽		GRAVEL AND SAND, GW-GM, LITTLE SILT, WELL GRADED, LIGHT OLIVE BROWN 2.5Y 5/4, SATURATED, MEDIUM DENSE.		(GM) (GW-GM)	32/12				
4	SS				... BECOMES TRACE SILT, DARK YELLOW BROWN 10YR 4/6.	E	(GM) (SW)	24/12				
5	SS						(SW-SM)	35/12				
6	SS		10'				(GP-GM)	36/12				
					TOTAL DEPTH = 10FT.							
					CAVED TO 5.0 FT. SWL TO 5.0 FT. (3/20/85)							
					SAMPLES COLLECTED							
			15'		ST 1 SS 5							
					TOTAL 6							

97

FORM F042685

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
18.2													
17.4						(3")							
5.6							(1-3/8)						
MOIST							(2")						
SAT						(3")							
SAT							(1-3/4)						
8.6							(7/8)						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (HIGH ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (HIGH ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 3-19-85
COORDINATES N 423 E 125
GROUND ELEV. 733.0

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 149

DRAWN BY: WP/WP	SCALE: 1" = 4'	REV. 1
CHK'D. BY: REP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

48

DH152

GEOTECHNICAL LOG

FIELD DATA

NO.	TYPE	SAMPLE % RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM ①	USC	BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PR PRESS. METER (KSF)	EM (KSF)
1	ST				FILL, ORGANIC SILTY CLAY, OL, LITTLE SAND, LITTLE GRAVEL, COLOR MOTTLED, BLACK 10YR 2/1, AND 10YR 5/3, NO ODOR, MOIST, STIFF.	FILL	(CL)	500	2.4	1.5		
2	SS		2.0		GRAVELLY CLAY, CL, SOME GRAVEL, LITTLE SILT, TRACE SAND, OLIVE GRAY 5Y 4/2, MOIST, STIFF.	F	(CL)	28/12	3.0			
3	ST		3.0 4.0		GRAVELLY SILT, ML, SOME GRAVEL, SOME SAND, PALE OLIVE 5Y 6/3, MOIST, STIFF.		(ML)	600	2.4			
4	SS		5'		GRAVELLY SAND, SM, LITTLE SILT, LIGHT GRAY 5Y 7/2 MOIST, DENSE.		(SM)	67/12				
5	SS				... BECOMES LESS SILTY TO TRACE SILT @ 7.5 FT.		(SM)	35/12				
6	SS		8.5 ▼		... MEDIUM DENSE.	E	(SW-SM)	20/12				
7	SS		10'				(SW-SM)	17/12				
8	SS						(SW-SM)	17/12				
9	SS						(SW-SM)	32/12				
			15'		TOTAL DEPTH = 13.5 FT. CAVED TO 8.3 FT. (3/20/85) SWL TO 8.5 FT. (3/20/85) SAMPLES COLLECTED ST 2 SS 7 TOTAL 9							

FORM F042685

48

LABORATORY DATA ③

(3) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
7.2							(1-1/2)						
MOIST							(2-3/8)						
MOIST							(2-3/8)						
MOIST							(2-3/8)						
5.2							(1-1/2)						
MOIST							(1-3/8)						
SAT							(1-1/2)						
SAT							(2-1/2)						
SAT							(3/8)						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (HIGH ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (HIGH ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 3-19-85
COORDINATES N 426 E 274
GROUND ELEV. 737.5

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 152

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH160

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM ①	USC	BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PR PRESS. METER (KSF)	EM (KSF)
1	ST				FILL, CLAYEY GRAVEL, SANDY GRAVEL, BLACK 10YR 2/1, AND DARK BROWN 10YR 3/3, MOIST, FIRM.	FILL	(GC)	450	1.5			
			3.4				(GM)					
2	ST		5'		ORGANIC SILTY CLAY, (TOPSOIL) OL, TRACE SAND, LOW PLASTICITY, BLACK 10YR 2/1, MOIST, STIFF.		(OL)	500	2.4			
			5.4									
3	ST				SILTY CLAY, CL, TRACE GRAVEL, LOW PLASTICITY, DARK GRAY 4/1, MOIST, FIRM ROOTS, NONSTRATIFIED.	F	(OL) (CL)	200	1.2			
4	ST		8.0				(CL) (ML)	500	1.1			
			8.8		CLAYEY SILT, ML, DARK GRAY 10YR 4/1, MOIST, FIRM.							
5	SS		10'		GRAVEL AND SAND, GW, TRACE SILT, WELL GRADED, LIGHT YELLOWISH BROWN 10YR 6/4, DRY, VERY DENSE.		(ML) (GW)	105/12	2.2			
					...BECOMES SATURATED @ 9.9 FT.			108/12				
			12.5 ▼		...BECOMES DENSE BELOW 13.0 FT.	E		101/12				
6	SS						(GW)	40/12				
7	SS		15'				(GW-GM)	53/12				
8	SS						(GW-SW)	53/12				
			20'		TOTAL DEPTH = 17.5 FT. CAVED TO 9.9 FT. 2/12/85 SWL TO 12.5 FT. 2/8/85 SAMPLES COLLECTED ST 4 SS 4 TOTAL 8							

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FORM F042685

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
43.02						(3")							
41.41							(2-3/8)						
MOIST)							(3/8)						
MOIST)							(3/8)						
26.92							(2-1/2)						
NR													NO RECOVERY
NR													NO RECOVERY
(SAT)							(2-3/8)						
(SAT)							(2-3/4)						
6.90							(1-7/8)						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (HIGH ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (HIGH ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 2-8-85
COORDINATES N 427 E 671
GROUND ELEV. 742.1

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 160

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH165

GEOTECHNICAL LOG

FIELD DATA

NO.	TYPE	SAMPLE % RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM (1)	USC	(BLOW CT. OR PSI (N))	PENE-TROMETER (KSF)	TORVANE (KSF)	P PRESS. METER (KSF)	EM (KSF)
1	ST				FILL, PT, TOPSOIL TO 2.9, CL, W/ONE ONE INCH THICK LAYER OF SM TO 6.0. PEAT, PT, TRACE SAND AND GRAVEL, BLACK 10YR 2/1, MOIST.		(PT)	250	0.9			
2	ST		5'		SILTY CLAY, CL, LITTLE GRAVEL, TRACE SAND, VERY DARK GRAYISH BROWN 10YR 3/2, MOIST. GRAVELLY SAND, SM, LITTLE SILT, LIGHT OLIVE BROWN 2.5Y 5/4, MOIST.	FILL	(CL) (SM) (CL)	150	3.2			
3	ST		6.0		ORGANIC SILT, (TOPSOIL) OL, TRACE SAND, LOW PLASTICITY, BLACK 10YR 2/1, MOIST, STIFF.		(CL) (OL)	150	3.0			
4	ST		7.7		CLAYEY SILT GRADING TO SILT, ML, TRACE GRAVEL, TRACE SAND, GRAYISH BROWN 2.5Y 5/2 TO PALE BROWN 10YR 6/2, MOIST, STIFF TO FIRM.	F	(OL) (ML)	350	1.6			
5	SS		9.7 10'		SANDY GRAVEL, GP, POORLY GRADED, TRACE SILT, LIGHT YELLOWISH BROWN 2.5Y 6/4, MOIST, DENSE. CARBONATE SUBROUNDED TO SUBANGULAR GRAVEL.		(ML) (GP)	75/12	1.2			
6	SS						(GP)	79/12				
7	SS		13.5 ▽ ▼		... BECOMES SATURATED @ 13.5 FT.	E	(GP)	67/12				
8	SS		15' 16.3		... SILT, ML, LAYER.		(GP)	57/12				
9	SS		16.4				(GW) (GW-GM)	52/12				
10	SS				SAND AND GRAVEL, SW-GW, WELL GRADED, TRACE SILT, LIGHT OLIVE BROWN 2.5Y 5/4 LOOSE.		(SW-SM)	16/12				
			20'		TOTAL DEPTH = 18.5 FT. CAVED TO 12.5 FT. (3/6/85) SWL TO 13.6 FT. (2/28/85) SAMPLES COLLECTED ST 4 SS 6 TOTAL 10							

FORM F042685

LABORATORY DATA ③

③ MOISTURE	DRY DENSITY (PCF)	② SPECIFIC GRAVITY	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
9357							(5/8")						
MOIST							(1")						
3651							(7/8")						
MOIST							(1-1/4")						
WET						(3")							
MOIST							(1-5/8")						
MOIST													
965							(1-1/2")						
SAT.													
SAT.							(1-1/4")						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (HSM ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (HSM ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.

② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS

③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 2-27-85
COORDINATES N 431 E 924
GROUND ELEV. 745.7

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 165

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH207

GEOTECHNICAL LOG

FIELD DATA

NO.	TYPE	SAMPLE % RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM	USC	(BLOW CT. OR PSI) (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
1	ST		2.5		ORGANIC SILTY CLAY, (TOPSOIL) OL, MOTTLED COLOR - BLACK 10YR 2/1, AND BROWN 10YR 5/3, NO ODOR, MOIST, STIFF.	F	(OL)	1200	2.7			
2	ST		5'		SILTY CLAY, CL, TRACE GRAVEL, TRACE SAND, STIFF, OLIVE GRAY 5Y 5/2, MOIST, STIFF.		(CL)	300	2.8	3.0		
3	ST		7.8 7.0		... CLAY SOFT, MOIST TO VERY MOIST.		(CL)	1200	0.4			
4	SS		9.2 9.0		GRAVELLY SAND, SW-SM, LITTLE SILT, YELLOWISH BROWN 10YR 5/4, MOIST, EXTREMELY DENSE.	E	(SW-SM)	88/12				
5	SS		10.0 10		SANDY GRAVEL, GW-GM, WELL GRADED, LITTLE SILT, YELLOWISH BROWN 10YR 5/4, SATURATED, DENSE.		(GP-GM)	45/12				
6	SS						(GW-GM)	43/12				
7	SS						(GW-GM)	25/12				
8	SS		14.0 15'		SILTY SAND AND GRAVEL, SM-GM, SOME SILT, YELLOWISH BROWN 10YR 5/4, SATURATED, VERY DENSE.		(GW) (SM-GM)	50/12				
			20'									
			25'									
			26.0		SILTY CLAY, CL, LITTLE SAND, TRACE GRAVEL, GRAY 10YR 5/1, FIRM.	D	(CL)					
			30'		TOTAL DEPTH = 27.0 FT. SWL = 9.2 FT. 2/27/85 SWL = 7.8 FT. 3/5/85 CAVED TO 8.3 FT., 3/5/85 SAMPLES COLLECTED ST 3 SS 5 TOTAL 8							

FORM F042685

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
9.32						(3")							
6.7							(1-3/8)						
2.1													DIFFICULT TO EXTRUDE
.74							(2-1/8)						300 LB HAMMER USED FOR SAMPLES 4 TO 8
AT.							(1-1/4)						
AT.							(2)						
3							(1-3/8)						
AT.						(3")							
													NOT SAMPLED
													CLAY ON AUGER TIP

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

HOLLOW STEM AUGER/
DRILLING METHOD ROTARY
DATE DRILLED 2-25-85
COORDINATES N 524 E 974
GROUND ELEV. 742.0

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 207

DRAWN BY: MPW/WP	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH218

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM ①	USC	BLOW CT. OR PSI ②	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
					ORGANIC SILTY (TOPSOIL) OL, TRACE CLAY, TRACE ROOTS, TRACE GRAVEL, BLACK N 2/0, FIRM.							
1	ST		2.3		SILTY CLAY, CL, GRADING DOWNWARDS TO CLAYEY SILT, ML, TRACE SAND, LOW PLASTICITY, GRAYISH BROWN 2.5Y 5/2, MOIST, STIFF.		OH	400	1.4			
2	ST		5'			F	(ML)	500	3.7	0.3		
3	ST		▽ 5.8 ▽				(ML)	750	1.4			
4	SS				GRAVELLY SAND, SM, LITTLE SILT, POORLY GRADED, YELLOWISH BROWN 10YR 5/8, SATURATED MEDIUM DENSE.		(ML) (SM)	35/12	1.2			
5	SS					E	(SP-SM) (GP)	36/12				
6	SS		10'		... LOOSE.		(SM)	6/12				
7	SS				... BECOMES WELL GRADED, MEDIUM DENSE.		(SM-SW)	34/12				
			15'		TOTAL DEPTH = 11.5 FEET. CAVED TO 5.3 FT. - 3-28-85 STATIC WATER LEVEL - 5.8 FT. - 3-15-85 SAMPLES COLLECTED SS 4 ST 3 TOTAL 7							

FORM F04-7685

52

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
													DISTURBED SAMPLE
112.9	40.1		118	99	19		0	15	50	35	2×10^{-7}		
49.7													
19.2													
MOIST													BENT TUBE TIP
8.8							(1-1/2)						
SAT.							(3/4)						
SAT.							(2-1/2)						
SAT.							(1-3/8)						

LEGEND

SAMPLE TYPE

- SS SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. UNCONFINED COMPRESSION
- T.C.U. TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 3-14-85
COORDINATES N 577 E 570
GROUND ELEV. 739.5

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 2-18

DRAWN BY MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY REP	DATE: 10-1-85	
APP'D. BY EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH223

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM (1)	USC	BLOW CT. OR PSI (2)	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
					FILL, TOPSOIL, SANDY GRAVEL MIX, BLACK 10YR 2/1, BROWN 10YR 4/3, OLIVE BROWN 2.5Y 4/4. GRAVEL IS LIMESTONE.		(CL)					
1	STU						(GM)	300	1.2			
2	SS						(GM)	12/12				
3	STU					FILL	(CL)	400	0.9			
			5'									
4	STU						(CL) (SM)	400	1.4			
					7.5 8.2 ORGANIC SILTY CLAY, OL, (TOPSOIL), TRACE SAND, LOW PLASTICITY, BLACK 10YR 2/1, MOIST, SOFT.		(OL)					
5	STU		10'		SILTY CLAY, CL, MEDIUM PLASTICITY, DARK GRAY BROWN 2.5 Y 4/2, MOIST, MEDIUM FIRM.	F	(CH)	300	0.9	0.7		
			11.5 ▼ 11.5 11.9				(CL)					
6	STU				GRADES INTO CLAYEY SILT, ML, LOW PLASTICITY, LIGHT OLIVE BROWN 2.5Y 5/4, SATURATED.		(ML)	400	1.8	0.4		
7	SS				SANDY GRAVEL, GM, LITTLE SILT, WELL GRADED, VERY DARK GRAY 10YR 3/1, TO DARK GRAY 10YR 4/1, SATURATED, DENSE.		(GM)	84/12				
8	SS		15'		... BECOMES TRACE SILT BELOW 13.5'.	E	(GW-GM)	58/12				
9	SS				... COARSE MATERIAL IS CARBONATE.		(GW-GM)	73/12				
					TOTAL DEPTH = 16.5 FT.							
					HOLE CAVED TO 4.5 FEET 3 13 85 NO STATIC WATER LEVEL TAKEN							
					SAMPLES COLLECTED							
					SS 5 STU 4							
					TOTAL 9							
			20'									

FORM #042685

53

LABORATORY DATA ③

(%) MOISTURE	DRY (PCF) DENSITY	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
MOIST							(2-1/8)						
MOIST							(1-7/8)						
42.25							(1-1/4)						SOME SLOUGH
													NO SAMPLE (BOULDER)
MOIST							(1-1/4)						
34.1	82.99		56	17	39		0	0	51	49			
26.8	96.09						0	1	65	34	6×10^{-8}		
SAT.							(2-3/4)						
10.27							(2-3/8)						SOME SLOUGH
SAT.							(1-3/8)						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 3-12-85
COORDINATES N 576 E 329
GROUND ELEV. 742.5

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 223

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH226

GEOTECHNICAL LOG

FIELD DATA

Sheet 1 of 1

Sample No.	Type	Depths & Grd. Water	Description	Stratum	USC	Blow Ct. or PSI (N)	Penetrometer (KSF)	Torvane (KSF)	Press. Meter PL (KSF)	Press. Meter EM (KSF)
		0.9	FILL, SANDY GRAVEL, LITTLE SILT, LIGHT OLIVE BROWN 2.5Y 5/4, MOIST, STIFF.	FILL	(GM)	NR	2.8			
1	ST	2.4	ORGANIC SILTY CLAY (TOPSOIL) OL, LITTLE SAND, LOW PLASTICITY, BLACK 10YR 2/1, MOIST, STIFF.	F	(OL)					
2	ST	5.7	SILTY CLAY, CL, TRACE SAND, MEDIUM PLASTICITY, LIGHT OLIVE BROWN 2.5Y 5/4, MOIST, STIFF. ... GRADES INTO CLAYEY SILT, ML, @ APPROX. 4.0', TRACE GRAVEL, LOW PLASTICITY, LIGHT OLIVE BROWN 2.5Y 5/4, MOIST, STIFF.	F	(CL)	300	3.2	0.9		
3	ST		SILTY SAND, SM, SOME GRAVEL, BROWNISH YELLOW 10YR 6/6, MOIST, DENSE.	E	(ML)	500	1.8			
4	SS	8.6 8.0		E	(SM)	59/12				
5	SS	9.2	GRAVELLY SAND, SW-SM, LITTLE TO TRACE SILT, WELL GRADED, BROWN YELLOW 10YR/6, MOIST, MEDIUM DENSE.	E	(SW-SM)	42/12				
6	SS		... BECOMES LIGHT YELLOW BROWN 2.5 Y 6/4, SATURATED @ 9.2 FT.	E	(SW)	43/12				
7	SS			E	(SW)	43/12				
8	SS	22.0		E	(SW)	74/12				
9	SS		SILTY CLAY, CL, TRACE SAND, MEDIUM PLASTICITY, DARK GRAY 10YR 4/1, SATURATED, VERY STIFF.	D	(CL)		5.8			

Depth scale: 5', 10', 15', 20', 25'

TOTAL DEPTH = 24.5 FT.

CAVED TO 8.6 FT. - 3-25-85
STATIC WATER LEVEL - 9.2 FT. - 3-22-85

SAMPLES COLLECTED

ST	3
SS	6
TOTAL	9

54

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	PERCENT PARTICLE SIZE COBBLE (est.)	PERCENT PARTICLE SIZE GRAVEL 75mm	PERCENT PARTICLE SIZE SAND 4.75mm	PERCENT PARTICLE SIZE SILT .075mm	PERCENT PARTICLE SIZE CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
0.53							(2")						
3.1													
7.2							(5/8)						
WET							(7/8)						
7.56							(2-1/2)						
SAT.							(1-3/8)						
SAT.							(1-1/8)						
SAT.							(7/8)						
													NO SAMPLE DRILLED THROUGH
18.10													

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (MOD ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (MOD ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, BRIDE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. UNCONFINED COMPRESSION
- T.C.U. TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 3-22-85
COORDINATES N 577 E 175
GROUND ELEV. 740.0

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 226

DRAWN BY MPW/WF	SCALE: 1" = 4'	REV. 1	
CHK'D. BY RFR	DATE: 10-1-85		
APP'D. BY EHW	SHT. NO. 1 OF 1		
ORDER NO. 27972	Stearns Catalytic	DWG. NO.	

DH243

GEOTECHNICAL LOG

FIELD DATA

NO.	TYPE	SAMPLE % RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM (1)	USC	BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PR PRESS. METER (KSF)	EM (KSF)
1	SS				FILL, GRAVELLY TO SILTY SAND WITH SOME SILTY GRAVEL AND LITTLE TOPSOIL; (SM), DARK YELLOW BROWN, 10YR 4/6, MOIST, LOOSE.	FILL	(GP)	27/12	1.5			
2	SS						(SM)	11/12				
3	SS						(SM)	7/12				
4	SS		5'				(OL)	5/12				
5	ST		6.6		SILTY CLAY; CL, GRAYISH BROWN, 2.5Y 5/2, MOIST, FIRM.	F	(GM) (CL)	900	1.5			
6	SS		8.4 10'		SANDY GRAVEL; (GP-GM), TRACE SILT, POORLY GRADED, BECOMES WELL GRADED AT 16.0', LIGHT OLIVE BROWN, 2.5Y 5/4, MOIST, MEDIUM DENSE.	E	(CL) (GP-GM)	42/12	1.4			
7	SS						(GM)	43/12				
8	SS		12.0 12.5		...WET ...SATURATED		(GP)	27/12				
9	SS						(GP-GM)	32/12				
10	SS		15'				(GP-GM)	37/12				
11	SS						(GW)	34/12				
			20'		TOTAL DEPTH = 17.5 FT. SWL TO 12.0 FT. 2-27-85 CAVED TO 12.0 FT. 2-28-85 CAVED TO 11.8 FT. 3-5-85 SAMPLES COLLECTED SS 10 ST 1 TOTAL 11							
			25'									

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FORM F042685

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
MOIST						(3")							
MOIST						(3")							
MOIST							(1-1/4)						
MOIST													
20.98													
MOIST							(2-1/8)						
MOIST							(2)						
SAT.							(2-3/8)						
9.5							(2)						
SAT.							(1-7/8)						
SAT.							(2-3/8)						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. UNCONFINED COMPRESSION
- T.C.U. TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 2-27-85
COORDINATES N 625 E 773
GROUND ELEV. 745.4

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 243

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHN	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH250

GEOTECHNICAL LOG

FIELD DATA

NO.	TYPE	SAMPLE % RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM ①	USC	BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER PL (KSF)	PRESS. METER EM (KSF)
1	ST		2.5		ORGANIC SILTY CLAY, OL (TOPSOIL), TRACE SAND, BLACK 10YR 2/1, MOIST, STIFF WITH LENSES OF CLAYEY SILT, GRAY 5Y 5/1.		(OL)	100	2.8	1.3		
2	ST		5'		SILTY CLAY, CL, TRACE SAND, WITH LENSES OF TOPSOIL, GRAY 5Y 5/1, MOIST, MEDIUM FIRM. . . . GRADES TO . . . SILT, ML, TRACE SAND, SLIGHT PLASTICITY, LIGHT OLIVE BROWN 2.5Y 5/4, MOIST, STIFF.	F	(CL) (ML)	150	2.2			
3	ST		5.9		. . . BECOMES SOME SAND BELOW 5.0'.		(ML)	200	1.0	0.5		
4	SS				SANDY GRAVEL, GP-GM, POORLY GRADED, LITTLE SILT BECOMES TRACE SILT BELOW 6.5', LIGHT OLIVE BROWN 2.5Y 5/4, MOIST, DENSE. GRAVEL IS CARBONATE MATERIAL.		(GM-GP)	75/12				
5	SS		8.5 ▼		. . . BECOMES BROWN YELLOW 10YR 6/6, SATURATED BELOW 8.5'.		(GW)	61/12				
6	SS		10'		. . . BECOMES MEDIUM DENSE BELOW 9.0 FT.	E	(SP-GP)	38/12				
7	SS				. . . BECOMES DENSE AT 10.5 FT.		(GM GP)	61/12				
8	SS				. . . BECOMES WELL GRADED AND DENSE AT 12.0 FT. OLIVE YELLOW 2.5Y 6/6.		(GW-GM)	30/12				
			15'		TOTAL DEPTH = 13.5 FT. STATIC WATER LEVEL 8.5 FT, 2.27.85 HOLE CAVED TO 4.25 FT. ON 3.5.85 SAMPLES COLLECTED ST 3 SS 5 TOTAL 8							

FORM F042685

56

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
35.7													
15.7													
14.8													SOME SLOUGH
MOIST						(3")							
WET							(2 3/8)						
SAT.							(3/8)						
11.96							(1 1/4)						POSSIBLE SLOUGH
7.59							(1 3/4)						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (HIGH ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (HIGH ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD SOLID AUGER
DATE DRILLED 2-27-85
COORDINATES N 680 E 973
GROUND ELEV. 741.9

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 250

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH278

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM (1)	USC	BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER P_L (KSF)	PRESS. METER E_M (KSF)
1	ST				FILL, SILTY CLAY, CL, TRACE ORGANICS, OLIVE BROWN, 2.5Y 4/4, WET.							
					... GEOTEXTILE COVERING.		(CL)	300	0.5	0.4		
2	ST		5' 5.0			FILL	CL-CH	500				
3	ST		6.9 ▽ 7.5		TAILINGS, SILTY CLAY, CH, TRACE GRAVEL, MOIST-WET, OLIVE BROWN, 2.5Y 4/4, SOFT, NONSTRATIFIED.		CL-CH	300	0.4	0.7		
4	ST		8.5 ▼ 9.0		SILTY CLAY, CL, DARK GRAY, 5Y 4/1, TO OLIVE 5Y 5/3, MOIST TO WET, STRATIFIED, SOFT.	F	(ML-CL)	250	0.8			
					SANDY GRAVEL, GM, SOME SILT, LIGHT OLIVE BROWN, 2.5Y 5/4, MOIST.	E	(GM)					
			10'									
					TOTAL DEPTH = 9.2 FT.							
					CAVED AT 6.5 FT. 3-12-85 STATIC WATER LEVEL = 6.9 FT. 3-8-85							
			15'		SAMPLES COLLECTED ST 4 TOTAL 4							

FORM FG42685

LABORATORY DATA ③

(3) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
WET							(1-1/4)						
19.1			53	20	33		0 (2-3/8)	1	57	42			TESTS ON SAMPLE 2 & 3 COMPOSITE
38.92													
24.4							(1-1/4)						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 3-7-85
COORDINATES N 726 E 519
GROUND ELEV. 741.3

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 278

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: REP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH288

GEOTECHNICAL LOG

FIELD DATA

NO.	TYPE	SAMPLE % RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM	USC	BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
			1.7 1.0		CONCRETE SLAB.							
1	SS				FILL, SANDY GRAVEL, GM, LITTLE SILT, POORLY GRADED, YELLOW BROWN, 10YR 5/6, MOIST, VERY DENSE.	FILL	(GM)	141/12				
2	SS				... BECOMES MEDIUM DENSE BELOW 2.5 FT.		(GM)	42/12				
3	SS		5'		... BECOMES FRAGMENTED GRAVEL-SIZED PIECES OF CEMENTED SAND, POSSIBLE BUILDING BLOCK BELOW 4.0 FT., LITTLE SILT.		(SM)	21/12				
			5.5		ORGANIC SILTY CLAY, (TOPSOIL), OL, BLACK 10YR 2/1, MOIST, STIFF.	F	(OL) CL-CH					
4	ST		6.9		SILTY CLAY, CL-CH, LOW PLASTICITY, OLIVE GRAY 5Y 4/2, MOIST, STIFF.			100	2.4	1.0		
5	ST		8.6		SANDY GRAVEL, GW-GM, POORLY GRADED, TRACE SILT, LIGHT OLIVE BROWN, 2.5Y 5/6, MOIST, VERY DENSE.	E	(ML)	300	2.4	1.0		
6	SS		10'				(GP-GM)	105/12				
7	SS						(GW-GM)	148/12				
8	SS				... BECOMES WET THEN SATURATED.		(GW-GM)	89/12				
			14.5									
9	SS		15'				(SP-GP)	83/12				
10	SS						(GP)	89/12				
11	SS						(GW)	59/12				
12	SS		20'				(GW)	55/12				
13	SS		30'		SILTY CLAY, CL, TRACE SAND, GRAY 10YR 5/1, MOIST, VERY HARD.		(CL)	148/12				
			31.3									
			31.5		TOTAL DEPTH = 31.5 FT.	D						
			35'		SWL TO 1.7 FT. 3-5-85 CAVED TO 1.9 FT. 3-20-85 NOTE: SHALLOW WATER READING MAY BE DUE TO PONDING FROM HEAVY RAIN. SAMPLES COLLECTED SS 11 ST 2 = TOTAL 13							

FORM F042685

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
													NO SAMPLE (CONCRETE)
67							(2-1/8)						
94						(3")							
MOIST													
4.6	79.3		53	20	33		0	1	51	48			
MOIST													
06							(2-3/8)						
MOIST						(3")							
MOIST							(2")						
VET SAT.							(1-1/4)						
09							(1-3/4)						
SAT.							(2-3/8)						
SAT.						(3")							
													NO SAMPLE - DRILL
MOIST													

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 3185
COORDINATES N 772 E 878
GROUND ELEV. 748.1

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 288

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 1 OF 1	
ORDER NO. 2797Z	Stearns Catalytic	DWG. NO.

DH303

GEOTECHNICAL LOG

FIELD DATA

NO.	TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM (T)	USC	(BLOW CT. OR PSI) (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
1	ST		2.0		FILL, CLAYEY SILT, ML, YELLOW BROWN, 10YR 3/2, VERY DARK GRAY BROWN, BLACK, MOTTLED, MOIST, FIRM.		(ML)	700	1.7	0.6		
2	ST		5'		TAILINGS, SILT, ML, LT. GRAY, 5YR 7/1, FIRM TO VERY STIFF, MOISTURE CONTENT APPEARS TO BE LOWER THAN ACTUAL MOISTURE CONTENT WITH WET LAYERS BETWEEN MOIST LAYERS NONSTRATIFIED.		(ML)	700	3.9	0.6		
3	ST						(ML)	700	5.6	0.8		
4	ST		10'				(ML)	700	4.1	0.8		
5	ST					FILL	(ML)	700	5.4	0.8		
6	ST		15'				(ML)	800	5.0			
7	ST						(ML)	1000	5.1			
8	ST		20'				(ML)	700	4.0			
9	ST						(ML)	800	6.2			
10	ST		24.3				(ML) (OL-CL)	700	4.7			
11	ST		24.7		ORGANIC SILTY CLAY, OL-CL, (TOPSOIL), V. DK. BROWN, 10YR 2/2, MOIST, VERY STIFF.		(CL)	1000	4.0			
12	SS		25'		SILTY CLAY, CL, TRACE GRAVEL, DARK GRAY SH BROWN, 2.5Y 4/2, MOIST, VERY STIFF.	F	(CL)	64/12	4.2			
13	SS		27.0		SANDY GRAVEL, GM, LITTLE SILT, LT. YELLOW BROWN, 2.5Y 6/4, MOIST, DENSE.	E	(CL) (GM)	60/12	4.2			
			28.2									
			30'									

TOTAL DEPTH = 28.2 FT.

CAVED TO 19.8 FT. 3-6-85
NO GROUND WATER ENCOUNTERED

SAMPLES COLLECTED

ST	11
SS	2
TOTAL	13

FORM F042685

LABORATORY DATA ③

MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
MOIST WET							(1-3/8")						
MOIST													
54.98													
MOIST													
MOIST													
44.62													
MOIST			47	43	4		0	2	78	20			BLENDED SAMPLES 4, 7, 10
MOIST													
MOIST													
54.46													
27.70							(5/8")						
MOIST							(7/8")						
WET							(1.3/8")						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 2-19-85
COORDINATES N 774 E 130
GROUND ELEV. 760.3

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 303

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH318

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM (1)	USC	BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)	
			1.0		CONCRETE PAD								
					FILL - GRAVELLY, SILTY SAND, (SM) AND GRAVELLY ORGANIC SILT (OL) WITH BRICKS AND CINDERS AND ORGANIC SILT TOPSOIL (OL), LIGHT OLIVE BROWN, 2.5Y 5/4, TO BLACK 10YR 2/1, MOIST TO WET, LOOSE.								
1	SS					FILL	(SM)	6/12					D
2	SS		5'				(OL)	4/12	2.5				M
3	ST						(GM)	750					8
4	SS		8.7		ORGANIC SILTY CLAY (TOPSOIL - OL), LITTLE SAND, LITTLE GRAVEL, BLACK 10YR 2/1, MOIST, STIFF.		(SM) (ML) (OL)	5/12	3.9	0.70			3
			10'	10.2	SILTY CLAY, CL, TRACE GRAVEL AND SAND, SUBROUNDED GRAVEL, OLIVE GRAY 5Y 4/2, MOIST, MED. FIRM, STRATIFIED.		(OL)						
5	ST					F	CL	250	2.0				2
					..SANDY SILT, (ML), LITTLE GRAVEL, TRACE CLAY, OLIVE BROWN 2.5Y 4/4, WET, FIRM.		(CL) (ML)						
6	ST		14.5 ▼ 15' ▽	14.1 14.9	SANDY, SILTY GRAVEL (GW-GM), WELL GRADED, COBBLES, OLIVE YELLOW 2.5Y 6/6, SATURATED, DENSE.			150	1.2	0.25			1
7	SS						(GW)	48/12					9
8	SS				..LIGHT BROWNISH YELLOW 2.5Y 6/4, INCREASING SILT.	E	(GW)	85/12					S
9	SS						(GW-GM)	23/12					S
			20'		TOTAL DEPTH = 19.0 FT.								
					CAVED TO 12.3 FT. 3-5-85								
					STATIC WATER LEVEL = 10.8 FT. 3-5-85								
					SAMPLES COLLECTED								
					SS 6								
					ST 3								
					TOTAL 9								

FORM F043685

LABORATORY DATA ③

③ MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
													CONCRETE
													NO SAMPLE
RY							(1-3/8)						
OIST							(2-3/8)						
8							(1-1/2)						
2.2							(3/8)						
2.9	100.1		33	21	12		5 (3/4)	35	34	26	4×10^{-8}		
3.8							(1-1/2)						
3						(3")							
AT.						(3")							
AT.							(1-7/8)						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 2-27-85
COORDINATES N 826 E 725
GROUND ELEV. 747'

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 318

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH331

GEOTECHNICAL LOG

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM ①	USC	FIELD DATA: BLOW CT. (N) OR PSI	PENE-TROMETER (KSF)	TORVANE (KSF)	PP PRESS. METER (KSF)	EM (KSF)
1	ST				FILL		(SC) (GM)	500	1.0			
2	SS				CLAYEY SAND, SC, TO 0.3 FT. BLACK 10YR 2/1, NO ODOR, MOIST, FIRM.	FILL	(GM)	65/12				
3	SS				SILTY GRAVEL, GM, TO 5.5 FT., YELLOWISH BROWN 10YR 5/6, MOIST, DENSE.		(GM)	83/12				
4	SS		5'				(GM)	26/12				
5	SS			5.5	ORGANIC SILTY CLAY, (TOPSOIL), OL, TRACE GRAVEL, BLACK 10YR 2/1, MOIST, STIFF.	F	(CL-OL)	13/12	3.0			
6	SS			7.3	SILTY CLAY, CL, TRACE SAND AND GRAVEL, GRAY 10YR 7/1, MOIST, STIFF.		(CL-OL) (CL)	21/12	1.7	1.2		
7	SS		8.6 8.2 9.0 10'		GRAVELLY SAND, SW, TRACE SILT, TRACE CLAY, WELL GRADED, CALCAREOUS CARBONATE GRAVEL, YELLOWISH BROWN, MOIST TO WET AND SATURATED, DENSE.	E	(SW)	63/12				
8	SS						(SW)	64/12				
9	SS						(SW)	70/12				
10	SS						(SW)	66/12				
			15'		TOTAL DEPTH = 14.5 FT.							

SWL (CAVE LEVEL) = 8.6 FT. 3.26.85

SAMPLES COLLECTED

ST	1
SS	9
TOTAL	10

61

FORM F04.2685

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
MOIST							(2)						
MOIST							(1/2)						
MOIST							(1-1/2)						
MOIST							(2)						
V. MOIST 7.2							(1/4)						
V. MOIST 3.9							(1-1/2)						
WET							(2)						
SAT							(2)						
2 SAT.							(2)						
SAT.							(1-1/2)						

LEGEND

SAMPLE TYPE

SS	SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
SSA	SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
ST	DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
STU	UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
J	JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

U.C.	UNCONFINED COMPRESSION
T.C.U.	TRIAXIAL CONSOLIDATED UNDRAINED
U.U.	UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 3-25-85
COORDINATES N 893 E 421
GROUND ELEV. 742.3

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 331

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CH'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: ETW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH341

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM ①	USC	FIELD DATA: BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
1	ST				FILL, SILTY SAND, SM, BLACK N 2/0, WET, TO 4.6'. SANDY SILT, ML, OLIVE 5Y 4/3, WET, AND ORGANIC SILT, OL, BLACK N 2/0, WET TO 7.4'. SILTY SAND, SM, DARK REDDISH BROWN SATURATED TO 9.1 FT.	FILL	(SM)	100				
2	ST						(GM) (SM)	150				
3	SS		5'		... TAILING BACKFILL.		(SM) (ML) (OL)	20/12				
4	ST		6.8 ▽ 8D ▼ 7.4				(ML)	150				
			9.1		... BECOMES SILTY SAND, ML, TRACE GRAVEL, DARK REDDISH BROWN, 5YR 2.5/2, SATURATED.							
5	ST		10'		CLAYEY SILT, ML, TRACE SAND, TRACE GRAVEL, LIGHT OLIVE BROWN, 2.5Y 5/4, SATURATED, VERY STIFF.	F	(SM) (ML)	N.R.	4.2			
6	SS		12.0		... GRADING TO SANDY SILT BELOW 10.5'.		(ML)	39/12	3.0			
					SANDY GRAVEL, GW-GM, TRACE SILT, WELL GRADED, LIGHT OLIVE BROWN, 2.5Y 5/4, SATURATED, MEDIUM DENSE.	E		49/12				
7	SS		15'		... COBBLES AT 13.0 FT.		(GW-GM)	46/12				
			20'		TOTAL DEPTH = 15.0 FT. CAVED TO 11.0 FT. 3-27-85 STATIC WATER LEVEL - 6.8 FT. 3-18-85 STATIC WATER LEVEL - 7.9 FT. 3-27-85 SAMPLES COLLECTED ST 4 SS 3 TOTAL 7							

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FORM FOR 2685

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
WET													
16.2						(2 3/4")							
WET						(1-1/4")							
31.9													
16.3						(3")							
SAT.													
													NO RECOVERY (COBBLES)
SAT.						(3")							

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 3.15.85
COORDINATES N 930 E 170
GROUND ELEV. 743.0

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 341

DRAWN BY MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY REP	DATE: 10-1-85	
APP'D. BY EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH363

GEOTECHNICAL LOG

Sheet 1 of 1

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM (T)	USC	FIELD DATA: BLOW CT. (N) OR PSI	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER P_L (KSF)	PRESS. METER EM (KSF)
1	SS				FILL, GRAVELLY SAND (SM), LITTLE SILT, YELLOWISH BROWN 10YR 5/4, MOIST, MEDIUM DENSE.	FILL	(SM)	36/12				
					... COBBLES.							
2	SS				... BECOMES SILTY CLAY (CL), @ 3.0', WITH TRACE SAND, LOW PLASTICITY, OLIVE GRAY 5Y 4/2, STIFF.		(SM)	32/12				
			3.4		ORGANIC SILTY CLAY (TOPSOIL) (OL), LOW PLASTICITY,	F						
3	SS				BLACK 10YR 2/1, MOIST, STIFF.		(OL)	22/12	2.2			
			4.5		CLAYEY GRAVEL (GC), SOME SILT, MOTTLED BLACK 10YR		GC	400				
			5.3 5.2		2/1, OLIVE 5Y 5/3, MOIST,							
4	STU		5' ▽		SILTY SAND AND GRAVEL, SM-GM, LITTLE SILT, POORLY GRADED, YELLOWISH BROWN 10YR 5/8, MOIST, DENSE, SUBROUNDED CARBONATES.	E						
5	SS						(GM)	88/12	4.0			
6	SS						(SP-SM)	51/12				
			9.8		... BECOMES GRAVELLY SAND @ 9.0', SP-SM, POORLY GRADED, TRACE SILT, MEDIUM DENSE.		(SP-SM)					
7	SS		10' ▽		... BECOMES SATURATED @ 9.8'.			29/12				
8	SS						(SP)	43/12				
					... GRADES TO ...							
			12.6		GRAVEL AND SAND, GW, WELL GRADED, TRACE SILT,		(SW) (GW)					
9	SS				YELLOWISH BROWN 10YR 5/8, SATURATED, MEDIUM DENSE, SUBROUNDED CARBONATES.			53/12				
10	SS		15'				(GW)	36/12				
			20'									
			21.0		SILTY CLAY, CL, TRACE SAND, LOW PLASTICITY, DARK GRAY 10YR 4/1, SATURATED, STIFF.	D						
11	SS		25'				(CL)	32/12	3.0			
					TOTAL DEPTH = 26.0 FT.							
					CAVED TO 5.7 FT., 3-27-85 STATIC WATER LEVEL - 5.3 FT., 3-22-85							
			30'		SAMPLES COLLECTED STU 1 SS 10 TOTAL 11							

FORM FD43685

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LABORATORY DATA ③

③ MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (sat.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
OIST							(1-3/8)						LOW RECOVERY
DRY 86							(1-1/2)						LOW RECOVERY
OIST 9.63													
6.2 3.2	91.8		31	15	16		60 (2-1/8)	7	20	13	4×10^{-7}		TOP 0.5 FEET POSSIBLE SLOUGH.
OIST 73							(2-1/8)						
OIST							(1-1/2)						
ET							(2-1/2)						
AT.							(1-1/4)						
AT.							(2-1/2)						
AT							(1-7/8)						BEGIN ROTARY WASH AT 10 FEET.
													NO SAMPLES TAKEN
													NO SAMPLE - NO RECOVERY
MOIST													NO SAMPLE
													NOTE: DH 363 ADDED TO SUBSTITUTE FOR DH 378.

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD: HOLLOW STEM AUGER / ROTARY WASH
DATE DRILLED: 3 21 85
COORDINATES: N 974 E 902
GROUND ELEV.: 744.1

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 363

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: E/W	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH351

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM (T)	USC	BLOW CT. OR PSI (3")	PENE-TROMETER (TSF)	TORVANE (TSF)	P PRESS. METER (TSF)	E METER (TSF)
					FILL, GRAVELLY SAND, SM, POORLY GRADED, TRACE SILT, TRACE CLAY, GRAYISH BROWN, 10 YR 5/2, MOIST, DENSE, LENSES OF CLAY (NON PLASTIC).	FILL	(SM)	112/2				
2	ST		1.5 / 2.6		SILTY CLAY, CL, TRACE GRAVEL, TRACE SAND, BROWN, 10YR 4/3, MOIST, VERY STIFF.	F	(CL)	400	5.6			
3	SS				SANDY GRAVEL, GW GM, WELL GRADED, LITTLE SILT, BROWN YELLOW 10YR 6/6, DRY, VERY DENSE.		(GW-GM)	80/12				
4	SS		5'				(GW-GM)	133/12				
5	SS						(GW-GM)	121/12				
6	SS						(GM)	100/12				
7	SS		10' 10.1 ▽		... BECOMES POORLY GRADED, WET, DENSE TO MEDIUM DENSE.		(GP-GM)	52/12				
8	SS		11.3 ▼		... SATURATED.	E	(GP-GM)	23/12				
9	SS/J		12.0		GRAVELLY SAND, SM, WELL GRADED, LITTLE SILT, LIGHT OLIVE BROWN, 2.5Y 5/6, SATURATED, LOOSE.		(SM)	8/12				
10	SS				... TRACE COBBLES		(GM)	120/12				
11	SS		15'				(GP-SM)	215/6				
12	SS		16.0		SANDY GRAVEL, GM, WELL GRADED, LITTLE SILT, LIGHT OLIVE BROWN, 2.5Y 5/4, SATURATED, MEDIUM DENSE.		(GM)	39/12				
13	SS						(GM)	53/12				
14	SS		19.4 / 20'		SILT, ML, LIGHT BROWNISH GRAY, 10YR 6/2, SATURATED, SOFT, FIRM.	D	(GP-GM) (ML)	36/12	1.0			
								34/12				
			25'		TOTAL DEPTH = 22.0 FT. S.W.L. = 10.1 FT. - 2-5-85 CAVED TO 14.8 FT. - 2-22-85 SAMPLES COLLECTED ST 1 SS 11 SS/J 2 TOTAL 14							

FORM FOX365

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
MOIST							(5/8")						ROAD BASE FROZEN-DRILL
20.95 MOIST							(5/8")						
DRY							(2-3/8")						
DRY						(3")							
DRY						(3")							
DRY							(2-3/4")						
DRY							(1-1/2")						
WET							(1-1/2"						
SAT							(3/6")						
SAT							(2-3/4")						USED SAMPLER WITH FLAPPER VALVE
13.94 SAT							(1-1/4")						COBBLE-DRILL
SAT							(2-3/8")						
SAT							(2-3/4"						
20.38							(1-1/4")						
SAT													NO RECOVERY

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (MIN ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (MIN ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. UNCONFINED COMPRESSION
- T.C.U. TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 2-1-85
COORDINATES N 923 E 673
GROUND ELEV. 747.2

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 351

DRAWN BY MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY RFP	DATE: 10-1-85	
APP'D. BY Ellw	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH373

GEOTECHNICAL LOG

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM ①	USC	FIELD DATA: BLOW CT. OR PSI ②	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
1	ST				FILL, SILTY CLAY, CL, TO 0.6 FT. AND SANDY AND SILTY GRAVEL, GM, TO 4.6 FT., TRACE CLAY, DARK BROWN, 10YR 7/4 TO 3/3, MOIST, MEDIUM DENSE TO LOOSE.	FILL	(CL)	200	3.8			
2	SS						(GM)	43/12				
3	SS		3.0 ▽		...MOTTLED COLORS, GRAVEL BECOMES SILTY AT 2.5 FT.		(GM)	30/12				
4	SS		5'	4.6	CLAYEY SILT, ML, LITTLE SAND, LITTLE GRAVEL, DARK BROWN, 10YR 3/3, MOIST, FIRM	F	(GM) (ML)	12/12				
5	ST			6.0	SANDY GRAVEL, GP-GM, POORLY GRADED, TRACE SILT, PALE OLIVE 5Y 5/3, BECOMES WET AT 7.5', DENSE. SUBROUNDED CARBONATES.	E	(CL)	--	1.0	0.62		
6	SS						(GM)	87/12				
7	SS		8.3 ▽		...BECOMES SATURATED AT 8.3 FT.		(GM-GP)	45/12				
8	SS		10'				(GW-GM)	52/12				
9	SS						(GP-GM)	50/12				
10	SS						(GP-GM)	64/12				
11	ST/J		15'									
			20'	18.0	SILTY CLAY, CL, TRACE GRAVEL, TRACE SAND, DARK GRAY, 10YR 4/1, MOIST.	D	(CL)	200				
			25'		TOTAL DEPTH = 22.2 FT S.W.L. 3/18/85 3.0 FT. S.W.L. 3/19/85 3.3 FT. CAVED TO 4.5 FT. 3/19/85 SAMPLES COLLECTED ST 2 SS 8 ST/J 1 TOTAL 11							

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FORM F047485

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
MOIST							(7/8")						
MOIST							(2-5/8"						
MOIST						(3")							
48.3							(1-1/2"						
22.4													
6.21						(3")							
WET							(1-1/2"						
11.8						(2-1/2"							
SAT							(1")						
SAT							(1-3/8"						
													NOT SAMPLED
MOIST													

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (MOD ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (MOD ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD: HOLLOW STEM AUGER/ROTARY
DATE DRILLED: 3-14-85
COORDINATES: N 1024 E 76
GROUND ELEV.: 741.0

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 373

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: REP	DATE: 10-1-85	
APP'D. BY: EHN	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH378

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM ①	USC	FIELD DATA: BLOW CT. OR PSI (N)	FIELD DATA: PENE-TROMETER (KSF)	FIELD DATA: TORVANE (KSF)	FIELD DATA: PRESS. METER P_L (KSF)	FIELD DATA: PRESS. METER E_M (KSF)
1	ST				FILL, SILTY SAND, SM, GRADING TO SILTY GRAVEL, GM, POORLY GRADED, TRACE CLAY, BLACK N 2/0 TO VERY DARK GRAY BROWN 10YR 3/2, WET, DENSE, STRATIFIED.	FILL	(SM)	400				
2	SS		3.5				(GM)	80/12				
3	ST		5'		SILTY CLAY, CL, TRACE SAND, OLIVE BROWN, 2.5 Y 4/4, MOIST, STIFF.	F	(CL)	300	2.0			
4	ST		7.1 / 7.7 ▽ 7.6		... BECOMES SILT AT 6.0', LIGHT OLIVE BROWN 2.5Y 5/4, WET.		(ML)	NR	3.2			
5	SS				SANDY GRAVEL, POORLY GRADED, GP-GM, SOME SILT, OLIVE 5Y 5/4, SATURATED, MEDIUM DENSE.	E	(SM)	41/12				
6	SS		10'		... GRADES TO TRACE SILT BELOW 11.0 FT.		(GP-GM)	52/12				
7	SS						(GP)	56/12				
			15'		TOTAL DEPTH = 12.5 FEET CAVED TO 7.6 FT - 3.27.85 SWL - 7.1 FT - 3.21.85 SWL - 6.5 FT. - 3.27.85 SAMPLES COLLECTED ST 3 SS 4 TOTAL 7							

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FORM F047685

LABORATORY DATA ③

(%) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
VET							(1/2")						
WET							(1-1/4)						
22.0													
41.7	79.8											U.C. = 1.3 KSC	
21.3													
SAT.							(1 3/8)						
37.6							(1-1/2)						
SAT.							(1 1/8)						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (SHOP ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (SHOP ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 3 20 85
COORDINATES N 1023 E 320
GROUND ELEV. 741.5

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 378

DRAWN BY MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY RFP	DATE: 10-1-85	
APP'D. BY EHN	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH389

GEOTECHNICAL LOG

Sheet 1 of 1

SAMPLE NO.	TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM (1)	USC	BLOW CT. (N) OR PSI	PENETROMETER (KSF)	TORVANE (KSF)	PRESS. METER P_L (KSF)	PRESS. METER E_M (KSF)
1	SS				SILTY CLAY, CL, UPPER 0.35' TOPSOIL, DARK YELLOWISH BROWN, 10YR 4/4, MOIST, VERY STIFF.	F	(CL)	45/12	6.8			
2	ST		2.6		CLAYEY GRAVEL, GC, POORLY GRADED, LITTLE CLAY, LITTLE SILT, YELLOWISH BROWN, 10YR 4/4, MOIST, DENSE.		(CL) (GL)	400	3.8			
3	SS		5'		... GRADES TO SANDY GRAVEL, GP-GM, @ 4.0 FT., LARGE GRAVEL, TRACE SILT, BROWN YELLOW 10YR 6/6 DRY, EXTREMELY DENSE.		(GL) (GM)	97/12				
4	SS						(GW-GM)	155/12				
5	SS						(GP-GM)	150/12				
6	SS		10'		... BECOMES STRONG BROWN 7.5YR 5/8 @ 9.5 FT.		(GW-GM)	168/12				
7	SS		11.8 ▽				(SM)	76/12				
8	SS					E	(GP-GM)	109/12				
9	SS						(GP-GM)	124/12				
10	SS		15.5 ▼				(GW-GM)	106/12				
11	SS				... GRADES TO GRAVELLY SAND, (SP-SM) AT 15.5', POORLY GRADED, TRACE SILT, LIGHT OLIVE BROWN, 2.5Y 5/6 TO 5/4, MOIST TO SATURATED, DENSE.		(SW-SM) (SP-SM)	61/12				
12	SS				... LAYER OF FINE SAND 16.4 TO 16.8 FT. ... LOOSE 18.0 TO 19.3 FT.		(GP-GM)	61/12				
			20'		... VERY LOOSE 19.3 TO 21.7 FT.							
13	SS						(SP-SM)	8/12				
14	SS				... BECOMES DENSE @ 22.0 FT.		(SP)	66/12				
15	SS		24.2 / 25'		SILT, ML, GRAY 10YR 5/1, SATURATED, VERY STIFF.	D	(SP) (ML)	23/12	0.7			

TOTAL DEPTH = 25.0 FT.

SWL = 11.8 FT. - 1-29-85
CAVED TO 16.9 FT. - 2-19-85
NO SWL OBSERVED 2-19-85

SAMPLES COLLECTED

SS 14
ST 1

TOTAL 15

30'

FORM F04366S

67

LABORATORY DATA ③

(3) MOISTURE	DRY (PCF) DENSITY	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
													FROZEN - DRILL
54													
DIST							(2)						
DIST RY							(1-7/8)						
RY						(3)							
RY							(1-7/8)						
RY							(2-3/8)						
RY													
RY-DIST							(1-7/8)						
RY							(1-3/8)						
RY							(2-1/4)						
47							(1-1/4)						
AT.							(1-1/2)						
													SAMPLER DROPPED 1.4 FT. ON LAST BLOW.
AT.													NO SAMPLE - DRILL
AT.													
00													

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (SHOW ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (SHOW ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. UNCONFINED COMPRESSION
- T.C.U. TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 1-28-85
COORDINATES N 1024 E 874
GROUND ELEV. 750.4

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 389

DRAWN BY MPW/WF	SCALE: 1" = 4'	REV. 1
CH'K'D. BY AFP	DATE: 10-1-85	
APP'D. BY EHW	SHT. NO. 1 OF 1	
ORDER NO. 27072	Stearns Catalytic	DWG. NO.

DH411

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM ①	USC	BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER PL (KSF)	PRESS. METER EM (KSF)
1	ST				FILL, CLAY (CL), GRAVELS, GC, POORLY GRADED, SOME SAND, LITTLE SILT, LIGHT OLIVE, BROWN - DARK GRAYISH BROWN, 2.5 Y 4/2 TO 5/4, MOIST, DENSE, STRATIFIED.	FILL	(CL)	400	1.6			
2	SS						(GC)	64/12				
3	SS		4.2		SILTY CLAY, CL, LITTLE SAND, OLIVE GRAY 5Y 5/2, MOIST, STIFF. BECOMES SILT @ 5.0'.	F	(SC) (CL)	36/12	2.8			
4	SS		5' 5.4		GRAVELLY SAND, SP-SM, POORLY GRADED, TRACE SILT, LIGHT OLIVE GRAY, 5Y 6/2, MOIST DENSE . . . BECOMES SATURATED @ 6.5 FT.	E	(ML) (GW-GM)	73/12	3.6			
5	SS		7.5 ▽ ▽				(SW-SM)	56/12				
6	SS				. . . BECOMES MEDIUM DENSE BELOW 9.5 FT.		(SW)	60/12				
7	SS		10'				(SP) (GP)	39/12				
8	SS						(SM)	46/12				
			15'		TOTAL DEPTH = 12.5 FEET SWL = 7.5 FT. - 3.21.85 SWL = 7.5 FT. - 3.28.85 CAVED TO 7.7 FT. - 3.28.85 SAMPLES COLLECTED SS 7 ST 1 TOTAL 8							

60

TI
APERTURE
CARD

Also Available On
Aperture Card

LABORATORY DATA ③

(%) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
OIST						(3)							
													NO SAMPLE DRILL
OIST							(1-1/2)						
.05							(1-3/8)						
54							(2-1/4)						
AT.							(1-1/2)						
AT.							(1-5/8)						
58							(1-1/2)						
AT.							(1-5/8)						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.0" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 3-20-85
COORDINATES N 1128 E 204
GROUND ELEV. 742.3

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 411

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

8604240475-82

DH1432

GEOTECHNICAL LOG

Sheet 1 of 1

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM (1)	USC	FIELD DATA: BLOW CT. OR PSI (2)	FIELD DATA: PENE-TROMETER (KSF)	FIELD DATA: TORVANE (KSF)	FIELD DATA: PL PRESS. METER (KSF)	FIELD DATA: EM (KSF)
1	ST				FILL, SILTY CLAY, CL, VERY DARK BROWN 10YR 2/2, MOIST, STIFF TO VERY HARD TO 1.5'.	FILL	(CL)	400	5.9			
2	ST				ORGANIC SILTY CLAY (TOPSOIL), OL, LITTLE SAND, LITTLE GRAVEL, VERY STIFF.		(OL)	400				
3	ST						(OL-CL)	500	5.8			
4	SS		5'				(OL-CL) (SM)	54/12	5.2			
5	SS						(OL-CL)	24/12	3.4			
					7.0							
6	ST		9.1 ▽		ORGANIC SILTY CLAY (TOPSOIL), OL, LOW PLASTICITY, BLACK 10YR 2/1, MOIST, STIFF. SILTY CLAY, CL, MEDIUM PLASTICITY, DARK GRAY BROWN 2.5Y 4/2, MOIST, FIRM,	F	(OL) (CL)	400	2.0			
7	ST		10' 11.5 ▽		...BECOMES CLAYEY SILT, ML, BELOW 10.0', LOW PLASTICITY, OLIVE 5Y 5/3, WET, STIFF. ...SATURATED BELOW 12.0'.		ML-CL	400	1.6	0.6		
8	SS				12.0		(ML) (GM)	38/12				
9	SS				SILTY GRAVEL AND SAND, GP-GM, POORLY GRADED LITTLE TO TRACE SILT, YELLOW BROWN 10YR 5/6, SATURATED, DENSE	E	(GP-GM)	65/12				
10	SS		15'				(SM)	65/12				
			20'		TOTAL DEPTH = 16.5 FEET HOLE CAVED TO 10.3' - 3/27/85 STATIC WATER LEVEL - 9.1' - 3/21/85 (23 HRS. AFTER COMPLETION) SAMPLES COLLECTED SS 5 ST 5 TOTAL 10							

FORM P047685

61

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (pcf)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
16.0							(3/8)						
17.4							(1)						
MOIST							(3/4)						
MOIST							(2)						
MOIST							(3/4)						
37.5 37.3	82.8											U.C. = 0.6 KSC	
25.3 17.4	107.3		23	18	5		4 (1-7/8)	9	66	22	1×10^{-7}	U.C. = 1.4 KSC	
SAT							(2-1/8)						
10.7							(1-1/4)						
SAT							(1-3/8)						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (MOD ASTM SPEC)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC)
- ST — DISTURBED SHELBY TUBE 3" DIA. (MOD ASTM SPEC)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. UNCONFINED COMPRESSION
- T.C.U. TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 3 19 85
COORDINATES N 1174 E 476
GROUND ELEV. 744.3

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 432

DRAWN BY MPW/WF	SCALE 1" = 4'		REV. 1
CH'D. BY RFP	DATE		
APP'D. BY EHW	SHT. NO. 1 OF 1		
ORDER NO. 27972	Stearns Catalytic	DWG. NO.	

DH440

GEOTECHNICAL LOG

Sheet 1 of 1

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM (1)	USC	FIELD DATA: BLOW CT. OR PSI (2)	FIELD DATA: PENE-TROMETER (KSF)	FIELD DATA: TORVANE (KSF)	FIELD DATA: PP (KSF) PRESS. METER EM (KSF)
1	ST				FILL, SILTY SAND, SM, POORLY GRADED, LITTLE CLAY, LITTLE GRAVEL, BLACK, 2.5Y 2/0, ASPHALTIC ODOR, WET, LOOSE.		(SM)	300	1.0		
			3.7 ▽			FILL					
2	SS				... BECOMES SANDY GRAVEL, GM, WELL-GRADED, LITTLE SILT, TRACE CLAY, OLIVE TO LIGHT OLIVE BROWN 5Y 5/3 TO 2.5Y 5/4 MOIST TO WET, DENSE, STRATIFIED.		(GM)	59/12			
3	SS		5'				(GC)	36/12			
				6.4	ORGANIC SILT, OL, (TOPSOIL), TRACE CLAY, SLIGHT PLASTICITY, BLACK, 10YR 2/1, MOIST, FIRM.		(GM) (OL)	22/12	1.6		
4	SS			7.5		F					
5	ST			7.9	SILTY CLAY, CL, LITTLE SAND, LITTLE GRAVEL, LOW PLASTICITY, DARK GRAYISH BROWN, 2.5Y 4/2, MOIST, MEDIUM FIRM.		(CL)		1.4	0.6	
6	SS						(GP-GM)	79/12			
			10.5 ▽		SANDY GRAVEL, GP-GM, POORLY GRADED, TRACE SILT, PALE OLIVE, 5Y 6/3, SATURATED, DENSE TO VERY DENSE.						
7	SS						(GW)	94/12			
8	SS						(GW)	90/12			
9	SS						(GW-GM)	109/12			
10	SS		15'			E	(GP)	74/12			
			20'								
				22.5	SILTY CLAY, CL, TRACE SAND, TRACE GRAVEL, LOW PLASTICITY, DARK GRAY, 5Y 4/1, VERY MOIST TO WET, MEDIUM FIRM	D	(CL)	400	1.4	1.6	
11	ST										
			25'		TOTAL DEPTH = 24.0 FEET						
					CAVED TO 6.6 FT. - 3-19-85 STATIC WATER LEVEL 3.7 FT. - 3-15-85 STATIC WATER LEVEL 3.9 FT. - 3-19-95						
					SAMPLES COLLECTED SS 8 ST 3 TOTAL 11						

70

LABORATORY DATA ③

(2) MOISTURE	DRY (PCF) DENSITY	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
.32							(5/8)						
													NO SAMPLE
OIST						(3)							
ET							(1-1/2)						
ET						(3)							
OIST							(1-3/8)						
OIST							(1-1/2)						
AT.							(2-5/8)						
AT.							(2-1/2)						
AT.							(2)						
AT.							(1-1/4)						
AT.													NO SAMPLE - DRILLED THROUGH
.93							(1-1/8)						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.0" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. UNCONFINED COMPRESSION
- T.C.U. TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. UNCONSOLIDATED UNDRAINED

SYMBOLS

GRAVEL
SAND
CLAY
SILT
CLAYEY-SILT
SILTY-CLAY
FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
DOLOMITE – (BEDROCK)
WATER-TABLE (INITIAL)
WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

HOLLOW STEM AUGER
0-12.5

DRILLING METHOD ROTARY WASH 12.5-23.0
DATE DRILLED 3-13-85
COORDINATES N 1173 E 74
GROUND ELEV. 744.0

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 440

DRAWN BY MPW/WF	SCALE 1" = 4'	REV. 1
CHK'D. BY REP	DATE 10-1-85	
APP'D. BY ELN	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH460A

GEOTECHNICAL LOG

SAMPLE NO.	SAMPLE TYPE	DEPTHS & GRD. WATER	DESCRIPTION (Sheet 1 of 1)	STRATUM (1)	USC	FIELD DATA: BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER PL (KSF)	PRESS. METER EM (KSF)	
			ORGANIC SILTY CLAY OL, (TOPSOIL), LITTLE SAND, BLACK 10YR 2/1, MOIST, FIRM.	F							
1	ST				(OL)	150	1.8				4
2	STU	3.2	SILTY CLAY, CL, LITTLE SAND, LITTLE GRAVEL, GRAY 5Y 5/1, MOIST, STIFF.		CL-CH	250	2.8	0.6			2
3	SS	3.5 / 5'	SANDY GRAVEL, GM, LITTLE SILT, TRACE ROOTS, LIGHT BROWN, GRAY 2.5Y 6/2, MOIST, MEDIUM DENSE.		(GM)	46/12					4
4	SS				(GM)	49/12					1
5	SS	7.2 ▽ 8.0 ▼	. . . BECOMES GRAVELLY SILT, ML @ 6.5 FT., LITTLE CLAY, TRACE SAND, OLIVE 5Y 4/3, MOIST, VERY DENSE.		(ML)	101/12					M
6	SS		SANDY GRAVEL, GW-GM, WELL GRADED, TRACE TO LITTLE SILT, LIGHT OLIVE BROWN 2.5Y 5/4, SATURATED, VERY DENSE, COARSE MATERIAL IS CARBONATE.	E	(GW)	49/12					S
7	SS	10'			(GM)	52/12					S
8	SS		. . . BECOMES POORLY GRADED BELOW 11.0'.		(GP-GM)	53/12					S
		15'	TOTAL DEPTH = 12.5'								

HOLE CAVED TO 7.1 FEET - 3-27-85
NO STATIC WATER LEVEL RECORDED

SAMPLES COLLECTED

SS	6
ST	1
STU	1
TOTAL	8

FORM F042685

71

LABORATORY DATA ③

③ MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
6													
5	95.5		49	21	28		0 (1-1/2)	3	48	49	2×10^{-7}		BENT END OF TUBE
77							(2-1/2)						
72							(2-1/2)						TOP OF SAMPLE IS SLOUGH (0.17 FEET)
DIST							(1-1/4)						
AT.						(3")							
AT.						(3")							
AT.							(1 7/8)						0.3' OF SLOUGH

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 3-18-85
COORDINATES N 1274 E 777
GROUND ELEV. 743.4

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 460A

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: REP	DATE: 10-1-85	
APP'D. BY: BHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH463

GEOTECHNICAL LOG

Sheet 1 of 1

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM (1)	USC	FIELD DATA: BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)	
					ORGANIC SILTY CLAY, (TOPSOIL) OL, BLACK 10YR 2/1 MOIST, STIFF, TRACE SAND, TRACE GRAVEL.	F							
1	STU						(OL)	200	3.5	0.8			37
2	STU		2.8 / 3.3		SANDY SILT, ML, LITTLE CLAY, LITTLE GRAVEL, GRAYISH BROWN 2.5Y 5/2, MOIST, VERY STIFF.		(ML)	400	4.3				24
3	SS		5'		SANDY GRAVEL, GP-GM, POORLY GRADED, TRACE SILT, LIGHT YELLOWISH BROWN, 2.5Y 6/4, MOIST, DENSE.		(GP-GM)	52/12					M
4	SS		6.4 / 7.0		...COBBLES.		(GM)	80/12					M
5	SS				...SATURATED.		(GW-GM)	69/12					W SA
6	SS				...ROCK FRAGMENTS ARE CARBONATE.		(GW)	55/12					12
7	SS		10'				(GW-GM)	69/12					9
8	SS				...BECOMES LIGHT YELLOWISH BROWN, 2.5Y 6/4 AT 11.0 FT., DENSE.	E	(GW)	67/12					11
			15'										
			20'										
			24.5 / 25'		SILTY CLAY, CL, LITTLE SAND, TRACE GRAVEL, DARK GRAY 10YR 4/1, SATURATED, STIFF.	D							
9	ST						(CL)	500	3.2				
			30'		TOTAL DEPTH = 28.0 FT.								

HOLE CAVED TO 6.25 FT. - 3-27-85
STATIC WATER LEVEL - 6.4 FT. - 3-18-85

SAMPLES COLLECTED

SS	6
ST	1
STU	2
TOTAL	9

FORM F042685

72

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
.30													
.3	.04.0						(1-1/4)					U.C. = 2.0 KSC	
DIST						(3")							
DIST						(3")							
ET AT.							(2-3/8)						BEGIN ROTARY WASH @ 8.0 FEET.
48							(2-5/8)						
23							(2-3/8)						
.31							(1-3/4)						
													NO SAMPLE
							(5/8)						BENT TUBE @ 25.5' DISTURBED SAMPLE.

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (HOW ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (HOW ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

HOLLOW STEM AUGER

DRILLING METHOD ROTARY WASH
DATE DRILLED 3.18.85
COORDINATES N 1282 E 625
GROUND ELEV. 742.5

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 463

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV.
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH472

GEOTECHNICAL LOG

Sheet 1 of 1

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM ①	USC	FIELD DATA: BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
1	ST				FILL (TOPSOIL AND SILTY CLAY), LOW PLASTICITY, VERY DARK BROWN, 10YR 2/2, MOIST, FIRM.	FILL	OL CL	200	3.6	0.9		
2	ST		2.5		SILTY CLAY, CL-CH, TRACE OF SAND AND GRAVEL, STRONG BROWN AND GRAY 7.5YR 5/8 AND 10YR 5/1, MOIST, FIRM.	F	CL-CH	250				
3	SS		5' 6.0 ▼		...GRADES TO SANDY SILT, ML, TRACE OF SAND AND GRAVEL, NO PLASTICITY, DARK YELLOWISH BROWN, 10YR 4/4, MOIST, VERY STIFF.		(ML)	25/12				
4	SS				...SATURATED		SM	115/12				
5	SS		6.8		SILTY SAND, SM, SOME GRAVEL, POORLY GRADED, YELLOWISH BROWN 10YR 5/6, SATURATED, VERY DENSE.	E	(SP)	87/12				
6	SS		10'		...CHANGES TO SILTY GRAVEL, GM, SOME SAND, OLIVE YELLOW TO OLIVE BROWN, 2.5Y 6/8, 2.5Y 4/4, SATURATED, EXTREMELY DENSE.		(GM)	190/12				
			15'		TOTAL DEPTH = 10.5' HOLE CAVED TO 5.6' - 1-17-85 NO STATIC WATER LEVEL TAKEN SAMPLES COLLECTED SS 4 ST 2 TOTAL 6							

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FORM FO42685

LABORATORY DATA ③

(%) MOISTURE	DRY (PCF) DENSITY	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
MOIST			41	26	15								
MOIST			46	20	26		4	8	56	32			
MOIST													
SAT		2.76					22	38	32	8			
SAT													
SAT													

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (MOD ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.8" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (MOD ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 12-4-84
COORDINATES N 1277 E 171
GROUND ELEV. 740.5

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 472

DRAWN BY MPW/WE	SCALE: 1" = 4'	REV. 1
CHK'D. BY RFP	DATE: 10-1-85	
APP'D. BY EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH481

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM (1)	USC	FIELD DATA: BLOW CT. OR PSI (N)	FIELD DATA: PENE-TROMETER (KSF)	FIELD DATA: TORVANE (KSF)	FIELD DATA: PL PRESS. METER (KSF)	FIELD DATA: EM PRESS. METER (KSF)
1	ST		2.5		ORGANIC SILTY CLAY, (OL), (TOPSOIL), SLIGHT PLASTICITY, VERY DARK BROWN, 10YR 2/2, MOIST, STIFF.	F	OL	400	3.2	2.4		
			3.8		SILTY CLAY, (CL), TRACE SAND, LOW PLASTICITY, DARK GRAYISH BROWN 2.5Y 4/2, MOIST, STIFF.		(CL)					
2	ST		5' ▼ 5.0 ▽		GRAVELLY SAND (SW-SM), LITTLE SILT, WELL GRADED, OLIVE TO LIGHT OLIVE BROWN, 2.5Y 4/4 TO 5/4, SATURATED, VERY DENSE.	E		1200	2.8			
3	SS						(SW-SM)	100/12				
4	SS						(SW-SM)	136/12				
5	SS		10'		SANDY GRAVEL (GP-GM), LITTLE SILT, POORLY GRADED, OLIVE 5Y 5/3, SATURATED, EXTREMELY DENSE.		(GP-GM)	185/12				
			15'									
			17.5									
6	J		20'		SILTY CLAY (CL), LOW PLASTICITY, GRAY, 10YR 5/1, WET.	D	(CL)					
			25'		TOTAL DEPTH = 20.0 FT. STATIC WATER LEVEL - 5.0' - 12 18 84 STATIC WATER LEVEL - 5.0' - 3 19 85 NO CAVING, 3/19/85 SAMPLES COLLECTED SS 3 ST 2 J 1 TOTAL 6							

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FORM FD4368S

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLES (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
23.2	99.9										UNDIST.	TUU $\phi = 0.0°$	
21.0	102.3		37	22	15			5	63	32	1×10^{-8}	C = 2.27 KSC	
36.16													
SAT.							(2-1/2)						
SAT.													
8.97								(1-1/2)					
SAT.													NO SAMPLE
WET													CUTTINGS

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.

② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS

③ LABORATORY TEST DATA BY STS

DRILLING METHOD ROTARY WASH
DATE DRILLED 3-10-85
COORDINATES N 1324 E 376
GROUND ELEV. 740.6

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 481

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH509

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM (1)	USC	FIELD DATA: (BLOW CT. OR PSI) (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER P (KSF)	PRESS. METER E (KSF)
			0.5		FILL (SANDY SILT), LITTLE CLAY, TRACE GRAVEL, TRACE ORGANIC ROOTS, DARK BROWN, 7.5 YR 3/2, MOIST.	FILL						
1	ST		2.0		SANDY SILT, ML, LITTLE CLAY, TRACE OF GRAVEL, BROWNISH GRAY 10YR 6/2, MOIST.		ML	150				
2	SS				SANDY GRAVEL, GW, WELL GRADED, LITTLE SILT, TRACE CLAY, YELLOW 10YR 7/6, MOIST, DENSE TO VERY DENSE.		(SW)	131/12				
3	SS		4.1 ▽ 4.8 ▼ 5.0				GM	75/12				
4	SS				...GRADING TO GRAVELLY SAND, SP, POORLY GRADED, SOME GRAVEL, TRACE SILT, BROWNISH YELLOW 10YR 6/6, SATURATED, DENSE.	F	(SP-GP)	53/12				
5	SS				...LITTLE SILT.		(SM-GM)	55/12				
6	SS				...WELL GRADED, TRACE OF SILT.		(SW)	69/12				
			10'		TOTAL DEPTH = 9.5 FEET CAVED TO 3.9 FEET - 1-16-85 STATIC WATER LEVEL = 4.1 FEET - 12-7-84 SAMPLES COLLECTED SS 5 ST 1 TOTAL 6							

FORM P042685

LABORATORY DATA ③

(%) MOISTURE	DRY (PCF) DENSITY	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
MOIST			19	19	NP		3 (1-1/8)	37	50	10			pH = 5.9
MOIST													
MOIST							55 (2-1/2)	32	10	3			
SAT.													
SAT.							(3/4")						
SAT.							(1-1/2)						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (HIGH ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (HIGH ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 12-6-84
COORDINATES N 1417 E 76
GROUND ELEV. 740.3

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 509

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHM	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH513

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTH & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM ①	USC	BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
1	ST				FILL (SILTY FINE SAND) SOME ORGANIC SILT AND CLAY LITTLE GRAVEL, TRACE OF GLASS, RUBBER AND TRASH, BLACK 10YR 2/1, MOIST, STIFF TO VERY STIFF.	FILL	SM	250	4.0			
			2.5									
2	ST				SILTY CLAY, CH-CL, TRACE OF SAND AND GRAVEL, MOTTLED COLOR - GRAYS, BROWNS, TRACE OF BLACKS, DARK GRAYISH BROWN 2.5Y 4/2, MOIST, STIFF.		CH-CL	250	2.4			
3	SS		5'		... GRADES TO CLAYEY SILT, ML, SOME CLAY, SOME SAND, TRACE OF GRAVEL, LIGHT BROWNISH GRAY 2.5Y 6/2, MOIST, HARD.	F	(ML-CL)	38/12				
8	ST				... WET, STIFF		ML	250	2.6			
			8.0 7.5 ▼									
4	SS				SILTY SAND AND GRAVEL, GM SM, POORLY GRADED, LIGHT OLIVE BROWN 2.5Y 5/6, SATURATED, VERY DENSE TO EXTREMELY DENSE.		(ML-SM)	156/12				
5	SS		10'			E	(SM)	86/12				
6	SS				... TO YELLOWISH BROWN 10YR 5/6.		(GM-SM)	145/12				
7	SS						(SM-GM)	113/12				
			15'		TOTAL DEPTH = 13.0 FT. SWL = 8.0 FT. 12/6/84 HOLE CAVED TO 4.5 FT. 1/16/85 SAMPLES COLLECTED SS 5 ST 3 TOTAL 8							

FORM F0427685

76

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
25.6			45	34	11		12 (1/4)	41	31	16			
26.1			54	19	35		0 (1-1/4)	2	44	54			
MOIST													
20.4	113		24	21	3		4 (2)	16	65	15			SAMPLE FROM 513A (1' FROM 513) 5.0'-7.0'
WET													
SAT.													
SAT.													
SAT.													

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NOM ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NOM ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 12.6.84
COORDINATES N 1426 E 272
GROUND ELEV. 742.4

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 513

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: REP	DATE: 10-1-85	
APP'D. BY: ELW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH522

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM ①	USC	BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
			0.3		ORGANIC SILTY CLAY, OH, (TOPSOIL) DARK BROWN, MOIST.		OL		4.4			
1	ST				SILTY CLAY, CH, TRACE GRAVEL, LITTLE SAND, WITH LENSES OF TOPSOIL, LIGHT OLIVE BROWN, 2.5Y 5/4, MOIST, STIFF.	FILL	CH	500	3.0			
2	STU		2.8		SANDY SILT, ML, LITTLE CLAY, LIGHT OLIVE BROWN, 2.5Y 4/4, MOIST, STIFF.	F	ML	600	4.8	0.56		
3	ST		4.0					1200	2.0			
4	SS		5'		SANDY GRAVEL, SW GW, LITTLE SILT, TRACE CLAY, WELL GRADED, YELLOW, 10YR 7/6, TO BROWNISH YELLOW, 10YR 6/8, MOIST, EXTREMELY DENSE.		(GW)	166/12				
5	SS						(SW-GW)	198/12				
6	SS						GM	187/12				
7	SS		10.0 ▼			E	(SW-GW)	116/12				
			10'		...SATURATED, DENSE.							
8	SS				...LARGE ROUNDED COBBLES AT 11.0 FEET.		(GW)	67/12				
9	SS				...VERY DENSE.		(SW-GW)	82/12				
10	SS				...DARK YELLOWISH BROWN, 10YR 4/6, VERY DENSE.		(SW-GW)	106/12				
			15'									

TOTAL DEPTH = 14.5 FEET

CAVED TO 8.1 FEET ON 11 29 84
NO STATIC WATER LEVEL RECORDED

SAMPLES COLLECTED

SS	7
ST	2
STU	1
TOTAL	10

77

FORM F042685

LABORATORY DATA ③

(%) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
							1	10	44	45			
24.9			55	23	32		(1-3/4")					T.C.U. MULTISTAGE	CONSOLIDATION
14.0		2.67	19	18	1		(1-3/4")	38	44	18		Pc = 0 Cc = 0.103 Cr = 0.012	Pc = 4.8 KSC Cc = 0.114 Cr = 0.011
16.3			32	17	15								
MOIST						(3-1/8")							
MOIST						(3-1/8")							
MOIST							46	41	10	3			
MOIST													
SAT.						(4")							
SAT.						(4")							
SAT.						(4")							

LEGEND

SAMPLE TYPE

SS	SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
SSA	SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
ST	DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
STU	UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
J	JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

U.C.	UNCONFINED COMPRESSION
T.C.U.	TRIAXIAL CONSOLIDATED UNDRAINED
U.U.	UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEAM AUGER
DATE DRILLED 11-15-84
COORDINATES N 1424 E 727
GROUND ELEV. 745.1

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH-522

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHN	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH544

GEOTECHNICAL LOG

Sheet 1 of 1

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM (1)	USC	FIELD DATA: BLOW CT. (2) OR PSI	FIELD DATA: PENE-TROMETER (KSF)	FIELD DATA: TORVANE (KSF)	FIELD DATA: PRESS. METER PL (KSF)	FIELD DATA: PRESS. METER EM (KSF)
			0.4		CONCRETE							
1	STU				ORGANIC SILTY CLAY, OL, TRACE OF SAND, MEDIUM PLASTICITY, VERY DARK BROWN 10YR 2/2 AND BLACK 10YR 2/1, MOIST, NO ODOR		(OL)	350	3.0	0.90		
			2.3		SILTY CLAY, CH, TRACE OF SAND, MEDIUM TO HIGH PLASTICITY, VERY DARK GRAY 10YR 3/1 TO YELLOW 10YR 7/8 AND GRAY 5Y 5/1 MOTTLED, MOIST, VERY STIFF, INTERBEDDED WITH POORLY GRADED SAND, BROWNISH GRAY, 10YR 6/2 AND SANDY SILT, BROWNISH YELLOW, 10YR 6/6.	F						
2	STU						CH	500	3.5	0.90		
			5'									
3	STU		5.8		SAND, SP, FINE, TRACE GRAVEL, LT. BROWN GRAY, 10YR 6/2, MOIST DENSE, GRADES TO SANDY SILT.		(SP)	800	7.0	1.6		
4	SS		7.5		SAND AND GRAVEL, SW-GW, WELL GRADED, TRACE OF SILT, YELLOWISH BROWN, 10YR 5/8, MOIST DENSE.		(ML) (SW-GW)	83/12				
5	SS						(SW)	76/12				
			10'									
6	SS					E	(GW-GM)	65/12				
			12.0 ▼									
7	SS				... TO SANDY GRAVEL, LITTLE SILT, ROUND TO SUBROUNDED LIMESTONE, LIGHT BROWNISH GRAY, 2.5Y 6/2, SATURATED.		(GM)	64/12				
8	SS				... COBBLES AND BOULDERS.		—	53/12				
9	SS		15'		... SUBANGULAR, MEDIUM DENSE.		—	44/12				
					TOTAL DEPTH = 16.0 FT.							
					HOLE CAVED TO 9.1 FEET ON 12-4-84 STATIC WATER LEVEL NOT RECORDED							
			20'		SAMPLES COLLECTED SS 6 STU 3 TOTAL 9							

FORM FOA2685

78

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
MOIST			46	28	18								NO SAMPLE (CONC)
MOIST			58	24	34		0	4	42	54			
MOIST													
MOIST							7 (1-1/2")	35	45	13			
MOIST							(1-1/2")						
MOIST													
SAT						(6-7/8")							
SAT						(7-7/8")							NO RECOVERY BEGIN ROT. WASH AT 13.0 FEET
SAT						(7-7/8")							NO RECOVERY

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

HOLLOW STEM AUGER 0-13.0'
DRILLING METHOD ROTARY WASH 13-14.5'
DATE DRILLED 11-14-84
COORDINATES N 1524 E 374
GROUND ELEV. 745.6

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 544

DRAWN BY MPW/WF	SCALE 1" = 4'	REV. 1
CHK'D. BY RFP	DATE 10-1-85	
APP'D. BY EHN	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

01 550

GEOTECHNICAL LOG

Sheet 1 of 1

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM (1)	USC	FIELD DATA: BLOW CT. OR PSI (2)	PENETROMETER (KSF)	TORVANE (KSF)	PRESSUREMETER P (KSF)	PRESSUREMETER E (KSF)
1	STU				FILL, SM, (SILTY SAND), SOME GRAVEL, LITTLE CLAY TRACE ORGANICS, ASH, AND CINDERS, BLACK TO VERY DARK BROWN, 10YR 2/1 TO 10YR 2/2, MOIST, LOOSE TO MEDIUM DENSE	FILL	SM	800				
2	STU		2'									
3	SS				SAND AND GRAVEL, (SW-GW), WELL GRADED, TRACE OF SILT SUBROUNDED, LIMESTONE, LIGHT YELLOWISH BROWN 10YR 6/4, MOIST, VERY DENSE.	E	(SW GW)	122/12				
4	SS		5'				(SW GW)	101/12				
5	SS				... TO BROWNISH YELLOW, 10YR 6/8, EXTREMELY DENSE AT 5.5 FEET.		(GP-GM)	161/12				
6	SS				... TO YELLOWISH BROWN 10YR 5/6, VERY DENSE AT 7.0 FEET.		(SW GW)	94/12				
7	SS		9.7 ▼ 10'		... BECOMES WET AT 9.7 FEET.		(GW)	59/12				
8	SS				SILTY SAND AND GRAVEL, SM-GM, WELL GRADED, TRACE OF COBBLES, SUBROUNDED, LIMESTONE, YELLOWISH BROWN, 10YR 5/4, SATURATED, DENSE.		(SM GM)	68/12				
9	SS				... BECOMES MEDIUM DENSE AT 13.0 FEET.		(SP)	58/12				
10	SS		15'					37/12				

TOTAL DEPTH = 14.5 FEET.

HOLE CAVED TO 6.75 FEET ON 12-4-84
STATIC WATER LEVEL 9.7 FEET - 11-13-84

SAMPLES COLLECTED

SS 2.5 IN DIA	8
STU 3.0 IN DIA	2
TOTAL	10

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FORM F042685

LABORATORY DATA ③

③ MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
MOIST			46	33	13		29 (1-5/8")	37	21	13			
MOIST													TUBE BENT
MOIST							(1-5/8")						
MOIST							(1-5/8")						
MOIST							56 (2-3/4")	34	5	5			
MOIST													
WET													
SAT						(5-7/8")							
SAT						(5-7/8")							STARTED WASH BORING
SAT													NO RECOVERY

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (HSA AASHO SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER AASHO SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (HSA AASHO SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER AASHO SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 11-13-84
COORDINATES N 1525 E 677
GROUND ELEV. 745.3

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 550

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV.
CHK'D. BY: RFP	DATE: 10-1-85	1
APP'D. BY: EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH560A

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM (1)	USC	BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
			0.3		CONCRETE							
			0.6		FILL SILTY CLAY, CL, TRACE SAND, LOW PLASTICITY, DARK BROWN 7.5YR 3/4, MOIST, FIRM.	FILL	(CL)					
1	ST		2.5		ORGANIC SILTY CLAY, OL, TRACE OF ROOTS, LOW PLASTICITY, VERY DARK BROWN 7.5YR 3/4, MOIST, FIRM TO STIFF.		(OL)	100	3.0	1.0		
2	ST				SILTY CLAY, CL, TRACE SAND, MED. TO HIGH PLASTICITY, YELLOWISH BROWN 10YR 5/6 AND LIGHT GRAY 10YR 6/1 MOIST, FIRM TO STIFF.	F	CL	150	2.0	0.80		
3	ST		5'		... TO CLAYEY SILT, ML, SOME FINE SAND, TRACE GRAVEL, LOW PLASTICITY, LIGHT BROWNISH GRAY 2.5Y 6/2, MOIST.		(CL-ML)	500				
			6.0		GRAVELLY SAND, SM, LITTLE SILT, TRACE CLAY, WELL GRADED, VERY PALE BROWN 10YR 7/4, MOIST, V. DENSE.		(SM)	98/12				
4	SS				SAND AND GRAVEL, GW-GM, WELL GRADED, TRACE TO LITTLE SILT, LIMESTONE, PALE BROWN 10YR 6/3, WITH SEAMS 4" TO 12" THICK OF POORLY GRADED FINE TO MEDIUM SAND WITH SOME GRAVEL, MOIST, EX. DENSE TO DENSE.		(SW GW SP)	169/12				
5	SS											
6	SS		10' ▼ 10.5		... SATURATED, LIGHT GRAYISH BROWN 10YR 6/2.	E	(SW)	67/12				
7	SS						(GM)	39/12				
8	SS				... LIGHT GRAY 2.5Y 7/2.		(SM)	49/12				
9	SS		15'				(SP)	49/12				
10	SS							54/12				
			20'		TOTAL DEPTH = 16.5' HOLE CAVED TO 5.5' - 12-4-84 STATIC WATER LEVEL - 4.5' - 12-4-84 SAMPLES COLLECTED SS 7 ST 3 TOTAL 10							

FORM F042985

86

LABORATORY DATA ③

(%) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
													NO SAMPLE
MOIST													
MOIST			40	17	23		0	5	61	34			
MOIST													
MOIST							36	48	13	3			
MOIST													
WET													
SAT.													
SAT.													START WASH BORING AT 12.0 FEET.
SAT.													
SAT.													NO RECOVERY WASH ONLY

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

HOLLOW STEM AUGER 0-12.0
DRILLING METHOD ROTARY WASH 12.0-16.5
DATE DRILLED 11-26-84
COORDINATES N 1575 E 516
GROUND ELEV. 745.5

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 560A

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV.
CHK'D. BY: RFP	DATE: 10-1-85	1
APP'D. BY: EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

TH573

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM (1)	USC	BLOW CT. (2) OR PSI	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
1	SS				CLAYEY SAND, SC, SOME GRAVEL, LITTLE SILT, WELL GRADED, BROWN AND DARK BROWN, 10YR 4/2, MOIST, VERY STIFF.	FILL	SC	34/12				
			1.5									
2	SS		4.0		GRAVELLY SAND, GW, LITTLE SILT, TRACE CLAY, WELL GRADED, BROWNISH YELLOW, 10YR 6/4, MOIST.		SM	92/12				
3	SS				SAND, SW, AND GRAVEL, WELL GRADED, TRACE SILT, BROWNISH YELLOW, 10YR 6/6, TO YELLOWISH BROWN, 10YR 5/8, TRACE OF LIMESTONE COBBLES, MOIST, EXTREMELY DENSE.		(SW-GW)	103/12				
4	SS		5'				(SW-GW)	101/12				
5	SS						(SW)	73/12				
6	SS				...DENSE.		(SW-GW)	79/12				
7	SS		10'			E	(SW-SP)	53/12				
8	SS				...@ 11.5 PALE BROWN 10YR 6/3, LIMESTONE, SHALE, DENSE.		(SW-GW)	58/12				
9	SS		▼ 13.0		...@ 13.0 WET, BROWN 10YR 5/3		(SW-GW)	56/12				
10	SS		15'		...SATURATED, BROWN, 10YR 4/3, MEDIUM DENSE.		(SW-GW)	43/12				
11	SS				...YELLOWISH BROWN, 10YR 5/8, MEDIUM DENSE.		(SW)	48/12				
12	SS				...VERY PALE BROWN 10YR 7/4, DENSE.		(SW-GP)	55/12				
			20'		TOTAL DEPTH = 18.0 FT. CAVED TO 13.1 FT. - 11-8-84 CAVED TO 12.1 FT. - 11-29-84 NO STATIC WATER LEVEL OBSERVED SAMPLES COLLECTED SS 12 TOTAL 12							

FORM F047685

18

LABORATORY DATA ③

MOISTURE ③	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
MOIST			45	23	22		33	36	18	13			
MOIST							28	47	19	6			
MOIST													
MOIST													
MOIST													
MOIST													
MOIST													
MOIST													
WET													
SAT.													
SAT.													WASH OUT AUGER
SAT.													

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 11-5-84
COORDINATES N 1624 E 826
GROUND ELEV. 748.5

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 573

DRAWN BY: MPW/WF	SCALE: 1" = 4'		REV. 1
CHK'D. BY: RFP	DATE: 10-1-85		
APP'D. BY: EAW	SHT. NO. 1 OF 1		
ORDER NO. 27972	Stearns Catalytic	DWG. NO.	

DH595

GEOTECHNICAL LOG

FIELD DATA

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION (Sheet 1 of 1)	STRATUM ①	USC	FIELD DATA: BLOW CT. OR PSI (N)	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
1	SS				ORGANIC SILTY CLAY, OL, (TOPSOIL), TRACE OF SAND, ROOTS, AND COAL, VERY DARK BROWN, 10YR 2/2, MOIST.	FILL	(OL-CL)	22/12				
2	SS				... SILTY CLAY, (CL), TRACE OF SAND, ROOTS, DARK YELLOWISH BROWN, 10YR 4/6, MOIST, (FILL).		CL	54/12				
			3.0		... TRACE OF SAND, GRAVEL, TOPSOIL, METAL, STRONG BROWN, 7.5YR 5/6, AND VERY DARK BROWN, 7.5YR 2/2.							
3	SS				GRAVELLY SAND, (SP), LITTLE SILT, TRACE CLAY, YELLOWISH BROWN, 10YR 6/4, MOIST, DENSE.	E	(SC-SM)	103/12				
4	SS		5'				SM	74/12				
			6.0		... SAND AND GRAVEL, (SP-GP), POORLY GRADED, TRACE OF SILT AND CLAY, VERY PALE BROWN, 10YR 7/4, (SP-GP).							
5	SS						(SP-GP)	87/12				
6	SS				... BROWNISH YELLOW, 10YR 6/8.		(SP-GP)	59/12				
7	SS		10'		... @ 9.0', RED, 2.5YR 4/8. ... CHANGING TO YELLOW, 10YR 7/4, AND LIGHT YELLOWISH BROWN, 10YR 6/4.		(SP-GP)	56/12				
8	SS						(SW)	94/12				
9	SS				... MEDIUM DENSE.		(SW-GW)	78/12				
10	SS		15'		... LIGHT OLIVE BROWN, 2.5Y 5/6.		(SP)	45/12				
			15.0		... CHANGING TO SILTY SAND, (SP-SM), TRACE GRAVEL, POORLY GRADED, YELLOWISH BROWN, 10YR 5/4.							
11	SS		17.0 ▼ 16.5				(SP-SM)	47/12				
12	SS				... CHANGING TO SANDY GRAVEL, (GM), LITTLE SILT, TRACE CLAY, LIMESTONE, BROWN AND DARK BROWN, 10YR 4/3, SATURATED.		(GP)	39/12				
13	SS		19.5				(SW-SM)	39/12				
14	SS		20'		SAND, (SP), POORLY GRADED, TRACE SILT AND CLAY, GRAYISH BROWN, 2.5Y 5/2, SATURATED, DENSE.		(SP)	44/12				
			25'		TOTAL DEPTH = 21.0 FEET. HOLE CAVED TO 15.3' - 12-10-84 NO STATIC WATER LEVEL TAKEN SAMPLES COLLECTED SS 14 TOTAL 14							

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FORM F042685

LABORATORY DATA ③

MOISTURE ③	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (sat.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
MOIST													
MOIST		2.60	49	24	25		0 (2")	21	45	34			COBBLE IN SHOE
MOIST													
MOSIT		2.79					37	50	14	5			
MOIST													
MOIST													
MOIST													
MOIST							(1-1/2)						
MOIST							(1-1/2)						
MOIST													
MOIST													
SAT.													
SAT.													
SAT.													

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (NON ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (NON ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BED ROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 11-6-84
COORDINATES N 1773 E 775
GROUND ELEV. 752.1

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 595

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY: RFP	DATE: 10-1-85	
APP'D. BY: EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH599

GEOTECHNICAL LOG

Sheet 1 of 1

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM (1)	USC	FIELD DATA (2) BLOW CT. OR PSI	PENETROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
1	SS				ORGANIC SILT, OL (TOPSOIL), VERY DK. BROWN 10YR 2/2, EARTHY ODOR, MOIST, SOFT, HOMOGENEOUS.	F	OL	19/12				
2	SS		2.3		SILTY SAND, SM, LITTLE CLAY, TRACE GRAVEL, YELLOWISH BROWN 10YR 6/6 TO VERY PALE BROWN 10YR 7/4, MOIST, DENSE.	E	(OL) (SW)	55/12				
3	SS		4.5				SM	50/12				
4	SS		5'		GRAVELLY SAND, SW, WELL GRADED, SOME GRAVEL, TRACE SILT AND CLAY, SUBROUNDED GRAVEL 1-1/2, VERY PALE BROWN 10YR 7/4, MOIST, DENSE.		(SW)	72/12				
5	SS						(SP)	52/12				
6	SS				... YELLOW 2.5Y 7/6 TO LIGHT YELLOWISH BROWN 10YR 6/4		(SW-SP)	49/12				
7	SS		10'		... LIGHT BROWNISH GRAY 2.5Y 6/2, MOIST.		(SW)	44/12				
8	SS						(SW)	33/12				
9	SS		13.0 ▼		... BECOMES MEDIUM DENSE.		(SW)	23/12				
10	SS				... DARK YELLOWISH BROWN 10YR 3/6, SATURATED.		(SW)	21/12				
11	J		15' 15.0		SAND, SP, POORLY GRADED, TRACE SILT, YELLOWISH BROWN 10YR 5/4, SATURATED, MEDIUM DENSE, NOT STRATIFIED.		(SP)	29/12				
12	J				... TRACE GRAVEL, GRAYISH BROWN, 10YR 5/2, LOOSE.		(SP)	13/12				
			20'		TOTAL DEPTH = 18.0 FT. HOLE CAVED AT 7.8 FEET ON 12-10-84 STATIC WATER LEVEL 13.0 FT 11-7-84 SAMPLES COLLECTED SS 10 J 2 TOTAL 12							

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FORM FG4265

LABORATORY DATA ③

MOISTURE (%)	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
MOIST		2.51					1	20	52	27			SAMPLE DISTURBED
MOIST													
MOIST		2.79					0	52	37	11			SAMPLE DISTURBED
MOIST							(1-1/2")						
MOIST							(1-1/2")						
MOIST							(1-1/2")						
MOIST							(2-1/2")						
MOIST							(2-1/2")						
MOIST							(2-1/2")						
SAT							(2-1/2")						
SAT													
SAT													

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (SHOW ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (SHOW ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

HOLLOW STEM AUGER FROM 0 TO 13.5'
ROTARY WASH 13.5' TO 18.0'.

DRILLING METHOD
DATE DRILLED 11-7-84
COORDINATES N 1772 E 566
GROUND ELEV. 748.5

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 599

DRAWN BY MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY RFP	DATE: 10-1-85	
APP'D. BY EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH603

GEOTECHNICAL LOG

Sheet 1 of 1

NO.	TYPE	SAMPLE % RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM (1)	USC	FIELD DATA: (N) BLOW CT. OR PSI	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EM (KSF)
1	SS				ORGANIC SILT (TOPSOIL), OL, TRACE SAND & GRAVEL, VERY DARK GRAY 10 YR 3/1, MOIST.		(OL)	10/12				
2	STU		1.5		SILTY CLAY, CH, TRACE SAND, VERY HIGH DRY STRENGTH, MEDIUM TO HIGH PLASTICITY, DARK YELLOWISH BROWN 10YR 4/4, MOIST, VERY STIFF TO HARD, HOMOGENEOUS.	F	CH	500				
3	SS		4.1		GRAVELLY, SILTY SAND, SP-SM, POORLY GRADED, 2-1/2" GRAVEL, BROWNISH YELLOW 10YR 5/6 TO LIGHT YELLOWISH BROWN 10YR 6/4, MOIST, DENSE, GRAVEL LIMESTONE COMPOSITION.		(SP-SM)	86/12				
4	SS		5'				SM	86/12				
5	SS				... BECOMES MEDIUM DENSE @ 8.3 FEET.		(SP-GP)	86/12				
6	SS				... COBBLE @ 9.0'.		(SP)	45/12				
7	SS		10'		... BROWN 10YR 6/2.		(SP-SM)	39/12				
8	SS				SAND, SW, WELL GRADED, TRACE SILT, TRACE GRAVEL, PALE BROWN 10YR 6/3, MOIST, MEDIUM DENSE, HOMOGENEOUS.	E	(SW)	35/12				
9	SS						(SW)	48/12				
10	SS		15'		... LITTLE GRAVEL, YELLOWISH BROWN 10YR 5/4 TO VERY PALE BROWN, 10YR 7/2, VERY DENSE.		(SW-GW)	113/12				
11	SS		17.0 ▼		... YELLOWISH BROWN 10YR 5/4, WET TO SATURATED, DENSE.		(SW)	52/12				
12	SS						(SW-GW)	74/12				
13	SS		19.5		SAND, SP, POORLY GRADED, TRACE SILT & GRAVEL, LIGHT BROWNISH GRAY 10YR 6/2, SATURATED, DENSE.		(SW)	85/12				
14	SS		20'		... BECOMES MEDIUM DENSE @ 19.8 FEET, SATURATED.		(SP)	48/12				
			25'		TOTAL DEPTH = 21.8 FEET HOLE CAVED TO 15.0 FEET ON 12-11-84 STATIC WATER LEVEL NOT OBSERVED 12-11-84 SAMPLES COLLECTED SS 13 STU 1 TOTAL 14							

FORM F042985

34

LABORATORY DATA ③

(%) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY ②	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
													HOLLOW STEM AUGER
24.3 12.5		2.66	55	22	33		0	36	48	16			
		2.69					31	50	14	5			
							(1-1/2"						
							(1-1/2"						
							(1-1/2"						
							(1")						
							(1")						
							(1")						
							(1")						
							(1")						BEGIN ROTARY WASH 17.3'

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (HOW ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (HOW ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L.GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER / ROTARY WASH
DATE DRILLED 11 7 84
COORDINATES N 1775 E 372
GROUND ELEV. 752.5

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 603

DRAWN BY MPW/WF	SCALE: 1" = 4'	REV. 1
CHK'D. BY RFP	DATE: 10-1-85	
APP'D. BY EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH614

GEOTECHNICAL LOG

Sheet 1 of 1

SAMPLE NO.	SAMPLE TYPE	% RECOVERY (25 50 75 100)	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM ①	USC	FIELD DATA: BLOW CT. OR PSI ②	PENE-TROMETER (KSF)	TORVANE (KSF)	PL PRESS. METER (KSF)	EE (KSF)
1	SS				FILL, SILTY CLAY, CL, SOME CINDER FILL, SOME SAND, LITTLE GRAVEL, BLACK N 2/0, BLACK, MOIST, FIRM.	FILL	(GW) (CL)	39/12				
2	SS						(CL)	26/12				
3	SS				...SOME WET SAND POCKETS @ APPROX. 5.0'.		(CL)	22/12				
4	SS		5'				(CL)	33/12				
5	SS		7.0		...BECOMES WET @ 6.5'.		(CL) (ML)	47/12				
6	SS		8.8		CLAYEY SILT, ML, SOME GRAVEL, LITTLE SAND, LOW PLASTICITY, DARK GRAY, 10YR 4/1, MOIST.	F	(ML)	170/12				
7	SS		9.7 10'		SANDY GRAVEL, GW-GM, LITTLE SILT, WELL GRADED, BROWN 10YR 4/3, MOIST, LOOSE TO EXTREMELY DENSE.	E	(ML) (GW-GM)	51/12				
8	SS		12.5 12.8		...BECOMES LT. OLIVE BROWN 2.5Y 5/4 @ 11.0'.			7/12				
9	SS				...BECOMES SATURATED @ 12.8 FT.			16/12				
10	SS		15'		...BECOMES SANDY 14.0 TO 14.4. FEET.		(SP) (GW-GM)	132/9				
11	SS						(GW-GM)	49/12				
12	SS							22/12				
13	SS				...BECOMES GRAY-BROWN 2.5Y 5/2 @ 18.5'.		(GW GM)	150/12				
14	SS		20'				(SW) (GW-GM)	231/12				
15	SS		21.5		SILT, ML, LITTLE CLAY, GRAY 10YR 5/1, WET, VERY HARD.	D	(ML)	122/12				
			25'		TOTAL DEPTH = 23.0 FEET S.W.L. = 12.8 FEET 12-17-84 CAVED TO 9.5 FEET 1-30-85 SAMPLES COLLECTED SS 15							

85

FORM FO47085

LABORATORY DATA ③

(%) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY (G)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
MOIST							(1-7/8)						300 LB. HAMMER USED FOR SAMPLES 1 TO 15
18.1							(1/2)						
MOIST							(7/8)						
MOIST							(1)						
MOIST							(1-7/8)						
MOIST							(1-3/4)						
MOIST							(1-1/2)						
SAT							(1-1/2)						SLOUGH
SAT							(1-3/8)						SLOUGH
SAT							(1-1/8)						REFUSAL @ 15.2'
													NO SAMPLE
SAT							(2)						
SAT							(5/8)						SLOUGH
20.7							(1)						
SAT							(1-1/4)						
19.8													

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (MOD ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (MOD ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 12-14-84
COORDINATES N 1630 E 127
GROUND ELEV. 748.0

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 614

DRAWN BY: MPW/WF	SCALE: 1" = 4'	REV.
CHK'D. BY: RFP	DATE: 10-1-85	1
APP'D. BY: EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

DH631

GEOTECHNICAL LOG

Sheet 1 of 1

SAMPLE NO.	SAMPLE TYPE	% RECOVERY 25 50 75 100	DEPTHS & GRD. WATER	GRAPHIC LOG	DESCRIPTION	STRATUM (1)	USC	FIELD DATA: BLOW CT. (N) OR PSI	PENE-TROMETER (KSF)	TORVANE (KSF)	PRESS. METER PL (KSF)	PRESS. METER EM (KSF)
1	SS				FILL GRAVEL, GP (ROADBASE), LIMESTONE, TO 0.5', SILTY CLAY, CL, SOME GRAVEL, LITTLE SAND, TRACE ORGANICS, DARK BROWN 7.5YR 3/4, MOIST, VERY STIFF.	FILL	(CL)	17/12	7.7			
2	ST		2.0		SILTY CLAY, CL, SOME GRAVEL, LITTLE SAND, DARK BROWN 2.5Y 3/2, MOIST, VERY STIFF.	F	(CL)	1200	4.4			
3	SS		3.4		GRAVELLY SAND, SW, WELL GRADED, TRACE SILT, YELLOWISH BROWN 10YR 5/8, DRY, MEDIUM DENSE TO DENSE.	E	(CL) (SW)	52/12				
4	SS		5'				(CL) (SW)	27/12				
5	SS						(SW)	38/12				
6	SS						(SP)	77/12				
7	SS		10'				(SP)	68/12				
8	SS		11.5 ▽				(SP)	76/12				
9	SS		12.9 ▽		...GRADES TO SILTY SAND, SM, POORLY GRADED, LIGHT BROWNISH GRAY 10YR 6/2, WET, DENSE.		(SP)	71/12				
10	SS		13.1		...SILT AT BOTTOM (3"), SATURATED. SANDY GRAVEL, GM, LITTLE SILT, TRACE CLAY, WELL GRADED, YELLOW BROWN 10YR 5/4, SAT., EX. DENSE.		(GM)	58/12				
11	SS/J		15'				(GM)	181/12				
			20'		TOTAL DEPTH = 16.5 FT. HOLE COLLAPSED AT 8.0' - 1.30.85 STATIC WATER LEVEL - 12.9' - 12.10.84 (0.5 HR. AFTER BOREHOLE COMPLETION) SAMPLES COLLECTED SS 9 ST 1 J 1 TOTAL 11							

FORM FM-X585

LABORATORY DATA ③

(2) MOISTURE	DRY DENSITY (PCF)	SPECIFIC GRAVITY (2)	ATTERBERG LIMITS LL	PL	PI	PERCENT PARTICLE SIZE COBBLE (est.)	GRAVEL 75mm	SAND 4.75mm	SILT .075mm	CLAY .005mm	PERMEABILITY cm/sec	STRENGTH DATA	NOTES
													NO SAMPLE
MOIST							(1-7/8)						
17.5							(1-1/4)						
DRY							(1-1/2)						
DRY							(1-7/8)						
DRY							(1-1/2)						
DRY							(2-1/2)						
DRY							(1-3/8)						
MOIST							(2)						
SAT.							(1-1/2)						
SAT.							(2-1/2)						
SAT.							(1-1/2)						

LEGEND

SAMPLE TYPE

- SS — SPLIT SPOON 2.5" DIA. (HIGH ASTM SPEC.)
- SSA — SPLIT SPOON (A) 1.5" DIA. (AS PER ASTM SPEC.)
- ST — DISTURBED SHELBY TUBE 3" DIA. (HIGH ASTM SPEC.)
- STU — UNDISTURBED SHELBY TUBE 3" DIA. (AS PER ASTM SPEC.)
- J — JAR SAMPLE – FROM POOR RECOVERY, ROTARY WASH CUTTINGS, SHOE, AND AUGER CUTTINGS

STRENGTH TESTING

- U.C. — UNCONFINED COMPRESSION
- T.C.U. — TRIAXIAL CONSOLIDATED UNDRAINED
- U.U. — UNCONSOLIDATED UNDRAINED

SYMBOLS

- GRAVEL
- SAND
- CLAY
- SILT
- CLAYEY-SILT
- SILTY-CLAY
- FILL – (LETTERS SHOW TYPE) M = MISC., T = TAILINGS, AND S = SLUDGE
- DOLOMITE – (BEDROCK)
- WATER-TABLE (INITIAL)
- WATER-TABLE (DATE)

① STRATUM ASSIGNED BY J.L. GRANT & ASSOC.
② SPECIFIC GRAVITY FOR INDIVIDUAL GRAINS
③ LABORATORY TEST DATA BY STS

DRILLING METHOD HOLLOW STEM AUGER
DATE DRILLED 12-10-84
COORDINATES N 1273 E 224
GROUND ELEV. 749.2

KERR McGEE CHEMICAL CORPORATION
WEST CHICAGO PROJECT
GEOTECHNICAL INVESTIGATION
DH 631

DRAWN BY MPW/WF	SCALE: 1" = 4'	REV.
CHK'D. BY RFP	DATE 10-1-85	
APP'D. BY EHW	SHT. NO. 1 OF 1	
ORDER NO. 27972	Stearns Catalytic	DWG. NO.

40-2061

DOCKET NO. 40-2061
CONTROL NO. 26852
DATE OF DOC. 04/16/86
DATE RCVD. 04/21/86
FCUF _____ PDR _____
FCAF _____ LPDR _____
WM _____ I&E REF. _____
WMUR _____ SAFEGUARD: _____
FCTC _____ OTHER _____
DESCRIPTION:

_____

_____

_____

_____

_____

_____ INITIAL _____

26852