APPENDIX D-12:
LEROY CRANDALL AND ASSOCIATES, "REPORT OF BLUFF STABILITY INVESTIGATION TENTATIVE TRACT NOS. 44857, 43415, AND 43416 SOUTH OF JEFFERSON BOULEVARD BETWEEN LINCOLN BOULEVARD AND CENTINELA AVENUE LOS ANGELES, CALIFORNIA FOR HOWARD HUGHES PROPERTIES AND HOWARD HUGHES REALTY," OCTOBER 16, 1987

10-16-87

REPORT OF BLUFF STABILITY INVESTICATION
TENTATIVE TRACT NOS. 44857, 43415, AND 43416
SOUTH OF JEFFERSON BOULEVARD
BETWEEN LINCOLN BOULEVARD AND CENTINELA AVENUE
LOS ANGELES, CALIFORNIA
FOR
HOWARD HUGHES PROPERTIES
AND
HOWARD HUGHES REALTY

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October 16, 1987

Howard Hughes Properties
13250 Jefferson Boulevard
Los Angeles, California 90094

Attention: Mr. P. C. Swan
Project Manager

(LC&A Job No. AE-86125-I)
(KB /606-7607)

Howard Hughes Realty
6167 Bristol Parkway, Suite 330
Culver City, California 90230

Attention: Ms. Stephanie Miller

Gentlemen:

We are pleased to submit this "Report of Bluff Stability Investigation, Tentative Tract Nos. 44857, 43415, and 43416, South of Jefferson Boulevard between Lincoln Boulevard and Centinela Avenue, Los Angeles, California, for Howard Hughes Properties and Howard Hughes Realty".

The scope of this investigation was planned in collaboration with Mr. P. C. Swan of Howard Hughes Properties, Ms. Stephanie Miller of Howard Hughes Realty, and with Mr. George Colvin of Psomas and Associates.

This report presents the results of analyses to determine the stability of the bluff above the Playa Vista Project at the toe of the bluff, and two residential developments at the top of the bluff. The report includes studies by LeRoy Crandall and Associates and by Kovacs-Byer and Associates. The soil and geologic conditions are discussed in the report, and recommendations are presented for remedial grading to protect the proposed developments from slope problems. The detailed exploration and tests on which our recommendations are based are contained in the appendixes to the report.

October 16, 1987
(LC&A Job No. AE-86125-1)
(KB 7606-7607)

We will be happy to discuss the recommendations with you and would welcome the opportunity to provide any additional information that may be necessary.

Respectfully submitted,

LeROY CRANDALL AND ASSOCIATES

by
Mervin E. Johnson
Senior Engineering Geologist

by
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Senior Engineer/Vice President

KOVACS-BYER AND ASSOCIATES

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Chairman

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cc: (4) Psomas and Associates

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REPORT OF BLUFF STABILITY INVESTIGATION

TENTATIVE TRACT NOS. 44857, 43415, AND 43416

SOUTH OF JEFFERSON BOULEVARD

BETWEEN LINCOLN BOULEVARD AND CENTINELA AVENUE

LOS ANGELES, CALIFORNIA

FOR

HOWARD HUGHES PROPERTIES

AND

HOWARD HUGHES REALTY

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REPORT BY LeROY CRANDALL AND ASSOCIATES

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SCOPE

This report presents the results of analyses to determine the stability of the bluff adjacent to the Playa Vista Project for Howard Hughes Properties (Tentative Tract No. 44857) and two residential developments for Howard Hughes Realty (Tentative Tract Nos. 43415 and 43416). The limits of the bluff are shown on Plate 1, Location Plan. The bluff between Lincoln Boulevard and Centinela Avenue forms the approximate southern boundary of Tentative Tract No. 44857 of the Playa Vista development. Tentative Tract Nos. 43415 and 43416 are located at the top of the eastern half of the bluff.

This investigation was performed to address questions raised by the City of Los Angeles, Grading Division regarding the stability of the bluff adjacent to the three tentative tracts and the impact of that stability on the proposed developments.

This report covers the investigation of the approximate western 5,000 feet of the bluff as performed by LeRoy Crandall and Associates (LCA), and the investigation of the approximate eastern 5,000 feet of the bluff performed by Kovacs-Byer and Associates Inc. (KBA). The limits of the two study areas are indicated on Plate 1. Appendix A describes the soil and geologic conditions and the explorations, testing, and analyses performed for the LCA investigation. The KBA report is presented in Appendix B. Landscaping recommendations, prepared by The SWA Group, are attached as Appendix C.

Our professional services have been performed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical consultants practicing in this or similar localities. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report has been prepared for Howard Hughes Properties and Howard Hughes Realty and their design consultants to be used solely in the determination of bluff stability. The report has not been prepared for use by other parties, and may not contain sufficient information for purposes of other parties or other uses.

BLUFF DESCRIPTION

The bluff is a north-facing slope formed by erosion by the ancestral Los Angeles River. The top of the bluff varies from approximately Elevation 130 to 160 feet above sea level. The base of the bluff varies from approximately Elevation 10 to 25 feet. The average slope of the face of the bluff varies from about 1-3/4:1 (horizontal to vertical) to 2-1/2:1.

The existing City of Los Angeles North Outfall Sewer is located within the bluff some 35 to 45 feet above the toe. The sewer, which was constructed in 1925, consists primarily of cast-in-place concrete with a vitrified clay block lining constructed in an open excavation that was subsequently backfilled. The sewer is founded in the undisturbed bluff materials. Cabora Road, a sewer construction and maintenance road, has been constructed along the sewer right-of-way. The sewer is in a tunnel along the easternmost 2,000 feet of the bluff.

The bluff is composed principally of late Pleistocene age dune sand. Although classified as "dune sand", these soils actually contain varying amounts of fines; much of the materials are classified as silty sand. These natural deposits are somewhat cemented and although bedding was observed in these materials, the bedding is relatively flat.

Fill soils were encountered over the sewer and on the portion of the slopes below the sewer.

POTENTIAL HAZARDS

The natural materials encountered in the bluff are dense, slightly cemented, sandy deposits. The natural deposits do not contain adverse geologic structure that could create slope stability problems. Fill soils occur on the portion of the slope below the sewer. Such fill soils are the result of both sewer construction and maintenance of the sewer access road.

The bluff is considered grossly stable (not potentially subject to deep seated sliding). However, construction of the North Outfall Sewer along the bluff has resulted in some oversteepened portions of the slope above the sewer with subsequent slumping of some portions of this slope. Such slumping will continue to occur until the portion of the slope above the sewer reaches a stable inclination.

The soils in the bluff are susceptible to erosion. Localized erosion has occurred where drainage of runoff has been directed over the top of the bluff.

The potential hazard for development at the toe of the bluff is related to the accumulation of soil debris at the toe of the slope. Such debris is a result of shallow surficial failures and erosion within the lower slope below the sewer. The sewer maintenance road is at least 30 feet wide and serves as an effective catchment for soil debris from the upper slope. The hazard at the toe of the slope can be reduced by flattening the lower portion of the slope, removing the fill soils below Cabora Road or by placing a compacted fill on the face of the slope below Cabora Road.

The potential hazard for development at the top of the bluff is the gradual retreat of the edge of the bluff due to both erosion and slumping caused by the oversteepened portions of the slope. In our opinion, there is little likelihood of the slumping ever reaching the top of the bluff and therefore the bluff does not pose a hazard to the existing development at the top of the bluff. Where development is planned on Tracts 43415 and 43416, the potential for slope retreat can be eliminated by trimming the slope.

RECOMMENDATIONS

GENERAL

Four basic areas of the bluff where remedial grading is recommended are identified on Plate 2, Remedial Grading Plan. These areas are: 1) below Cabora Road; 2) below Tract 43415 above Cabora Road; 3) below Tract 43416 above Cabora Road, and west of the sewer tunnel; and 4) between Tracts 43415 and 43416 above Cabora Road.

Throughout the remainder of the bluff, remedial grading is not suggested; in fact, the slope will be better if left in the present condition.

Two large canyons are being filled as part of development of Tracts 43415 and 43416. The filling will result in compacted fill slopes at the east end of Tract 43415 and the west end of 43416.

If the recommendations provided below are followed, we believe that the presence of the bluff will not adversely affect the Playa Vista development (Tentative Tract 44857) and Tracts 43415 and 43416. However, we would recommend that a building setback conforming with the City of Los Angeles Code for structures be provided at the toe of the slope.

All areas requiring remedial grading will have to be replanted. A list of recommended planting material is presented in Appendix C.

REMEDIAL GRADING

AREA 1 - SLOPE BELOW CABORA ROAD

Area 1 involves the portion of the slope below Cabora Road. The slope is locally mantled by fill soils which are potentially unstable. This slope could be trimmed or flattened to 2-1/2:1 (horizontal to vertical) where fill is present. As an alternative, where the slope cannot be trimmed due to the existing sewer, the condition can be improved by placing a stabilization fill against the bluff face.

The face of the stabilization fill may be constructed at 2:1; the fill should be at least eight feet in thickness. The stabilization

fill should be properly benched into the underlying materials. All of the existing fill, such as backfill around the sewer, would not have to be excavated as part of the benching. All required fill should be placed in loose lifts not exceeding eight inches in thickness and compacted to at least 90%. The on-site soils may be used in the required fill; the materials should be brought to within 2% of optimum moisture content prior to compacting.

The face of the completed stabilization fill may be constructed at 2:1 (horizontal to vertical). We recommend that the soils be overfilled and trimmed back to achieve a firm surface. The drainage, benching, and terrace requirements of the City of Los Angeles Building Code should be followed for stabilization fills.

AREA 2 - SLOPE BELOW TRACT 43415

The slope below Tract 43415 should be flattened to 1-3/4:1 (horizontal to vertical). The drainage, benching, and terrace requirements of the City of Los Angeles Building Code should be followed.

AREA 3 - SLOPE BELOW TRACT 43416

Area 3 involves the slope below the western portion of Tract 43416 (west of the sewer tunnel outlet). This slope should be flattened to 2:1 (horizontal to vertical). The drainage, benching, and terrace requirements of the City of Los Angeles Building Code should be followed. The remainder of the slope below Tract 43416 may be left in its current condition provided that locally oversteepened areas be supported by 2:1 stabilization fills.

AREA 4 - SLOPE BETWEEN TRACTS 43415 AND 43416

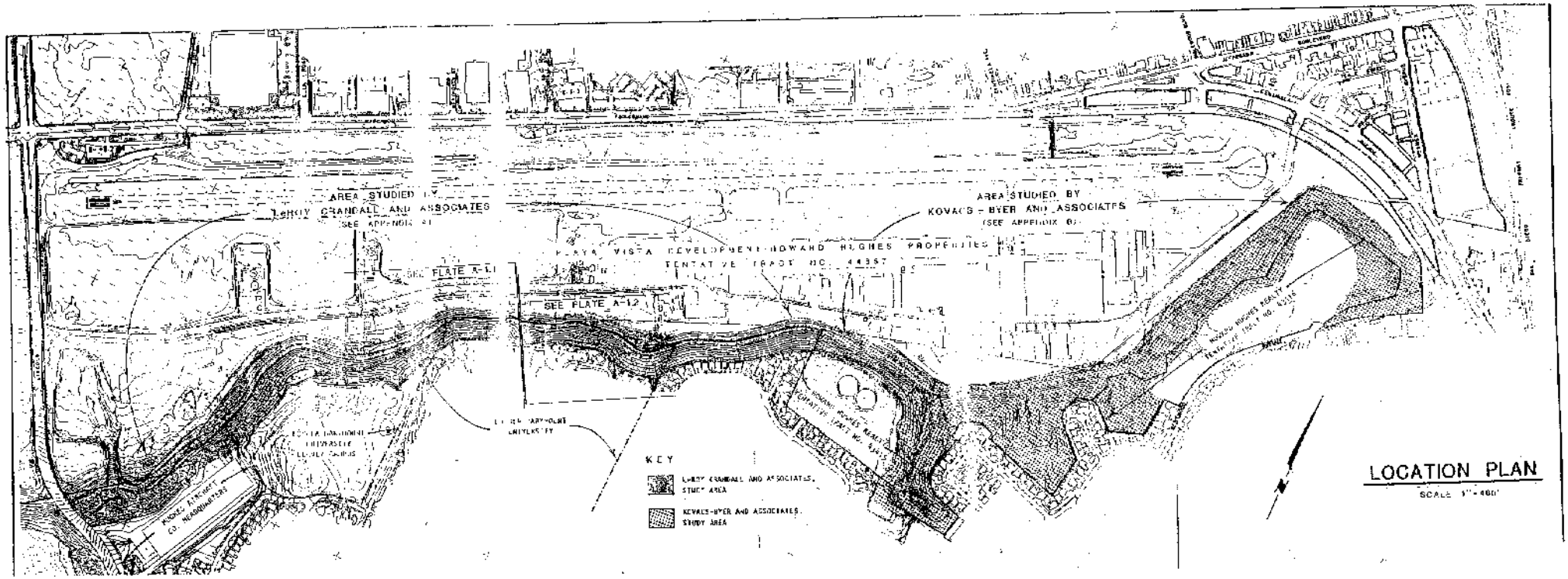
Area 4 includes a portion of the bluff above Cabora Road between Tracts 43415 and 43416. This area extends from the canyon between the tracts east to Tract 43416. A debris basin should be constructed at the mouth of the canyon to prevent debris generated within the canyon from crossing Cabora Road. In addition, the oversteepened portion of the slope between the canyon and Tract 43416 should be trimmed of all slump debris and surface drainage above the oversteepened portion should be intercepted by constructing a sidehill drain near the top of the cut slope.

Although the factor of safety of this slope within Area 4 is slightly lower than the minimum normally acceptable, if the recommendations are implemented, it is our opinion that the slope will not present a hazard to the developments at either the top or the toe of the slope.

BUILDING SETBACK/DEBRIS WALL

Because of the possibility of soil debris accumulating at the toe of the slope, we recommend that building setbacks as provided for in the City of Los Angeles Code be established from the toe of the slope. Debris walls near the toe of the slope could be used in place of or to reduce building setbacks. Debris walls should be capable of retaining at least four feet of material behind the wall. Access should be provided behind the wall for the removal of any accumulated soil debris.

Walls should be designed to resist an active pressure equal to that developed by a fluid with a density of 35 pounds per cubic foot. Weep holes should be provided within the wall to prevent the development of damaging hydrostatic pressures behind the wall.



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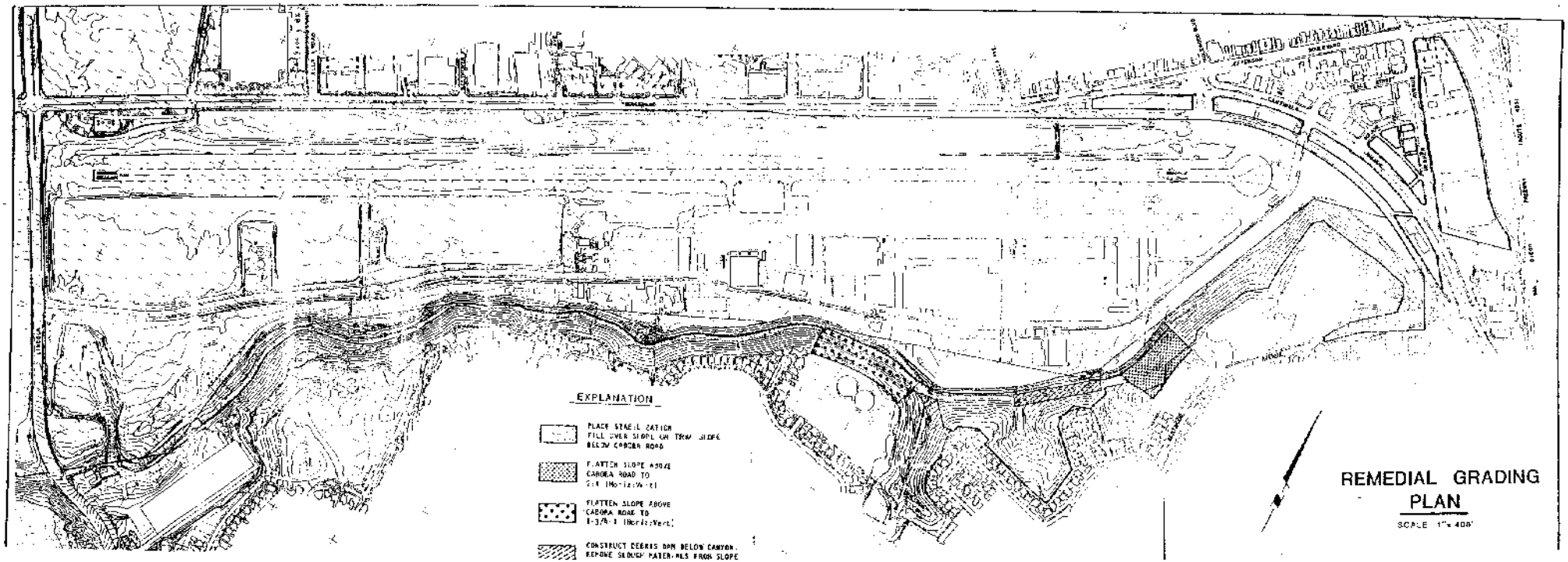

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October 16, 1987

Howard Hughes Properties
13250 Jefferson Boulevard
Los Angeles, California 90094

(Job No. AE-86125-I)

Attention: Mr. P. C. Swan
Project Manager

Gentlemen:

Appendix A
Bluff Stability Investigation
Playa Vista Project
Tentative Tract No. 44857
South of Jefferson Boulevard
Between Lincoln Boulevard and
Centinela Avenue
Los Angeles, California

This Appendix describes the soil and geologic conditions and the explorations, testing, and analyses performed during our investigation of the stability of a portion of the bluff adjacent to the Playa Vista Project.

Respectfully submitted,

LeROY CRANDALL AND ASSOCIATES

REGISTERED PROFESSIONAL ENGINEER
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Senior Engineer/Vice President

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APPENDIX A

INTRODUCTION

This Appendix A contains the results of the LCA investigation of the stability of a portion of the bluff adjacent to the Playa Vista Project. Appendix A is concerned with the approximate western 5,000 feet of the bluff. Appendix B of this report addresses the approximate eastern 5,000 feet of the bluff investigated by Kovacs-Byer & Associates.

Our investigation was authorized to determine the static physical characteristics of the soils within the bluff to enable a determination of the bluff stability. The investigation was to include geologic mapping of the surface of the bluff between Lincoln Boulevard and the Howard Hughes Realty property to identify the general characteristics and distribution of the geologic units and to locate areas of water seepage, erosion, slumps, and other indications of potential instability. We were also to explore the soil conditions by drilling exploration borings and determine the strength of the materials by performing laboratory tests upon the undisturbed samples. Because the upper portion of the slope is not part of the Playa Vista Development property, the borings were drilled from Cabora Road, parallel to and some 40 feet above the toe of the bluff.

PRIOR INVESTIGATIONS

We have performed several investigations on the adjacent properties at the top of the western portion of the bluff. Reports covering these prior investigations are as follows:

> Report of Preliminary Geotechnical Investigation, Proposed University Expansion, Fordham Road and 78th Street, Los Angeles, California, for the Loyola-Marymount University, dated October 27, 1982 (our Job No. AE-82255).
>
> Report of Preliminary Foundation Investigation, Proposed Corporate Headquarters, Lincoln Boulevard South of Jefferson Boulevard, Los Angeles, California, for the Hughes Aircraft Company, dated February 9, 1983 (our Job No. A-82139-B).
>
> Report of Geotechnical Investigation, Proposed Corporate Headquarters, Lincoln Boulevard South of Jefferson Boulevard, Los Angeles, California, for the Hughes Aircraft Company, dated April 19, 1983 (our Job No. ADE-83049).

GEOLOGIC MAPPING

A detailed geologic map was prepared of the bluff surface between Lincoln Boulevard and the Howard Hughes Realty property. The geologic mapping was performed to ascertain the general characteristics and distribution of geologic units, and to locate areas of erosion, slumps and other indications of potential instability. The mapping included observing areas of water seepage or evidence of water seepage, such as the presence of water-loving vegetation. The results of the geologic mapping are presented on Plates A-1.1 and A-1.2, Geologic Map.

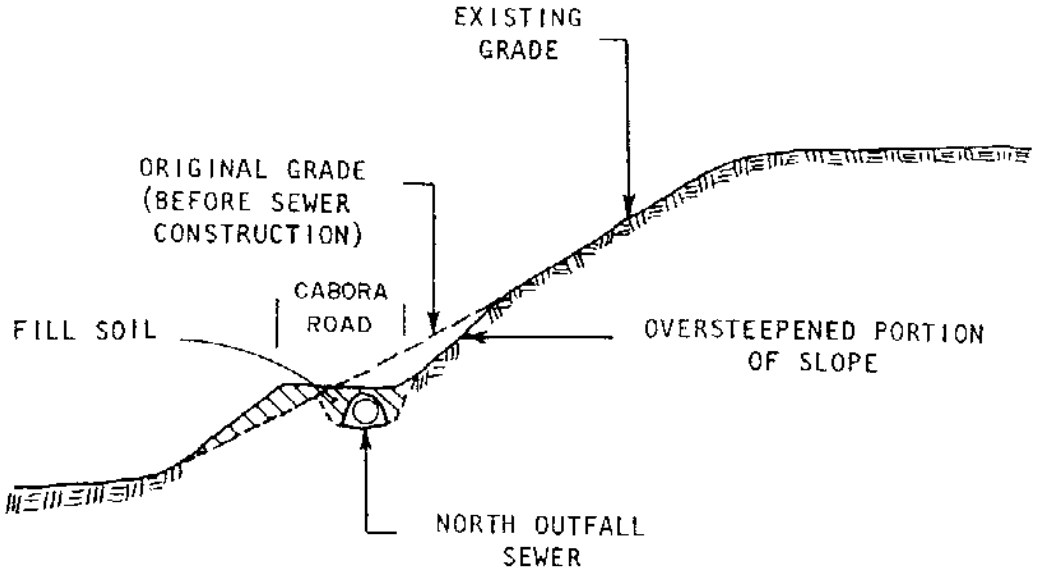
SITE CONDITIONS

PHYSIOGRAPHY

The bluff between Lincoln Boulevard and Centinela Avenue forms the approximate southern boundary of the Playa Vista Development over a length of about 10,000 feet. Our firm investigated the western 5,000 feet of the bluff. Within this portion, the bluff varies from approximately 120 to 140 feet in height; the average slope of the face of the bluff varies from 1-3/4:1 (horizontal to vertical) to 2-1/2:1.

NORTH OUTFALL SEWER

The existing City of Los Angeles, North Outfall Sewer is located within the lower portion of the bluff. The sewer construction and maintenance road, known as Cabora Road, is located over the sewer some 35 to 45 feet above the toe of the bluff. Based upon drawings furnished us, the sewer was constructed in 1925 and is semi-elliptical in shape, 10½-feet high, and is constructed of cast-in-place concrete with a vitrified clay block lining. The sewer was designed to be bedded entirely within natural materials. Within the section of the bluff covered by this investigation, the sewer was constructed in an open excavation that was subsequently backfilled. The exact location of the sewer within Cabora Road has not been defined on the survey drawings provided us, but its general location can be established by the locations of manholes within the road. The location of the sewer on the bluff is shown in the following generalized sketch. The approximate original grade is also shown on the sketch.



Although the sewer trench was subsequently backfilled, the roadway was preserved and the oversteepened cut portion of the slope remained. The present height of the oversteepened portion of the slope, which is most evident east of Boring 3, varies from about 25 feet to 40 feet. The slope of this oversteepened portion varies from about 1:1 to 1-1/4:1 (horizontal to vertical).

ADJACENT PROPERTY

The south property line for the Playa Vista Development within the limits of this study is located approximately along Cabora Road. The adjacent property at the top of the bluff is occupied (from west to east) by the Hughes Aircraft Headquarters Facility, Loyola Marymount University, and residential development. The locations of these adjacent areas are identified on Plate 1.

The Hughes Aircraft Headquarters Facility was constructed within the upper portion of the bluff, significantly reducing the total slope height in this area. The remnants of a secondary access road from Cabora Road to a former building is present on the slope below the planned Leavey Campus of Loyola-Marymount University. This secondary road has been breached by erosion.

VEGETATION

The existing vegetation adjacent to and below the Hughes Aircraft Headquarters Building and the Loyola-Marymount Leavey Campus is generally sparse consisting of scattered grasses and weeds with some light brush. A relatively heavy growth of vegetation was observed immediately above Cabora Road south of the Leavey Campus. A portion of the slope above Cabora Road and immediately below the primary Loyola-Marymount Campus and the residential development to the east of the Campus has been planted in ice plant. There are significant bare portions of the slope principally below Cabora Road and on the easternmost portion of the bluff.

EXPLORATIONS

The bluff materials were investigated by drilling seven exploration borings to depths of 19 to 60 feet. The locations of the borings are shown on on Plates A-1.1 and A-1.2. The locations of borings from our nearby projects on the adjacent properties at the top of the bluff are also shown.

During the drilling of Boring 5, a portion of the sewer liner was encountered at a depth of approximately 19 feet. Boring 5 was subsequently abandoned and Boring 5A was drilled approximately 280 feet to the west of Boring 5. All of the borings were drilled utilizing bucket-type drilling equipment. Caving of the boring walls occurred and Borings 1 through 4 were terminated due to heavy caving when water was encountered at about Elevation +2.

The soils encountered were logged by our field technician, and undisturbed and loose samples were obtained for laboratory inspection and testing. The logs of the borings are presented on Plates A-2.1 through A-2.7; the depths at which undisturbed samples were obtained are indicated to the left of the boring logs. The energy required to drive the sampler twelve inches is indicated on the logs. The soils are classified in accordance with the Unified Soil Classification System described on Plate A-3.

LABORATORY TESTS

The field moisture content and dry density of the soils encountered were determined by performing tests on the undisturbed samples. The results of the tests are shown to the left of the boring logs.

Direct shear tests were performed to determine the strength of the soils. The tests were performed on undisturbed samples and on remolded samples compacted to 90% of the maximum density obtainable by the ASTM Designation D1557-70 method of compaction. These samples were tested at field or optimum moisture content and at increased moisture

content after soaking for at least 24 hours. Each sample was tested at two different surcharge pressures. The shear values determined from the direct shear tests are presented on Plates A-4.1 through A-4.3, Direct Shear Test Data. In addition to testing the samples obtained during this investigation, direct shear test results were availabe from our prior investigations on the adjacent properties at the top of the bluff. The results of the prior shear tests on samples from nearby prior borings are presented on Plate A-4.4.

To assist in classification of the soils, the percent passing the No. 200 Sieve was determined on 22 samples. The tests were performed in accordance with the ASTM Designation D1140-54 test method. The results of those determinations are presented on Plate A-5, Sieve Data.

The optimum moisture content and maximum dry density of the existing fill soils were determined by performing compaction tests on two samples. The tests were performed in accordance with the ASTM Designation D1557-70 method of compaction. The results of the tests are presented on Plate A-6, Compaction Test Data.

GEOLOGY

GENERAL

The Ballona Bluff, also known as the Ballona Escarpment, is an erosional feature formed by downcutting of the ancestral Los Angeles River, which has since been redirected to the south. The bluff is composed principally of late Pleistocene age dune sand which has been

generally interpreted as ancient offshore bars modified by wind and stream action since their emergence from the ocean (Poland et al., 1959). According to Poland et al., these deposits were probably formed during a high level of the seas immediately before the latest Pleistocene withdrawal which instituted the cutting of the present escarpment. The dune sand is underlain by marine and continental deposits of the late Pleistocene age Lakewood Formation (Department of Water Resources, 1961).

The geologic materials exposed in the bluff and mapped during this investigation are identified on Plates A-1.1 and A-1.2. Other features mapped during the investigation, such as slumps, bedding attitudes, and a spring are also shown.

GEOLOGIC MATERIALS

General

Sections at each of the boring locations have been prepared and are presented on Plates A-7.1 through A-7.7, Geologic Section. The geologic conditions observed in this investigation and the topography of the existing bluff are shown on the sections.

Fill Soils

Up to 20 feet of fill was encountered in our exploration borings adjacent to the North Outfall Sewer. The fill consists primarily of silty sand and sandy silt and is backfill placed over the sewer, which was constructed in an open excavation in this area.

Additional fill deposits overlie the lower portions of the slope. These fill deposits are a result of prior sewer construction and maintenance of Cabora Road, where soil debris has accumulated on the road and has been cast over the side of the road, and construction of the Hughes Aircraft headquarters building.

Only minor deposits of fill (less than one foot thick) were observed on the adjacent properties at the top of the bluff.

Alluvium

The flood plain adjacent to the base of the bluff is underlain by approximately 100 feet of recent alluvium deposited by the ancestral Los Angeles River. The upper 20 to 30 feet of alluvium is composed primarily of soft silty clay and clay with layers of silt and sand. Underlying the soft surficial deposits is another 20 to 30 foot thickness of firmer silt and clay sediments. The lowermost 30 to 50 feet of sediments are composed of sand and gravel, and are described by Poland et al. (1959) as the "50-foot gravel", a ground water aquifer.

The alluvium was not encountered in our exploration borings, which were drilled in the bluff above the flood plain.

Dune Sand

The bluff above Cabora Road is capped by a variable thickness of late Pleistocene dune sands. These sands are well sorted and clean. Bedding structure within the dune sand is generally poorly developed or absent. Cross-bedding, however, is common.

Lakewood Formation

Underlying the dune sands is the Lakewood Formation, which is described by Poland et al. (1959) as consisting of sand and gravel with some silty layers. The sediments are only slightly cemented and are high erodible. The Lakewood Formation in the bluff area is similar to the overlying Pleistocene sands and the contact has not been identified on either the geologic map or the boring logs. The Lakewood Formation unconformably overlies the early Pleistocene age San Pedro Formation at depth.

GROUND WATER OCCURRENCE

Ground Water

Water was measured in five of our borings at depths of 50 to 55 feet, corresponding to an elevation of one to three feet above mean sea level (Elevation +1 to +3). This water level is at least 15 feet below the toe of the bluff and is consistent with water levels observed elsewhere within the Playa Vista development. As a result, ground water will not adversely impact the bluff stability.

Springs

Surface waters percolating through the dune sand occasionally resurface as springs in the bluff face, and may contribute to slope erosion. One spring was observed crossing Cabora Road approximately 260 feet west of Boring 2 (see Plate A-1.1, Geologic Map). Accelerated erosion does not appear to have resulted from the spring flow, although water-loving vegetation associated with the spring may mask or discourage erosion.

SLOPE STABILITY

GENERAL

The geologic mapping of the bluff did not reveal the presence of any deep-seated rotational or translational landslide failures. There was no indication of failure of the slopes below Cabora Road. Shallow slumps were observed to occur in a secondary road cut made above Cabora Road. Deeply incised erosion gullies were found in areas where surface water runoff has been allowed to flow over the edge of the bluff.

SLUMPING AND SLOPE RETREAT

The bluff within the study area varies in height from approximately 120 to 140 feet. The upper portions of the slope are generally inclined from 1-1/2:1 to 2:1 (horizontal to vertical). The slope below Cabora Road has inclinations varying from 1-3/4:1 to 3:1. Localized erosion gullies are steeper.

The naturally weathered slopes do not contain any indications of deep-seated instability and the layering within the sedimentary materials was observed to dip in a favorable direction into the slope. The bluff appears to have reached an essentially stable slope configuration prior to the construction of the sewer outfall. Cabora Road and the secondary access road were cut into the slightly cemented sands at inclinations of 1/2:1 to 1:1 (horizontal to vertical). The oversteepened portions of the slopes have subsequently retreated by a combination of shallow slumping (mass wasting). The cut slopes are likely to continue slumping until a stable configuration is reestablished, probably when the slopes

reach an inclination of 1-1/2:1 to 2:1. Many of the old road cuts appear to have already stabilized at inclinations of approximately 1-1/2:1.

SLOPE EROSION

Steeply incised erosion gullies have formed where surface water runoff has drained over the edge of the bluff. An example of this process has formed immediately to the north of the central depression in the Loyola-Marymount University proposed Leavey Campus site. Mass wasting occurred as rainwater accumulated in a depression at the top of the bluff and drained over the edge. The runoff resulted in an erosion gully by direct scouring, and by secondary slumping of adjacent sediments into the widening chasm. A small access road on the bluff slope was completely breeched, and a 100-foot section of steel pipe was placed to carry surface water across the chasm. Secondary slumping into the gully is still continuing. The runoff from the top of the slope at this location has been directed westerly by placement of an earth berm and excavation of a diversion channel.

STABILITY ANALYSES

Shear Strength

Direct shear tests were performed to determine the shear strength of the bluff materials. The tests were performed on undisturbed samples of the fill and natural soils and on remolded samples of the on-site soils compacted to 90%. The shear tests are described in a previous section Laboratory Tests; the test results are presented on Plates A-4.1 through A-4.4.

Based upon the direct shear tests, the following shear strength parameters were used in our analyses:

Gross Stability

Natural Soil:	Cohesion = 250 pounds per square foot Angle of Internal Friction = 33 degrees
Existing Fill Soil:	Cohesion = 100 pounds per square foot Angle of Internal Friction = 32 degrees
Compacted Fill Soil:	Cohesion = 300 pounds per square foot Angle of Internal Friction = 33 degrees

Surficial Stability

Natural Soil:	Cohesion = 200 pounds per square foot Angle of Internal Friction = 30 degrees
Existing Fill Soil:	Cohesion = 100 pounds per square foot Angle of Internal Friction = 30 degrees
Compacted Fill Soil:	Cohesion = 300 pounds per square foot Angle of Internal Friction = 33 degrees

The shear strength determinations are based on samples tested both at field and optimum moisture contents and on samples that were soaked prior to testing. The shear strengths used in our gross stability analyses are based upon a low average of the weaker tests. However, the strengths used in the surficial analyses are based upon the weakest of the wet samples tested. The weakest strengths are more appropriate to a surficial analysis than to a gross stability analysis.

It should be noted that some cohesion is used in all of the analyses. The cohesion is justified by the shear tests and is obvious when observing the materials in place in the bluff. In fact, recent

trenching within the easterly portion of the bluff by Kovacs-Byer and Associates for a fault study, showed that the materials will stand vertically for heights of more than ten feet for extended periods of time. Cohesion is clearly present in the materials at field moisture content and we believe that cohesion is also present when these materials become wet. (The cohesion value used in the analyses is deliberately relatively low.) The cohesion is a result of intergranular cementation between the soil particles by the mineral content and by the amount of fines in the soils (see Plate A-5).

Gross Stability

Analyses were performed for various sections along the slope as presented on Plates A-7.1 through A-7.7. The most critical conditions occur along Section 4 where the slope is about 125 feet in height and the average inclination of the slope is about 1.8:1 (horizontal to vertical). The results of the gross stability analysis are presented on Plate A-8.1, Stability Analyses (Gross Stability).

As shown, the most critical potential failure circle is through the toe of the slope above Cabora Road where the slope was oversteepened by the sewer construction. For this case, the slope has a static factor of safety of 1.4 and a factor of safety of 1.1 when subjected to a 0.15g lateral seismic force. The slope has a factor of safety of 1.5 for a potential failure through the toe of the bluff at its full height.

These analyses are consistent with the observed performance of the slope, where the prior sewer excavation resulted in an oversteepened slope above Cabora Road.

Surficial Stability

The surficial stability analyses are presented on Plate A-8.2. The analyses were performed to determine the steepest slope possible to achieve a factor of safety of 1.5 against surficial failure. The allowable slope inclinations for this condition are as follows:

Natural Slopes: 1-1/4:1

Existing Fill Slopes: 2-1/2:1

Compacted Fill Slopes: 1-1/4:1

The analyses actually gave a factor of safety of 2.0 for a 1-1/4:1 compacted fill slope, but we do not believe that steeper compacted fill slopes would be appropriate.

CONCLUSIONS

GENERAL

Our analyses indicate that the bluff is grossly stable (not potentially subject to deep seated sliding). However, the portion of the bluff above the sewer was oversteepened by the sewer construction, and this portion of the bluff above Cabora Road does not have as high a factor of safety as would normally be considered acceptable. The natural soils on the bluff are also stable against surficial failure, where the natural slopes are at an inclination of 1-1/4:1 or flatter. The oversteepened portion of the bluff above Cabora Road is presently between 1:1 and 1-1/4:1. Although the slope below Cabora Road has performed relatively well, the fill soils below Cabora Road are susceptible to surficial failure upon saturation where the slopes are steeper than about 2-1/2:1.

Drainage of surface waters over the top of the bluff and the presence of the spring above Cabora Road have resulted in localized erosion of the slope.

Flattening of the slopes above Cabora Road, or placing a stabilization fill over the face of the slopes, would be required to achieve a greater factor of safety of the bluff. However, the portion of the slope above Cabora Road is on the adjacent property and remedial grading would not be possible. Furthermore, the placing of a stabilization fill would place additional load on the North Outfall Sewer and we understand that the City is concerned about the structural capability of the sewer to carry additional load.

The sewer was constructed in 1925 and the slope above the sewer has been in its present condition for over 60 years. The only problem resulting from the mass wasting of the slopes is the accumulation of debris on Cabora Road, which is periodically cleaned. In our opinion, if the maintenance of the road is continued in the current manner, the performance of the portion of the bluff above Cabora Road is acceptable and does not present a hazard to the development at the toe of the bluff. Eventually, the oversteepened portion would stabilize at an inclination of about 1-1/2:1. Any development at the top of the bluff extending above a 1-1/2:1 plane upward from Cabora Road, could be endangered. However, the average slope above Cabora Road is generally flatter than 1-1/2:1.

The portion of the slope below Cabora Road is locally mantled by fill soils which are potentially unstable. We recommend that either these fill soils be trimmed to a less steep inclination, or if sufficient space is not available for flattening the slope without impacting the sewer or Cabora Road, the fill could be stabilized by placing a stabilization fill. Part or all of the fill could be removed prior to placing the stabilization fill.

If the above recommendations are followed, we believe that the presence of the bluff will not adversely affect the Playa Vista development along the toe of the slope. However, we would recommend that a nominal building setback be provided at the toe of the slope.

SLOPE STABILIZATION

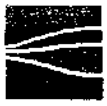
The lower portion of the bluff, below Cabora Road, could either be flattened to an inclination of 2-1/2:1 (horizontal to vertical) or a stabilization fill could be placed over the face of the slope. If the stabilization fill is used, it should be constructed to a horizontal width of at least eight feet.

The stabilization fill should be properly benched into the underlying materials. The existing fill would not have to be excavated as part of the benching. All required fill should be placed in loose lifts not exceeding eight inches in thickness and compacted to at least 90%. The on-site soils may be used in the required fill; the materials should be brought to within 2% of optimum moisture content prior to compacting.

The face of the completed stabilization fill may be constructed at 2:1 (horizontal to vertical). We recommend that the slope be over-filled and trimmed back to achieve a firm surface. The drainage, benching, and terrace requirements of the City of Los Angeles Building Code should be followed for the required stabilization fill.

BUILDING SETBACK/DEBRIS WALL

Because of the possibility of soil debris accumulating at the toe of the slope, we recommend that a building setback conforming to the City of Los Angeles Code be established from the toe of the slope. Debris walls near the toe of slope could be used in place of or to reduce building setbacks. Debris walls should be capable of retaining at least four feet of material behind the wall. Access should be provided behind the wall for the removal of any accumulated soil debris. The wall should be designed to resist an active pressure equal to that developed by a fluid with a density of 35 pounds per cubic foot. Weep holes should be provided within the wall to prevent the development of hydrostatic pressures behind the wall.



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Poland, J. F., Garrett, A. A., and Sinnott, A., 19059, Geology, Hydrology, and Chemical Character of Ground Waters in the Torrance - Santa Monica Area, California: U.S. Geological Survey Water Supply Paper 1461, 524 p.

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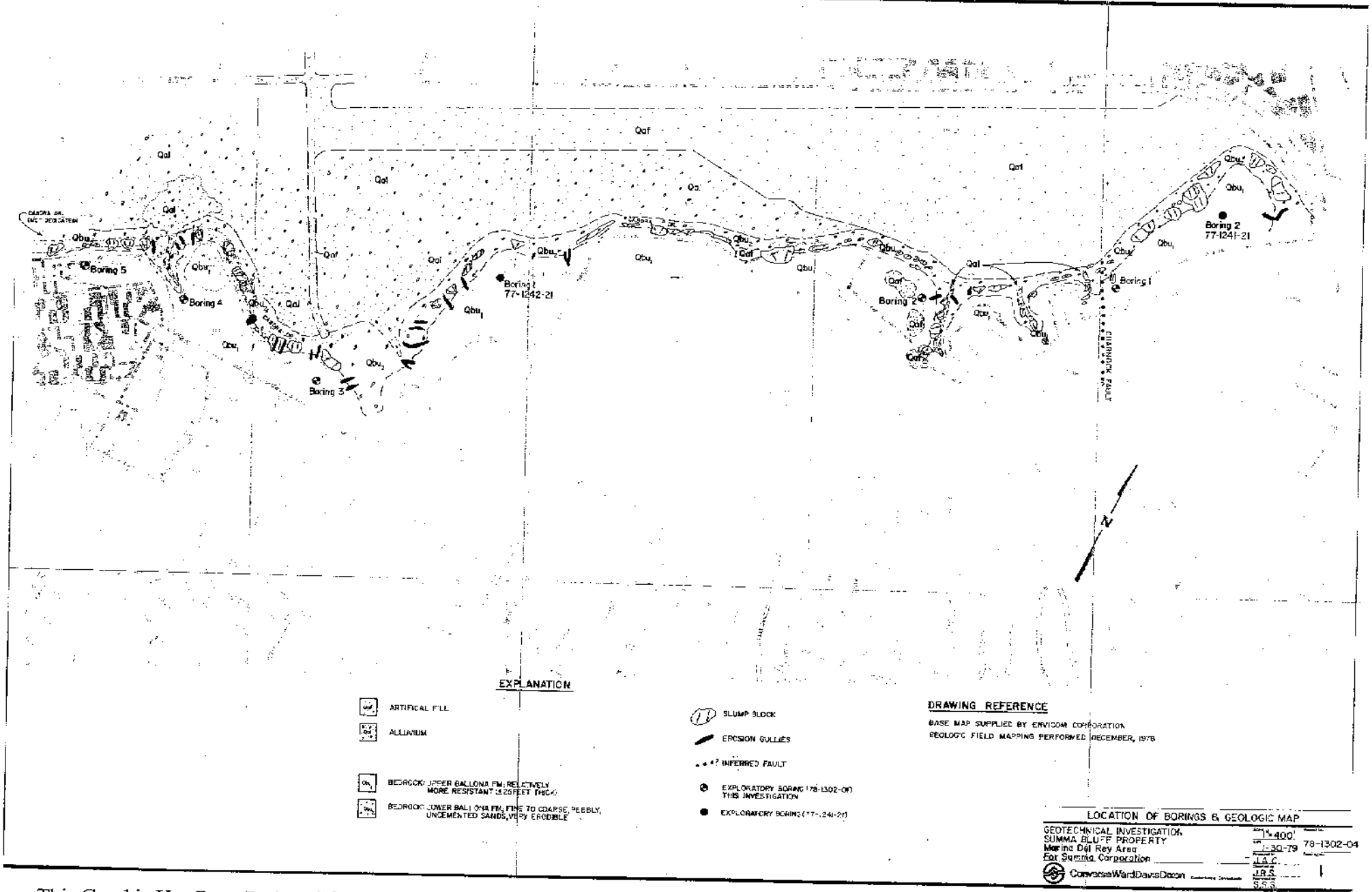

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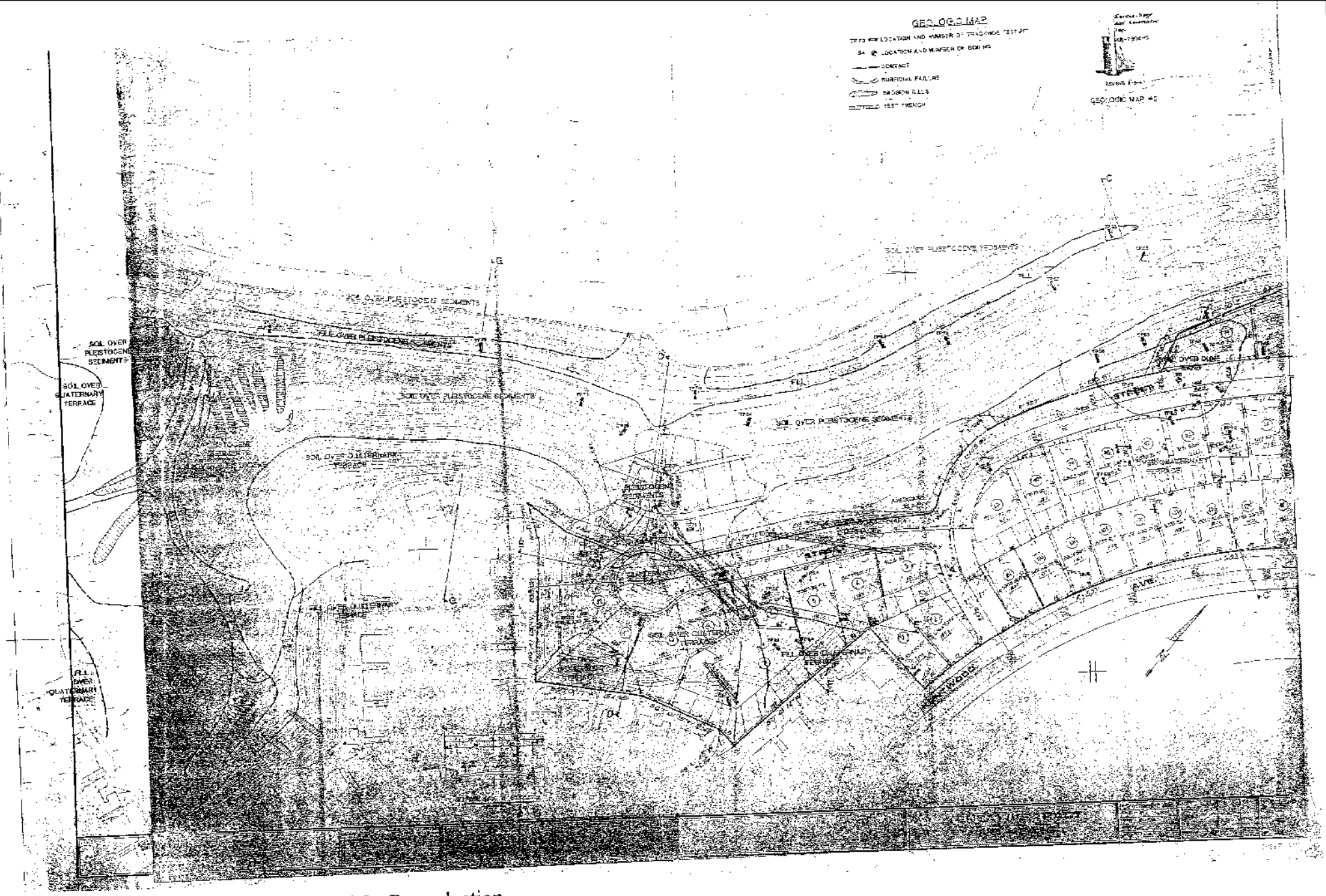

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JOB AE-86125-I DATE 7/17/87 F.T. LS DR. dmh O.E. AS W.P. dmh CHKD Cw

Note : The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

BORING 1

DATE DRILLED: June 25, 1987
EQUIPMENT USED: 24"-Diameter Bucket

ELEVATION 53.1 *

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.		
50	0	4.0	104	2		SM	FILL - SILTY SAND - fine, light brown
		3.2	116	8		SM	SILTY SAND - fine, brown
	5	1.0	101	2			Light brown
45							
	10	1.8	104	5			
40						SC	CLAYEY SAND - fine, brown
	15	5.6	111	3		SP SM	SAND - fine, some Silt, light brown
35							
	20	3.4	97	2			
30							Some Clay
	25	3.0	95	5			
25						SC	CLAYEY SAND - fine, brown
	30	4.7	105	6			
20							
	35	6.8	115	6			
15							
	40	35.5	87	3		CL	SILTY CLAY - lenses of Sand, grey and brown

FILL SOIL

PLEISTOCENE SEDIMENTS

* Elevations provided by Psomas and Associates.

(CONTINUED ON FOLLOWING PLATE)

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A - 2.1a

JOB AE-86125-1 DATE 7/17/87 F.T. LS DR. dmh O.E. AS W.P. dmh CHKD LW

BORING 1 (Continued)

DATE DRILLED: June 25, 1987
EQUIPMENT USED: 24"-Diameter Bucket

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.
10	45	2.7	112	13	
5	50	13.6	121	20	
0	55				

SP SAND - fine to medium, light brown

PLEISTOCENE SEDIMENTS

(BORING TERMINATED DUE TO CAVING)

NOTE: Water level measured at a depth of 51' at completion of drilling and at 50' 5 minutes later. Heavy caving below 51'.

Note : The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A - 2.1b

BORING 2

DATE DRILLED: June 25, 1987
EQUIPMENT USED: 24"-Diameter Bucket

ELEVATION 53.4

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.		
50	0	3.5	102	2		ML SM	FILL - SANDY SILT and SILTY SAND - fine, light brown
		4.9	107	2		SC	FILL - CLAYEY SAND - fine, pieces of concrete, brown
45	5	2.2	100	< 1		SM	FILL - SILTY SAND - fine, brown
40	10	2.9	100	2			
35	15	4.3	98	2			
30	20	13.3	106	5		SP SM	Piece of concrete SAND - fine, some Silt, light brown
25	25	6.0	110	2			
20	30	6.9	100	4		SM	SILTY SAND - fine, some Silt, light brown
15	35	13.7	115	3			Few layers of Gravel
	40	11.2	103	3			

FILL SOIL

PLEISTOCENE SEDIMENTS

Note : The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

JOB AE-86125-I DATE 7/17/87 F.T. LS DR. dmh O.E. AS W.P. dmh CHKD DW

(CONTINUED ON FOLLOWING PLATE)

LOG OF BORING

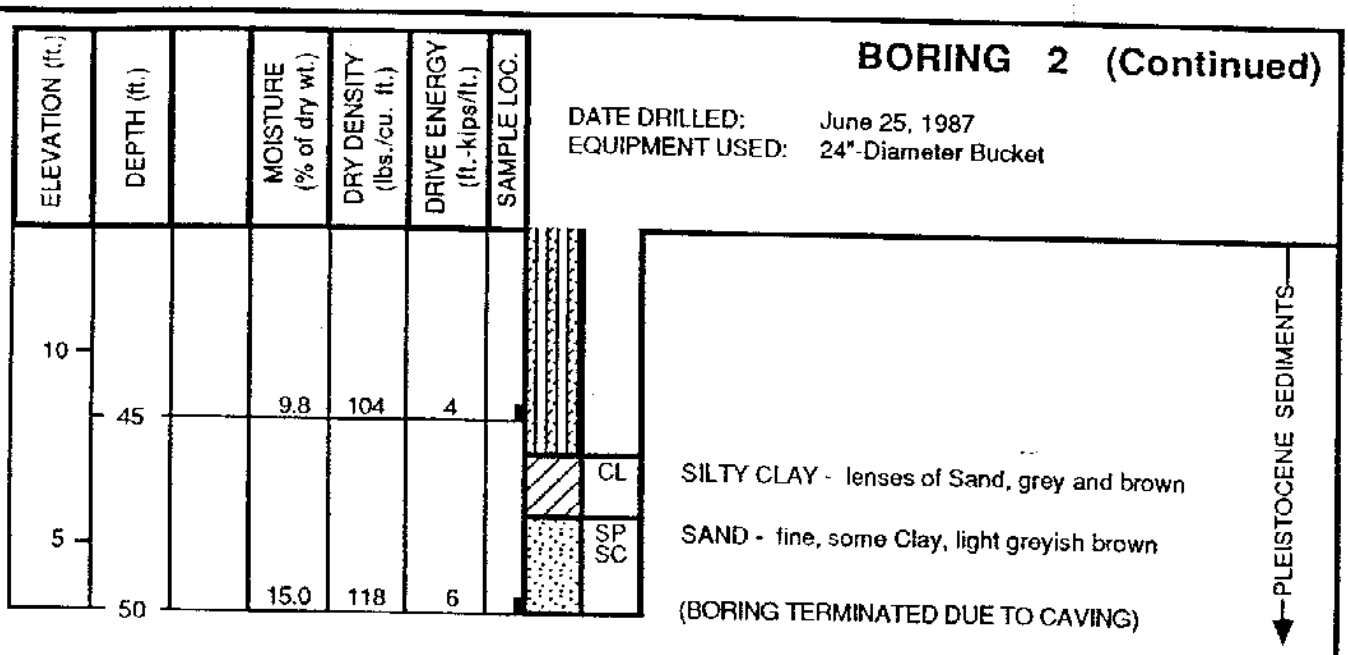
LeROY CRANDALL AND ASSOCIATES

PLATE A - 2.2a

JOB AE-86125-I DATE 7/17/87 F.T. LS DR. dmh O.E. AS W.P. dmh CHKD

BORING 2 (Continued)

DATE DRILLED: June 25, 1987
EQUIPMENT USED: 24"-Diameter Bucket



NOTE: Water not encountered. Caving from 19' to 50' (to 3' in diameter).

Note : The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A - 2.2b

BORING 3

DATE DRILLED: June 26, 1987
EQUIPMENT USED: 24"-Diameter Bucket

ELEVATION 53.9

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.		
50	5	6.4	111	2		ML SM	FILL - SANDY SILT and SILTY SAND - fine, some Clay, light brown
		5.5	109	2			Light greyish brown
45	10	11.5	94	2			Light brownish grey
40	15	3.7	106	2		SM	SILTY SAND - fine, brown
35	20	21.2	101	2		ML	SANDY SILT - layers of Clay, light grey
30	25	31.1	90	<1			Layer of Clay, grey
25	30	16.6	104	4			Layer of Silty Sand
20	35	33.3	89	2		CL	SILTY CLAY - layers of Sandy Silt, grey
15	40	39.2	85	9			

FILL SOIL

PLEISTOCENE SEDIMENTS

(CONTINUED ON FOLLOWING PLATE)

Note : The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

JOB AE-86125-1 DATE 7/17/87 F.T. LS DR. dmh O.E. AS W.P. dmh CHKD

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A - 2.3a

JOB AE-86125-1 DATE 7/17/87 F.T. LS DR. dmh O.E. AS W.P. dmh CHKD pw

BORING 3 (Continued)

DATE DRILLED: June 25, 1987
EQUIPMENT USED: 24"-Diameter Bucket

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.
10	45	6.5	106	13	
5	50	19.0	108	40	
0	55				

SP SAND - medium, light brown

Some Clay, light grey

(BORING TERMINATED DUE TO CAVING)

PLEISTOCENE SEDIMENTS

NOTE: Water level measured at a depth of 51-1/2' at completion of drilling and at 51' 5 minutes later. Heavy caving from 51' to 52'.

Note : The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A - 2.3b

BORING 4

DATE DRILLED: June 26, 1987
EQUIPMENT USED: 24"-Diameter Bucket

ELEVATION 56.4

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.		
55	0	4.9	109	3		SM ML	FILL - SILTY SAND and SANDY SILT - fine, some Clay, light brown
50	5	4.5	103	2			
45	10	16.7	103	2			
40	15	8.0	100	2			
35	20	12.9	102	5		SP SM	Large piece of concrete SAND - fine, some Silt, light brownish grey
30	25	11.9	122	8		SC	Layer of Silty Clay CLAYEY SAND - fine, brownish grey
25	30	5.1	109	8		SP SC	SAND - fine, some Clay, light brown
20	35	4.2	109	8		SP	SAND - medium, light brown
	40	4.6	111	12		SP SC	SAND - fine, some Clay, light brown

FILL SOIL

PLEISTOCENE SEDIMENTS

(CONTINUED ON FOLLOWING PLATE)

JOB AE-86125-1 DATE 7/17/87 F.T. LS DR. dmh O.E. AS W.P. dmh CHKD DW

Note : The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

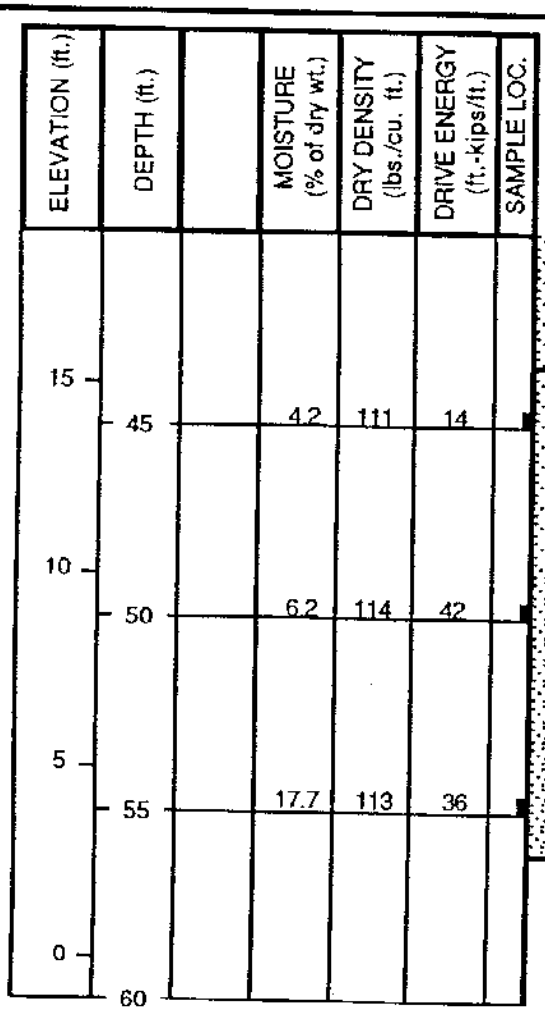
LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A - 2.4a

BORING 4 (Continued)

DATE DRILLED: June 26, 1987
EQUIPMENT USED: 24"-Diameter Bucket



SP SAND - fine, light brown

PLEISTOCENE SEDIMENTS

(BORING TERMINATED DUE TO CAVING)

NOTE: Water level measured at a depth of 55-1/2' at completion of drilling and at 55' 5 minutes later. Heavy caving below 53'.

Note : The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

JOB AE-86125-I DATE 7/17/87 F.T. LS DR. dmh O.E. AS W.P. dmh CHKD DW

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A - 2.4b

BORING 5-A

DATE DRILLED: June 27, 1987
EQUIPMENT USED: 20"-Diameter Bucket

ELEVATION 56.3

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.		
55		3.5	102	5		SM ML	FILL - SILTY SAND and SANDY SILT - fine, light brownish grey
	5						
50		1.6	105	2		SP SM	SAND - fine, some Silt, light brown
						SP	SAND - fine to medium, few Gravel, light brown
45	10	4.5	103	2			
						ML	SANDY SILT - some Clay, brown
40	15	27.3	97	3			
						SP SM	SAND - fine, some Silt, greyish brown
35	20	12.5	98	2		CL	SILTY CLAY - grey
	25	14.5	118	5		ML	SANDY SILT - some Clay, brown
30						SP	SAND - medium, light brown
25	30	3.7	103	2			
						CL	SILTY CLAY - light brownish grey
20	35	23.9	103	2		SC	CLAYEY SAND - fine to medium, grey
	40	5.9	108	5		SP SM	SAND - fine, some Silt, light brown

FILL
SOIL

PLEISTOCENE SEDIMENTS

Note : The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

JOB AE-86125-1 DATE 7/17/87 F.T. LS DR. dmh O.E. AS W.P. dmh CHKD

(CONTINUED ON FOLLOWING PLATE)

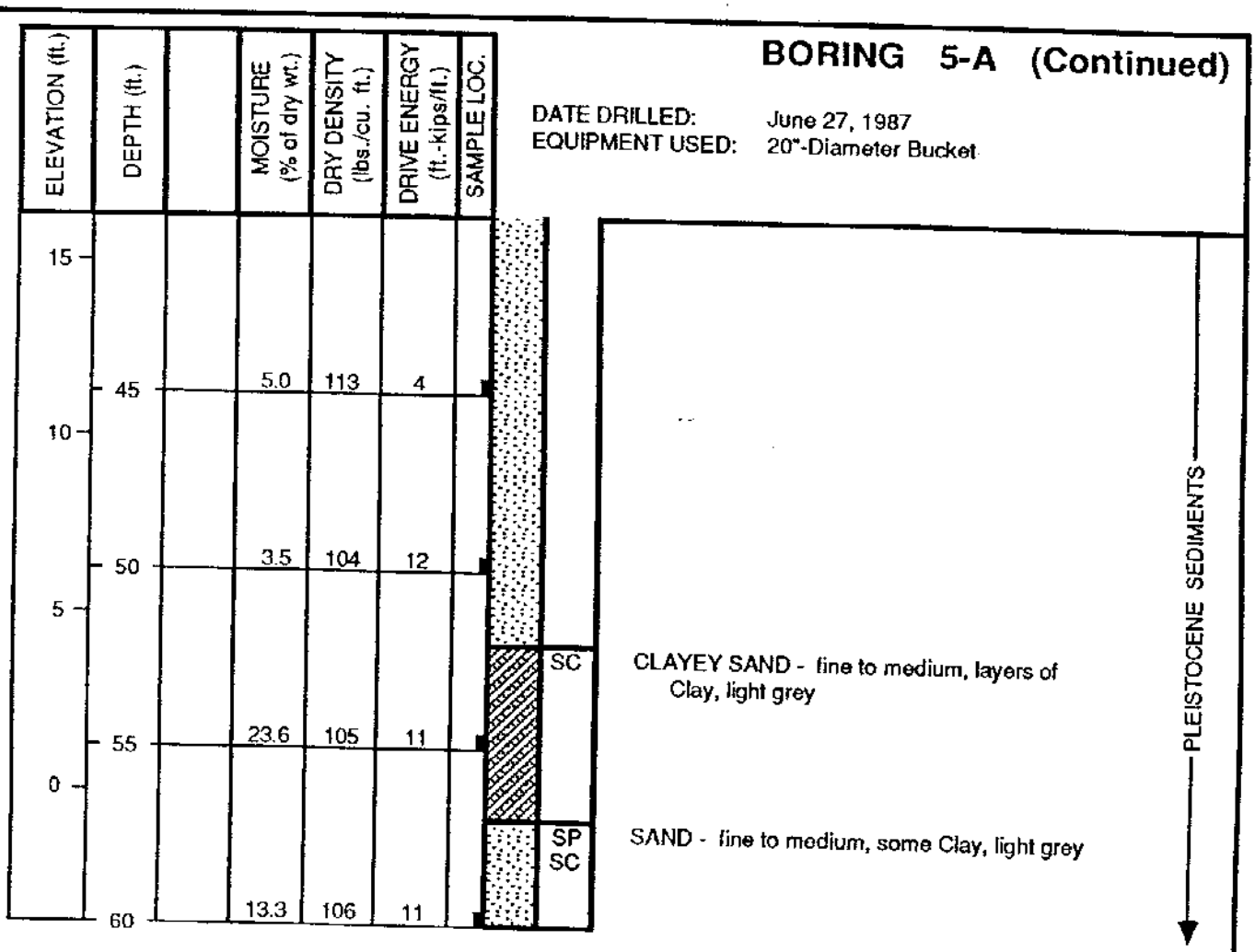
LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A - 2.5a

BORING 5-A (Continued)

DATE DRILLED: June 27, 1987
EQUIPMENT USED: 20"-Diameter Bucket



NOTE: Water measured at a depth of 56' at completion of drilling and at 55' 5 minutes later. Heavy caving below 57'.

Note : The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

JOB AE-86125-I DATE 7/17/87 F.T. LS DR. dmh O.E. AS W.P. dmh CHKD

LOG OF BORING

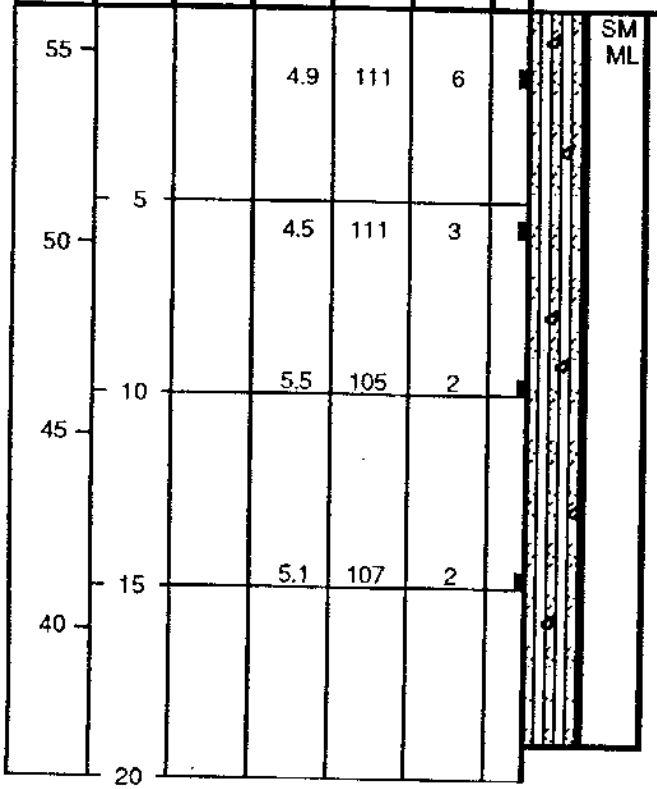
LeROY CRANDALL AND ASSOCIATES

PLATE A - 2.5b

BORING 5

DATE DRILLED: June 26, 1987
EQUIPMENT USED: 24"-Diameter Bucket

ELEVATION 56.1



FILL - SILTY SAND and SANDY SILT - fine, pieces of concrete, light grey and light brown

Light brown

(BORING TERMINATED DUE TO CONCRETE OBSTRUCTION)

FILL SOIL

NOTE: Water not encountered. No caving.

Note : The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

JOB AE-86125-1 DATE 7/17/87 F.T. LS DR. dmh O.E. AS W.P. dmh CHKD

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A-2.6

BORING 6

DATE DRILLED: June 27, 1987
EQUIPMENT USED: 24"-Diameter Bucket

ELEVATION 56.8

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.		
55		4.8	115	3		SM ML	FILL - SILTY SAND and SANDY SILT - fine, pieces of concrete, light brown and brown
50	5	4.7	102	< 1			
45	10	10.8	99	< 1			
40	15	11.6	101	< 1			
35	20	5.3	111	3			Pieces of concrete and wood Less Silt, light grey
						SP	SAND - fine to medium, light brown
30	25	8.7	105	5		SC	CLAYEY SAND - fine to medium, light brown
						CL	SILTY CLAY - brown and grey
25	30	12.1	125	4		SC	CLAYEY SAND - fine to medium, greyish brown
20	35	11.5	118	3			Light brown
	40	8.8	115	3			Fine to coarse

FILL SOIL

PLEISTOCENE SEDIMENTS

Note : The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

JOB AE-86125-I DATE 7/17/87 F.T. LS DR. dmh O.E. AS W.P. dmh CHKD

(CONTINUED ON FOLLOWING PLATE)

LOG OF BORING

LeROY CRANDALL AND ASSOCIATES

PLATE A - 2.7a

JOB AE-86125-I DATE 7/17/87 F.T. LS DR. dmh O.E. AS W.P. dmh CHKD

Note : The log of subsurface conditions shown hereon applies only at the specific boring location and at the date indicated. It is not warranted to be representative of subsurface conditions at other locations and times.

BORING 6 (Continued)

DATE DRILLED: June 27, 1987
EQUIPMENT USED: 24"-Diameter Bucket

ELEVATION (ft.)	DEPTH (ft.)	MOISTURE (% of dry wt.)	DRY DENSITY (lbs./cu. ft.)	DRIVE ENERGY (ft.-kips/ft.)	SAMPLE LOC.	
15	45	8.2	101	4		Fine to medium
10	50	4.6	110	10		
5	55	20.8	102	19		Reddish brown
0	60	14.2	108	19.		Light brown

PLEISTOCENE SEDIMENTS

NOTE: Water level measured at a depth of 56' at completion of drilling and at 55' 5 minutes later. Heavy caving below 57'.

LOG OF BORING

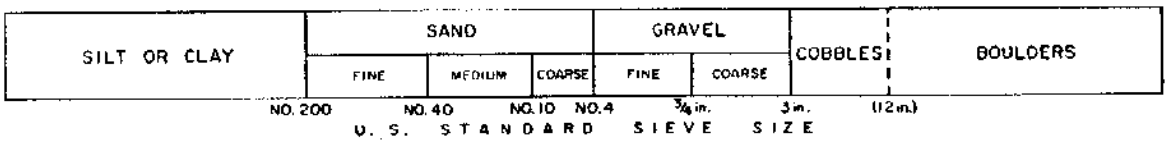
LeROY CRANDALL AND ASSOCIATES

PLATE A-2.7b

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of material is LARGER than No. 200 sieve size)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size)	CLEAN GRAVELS (Little or no fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amt. of fines)	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 sieve size)	CLEAN SANDS (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amt. of fines)	SM	Silty sands, sand-silt mixtures.
			SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS (More than 50% of material is SMALLER than No. 200 sieve size)	SILTS AND CLAYS (Liquid limit LESS than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS (Liquid limit GREATER than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

PARTICLE SIZE LIMITS



UNIFIED SOIL CLASSIFICATION SYSTEM

Reference:
The Unified Soil Classification System, Corps of Engineers, U. S. Army Technical Memorandum No. 3-357, Vol. 1, March, 1953. (Revised April, 1960)

LEROY CRANDALL & ASSOCIATES

JOB AE-86125-I DATE 8/6/87 W.P. lp O.E. AS CHKD

BORING NUMBER AND SAMPLE DEPTH	SOIL TYPE	% PASSING NO. 200 SIEVE
1 at 5'	SILTY SAND	14
1 at 19'	SAND (SP-SM)	7
2 at 5'	FILL - SILTY SAND	17
2 at 14'	FILL - SILTY SAND	13
2 at 29'	SAND (SP-SM)	7
2 at 39'	SILTY SAND	12
3 at 3'	FILL - SILTY SAND	12
3 at 9'	FILL - SANDY SILT	55
3 at 19'	SILTY SAND	42
4 at 14'	FILL - SILTY SAND	29
4 at 24'	CLAYEY SAND	44
4 at 34'	SAND	4
4 at 39'	SAND	10
5A at 5'	SAND (SP-SM)	6
5A at 9'	SAND	4
5A at 19'	SAND (SP--SM)	7
5A at 39'	SAND (SP-SM)	7
6 at 5'	FILL - SILTY SAND	17
6 at 14'	FILL - SILTY SAND	22
6 at 24'	CLAYEY SAND	12
6 at 29'	CLAYEY SAND	36
6 at 44'	CLAYEY SAND	16

Test Method: ASTM Designation D1140-54

SIEVE DATA

LeROY CRANDALL AND ASSOCIATES

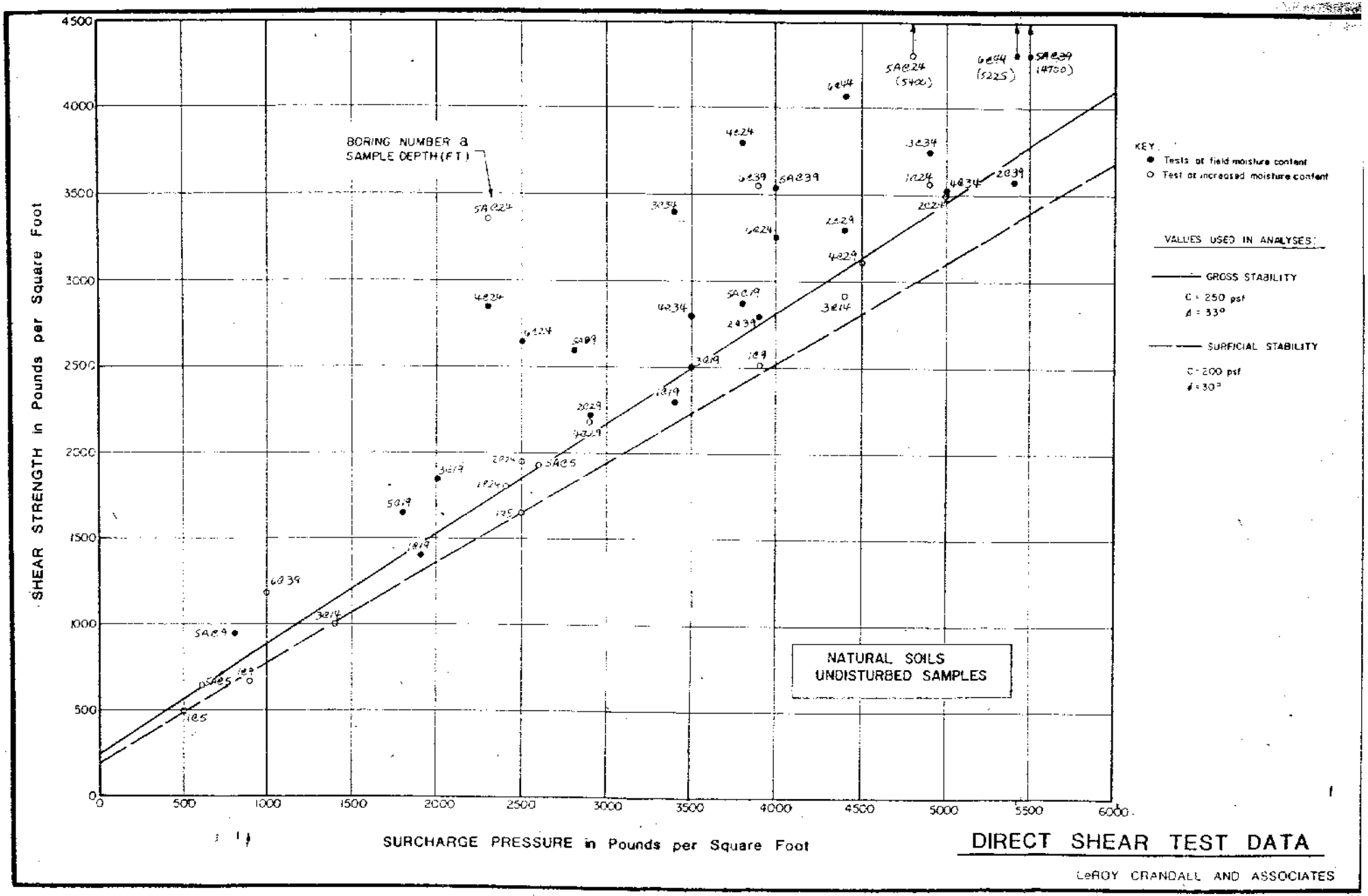
PLATE A-5

JOB AE-86125-I DATE 7/13/87 W.P. dmh O.E. AS CHKD

BORING NUMBER AND SAMPLE DEPTH :	4 at 5' to 10'	6 at 10' to 15'
SOIL TYPE :	FILL - SILTY SAND and SANDY SILT	FILL - SILTY SAND and SANDY SILT
MAXIMUM DRY DENSITY : (lbs./cu. ft.)	133	126
OPTIMUM MOISTURE CONTENT : (% of dry wt.)	8.5	9.5

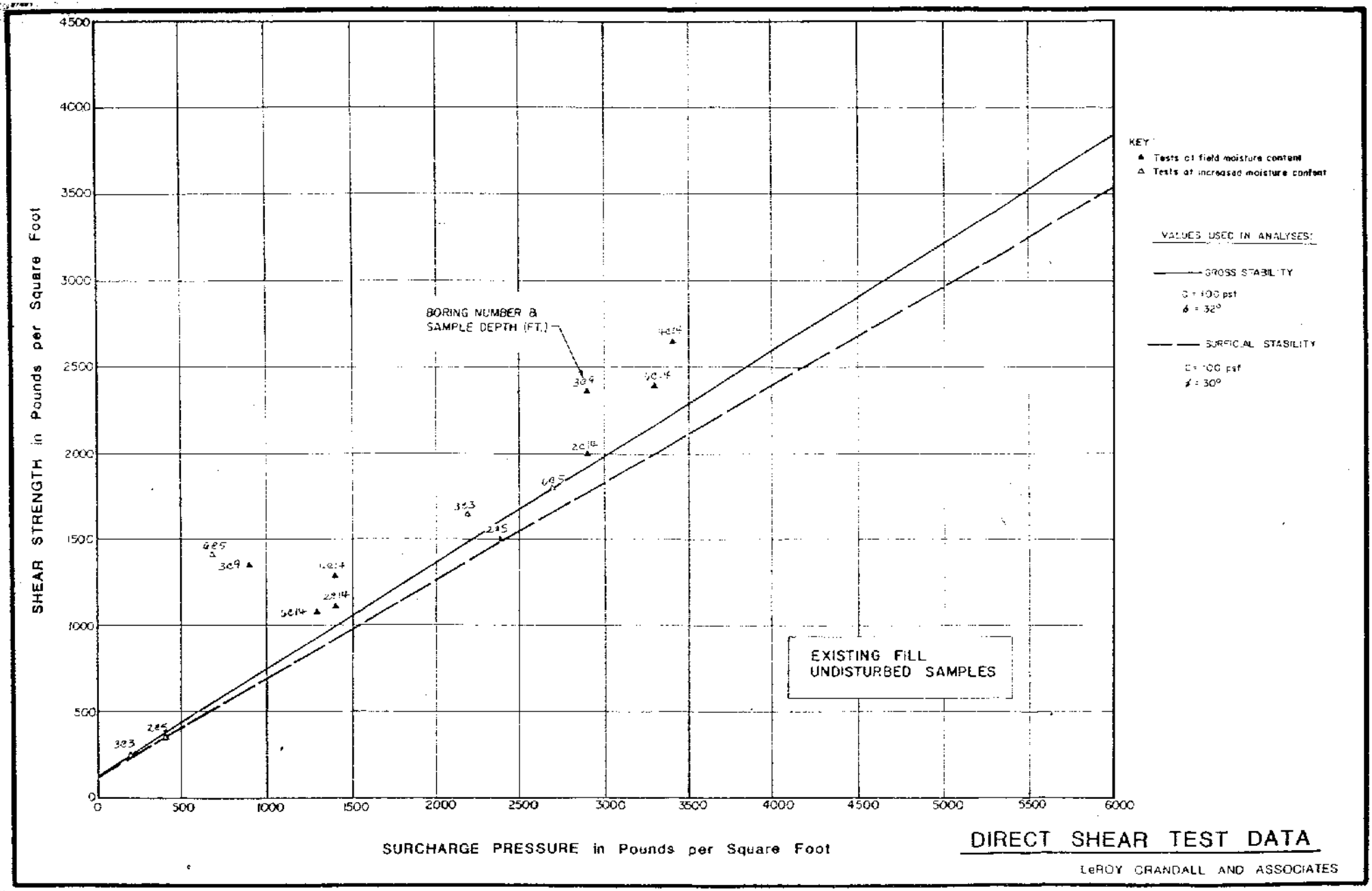
TEST METHOD : ASTM Designation D1557 - 70

COMPACTION TEST DATA



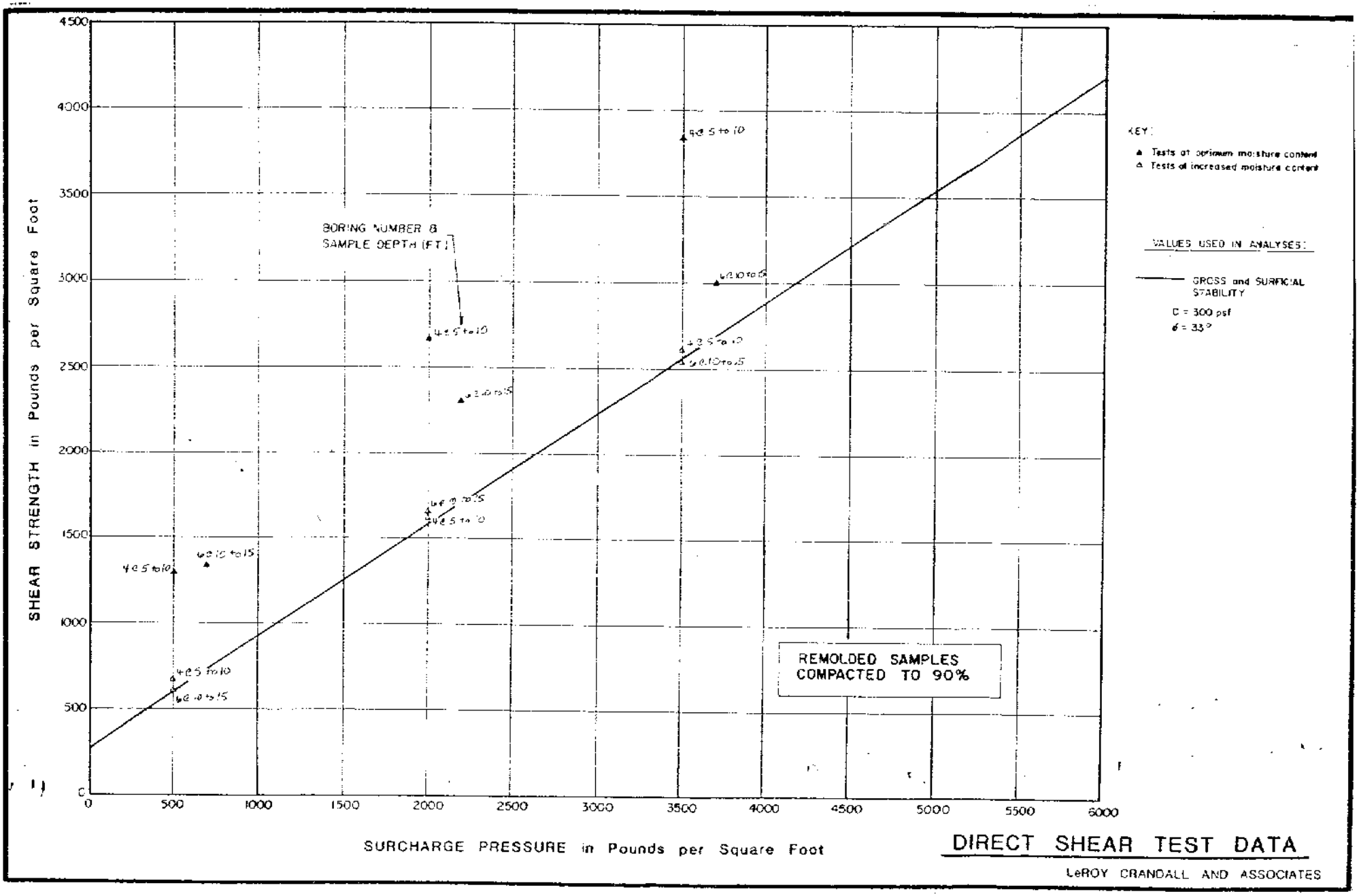
DIRECT SHEAR TEST DATA

LeROY CRANDALL AND ASSOCIATES



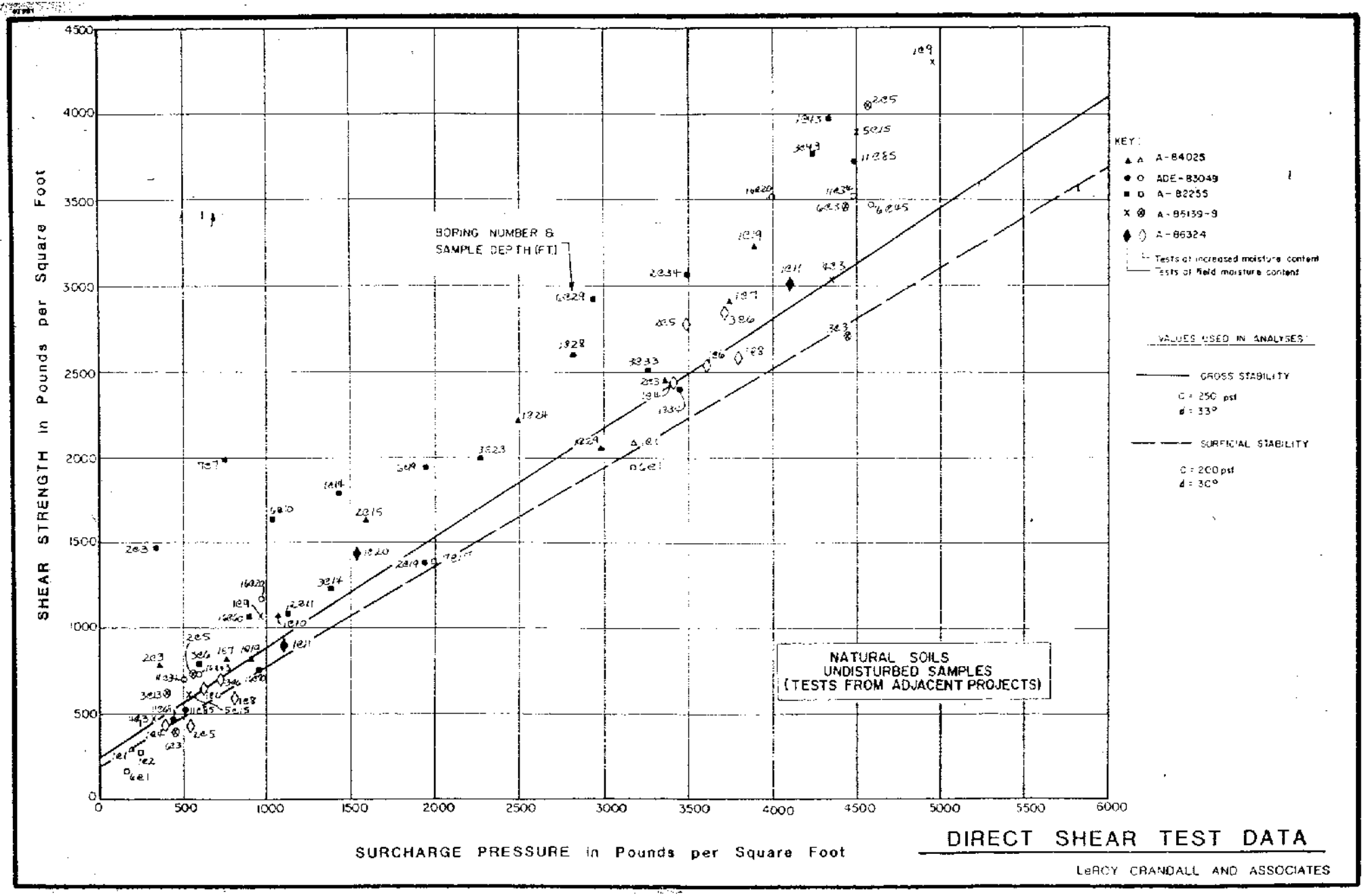
DIRECT SHEAR TEST DATA

LeROY GRANDALL AND ASSOCIATES



DIRECT SHEAR TEST DATA

LeROY CRANDALL AND ASSOCIATES



DIRECT SHEAR TEST DATA

LeROY CRANDALL AND ASSOCIATES

JOB AE-86125-I DATE 8/6/87 W.P. lp O.E. AS CHKD

BORING NUMBER AND SAMPLE DEPTH	SOIL TYPE	% PASSING NO. 200 SIEVE
1 at 5'	SILTY SAND	14
1 at 19'	SAND (SP-SM)	7
2 at 5'	FILL - SILTY SAND	17
2 at 14'	FILL - SILTY SAND	13
2 at 29'	SAND (SP-SM)	7
2 at 39'	SILTY SAND	12
3 at 3'	FILL - SILTY SAND	12
3 at 9'	FILL - SANDY SILT	55
3 at 19'	SILTY SAND	42
4 at 14'	FILL - SILTY SAND	29
4 at 24'	CLAYEY SAND	44
4 at 34'	SAND	4
4 at 39'	SAND	10
5A at 5'	SAND (SP-SM)	6
5A at 9'	SAND	4
5A at 19'	SAND (SP-SM)	7
5A at 39'	SAND (SP-SM)	7
6 at 5'	FILL - SILTY SAND	17
6 at 14'	FILL - SILTY SAND	22
6 at 24'	CLAYEY SAND	12
6 at 29'	CLAYEY SAND	36
6 at 44'	CLAYEY SAND	16

Test Method: ASTM Designation D1140-54

SIEVE DATA

LeROY CRANDALL AND ASSOCIATES

PLATE A-5

JOB AE-86125-I DATE 7/13/87 W.P. dmh O.E. AS CHKD dw

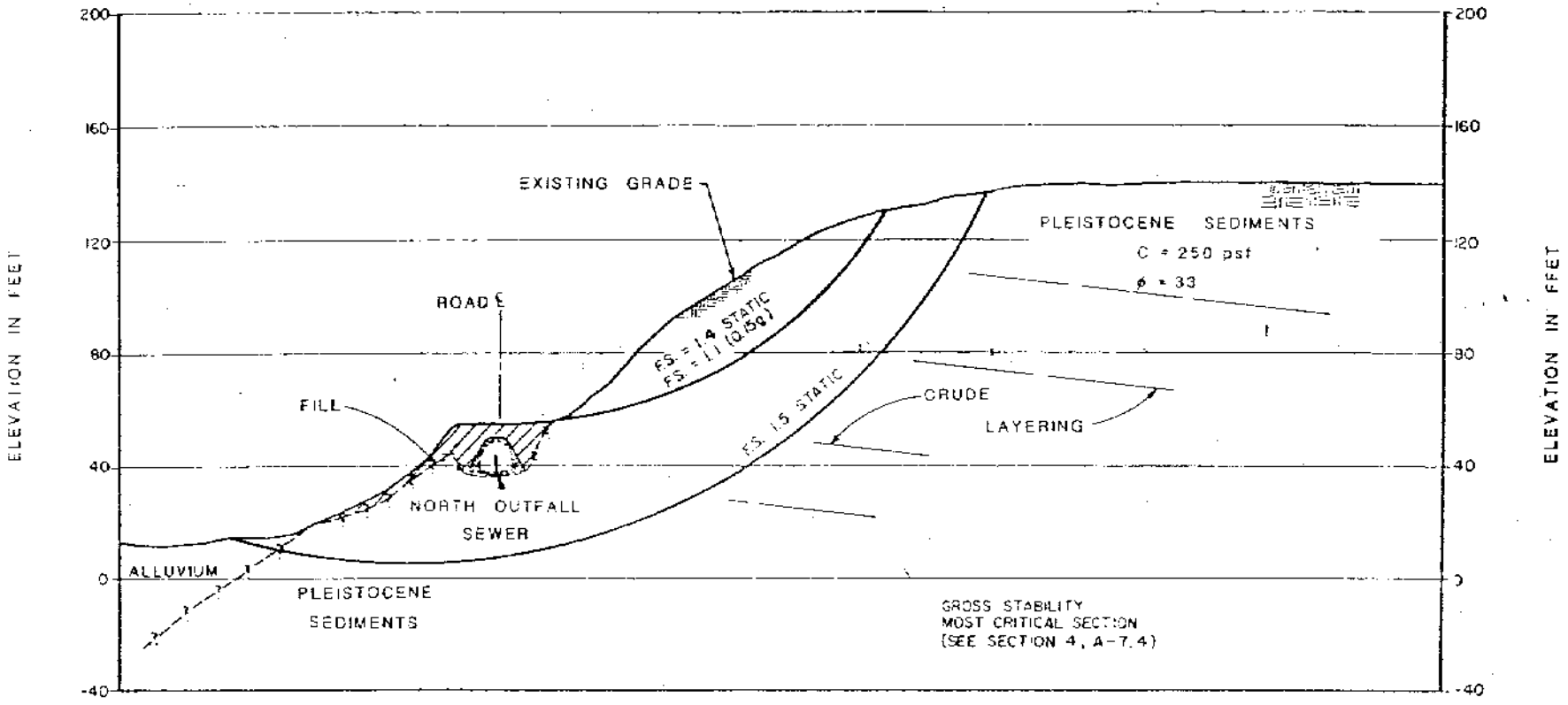
BORING NUMBER AND SAMPLE DEPTH :	4 at 5' to 10'	6 at 10' to 15'
SOIL TYPE :	FILL - SILTY SAND and SANDY SILT	FILL - SILTY SAND and SANDY SILT
MAXIMUM DRY DENSITY : (lbs./cu. ft.)	133	126
OPTIMUM MOISTURE CONTENT : (% of dry wt.)	8.5	9.5

TEST METHOD : ASTM Designation D1557 - 70

COMPACTION TEST DATA

LeROY CRANDALL AND ASSOCIATES

PLATE A - 6

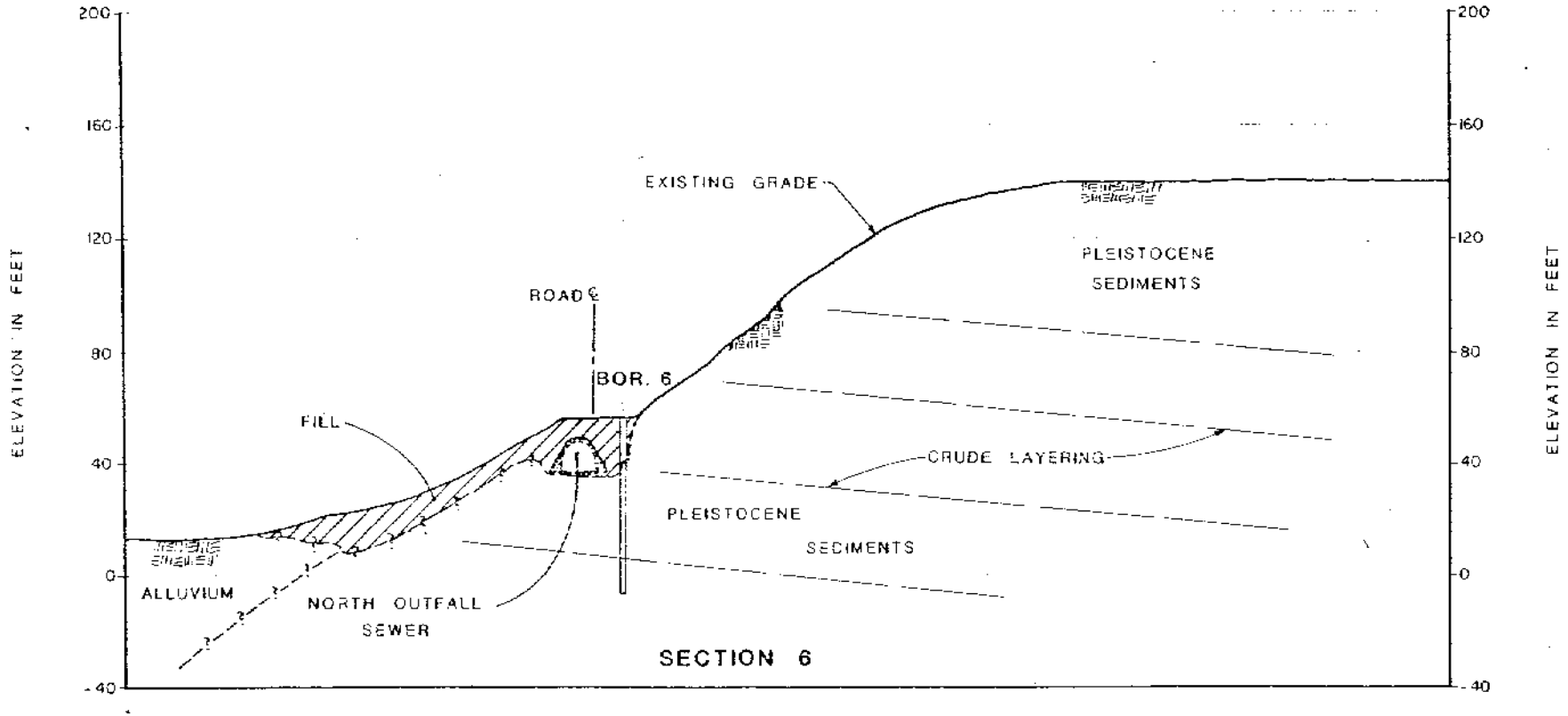


STABILITY ANALYSES

(GROSS STABILITY)

SCALE 1" = 40'

LeROY CRANDALL AND ASSOCIATES



NOTES:

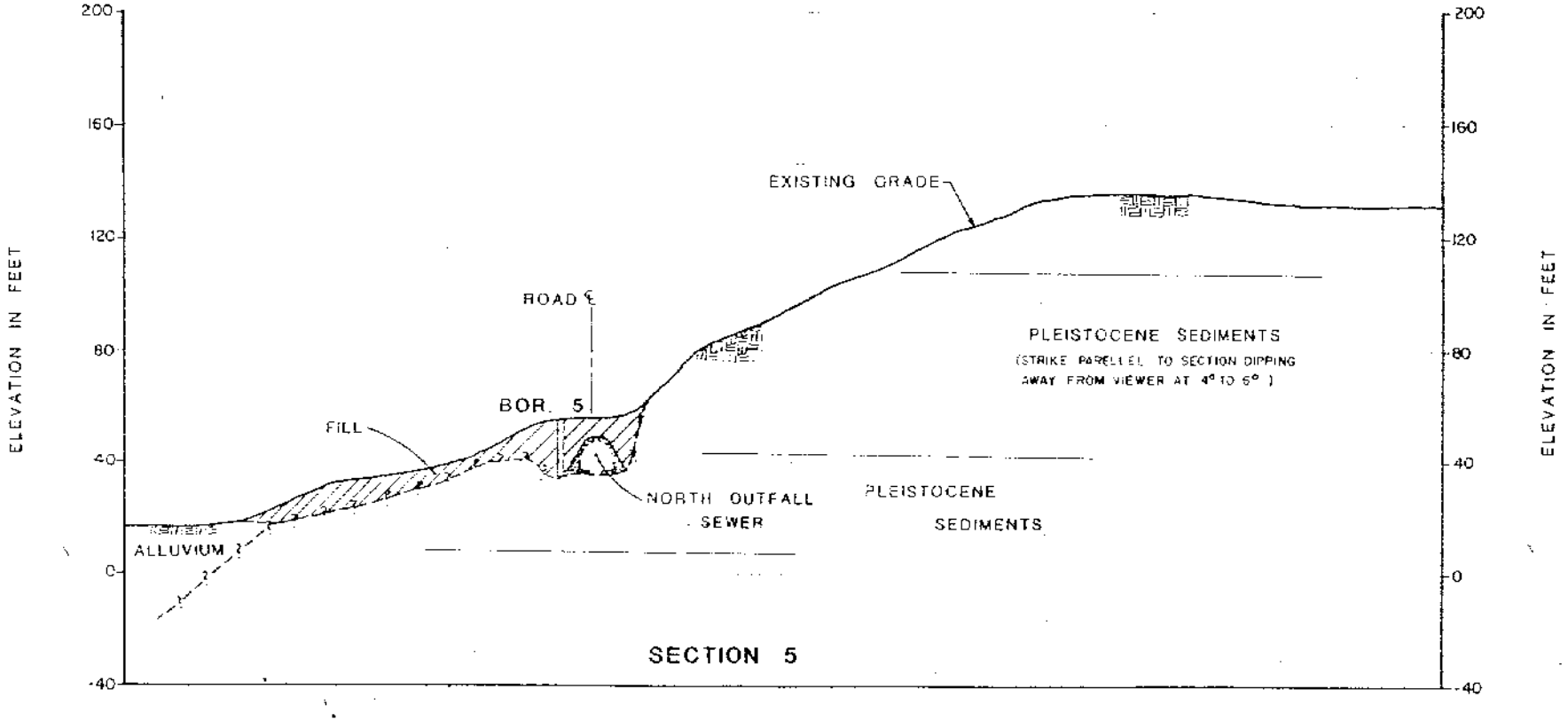
1.) THE SECTION IS BASED ON GEOLOGIC CONDITIONS AT BORING LOCATIONS AND AT SURFACE EXPOSURES MAPPED DURING THE INVESTIGATION. THE GEOLOGIC CONDITIONS BETWEEN SUCH LOCATIONS HAVE BEEN INTERPOLATED. LOCALIZED VARIATIONS COULD OCCUR. THE SECTION IS INTENDED FOR DESCRIPTIVE PURPOSES ONLY.

2.) SEE PLATE A-1.2 FOR LOCATION OF SECTION.

GEOLOGIC SECTION

SCALE 1" = 40'

LeROY CRANDALL AND ASSOCIATES



SECTION 5

NOTES:

1.) THE SECTION IS BASED ON GEOLOGIC CONDITIONS AT BORING LOCATIONS AND AT SURFACE EXPOSURES MAPPED DURING THE INVESTIGATION. THE GEOLOGIC CONDITIONS BETWEEN SUCH LOCATIONS HAVE BEEN INTERPOLATED. LOCALIZED VARIATIONS COULD OCCUR. THE SECTION IS INTENDED FOR DESCRIPTIVE PURPOSES ONLY.

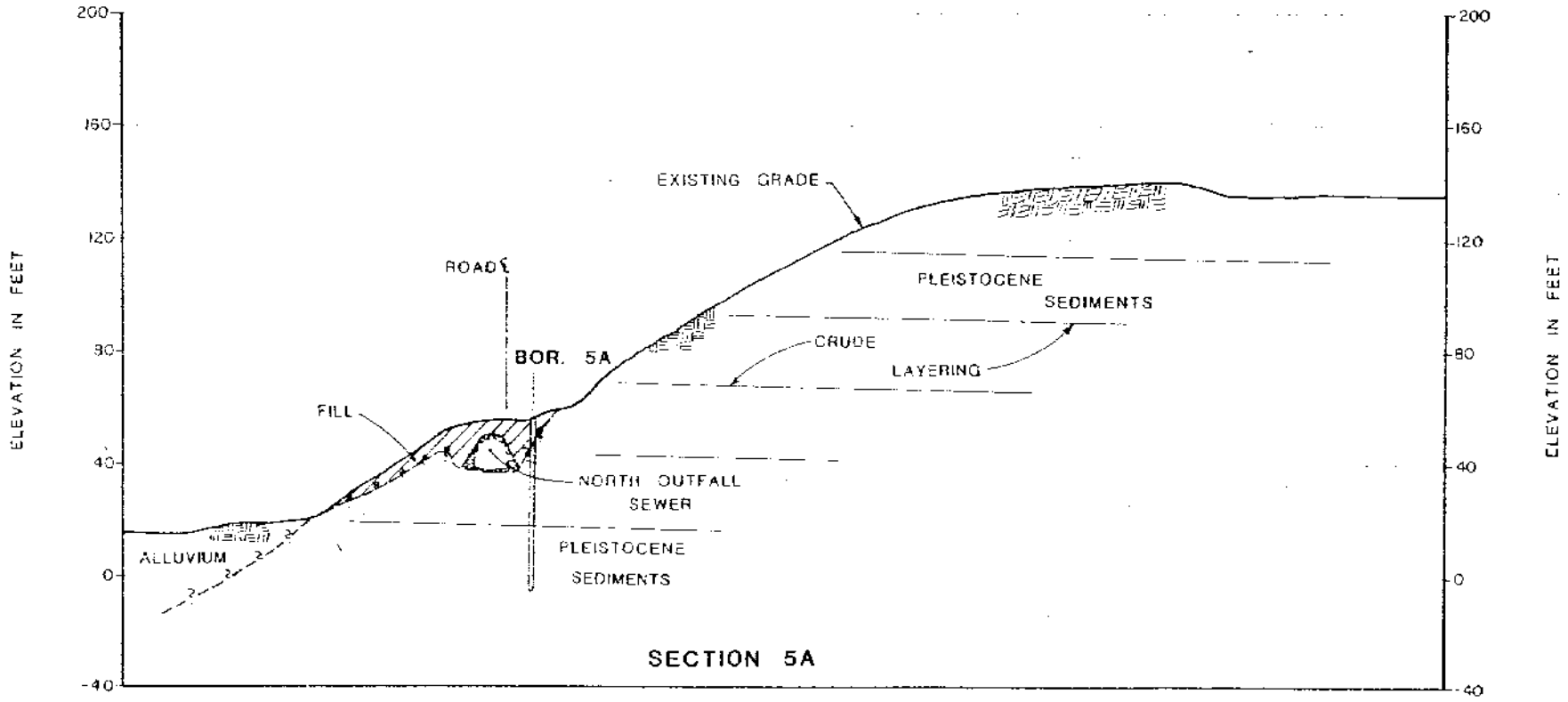
2.) SEE PLATE A-1.2 FOR LOCATION OF SECTION.

GEOLOGIC SECTION

SCALE 1" = 40'

LeROY CRANDALL AND ASSOCIATES

FORM 137



NOTES:

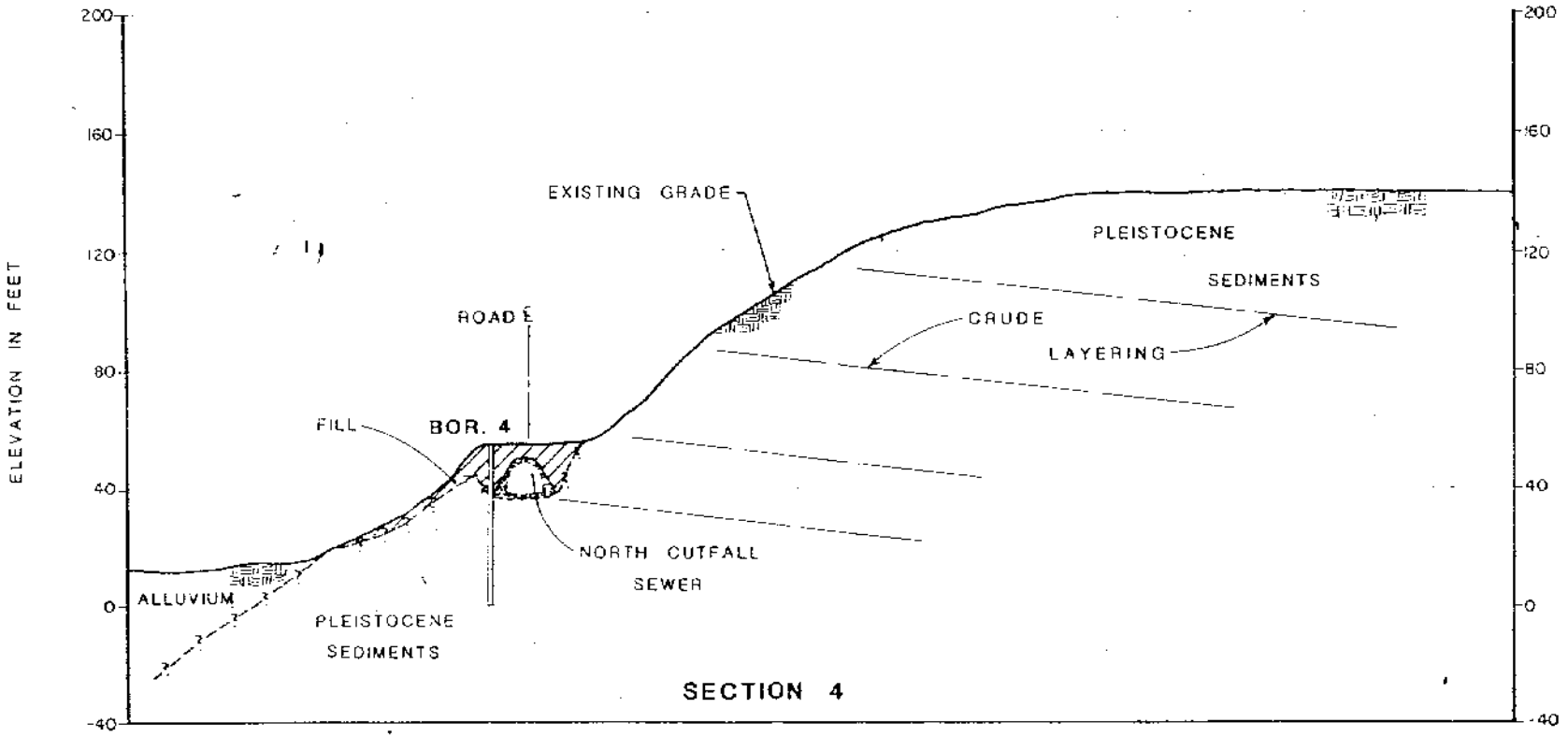
1.) THE SECTION IS BASED ON GEOLOGIC CONDITIONS AT BORING LOCATIONS AND AT SURFACE EXPOSURES MAPPED DURING THE INVESTIGATION. THE GEOLOGIC CONDITIONS BETWEEN SUCH LOCATIONS HAVE BEEN INTERPOLATED. LOCALIZED VARIATIONS COULD OCCUR. THE SECTION IS INTENDED FOR DESCRIPTIVE PURPOSES ONLY.

2.) SEE PLATE A-1.2 FOR LOCATION OF SECTION.

GEOLOGIC SECTION

SCALE 1" = 40'

LeROY CRANDALL AND ASSOCIATES



NOTES:

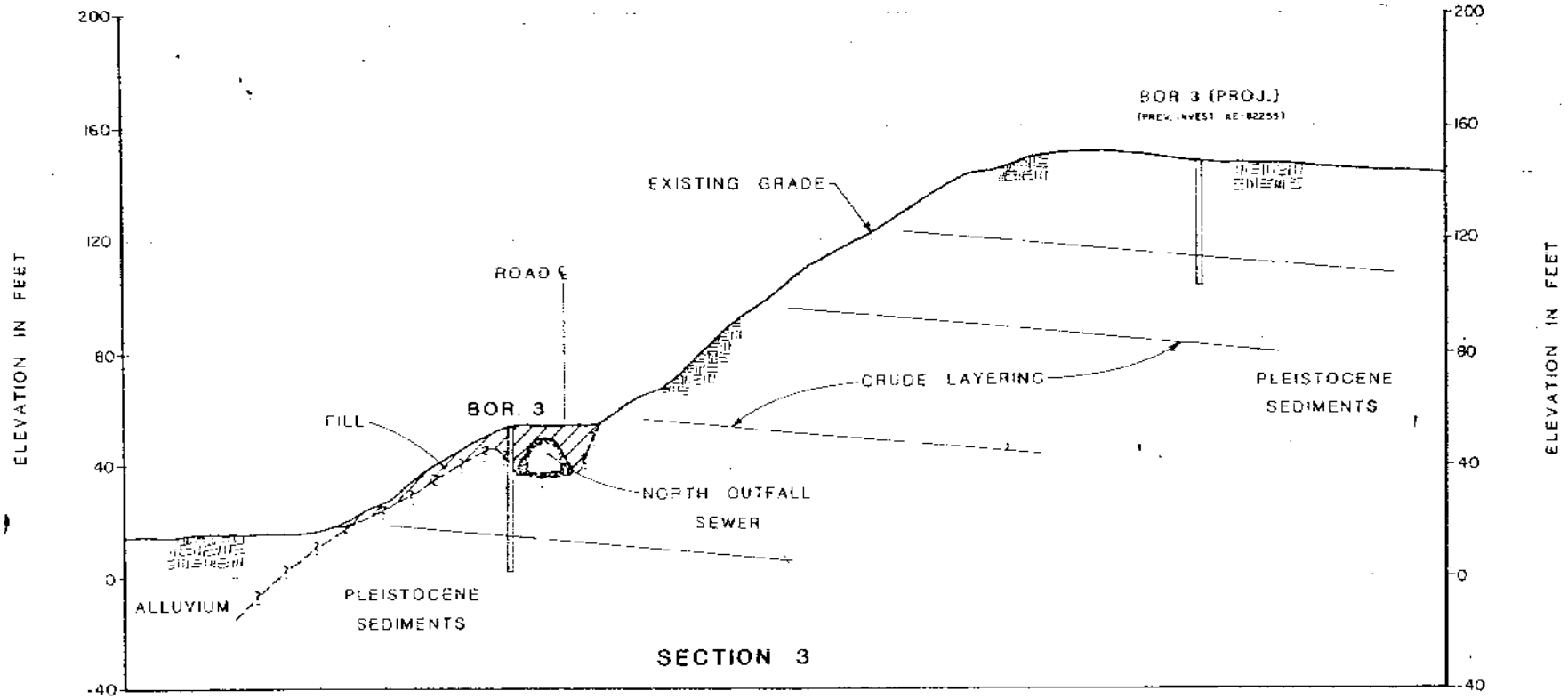
1.) THE SECTION IS BASED ON GEOLOGIC CONDITIONS AT BORING LOCATIONS AND AT SURFACE EXPOSURES MAPPED DURING THE INVESTIGATION. THE GEOLOGIC CONDITIONS BETWEEN SUCH LOCATIONS HAVE BEEN INTERPOLATED. LOCALIZED VARIATIONS COULD OCCUR. THE SECTION IS INTENDED FOR DESCRIPTIVE PURPOSES ONLY.

2.) SEE PLATE A-1.1 FOR LOCATION OF SECTION.

GEOLOGIC SECTION

SCALE 1" = 40'

LeROY CRANDALL AND ASSOCIATES



SECTION 3

NOTES:

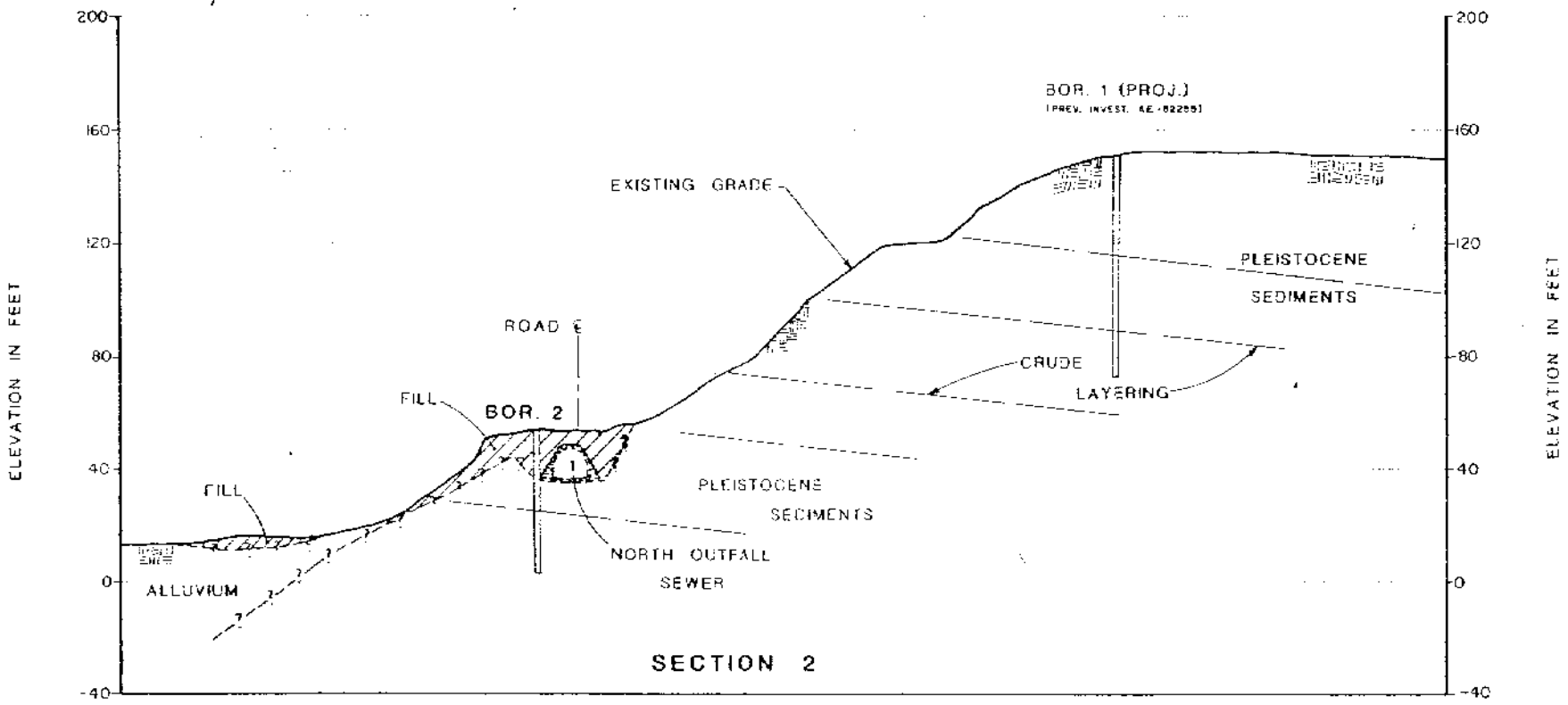
1.) THE SECTION IS BASED ON GEOLOGIC CONDITIONS AT BORING LOCATIONS AND AT SURFACE EXPOSURES MAPPED DURING THE INVESTIGATION. THE GEOLOGIC CONDITIONS BETWEEN SUCH LOCATIONS HAVE BEEN INTERPOLATED. LOCALIZED VARIATIONS COULD OCCUR. THE SECTION IS INTENDED FOR DESCRIPTIVE PURPOSES ONLY.

2.) SEE PLATE A-1.1 FOR LOCATION OF SECTION.

GEOLOGIC SECTION

SCALE 1" = 40'

LeROY CRANDALL AND ASSOCIATES



NOTES:

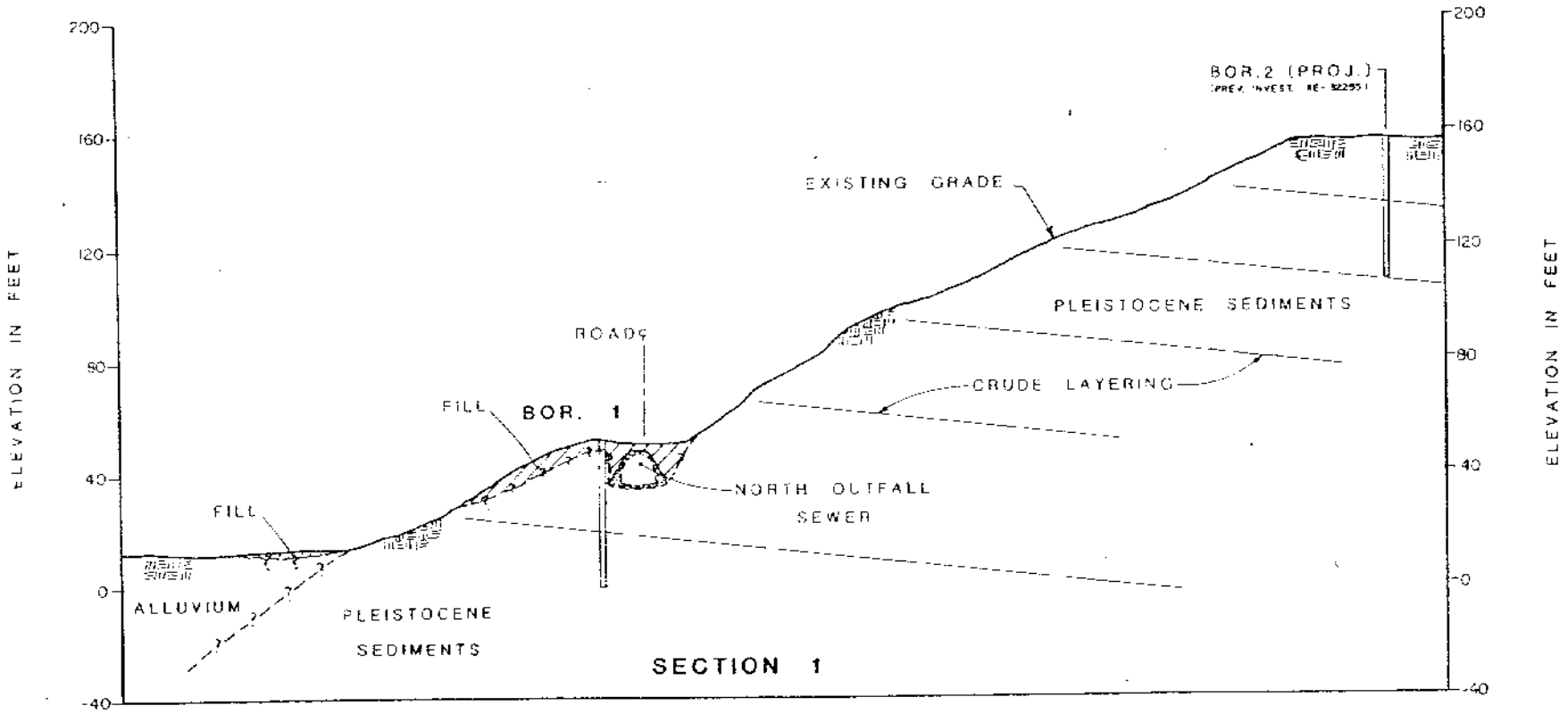
1.) THE SECTION IS BASED ON GEOLOGIC CONDITIONS AT BORING LOCATIONS AND AT SURFACE EXPOSURES MAPPED DURING THE INVESTIGATION. THE GEOLOGIC CONDITIONS BETWEEN SUCH LOCATIONS HAVE BEEN INTERPOLATED. LOCALIZED VARIATIONS COULD OCCUR. THE SECTION IS INTENDED FOR DESCRIPTIVE PURPOSES ONLY.

2.) SEE PLATE A-1.1 FOR LOCATION OF SECTION.

GEOLOGIC SECTION

SCALE 1" = 40'

LeROY CRANDALL AND ASSOCIATES



NOTES:

1.) THE SECTION IS BASED ON GEOLOGIC CONDITIONS AT BORING LOCATIONS AND AT SURFACE EXPOSURES MAPPED DURING THE INVESTIGATION. THE GEOLOGIC CONDITIONS BETWEEN SUCH LOCATIONS HAVE BEEN INTERPOLATED. LOCALIZED VARIATIONS COULD OCCUR. THE SECTION IS INTENDED FOR DESCRIPTIVE PURPOSES ONLY.

2.) SEE PLATE A-1.1 FOR LOCATION OF SECTION.

GEOLOGIC SECTION

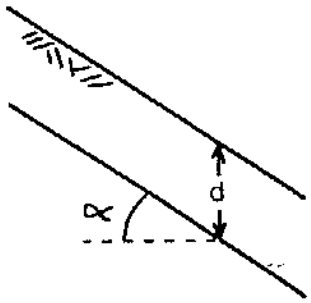
SCALE 1" = 40'

LeROY CRANDALL AND ASSOCIATES

JOB AE-86125-I DATE 8/10/87 BY DW O.E. DW CHKD. LB

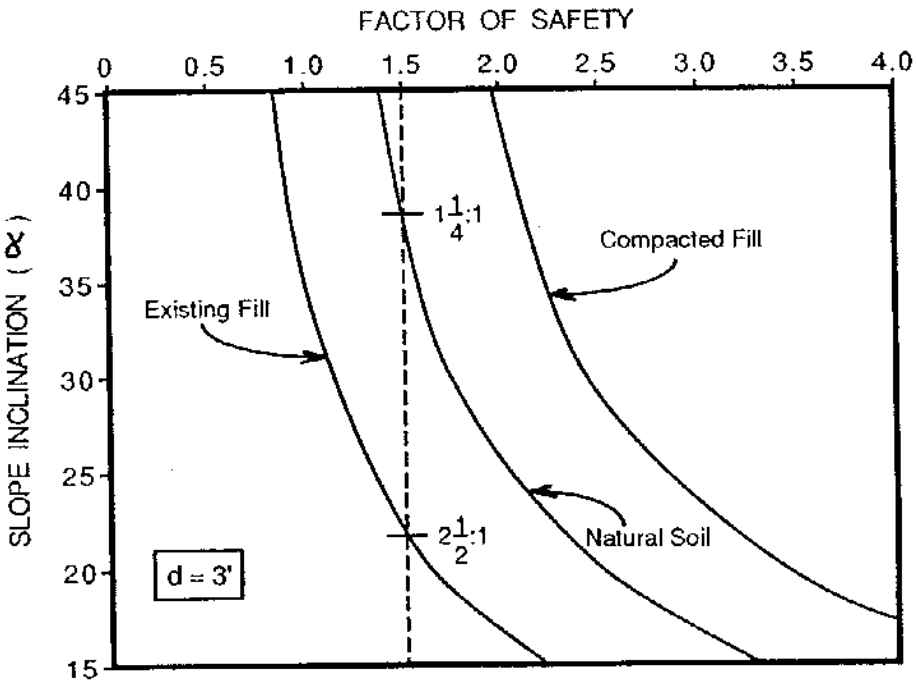
Surficial Stability

$$\text{Factor of Safety} = \frac{C + (\gamma t - \gamma w) \cdot d \cdot \cos^2 \alpha \tan \phi}{\gamma t \cdot d \cdot \cos \alpha \sin \alpha}$$



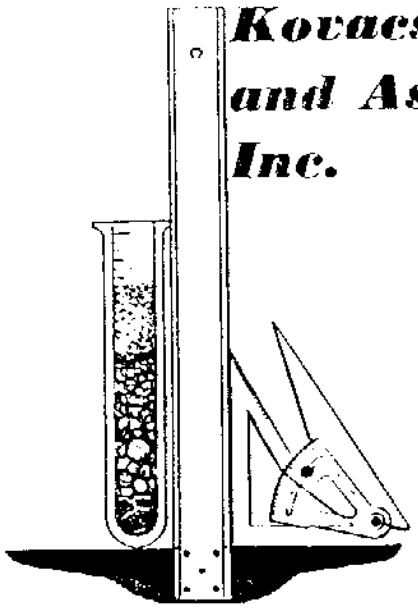
Shear Strength

Natural Soil : C = 200 psf; $\phi = 30^\circ$
Existing Fill : C = 100 psf; $\phi = 30^\circ$
Compacted Fill : C = 300 psf; $\phi = 33^\circ$



STABILITY ANALYSES
(SURFICIAL STABILITY)

LeROY CRANDALL AND ASSOCIATES
PLATE A-8.2



Kovacs-Byer and Associates Inc.

Revised October 9, 1987
August 5, 1987
KB 7606-G and KB 7607-G

Howard Hughes Realty
6167 Bristol Parkway
Suite 330
Culver City, California 90230

Attention: Stephanie Miller

Subject

Additional Geotechnical Exploration
Slope Stability Evaluation
Tentative Tracts 43415 and 43416
Westchester, California

References: KB 7606-G, Preliminary Geologic and Soils Engineering Investigation, May 14, 1984;
KB 7607-G, Preliminary Geologic and Soils Engineering Investigation, September 19, 1983, Revised April 26, 1984;
KB 7606-7607, Additional Geotechnical Information, June 30, 1986.

City of Los Angeles Review Letters, December 6, 1986 February 11, 1987 and April 3, 1987.

Gentlemen:

The following presents the findings of our additional exploration performed on the subject tracts. The purpose of this exploration was to address concerns raised by the City of Los Angeles Department of Building and Safety regarding the stability of slopes within and north of the tracts.

Additional exploration has consisted of excavating 32 test pits during June and July, 1987. Observation of the earth materials encountered in the test pits was performed by the undersigned. Logs of the additional and previous test pits are included herein. The geologic information obtained during our recent and previous exploration has been transferred to the tract plans prepared by Psomas. These plans are based on the most recent topographic survey.

ENGINEERING CONSIDERATIONS

Relatively undisturbed samples of the earth materials encountered within the tracts were obtained during our previous exploration. The strength of the soils was determined by performing shear tests in a direct shear machine under saturated conditions. The results of this testing are provided herein on Plates B-1 through B-6. The weakest strengths obtained were used in the subsequent stability analyses.

Questions have been raised regarding the use of cohesion in previous slope stability analyses. The earth materials, with the exception of the Dune Sand, all exhibit evidence of cohesion in

the field. Both the Quaternary Terrace deposits and Pleistocene sediments maintain vertical or near vertical slopes at numerous sites along the Ballona Escarpment. These slopes maintain their profile during the winter months, indicating that the cohesive properties are present, even when the soils are saturated. Further evidence of the cohesive properties of the natural soil and terrace deposits was observed in the test trenches. Open near vertical fractures were observed in the trenches to a depth of 4 feet where the trench extended down the natural slope.

SLOPE STABILITY

Deep Seated

The deep seated stability of the natural and proposed cut slopes north of the subject tracts has been re-evaluated. The stability of the natural and cut slopes between the two tracts has also been analyzed. The analyses were performed, using Bishop's method and a computer search program by TAGA Engineering. Analyses were performed for Sections G, H and I. The results are provided on Calculation Sheets 1 - 14.

The descending slope north of tentative Tract 43416 averages 2:1 in gradient except where over steepened by the construction of Cabora Drive which overlies the North Outfall Sewer. It is proposed to trim the slope above Cabora Drive to a 2:1 gradient between the sewer tunnel and the proposed 2:1 canyon fill at the western limit of the development. The locally oversteepened slopes east of the sewer tunnel will be provided with 2:1 stabilization fills. The Dune Sand deposit which is smaller in extent than originally thought will be completely removed during development. It is our opinion that the natural slopes which will remain on Tentative Tract 43416 and the proposed cut and fill slopes will be stable.

No development is planned between Tentative Tracts 43415 and 43416. The slopes in this area will remain in their present condition with the exception of surface trimming of the road cuts. Stability analyses performed along Section G indicate that over-steepened portion of the slope above Cabora Drive is stable with a minimum factor of safety of 1.37. The over-steepened slope in the vicinity of Section H is stable with a minimum factor of safety of 1.52. It is our opinion that potential deep seated instability of these slopes above Cabora Drive does not pose a risk

to the development of tentative Tracts 43415 and 43416 or tentative Tract 44857 which is located below.

The minimum factor of safety of the entire slope extending above and below Cabora Drive in the vicinity of Section G is 1.46. It is our opinion that the stability of this slope conforms with the intent of the grading code requirements and that stabilization is not necessary. Should the city, however, require stabilization to increase the factor of safety. A buttress fill may be provided as shown on Section G. This buttress fill raises the factor of safety to in excess of 1.50. The minimum factor of safety of the entire slope in the vicinity of Section H exceeds the minimum code requirements.

The slope north of Tentative Tract 43415 does not possess the city required factor of safety in its present condition. As part of the development of this tract, it is recommended that the slope between the proposed pads and Cabora Drive be trimmed to a 1-3/4:1 gradient. At a 1-3/4:1 gradient, calculations indicate that the portions of the slope above and below the road are stable with factors of safety in excess of the minimum code requirements.

Surficial Stability

The surficial stability of slopes within the tracts which are steeper than 2:1 was analyzed using the "parallel seepage model" recommended by the ASCE and Building and Safety Advisory Committee. It is presently planned to leave the existing slope on the northeast portion of Tract 43416 in its natural condition. Calculations indicate that this slope is surficially stable with a factor of safety ranging from 1.45 to 1.62. This slope does not exhibit evidence of previous surficial slope failures and it is our opinion that such failures should not occur following development.

The City of Los Angeles Grading Division has raised concerns regarding the presence of phreatophytes and their groundwater and surficial stability implications. The plants identified as phreatophytes have higher moisture requirements than the remainder of the native vegetation. These plants do not, however, require freewater or a perched groundwater table to survive. These plants are found in gentle swales where they receive less direct sun during the day. Test Pit 71 was excavated in one area where these plants exist on Tract 43416. The moisture content of the natural soil encountered in this test pit was found to be

slightly higher than average for the slope. However, no evidence of a present or past perched groundwater table was found. It is our opinion that the presence of these plants does not indicate the presence of perched groundwater or a higher risk of surficial slope instability.

The erosion scars on the slope at the eastern end of Tract 43416 have resulted from concentrated drainage. Concentrated drainage from the bluff top will be eliminated by the proposed development. The erosion channels will be repaired with compacted fill placed at a 2:1 gradient. The potential for future erosion of the natural slopes will be greatly reduced by the proposed developments. The natural and oversteepened slopes west of the sewer tunnel and above Cabora Drive on Tract 43416 will be trimmed to a 2:1 gradient as part of the development. At a 2:1 gradient, these slopes are considered surficially stable.

The slope above Cabora Drive, between Tentative Tracts 43415 and 43416, where it has been over-steepened by previous roadway construction has been subject to surficial instability in the past. The natural portion of the slope above the cut does not exhibit evidence of past surficial instability. Surficial failures and erosion have also occurred within the natural canyon between the

two tracts. The surficial failures have occurred on naturally, oversteepened portions of the slopes. The remainder of the natural slopes in this canyon area are free of surficial failures. The debris from the past failures and erosion in these areas has been collected by Cabora Drive in the past. Debris has not flowed over the descending slope north of the road.

The cut slope above Cabora Drive is subject to future surficial failures. It is not considered feasible to eliminate the potential for future surficial failures on the cut slope above Cabora Drive. Elimination of the potential for such failures would necessitate trimming the slope to a flatter gradient or constructing a 2:1 stabilization fill against the slope. Neither treatment is feasible due to the presence of offsite homes at the top of the slope and the north outfall sewer at the toe. It is our opinion that the risk of future failures may be reduced by removing the slump debris from the cut face and intercepting surface drainage above the cut. A sidehill drain designed per the enclosed detail may be used to intercept the slope drainage. The drain should be located 6 to 10 feet vertically above the top of the trimmed cut slope. Should a surficial failure occur on the trimmed cut slope following implementation of the above described mitigating measures, Cabora Drive will provide an adequate catch-

ment area for any debris generated. It is our opinion that debris from future cut slope failure will not reach the flatland area north of the road (Tentative Tract 44857).

The natural over-steepened slopes within the undeveloped canyon between the developed portions of Tentative Tract 43415 and 43416 are subject to future surficial failures. It is our opinion that Cabora Drive does not provide an adequate catchment area for potential debris generated within the canyon. It is, therefore, recommended that a debris basin sized per MGD63 be constructed at the mouth of the canyon along the southern edge of Cabora Drive. It is our opinion that following construction of the basin, the potential for future surficial slope instability within the undeveloped canyon will not pose a hazard to the development of Tentative Tract 44857 below.

The descending slope between Tentative Tract 43415 and Cabora Drive will be trimmed to a 1-3/4:1 gradient during site development. Calculations indicate that the trimmed slope will be surficially stable with a factor of safety in excess of 1.5. The remainder of the slopes within the developed portion of the tract will be created at a 2:1 gradient and are considered surficially stable.

The slope descending below Cabora Drive to Tentative Tract 44857 is locally steeper than 2:1. The upper portion of this slope is also overlain by spill fill generated during roadway construction. The spill fill is not considered surficially stable and should be trimmed to a 2-1/2:1 gradient during development of Tract 44857. Should the City of Los Angeles Sanitation Department object to slope trimming due to the proximity of the North Outfall Sewer, a 2:1 stabilization fill may be construction as shown on the enclosed schematic section. The "V" drain at the top of the stabilization fill will serve to collect any erosion debris from the uncompacted fill above.

CONCLUSIONS

Slopes on and below the subject tracts have been subject to erosion and surficial instability in the past. Areas of slope erosion occur where drainage from the top of the bluff is directed over the slope face in a concentrated fashion. Areas of surficial slope instability occur where slopes have been oversteepened by man or nature. The majority of the surficial failures occur where the natural slopes have been over-steepened by construction of Cabora Drive. Roadway construction created 1

1/4:1 to 1:1 cut slopes. At these gradients, the natural soils are not surficially stable. Naturally over-steepened slopes occur on the flanks of the canyons located within and between Tentative Tracts 43415 and 43415. No evidence of deep seated failures or landslides has been observed during exploration.

The recommendations contained herein are intended to bring the slopes within and below the developed portions of the Tracts 43415 and 43416 into conformance with the slope stability standards of the City of Los Angeles Department of Building and Safety. The slopes below Cabora Drive will be brought into conformance during development of Tract 44857.

The only portion of the bluff which will not be graded and is subject to future slope instability is located upslope of Cabora Drive between the developed sections of Tracts 43415 and 43416. Calculations indicate that the slopes above Cabora Drive in this area are stable with respect to deep seated failure, but do not possess the code required factor of safety. It is our opinion that these slopes are not subject to deep seated instability. The over-steepened sections of these slopes are also subject to surficial instability.

It is our opinion that the recommended cut slope trimming and sidehill drain installation will significantly reduce the potential for future surficial failures. However, should surficial failures occur on the trimmed slope in the future, Cabora Drive will provide an adequate catchment area for any debris generated. It is our opinion that the potential for future surficial slope instability does not pose a hazard to the proposed development.

Should you have any questions, please call.

Respectfully submitted,

ROBERT A. HOLLINGSWORTH
E.G. 1265/G.E. 2022

RAH:mds

Enc: Geologic Map (3 sheets)
Sections A-M (6 Sheets)
Schematic Section
Schematic Detail
Table IV
Plates A-1 through A-17
Plates B-1 through B-6
Calculation Sheets 1 - 14

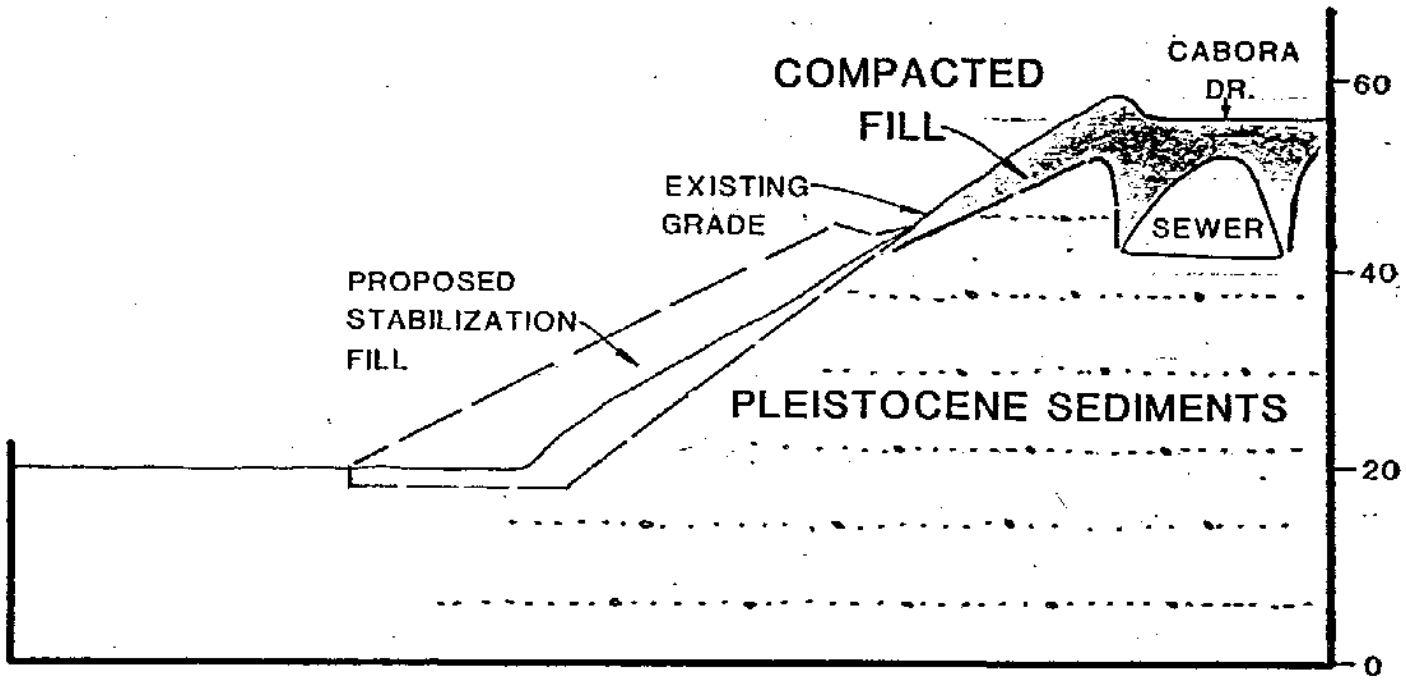
Kovacs-Byer and Associates Inc.
CONSULTING ENGINEERS and GEOLOGISTS

BY_____ DATE_____ SUBJECT_____

HUGHES

CHECKED BY_____ DATE REVISED 8-5-87

KB 7606



SCHEMATIC SECTION

May 14, 1984
KB 7606-G

TABLE IV

LOG OF TEST PITS

Pit Number	Depth (Feet)	Description
1	0 - 4	QUATERNARY TERRACE: Sand, dark reddish-brown, moist, dense, slightly cemented, fine-grained Sand
		End at:4 feet; No Water; No Caving; No Fill
2	0 - ½	SOIL: Sand, reddish-brown, moist, medium dense, fine-grained Sand
	½ - 1½	PLEISTOCENE SEDIMENTS: Sand, light yellow-brown, moist, dense, fine to medium-grained Sand
	1½ - 4	Sand, yellow-brown, moist, dense, fine-grained Sand, slightly cemented
		End at 4 feet; No Water; No Caving; No Fill
3	0 - ½	SOIL: Sand, reddish-brown, moist, medium dense, fine-grained Sand
	½ - 5	PLEISTOCENE SEDIMENTS: Sand, light gray to yellow-brown, moist to wet, dense, fine to medium-grained Sand, slightly cemented, banding approximately horizontal
		End at 5 feet; No Water; No Caving; No Fill
4	0 - 1	FILL: Sand, reddish-brown, slightly moist, medium dense, pieces of concrete and asphaltic concrete
	1 - 3	ALLUVIUM: Sand, reddish-brown, moist, dense, fine-grained Sand
	3 - 5	PLEISTOCENE SEDIMENTS: Sand, light yellow-brown, moist, dense, fine-grained Sand, some horizontal banding apparent; abundant very small roots
		End at 5 feet; No Water; No Caving; Fill to 1 foot

(Continued)

TABLE IV- LOG OF TEST PITS (Continued)

Pit Number	Depth (Feet)	Description
5	0 - 1	FILL: Sand, brown, slightly moist, dense
	1 - 6	ALLUVIUM: Sand, light reddish-brown, moist, dense, fine-grained Sand; becomes reddish-brown at 4 feet
	6 - 8	Sand alternating yellow-brown and red-brown layers, moist, dense, very slightly cemented, fine to coarse-grained
		End at 8 feet; No Water; No Caving; Fill to 1 foot
6	0 - 1	FILL: Sand, reddish-brown, slightly moist, dense, pieces of asphaltic concrete present
	1 - 2	ALLUVIUM: Sand, light brown, slightly moist, dense, fine-grained Sand, layering apparent
	2 - 3½	Sand, dark brown, moist, dense, fine-grained
	3½ - 7	Sand, reddish-brown, moist, dense, fine-grained
		End at 7 feet; No Water; No Caving; Fill to 1 foot
7	0 - 1	FILL: Sand, light brown, slightly moist to moist, medium dense
	1 - 2	Sand, reddish-brown, moist, medium dense, fine-grained Sand, pieces of asphaltic concrete present
	2 - 4	ALLUVIUM: Sand, reddish-brown, moist, dense, fine to medium-grained Sand
	4 - 7	Sand, dark brown to black, moist, dense, fine-grained
		End at 7 feet; No Water; No Caving; Fill to 2 feet

(Continued)

TABLE IV- LOG OF TEST PITS (Continued)

Pit Number	Depth (Feet)	Description
8	0 - 3	FILL: Sand, brown, dry to slightly moist, dense, fine-grained Sand, occasional concrete pieces; contact dips gently downslope
	3 - 5	SOIL: Sand, reddish-brown, slightly moist, dense, fine-grained Sand, slightly cemented
	5 - 7½	PLEISTOCENE SEDIMENTS: Sand, yellow-brown to brown, slightly moist, dense, fine-grained Sand, slightly cemented
		End at 7½ feet; No Water; No Caving; Fill to 3 feet
9	0 - 1	SOIL: Sand, brown, slightly moist to moist, medium dense, fine-grained Sand
	1 - 5	Sand, brown, dry, dense, fine-grained Sand
	5 - 8	PLEISTOCENE SEDIMENTS: Sand, light greenish-brown, moist, dense, fine to medium-grained Sand
		End at 8 feet; No Water; No Caving; No Fill
10	0 - 1½	SOIL: Sand, brown, slightly moist, medium dense
	1½ - 4½	PLEISTOCENE SEDIMENTS: Sand, alternating light brown and light yellow-brown layers, moist, dense, fine to medium-grained Sand, slightly cemented
		End at 4½ feet; No Water; No Caving; No Fill
11	0 - 8	SOIL: Sand, dark brown, moist, dense, fine-grained Sand; occasional light brown and reddish-brown pockets at 4 feet
	8 - 9½	PLEISTOCENE SEDIMENTS: Sand, light brown to yellow-brown, moist, dense, fine-grained Sand
		End at 9½ feet; No Water; No Caving; No Fill

(Continued)

TABLE IV- LOG OF TEST PITS (Continued)

Pit Number	Depth (Feet)	Description
12	0 - 1	SOIL: Sand, light brown, dry, loose, fine-grained Sand
	1 - 4	PLEISTOCENE SEDIMENTS: Sand, yellow-brown, slightly moist, dense, fine-grained Sand
		End at 4 feet; No Water; No Caving; No Fill
13	0 - 1½	SOIL: Sand, dark brown, slightly moist, medium dense, fine-grained Sand
	1½ - 4	PLEISTOCENE SEDIMENTS: Sand, light brown with dark brown layers, moist, dense, slightly cemented, fine-grained Sand
		End at 4 feet; No Water; No Caving; No Fill
14	0 - 1	SOIL: Sand, dark brown, moist, medium dense, fine-grained Sand
	1 - 2½	Sand, reddish-brown, moist, dense, fine-grained, slightly cemented
	2½ - 4	Sand, reddish-brown to yellow-brown, moist, dense, cemented
	4 - 5½	PLEISTOCENE SEDIMENTS: Sand, gray to greenish-yellow, moist, dense, fine-grained Sand, not cemented
	5½ - 6½	Sand, brown, moist, dense, fine-grained Sand, slightly cemented
	6½ - 7	Sand, gray, moist, dense, fine-grained Sand, not cemented
		End at 7 feet; No Water; No Caving; No Fill

(Continued)

TABLE IV- LOG OF TEST PITS (Continued)

Pit Number	Depth (Feet)	Description
15	0 - 1	SOIL: Sand, dark brown, moist, medium dense, fine-grained
	1 - 6½	Sand, brown to dark brown, slightly moist, dense, fine-grained Sand, slightly porous
	6½ - 8	PLEISTOCENE SEDIMENTS: Sand, brown to yellow-brown, moist, dense, fine-grained Sand, occasional brown pockets
		End at 8 feet; No Water; No Caving; No Fill
16	0 - 1½	SOIL: Sand, brown to reddish-brown, moist, medium dense to dense, fine-grained Sand
	1½ - 3½	PLEISTOCENE SEDIMENTS: Clay, green-brown, moist, firm to stiff
	3½ - 4½	Sand, reddish-brown, moist, dense, fine-grained Sand, slightly moist, dense, not cemented
	4½ - 7	Sand, light greenish-gray to yellow-brown, moist, dense, fine-grained Sand, slightly cemented
		End at 7 feet; No Water; No Caving; No Fill
17	0 - 4	SOIL: Sand, dark brown, slightly moist, medium dense becomes dense and slightly porous at 1 foot
	4 - 5½	Sand, brown, moist, dense, slightly cemented, fine-grained
	5½ - 6½	Sand, light brown, moist, dense, fine-grained Sand
	6½ - 7½	Clayey Sand, brown, moist, dense, fine-grained
		End at 7½ feet; No Water; No Caving; No Fill

(Continued)

TABLE IV- LOG OF TEST PITS (Continued)

Pit Number	Depth (Feet)	Description
18	0 - 1	SOIL: Sand, brown, moist, medium dense, fine-grained Sand
	1 - 5½	Sand, brown to dark brown, slightly moist, dense, fine-grained Sand, porous
	5½ - 7	PLEISTOCENE SEDIMENTS: Sand, light yellow-brown, moist, dense, fine-grained Sand, slightly cemented
		End at 7 feet; No Water; No Caving; No Fill
19	0 - 1	SOIL: Sand, light brown, dry, loose, fine-grained Sand
	1 - 5½	Sand, brown, slightly moist, dense, fine-grained Sand, porous
	5½ - 7½	QUATERNARY TERRACE: Sand, reddish-brown, moist, dense, fine to medium-grained, cemented or slight Clay Binder
		End at 7½ feet; No Water; No Caving; No Fill
20	0 - 1	SOIL: Sand, dark brown, moist, medium dense, fine-grained
	1 - 3	Sand, brown, slightly moist, dense, fine-grained Sand, porous
	3 - 5	PLEISTOCENE SEDIMENTS: Sand, yellow-brown, moist, dense, fine-grained Sand, slightly cemented
		End at 5 feet; No Water; No Caving; No Fill

(Continued)

TABLE IV- LOG OF TEST PITS (Continued)

21	0 - 1	SOIL: Sand, brown, slightly moist, medium dense, fine-grained Sand
	1 - 2	becomes dense and porous
	2 - 3½	becomes light brown and dry
	3½ - 6	PLEISTOCENE SEDIMENTS: Sand, light brown to brown, moist, dense, fine-grained Sand, slightly cemented
		End at 6 feet; No Water; No Caving; No Fill
22	0 - 5	SOIL: Sand, brown, slightly moist, medium dense, fine-grained Sand; becomes dense at 1 foot
	5 - 7	PLEISTOCENE SEDIMENTS: Sand, yellow-brown, moist, dense, fine-grained
		End at 7 feet; No Water; No Caving; No Fill
23	0 - 2	SOIL: Sand, brown, moist, loose to medium dense, fine-grained Sand
	2 - 5	PLEISTOCENE SEDIMENTS: Sand, light brown with occasional brown banding, moist, dense, fine-grained Sand, slightly cemented
		End at 5 feet; No Water; No Caving; No Fill
24	0 - 2	SOIL: Sand, brown, moist, loose to medium dense, fine-grained Sand
	2 - 5	PLEISTOCENE SEDIMENTS: Sand, light yellow-brown with occasional brown banding, moist, dense, fine-grained
	5 - 7	Sand, yellow-brown, moist, dense, fine to coarse-grained, occasional rounded cobbles
		End at 7 feet; No Water; No Caving; No Fill

(Continued)

TABLE IV- LOG OF TEST PITS (Continued)

Pit Number	Depth (Feet)	Description
25	0 - 4½	SOIL: Sand, brown, slightly moist, loose to medium dense, fine-grained Sand; becomes dense at 1 foot
	4½ - 7	PLEISTOCENE SEDIMENTS: Sand, light yellow to orange-brown, moist, dense, fine to coarse-grained Sand, occasional rounded gravel
		End at 7 feet; No Water; No Caving; No Fill
26	0 - 1½	SOIL: Sand, light brown, dry to slightly moist, loose to medium dense
	1½ - 5	PLEISTOCENE SEDIMENTS: Sand, yellow-brown, slightly moist, dense, fine-grained Sand, slightly cemented, some generally horizontal banding apparent
		End at 5 feet; No Water; No Caving; No Fill
27	0 - 2½	ALLUVIAL FILL: Sand, brown, slightly moist, medium dense, fine-grained Sand, contains pieces of wood
	2½ - 4	ALLUVIUM: Sand, brown, slightly moist, dense, fine-grained, cemented
	4 - 5	Sand, light brown, slightly moist, dense, fine-grained, not cemented
	5 - 6	Sand, brown, slightly moist, dense, fine-grained, cemented
		End at 6 feet; No Water; No Caving; No Fill
28	0 - 2	SOIL: Sand, reddish-brown, slightly moist, medium dense; becomes dense at 1 foot
	2 - 7	ALLUVIUM: Sand, reddish-brown, slightly moist to moist, dense, fine-grained, slightly cemented
		End at 7 feet; No Water; No Caving; No Fill

(Continued)

TABLE IV- LOG OF TEST PITS (Continued)

Pit Number	Depth (Feet)	Description
29	0 - ½	SOIL: Sand, reddish-brown, slightly moist, medium dense to dense, fine-grained Sand
	½ - 4	QUATERNARY TERRACE: Sand, reddish-brown, slightly moist, dense, fine-grained Sand, cemented
		End at 4 feet; No Water; No Caving; No Fill
30	0 - ½	SOIL: Sand, reddish-brown, slightly moist, medium dense to dense, fine-grained Sand
	½ - 4	QUATERNARY TERRACE: Sand, reddish-brown, slightly moist, dense, fine-grained Sand, cemented; some horizontal layering apparent
		End at 4 feet; No Water; No Caving; No Fill
31	0 - 1½	FILL: Sand, reddish-brown, slightly moist, medium dense, fine-grained Sand
	1½ - 5	QUATERNARY TERRACE: Sand, light reddish-brown, slightly moist to moist, dense, fine-grained Sand, slightly cemented
		End at 5 feet; No Water; No Caving; Fill to 1½ feet
32	0 - ½	SOIL: Sand, reddish-brown, slightly moist, medium dense, fine-grained Sand
	½ - 5	QUATERNARY TERRACE: Sand, light reddish-brown, slightly moist to moist, dense, fine-grained Sand, slightly cemented
		End at 5 feet; No Water; No Caving; No Fill

(Continued)

TABLE IV- LOG OF TEST PITS (Continued)

Pit Number	Depth (Feet)	Description
33	0 - 1½	FILL: Sand, reddish-brown to brown, slightly moist, medium dense
	1½ - 3	Sand, reddish-brown, slightly moist, dense, fine-grained, cemented
	3 - 6	Sand, light brown, dry, dense, not cemented, caving occurs
		End at 6 feet; No Water; Caving below 3 feet; Fill to total depth
34	0 - 8	FILL: Sand, reddish-brown, slightly moist, dense, fine-grained Sand, pieces of plastic or hard rubber and concrete present
		approximate location of contact; contact difficult difficult to discern
	8 - 11	QUATERNARY TERRACE: Sand, reddish-brown, slightly moist, dense, fine-grained, slightly cemented
		End at 11 feet; No Water; No Caving; Fill to approximately 8 feet
35	0 - 1	SOIL: Sand, reddish-brown, moist, medium dense, fine-grained Sand
	1 - 6	PLEISTOCENE SEDIMENTS: Sand, light yellow-brown, moist, dense, fine-grained Sand; no cohesion; severe caving
		End at 6 feet; No Water; Caving; No Fill
36	0 - 3	SOIL: Sand, dark brown, moist, medium dense, fine-grained Sand, slightly porous
	3 - 6	QUATERNARY TERRACE: Sand, reddish-brown, moist, dense, slightly cemented, fine-grained Sand
		End at 6 feet; No Water; No Caving; No Fill

(Continued)

TABLE IV- LOG OF TEST PITS (Continued)

Pit Number	Depth (Feet)	Description
37	0 - 1½	SOIL: Sand, dark brown, moist, medium dense, fine-grained Sand, slightly porous
	1½ - 6	QUATERNARY TERRACE: Sand, light reddish-brown, slightly moist, dense, fine-grained Sand, slightly porous.
		End at 6 feet; No Water; No Caving; No Fill
38	0 - 1	SOIL: Sand, light reddish-brown, dry, loose to medium dense, fine-grained
	1 - 5	QUATERNARY TERRACE: Sand, light reddish-brown, slightly moist, dense, fine-grained Sand, slightly porous
		End at 5 feet; No Water; No Caving; No Fill
39	0 - 5	QUATERNARY TERRACE: Sand, reddish-brown, moist, dense, fine-grained Sand, slightly cemented, slightly porous near surface
		End at 5 feet; No Water; No Caving; No Fill
40	0 - 3	SOIL: Sand, brown, slightly moist to moist, medium dense, fine-grained Sand, slightly porous
	3 - 6	QUATERNARY TERRACE: Sand, reddish-brown, moist, dense, fine-grained Sand, slightly cemented, upper portion slightly porous
		End at 6 feet; No Water; No Caving; No Fill

(Continued)

TABLE IV- LOG OF TEST PITS (Continued)

Pit Number	Depth (Feet)	Description
41	0 - 1	DISTURBED SOIL: Sand, reddish-brown, slightly moist, medium dense, fine-grained Sand, disturbed by discing weeds
	1 - 5½	QUATERNARY TERRACE: Sand, reddish-brown with irregular light brown zones, moist, dense, fine-grained Sand. Reddish-brown Sand is slightly cemented, light brown Sand is non-cemented
		End at 5½ feet; No Water; No Caving; No Fill
42	0 - 2	SOIL: Sand, brown, slightly moist, medium dense, fine-grained Sand, slightly porous
	2 - 6	DUNE SAND: Sand, light brown, slightly moist, dense, very fine-grained, non-cemented; contact dips gently downslope
	6 - 10	QUATERNARY TERRACE: Sand, reddish-brown, moist to wet, fine to medium-grinaed, slightly cemented
		End at 10 feet; No Water; No Caving; No Fill
43	0 - 2½	SOIL: Sand, brown, slightly moist, medium dense, fine-grained Sand, slightly porous
	2½ - 4½	DUNE SAND: Sand, light brown, slightly moist, dense, fine to very fine-grained Sand, non-cemented; contact dips gently downslope
	4½ - 7½	QUATERNARY TERRACE: Sand, reddish-brown, moist, dense, fine to medium-grained Sand, slightly cemented
		End at 7½ feet; No Water; No Caving; No Fill

(Continued)

TABLE IV- LOG OF TEST PITS (Continued)

Pit Number	Depth (Feet)	Description
44	0 - 4	FILL: Sand, light brown, slightly moist, medium dense, fine-grained Sand
	4 - 8	DUNE SAND: Sand, light yellow, slightly moist to moist, dense, fine-grained, not cemented; some layering apparent, dipping 10 to 20 degrees to the south; encountered 6-inch Clay sewer pipe not in use at 3 to 4 feet
		End at 8 feet; No Water; Severe Caving; Fill to 4 feet
45	0 - 1	DISTURBED SOIL: Sand, light brown to reddish-brown, slightly moist, loose, fine-grained Sand, disturbed by discing weeds
	1 - 5	QUATERNARY TERRACE: Sand, reddish-brown, moist, dense, fine-grained Sand, slightly cemented
		End at 5 feet; No Water; No Caving; No Fill
46	0 - 1	DISTURBED SOIL: Sand, reddish-brown, slightly moist, medium dense, disturbed by discing weeds
	1 - 5	QUATERNARY TERRACE: Sand, reddish-brown, moist, dense, fine-grained Sand, slightly cemented
		End at 5 feet; No Water; No Caving; No Fill
47	0 - 4	SOIL: Sand, brown, slightly moist to moist, medium dense, fine-grained Sand, slightly to moderately porous; occasional light brown pockets; caving
	4 - 7	QUATERNARY TERRACE: Sand, light brown to reddish-brown, moist, dense, fine-grained Sand, slightly cemented
		End at 7 feet; No Water; Caving in Soil; No Fill

(Continued)

TABLE IV- LOG OF TEST PITS (Continued)

Pit Number	Depth (Feet)	Description
48	0 - 1	SOIL: Sand, light brown, slightly moist, loose to medium dense, fine-grained Sand
	1 - 3	Sand, brown, slightly moist, dense, fine-grained Sand, porous
	3 - 4	Sand, light yellow-brown, moist, dense, fine-grained
	4 - 5	Sand, brown to reddish-brown, moist, dense, fine-grained
	5 - 8	QUATERNARY TERRACE: Sand, reddish-brown, moist, dense, fine-grained, slightly cemented
		End at 8 feet; No Water; No Caving; No Fill
49	0 - 4½	SOIL: Sand, brown, slightly moist, medium dense, fine-grained; becomes dense at 1½ feet
	4½ - 7	QUATERNARY TERRACE: Sand, reddish-brown with light brown pockets, moist, dense, fine-grained, slightly cemented
		End at 7 feet; No Water; No Caving; No Fill
50	0 - 3	SOIL: Sand, brown, dry to slightly moist, medium dense, fine-grained; becomes dense at 1 foot
	3 - 6	QUATERNARY TERRACE: Sand, reddish-brown, slightly moist to moist, dense, fine-grained Sand, cemented
		End at 6 feet; No Water; No Caving; No Fill

(Continued)

TABLE IV- LOG OF TEST PITS (Continued)

Pit Number	Depth (Feet)	Description
51	0 - 4	SOIL: Sand, brown, slightly moist, medium dense, fine-grained Sand; becomes dense at 1 foot; becomes dark brown at 3 feet
	4 - 7	QUATERNARY TERRACE: Sand, light reddish-brown, slightly moist, dense, fine-grained Sand, slightly cemented; becomes brown at 6 feet
	7 - 11	PLEISTOCENE SEDIMENTS: Clayey Sand, green-brown, slightly moist, dense, fine to medium-grained Sand; Clay content becomes less with depth
		End at 11 feet; No Water; No Caving; No Fill
52	0 - 1½	SOIL: Sand, reddish-brown, slightly moist, loose to medium dense, fine-grained Sand
	1½ - 4½	QUATERNARY TERRACE: Sand, reddish-brown, slightly moist, dense, fine-grained Sand, slightly cemented
		End at 4½ feet; No Water; No Caving; No Fill
53	0 - 3½	SOIL: Sand, brown, slightly moist, medium dense, fine-grained Sand; becomes dense at 1½ feet
	3½ - 6	QUATERNARY TERRACE: Sand, reddish-brown, slightly moist, dense, fine-grained Sand, slightly cemented
		End at 6 feet; No Water; No Caving; No Fill

NOTE: The stratification depths represent the approximate boundary between earth types; the transition may be gradual.

TABLE IV

LOG OF TEST PITS

Number	(Feet)	Description
54	0 - 1	FILL: Silty Sand, light reddish brown, slightly moist, slightly cemented
	1 - 4	DUNE SAND: Sand, light yellow, slightly moist, moderately dense, layered
		End at 4 feet; No Water; No Caving; Fill to 1 ft.
55	0 - 5	TERRACE: Silty Sand, reddish brown, slightly moist, dense, some layering, locally cemented
		End at 5 feet; No Water; No Caving; No Fill.
56	0 - 4	TERRACE: Sand and Silty Sand, reddish brown, moist, dense, locally cemented
		End at 4 feet; No Water; No Caving; No Fill.
57	0 - 5	TERRACE: Sand and Silty Sand, reddish brown, moist, dense, locally cemented
		End at 5 feet; No Water; No Caving; No Fill.
58	0 - 5	TERRACE: Sand and Silty Sand, reddish brown, moist, dense, locally cemented
		End at 5 feet; No Water; No Caving; No Fill.

Continued...

TABLE IV

LOG OF TEST PITS

59	0 - 1	FILL: Silty Sand, reddish brown, dry, loose
	1 - 6	TERRACE: Silty Sand, red brown, moist, medium dense to dense
		End at 6 feet; No Water; No Caving; Fill to 1 ft.
60	0 - 6	DUNE SAND: Sand, brown, slightly moist, medium dense, layered, layers dipping southeast about 2:1
	6 - 8	TERRACE: Sand to Silty Sand, red brown, slightly moist, medium dense
		End at 8 feet; No Water; No Caving; No Fill.
61	0 - 4	DUNE SAND: Sand, brown, slightly moist, medium dense, layered
	4 - 6	TERRACE: Sand to Silty Sand, red brown, slightly moist, medium dense
		End at 6 feet; No Water; Caving in dune sand, No Fill
62	0 - 4	TERRACE: Sand, brown, slightly moist, medium dense, no layering
		End at 4 feet; No Water; Caving in terrace; No Fill.

Continued...

TABLE IV

LOG OF TEST PITS

63	0 - 1	FILL: Silty Sand, light brown, slightly moist, loose
	1 - 5	TERRACE: Sandy to Silty Sand, brown to red brown, moist, medium dense
		End at 5 feet; No Water; No Caving; Fill to 1 ft.
64	0 - 1	SOIL: Silty Sand, light brown, dry, loose
	1 - 5	TERRACE: Silty Sand, red brown, slightly moist, medium dense to dense, slightly cemented
		End at 5 feet; No Water; No Caving; No Fill.
65	0 - 1 1/2	SOIL: Silty Sand, light brown, dry, loose, burrows
	1 1/2 - 3	Silty Sand, light brown, slightly moist, medium dense
	3 - 5	TERRACE: Silty Sand, red brown, moist, dense, slightly cemented
		End at 5 feet; No Water; No Caving; No Fill.
66	0 - 1 1/2	SOIL: Silty Sand, light brown, dry, loose, burrows
	1 1/2 - 3	Silty Sand, light brown, slightly moist, medium dense
	3 - 5	TERRACE: Silty Sand, red brown, moist, dense, slightly cemented
		End at 5 feet; No Water; No Caving; No Fill.

Continued...

TABLE IV

LOG OF TEST

67	0 - 1	SOIL: Silty Sand, light brown, slightly moist, loose
	1 - 5	Silty Sand, light brown, slightly moist, medium dense with red brown, silty sand stringers
		End at 5 feet; No Water; No Caving; No Fill.
68	0 - 4	FILL: Silty Sand, brown, slightly moist, loose to medium dense, minor concrete rubble
	4 - 5	TERRACE: Silty Sand, medium brown, slightly moist, dense, cemented
		End at 5 feet; No Water; No Caving; Fill to 4 feet.
69	0 - 5	FILL: Silty Sand, brown, dry to slightly moist, medium dense, minor concrete debris near base
	5 - 6	TERRACE: Silty Sand, red brown, slightly moist, medium dense, slightly cemented
		End at 6 feet; No Water; No Caving; Fill to 5 ft. Electric line at 1 foot on south side of pit.
70	0 - 5	FILL: Silty Sand, brown, slightly moist, medium dense
		End at 5 feet; No Water; No Caving; Fill to total depth. Electric line at 1 foot on south side of pit.

Continued...

TABLE IV

LOG OF TEST PITS

71	0 - 3	SOIL: Silty Sand, light brown, slightly moist, medium dense
	3 - 7	PLEISTOCENE SAND: Sand to Sandy Gravel, Sand is coarse-grained, brown, moist, dense, layered
	7 - 9	Sand to Silty Sand, Sand is fine to medium-grained, brown to red brown, moist, dense, layered
	9 - 11	Sand, brown, coarse-grained, moist, dense
		End at 11 feet; No Water; No Caving; No Fill.
72	0 - 4	FILL: Silty Sand, light brown and dark brown, slightly moist, medium dense
		End at 4 feet; No Water; No Caving; Fill to total depth. Electric line at 1/2 foot, running parallel to rear wall.
73	0 - 4	FILL: Silty Sand, light brown, slightly moist, medium dense
	4 - 4 1/2	minor concrete rubble, horizontal layering
	4 1/2 - 9	Silty Sand, light brown and dark brown, slightly moist, medium dense
	9 - 10	Silty Sand, light brown, slightly moist, medium dense, slightly cemented
		End at 10 feet; No Water; No Caving; Fill to 9 feet.
74	0 - 3	TERRACE: Silty Sand, red brown, slightly moist, cemented, difficult to excavate
		End at 3 feet; No Water; No Caving; No Fill.

Continued...

TABLE IV

LOG OF TEST PITS

75	0 - 4	TERRACE: Silty Sand, red brown, slightly moist, cemented
	4 - 7	Sand, light brown, slightly moist, medium dense, with red brown silty sand, lenses, cemented
		End at 7 feet; No Water; No Caving; No Fill.
76	0 - 3	TERRACE: Silty Sand, red brown, slightly moist, cemented, slightly porous
		End at 3 feet; No Water; No Caving; No Fill.
77	0 - 3	ALLUVIUM: Silty Sand to Sand, light brown, slightly cemented, porous
	3 - 7	TERRACE: Sand to Silty Sand, light brown, slightly moist, medium dense to dense, slightly cemented
		End at 7 feet; No Water; No Caving; No Fill.
78	0 - 2 1/2	PLEISTOCENE SAND: pebbles sand, light brown, slightly moist, minor red brown silty sand stringers
	2 1/2 - 4	Silty Sand, red brown, slightly moist, cemented
	4 - 7	Silty Sand, light red brown, slightly moist, slightly cemented
		End at 7 feet; No Water; No Caving; No Fill.

Continued...

TABLE IV

LOG OF TEST PITS

79	0 - 1	SOIL: Silty Sand, brown, dry, loose
	1 - 4	PLEISTOCENE SAND: Silty Sand, red brown, slightly moist, cemented
	4 - 5	Bands of Silty Sand, sand is light brown, coarse-grained, slightly moist and dense
	5 - 5 1/2	Silty Sand is red brown, slightly moist and cemented
		End at 5 1/2 feet; No Water; No Caving; No Fill.
80	0 - 1 1/2	SOIL: Silty Sand, light brown, dry, loose
	1 1/2 - 8 1/2	PLEISTOCENE SAND: Silty Sand and Sand, light brown to red brown, medium to coarse-grained, layered, slightly moist, dense
		End at 8 1/2 feet; No Water; No Caving; No Fill.
81	0 - 8 1/2	FILL: Silty Sand, brown, slightly moist, loose to medium dense, minor rubble
		End at 8 1/2 feet; No Water; No Caving; Fill to total depth.
82	0 - 7	FILL: Silty Sand, brown, dry, loose to medium dense, minor rubble
		End at 7 feet; No Water; No Caving; Fill to total depth.

Continued...

TABLE IV

LOG OF TEST PITS

83	0 - 1	DISTURBED SOIL: Sand, reddish brown, slightly moist, medium dense, sand fine-grained, disturbed by discing weeds
	1 - 6 1/2	QUATERNARY TERRACE: Sand, reddish brown, moist dense, sand, fine-grained, slightly cemented, moderately porous (to 5 1/2 feet) becomes light reddish brown, non-porous (from 5 1/2 to 6 1/2 feet)
		End at 6 1/2 feet; No Water; No Caving; No Fill.
84	0 - 1	DISTURBED SOIL: light brown, dry to slightly moist, loose to medium dense, sand fine grained, disturbed by discing weeds
	1 - 6 1/2	QUATERNARY TERRACE: Sand, reddish brown, moist, dense, sand, fine-grained, slightly cemented, slightly to moderately porous, becomes less porous with depth (to 5 1/2 feet) becomes light reddish brown and non-porous from 5 1/2 to 6 1/2 feet
		End at 6 1/2 feet; No Water; No Caving; No Fill.

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TABLE IV (Continued)

Log Of Test Pits

Pit No.	Depth (Feet)	Description
85	0 - 2	SOIL: Sand, light brown, dry to slightly moist, medium dense, sand fine grained, moderately porous
	2 - 6	QUATERNARY TERRACE: Sand, reddish brown, moist, dense, sand fine grained, slightly cemented, slightly porous. Becomes non-porous with depth
		End at 6 feet; No Water; No Caving; No Fill.
86	0 - ½	DISTURBED SOIL: Sand, brown, dry, loose, sand fine grained, disturbed by disking weeds
	½ - 5	QUATERNARY TERRACE: Sand, dark reddish brown, slightly moist, dense, sand fine grained, slightly cemented, slightly porous (to 4 feet) Becomes reddish brown, non-porous from 4 to 5 feet).
		End at 5 feet; No Water; No Caving; No Fill.
87	0 - 1	DISTURBED SOIL, Sand, light brown, dry, loose, sand fine grained, disturbed by disking weeds
	1 - 5	QUATERNARY TERRACE: Sand, dark reddish brown, slightly moist, dense, sand fine grained, slightly cemented, moderately porous (to 3½ feet) Sand, reddish brown, moist, dense, sand fine grained, slightly cemented, non-porous from 3½ to 5 feet).
		End at 5 feet; No Water; No Caving; No Fill.

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TABLE IV(Continued)

Log Of Test Pits

Pit No.	Depth (Feet)	Description
88	0 - 1	DISTURBED SOIL: Sand,light brown, dry,loose, sand fine grained,disturbed by disking weeds
	1 - 5	QUATERNARY TERRACE: Sand, dark reddish brown, slightly moist, dense, sand fine grained,slightly cemented, moderately porous(to 4 feet) Sand, reddish brown, moist, dense, sand fine grained, slightly cemented,non-porous from 4 to 5 feet)
		End at 5 feet; No Water; No Caving; No Fill.
89	0 - 4	DISTURBED SOIL: Sand,light brown, dry, loose, sand fine grained,disturbed by disking weeds(to 1 foot)Becomes brown, dense and moderately porous (from 1 to 4 feet)
	4 - 6	QUATERNARY TERRACE: Sand, reddish brown, moist, dense, sand fine grained,slightly cemented, non-porous
		End at 6 feet; No Water; No Caving; No Fill.
90	0 - 4	SOIL: Sand, light brown, slightly moist, loose to medium dense, sand fine grained (to one foot)Becomes brown,dense and moderately porous from 1 to 4 feet)
	4 - 6	QUATERNARY TERRACE: Sand, reddish brown, moist, dense, sand fine grained, slightly cemented, non-porous
		End at 6 feet: No Water; No Caving; No Fill.

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TABLE IV (Continued)

Log Of Test Pits

Pit No.	Depth (Feet)	Description
91	0 - 4	FILL: Sand, mottled brown, slightly moist, medium dense, sand fine grained, pieces of asphalt and concrete present Fill becomes dense from 1 foot.
	4 - 6	SOIL: Sand, brown to dark brown, slightly moist, dense, sand fine grained, porous
	6 - 8	PLEISTOCENE SAND, light yellow brown, moist, dense, sand fine to medium grained, non-cemented, non porous
		End at 8 feet; No Water; No Caving Fill to 4 feet.
92	0 - 4½	FILL: Sand, mottled brown, slightly moist, medium dense, sand fine grained, pieces of asphalt and concrete present, Fill becomes dense from 3½ feet, Sand yellow brown, moist, fine to coarse grained, occasional rounded cobbles
		End at 4½ feet; No Water; No Caving; Fill to depth.
		Encountered corrugated drain pipe on west side of test pit.
93	0 - 2	FILL: Sand, mottled brown, slightly moist, medium dense, sand fine grained, pieces of concrete and asphalt present
	2 - 9	ALLUVIUM: Sand, reddish brown, moist, dense, sand fine grained
	9 - 10½	PLEISTOCENE SAND: light yellow brown, moist, dense, sand fine to medium grained, occasional gravel, non cemented
		End at 10½ feet; No Water; No Caving; Fill to 2 feet.

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TABLE IV (Continued)

Log Of Test Pits

Pit No.	Depth (Feet)	Description
94	0 - 3	SOIL: Sand, brown, slightly moist, medium dense to dense, sand fine grained, (from 1½ feet occasional pockets of light yellow brown sand)
	3 - 6½	PLEISTOCENE SAND: light yellow brown, moist, dense, fine to very fine grained, not cemented - occasional cobbles present
		End at 6½ feet; No Water; No Caving; No Fill.
95	0 - 4	SOIL: Sand, light brown to brown, dry to slightly moist, medium dense, sand fine grained. Becomes dense from one foot
	4 - 6	PLEISTOCENE SAND: light yellow brown, moist, dense, fine to very fine grained, not cemented - occasional cobbles present
		End at 6 feet; No Water; No Caving; No Fill.
96	0 - 2½	SOIL: Sand, brown, dry to slightly moist, loose to medium dense, sand fine grained. Becomes slightly moist, dense and moderately porous from one foot)
	2½ - 5½	QUATERNARY TERRACE: Sand, reddish brown, moist, dense, sand fine grained, slightly cemented, non-porous
		End at 5½ feet; No Water; No Caving; No Fill.

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TABLE IV (Continued)

Log Of Test Pits

Pit No.	Depth (Feet)	Description
97	0 - 8	FILL: Sand with Clay Binder, mottled brown, moist, medium dense, pieces of asphalt present (from 4 feet to 6 feet Clayey Sand, mottled green grey, moist, medium dense) (From 6 to 7 feet - Sand, reddish brown, moist, medium dense, sand fine grained) (From 7 to 8 feet - Clayey Sand, mottled green grey, moist, medium dense
		End at 8 feet; No Water; No Caving; Fill to total depth.
98	0 - 9	FILL: Sand, brown, slightly moist, medium dense, sand fine grained, pieces of asphalt are present (abundant pieces of asphalt from about 8 feet)
	9 - 11	QUATERNARY TERRACE: Sand, reddish brown, moist, dense, sand fine grained, slightly cemented
		End at 11 feet; No Water; No Caving; Fill to 9 feet.
99	0 - 2	FILL: Sand, brown, slightly moist, medium dense (From one foot to two feet-Sand with Clay Binder, mottled, green brown, moist, dense)
	2 - 6	QUATERNARY TERRACE: Sand, reddish brown, moist, dense, sand fine grained, slightly cemented, slightly porous
		End at 6 feet: No Water; No Caving; Fill to 2 feet.

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TABLE IV (Continued)

Log Of Test Pits

Pit No	Depth (Feet)	Description
100	0 - 4	FILL: Sand, brown, moist, medium dense, sand fine grained, pieces of asphalt present
	4 - 7	QUATERNARY TERRACE: Sand, reddish brown, moist, dense, sand fine grained, slightly cemented, slightly porous
		End at 7 feet; No Water; No Caving; Fill to 4 feet.
101	0 - 2	SOIL: Sand, brown, moist, medium dense, sand fine grained, porous
	2 - 6	QUATERNARY TERRACE: Sand, reddish brown, moist, dense, sand fine grained, slightly cemented. (Becomes light red brown from 5 feet)
		End at 6 feet; No Water; No Caving; No Fill.
102	0 - 2½	SOIL: Sand, brown, slightly moist, medium dense, sand fine grained, porous
	2½ - 5½	QUATERNARY TERRACE: Sand, reddish brown, moist, dense, sand fine grained, slightly cemented
		End at 5½ feet; No Water; No Caving; No Fill.
103	0 - 2½	FILL: Sand, brown to light brown, slightly moist to moist, medium dense
	2½ - 3½	SOIL: Sand, brown, slightly moist, dense, sand fine grained, porous (Contact between fill and soil dips gently downslope)
	3½ - 5	QUATERNARY TERRACE: Sand, reddish brown, moist, dense, sand fine grained, slightly cemented
		End at 5 feet: No Water; No Caving; Fill to 2½

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TABLE IV (Continued)

Log Of Test Pits

Pit No.	Depth (Feet)	Description
104	0 - 2½	FILL: Sand, brown to light brown, slightly moist to moist, medium dense
	2½ - 6½	SOIL: Sand, brown, slightly moist, dense, sand fine grained, porous (Contact between fill and soil dips gently downslope)
	6½ - 8	PLEISTOCENE SAND: light yellow brown, slightly moist, dense, sand fine grained, not cemented
		End at 8 feet; No Water; No Caving; Fill to 2½ feet.
105	0 - 1½	SOIL: Sand, brown, moist, medium dense, sand fine grained, slightly porous
	1½ - 4	PLEISTOCENE SAND: light yellow brown, moist, dense, sand fine grained, occasional rounded cobbles, not cemented
		End at 4 feet; No Water; No Caving; No Fill.
106	0 - 1½	FILL: Sand, light brown, slightly moist, loose to medium dense, sand fine grained,
	1½ - 2½	SOIL: Sand, brown, moist, medium dense, sand fine grained, slightly porous (Contact between fill and soil dips gently downslope)
	2½ - 5	PLEISTOCENE SAND: light yellow brown, moist, dense, sand fine grained, occasional rounded cobbles, not cemented
		End at 5 feet; No Water; No Caving; Fill to 1½ feet.

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TABLE IV (Continued)

Log Of Test Pits

Pit No.	Depth (Feet)	Description
107	0 - 1½	SOIL: Sand, brown, slightly moist, medium dense, sand fine grained, slightly porous
	1½ - 5	PLEISTOCENE SAND: light yellow brown to orange brown, moist, dense, sand medium to coarse grained(to 2½ feet), sand alternating yellow brown and reddish brown layering, moist, dense, sand fine grained, layering nearly horizontal
		End at 5 feet; No Water; No Caving; No Fill.
108	0 - 2	FILL/FAILURE DEBRIS: Sand, light brown,slightly moist, medium dense, sand fine grained
	2 - 4½	SOIL: Sand, brown, slightly moist, dense,sand fine grained,slightly porous
	4½ - 6	PLEISTOCENE SAND: light yellow brown, moist, dense, sand fine to very fine grained, non-cemented
		End at 6 feet; No Water; No Caving; Fill to 2 feet.
109	0 - 5	FILL/FAILURE DEBRIS: Sand, light brown to brown, slightly moist, medium dense, sand fine grained (to 1½ feet) Fill becomes mottled brown, slightly moist to moist and dense. (Possible fill over pipe)
		End at 5 feet; No Water; No Caving; Fill to total depth.

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TABLE IV (Continued)

Log Of Test Pits

Pit No.	Depth (Feet)	Description
110	0 - 3	FILL/FAILURE DEBRIS: Sand, light brown to mottled brown, slightly moist to moist, medium dense to dense
	3 - 8	SOIL: Sand, brown, slightly moist to moist, dense, sand fine grained, slightly porous
	8 - 10	PLEISTOCENE SAND: light yellow brown, moist, dense, sand fine grained, not cemented
		End at 10 feet; No Water; No Caving; Fill to 3 feet.
111	0 - 1	FAILURE DEBRIS: Sand, light brown, moist, medium dense
	1 - 2	SOIL: Sand, brown, slightly moist, dense, slightly porous
	2 - 4	PLEISTOCENE SAND: light yellow brown, moist, dense, sand fine grained, non cemented
		End at 4 feet; No Water; No Caving; No Fill.
112	0 - 2	FAILURE DEBRIS: Sand, brown, moist, medium dense (to 1 foot) Sand, orange brown, slightly moist, dense, sand fine to medium grained (from one to two feet)
	2 - 3	SOIL: Sand, brown, slightly moist, dense, slightly porous
	3 - 5	PLEISTOCENE SAND: light yellow brown, moist, dense, sand fine to very fine grained, not cemented
		End at 5 feet; No Water; No Caving; No Fill.

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TABLE IV (Continued)

Log Of Test Pits

Pit No.	Depth (Feet)	Description
113	0 - 6	SOIL: Sand, light brown, slightly moist, loose to medium dense, sand fine grained (to 2 feet) Becomes brown, slightly moist to moist, dense and slightly porous
	6 - 8	PLEISTOCENE SAND: light yellow brown, moist, dense, sand fine to very fine grained, non-porous
		End at 8 feet; No Water; No Caving; No Fill.
114	0 - 2	SOIL: Sand, brown, moist, loose to medium dense, porous
	2 - 5	PLEISTOCENE SAND: yellow brown, to light brown, moist, dense, sand fine grained
		End at 5 feet; No Water; No Caving; No Fill.
115	0 - 2½	SOIL: Sand, brown, moist, loose to medium dense, porous
	2½ - 5	PLEISTOCENE SAND: yellow brown, moist, dense, sand fine grained, non cemented, occasional soil pockets in upper portion
		End at 5 feet; No Water; No Caving; No Fill.

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TABLE IV (Continued)

Log Of Test Pits

Pit No.	Depth (Feet)	Description
116	0 - 1	SOIL: Sand: light brown, dry, loose, sand fine grained
	1 - 7	ALLUVIUM: Sand, alternating reddish brown & light yellow brown layers, moist, dense, occasional rounded cobbles
	7 - 9	PLEISTOCENE SAND: light yellow brown, moist, dense, fine to coarse grained
		End at 9 feet; No Water; No Caving; No Fill.
117	0 - 1½	SOIL: Sand, brown, moist, medium dense, sand fine grained, porous
	1½ - 4	PLEISTOCENE SAND: light yellow brown with occasional brown banding, moist, dense, sand fine to very fine grained, non cemented, occasional pockets of soil in upper portion
		End at 4 feet; No Water; No Caving; No Fill.
118	0 - 2½	SOIL: Sand, brown, slightly moist, loose, sand fine grained (to ½ foot) Clayey Sand to Sandy Clay, brown, slightly moist, dense to stiff, sand fine grained (from ½ foot to 2½ feet)
	2½ - 6	PLEISTOCENE SAND: light yellow brown, slightly moist, dense, sand fine to medium grained, non cemented, caving
		End at 6 feet; No Water; Caving 3 to 6 feet; No Fill.

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TABLE IV(Continued)

Log Of Test Pits

Pit No.	Depth (Feet)	Description
119	0 - 3	FILL: Sand, light brown, slightly moist, loose to medium dense, sand fine grained (to 1½ feet) Alternating thin layers of Sand and Clayey Sand, light orange to dark brown, slightly moist to moist, medium dense, contains pieces of plates and bottles (from 1½ feet to 3 feet)
	3 - 7	ALLUVIUM: Sand, brown, moist, dense, sand fine grained, slightly porous
	7 - 10	PLEISTOCENE SAND: light yellow brown, moist, dense, sand fine to very fine grained, non cemented, occasional brown pockets decreasing with depth
		End at 10 feet; No Water; No Caving; Fill to 3 feet.
120	0 - 6	SOIL: Sand, brown, moist, medium dense to dense, sand fine grained, occasional rounded cobbles, slightly porous
	6 - 9	PLEISTOCENE SAND: light yellow brown, moist, den: sand fine to grained occasional rounded cobbles, occasional pockets of soil decreasing with depth, non cemented
		End at 9 feet; No Water; No Caving; No Fill.
121	0 - 3	FILL: Sand, layers of light brown and dark brown slightly moist, medium dense, sand fine grained, occasional pieces of wood and asphalt
	3 - 7	ALLUVIUM: Sand, brown, moist, dense, sand fine to med grained, occasional cobbles, slightly por
	7 - 9	PLEISTOCENE SAND: light yellow brown, moist, dense sand fine to grained occasional rounded cobbles, occasional pockets of soil decreasing with depth, non cemented
		End at 9 feet; No Water; No Caving; Fill to 3 feet.

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TABLE IV (Continued)

Log Of Test Pits

Pit No.	Depth (Feet)	Description
122	0 - 6	SOIL: Sand, brown, slightly moist, medium dense, sand fine grained (to 1 foot) Sand, reddish brown, slightly moist, dense, sand fine grained, occasional rounded cobbles, not porous
	6 - 8½	PLEISTOCENE SAND: light brown with brown pockets, moist, dense, sand fine grained, not cemented
		End at 8½ feet; No Water; No Caving; No Fill.
123	0 - 7	SOIL: Sand, brown, slightly moist, medium dense, sand fine grained, porous (to 1½ feet) Becomes reddish brown to brown, moist, medium dense, slightly porous, occasional rounded cobbles (from 1½ to 7 feet)
	7 - 10	QUATERNARY TERRACE: Sand, light brown with some red brown layering, moist, dense, sand fine to medium grained, occasional cobbles, not cemented, rounded (from 7 to 9 feet) Becomes yellow brown, sand fine to coarse grained, cobbles more abundant
		End at 10 feet; No Water; No Caving; No Fill

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TABLE IV (Continued)

Log Of Test Pits

Pit No.	Depth (Feet)	Description
124	0 - 2	SOIL: Sand, light brown, slightly moist, loose (to ½ foot) Sand, brown, moist, medium dense, sand fine to medium grained (from ½ foot to 2 feet)
	2 - 7	PLEISTOCENE SAND: light brown with occasional reddish brown banding, moist, dense, sand fine to medium grained, slightly cemented, non porous
		End at 7 feet; No Water; No Caving; No Fill.
125	0 - 2	FILL: Sand, brown, slightly moist, medium dense to dense, sand fine grained, occasional pieces of asphalt
	2 - 5	PLEISTOCENE SAND: light yellow brown, moist, dense, sand fine to coarse grained, non cemented, some cross bedding apparent in coarse sand
		End at 5 feet; No Water; No Caving; Fill to 2 feet.
126	0 - 2	FILL: Sand, reddish brown, slightly moist, dense, sand fine grained
	2 - 7	QUATERNARY TERRACE: Sand, reddish brown, moist, dense, sand fine grained, slightly cementec non porous (from 2 to 4½ feet) Sand, alternating yellow brown and reddish brov layers, moist, dense, sand fine to medium grained, slightly cemented, non porous
		End at 7 feet; No Water; No Caving; Fill to 2 feet.

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TABLE IV (Continued)

Log Of Test Pits

Pit No.	Depth (Feet)	Description
127	0 - 7	FILL: Sand alternating light yellow brown and reddish brown layering, thicknesses variable, moist, medium dense, caving
		End at 7 feet due to Caving; No Water; Caving; Fill to total depth.
128	0 - 4	FILL: Sand with Clay Binder, mottled brown, moist, medium dense, sand fine grained (Contact horizontal)
	4 - 9	PLEISTOCENE SAND: light yellow brown, moist, dense, sand fine to medium grained, non cemented (to 7 feet) Sand fine to coarse grained - some horizontal layering apparent (from 7 to 9 feet)
		End at 9 feet; No Water; No Caving; Fill to 4 feet.
129	0 - 6	SOIL: Sand, brown to reddish brown, slightly moist, medium dense, sand fine grained (to 1 foot) Becomes dense, porous (to 6 feet)
	6 - 9	PLEISTOCENE SAND, light yellow brown to brown, moist, dense, sand fine grained, non cemented, non porous
		End at 9 feet; No Water; No Caving; No Fill.

Continued...

TABLE IV

LOG OF TEST PITS

Number	(Feet)	Description
130	0 - 5	FILL: Silty Sand, brown with light brown, mottles dry, loose to medium dense End at 5 feet; No Water; No Caving; Fill to total depth.
131	0 - 5	FILL: Silty Sand, brown, slightly moist, loose to medium dense, minor rubble End at 5 feet; No Water; No Caving; Fill to total depth.
132	0 - 5	FILL: Silty Sand, brown, slightly moist, loose to medium dense, minor rubble End at 5 feet; No Water; No Caving; Fill to total depth.

NOTE: The stratification depths represent the approximate boundary between earth types; the transition may be gradual.

BORING LOG NUMBER 1

Drilling Date 6/14/83 Elevation

Project KB 7606-G HOWARD HUGHES

Sample Depth ft.	Blows per ft.	Moisture Content %	Dry Unit Weight p.c.f.	Depth in feet	Graphic Log	Description Surface Conditions
				1	SP	QUATERNARY TERRACE: Sand, reddish-brown, moist, dense, fine to medium-grained, slightly cemented
2	* 2	10.8	122.3			
						alternating reddish-brown and brown layers
5	3	9.4	124.1	5		
						light brown layer
10	T	10.3	111.8	10		becomes brown and moderately porous
						becomes reddish-brown
15	2	11.9	115.4	15		becomes brown to light brown and less cemented
					SW	Sand with Clay Binder, light brown, moist, dense, fine to medium-grained
					SP	PLEISTOCENE SEDIMENTS: Sand, light yellow-brown, moist, dense, fine to medium-grained, non to very slightly cemented
20	7	4.3	164.1	20		
						occasional light brown layers and occasional layers with medium to coarse-grained Sand
25	** 9	7.0	100.1	25		

(Continued)

BORING LOG NUMBER 1 (Continued)

Drilling Date _____ Elevation _____

Project KB 7606-G HOWARD HUGHES

Sample Depth ft.	Blows per ft.	Moisture Content %	Dry Unit Weight p.c.f.	Depth in feet	Graphic Log	Description Surface Conditions
				26	SP	PLEISTOCENE SEDIMENTS continues
30	15	9.6	102.5	30		alternating light yellow-brown and light brown layering
						becomes primarily light yellow-brown
35	16	15.6	100.6	35		
						becomes light gray-green with occasional medium to coarse-grained layers, occasional rounded pebbles to 1" diameter
40	14	19.0	101.8	40		
45	*** 14	5.0	101.4	45		
						becomes darker green-gray
50	16	7.1	108.7	50		

(Continued)

BORING LOG NUMBER 1 (Continued)

Drilling Date _____ Elevation _____

Project KB 7606-G HOWARD HUGHES →

Sample Depth ft.	Blows per ft.	Moisture Content % / Dry Unit Weight p.c.f.	Depth in feet	Graphic Log	Description Surface Conditions
			51	SP	PLEISTOCENE SEDIMENTS continues
					End at 51 feet; No Water; No Caving; No Fill
			55		*2600# Kelly, 12" Drop **1600# 1st Inner Kelly *** 800# 2nd Inner Kelly
					NOTE - PLATES A-1 THROUGH A-11: The stratification depths represent the approximate boundary between earth types; the transition may be gradual.
			60		
			65		
			70		
			75		

BORING LOG NUMBER 2

Drilling Date 6/14/83 Elevation

Project KB 7606-G HOWARD HUGHES

Sample Depth ft.	Blows per ft.	Moisture Content %	Dry Unit Weight p.c.f.	Depth in feet	Graphic Log	Description Surface Conditions
				1		QUATERNARY TERRACE: Sand, reddish-brown, moist, dense, fine to medium-grained Sand, slightly cemented, slightly to moderately porous, possible slight Clay Binder
	*				SP	
2	4	7.6	114.1			
5	4	6.6	109.6	5		
10	7	7.1	105.7	10		
15	11	8.2	116.4	15		becomes reddish-brown to brown
20	7	11.9	121.7	20		
	**					
25	11	10.2	118.6	25		

(Continued)

BORING LOG NUMBER 2 (Continued)

Drilling Date _____ Elevation _____

Project KB 7606-G HOWARD HUGHES

Sample Depth ft.	Blows per ft.	Moisture Content %	Dry Unit Weight p.c.f.	Depth in feet	Graphic Log	Description Surface Conditions
				26	SP	QUATERNARY TERRACE continues alternating layers of light brown and reddish-brown
30	13	13.9	114.0	30	SP	PLEISTOCENE SEDIMENTS: Sand with Clay Binder, green-gray with black spots, moist, dense, fine to medium-grained Sand; Clay layer present in sample becomes green-gray
35	12	35.0	87.8	35	CL	Clay, green-brown, moist, jointed, firm to stiff
					SP	Sand, gray-green, moist, dense, fine to medium-grained Sand, non to very slightly cemented
40	14	4.2	108.4	40		
						Sand becomes fine to coarse-grained
45	*** 12	4.2	102.0	45		
50	16	4.3	107.5	50		

(Continued)

BORING LOG NUMBER 2 (Continued)

Drilling Date _____ Elevation _____

Project KB 7606-G HOWARD HUGHES

Sample Depth ft.	Blows per ft.	Moisture Content %	Dry Unit Weight p.c.f.	Depth in feet	Graphic Log	Description Surface Conditions
				51		PLEISTOCENE SEDIMENTS continue
55	14	4.0	100.6	55		
60	13	5.1	104.9	60		
				65		End at 61 feet; No Water; No Caving; No Fill
				70		
				75		

BORING LOG NUMBER 3

Drilling Date 6/14/83 Elevation

Project KB 7606-G HOWARD HUGHES

Sample Depth ft.	Blows per ft.	Moisture Content %	Dry Unit Weight p.c.f.	Depth in feet	Graphic Log	Description Surface Conditions
				1	SP	SOIL: Sand, reddish-brown, moist, dense, fine to medium-grained, slightly cemented, slight Clay Binder, slightly to moderately porous
	*					becomes brown
5	6	---	---	5		sample wasted
					SP	DUNE SAND: Sand, light brown to yellow-brown, not cemented, moist, dense, fine to medium-grained, minor caving below 7 feet
10	4	5.9	106.4	10		
15	6	3.7	97.7	15		
20	3	3.7	95.8	20		
	**					
25	4	3.8	99.5	25		

(Continued)

BORING LOG NUMBER 3 (Continued)

Drilling Date _____ Elevation _____

Project KB 7606-G HOWARD HUGHES

Sample Depth ft.	Blows per ft.	Moisture Content %	Dry Unit Weight p.c.f.	Depth in feet	Graphic Log	Description Surface Conditions
				26	SP	DUNE SAND continues
30	5	3.6	96.9	30		severe caving
				35	SP	QUATERNARY TERRACE: Sand, reddish-brown, moist, dense, fine to medium-grained Sand, slightly cemented, no caving alternating reddish-brown and light brown layers
40	6	5.6	99.3	40		PLEISTOCENE SEDIMENTS: Sand, light brown, moist, dense, fine to medium-grinaed Sand, non to very slightly cemented becomes light brown to yellow-brown
				45		
50	*** 12	9.1	97.8	50		becomes light brown to orange-brown (Continued)

BORING LOG NUMBER 3

Drilling Date _____ Elevation _____

Project KB 7606-G HOWARD HUGHES

Sample Depth ft.	Blows per ft.	Moisture Content %	Dry Unit Weight p.c.f.	Depth in feet	Graphic Log	Description Surface Conditions
				51	SP	PLEISTOCENE SEDIMENTS continue
				55		End at 53 feet due to caving; No Water; No Fill
				60		
				65		
				70		
				75		

BORING LOG NUMBER 4

Drilling Date 6/15/83 Elevation

Project KB 7606-G HOWARD HUGHES

Sample Depth ft.	Blows per ft.	Moisture Content %	Dry Unit Weight p.c.f.	Depth in feet	Graphic Log	Description Surface Conditions
				1	SP	SOIL: Sand, brown, moist, dense, fine to medium-grained Sand, slightly cemented, slightly porous
5	* 2	7.2	116.8	5	SP	QUATERNARY TERRACE: Sand, reddish-brown, moist, dense, fine to medium-grained Sand, slightly cemented, non-porous
						becomes lighter reddish-brown
10	6	6.1	113.9	10		
15	6	2.3	106.9	15		alternating layers of light brown and light reddish-brown
20	9	3.8	114.5	20		
					SP	Sand, light yellow-brown, moist, dense, fine to medium-grained, not cemented
25	** 10	1.7	103.1	25		(Continued)

BORING LOG NUMBER 4 (Continued)

Drilling Date _____ Elevation _____

Project KB 7606-G HOWARD HUGHES

Sample Depth ft.	Blows per ft.	Moisture Content %	Dry Unit Weight p.c.f.	Depth in feet	Graphic Log	Description Surface Conditions
				26		QUATERNARY TERRACE continues
30	8	4.3	100.0	30		occasional reddish-brown, slightly cemented layers
						PLEISTOCENE SEDIMENTS: Sand, light yellow-brown, moist, dense, fine tomedium-grained Sand, non to very slightly cemented
35	6	2.3	107.0	35		
40	6	7.8	112.2	40		minor caving
				45		severe caving
				50		End at 50 feet due to caving; No Water; No Fill

BORING LOG NUMBER 5

Drilling Date _____ Elevation _____

Project KB 7607 HOWARD HUGHES REALTY

Sample Depth ft.	Blows per ft.	Moisture Content %	Dry Unit Weight p.c.f.	Depth in feet	Graphic Log	Description Surface Conditions
				1		SOIL: Sand, brown, moist, dense, sand fine to medium grain, slightly cemented, slightly porous
	* 2600					QUATERNARY TERRACE: Sand, reddish brown, moist, dense, slightly cemented, non-porous
5	2	7.8	112.2	5		
						alternating layers of reddish brown and light brown
10	6	9.3	110.9	10		NOTE: * 2600 # Kelly 12" Drop ** 1600 # Inner Kelly ***800 # 2nd Inner Kelly
15	4	6.8	104.7	15		PLEISTOCENE Sand: light yellow brown, moist, dense, sand fine to medium grain, non to very very slightly cemented
20	4	4.4	106.1	20		becomes light yellow brown to light brown, sand fine to coarse grained
						NOTE: On Plates A-1 through A-6 : The stratification lines represent the approximate boundary between earth types; the transition may be gradual.
	** 1600					occasional light orange brown layers
25	5	3.1	101.2	25		

BORING LOG NUMBER 5-Continued

Drilling Date _____ Elevation _____

Project KB 7607 HOWARD HUGHES REALTY

Sample Depth ft.	Blows per ft.	Moisture Content %	Dry Unit Weight p.c.f.	Depth in feet	Graphic Log	Description Surface Conditions
				26		occasional rounded pebbles to ½" diameter
30	7	2.8	103.5	30		alternating layers of fine and medium to coarse sand
						rounded cobbles to 4" diameter
35	11	3.5	103.4	35		Sand, light brown, fine to medium grained, occasional pebbles to 1" diameter
						becomes orange brown
40	8	4.4	112.0	40		becomes light brown alternating layers of fine and medium to coarse grained sand
						Sand, light brown to light yellow brown, predominantly fine to medium grained
	*** 800					occasional rounded pebbles to ½"diameter
45	12	5.9	96.2	45		
						occasional orange brown layers
50	16	5.3	88.7	50		Sand, light brown to light grey, very fine to fine grained

BORING LOG NUMBER 5-Continued

Drilling Date _____ Elevation _____

Project KB 7607 HOWARD HUGHES REALTY →

Sample Depth ft.	Blows per ft.	Moisture Content %	Dry Unit Weight p.c.f.	Depth in feet	Graphic Log	Description Surface Conditions
				51		PLEISTOCENE SAND continues
55	16	6.6	95.7	55		
60	16	7.5	94.0	60		
						End at 61 feet; No Water; No Caving; No Fill.

BORING LOG NUMBER 6

Drilling Date _____ Elevation _____

Project KB 7607 HOWARD HUGHES REALTY

Sample Depth ft.	Blows per ft.	Moisture Content %	Dry Unit Weight p.c.f.	Depth in feet	Graphic Log	Description Surface Conditions
				1		SOIL: Sand,brown, moist,dense, sand fine to medium grained,slightly cemented,slightly porous
	* 2600					QUATERNARY TERRACE: Sand,reddish brown,moist, dense, sand fine to medium grained,slightly cemented
5	2	7.5	112.7	5		minor caving
						alternating light brown and reddish brown layers
10	4	8.6	106.7	10		
						primarily reddish brown
15	5	10.4	107.8	15		
						alternating light brown & reddish brown layers
20	6	no sample		20		primarily light brown to yellow brown
	** 1600					PLEISTOCENE SAND,Light yellow brown,moist,dense, sand fine to medium grained,non to very slightly cemented
25	8	8.5	100.0	25		

BORING LOG NUMBER 6-Continued

Drilling Date _____ Elevation _____

Project KB 7607 HOWARD HUGHES REALTY

Sample Depth ft.	Blows per ft.	Moisture Content %	Dry Unit Weight p.c.f.	Depth in feet	Graphic Log	Description Surface Conditions
				26		Sand,yellow brown,primarily fine grained
						Sand,yellow to orange brown, fine to coarse grained
30	7	7.1	92.8	30		rounded gravel to ½" diameter
						alternating layers of fine and medium to coarse sand
						Sand to Silty Sand,light greenish brown,moist, dense,very fine to fine grained
35	9	9.3	106.1	35		
						Sand,light orange brown,moist, dense, sand fine to medium grained,primarily fine grained
						alternating orange brown and yellow brown layering
40	12	4.6	108.6	40		alternating layers of fine and medium to coarse sand
	*** 800					light yellow brown sand,primarily fine grained
45	18	4.6	100.2	45		
50	12	6.3	94.3	50		

BORING LOG NUMBER 6-Continued

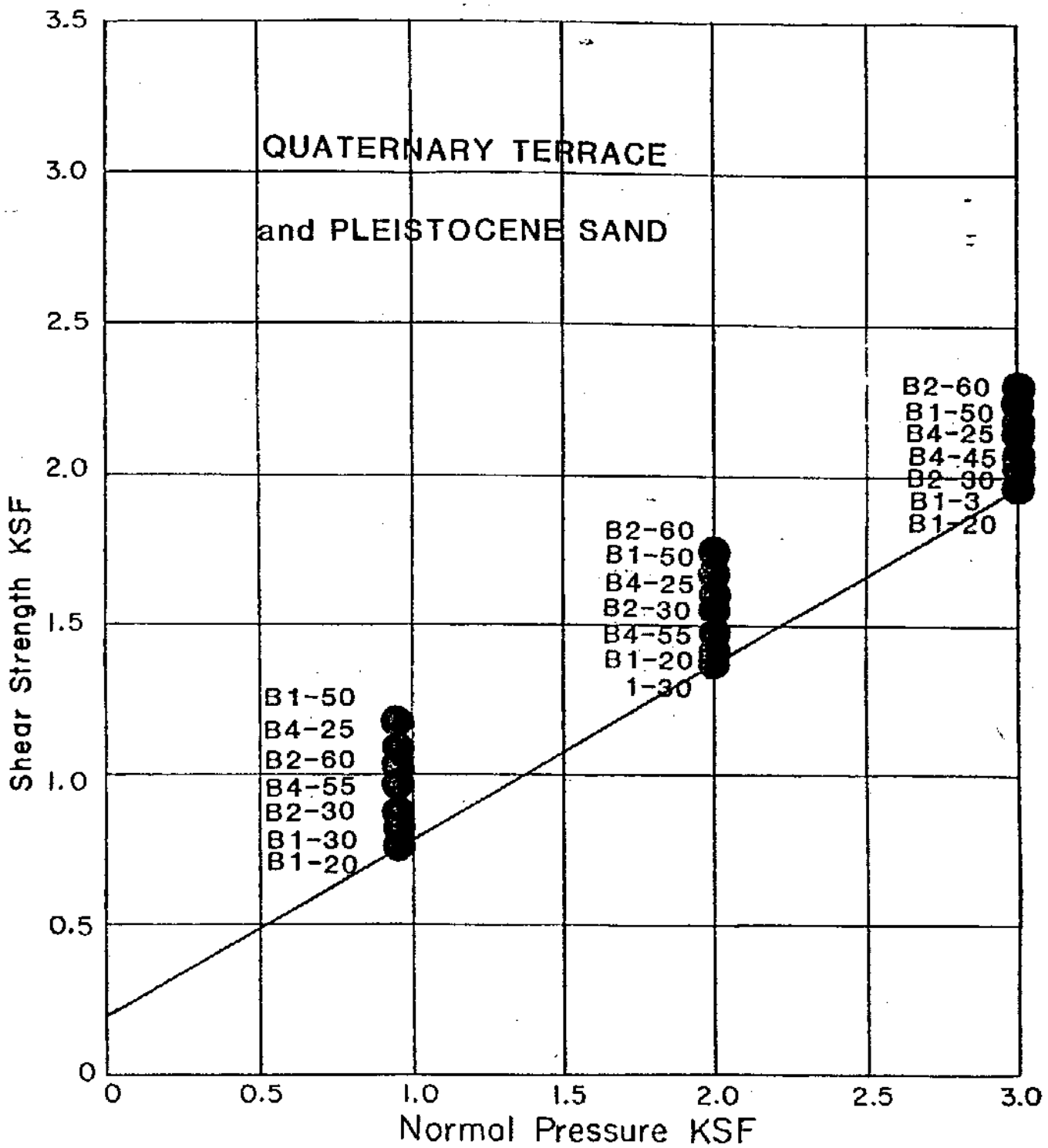
Drilling Date _____ Elevation _____

Project KB 7607 HOWARD HUGHES REALTY

Sample Depth ft.	Blows per ft.	Moisture Content %	Dry Unit Weight p.c.f.	Depth in feet	Graphic Log	Description Surface Conditions
				51		PLEISTOCENE SAND Continues
55	12	6.8	94.4	55		becomes light brown, sand fine grained
60	14	7.3	92.4	60		End at 61 feet; No Water; Minor Caving as noted; No Fill.

SHEAR TEST DIAGRAM

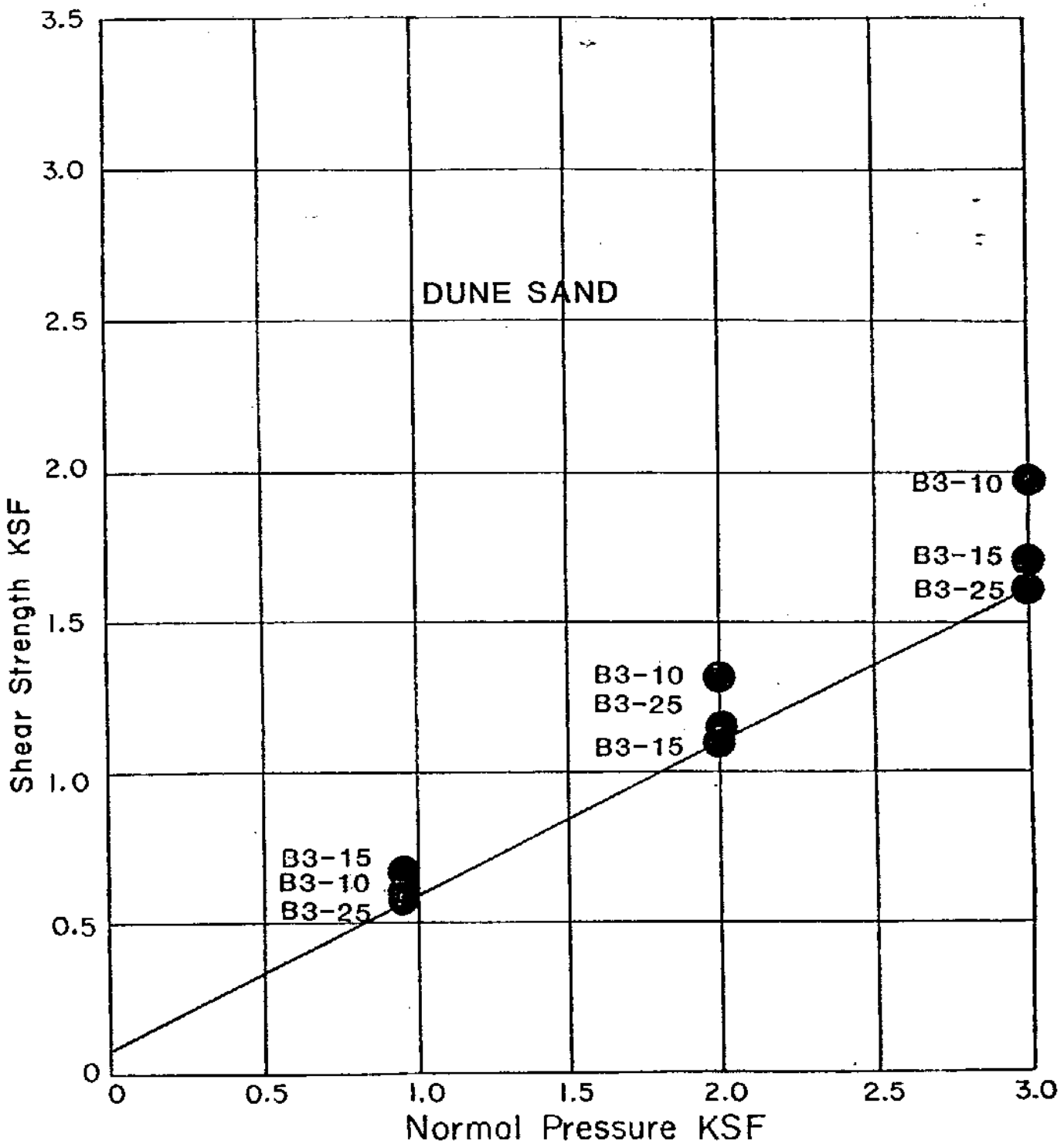
Project HUGHES REALTY KB 7606-G



○ Direct Shear at Field Moisture
● Direct Shear, Saturated
◡ Unconfined Compression Test
⊕ Vane Shear Test
⊙ Penetrometer

SHEAR TEST DIAGRAM

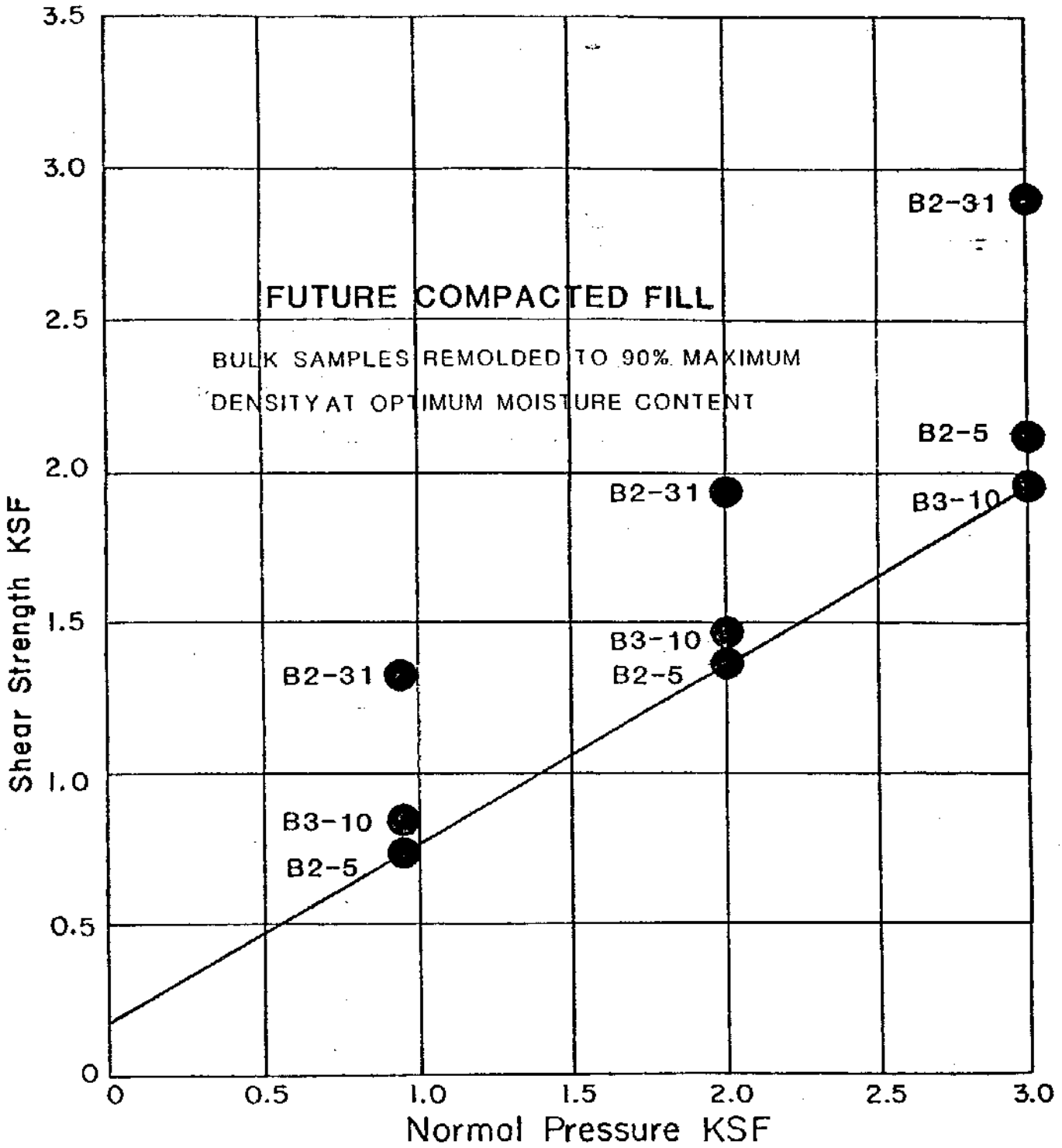
Project HUGHES REALITY KB 7606-G



○ Direct Shear at Field Moisture
● Direct Shear, Saturated
◡ Unconfined Compression Test
⊕ Vane Shear Test
⊙ Penetrometer

SHEAR TEST DIAGRAM

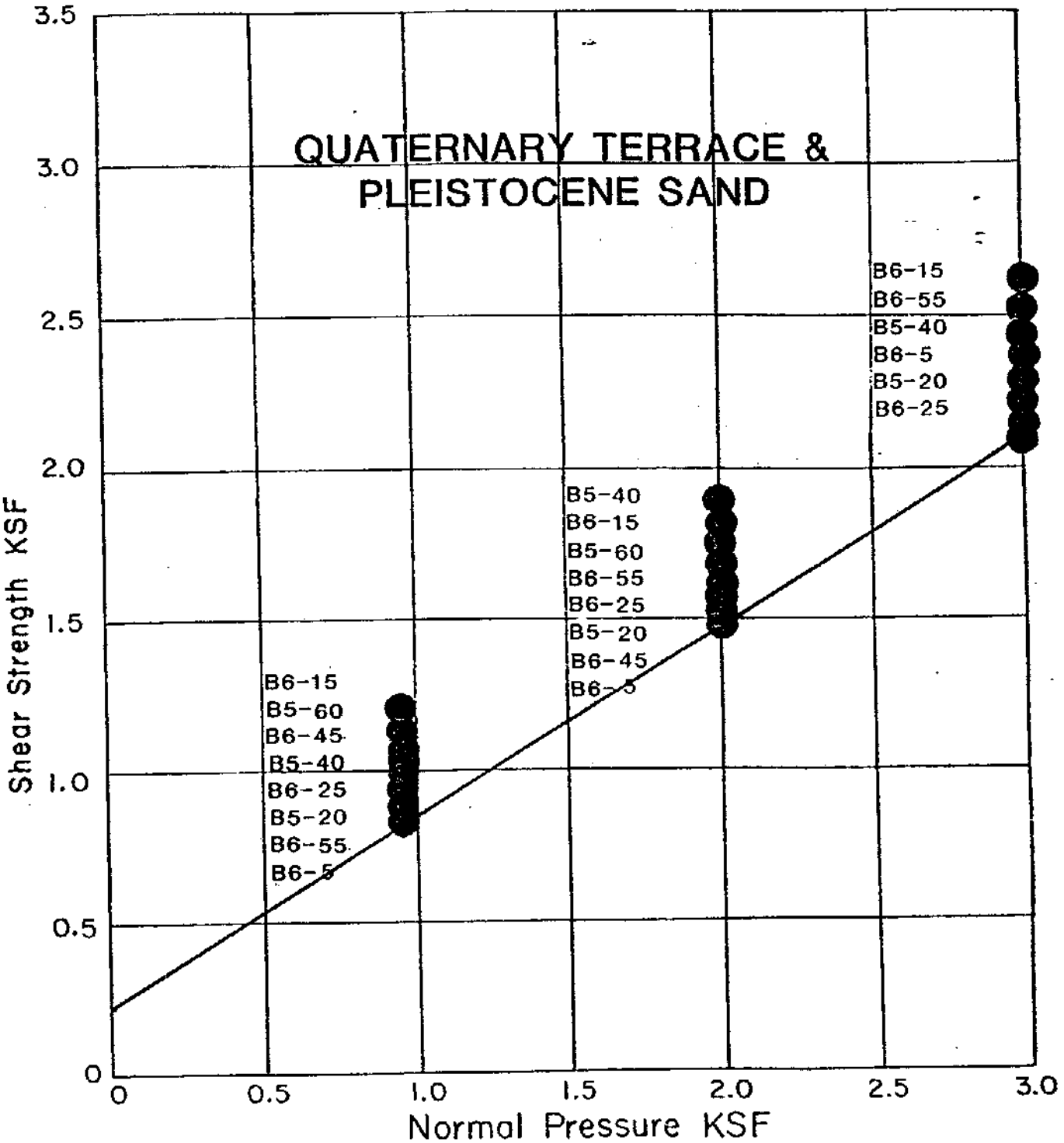
Project HUGHES REALITY KB 7606-G



○ Direct Shear at Field Moisture
● Direct Shear, Saturated
◡ Unconfined Compression Test
⊕ Vane Shear Test
⊙ Penetrometer

SHEAR TEST DIAGRAM

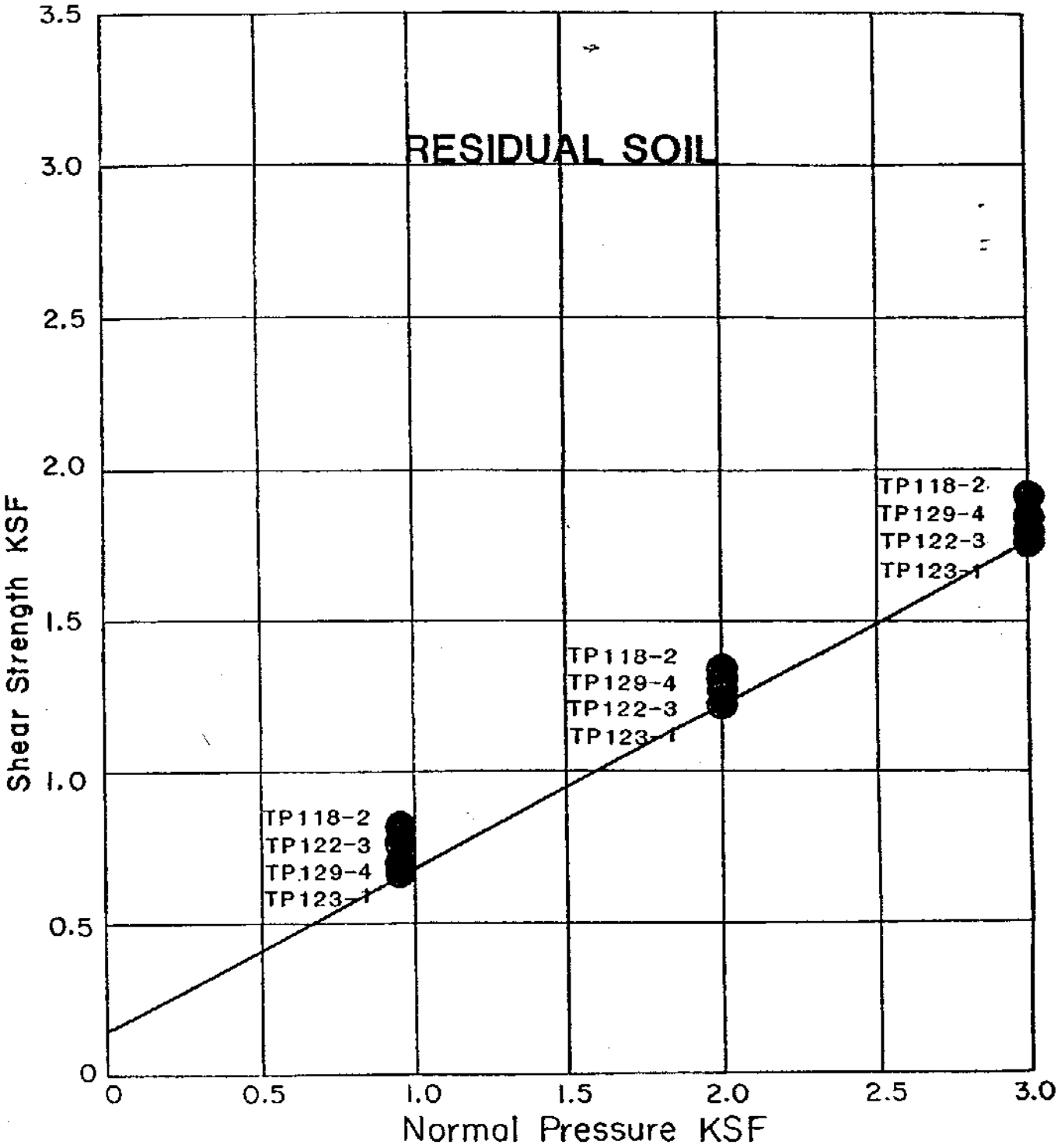
Project HUGHES REALTY KB 7607-G



○ Direct Shear at Field Moisture
● Direct Shear, Saturated
◡ Unconfined Compression Test
⊕ Vane Shear Test
⊙ Penetrometer

SHEAR TEST DIAGRAM

Project HUGHES REALTY KB 7607-G



○ Direct Shear at Field Moisture
● Direct Shear, Saturated
◡ Unconfined Compression Test
⊕ Vane Shear Test
⊙ Penetrometer

Kovacs-Byer and Associates Inc.
CONSULTING ENGINEERS and GEOLOGISTS

BY________ DATE________ SUBJECT SLOPE CALC

HOWARD HUGHES

CHECKED BY________ DATE________

KB 7606-G

****
HOWARD HUGHES SECTION 6
****

****
ANALYSIS BY BISHOP'S SIMPLIFIED METHOD
****

****
* ** *
* *   * *
* * ----------------------------------   * *
* * ISTAB - slope stability analysis   * *
* *   Revision 2.30 - 11/20/84   * *
* * ----------------------------------   * *
* *   * *
* * TAGA Engineering Software Services   * *
* *   Berkeley, California   * *
* *   * *
* * IBM PC & 8086/8088 MS-DOS Version by * *
* *   * *
* * Design Professionals Management Systems * *
* *   Kirkland, Washington   * *
* *   * *
* *   copyright (c) 1983, 1984 TAGA   * *
* *   copyright (c) 1983, 1984 DPMS   * *
* *   * *
* ** *
****

****
INPUT DATA
****

CONTROL DATA,

AUTOMATIC SEARCH FOR CRITICAL CIRCLE

NUMBER OF DEPTH LIMITING TANGENTS	2
NUMBER OF VERTICAL SECTIONS	14
NUMBER OF SOIL LAYER BOUNDARIES	2
NUMBER OF POINTS DEFINING COHESION PROFILE	0
NUMBER OF CURVES DEFINING COHESION ANISOTROPY	0
NUMBER OF BOUNDARY LINE LOADS	2
NUMBER OF BOUNDARY PRESSURE LOADS	0

SEISMIC COEFFICIENT =	.000
ATMOSPHERIC PRESSURE =	2116.000
UNIT WEIGHT OF WATER =	62.400
UNIT WEIGHT OF WATER IN TENSION CRACK =	62.400

SEARCH STARTS AT CENTER (320.0, -40.0),WITH FINAL GRID OF 10.0

ALL CIRCLES TANGENT TO DEPTH, 70.0, 103.0,

GEOMETRY

SECTIONS	.00	178.00	250.00	288.00	314.00	350.00	360.00	377.00	382.00	388.00	432.00	440.00
T. CRACKS	1.00	-1.00	37.00	61.00	75.00	100.00	103.00	103.00	101.00	104.00	131.00	133.00
W IN CRACK	1.00	-1.00	37.00	61.00	75.00	100.00	103.00	103.00	101.00	104.00	131.00	133.00
BOUNDARY 1	-4.00	-6.00	32.00	56.00	70.00	100.00	103.00	103.00	101.00	104.00	131.00	133.00
BOUNDARY 2	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00

SECTIONS	471.00	520.00
T. CRACKS	135.00	135.00
W IN CRACK	135.00	135.00
BOUNDARY 1	135.00	135.00
BOUNDARY 2	200.00	200.00

SOIL PROPERTIES

LAYER	DENSITY	COHESION	FRICTION ANGLE	DELTA PHI
1	110.00	220.00	32.00	.00

BOUNDARY FORCES AND PRESSURES

LINE LOADS

X COORDINATE	MAGNITUDE	INCLINATION WITH VERT - DEG
126.00	2000.000	.00
172.00	2000.000	.00

CALC SHEET #1

Kovacs-Byer and Associates Inc.

CONSULTING ENGINEERS and GEOLOGISTS

BY _____ DATE _____

CHECKED BY _____ DATE _____

SUBJECT SLOPE CALC

HOWARD HUGHES

KB 7606-G2

****
RESULTS
****

****
DEPTH LIMITING TANGENT NO. 1 AT Y = 70.00
****

NUMBER	TANGENT	RADIUS	(X) CENTER	(Y) CENTER	F.S.
1	70.0	110.0	320.0	-40.0	1.713
2	70.0	110.0	300.0	-40.0	1.650
3	70.0	130.0	320.0	-60.0	1.643
4	70.0	110.0	340.0	-40.0	9.630
5	70.0	90.0	320.0	-20.0	1.869
6	70.0	130.0	310.0	-60.0	1.611
7	70.0	140.0	320.0	-70.0	1.620
8	70.0	130.0	330.0	-60.0	1.779
9	70.0	120.0	320.0	-50.0	1.673
10	70.0	130.0	300.0	-60.0	1.619
11	70.0	140.0	310.0	-70.0	1.598
12	70.0	120.0	310.0	-50.0	1.627
13	70.0	140.0	300.0	-70.0	1.607
14	70.0	150.0	310.0	-80.0	1.586
15	70.0	140.0	320.0	-70.0	1.620
16	70.0	150.0	300.0	-80.0	1.605
17	70.0	160.0	310.0	-90.0	1.577
18	70.0	150.0	320.0	-80.0	1.602
19	70.0	160.0	300.0	-90.0	1.605
20	70.0	170.0	310.0	-100.0	1.568
21	70.0	160.0	320.0	-90.0	1.587
22	70.0	170.0	300.0	-100.0	1.624
23	70.0	180.0	310.0	-110.0	1.581
24	70.0	170.0	320.0	-100.0	1.574
25	70.0	180.0	300.0	-110.0	1.648
26	70.0	180.0	320.0	-110.0	1.564
27	70.0	160.0	320.0	-90.0	1.587
28	70.0	160.0	300.0	-90.0	1.605
29	70.0	190.0	320.0	-120.0	1.556
30	70.0	180.0	330.0	-110.0	1.597
31	70.0	190.0	310.0	-120.0	1.601
32	70.0	200.0	320.0	-130.0	1.568
33	70.0	190.0	330.0	-120.0	1.580
34	70.0	200.0	310.0	-130.0	1.624
35	70.0	200.0	330.0	-130.0	1.567
36	70.0	180.0	330.0	-110.0	1.597
37	70.0	180.0	310.0	-110.0	1.581

F.S. MINIMUM= 1.556 FOR THE CIRCLE OF CENTER (320.0,-120.0)

****
DEPTH LIMITING TANGENT NO. 2 AT Y = 103.00
****

NUMBER	TANGENT	RADIUS	(X) CENTER	(Y) CENTER	F.S.
1	103.0	223.0	320.0	-120.0	1.[illegible]
2	103.0	213.0	290.0	-110.0	1.[illegible]
3	103.0	233.0	310.0	-130.0	1.781
4	103.0	213.0	330.0	-110.0	1.[illegible]
5	103.0	193.0	310.0	-90.0	1.[illegible]
6	103.0	233.0	330.0	-130.0	1.[illegible]
7	103.0	213.0	350.0	-110.0	1.441
8	103.0	193.0	330.0	-90.0	1.539
9	103.0	233.0	350.0	-130.0	1.471
10	103.0	213.0	370.0	-110.0	1.390
11	103.0	193.0	350.0	-90.0	1.434
12	103.0	213.0	360.0	-110.0	1.409
13	103.0	223.0	370.0	-120.0	1.391
14	103.0	213.0	390.0	-110.0	1.379
15	103.0	203.0	370.0	-100.0	1.389
16	103.0	223.0	380.0	-120.0	1.379
17	103.0	213.0	390.0	-110.0	1.384
18	103.0	203.0	380.0	-100.0	1.379
19	103.0	223.0	370.0	-120.0	1.391
20	103.0	233.0	380.0	-130.0	1.379
21	103.0	223.0	390.0	-120.0	1.379
22	103.0	233.0	370.0	-130.0	1.392
23	103.0	233.0	390.0	-130.0	1.376
24	103.0	213.0	390.0	-110.0	1.384
25	103.0	213.0	370.0	-110.0	1.399
26	103.0	243.0	390.0	-140.0	1.374
27	103.0	233.0	400.0	-130.0	1.408
28	103.0	243.0	380.0	-140.0	1.380
29	103.0	253.0	390.0	-150.0	1.373
30	103.0	243.0	400.0	-140.0	1.399
31	103.0	253.0	380.0	-150.0	1.381
32	103.0	263.0	390.0	-160.0	1.373
33	103.0	253.0	400.0	-150.0	1.391
34	103.0	263.0	380.0	-160.0	1.384
35	103.0	273.0	390.0	-170.0	1.374
36	103.0	263.0	400.0	-160.0	1.386
37	103.0	273.0	380.0	-170.0	1.395
38	103.0	273.0	400.0	-170.0	1.392
39	103.0	253.0	400.0	-150.0	1.391
40	103.0	253.0	380.0	-150.0	1.381

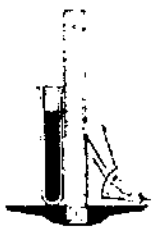
F.S. MINIMUM= 1.373 FOR THE CIRCLE OF CENTER (390.0,-150.0)

CALC SHEET #2

****
DEPTH LIMITING TANGENT NO. 3 AT Y = 133.00
****

NUMBER	TANGENT	RADIUS	(X) CENTER	(Y) CENTER	F.S.
1	133.0	253.0	440.0	-120.0	1.584
2	133.0	253.0	400.0	-120.0	1.535
3	133.0	293.0	440.0	-160.0	1.509
4	133.0	253.0	480.0	-120.0	2.589
5	133.0	213.0	440.0	-80.0	1.744
6	133.0	293.0	420.0	-160.0	1.495
7	133.0	313.0	440.0	-180.0	1.487
8	133.0	293.0	460.0	-160.0	1.592
9	133.0	273.0	440.0	-140.0	1.540
10	133.0	313.0	420.0	-180.0	1.493
11	133.0	333.0	440.0	-200.0	1.472
12	133.0	313.0	460.0	-180.0	1.539
13	133.0	333.0	420.0	-200.0	1.506
14	133.0	353.0	440.0	-220.0	1.471
15	133.0	333.0	460.0	-200.0	1.504
16	133.0	353.0	420.0	-220.0	1.526
17	133.0	373.0	440.0	-240.0	1.485
18	133.0	353.0	460.0	-220.0	1.478
19	133.0	373.0	420.0	-240.0	1.552
20	133.0	373.0	460.0	-240.0	1.462
21	133.0	333.0	460.0	-200.0	1.504
22	133.0	333.0	420.0	-200.0	1.506
23	133.0	393.0	460.0	-260.0	1.458
24	133.0	373.0	480.0	-240.0	1.521
25	133.0	393.0	440.0	-260.0	1.505
26	133.0	413.0	460.0	-280.0	1.470
27	133.0	393.0	480.0	-260.0	1.487
28	133.0	413.0	440.0	-280.0	1.530
29	133.0	413.0	480.0	-280.0	1.463
30	133.0	373.0	480.0	-240.0	1.521
31	133.0	373.0	440.0	-240.0	1.485

F.S. MINIMUM= 1.458 FOR THE CIRCLE OF CENTER (460.0,-260.0)



****

HOWARD HUGHES SECTION G WITH BUTTRESS
****
ANALYSIS BY BISHOP'S SIMPLIFIED METHOD
****

****
INPUT DATA
****

CONTROL DATA,

AUTOMATIC SEARCH FOR CRITICAL CIRCLE	
NUMBER OF DEPTH LIMITING TANGENTS	2
NUMBER OF VERTICAL SECTIONS	16
NUMBER OF SOIL LAYER BOUNDARIES	3
NUMBER OF POINTS DEFINING COHESION PROFILE	0
NUMBER OF CURVES DEFINING COHESION ANISOTROPY	0
NUMBER OF BOUNDARY LINE LOADS	2
NUMBER OF BOUNDARY PRESSURE LOADS	0

SEISMIC COEFFICIENT	=	.000
ATMOSPHERIC PRESSURE	=	2116.000
UNIT WEIGHT OF WATER	=	62.400
UNIT WEIGHT OF WATER IN TENSION CRACK	=	62.400

ARCH STARTS AT CENTER (440.0,-120.0),WITH FINAL GRID OF 20.0

ALL CIRCLES TANGENT TO DEPTH, 133.0, 135.0,

METRY

SECTIONS	.00	178.00	250.00	288.00	314.00	350.00	360.00	377.00	382.00	389.00	396.00	404.00
T. CRACKS	1.00	-1.00	37.00	61.00	75.00	100.00	103.00	103.00	101.00	104.00	109.00	109.00
W IN CRACK	1.00	-1.00	37.00	61.00	75.00	100.00	103.00	103.00	101.00	104.00	109.00	109.00
BOUNDARY 1	-4.00	-6.00	32.00	56.00	70.00	100.00	103.00	103.00	101.00	104.00	109.00	109.00
BOUNDARY 2	-4.00	-6.00	32.00	56.00	70.00	100.00	103.00	103.00	101.00	104.00	109.00	115.00
BOUNDARY 3	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00

SECTIONS	436.00	452.00	471.00	600.00
T. CRACKS	125.00	133.00	135.00	135.00
W IN CRACK	125.00	133.00	135.00	135.00
BOUNDARY 1	125.00	133.00	135.00	135.00
BOUNDARY 2	136.00	136.00	135.00	135.00
BOUNDARY 3	200.00	200.00	200.00	200.00

SOIL PROPERTIES

LAYER	DENSITY	COHESION	FRICTION ANGLE	DELTA PHI
1	115.00	180.00	31.00	.00
2	110.00	220.00	32.00	.00

BOUNDARY FORCES AND PRESSURES

LINE LOADS

X COORDINATE	MAGNITUDE	INCLINATION WITH VERT - DEG
126.00	2000.000	.00
172.00	2000.000	.00

Kovacs-Byer and Associates Inc.

CONSULTING ENGINEERS and GEOLOGISTS

BY_____ DATE_____

CHECKED BY_____ DATE_____

SUBJECT SLOPE CALC
HOWARD HUGHES

KB 7606-G

****
RESULTS
****

****
DEPTH LIMITING TANGENT NO. 1 AT Y = 133.00
****

NUMBER	TANGENT	RADIUS	(X) CENTER	(Y) CENTER	F.S.
1	133.0	253.0	440.0	-120.0	1.699
2	133.0	253.0	400.0	-120.0	1.694
3	133.0	293.0	440.0	-160.0	1.593
4	133.0	253.0	480.0	-120.0	2.752
5	133.0	213.0	440.0	-80.0	1.913
6	133.0	293.0	400.0	-160.0	1.593
7	133.0	333.0	440.0	-200.0	1.538
8	133.0	293.0	480.0	-160.0	2.179
9	133.0	333.0	420.0	-200.0	1.562
10	133.0	353.0	440.0	-220.0	1.531
11	133.0	333.0	460.0	-200.0	1.589
12	133.0	313.0	440.0	-180.0	1.560
13	133.0	353.0	420.0	-220.0	1.579
14	133.0	373.0	440.0	-240.0	1.539
15	133.0	353.0	460.0	-220.0	1.552
16	133.0	373.0	420.0	-240.0	1.601
17	133.0	373.0	460.0	-240.0	1.527
18	133.0	333.0	460.0	-200.0	1.589
19	133.0	333.0	420.0	-200.0	1.562
20	133.0	393.0	460.0	-260.0	1.518
21	133.0	373.0	480.0	-240.0	1.609
22	133.0	393.0	440.0	-260.0	1.556
23	133.0	413.0	460.0	-280.0	1.524
24	133.0	393.0	480.0	-260.0	1.563
25	133.0	413.0	440.0	-280.0	1.579
26	133.0	413.0	480.0	-280.0	1.530
27	133.0	373.0	480.0	-240.0	1.609
28	133.0	373.0	440.0	-240.0	1.539

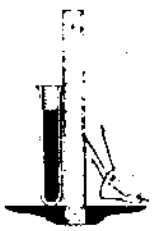
F.S. MINIMUM= 1.518 FOR THE CIRCLE OF CENTER (460.0,-260.0)

****
DEPTH LIMITING TANGENT NO. 2 AT Y = 135.00
****

NUMBER	TANGENT	RADIUS	(X) CENTER	(Y) CENTER	F.S.
1	135.0	395.0	460.0	-260.0	1.534
2	135.0	375.0	400.0	-240.0	1.700
3	135.0	415.0	440.0	-280.0	1.594
4	135.0	375.0	480.0	-240.0	1.609
5	135.0	335.0	440.0	-200.0	1.545
6	135.0	375.0	420.0	-240.0	1.614
7	135.0	355.0	440.0	-220.0	1.544
8	135.0	395.0	420.0	-260.0	1.639
9	135.0	395.0	460.0	-260.0	1.534
10	135.0	355.0	460.0	-220.0	1.562
11	135.0	355.0	420.0	-220.0	1.591
12	135.0	415.0	460.0	-280.0	1.542
13	135.0	395.0	480.0	-260.0	1.567
14	135.0	415.0	440.0	-280.0	1.594
15	135.0	415.0	480.0	-280.0	1.539
16	135.0	375.0	480.0	-240.0	1.609
17	135.0	375.0	440.0	-240.0	1.554

F.S. MINIMUM= 1.534 FOR THE CIRCLE OF CENTER (460.0,-260.0)

CALC SHEET # 5



****
HOWARD HUGHES SECTION H
****
ANALYSIS BY BISHOP'S SIMPLIFIED METHOD
****

****
INPUT DATA
****

CONTROL DATA,

AUTOMATIC SEARCH FOR CRITICAL CIRCLE	
NUMBER OF DEPTH LIMITING TANGENTS	3
NUMBER OF VERTICAL SECTIONS	17
NUMBER OF SOIL LAYER BOUNDARIES	2
NUMBER OF POINTS DEFINING COHESION PROFILE	0
NUMBER OF CURVES DEFINING COHESION ANISOTROPY	0
NUMBER OF BOUNDARY LINE LOADS	2
NUMBER OF BOUNDARY PRESSURE LOADS	0

SEISMIC COEFFICIENT	=	.000
ATMOSPHERIC PRESSURE	=	2116.000
UNIT WEIGHT OF WATER	=	62.400
UNIT WEIGHT OF WATER IN TENSION CRACK	=	62.400

SEARCH STARTS AT CENTER (320.0, -40.0),WITH FINAL GRID OF 10.0

ALL CIRCLES TANGENT TO DEPTH, 84.0, 104.0, 136.0,

GEOMETRY

SECTIONS	.00	120.00	160.00	168.00	206.00	302.00	323.00	336.00	358.00	387.00	392.00	398.00
T. CRACKS	11.00	10.00	11.00	13.00	25.00	75.00	89.00	95.00	104.00	104.00	102.00	104.00
W IN CRACK	11.00	10.00	11.00	13.00	25.00	75.00	89.00	95.00	104.00	104.00	102.00	104.00
BOUNDARY 1	6.00	5.00	6.00	8.00	20.00	70.00	84.00	90.00	104.00	104.00	102.00	104.00
BOUNDARY 2	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00

SECTIONS	408.00	425.00	440.00	449.00	520.00
T. CRACKS	110.00	120.00	132.00	136.00	138.00
W IN CRACK	110.00	120.00	132.00	136.00	138.00
BOUNDARY 1	110.00	120.00	132.00	136.00	138.00
BOUNDARY 2	200.00	200.00	200.00	200.00	200.00

SOIL PROPERTIES

LAYER	DENSITY	COHESION	FRICTION ANGLE	DELTA PHI
1	110.00	220.00	32.00	.00

BOUNDARY FORCES AND PRESSURES

LINE LOADS

X COORDINATE	MAGNITUDE	INCLINATION WITH VERT - DEG
124.00	2000.000	.00
192.00	2000.000	.00

Kovacs-Byer and Associates Inc.

CONSULTING ENGINEERS and GEOLOGISTS

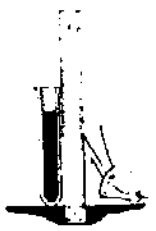
BY _____ DATE _____

CHECKED BY _____ DATE _____

SUBJECT SLOPE CALC

HOWARD HUGHES

KB 7607-G



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RESULTS
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****
DEPTH LIMITING TANGENT NO. 1 AT Y = 84.00
****

NUMBER	TANGENT	RADIUS	(X) CENTER	(Y) CENTER	F.S.
1	84.0	124.0	320.0	-40.0	1.639
2	84.0	124.0	300.0	-40.0	1.699
3	84.0	144.0	320.0	-60.0	1.621
4	84.0	124.0	340.0	-40.0	1.809
5	84.0	104.0	320.0	-20.0	1.660
6	84.0	144.0	310.0	-50.0	1.643
7	84.0	154.0	320.0	-70.0	1.621
8	84.0	144.0	330.0	-60.0	1.638
9	84.0	134.0	320.0	-50.0	1.629
10	84.0	154.0	310.0	-70.0	1.652
11	84.0	154.0	330.0	-70.0	1.625
12	84.0	134.0	330.0	-50.0	1.652
13	84.0	134.0	310.0	-50.0	1.652

F.S. MINIMUM= 1.621 FOR THE CIRCLE OF CENTER (320.0, -60.0)

****
DEPTH LIMITING TANGENT NO. 2 AT Y = 104.00
****

NUMBER	TANGENT	RADIUS	(X) CENTER	(Y) CENTER	F.S.
1	104.0	164.0	320.0	-60.0	1.662
2	104.0	154.0	290.0	-50.0	1.890
3	104.0	174.0	310.0	-70.0	1.734
4	104.0	154.0	330.0	-50.0	1.612
5	104.0	134.0	310.0	-30.0	1.727
6	104.0	154.0	320.0	-50.0	1.658
7	104.0	164.0	330.0	-60.0	1.605
8	104.0	154.0	340.0	-50.0	1.576
9	104.0	144.0	330.0	-40.0	1.616
10	104.0	164.0	340.0	-60.0	1.572
11	104.0	154.0	350.0	-50.0	1.582
12	104.0	144.0	340.0	-40.0	1.585
13	104.0	164.0	350.0	-60.0	1.564
14	104.0	154.0	360.0	-50.0	1.569
15	104.0	144.0	350.0	-40.0	1.572
16	104.0	164.0	340.0	-60.0	1.572
17	104.0	174.0	350.0	-70.0	1.547
18	104.0	164.0	360.0	-60.0	1.557
19	104.0	174.0	340.0	-70.0	1.566
20	104.0	184.0	350.0	-80.0	1.545
21	104.0	174.0	360.0	-70.0	1.547
22	104.0	184.0	340.0	-80.0	1.571
23	104.0	194.0	350.0	-90.0	1.541
24	104.0	184.0	360.0	-80.0	1.538
25	104.0	194.0	360.0	-90.0	1.532
26	104.0	184.0	370.0	-80.0	1.559
27	104.0	174.0	360.0	-70.0	1.547
28	104.0	194.0	350.0	-90.0	1.541
29	104.0	204.0	360.0	-100.0	1.531
30	104.0	194.0	370.0	-90.0	1.547
31	104.0	204.0	350.0	-100.0	1.547
32	104.0	214.0	360.0	-110.0	1.525
33	104.0	204.0	370.0	-100.0	1.536
34	104.0	214.0	350.0	-110.0	1.556
35	104.0	224.0	360.0	-120.0	1.533
36	104.0	214.0	370.0	-110.0	1.525
37	104.0	224.0	350.0	-120.0	1.566
38	104.0	224.0	370.0	-120.0	1.526
39	104.0	204.0	370.0	-100.0	1.535
40	104.0	204.0	350.0	-100.0	1.547
41	104.0	234.0	370.0	-130.0	1.520
42	104.0	224.0	380.0	-120.0	1.547
43	104.0	234.0	360.0	-130.0	1.541
44	104.0	244.0	370.0	-140.0	1.526
45	104.0	234.0	380.0	-130.0	1.535
46	104.0	244.0	360.0	-140.0	1.551
47	104.0	244.0	380.0	-140.0	1.530
48	104.0	224.0	380.0	-120.0	1.547
49	104.0	224.0	360.0	-120.0	1.533

F.S. MINIMUM= 1.520 FOR THE CIRCLE OF CENTER (370.0,-130.0)

CALC SHEET #7

Kovacs-Byer and Associates Inc.

CONSULTING ENGINEERS and GEOLOGISTS

BY_____ DATE_____

CHECKED BY_____ DATE_____

SUBJECT SLOPE CALC

HOWARD HUGHES

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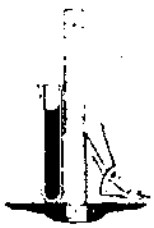

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DEPTH LIMITING TANGENT NO. 3 AT Y = 136.00

****

NUMBER	TANGENT	RADIUS	(X) CENTER	(Y) CENTER	F.S.
1	136.0	256.0	420.0	-120.0	1.821
2	136.0	256.0	380.0	-120.0	1.821
3	136.0	296.0	420.0	-160.0	1.744
4	136.0	256.0	460.0	-120.0	2.263
5	136.0	216.0	420.0	-80.0	1.966
6	136.0	296.0	400.0	-160.0	1.762
7	136.0	316.0	420.0	-180.0	1.730
8	136.0	296.0	440.0	-160.0	1.797
9	136.0	276.0	420.0	-140.0	1.775
10	136.0	316.0	400.0	-180.0	1.765
11	136.0	336.0	420.0	-200.0	1.725
12	136.0	316.0	440.0	-180.0	1.752
13	136.0	336.0	400.0	-200.0	1.778
14	136.0	356.0	420.0	-220.0	1.730
15	136.0	336.0	440.0	-200.0	1.721
16	136.0	356.0	440.0	-220.0	1.708
17	136.0	336.0	460.0	-200.0	1.808
18	136.0	316.0	440.0	-180.0	1.752
19	136.0	356.0	420.0	-220.0	1.730
20	136.0	376.0	440.0	-240.0	1.703
21	136.0	356.0	460.0	-220.0	1.755
22	136.0	376.0	420.0	-240.0	1.743
23	136.0	396.0	440.0	-260.0	1.707
24	136.0	376.0	460.0	-240.0	1.719
25	136.0	396.0	420.0	-260.0	1.762
26	136.0	396.0	460.0	-260.0	1.702
27	136.0	356.0	480.0	-220.0	1.755
28	136.0	356.0	420.0	-220.0	1.730
29	136.0	416.0	460.0	-280.0	1.694
30	136.0	396.0	480.0	-260.0	1.789
31	136.0	416.0	440.0	-280.0	1.719
32	136.0	436.0	460.0	-300.0	1.695
33	136.0	416.0	480.0	-280.0	1.744
34	136.0	436.0	440.0	-300.0	1.736
35	136.0	436.0	480.0	-300.0	1.713
36	136.0	396.0	480.0	-260.0	1.789
37	136.0	396.0	440.0	-260.0	1.707

F.S. MINIMUM= 1.694 FOR THE CIRCLE OF CENTER (460.0,-280.0)

CALC SHEET# 8

****
HOWARD HUGHES SECTION 1
****

****
ANALYSIS BY BISHOP'S SIMPLIFIED METHOD
****

****
INPUT DATA
****

CONTROL DATA.

AUTOMATIC SEARCH FOR CRITICAL CIRCLE	
NUMBER OF DEPTH LIMITING TANGENTS	2
NUMBER OF VERTICAL SECTIONS	12
NUMBER OF SOIL LAYER BOUNDARIES	2
NUMBER OF POINTS DEFINING COHESION PROFILE	0
NUMBER OF CURVES DEFINING COHESION ANISOTROPY	0
NUMBER OF BOUNDARY LINE LOADS	0
NUMBER OF BOUNDARY PRESSURE LOADS	0

SEISMIC COEFFICIENT	=	.000
ATMOSPHERIC PRESSURE	=	2116.000
UNIT WEIGHT OF WATER	=	62.400
UNIT WEIGHT OF WATER IN TENSION CRACK	=	62.400

SEARCH STARTS AT CENTER (280.0,-100.0),WITH FINAL GRID OF 15.0

ALL CIRCLES TANGENT TO DEPTH, 94.0, 130.0,

GEOMETRY

SECTIONS	-30.00	40.00	116.00	162.00	170.00	216.00	224.00	272.00	300.00	352.00	358.00	500.00
1. CRACKS	17.00	19.00	19.00	45.00	45.00	72.00	72.00	94.00	94.00	128.00	130.00	130.00
# IN CRACK	17.00	19.00	19.00	45.00	45.00	72.00	72.00	94.00	94.00	128.00	130.00	130.00
BOUNDARY 1	12.00	14.00	14.00	40.00	40.00	67.00	67.00	94.00	94.00	128.00	130.00	130.00
BOUNDARY 2	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00

SOIL PROPERTIES

LAYER	DENSITY	COHESION	FRICTION ANGLE	DELTA PHI
1	110.00	220.00	32.00	.00

Kovacs-Byer and Associates Inc.

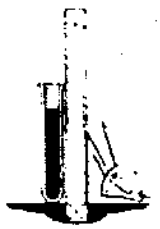
CONSULTING ENGINEERS and GEOLOGISTS

BY_____DATE_____

CHECKED BY_____DATE_____

SUBJECT SLOPE CALC
HOWARD HUGHES

KB 7607-G



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RESULTS
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****
DEPTH LIMITING TANGENT NO. 1 AT Y = 94.00
****

NUMBER	TANGENT	RADIUS	(X) CENTER	(Y) CENTER	F.S.
1	94.0	194.0	280.0	-100.0	1.781
2	94.0	194.0	250.0	-100.0	1.776
3	94.0	224.0	280.0	-130.0	1.715
4	94.0	194.0	310.0	-100.0	2.801
5	94.0	164.0	280.0	-70.0	1.833
6	94.0	224.0	265.0	-130.0	1.740
7	94.0	239.0	280.0	-145.0	1.711
8	94.0	224.0	295.0	-130.0	1.831
9	94.0	209.0	290.0	-115.0	1.744
10	94.0	239.0	265.0	-145.0	1.765
11	94.0	254.0	280.0	-160.0	1.723
12	94.0	239.0	295.0	-145.0	1.783
13	94.0	254.0	265.0	-160.0	1.797
14	94.0	254.0	295.0	-160.0	1.738
15	94.0	224.0	295.0	-130.0	1.831
16	94.0	224.0	265.0	-130.0	1.740

F.S. MINIMUM= 1.711 FOR THE CIRCLE OF CENTER (280.0,-145.0)

****
DEPTH LIMITING TANGENT NO. 2 AT Y = 130.00
****

NUMBER	TANGENT	RADIUS	(X) CENTER	(Y) CENTER	F.S.
1	130.0	275.0	280.0	-145.0	2.008
2	130.0	260.0	235.0	-130.0	2.387
3	130.0	290.0	265.0	-160.0	2.152
4	130.0	260.0	295.0	-130.0	1.895
5	130.0	230.0	265.0	-100.0	2.066
6	130.0	290.0	295.0	-160.0	1.927
7	130.0	260.0	325.0	-130.0	1.797
8	130.0	230.0	295.0	-100.0	1.888
9	130.0	290.0	325.0	-160.0	1.785
10	130.0	260.0	355.0	-130.0	1.845
11	130.0	230.0	325.0	-100.0	1.954
12	130.0	290.0	310.0	-160.0	1.844
13	130.0	305.0	325.0	-175.0	1.793
14	130.0	290.0	340.0	-160.0	1.766
15	130.0	275.0	325.0	-145.0	1.786
16	130.0	305.0	340.0	-175.0	1.757
17	130.0	290.0	355.0	-160.0	1.801
18	130.0	275.0	340.0	-145.0	1.789
19	130.0	305.0	325.0	-175.0	1.793
20	130.0	320.0	340.0	-190.0	1.758
21	130.0	305.0	355.0	-175.0	1.774
22	130.0	320.0	325.0	-190.0	1.805
23	130.0	320.0	355.0	-190.0	1.756
24	130.0	290.0	355.0	-160.0	1.891
25	130.0	290.0	325.0	-160.0	1.785
26	130.0	335.0	355.0	-205.0	1.740
27	130.0	320.0	370.0	-190.0	1.803
28	130.0	335.0	340.0	-205.0	1.765
29	130.0	350.0	355.0	-220.0	1.740
30	130.0	335.0	370.0	-205.0	1.776
31	130.0	350.0	340.0	-220.0	1.778
32	130.0	365.0	355.0	-235.0	1.747
33	130.0	350.0	370.0	-220.0	1.749
34	130.0	365.0	340.0	-235.0	1.774
35	130.0	365.0	370.0	-235.0	1.735
36	130.0	335.0	370.0	-205.0	1.776
37	130.0	335.0	340.0	-205.0	1.765
38	130.0	380.0	370.0	-250.0	1.732
39	130.0	365.0	385.0	-235.0	1.794
40	130.0	380.0	355.0	-250.0	1.758
41	130.0	395.0	370.0	-265.0	1.736
42	130.0	380.0	385.0	-250.0	1.763
43	130.0	395.0	355.0	-265.0	1.773
44	130.0	395.0	385.0	-265.0	1.742
45	130.0	365.0	385.0	-235.0	1.794
46	130.0	365.0	355.0	-235.0	1.747

F.S. MINIMUM= 1.732 FOR THE CIRCLE OF CENTER (370.0,-250.0)

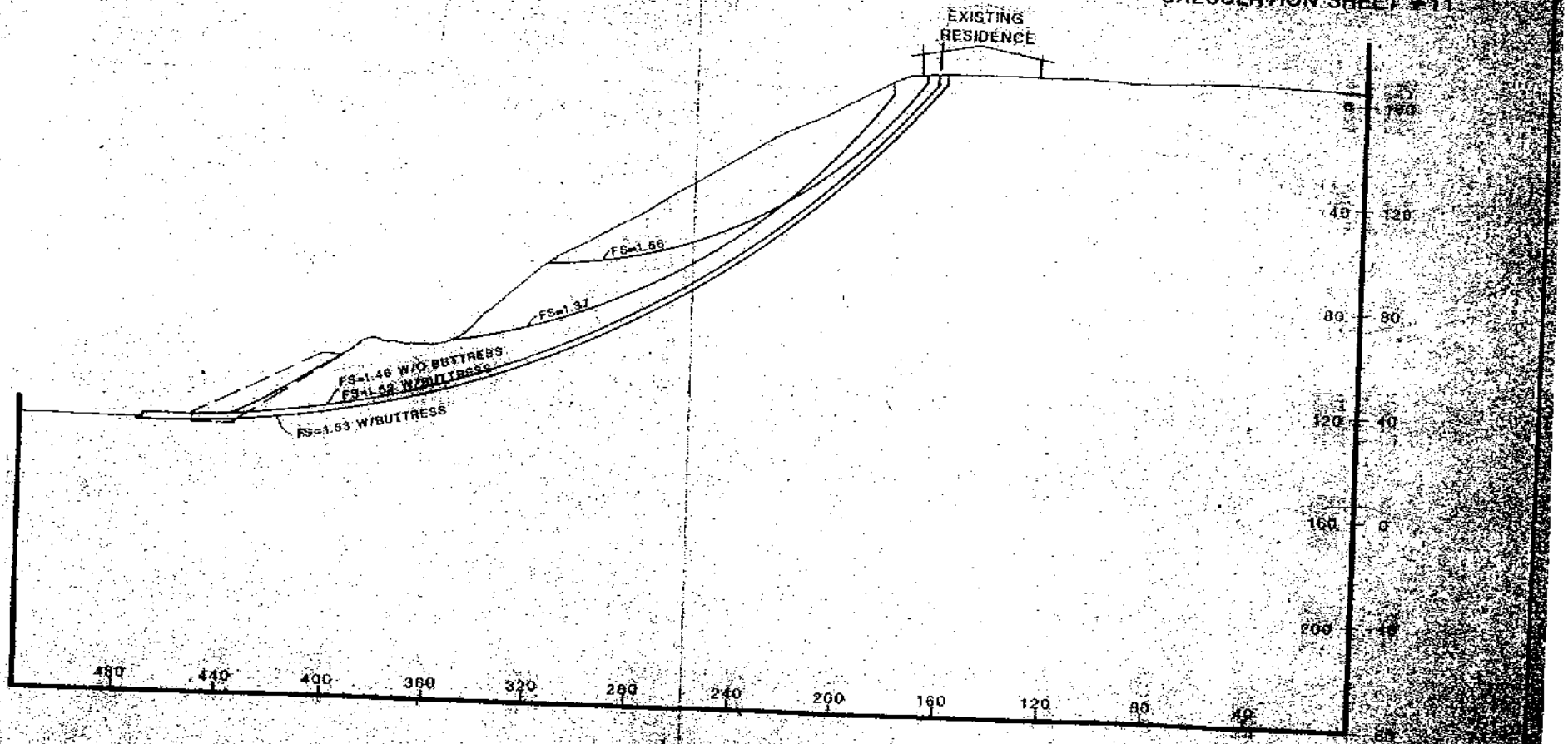
CALC SHEET #10

Kovacs-Byer and Associates Inc.
CONSULTING ENGINEERS and GEOLOGISTS

SCALE
DRAWN BY RAH
CONSULTANT RAH
REPORT DATE
CLIENT HUGHES
KB 760246

REVISED 8-6-87

CALCULATION SHEET #11



SECTION-G

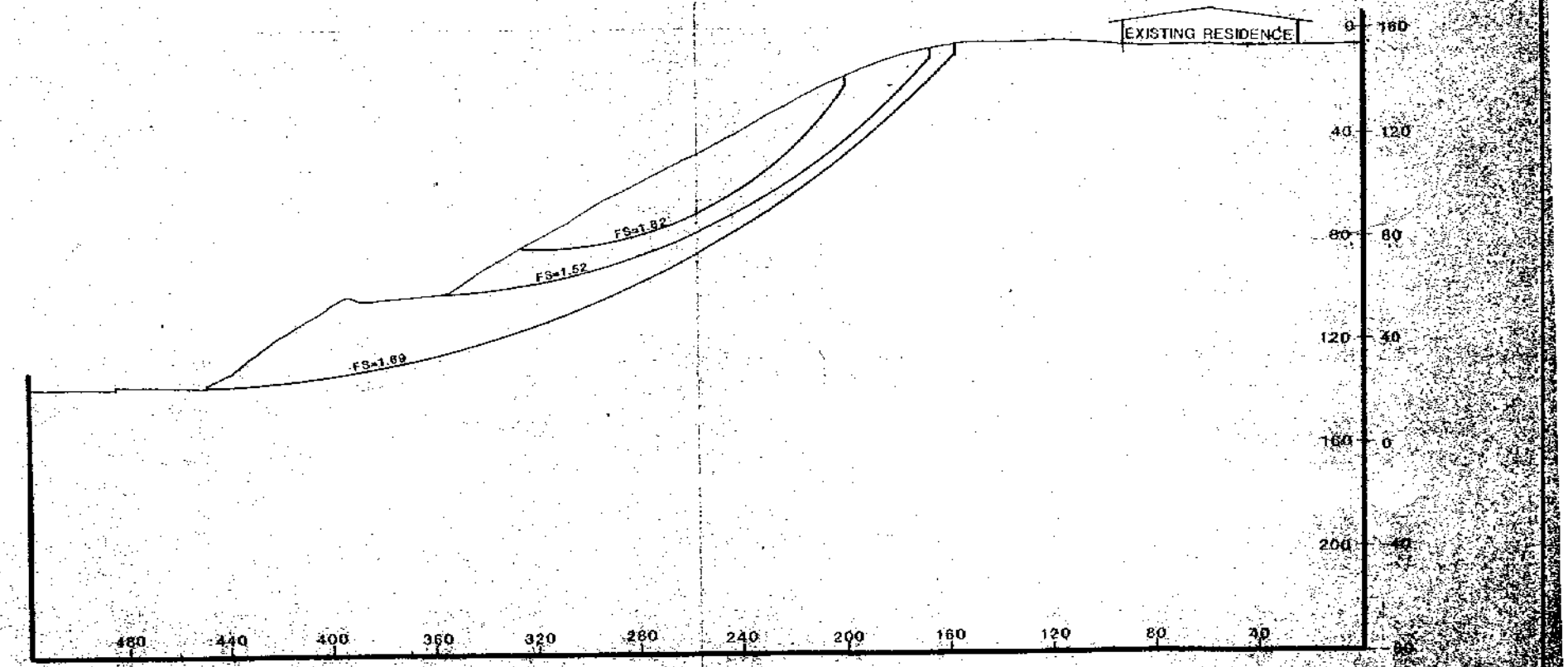
Kovacs-Byer and Associates Inc.
CONSULTING ENGINEERS and GEOLOGISTS

SCALE
DRAWN BY RAH
CONSULTANT RAH

REPORT DATE
CLIENT HUGHES
KB 7607-G

REVISED 8-5-87

CALCULATION SHEET #12



SECTION-H

Kovacs-Byer and Associates Inc.
CONSULTING ENGINEERS and GEOLOGISTS

DATE

SUBJECT HOWARD HUGHES
SURFICIAL STABILITY

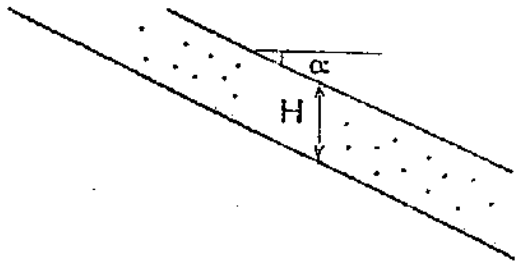
ECKED BY DATE

KB 7606-6

SURFICIAL STABILITY ANALYSIS

CALCULATE THE SURFICIAL STABILITY OF THE NATURAL SLOPES AT THE EASTERN END OF TENTATIVE TRACT 43416. THE SLOPES AVERAGE 2:1 IN GRADIENT BUT ARE AS STEEP AS 1¾:1

USE THE INFINITE SLOPE ANALYSIS WITH PARALLEL SEEPAGE*



SOIL PROPERTIES (ALL SATURATED)

γ_r = 110 PCF

ϕ = 28°

C = 150 PSF

REF: PLATE

H (DEPTH OF SATURATION) = 3 FT

α (SLOPE ANGLE) = 26° TO 30°

γ (DENSITY OF WATER) = 62.4 PCF

$$\text{FACTOR OF SAFETY} = \frac{C+(\gamma_r-\gamma_w)H\cdot\cos^2\alpha\cdot\tan\phi}{\gamma_r H\cdot\cos\alpha\cdot\sin\alpha}$$

$$= \frac{150+(110-62.4)3\cos^2{}^{30}_{26}\tan 28}{110\cdot 3\cdot\cos{}^{30}_{26}\cdot\sin{}^{30}_{26}} = \underline{1.62 \text{ TO } 1.45}$$

CONCLUSIONS

THE CALCULATION INDICATES THAT THE NATURAL SLOPES AT THE EAST END OF TENTATIVE TRACT 43416 ARE SURFICIALLY STABLE EVEN THOUGH THE FACTOR OF SAFETY FOR THE STEEPER PORTIONS IS SLIGHTLY LESS THAN THE CODE REQUIRED 1.50 S RECOMMENDED BY THE ASCE AND BUILDING & SAFETY ADVISORY COMMITTEE 8/16/78

Kovacs-Byer and Associates Inc.
CONSULTING ENGINEERS and GEOLOGISTS

DATE

SUBJECT HUGHES REALTY
SURFICIAL STABILITY

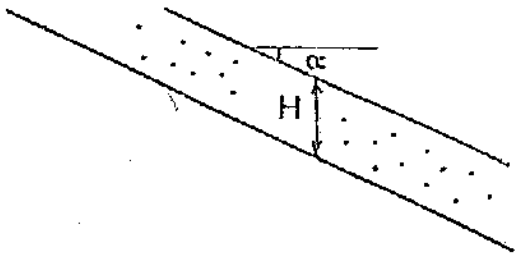
ECKED BY DATE

KB 7607-G

SURFICIAL STABILITY ANALYSIS

CALCULATE THE SURFICIAL STABILITY OF THE PROPOSED 1¾:1 CUT SLOPE

USE THE INFINITE SLOPE ANALYSIS WITH PARALLEL SEEPAGE*



STRENGTH PROPERTIES (ALL SATURATED)

$\gamma_T = 110$

$\phi = 32°$

$C = 220$

REF: PLATE

H (DEPTH OF SATURATION) = 3 FT

α (SLOPE ANGLE) = 30°

γ (DENSITY OF WATER) = 62.4 PCF

$$\text{FACTOR OF SAFETY} = \frac{C+(\gamma_T-\gamma_w)H\cdot\cos^2\alpha\cdot\tan\phi}{\gamma_T H\cdot\cos\alpha\cdot\sin\alpha}$$

$$= \frac{220+(110-62.4)3\cos^2 30\tan 32}{110\cdot 3\cdot\cos 30\cdot\sin 30} = \underline{2.0 > 1.5}$$

CONCLUSIONS

THE CALCULATION INDICATES THAT THE PROPOSED 1¾:1 CUT SLOPE WILL BE SURFICIALLY STABLE

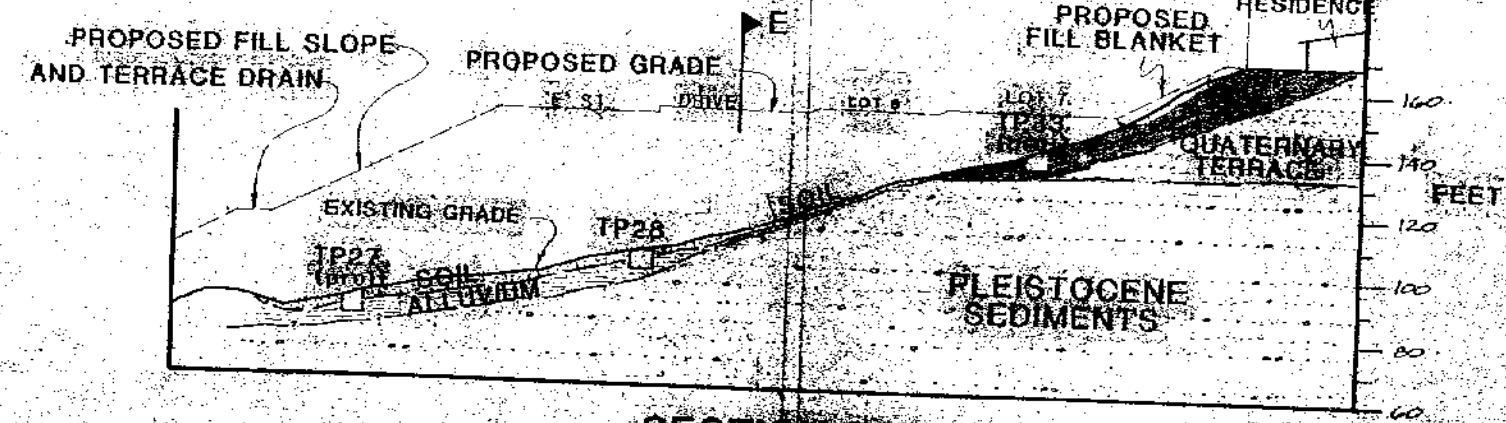
S RECOMMENDED BY THE ASCE AND BUILDING & SAFETY ADVISORY COMMITTEE 8/16/78

Kovacs-Byer and Associates Inc.
CONSULTING ENGINEERS and GEOLOGISTS

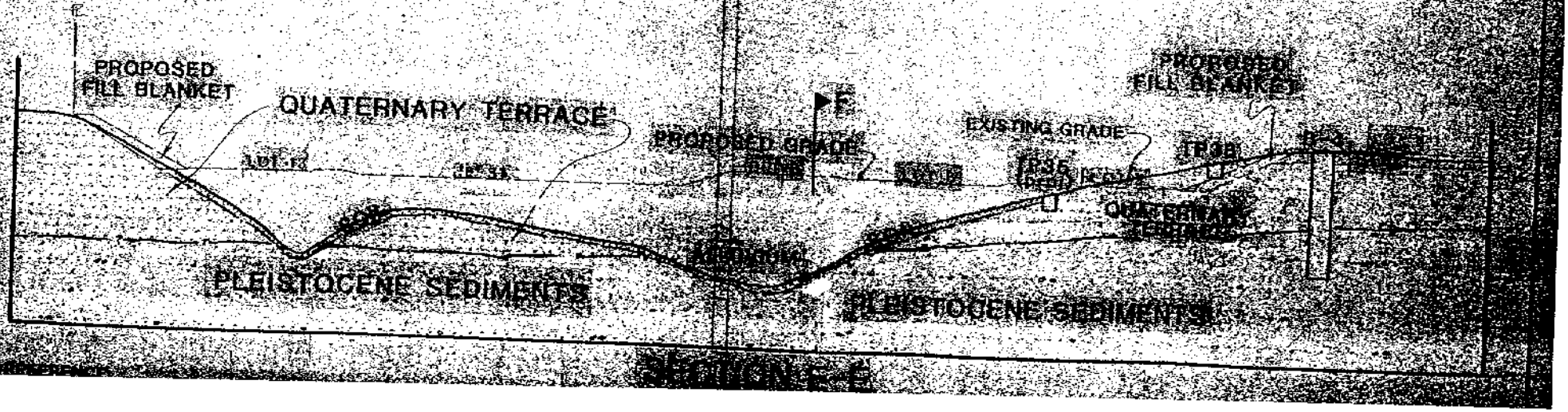
SCALE 1" : 40'
DRAWN BY CGM
CONSULTANT RAH
REPORT DATE 5/14/84
CLIENT HOWARD HUGHES
KB 7806-G REALTY

REVISED 8-5-87

SECTIONS E & F



SECTION F-F



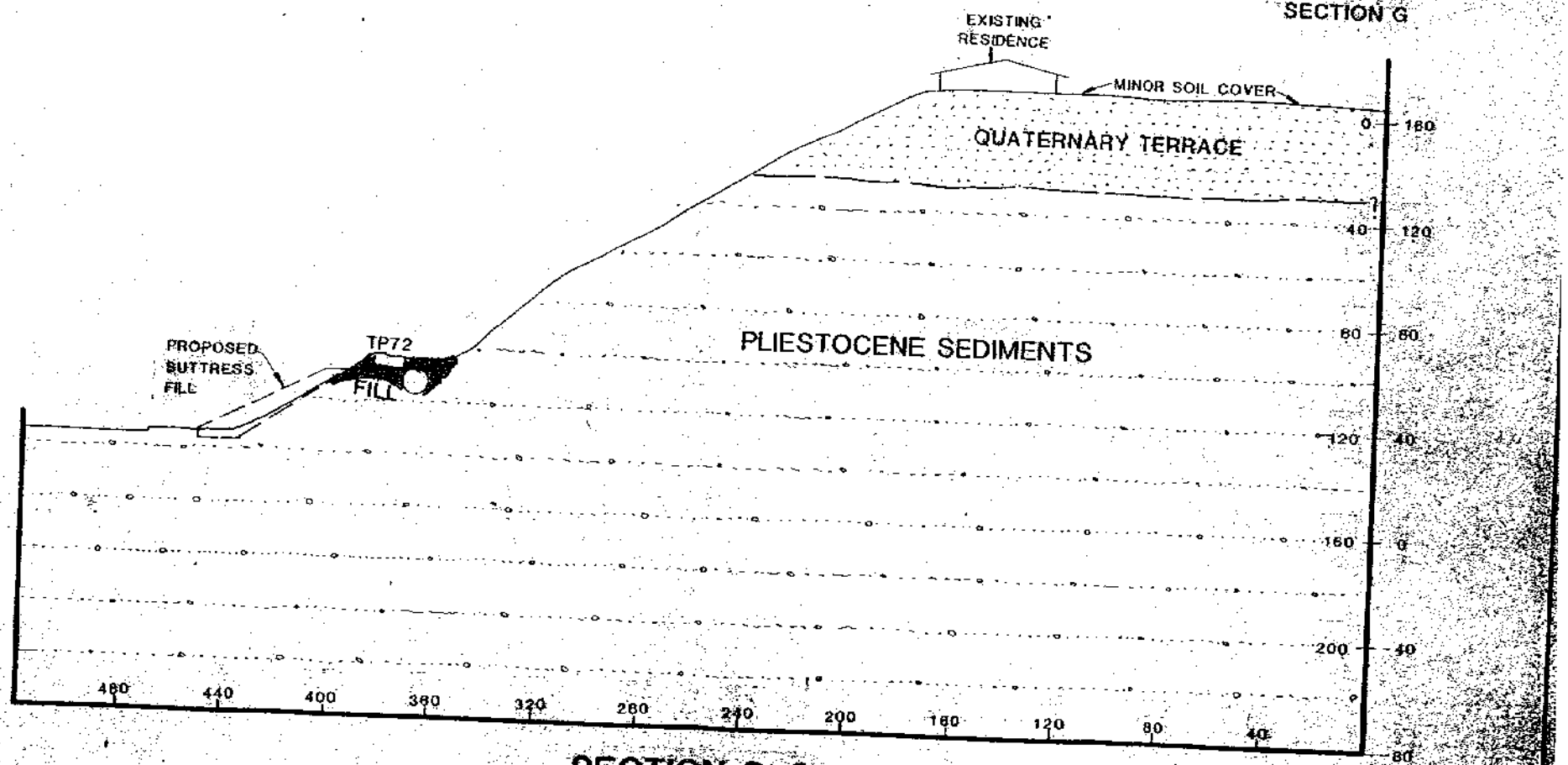
SECTION E-E

Kovacs-Byer and Associates Inc.
CONSULTING ENGINEERS and GEOLOGISTS

SCALE 1":40'
DRAWN BY RH
CONSULTANT RAH
REPORT DATE
CLIENT HUGHES REALTY
KB 7607-G

REVISED 8-5-87

SECTION G



SECTION G-G

REFERENCE

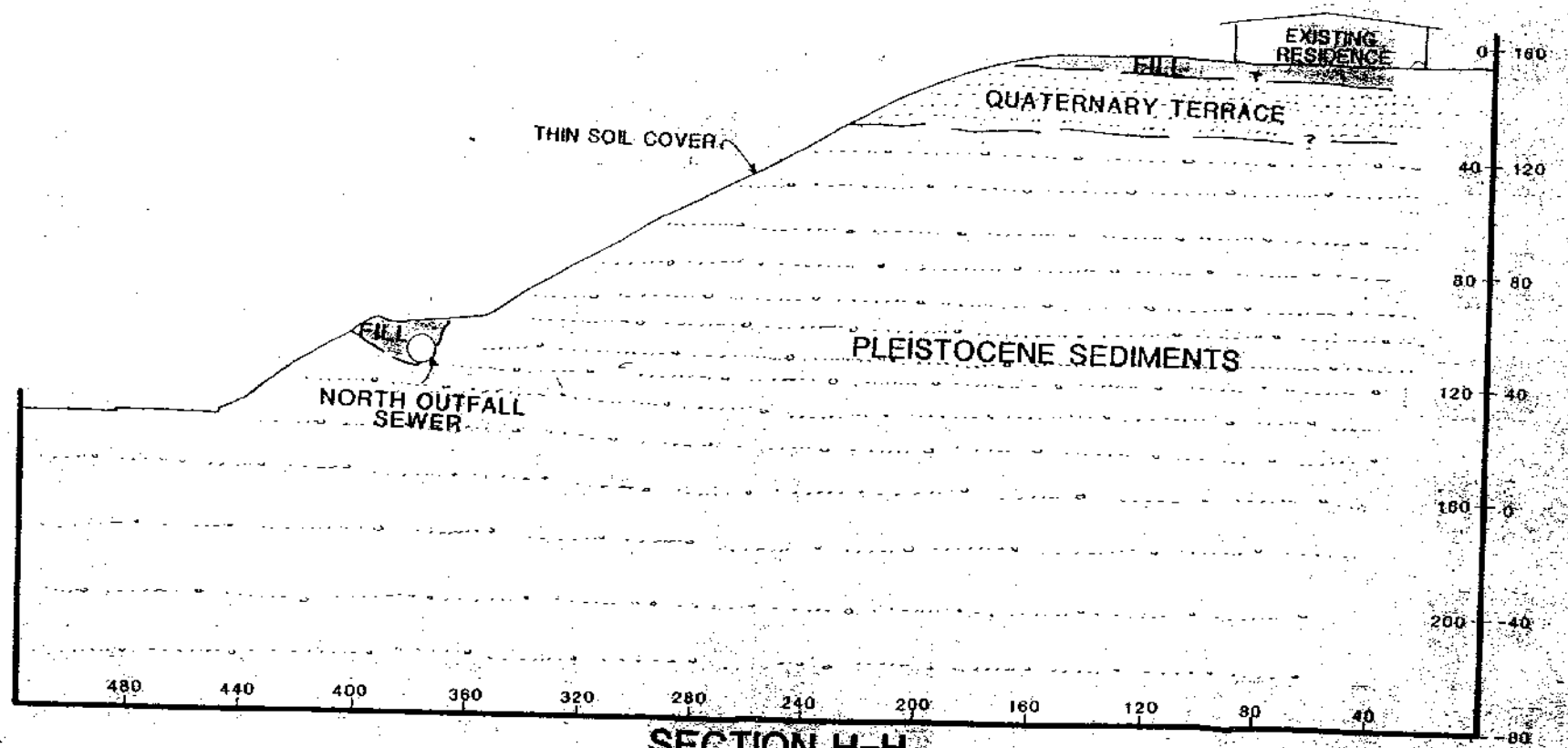
Kovacs-Byer and Associates Inc.
CONSULTING ENGINEERS and GEOLOGISTS

SCALE 1" : 40'
DRAWN BY SMW
CONSULTANT BAH

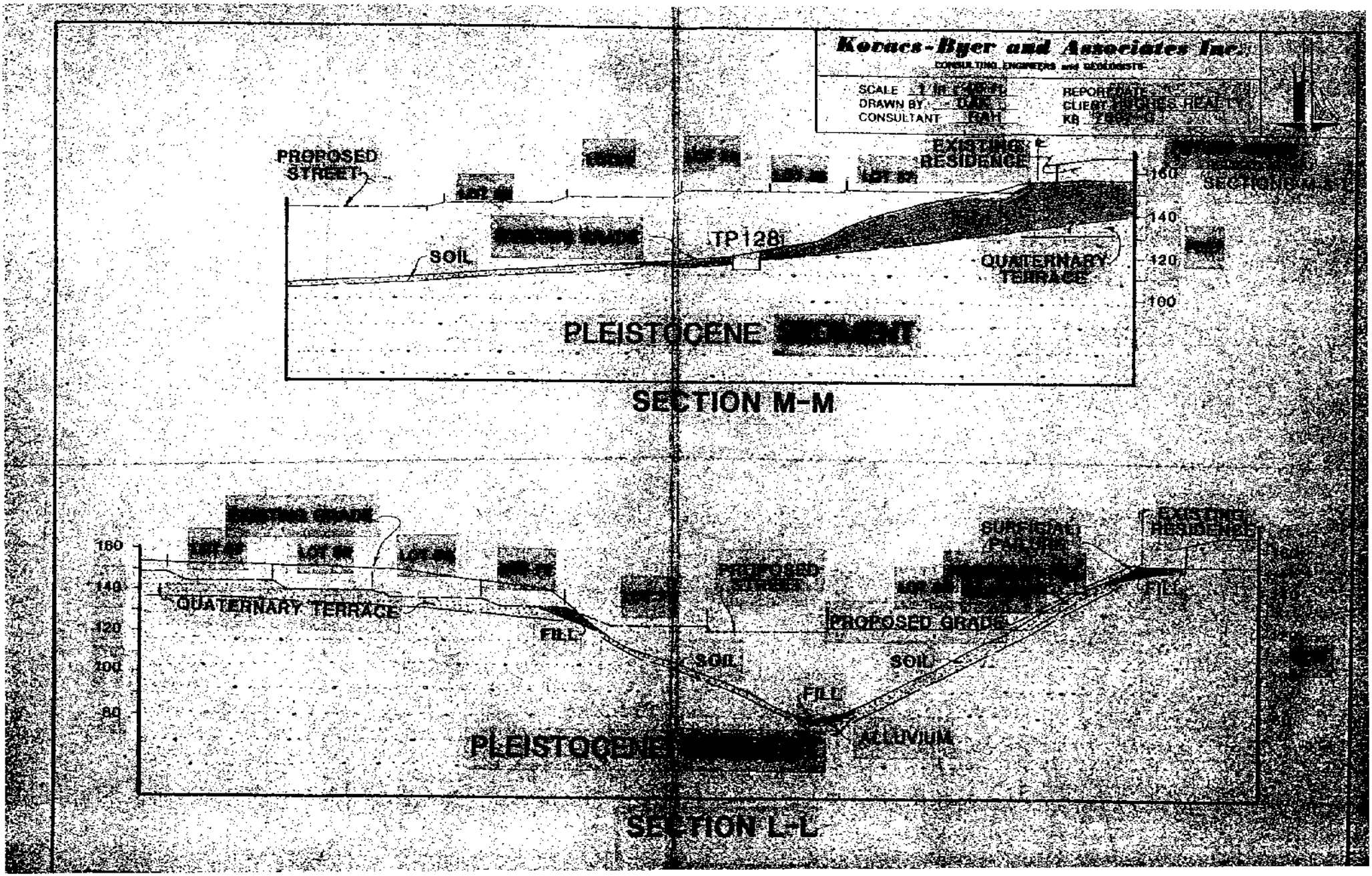
REPORT DATE
CLIENT HUGHES REALTY
KB 7607-G

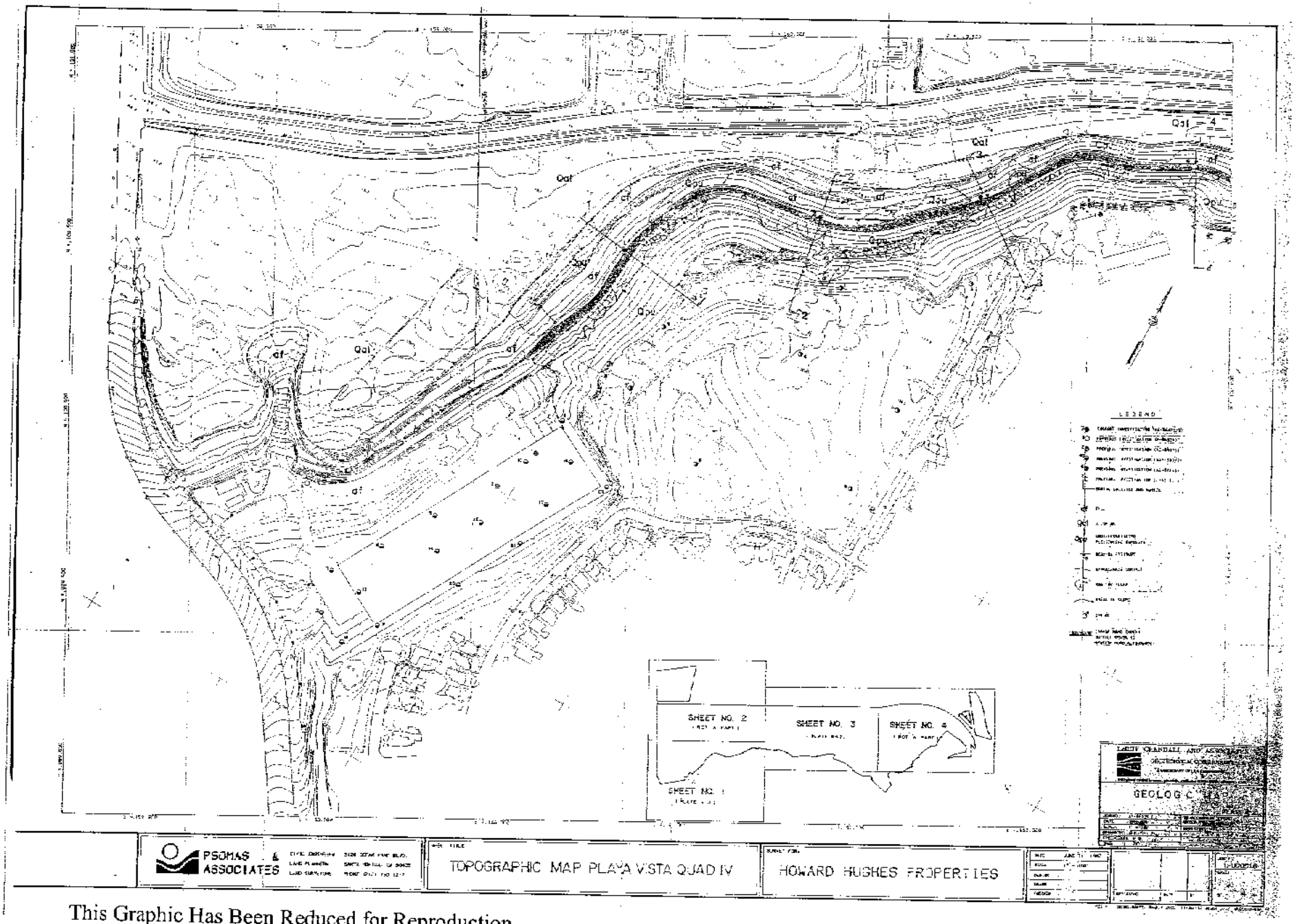
REVISED 8-5-87

SECTION H



SECTION H-H


Kovacs-Byer and Associates Inc.
CONSULTING ENGINEERS and GEOLOGISTS
SCALE
DRAWN BY
CONSULTANT
REPORT DATE
CLIENT
JOB
PROPOSED STREET
EXISTING RESIDENCE
SOIL
TP128
QUATERNARY TERRACE
PLEISTOCENE
160
140
120
100
SECTION M-M
QUATERNARY TERRACE
FILL
SOIL
FILL
ALLUVIUM
PROPOSED GRADE
SOIL
FILL
EXISTING RESIDENCE
160
140
120
100
80
PLEISTOCENE
SECTION L-L



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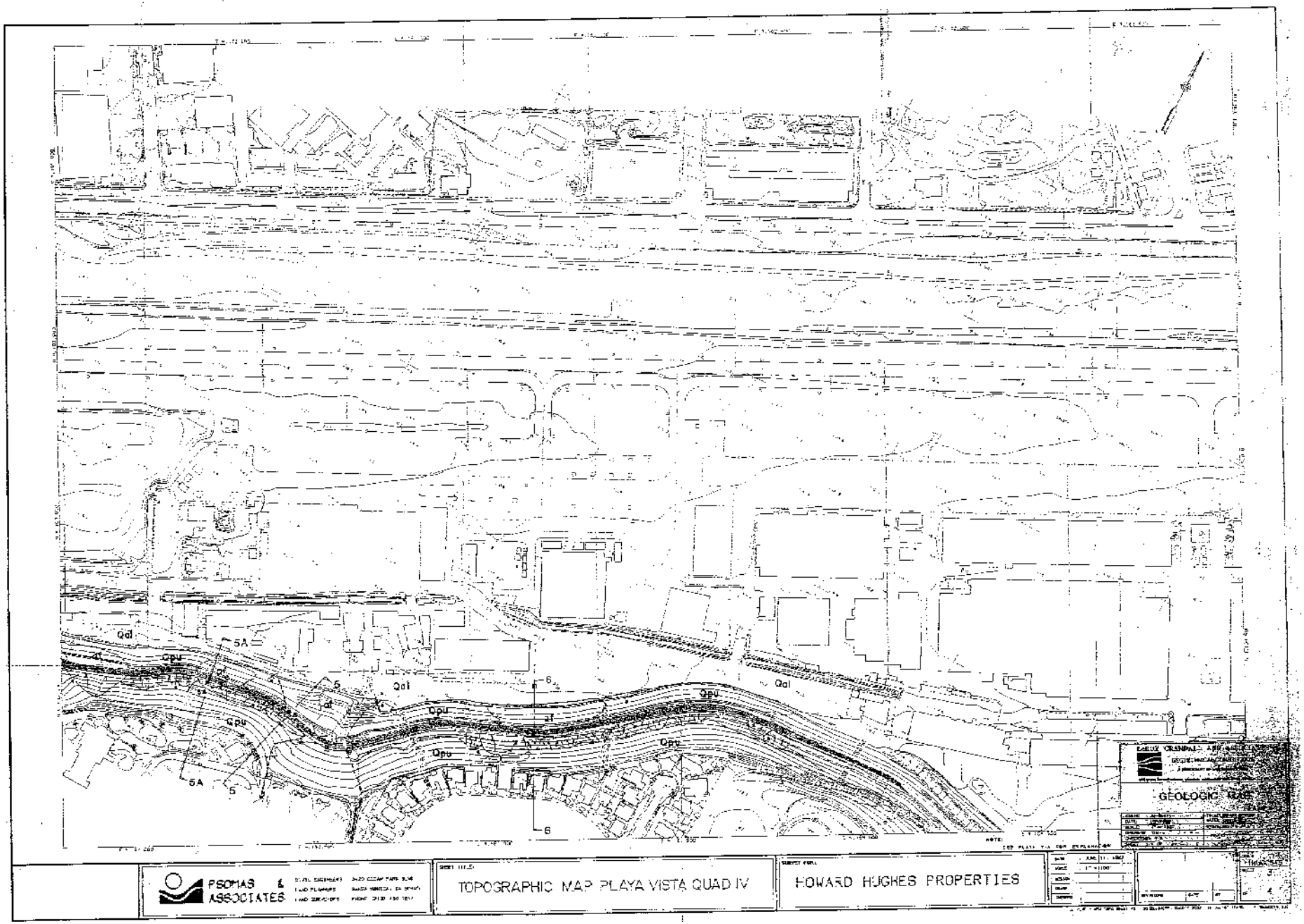

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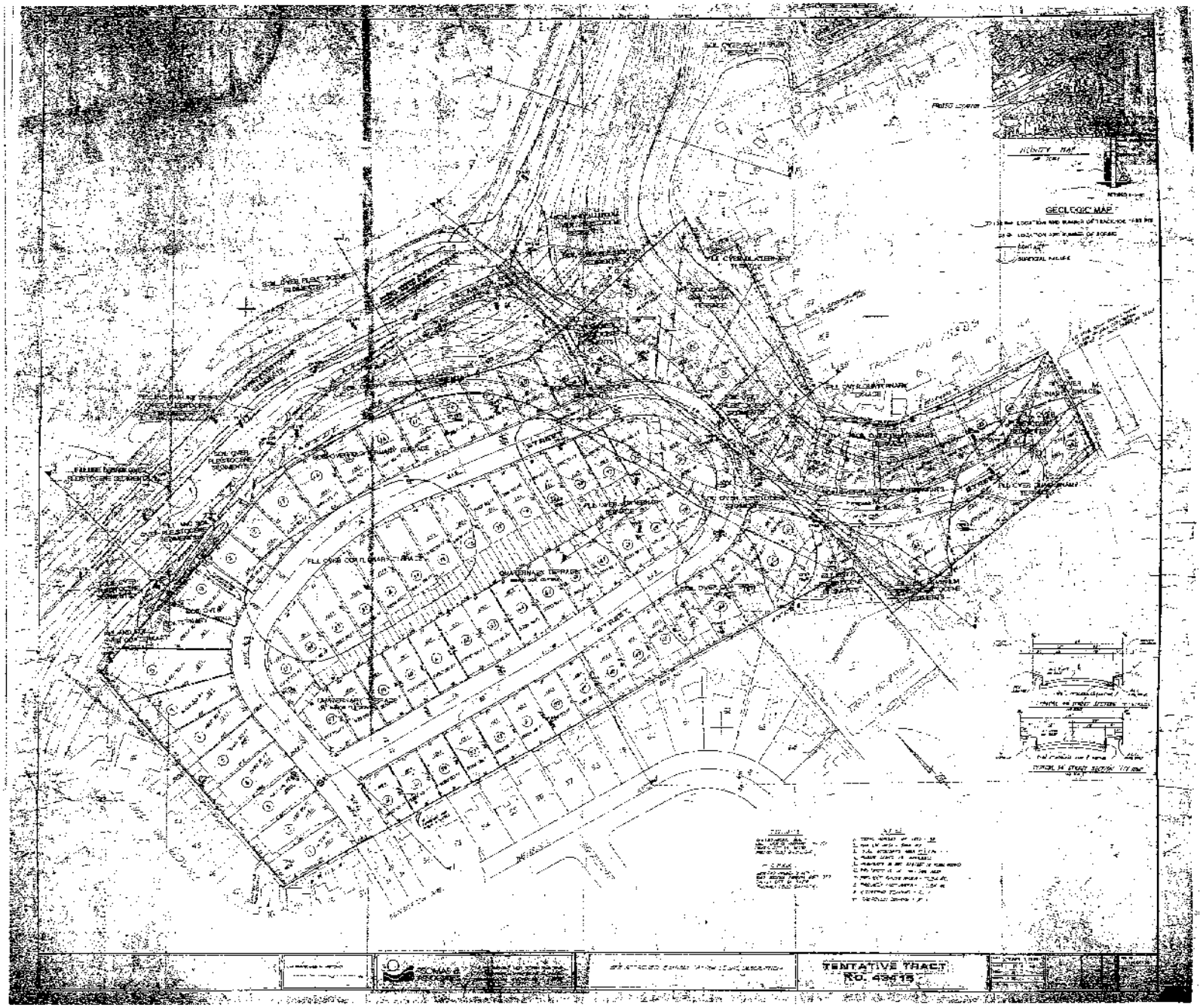

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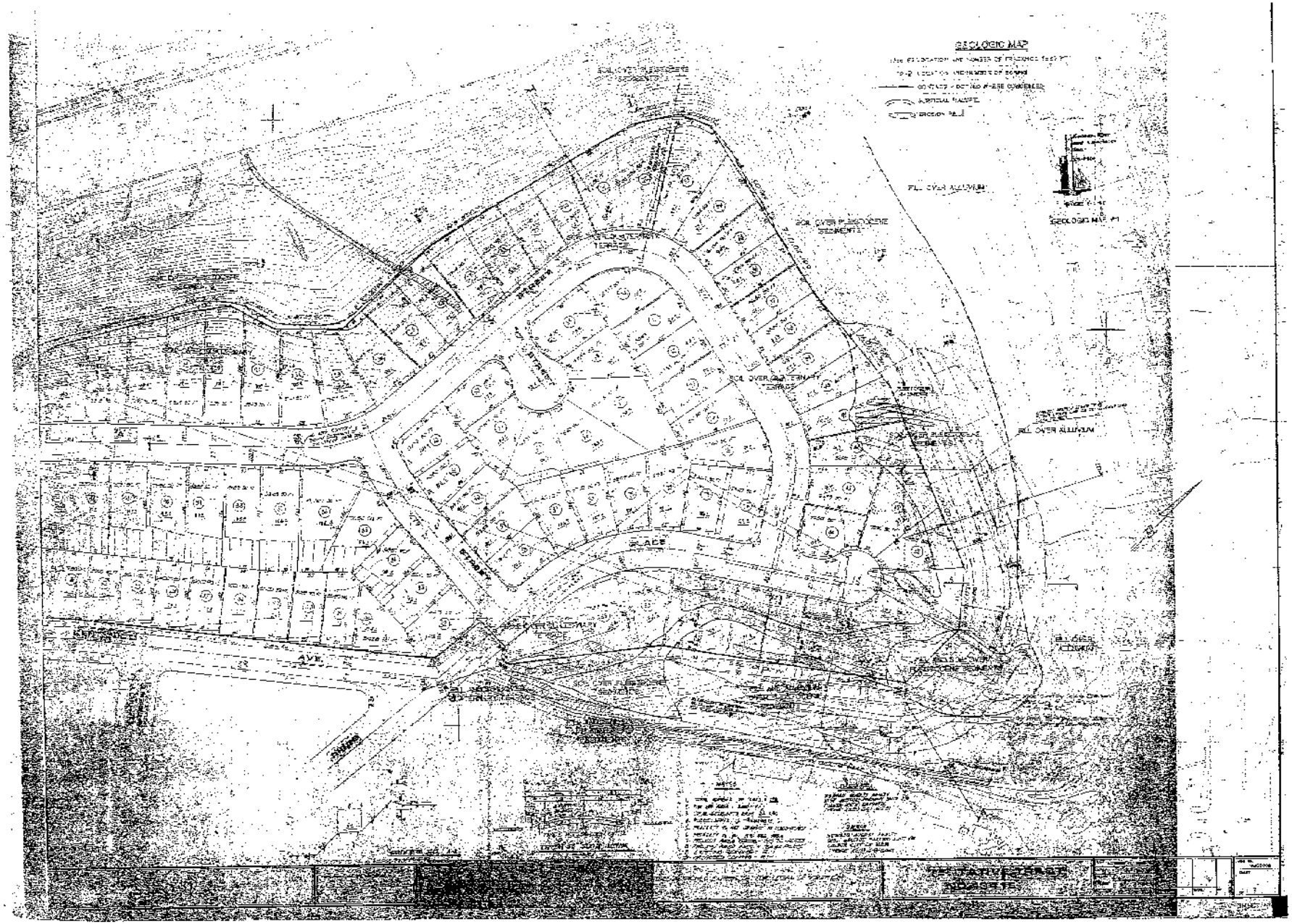

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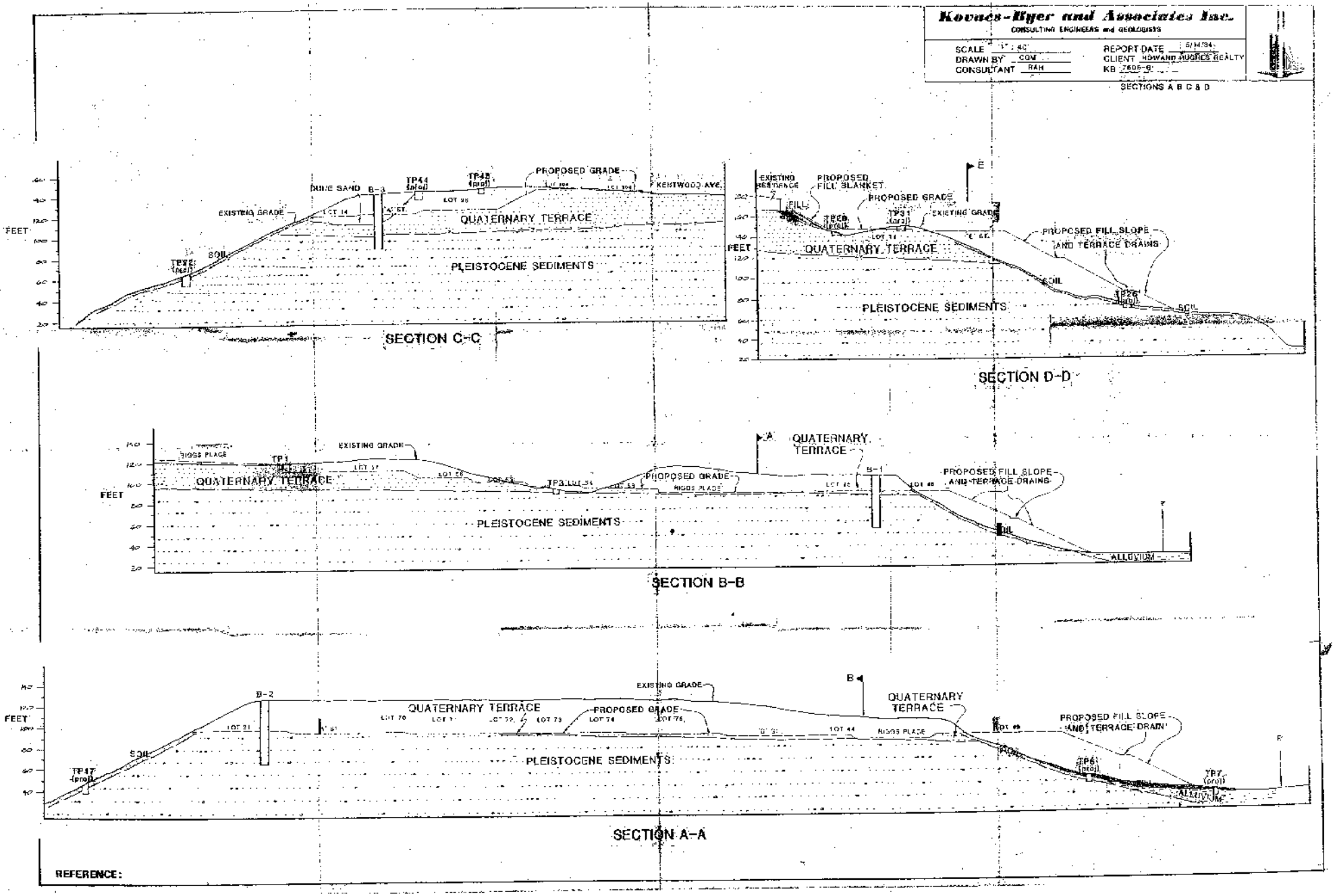

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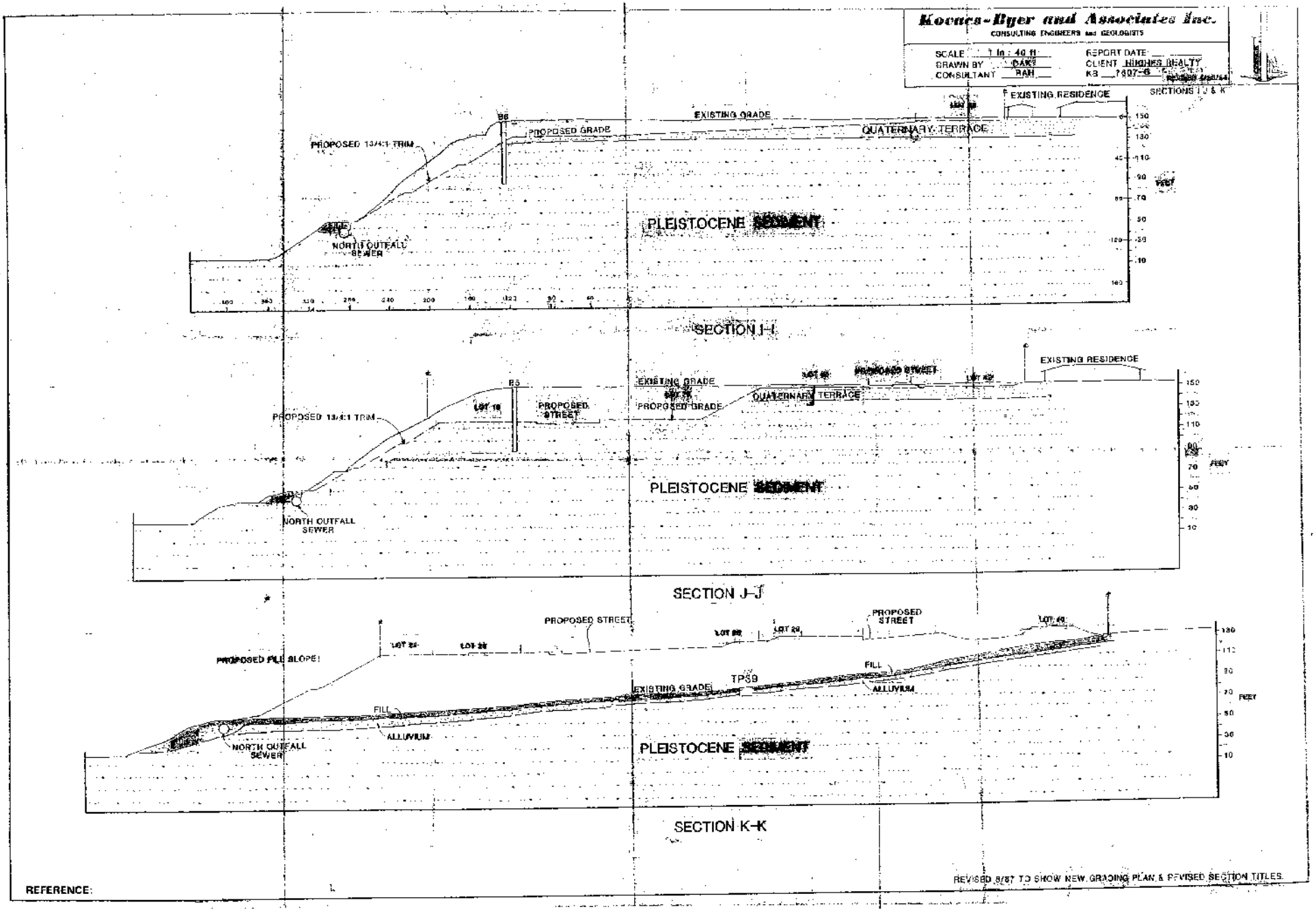

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