Appendix C: Geotechnical Report

Hetzels copy

PETRA

PRELIMINARY GEOTECHNICAL INVESTIGATION FOR RICH HAVEN SPECIFIC PLAN, APPROXIMATELY 500-ACRE RESIDENTIAL COMMUNITY, NEW MODEL COLONY, LOCATED SOUTH OF RIVERSIDE AVENUE BETWEEN HAVEN AND HAMNER AVENUES, CITY OF ONTARIO, SAN BERNARDINO COUNTY, CALIFORNIA

RICHLAND COMMUNITIES, INC.

September 27, 2005
J.N. 463-05

UN373

PETRA

OFFICES IN THE COUNTIES OF
ORANGE ▪ SAN DIEGO ▪ RIVERSIDE ▪ LOS ANGELES ▪ SAN BERNARDINO

September 27, 2005
J.N. 463-05

Mr. Jim Powers
RICHLAND COMMUNITIES, INC.
4100 Newport Place, Suite 800
Newport Beach, CA 92660-1403

Subject: **Preliminary Geotechnical Investigation for Rich Haven Specific Plan, Approximately 500-Acre Residential Community, New Model Colony, Located South of Riverside Avenue Between Haven and Hamner Avenues, City of Ontario, San Bernardino County, California.**

Dear Mr. Powers:

The following preliminary geotechnical investigation report presents our findings and opinions with respect to the feasibility of residential development of the subject site from a geotechnical engineering standpoint. The report outlines geotechnical constraints inherent to the site that may have an impact on the development of the property and was prepared to satisfy the submittal requirements of the Rich Haven Specific Plan.

The area of study considered under the purview of this investigation consists of a series of several adjoining parcels that cover a combined area of nearly 500 acres in the city of Ontario, San Bernardino County, California. The subject land is located south of Riverside Drive and extends in part southward to Edison Avenue. Hamner and Haven Avenues form the eastern and western boundaries of the site, respectively.

We sincerely appreciate this opportunity to be of service and look forward to continuing to provide consulting services to you on this and other projects in the future.

Respectfully submitted,

PETRA GEOTECHNICAL, INC.

David Hansen
Associate Engineer

DG/DH/DR/nls

PRELIMINARY GEOTECHNICAL INVESTIGATION FOR RICH HAVEN SPECIFIC PLAN, APPROXIMATELY 500-ACRE RESIDENTIAL COMMUNITY, NEW MODEL COLONY, LOCATED SOUTH OF RIVERSIDE AVENUE BETWEEN HAVEN AND HAMNER AVENUES, CITY OF ONTARIO, SAN BERNARDINO COUNTY, CALIFORNIA

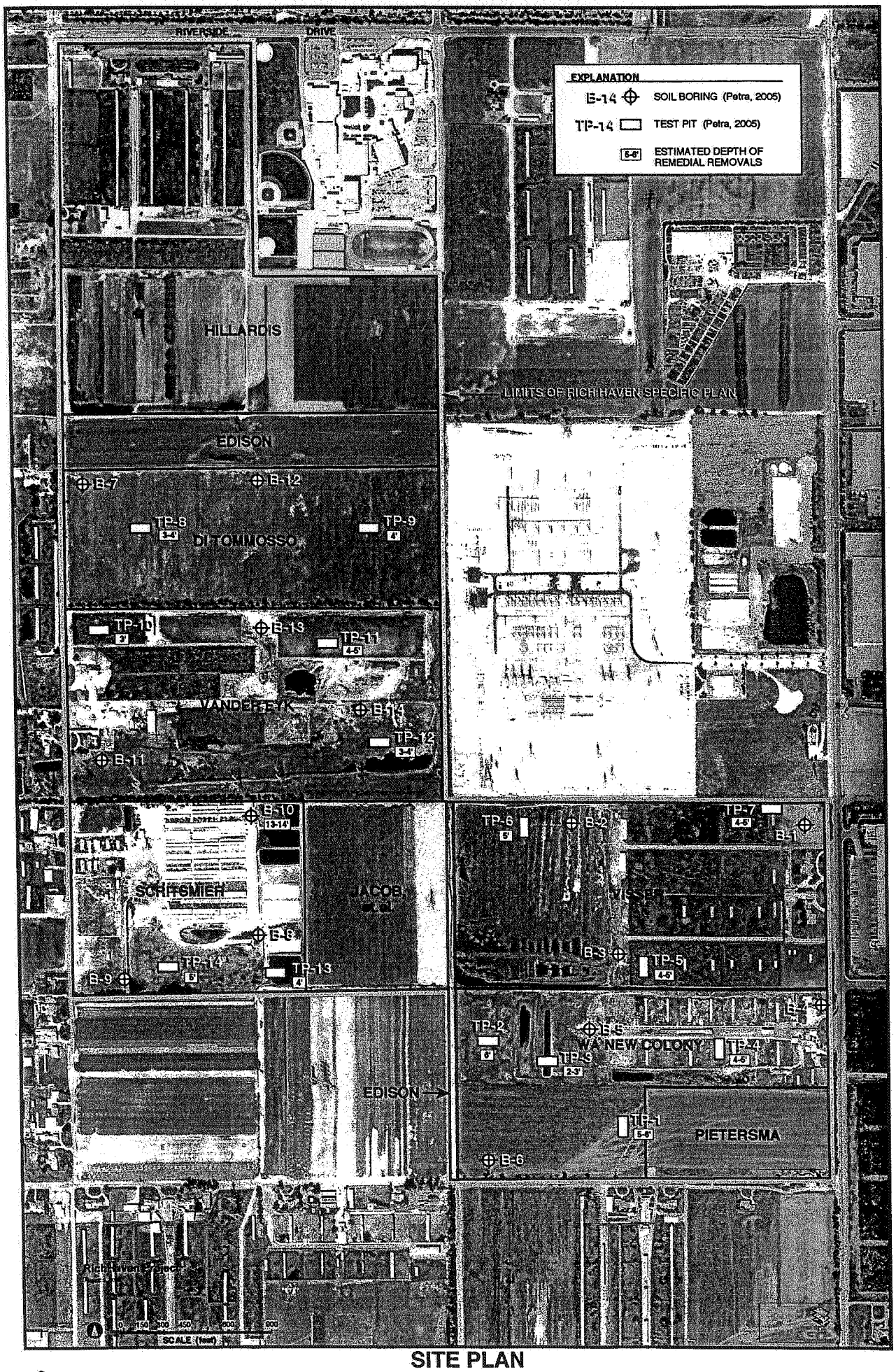
This geotechnical investigation report presents our preliminary findings and opinions with respect to the geotechnical feasibility of residential development at the subject site, and outlines key geologic and soils engineering factors that could impact the cost of earthwork grading and development. This report outlines geotechnical constraints inherent to the site that may have an impact on the development of the property and was prepared to satisfy the submittal requirements of the Rich Haven Specific Plan.

This evaluation is based on our review of published and unpublished geotechnical reports and maps describing local conditions, the results of our subsurface investigation and laboratory testing of representative samples of on-site materials, and our previous experience with other similar projects in the site area.

SITE LOCATION AND DESCRIPTION

The subject site includes multiple contiguous parcels that collectively occupy nearly 500 acres of land in the city of Ontario, San Bernardino County, California. As shown on Figure 1, the site is located south of Riverside Drive and extends southward, in part, to Edison Avenue. Hamner and Haven Avenues form the eastern and western boundaries of the site, respectively. Overall, the site is relatively flat with a mild ground surface gradient to the south-southwest that is on the order of about ½ to 1 percent. The maximum topographic relief within the site is estimated to be approximately 40 feet.

The individual properties within the purview of this report are identified on Figure 1 and are listed in the table below.



SITE PLAN

PETRA GEOTECHNICAL, INC.

JN 463-05 SEPT., 2005

FIGURE 1

Rich Haven Specific Plan New Model Colony		
Current Ownership	**Assessor Parcel Nos.**	**Acreage**
Hillardis*	218-161-04 218-161-05 218-161-10 218-161-11	106.1
Southern California Edison	218-161-09 218-211-08	19.5
DiTommosso	218-161-08	59.3
Vander Eyk	218-161-01	78.3
Scritsmier	218-211-02 218-211-05	49
Jacob, et. al.	218-211-23	28.5
Visser	218-211-24 218-211-17 218-211-26	79.4
WA New Colony	218-211-25 218-211-12	59
Pietersma	218-211-21 218-211-15	19.2
	Total	**498**

* Not accessible for subsurface investigation

The Hillardis property was not made accessible for the purposes of subsurface investigation; however, this property consists of three contiguous parcels. At the time of our field investigation in August 2005, the northernmost parcel was an active dairy. The parcel directly south of the dairy appeared to be utilized as an agricultural field for growing feedstuff crops. The easternmost parcel was an active agricultural field.

The Southern California Edison (Edison) property consists of two elongated parcels. The northern parcel, positioned between the Hillardis and Di Tommosso properties, was an inactive agricultural field at the time of our field investigation. This property was utilized as an electrical utility corridor that included high-power electrical lines supported overhead by steel

towers, one of which was located within the parcel. The other Edison parcel is a narrow strip of land that trends in a north-south direction through the central portion of the site. This second Edison parcel was essentially inconspicuous and usage was generally incorporated with the adjoining properties.

The DiTommosso property is a single, elongated parcel that, at the time of our field investigation, was an abandoned agricultural field that was absent of structures or other surface features. The ground surface appeared to have been disced or tilled and hosted a sparse to moderate growth of grasses and weeds.

The Vander Eyk property is a single, elongated parcel that includes a 300-foot-wide Edison easement along the southern boundary. At the time of our field investigation, the Vander Eyk property was an inactive dairy farm that was being dismantled. Manure within the majority of cattle pens had been scraped up and stockpiled. The southern and eastern portions of the parcel appeared to have been used as an agricultural field for growing feedstuff crops. A relatively small pond existed in the east-central portion of the parcel, within a depression that was estimated to be about 30 to 40 feet deep. Structures present on the Vander Eyk property included two canopies associated with the cattle pens, two residential homes, and a series of outbuildings and a warehouse.

At the time of our investigation, the Scritsmier property consisted of two contiguous parcels and was an active pig farm. Structures included a series of residential homes and trailers, an office building, a warehouse, outbuildings, and pigpens that were floored with concrete slabs. A series of retention basins existed along the eastern edge of the property. The basins were dry and one was noted to contain stockpiled manure. The southern portion of the property appeared to have been previously used as an agricultural field for growing feedstuff crops. A small pond had been constructed within the south-central portion of the property. Three corrals used for animal grazing were positioned along the western limits of the property near Haven Avenue.

The Jacob, et al., property consists of a single, nearly square parcel directly east of the Scritsmier property. At the time of our field investigation, this property was cultivated farmland that was devoid of structures save for an electrical power line tower.

The Visser property consists of three contiguous parcels. This property, at the time of our field investigation, was utilized as an active dairy farm. Two residential homes existed along the eastern edge of the site adjacent to Hamner Avenue. A cow milking structure existed between the two homes. Active cattle pens occupied the remainder of the eastern portion of the property. The western portion of the property, which essentially adjoins the eastern edge of the Jacob, et al., property, was occupied by a series of retention basins separated by earthen berms.

The WA New Colony property consists of two parcels. At the time of our field investigation, the northern parcel was an abandoned dairy farm. Remnants of a farmhouse and milking complex, such as concrete driveways and building foundations and associated features, were present along the eastern edge of the northern parcel near Hamner Avenue. Other features within the eastern portion of the northern parcel included cattle pens and associated structures. The cattle pens were observed as having been partially scraped clean of manure, but remnant manure was still present in some areas. The western portion of the northern parcel appeared to have been previously used as an agricultural field for growing feedstuff crops. Three dry retention basins, estimated to be on the order of 10 to 20 feet deep, were also observed on the northern parcel.

At the time of our field investigation, the southern parcel of the WA New Colony property was an abandoned agricultural field absent of structures or other surface features. The ground surface appeared to have been disced or tilled and hosted a sparse to moderate growth of grasses and weeds.

The Pietersma property is a single, elongated parcel that fronts the western side of Hamner Avenue. At the time of our field investigation, the property was largely an abandoned agricultural field that had been disced or tilled and hosted a sparse to moderate growth of grasses and weeds. A residential farmhouse with associated structures existed within the southeast corner of the property.

PROPOSED DEVELOPMENT

Development plans were not available for review by this firm as of the date of this report. However, we anticipate that the site will be developed as residential properties with dwellings that will be one to three stories in height and of wood-frame construction with floor slabs constructed on-grade. Appurtenant improvements will likely include streets, driveways, sidewalks and other concrete flatwork and landscaped areas. Maximum cuts and fills are unknown at this time. However, based on our experience with similar projects, cuts and fills are not anticipated to be greater than about 5 feet to establish finished grade elevations within the site. Slope heights would likely be less than 5 feet.

BACKGROUND INFORMATION

Previous geotechnical investigation reports for the subject site were not available for review by this firm.

SITE INVESTIGATION

Aerial Photograph Review

An aerial photograph review was performed to assess previous land usage and to determine whether geomorphic features are present within or adjacent to the site that would be suggestive of active faulting or former natural drainage courses that may have flooded the site in the past, or whether evidence suggestive of past grading activities is present in the aerial photographs but not currently discernable at the site. Single and stereo-paired and black-and-white aerial photographs for intermittent years between 1959 and 1999 were reviewed as part of our investigation. The photographs were provided by Continental Aerial Photo, Inc., of Los Alamitos, California, and a list of the photographs reviewed is provided in the References at the rear of this report.

All of the subject properties, with the exception of the Scritsmier property, appeared to have been cultivated agricultural land in 1959. Based on consistencies between the previous and current layout, the Scritsmier property has been utilized as a pig farm or for the raising of similar livestock from as early as 1959. By 1967, the northern parcel of the WA New Colony

property had been converted from agricultural farmland to a dairy. By 1975, the Visser and Vander Eyk properties had been converted from agricultural land to dairy farms. The Hillardis property had been converted from agricultural farmland to a dairy by 1977.

Our review did not reveal any obvious evidence of active faulting, flooding, or other significant geotechnical issues at the site.

Subsurface Exploration and Laboratory Testing

A subsurface investigation was performed by our firm as part of this study and included the drilling of 14 exploratory borings to a maximum depth of 51.5 feet utilizing a truck-mounted, hollow-stem auger drill rig. In addition, 14 exploratory test pits were excavated using a rubber-tired backhoe to a maximum depth of 9 feet. Soils encountered in the borings and test pits were visually classified and logged in accordance with the Unified Soil Classification System. The approximate locations of the exploratory borings and test pits are shown on Figure 1 and descriptive exploration logs are provided in Appendix A.

It should again be noted that the Hillardis property was not accessible at the time of our subsurface investigation. As such, borings or trenches were not advanced within the Hillardis property.

As each boring was advanced, representative in-situ and bulk samples of site soil materials were retrieved from selected depth intervals and transported to our geotechnical laboratory for testing. Our testing included determination of the following:

- In-situ moisture and density
- Maximum dry density/optimum moisture
- Expansion index
- Grain size analysis
- Shear strength parameters
- Consolidation
- Atterberg limits
- Soluble sulfate and chloride content
- Minimum resistivity and pH
- Organic content

A description of laboratory test procedures and summaries of the test data are presented in Appendix B. An evaluation of this data is reflected throughout the subsequent sections of this report.

FINDINGS

Subsurface Soil Conditions

Based on our review of pertinent geotechnical literature and on the findings of our subsurface investigation, the subject site is underlain by Quaternary-age alluvial deposits to the maximum depth explored (51.5 feet below ground surface). A relatively thin layer of artificial fill mantles the ground surface throughout the entire site. These surficial materials are generally less than 4 feet thick, but deeper fills on the order of 13 feet thick were observed locally within the northeast portion of the Scritsmier property. Surficial layers of manure, generally 6 to 12 inches thick, were observed within the existing cattle pens at the dairy farms. Stockpiles of manure, some several feet high, were observed locally within the dairies as well as within the pig farm. Localized pockets of manure-rich soils that were mixed with grasses and roots were also observed within the agricultural fields that were directly associated with the dairies and the pig farm.

The earth materials observed within our exploratory test pits and borings are described as follows:

Artificial Fills

Artificial fills overlie the majority of the site and consist of surficial soils that were disturbed by previous activities, such as plowing agricultural fields. The fill materials generally consist of loose to medium dense, fine to medium-grained silty sands that contain variable amounts of organic matter. Within cattle pens, the upper ground surface commonly consists of pure manure. The fill materials observed by this firm are considered non-engineered and unsuitable for support of additional fill and residential structures and/or improvements.

Alluvium (Map Symbol: Qal)

Native alluvial soils were observed beneath the fill materials within all of our exploratory test pits and borings. The alluvial materials consist of alternating layers of sand, silty sand, clayey sand, and sand with gravel. The uppermost layers of alluvium typically consist of fine-grained silty sands that are slightly porous to porous and loose to medium dense in the upper 3 to 6 feet.

Below these upper layers, slightly moist, medium dense to dense silty sands and gravelly sands were predominantly observed to the maximum depth explored (51.5 feet).

The combined upper 3 to 6 feet of existing fill and alluvial materials are generally lower in density, relatively dry and locally more porous as compared to the deeper alluvial materials, and are considered unsuitable for support of additional fill and residential structures and/or improvements. Below a general depth of approximately 3 to 6 feet, the native alluvial materials transition to a dense condition with only occasional slight porosity. It should again be noted that deeper unsuitable fill was encountered locally, reaching a depth of about 13 feet within the northeast portion of the Scritsmier property. Other localized pockets of deeper fill may also exist within other portions of the site.

Groundwater

The Chino Basin is host to an extensive groundwater aquifer that is managed by the Chino Basin Watermaster. Groundwater within the basin is relatively deep and generally occurs under water table conditions (i.e., unconfined). Historic groundwater data for the Chino Basin, dating back to 1933, are provided in Bulletin No. 104-3, which was prepared by the California Department of Water Resources in 1970. Historic groundwater elevation maps in Bulletin 104-3, and those prepared on behalf of the Chino Basin Watermaster (Wildermuth Environmental, 2002), indicate that regional water table beneath the site area has fallen significantly since 1933. For example, in 1933 the water table beneath the site was approximately 80 to 120 feet below ground surface, but had fallen to a depth of approximately 140 to 195 feet below ground surface in 2002. Groundwater was not encountered in any of our exploratory borings, which were drilled to a maximum depth of 51.5 feet.

Faulting and Seismicity

The geologic structure of the Southern California area is dominated by northwest-trending faults associated with the San Andreas system. Faults such as the Whittier-Elsinore, the San Jacinto, and the San Andreas are major faults of the system. They are all known to be seismically active, and the San Jacinto, San Andreas, and Elsinore faults are known to have

ruptured the ground surface in historic time. Also within the Southern California region are a number of west-trending reverse faults that are similarly active.

No active or potentially active faults are known to project through the site. In addition, the site does not lie within an Earthquake Fault Zone as designated by the State of California in the Alquist-Priolo Earthquake Zoning Act (Hart and Bryant, 1999). Several active and potentially active faults do, however, lie within close proximity to the site. The site lies approximately 7 miles northeast of the Chino-Central Avenue fault (part of the Whittier-Elsinore fault system), 10 miles southeast of the San Jose fault, 11 miles south of the Cucamonga fault, 11 miles northeast of the Whittier fault and the Glen Ivy fault that are both part of the Elsinore fault system, and 19 miles southwest of the San Andreas fault. However, the subject site is not considered to be at a particularly greater level of seismic risk than other areas in the region.

CONCLUSIONS AND RECOMMENDATIONS

General Project Feasibility

Based on our review of available literature and the results of our subsurface investigation, development of the site appears to be feasible from a geotechnical standpoint. However, future development of the site should be based on evaluation of property-specific conditions by the project geotechnical consultant following their review of the grading plans for a particular property. Additional subsurface exploration on a property-by-property basis is considered necessary. The contents of this report alone are not sufficient to provide specific recommendations for site development. The project geotechnical consultants should review this report and provide additional subsurface and laboratory test data to develop remedial grading and foundation design recommendations for individual properties.

Primary Geotechnical Issues

This evaluation has identified several geotechnical conditions inherent to the property that may impact future development. These conditions are discussed in the following paragraphs.

1. Removal and Recompaction of Compressible Surficial Soils: Based on the results of our limited subsurface investigation, the site is mantled by surficial soil materials that were observed to be generally loose and porous, and will thus require overexcavation and recompaction to mitigate excessive settlement. These unsuitable surficial materials typically extend to depths on the order of 3 to 6 feet below the existing ground surface; however, deeper removals of approximately 13 or more feet will be necessary locally. The approximate removal depths are shown on the attached site plan, Figure 1. It should be noted that removal depths may vary significantly between boring and test pit locations. Actual removal depths must be determined based on observation and testing by the geotechnical consultant during grading operations. In an effort to aid project planners in determining earthwork quantities, an average removal depth of 4.5 feet may be considered. However, contingencies should be made for the balancing of earthwork quantities based on actual removal depths during grading.

2. Manure Deposits: As discussed previously, localized deposits of manure and manure-rich topsoil exist within the site, including within the Hillardis, Vander Eyk, Scritsmier, Visser, and WA New Colony properties. The manure deposits within active cattle pens were observed as thick as 12 inches but could be greater in areas between test pits. Manure-rich topsoil was observed in some of the pastures as thick as 12 inches but could be thicker in some areas. In addition, stockpiled manure was noted within the dairies as well as in the pig farm. All concentrated manure deposits and manure-rich topsoil should be removed from the site prior to the commencement of grading.

3. Soil Organic Content: Organic content tests were performed on a total of 41 samples that were obtained from the upper 5 feet of on-site soils. The results of our laboratory testing indicate that the organic contents of these soils range from approximately 0.18 to 6.6 percent by weight. Only 9 of the 41 samples tested contained an organic content in excess of 1.0 percent and 3 samples exceeded 2.0 percent.

   It is our understanding that the City of Ontario has yet to adopt specific guidelines for the allowable percentage of organic material, mainly manure, in engineered fill. It is, however, a common engineering practice to allow a maximum organic content of around 2.0 percent in engineered fills. Therefore, based on the results of our field observations, laboratory testing and experience with earthwork grading at similar dairy properties, it is our opinion that engineered fills should have an average organic content of about 2 percent or less if adequately processed. This can be achieved by exporting the existing manure, manure-rich topsoil and vegetation off the property prior to grading operations. In addition, the remaining soils exhibiting an organic content greater than 2.0 percent shall be thoroughly mixed with other soils during remedial grading.

4. Shrinkage and Subsidence: Volumetric changes will occur when surficial fill and alluvial soils are removed and replaced as properly compacted fill. Based on laboratory test data and our experience with similar earth materials, a shrinkage of 10 to 15 percent may be anticipated. Subsidence on the order of 0.10 to 0.15 feet is anticipated as a result of the scarification and recompaction of the exposed ground surfaces within the removal areas. It should be understood that these shrinkage and subsidence values are merely estimates

and are only intended for use by project planners in determining earthwork quantities and should not be considered absolute values. Contingencies should be made for balancing earthwork quantities based on actual shrinkage and subsidence that occurs during grading.

5. Strong Ground Motion: The subject site is located in a seismically active area of southern California. Strong ground shaking hazards caused by earthquakes along regional active faults do exist and must be taken into account in the design and construction of the dwelling structures proposed within the subject site. The site is located about 18 kilometers from the Cucamonga fault zone, which is a Type A seismic source according to the 2001 California Building Code (CBC). Relatively high near-source factors and seismic coefficients will be required for structural design of the proposed dwellings.

Other Geotechnical Factors

1. Liquefaction Potential: The California Geological Survey (CGS) has yet to publish Seismic Hazard Zones maps for the subject area (Guasti and Corona North Quadrangles). However, based on our review of San Bernardino County Hazard Overlays Maps (2004), the site is not located within a zone of potential liquefaction. Furthermore, based on our investigation and other pertinent literature, liquefaction and associated dynamic settlement resulting from the effects of strong ground shaking are not expected to occur at the site due to the depth to groundwater (>50 feet) and the relatively dense nature of the underlying soils.

2. Seismic Design Considerations: The subject site is located in a seismically active area of southern California. The type and magnitude of seismic hazards that may affect the site are dependent on both the distance to causative faults and the intensity and duration of the seismic event. Although the probability of primary surface rupture is considered low, ground shaking hazards caused by earthquakes along regional active faults do exist and should be taken into account in the design and construction of the proposed facilities within the subject site. Site-specific seismic design parameters determined in accordance with Section 16 of the 2001 CBC should be provided in project-specific geotechnical investigation reports.

3. Seismically Induced Flooding: Seismically induced flooding, seiches or tsunamis are not considered to be of particular concern with respect to the proposed development, as the site lies approximately 750 feet above sea level and is more than 40 miles from the Pacific Ocean, does not lie in close proximity to a large enclosed body of water, and is not located downstream of a major reservoir or retention structure.

4. Expansive Soil Considerations: The results of laboratory tests suggest that the earth materials that will be exposed at proposed finished grade elevations within the site will likely exhibit expansion potentials which fall within the range of "Very Low" to "Low" as classified in accordance with CBC Table No. 18-I-B. Additional testing for expansion potential should be performed as part of property-specific investigations and a final

evaluation of expansion potential should be performed based on sampling and testing immediately following rough grading of each property.

5. Tentative Building Foundation Design: Based on the results of this geotechnical evaluation and on our experience on nearby properties with similar soil conditions, it is our professional opinion that conventional or, alternatively, post-tensioned foundation systems will generally be feasible for the structures within the proposed residential development provided remedial grading is performed as described herein and as further refined during property-specific geotechnical investigations.

6. Boundary Conditions: As stated previously, average remedial removals within the subject site are anticipated to generally range from 3 to 6 feet below the existing ground surface. Based on the relatively granular and non-cohesive nature of on-site soils, temporary backcut slopes adjacent to the project boundaries will generally be restricted to a slope ratio of 1:1 (horizontal to vertical) or flatter to protect adjacent offsite improvements (i.e., sidewalks, walls, buried utilities, etc.). Depending on the actual horizontal extent of remedial grading that is achievable by the grading contractor, it is likely that a wedge of unsuitable soil may remain in place along the site perimeter that will extend into the site to a horizontal distance equal to the depth of remedial removals (i.e., approximately 3 to 6 feet). Since new perimeter site improvements (i.e., screen walls, retaining walls, swimming pools and spas) may be proposed within this zone, such improvements may need to be designed and constructed with deepened and/or strengthened foundation systems designed to withstand relative movement that is likely to result from consolidation of these potentially compressible surficial soils.

7. Soil Corrosivity: Based on the results of our limited laboratory testing, a negligible to moderate exposure to sulfates can be expected for concrete placed in contact with the on-site earth materials. As such, at least some foundations will need to be constructed using Type V cement to mitigate deterioration from water-soluble sulfates. The results of preliminary testing for chlorides, pH, and resistivity indicate that on-site soil materials may be mildly corrosive to ferrous metals. Additional testing for corrosivity should be performed as part of property-specific investigations and a final evaluation should be performed at or near the completion of rough grading to more accurately assess soil corrosivity and a certified corrosion engineer should be consulted to prepare project-specific recommendations to protect against corrosion.

FUTURE STUDIES

The findings and conclusions presented in this due diligence evaluation are based on the information obtained during our investigation and on review of referenced documents. The information provided herein should be expanded upon in more comprehensive geotechnical reports for each property.

Petra Geotechnical, Inc., appreciates the opportunity to provide services on this project. Should you require any additional information, please do not hesitate to contact the undersigned.

Respectfully submitted,

PETRA GEOTECHNICAL, INC.

Daniel J. Gifford
Senior Project Geologist
CEG 1959

David Hansen
Associate Engineer
RCE 56591

David C. Seymour
Associate Geologist
CEG 1574

DG/DH/DCS/nls

Distribution: (5) Client

Attachments: Figure 1 – Site Plan
Appendix A - Exploration Logs
Appendix B - Laboratory Test Procedures and Laboratory Test Data

W:\2005\400\463-05a.plm.doc

REFERENCES

California Department of Water Resources (DWR), 1970, Meeting Water Demands in the Chino-Riverside Area, Appendix A: Water Supply: California Department of Water Resources, Bulletin No. 104-3.

Hart, E.W., and Bryant, W.A., 1999, Fault-Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zone Maps: California Division of Mines and Geology, Special Publication 42.

International Conference of Building Officials, 2001, California Building Code (CBC), Volume 2.

Morton, D.M., 1976, Geologic Hazards in Southwestern San Bernardino County, California: California Division of Mines and Geology, Special Report 113.

San Bernardino County, 2004, Official Land Use Plan, General Plan, Hazard Overlays, Corona North Quadrangle.

_____, 2004, Official Land Use Plan, General Plan, Hazard Overlays, Guasti Quadrangle.

Wildermuth Environmental, 2002, Chino Basin Optimum Basin Management Program, Initial State of the Basin Report: prepared for the Chino Basin Watermaster, dated October 2002.

Aerial Photographs Reviewed (Source – Continental Aerial Inc.)		
Date	Flight Series	Frame No.
10-16-59	16W	164 (not stereo)
5-15-67	4HH	164 (not stereo)
1-30-70	60-2	37,38
10-24-75	75000	104,105
1-15-76	PC-C11	42,43
2-15-77	RIV-2	1,2
Jan 1980	SBD-16	15,17
1-2-83	83001	61,62
1-8-87	F	159
6-12-90	C83-11	30,31
5-19-93	C92-19	71,72
7-11-95	C114-29	221,222
2-2-99	C131-29	48,49

APPENDIX A

EXPLORATION LOGS

PETRA

Key to Soil and Bedrock Symbols and Terms

PETRA

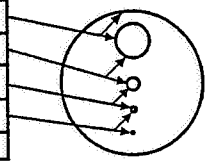
Unified Soil Classification System

Coarse-grained Soils > 1/2 of materials is larger than #200 sieve	GRAVELS more than half of coarse fraction is larger than #4 sieve	Clean Gravels (less than 5% fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
			GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
		Gravels with fines	GM	Silty Gravels, poorly-graded gravel-sand-silt mixtures
			GC	Clayey Gravels, poorly-graded gravel-sand-clay mixtures
	SANDS more than half of coarse fraction is smaller than #4 sieve	Clean Sands (less than 5% fines)	SW	Well-graded sands, gravelly sands, little or no fines
			SP	Poorly-graded sands, gravelly sands, little or no fines
		Sands with fines	SM	Silty Sands, poorly-graded sand-gravel-silt mixtures
			SC	Clayey Sands, poorly-graded sand-gravel-clay mixtures
Fine-grained Soils > 1/2 of materials is smaller than #200 sieve	SILTS & CLAYS Liquid Limit Less Than 50		ML	Inorganic silts & very fine sands, silty or clayey fine sands, clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts & clays of low plasticity
	SILTS & CLAYS Liquid Limit Greater Than 50		MH	Inorganic silts, micaceous or diatomaceous fine sand or silt
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic silts and clays of medium-to-high plasticity
Highly Organic Soils			PT	Peat, humus swamp soils with high organic content

The No. 200 U.S. Standard Sieve is about the smallest particle visible to the naked eye

Grain Size

Description		Sieve Size	Grain Size	Approximate Size
Boulders		>12"	>12"	Larger than basketball-sized
Cobbles		3 - 12"	3 - 12"	Fist-sized to basketball-sized
Gravel	coarse	3/4 - 3"	3/4 - 3"	Thumb-sized to fist-sized
	fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized
Sand	coarse	#10 - #4	0.079 - 0.19"	Rock salt-sized to pea-sized
	medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock salt-sized
	fine	#200 - #40	0.0029 - 0.017"	Flour-sized to sugar-sized to
Fines		Passing #200	<0.0029"	Flour-sized and smaller



Laboratory Test Abbreviations

MAX	Maximum Dry Density	MA	Mechanical (Particle Size) Analysis
EXP	Expansion Potential	AT	Atterberg Limits
SO4	Soluble Sulfate Content	#200	#200 Screen Wash
RES	Resistivity	DSU	Direct Shear (Undisturbed Sample)
pH	Acidity	DSR	Direct Shear (Remolded Sample)
CON	Consolidation	HYD	Hydrometer Analysis
SW	Swell	SE	Sand Equivalent
CL	Chloride Content	OC	Organic Content
RV	R-Value	COMP	Mortar Cylinder Compression

Modifiers

Trace	< 1 %
Few	1 - 5%
Some	5 - 12 %
Numerous	12 - 20 %

Sampler and Symbol Descriptions

- Approximate Depth of Seepage
- Approximate Depth of Standing Groundwater
- Modified California Split Spoon Sample
- Standard Penetration Test
- Bulk Sample
- Shelby Tube
- No Recovery in Sampler

Bedrock Hardness

Soft	Can be crushed and granulated by hand; "soil like" and structureless
Moderately Hard	Can be grooved with fingernails; gouged easily with butter knife; crumbles under light hammer blows
Hard	Cannot break by hand; can be grooved with a sharp knife; breaks with a moderate hammer blow
Very Hard	Sharp knife leaves scratch; chips with repeated hammer blows

Notes:

Blows Per Foot: Number of blows required to advance sampler 1 foot (unless a lesser distance is specified). Samplers in general were driven into the soil or bedrock at the bottom of the hole with a standard (140 lb.) hammer dropping a standard 30 inches unless noted otherwise in Log Notes. Drive samples collected in bucket auger borings may be obtained by dropping non-standard weight from variable heights. When a SPT sampler is used the blow count conforms to ASTM D-1586

EXPLORATION LOG

Project: **Due Diligence**			Boring No.: **B-1**
Location: **Hamner Avenue, Ontario**			Elevation:
Job No.: **463-05**	Client: **Richland Communities Inc.**		Date: **8/10/05**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**		Logged By: **EG**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Manure and Organic Rich Fill.							MAX
		ALLUVIUM (Qal)							EXP
		Silty Sand (SM): dry upper foot.							SO4
		Silty Sand (SM): Brown to yellowish-brown; moist; medium dense; fine-grained sand with some medium to coarse sand; some fine gravel; slightly micaceous.		4 5 7			4.0	104.2	pH RES CL
5		Silty Sand (SM): Yellowish-brown; moist; medium dense; fine- to medium-grained sand with some coarse sand; some fine gravel.		3 5 5			6.4	107.3	CON
		Silty Sand (SM): Gray; moist; medium dense; fine-grained sand; few fine gravel; slightly micaceous; sand ~ 85%.		5 8 10			6.9	98.0	
10		Silty Sand (SM): Olive brown; moist to very moist; medium dense; very fine- to fine-grained sand.		4 6 8			12.3	96.7	
15		Sand (SP): Light gray - yellow; moist; medium dense to dense; fine- to coarse-grained sand; some fine gravel; micaceous.		5 11 13			2.1	101.5	
20		Silty Sand (SM): Reddish-brown; very moist; medium dense; fine- to medium-grained sand; some clay; some carbonate stringers; some iron oxide staining.		4 6 8			23.0	96.7	
25		Sand (SP): Gray; moist; medium dense; fine- to coarse-grained sand; micaceous.		4 6 9					

EXPLORATION LOG - V3 463-05.GPJ PETRA.GDT 9/27/05

PLATE A-

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: **Due Diligence**			Boring No.: **B- 1**
Location: **Hamner Avenue, Ontario**			Elevation:
Job No.: **463-05**	Client: **Richland Communities Inc.**		Date: **8/10/05**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**		Logged By: **EG**

Depth (Feet)	Lith-ology	Material Description	Water	Samples			Laboratory Tests		
				Blows	Core	Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
		Sand with Gravel (SP): Gray; moist; dense; fine- to coarse-grained sand; subrounded gravel; gravel ~ 30%.		11 18 20			1.8	102.2	
35		Silty Sand (SM): Light olive brown; moist; medium dense; fine-grained sand; some iron oxide staining.		5 8 10					MA
40		Silty Sand (SM): Olive; very moist; dense; fine-grained sand; some carbonates; abundance of silt.		14 16 18			15.6	107.9	
45		Clayey Sand/Sandy Clay (SC/CL): Olive brown; very moist to saturated; medium dense; fine-grained sand; some iron oxide staining.		3 4 6					HYD
50		Clayey Sand (SC): Olive to olive brown; very moist to saturated; medium dense to dense; fine-grained sand; some iron oxide staining.		6 10 21			14.0	116.3	
		Total Depth = 51.5 feet No Groundwater Borehole backfilled with soil cuttings.							

EXPLORATION LOG - V3 463-05.GPJ PETRA.GDT 9/27/05

PLATE A-2

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: **Due Diligence**			Boring No.: **B- 2**
Location: **Hamner Avenue, Ontario**			Elevation:
Job No.: **463-05**	Client: **Richland Communities Inc.**		Date: **8/10/05**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**		Logged By: **EG**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ALLUVIUM (Qal)							
		Silty Sand (SM): dry upper foot becomes slightly moist below.							
		Silty Sand (SM): Brown to olive brown; slightly moist; medium dense; fine- to medium-grained sand with some coarse sand; slightly porous; some carbonates.		11 15 16	■		11.4	117.1	
5		Silty Sand (SM): Olive brown; moist; medium dense; fine-grained sand with some medium sand; some roothairs; slightly micaceous.		6 7 7	■		11.3	108.5	
10		Silty Sand (SM): Reddish-brown; moist; medium dense; fine- to medium-grained sand with some coarse sand; some iron oxide staining; slightly micaceous.		3 4 7	■		7.6	99.9	CON
		Silty Sand (SM): Reddish-brown to olive gray; moist; medium dense; fine-grained sand; slightly micaceous; some iron oxide staining.		3 5 6	■		19.1	95.3	
15		Sand with Silt (SP-SM): Light brownish-gray; moist; medium dense; fine-grained sand; some lens of Silty Clay (CL): dark reddish brown, very moist, firm to stiff.		4 9 11	■		6.1	98.9	
20		Sand (SW): Light gray; slightly moist; very dense; fine- to coarse-grained sand; some gravel; micaceous.		18 36 38	■		2.3	114.5	
		Total Depth = 21.5 feet No Groundwater Borehole backfilled with soil cuttings.							

EXPLORATION LOG - V3 463-05.GPJ PETRA.GDT 9/12/05

PLATE A-3

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: **Due Diligence**			Boring No.: **B- 3**
Location: **Hamner Avenue, Ontario**			Elevation:
Job No.: **463-05**	Client: **Richland Communities Inc.**		Date: **8/10/05**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**		Logged By: **EG**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ALLUVIUM (Qal)							
		Silty Sand (SM): dry upper foot.							
		Silty Sand (SM): Light olive brown; moist; medium dense; fine- to coarse-grained sand; some gravel.		6 10 12	■		3.8	115.1	
5		Sand with Silt (SP-SM): Olive gray; moist; medium dense; fine- to medium-grained sand with some coarse sand; some fine gravel; slightly micaceous.		6 9 12	■		3.6	104.6	
10		Sand (SP): Light brownish-gray; slightly moist; medium dense to dense; fine- to medium-grained sand; some gravel; slightly micaceous.		8 10 15	■		3.8	103.0	
		Sandy Silt/Silty Sand (ML/SM): Olive yellow; moist; medium dense (firm); fine-grained sand; some iron oxide staining; slightly micaceous.		5 8 11	■		16.3	91.3	
15		Silty Sand (SM): Light brownish-gray; moist; medium dense; fine- to coarse-grained sand; slightly micaceous.		5 7 8	■		5.4	94.3	
20		Sand with Silt and Gravel (SW): Light gray; slightly moist; dense to very dense; fine- to coarse-grained sand; subrounded gravel; gravel ~ 30%.		21 40 50-4"	■		1.3	127.7	
		Total Depth = 21.5 feet No Groundwater Borehole backfilled with soil cuttings.							

EXPLORATION LOG - V3 463-05.GPJ PETRA.GDT 9/27/05

PLATE A-4

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: **Due Diligence**			Boring No.: **B- 4**
Location: **Hamner Avenue, Ontario**			Elevation:
Job No.: **463-05**	Client: **Richland Communities Inc.**		Date: **8/10/05**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**		Logged By: **EG**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ALLUVIUM (Qal)							
		Silty Sand (SM): Dry upper foot.							
		Silty Sand (SM): Light brown to light brownish-gray; slightly moist; medium dense; fine-grained sand with some medium to coarse sand; slightly micaceous.		7 7 8	■		3.1	103.3	
5		Silty Sand (SM): Light brown; moist; medium dense; fine- to medium-grained sand with some coarse sand; some fine gravel; slightly porous; some iron oxide staining.		5 8 9	■		6.3	112.1	
		Sand with Silt (SP-SM): Gray; slightly moist; medium dense; fine- to medium-grained sand with some coarse sand; some fine gravel; slightly micaceous.		4 4 6	■		1.5	103.3	CON
10		Silty Sand (SM): Olive brown; moist; medium dense; fine-grained sand; some carbonate stringers; some iron oxide staining.		4 5 7	■		10.8	98.5	
15		Silty Sand (SM): Mottled light gray - reddish brown; moist; medium dense; fine-grained sand; slightly micaceous; some iron oxide staining; silt ~ 40%.		5 7 8	■		11.8	91.2	
20		Silty Sand (SM): Mottled gray - reddish brown; very moist; medium dense; fine-grained sand; slightly micaceous; some iron oxide staining.		4 5 8	■		10.3	104.0	
		Total Depth = 21.5 feet No Groundwater Borehole backfilled with soil cuttings.							

EXPLORATION LOG - V3 463-05.GPJ PETRA.GDT 9/12/05

PLATE A-5

EXPLORATION LOG

Project: **Due Diligence**			Boring No.: **B- 5**
Location: **Hamner Avenue, Ontario**			Elevation:
Job No.: **463-05**	Client: **Richland Communities Inc.**		Date: **8/10/05**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**		Logged By: **EG**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ALLUVIUM (Qal)							
		Silty Sand (SM): Dry upper foot.							
		Silty Sand (SM): Brown to olive brown; moist; medium dense; fine- to medium-grained sand; some pinhole porosity; few fine gravel; slightly micaceous.		8 10 11	■		12.3	101.3	
5		Sand with Silt (SP-SM): Light brownish-gray; slightly moist; medium dense; fine-grained sand; micaceous.		6 8 12	■		4.9	97.3	
		Same as 5 feet.		5 8 12	■		4.5	94.2	
10		Silty Sand (SM): Olive; very moist; medium dense; fine-grained sand; some iron oxide staining; slightly micaceous; silt ~ 40%.		5 8 9	■		4.6	93.5	
15		Silty Sand (SM): Olive gray; very moist; medium dense to dense; fine- to coarse-grained sand; some fine gravel; some iron oxide staining; slightly micaceous.		5 11 15	■		4.9	105.1	
20		Sand with Gravel (SW): Gray; moist; dense to very dense; fine- to coarse-grained sand; subrounded gravel.		12 24 26	■		1.3	97.9	
		Total Depth = 21.5 feet No Groundwater Borehole backfilled with soil cuttings.							

EXPLORATION LOG - V3 463-05.GPJ PETRA.GDT 9/12/05

PLATE A-6

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: **Due Diligence**		Boring No.: **B- 6**
Location: **Hamner Avenue, Ontario**		Elevation:
Job No.: **463-05**	Client: **Richland Communities Inc.**	Date: **8/10/05**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By: **EG**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ALLUVIUM (Qal)							
		Silty Sand (SM): Dry upper foot.							
		Silty Sand (SM): Light brown; slightly moist; dense; fine- to medium-grained sand with some coarse sand; some fine gravel; some pinhole porosity; some carbonate stringers.		18 20 21			3.8	116.3	
5		Silty Sand (SM): Brown; moist; medium dense; fine- to medium-grained sand with some coarse sand; some gravel; slightly micaceous; increase in sand content ~ 80-90%.		6 10 12			2.1	107.4	
				7 11 15			3.0	104.2	
10		Sand (SP): Gray; slightly moist; medium dense; fine- to medium-grained sand with some coarse sand; micaceous.							
		Silty Sand (SM): Reddish-brown; moist; medium dense; fine-grained sand; slightly micaceous.		5 6 9			6.8	98.1	CON
15		Silty Sand (SM): Light brown to light reddish-brown; moist; medium dense; fine-grained sand; some pinhole porosity; slightly micaceous.		5 8 10			14.6	95.0	
20		Sand with Silt (SP-SM): Light gray - light yellowish brown; moist; medium dense; fine-grained sand; slightly micaceous.		3 5 5					
25		Silty Sand (SM): Gray - yellowish red; very moist; dense; fine- to medium-grained sand; slightly micaceous.		6 10 14			20.9	100.7	

EXPLORATION LOG - V3 463-05.GPJ PETRA.GDT 9/12/05

PLATE A-'

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: **Due Diligence**			Boring No.: **B- 6**
Location: **Hamner Avenue, Ontario**			Elevation:
Job No.: **463-05**	Client: **Richland Communities Inc.**		Date: **8/10/05**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**		Logged By: **EG**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Silty Clay (CL): Olive gray; very moist; firm; few fine sand; some carbonate stringers.		2 3 5					AT HYD
35		Silty Sand (SM): Mottled olive gray - reddish brown; very moist; dense; fine- to coarse-grained sand; slightly micaceous; some carbonates.		18 22 24			11.9	115.3	
40		Silty Sand (SM): Reddish-brown; very moist; medium dense to dense; fine- to medium-grained sand; slightly micaceous.		5 6 10					MA
45		Silty Sand with some Clay (SM-SC): Light olive brown; very moist; dense to very dense; fine- to medium-grained sand; some carbonates.		7 17 32			14.1	116.5	
50		Silty Sand (SM): Brown; moist; medium dense to dense; fine- to medium-grained sand; some carbonates.		6 9 14					
		Total Depth = 51.5 feet No Groundwater Borehole backfilled with soil cuttings.							

EXPLORATION LOG - V3 463-05.GPJ PETRA.GDT 9/12/05

PLATE A-8

EXPLORATION LOG

Project: **Due Diligence**		Boring No.: **B- 7**	
Location: **Hamner Avenue, Ontario**		Elevation:	
Job No.: **463-05**	Client: **Richland Communities Inc.**	Date: **8/10/05**	
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By: **EG**	

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ALLUVIUM (Qal)							
		Silty Sand (SM): Dry upper foot.							
		Silty Sand (SM): Pale yellow; slightly moist; medium dense to dense; fine-grained sand; pinhole porosity; slightly micaceous.		8 13 15	■		6.4	114.1	
5		Sand with Silt (SP-SM): Light gray; slightly moist; medium dense; fine-grained sand; micaceous.		4 7 8	■		3.5	93.2	CON
10		Silty Sand (SM): Olive brown; moist; medium dense; fine-grained sand; some pinhole porosity; slightly micaceous.		3 5 6	■		9.2	101.0	
		Sandy Clay (CL): Dark brown; very moist; firm; fine-grained sand; still porous; some carbonate stringers.		3 5 6	■		23.5	97.5	CON
15		Sandy Silt (ML): Dark olive brown; very moist to saturated; firm; fine-grained sand; some carbonate stringers; some pinhole porosity.		3 4 6	■		23.1	98.3	
20		Silty Sand (SM): Dark brown; very moist; medium dense; fine- to medium-grained sand with some coarse sand; slightly micaceous.		5 5 6	■		13.1	109.1	
		Total Depth = 21.5 feet No Groundwater Borehole backfilled with soil cuttings.							

EXPLORATION LOG - V3 463-05.GPJ PETRA.GDT 9/12/05

PLATE A-

EXPLORATION LOG

Project: **Due Diligence**			Boring No.: **B- 8**
Location: **Hamner Avenue, Ontario**			Elevation:
Job No.: **463-05**	Client: **Richland Communities Inc.**		Date: **8/15/05**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**		Logged By: **EG**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ALLUVIUM (Qal)							
		Silty Sand (SM): Dry upper foot.							
		Silty Sand (SM): Light olive gray; moist; medium dense; fine-grained sand; sand approximately 85 - 90%.		6 7 10	■		11.7	99.8	CON
5		Sand with Silt (SP-SM): Light gray; moist; medium dense; fine-grained sand; slightly micaceous.		5 8 10	■		4.4	97.4	
10		Silty Sand (SM): Brown; moist; medium dense; fine-grained sand with some medium sand; some carbonates.		5 8 15	■		11.4	110.1	
15		Silty Sand (SM): Light olive gray; moist; medium dense to dense; fine-grained sand; sand approximately 85 - 90%.		8 16 20	■		4.4	96.0	
20		Silty Sand with Gravel (SM): Dark reddish-brown; very moist to saturated; dense; fine- to coarse-grained sand.		8 20 27	■		8.8	127.7	
		Total Depth = 20.5 feet No Groundwater Borehole backfilled with soil cuttings.							

EXPLORATION LOG - V3 463-05.GPJ PETRA.GDT 9/12/05

PLATE A-1(

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: **Due Diligence**			Boring No.: **B- 9**
Location: **Hamner Avenue, Ontario**			Elevation:
Job No.: **463-05**	Client: **Richland Communities Inc.**		Date: **8/15/05**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**		Logged By: **EG**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ALLUVIUM (Qal)							MAX
		Silty Sand (SM): Dry upper foot.							EXP
									SO4
		Silty Sand (SM): Light brown; slightly moist; medium dense; fine-grained sand; some fine gravel.		6 8 13			4.0	104.0	pH RES CL
5		Silty Sand (SM): Olive brown; very moist; medium dense to dense; fine-grained sand; some clay.		10 13 16			13.4	117.5	
		Silty Sand (SM): Brown; moist; dense; fine- to coarse-grained sand; layers of Clay (CL): dark olive, very moist, stiff.		6 10 21			7.8	121.3	
10									
		Silty Sand (SM): Olive brown; moist; medium dense; fine-grained sand; some medium sand.		8 10 14			7.6	105.6	
15									
		Silty Sand (SM): Yellowish-brown - gray; moist to very moist; dense; fine- to medium-grained sand with some coarse sand; trace of clay.		8 11 15			8.0	111.6	
20									
		Sand (SP): Red to reddish-yellow; moist; dense to very dense; fine- to coarse-grained sand; some gravel.							
25				13 16 18					

EXPLORATION LOG - V3 463-05.GPJ PETRA.GDT 9/27/05

PLATE A-11

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: **Due Diligence**			Boring No.: **B- 9**
Location: **Hamner Avenue, Ontario**			Elevation:
Job No.: **463-05**	Client: **Richland Communities Inc.**		Date: **8/15/05**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**		Logged By: **EG**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Clayey Sand (SC): Olive brown; very moist; dense to very dense; fine- to medium-grained sand with some coarse sand; few fine gravel; cemented; some silt.		14 30 37			13.3	120.9	
35		Silty Clay (CL): Olive yellow; very moist to saturated; firm; trace of fine gravel.		4 4					HYD
		Clayey Sand (SC): Olive brown to reddish-brown; very moist; dense; fine- to medium-grained sand; some iron oxide staining.		8					
40				14 15 20			19.0	107.3	
45		Silty Sand (SM): Reddish-yellow; very moist; dense; fine-grained sand; slightly micaceous.		9 9					
		Silty Clay (CL): Olive gray; very moist; firm to stiff.		11					
50		Silty Clay (CL): Reddish-yellow; very moist to wet; stiff; trace of fine sand; some iron oxide staining.		9 15 15			25.5	92.0	
		Total Depth = 51.5 feet No Groundwater Borehole backfilled with soil cuttings.							

EXPLORATION LOG - V3 463-05.GPJ PETRA.GDT 9/27/05

PLATE A-1

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: **Due Diligence**			Boring No.: **B-10**
Location: **Hamner Avenue, Ontario**			Elevation:
Job No.: **463-05**	Client: **Richland Communities Inc.**		Date: **8/15/05**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**		Logged By: **EG**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ARTIFICIAL FILL (Af)							
		Silty Sand (SM): Dry upper foot.							
		Silty Sand (SM): Brown; moist; medium dense; fine-grained sand.		6 5 6	■		11.4	99.4	
5		Silty Sand (SM): Black; very moist to wet; medium dense; fine- to medium-grained sand; some pieces of plastic; some manure.		6 10 16	■		19.3	101.3	
10		Silty Sand (SM): Black to brown; moist; medium dense; fine-grained sand; some pieces of concrete fragments and wire mesh.		32 14 5	■		9.9	94.4	
		Encountered possibly a concrete slab. Refusal.							
		Refusal at 13.0 feet No Groundwater Borehole backfilled with soil cuttings.							

EXPLORATION LOG - V3 463-05.GPJ PETRA.GDT 9/27/05

PLATE A-1

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: **Due Diligence**			Boring No.: **B-11**
Location: **Hamner Avenue, Ontario**			Elevation:
Job No.: **463-05**	Client: **Richland Communities Inc.**		Date: **8/15/05**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**		Logged By: **EG**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ALLUVIUM (Qal)							
		Silty Sand (SM): Dry upper foot.							
		Silty Sand (SM): Pale yellow; dry to slightly moist; medium dense; fine- to medium-grained sand.		10 11 14	■		1.4	109.0	
5		Sand with Gravel (SP): Light gray; slightly moist; dense; fine- to medium-grained sand; few coarse sand; gravel up to 3" diameter.		16 24 30	■		1.6	105.2	
10		Silty Sand/ Sandy Silt (SM/ML): Olive; moist; medium dense (firm); fine-grained sand.		7 11 12	■		6.2	101.0	
15		Sandy Silt (ML): Olive to olive brown; very moist; stiff; fine-grained sand; slightly porous.		10 16 20	■		25.9	98.8	
20		Silty Sand (SM): Light olive brown; moist; medium dense to dense; fine- to medium-grained sand.		7 11 20	■		15.0	107.5	
		Total Depth = 21.5 feet No Groundwater Borehole backfilled with soil cuttings.							

EXPLORATION LOG - V3 463-05.GPJ PETRA.GDT 9/12/05

PLATE A-1

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: **Due Diligence**		Boring No.: **B-12**	
Location: **Hamner Avenue, Ontario**		Elevation:	
Job No.: **463-05**	Client: **Richland Communities Inc.**	Date: **8/15/05**	
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**	Logged By: **EG**	

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ALLUVIUM (Oal) Dry upper foot.							MAX EXP SO4 pH RES CL DSR
		Sand with Silt (SP-SM): Light olive gray; slightly moist; medium dense; fine-grained sand.		7 8 9	■	▒	2.9	99.6	
5		Sand (SP): Light gray; slightly moist; dense; fine- to medium-grained sand with some coarse sand; some gravel.		11 11 11	■		1.8	110.0	
		Silty Sand (SM): Brown; moist; medium dense; fine-grained sand.							
10		Silty Sand (SM): Brown to olive brown; very moist; medium dense; fine-grained sand; slightly porous; some carbonate stringers.		5 7 11	■		16.8	108.1	
15		Silty Sand (SM): Brown to olive brown; very moist; medium dense; fine-grained sand; layers of Sand (SP): gray, very moist, dense, fine-grained sand.		7 9 20	■		15.4	102.4	
20		Sand with Gravel (SP): Gray; moist; dense; fine- to coarse-grained sand; subrounded gravel; micaceous; some Silty Sand (SM) layers.		21 21 21	■		3.1	125.0	
25		Becomes yellowish brown - gray; moist; dense; fine-to coarse-grained sand.		14 14 14	▒				

EXPLORATION LOG - V3 463-05.GPJ PETRA.GDT 9/27/05

PLATE A-1

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: **Due Diligence**			Boring No.: **B-12**
Location: **Hamner Avenue, Ontario**			Elevation:
Job No.: **463-05**	Client: **Richland Communities Inc.**		Date: **8/15/05**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**		Logged By: **EG**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Same as above; becomes very dense.		16 35 50-5"			2.8	113.6	
35		Sand (SP): Yellowish-brown; moist; dense; fine-grained sand; few fine gravel.		12 20 19					
40		Silty Sand (SM): Reddish-brown; very moist; dense to very dense; fine-grained sand; slightly micaceous; trace of clay.		33 36 33			3.4	103.9	
45		Same as above; sand approximately 80%.		7 14 15					
		Sand (SP): Light brown; moist; hard; fine-grained sand.							
50				26 50-5"			4.5	105.1	
		Total Depth = 51.0 feet No Groundwater Borehole backfilled with soil cuttings.							

EXPLORATION LOG - V3 463-05.GPJ PETRA.GDT 9/27/05

PLATE A-16

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: **Due Diligence**			Boring No.: **B-13**
Location: **Hamner Avenue, Ontario**			Elevation:
Job No.: **463-05**	Client: **Richland Communities Inc.**		Date: **8/15/05**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**		Logged By: **EG**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ALLUVIUM (Qal) Dry upper foot.							
		Silty Sand (SM): Brown; slightly moist to moist; medium dense; fine-grained sand; slightly micaceous; sand ~ 80-90%.		8 7 8	■		3.6	101.9	CON
5		Silty Sand (SM): Light olive brown; moist; medium dense; fine-grained sand; slightly micaceous; increase in silt content ~ 20%.		8 13 18	■		9.7	111.9	
10		Same as 6 feet.		7 11 17	■		10.2	108.3	
15		Sandy Silt (ML): Olive to olive brown; very moist; firm to stiff; fine-grained sand; some white minerals.		5 11 17	■		22.7	100.3	
20		Silty Sand (SM): Light gray; slightly moist to moist; dense; fine-grained sand; micaceous.		9 13 22	■		13.4	102.1	
		Total Depth = 21.5 feet No Groundwater Borehole backfilled with soil cuttings.							

EXPLORATION LOG - V3 463-05.GPJ PETRA.GDT 9/12/05

PLATE A-1

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: **Due Diligence**			Boring No.: **B-14**
Location: **Hamner Avenue, Ontario**			Elevation:
Job No.: **463-05**	Client: **Richland Communities Inc.**		Date: **8/15/05**
Drill Method: **Hollow-Stem Auger**	Driving Weight: **140 lbs / 30 in**		Logged By: **EG**

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ALLUVIUM (Qal)							
		Silty Sand (SM): Dry upper foot.							
		Silty Sand (SM): Brown; slightly moist; medium dense; fine-grained sand; slightly micaceous.		5 7 10	■		5.2	113.2	
5		Same as above.		8 11 14	■		6.5	109.7	
10		Silty Sand (SM): Olive brown; moist; medium dense to dense; fine-grained sand; micaceous.		10 11 15	■		7.8	111.5	
15		Same as 10 feet.		9 13 20	■		8.5	108.2	
20		Silty Sand / Clayey Sand (SM/SC): Olive gray to reddish-brown; very moist; medium dense to dense; fine-grained sand; slightly micaceous.		6 12 17	■		20.7	98.2	
		Total Depth = 21.5 feet No Groundwater Borehole backfilled with soil cuttings.							

EXPLORATION LOG - V3 463-05.GPJ PETRA.GDT 9/12/05

PLATE A-1

Petra Geotechnical, Inc.

LOG OF TEST PITS

Test Pit Number	Depth (ft.)	Description
TP-1		UNDOCUMENTED ARTIFICIAL FILL (Afu)
	0.0 – 1.0	Silty Sand (SM): Medium brown, dry, loose, fine-grained, abundant rootlets (disced/tilled farmland).
		QUATERNARY ALLUVIUM (Qal)
	1.0 – 6.0	Silty Sand with Silt (SP/SM): Yellowish-brown, slightly moist, medium dense, fine-grained, scattered subangular to subrounded gravel, local roots and rootlets (1/8" maximum diameter), pinhole voids at ½" spacing, infilled rodent burrow @ 3 feet.
	6.0 – 9.0	Silty Sand/Sandy Silt (SM/ML): Dark yellow-brown, moist, medium dense (stiff), fine-grained.
		No Groundwater R/R @ 5 to 6 feet No Caving Small Bulks at 0, 1, 2, 3, and 4 feet Lg. Bulk at 0-5 and 6-8 feet
TP-2		UNDOCUMENTED ARTIFICIAL FILL (Afu)
	0.0 – 0.75	Manure-rich Topsoil (OH): Grass/weed/manure admixture, dark brown, dry, loose.
		QUATERNARY ALLUVIUM (Qal)
	0.75 – 4.0	Silty Sand (SM): Light brown, slightly moist, medium dense, fine-grained with scattered subrounded gravel, abundant rootlets to 3 feet (decreasing with depth), pinhole voids at ½- 1 inch spacing.
	4.0 – 4.75	Sand (SP): Light brown, slightly moist, medium dense, fine to medium grained, scattered subrounded gravel.
	4.75 – 6.0	Sandy Silt (ML): Orange brown, moist, medium stiff, pinhole voids at ¼ to ½inch spacing, isolated rootlets. Gradational basal contact.

LOG OF TEST PITS

Test Pit Number	Depth (ft.)	Description
TP-2 (cont.)	6.0 – 8.5	**Sand (SP):** Light yellowish-brown, slightly moist, medium dense to dense, fine to medium grained.
		No Groundwater R/R at 6 feet No Caving Small Bulks at 1, 2, 3 and 4 feet
TP-3		**UNDOCUMENTED FILL (Afu)**
	0.0 – 1.0	**Organic Rich Topsoil (OH):** Dark brown to black, dry (upper 3 inches) to moist, soft, silty pond sediments.
	1.0 – 1.5	**Silty Sand (SM)** Medium gray, moist, medium dense, fine-grained, rootlets, pond sediments.
		QUATERNARY ALLUVIUM (Qal)
	1.5 – 4.0	**Sand (SP):** Medium gray-brown, moist, medium dense to dense, fine to medium grained.
	4.0 – 6.0	**Silty Sand (SM):** Medium gray, moist, dense, fine-grained, micromicaceous.
		No Groundwater R/R at 2 to 3 feet No Caving Small Bulks at 1 and 2 feet
TP-4		**UNDOCUMENTED ARTIFICIAL FILL (Afu)**
	0.0 – 0.25	**Manure (OH):** Dark brown, dry, loose, scattered subangular gravel.
		QUATERNARY ALLUVIUM
	0.25 – 5.0	**Silty Sand (SM):** Yellowish-brown, slightly moist, loose to medium dense, fine to medium grained, scattered subangular gravel, local roots (1/2" diameter). Gradational basal contact.

LOG OF TEST PITS

Test Pit Number	Depth (ft.)	Description
TP-6 (cont.)		
	4.0 – 9.0	**Silty Sand (SM):** Medium brown, slightly moist to moist, medium dense to dense, fine to medium grained.
		No Groundwater R/R at 5 feet No Caving Small Bulks at 1, 2, 3 and 4 feet
TP-7		**UNDOCUMENTED ARTIFICIAL FILL (Afu)**
	0.0 – 1.0	**Manure (OH):** Dark-brown, dry to slightly moist, loose.
		QUATERNARY ALLUVIUM
	1.0 – 1.5	**Silty Sand (SM):** Green-brown, slightly moist, medium dense, fine-grained with scattered subangular gravel.
	1.5 – 5.5	**Silty Sand (SM):** Medium yellowish-brown, slightly moist, medium dense to dense, fine to medium-grained.
	5.5 – 8.0	**Sand (SP):** Greenish-gray, slightly moist, medium dense, medium-grained.
		No Groundwater R/R at 4 to 5 feet No Caving Small Bulks at 1.5, 3 and 4.5 Lg. Bulk at 3 to 6 feet
TP-8		
		UNDOCUMENTED ARTIFICIAL FILL (Afu)
	0.0 – 1.0	**Silty Sand (SM):** Light brown, dry, loose to medium dense, fine to medium-grained, abundant rootlets, (disced, tilled farmland).
		QUATERNARY ALLUVIUM (Qal)
	1.0 – 3.0	**Silty Sand (SM):** Medium brown, slightly moist, medium dense, fine to medium-grained, occasional rootlets and roots (1/8" diameter), rodent burrow at 2 feet.

LOG OF TEST PITS

Test Pit Number	Depth (ft.)	Description
TP-8 (cont.)		
	3.0 – 6.0	**Gravelly Sand (SP):** Light gray, slightly moist, medium dense to dense, medium grained with scattered coarse grains, subrounded gravel and small cobbles to 2 inches, (10-15% gravel).
	6.0 – 8.0	**Silty Sand (SM):** Medium brown, moist, medium dense to dense, fine to medium grained.
		No Groundwater R/R at 3 to 4 feet Moderate Caving at 3 to 6 feet Small bulks at 1 and 2 feet Lg. bulks at 3 to 6 feet
TP-9		UNDOCUMENTED ARTIFICIAL FILL (Afu)
	0.0 – 1.0	**Silty Sand (SM):** Light brown, dry, loose to medium dense, fine gravel, scattered subrounded gravel, roots and rootlets common, (reworked farmland).
		QUATERNARY ALLUVIUM (Qal)
	1.0 – 2.0	**Sand (SP):** Light brown, slightly moist, medium dense, medium-grained, scattered subrounded gravel and small cobbles, local rootlets.
	2.0 – 8.0	**Sand with Silt (SM/SP):** Medium brown, slightly moist, medium dense to dense, fine to medium-grained, scattered subrounded gravel, rootlets to 3.5 feet.
		No Groundwater R/R at 4 feet No Caving Small bulks at 0.5 and 1.5 feet
TP-10		UNDOCUMENTED ARTIFICIAL FILL (Afu)
	0.0 – 0.25	**Silty Sand (SM):** Light brown, dry, medium dense, fine-grained.

LOG OF TEST PITS

Test Pit Number	Depth (ft.)	Description
TP-10 (cont.)	0.25 – 9.0	QUATERNARY ALLUVIUM (Qal) Sand (SP): Yellowish-brown, slightly moist, medium dense, medium-grained, locally silty, grades to fine-grained by 6 feet. No Groundwater R/R at 3 feet Minor Caving Sm. Bulks at 0.5, 1.5 and 3 feet
TP-11	0.0 – 0.25	UNDOCUMENTED FILL (Afu) Manure (OH): Medium brown, dry, loose.
	0.25 – 3.0	Silt (ML): Light medium brown, slightly moist, soft to medium stiff, abundant pinhole voids, decayed roots to a maximum diameter of inch.
	3.0 – 4.0	Sand (SP): Light brown, slightly moist, medium dense, medium grained, scattered debris (string and rusty nails).
	4.0 – 8.0	QUATERNARY ALLUVIUM (Qal) Sand (SP): Light to medium brown, slightly moist, medium dense to dense, medium-grained grades to fine-grained by 6 feet, scattered subrounded gravel. No Groundwater R/R at 4 to 5 feet Moderate Caving at 3 to 5 feet Sm. Bulk Samples taken at 0.5, 1.5 and 3 feet
TP-12	0.0 – 0.75	UNDOCUMENTED ARTIFICIAL FILL (Afu) Manure-Rich Topsoil with Silty Sand (OH/SM): Light medium brown, dry to slightly moist, loose, abundant manure and straw, roots and rootlets.
	0.75 – 2.0	Silty Sand (SM): Medium brown, slightly moist, medium dense, fine to medium grained, rootlets.
	2.0 – 2.5	Silt (ML): Light gray brown, slightly moist, medium stiff, pinhole voids, rootlets.

LOG OF TEST PITS

Test Pit Number	Depth (ft.)	Description
TP-12 (cont.)		QUATERNARY ALLUVIUM (Qal)
	2.5 – 8.0	Sand (SP): Light gray-brown, slightly moist, medium dense to dense, medium grained slowly grading down to fine grained by 6 feet.
		No Groundwater R/R at 3 to 4 feet Minor Caving
TP-13		UNDOCUMENTED ARTIFICIAL FILL (Afu)
	0.0 – 0.5	Silty Sand (SM): Light gray-brown, dry, loose, fine to medium grained, rootlets common, pinhole voids, scattered subrounded gravel.
		QUATERNARY ALLUVIUM (Qal0
	0.5 – 3.5	Silty Sand (SM): Light gray-brown, slightly moist, medium dense, fine to medium grained, pinhole voids, scattered subrounded gravel.
	3.5 – 8.0	Sand (SP): Medium gray brown, slightly moist, medium dense, to dense, medium grained.
		No Groundwater R/R at 4 feet Minor Caving at 3.5 feet Sm. Bulks at 0.5 and 1.5 feet
TP-14		UNDOCUMENTED ARTIFICIAL FILL (Afu)
	0.0 – 2.0	Silty Sand (SM): Reddish-brown, dry to slightly moist, loose to medium dense, fine to medium grained, scattered anthropogenic debris (shredded plastic, glass fragments, wire), rootlets.
		QUATERNARY ALLUVIUM (Qal)
	2.5 – 5.0	Silty Sand (SM): Olive-brown, slightly moist, medium dense to dense, fine to medium grained, scattered voids to -inch diameter.

LOG OF TEST PITS

Test Pit Number	Depth (ft.)	Description
TP-14 (cont.)		
	5.0 – 8.0	**Sandy Silt (ML):** Olive brown, moist, medium stiff, fine grained, slight orange mottling.
		No Groundwater R/R at 5 feet No Caving Sm. Bulks at 1, 2 and 3 feet

APPENDIX B

LABORATORY TEST PROCEDURES

LABORATORY TEST DATA

PETRA

LABORATORY TEST PROCEDURES

Soil Classification

Soil materials encountered within the property were classified and described utilizing the visual-manual procedures of the Unified Soil Classification System, and in general accordance with Test Method ASTM D 2488-00. The assigned group symbols are presented in the "Exploration Logs," Appendix A.

In-Situ Moisture and Density

Moisture content and dry density of the in place soils were determined in representative strata in accordance with Method ASTM D 2216-98. Test data are summarized for the exploratory borings in the Exploration Logs (Appendix A) and for the test pits on Plate B-1.

Laboratory Maximum Dry Density

Maximum dry density and optimum moisture contents were determined for selected samples of on-site soils in accordance with Method A of ASTM D 1557-02. Pertinent test values are given on Plate B-1.

Expansion Potential

Expansion index tests were performed on selected samples of on-site soil materials in accordance with California Building Code Standard 18-2. The results of these tests are presented on Plate B-1.

Soluble Sulfates and Chlorides

Chemical analyses were performed on selected samples of near-surface soils to determine preliminary soluble sulfate and chloride contents in accordance with California Test Method Nos. 417 and 422, respectively. Test results are presented on Plate B-1.

pH and Resistivity

pH and resistivity tests were performed on selected samples of near-surface site soils to provide a preliminary evaluation of their corrosive potential to concrete and metal construction materials. These tests were performed in accordance with California Test Method Nos. 532 and 643, respectively. The results of these tests are included in Plate B-1.

Organic Content

In-place organic contents of the near-surface soils were determined in accordance with ASTM Test Method D 2974-00. The test results are presented on Plate B-1.

Grain Size Analysis

Grain size analyses, including hydrometer, were performed on selected samples to verify visual classification. These tests were performed in accordance with Test Method ASTM D 422-98. The results of these tests are presented on Plates B-2 through B-6.

LABORATORY TEST PROCEDURES

Atterberg Limits

Atterberg limit tests (liquid limit, plastic limit and plasticity index) were performed on selected samples to verify visual classifications and to aid in evaluating the liquefaction potential of fine-grained soils (e.g., silts and clays). These tests were performed in accordance with ASTM Test Method D 4318-00. Test results are presented on Plate B-4.

Consolidation

Settlement predictions under anticipated loads were made on the basis of the consolidation tests. These tests were performed in general accordance with Test Method ASTM D 2435-96. Axial loads were applied in several increments to a laterally restrained 1-inch-high sample. Loads were applied in a geometric progression by doubling the previous load, and the resulting deformations were recorded at selected time intervals. Test samples were inundated at the calculated overburden pressure. Results of these are graphically presented on Plates B-7 through B-19.

Direct Shear

The Coulomb shear strength parameters, angle of internal friction and cohesion, were determined for soil remolded to 90 percent of maximum dry density. These tests were performed in general accordance with Test Method No. ASTM D 3080-03. Three specimens were prepared for each test. The test specimens were artificially saturated, and then sheared under various normal loads at a maximum constant rate of strain of 0.01 inches per minute. Results are graphically presented on Plates B-20 and B-21.

LABORATORY TEST DATA

IN SITU MOISTURE AND DRY DENSITY [1,2]

Test Pit Number	Depth (feet)	Soil Type	Moisture (%)	Dry Density (pcf)
TP-1	1	Silty Sand	3.3	95.6
TP-2	2	Silty Sand	1.5	104.0
TP-4	3	Silty Sand	7.5	98.5
TP-5	4	Gravelly Sand	3.9	104.3
TP-6	5	Silty Sand	10.4	108.3
TP-7	2	Silty Sand	11.1	109.6
TP-8	3	Silty Sand	7.5	109.6
TP-9	4	Sand with Silt	4.2	101.3
TP-10	4	Sand	6.6	106.9
TP-11	2	Silt	8.4	102.8
TP-12	3	Silt	3.6	104.8
TP-13	3	Silty Sand	14.6	111.2
TP-14	4	Silty Sand	12.8	106.0

LABORATORY MAXIMUM DRY DENSITY [3]

Boring or Test Pit No.	Depth (feet)	Soil Type	Optimum Moisture (%)	Maximum Dry Density (pcf)
B-1	0-5	Silty Sand	13	114
B-9	0-5	Silty Sand	10	116
B-12	0-5	Sand	11	113
TP-1	0-5	Silty Sand	11	110

EXPANSION INDEX TEST DATA [4]

Boring Number	Depth (feet)	Soil Type	Expansion Index	Expansion Potential [5]
B-1	0-5	Sand	1	Very Low
B-9	0-5	Silty Sand	21	Low
B-12	0-5	Sand	9	Very Low
TP-1	0-5	Sand	11	Very Low

SOLUBLE SULFATES AND CHLORIDES [6]

Boring Number	Depth (feet)	Soil Type	Sulfate Content (%)	Chloride Content (ppm)
B-1	0-5	Sand	0.0162	170
B-9	0-5	Silty Sand	0.00405	118
B-12	0-5	Sand	0.28755	122
TP-1	0-5	Sand	0.28755	138

PLATE B-1
(Sheet 1 of 2)

PETRA

LABORATORY TEST DATA

pH AND MINIMUM RESISTIVITY [7]

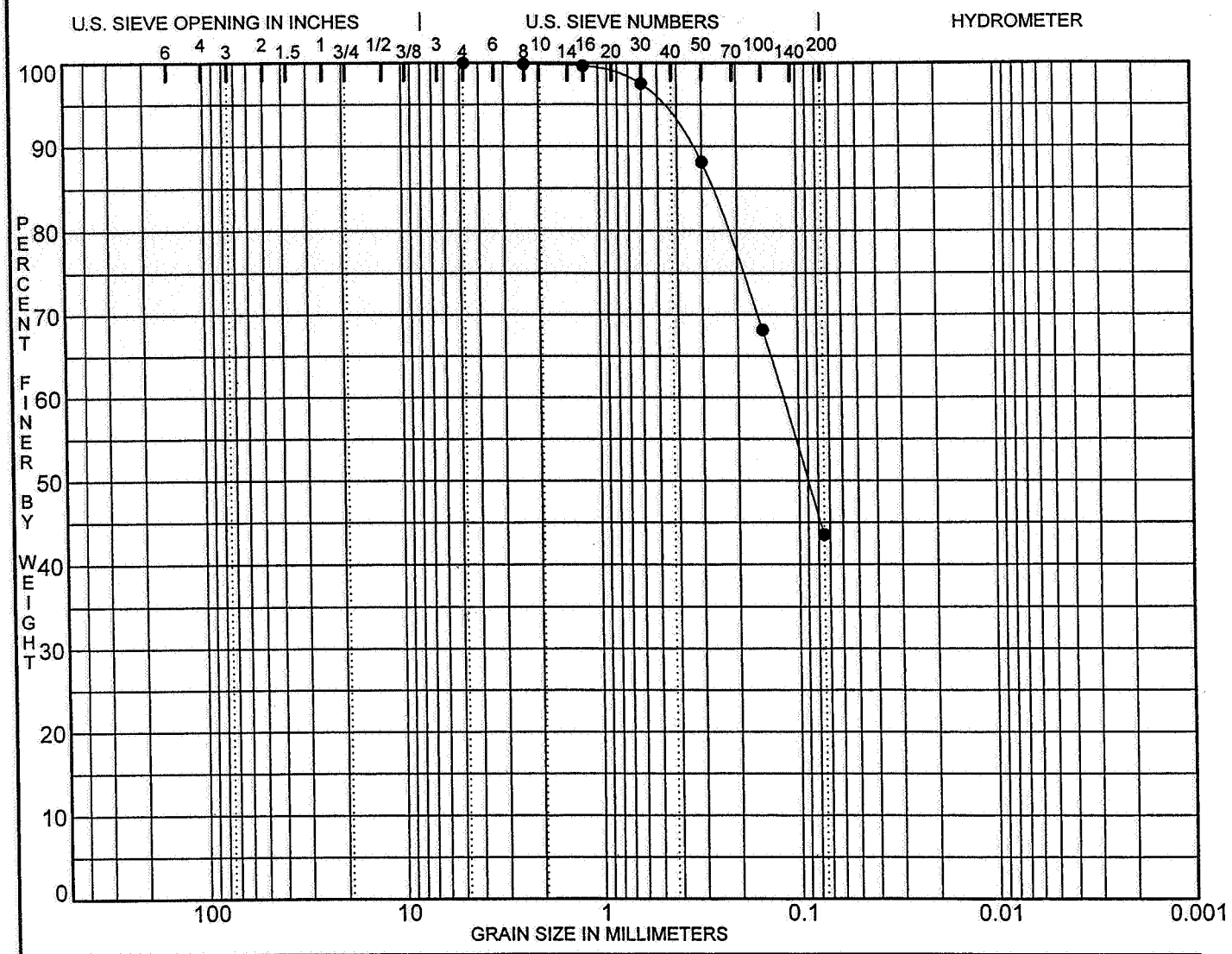
Boring Number	Depth (feet)	Soil Type	pH	Minimum Resistivity (ohm-cm)
B-1	0-5	Sand	6.9	3,000
B-9	0-5	Silty Sand	6.3	3,200
B-12	0-5	Sand	7.7	3,400
TP-1	0-5	Sand	7.8	3,700

IN PLACE ORGANIC CONTENT [8]

Test Pit Number	Depth (feet)	Organic Content (%)
TP-1	1	1.08
	2	0.45
	3	0.81
	4	0.56
TP-2	1	1.04
	2	1.13
	3	0.60
	4	0.35
TP-4	0.5	0.52
	1.5	0.43
	3	0.40
	4.5	0.50
TP-5	1.5	0.29
	3	0.29
	4.5	0.82
TP-6	1	0.80
	2	0.59
	3	0.39
	4	0.80
TP-7	1.5	0.51
	2	0.52
	3	0.90
TP-8	1	1.27
	2	0.38

Test Pit Number	Depth (feet)	Organic Content (%)
TP-9	0.5	2.61
	1.5	0.28
TP-10	0.5	0.47
	1.5	0.30
	3	0.32
TP-11	0.5	1.83
	1.5	1.63
	3	0.51
TP-12	0.5	6.61
	1.5	0.73
	3	0.18
TP-13	0.5	0.58
	1.5	0.49
	3	0.88
TP-14	0.5	6.12
	1.5	0.86
	3	0.98

(1) Per ASTM Test Method D 2216-98
(2) Refer to boring logs in Appendix A for additional in-situ moisture content and dry density data
(3) Per Test Method ASTM D 1557-02
(4) Per ASTM Test Method D 4829-03
(5) Per CBC (2001) Table 18-I-B
(6) Per California Test Method Nos. 417 and 422
(7) Per California Test Method Nos. 532 and 643
(8) Per ASTM Test Method D 2974-00



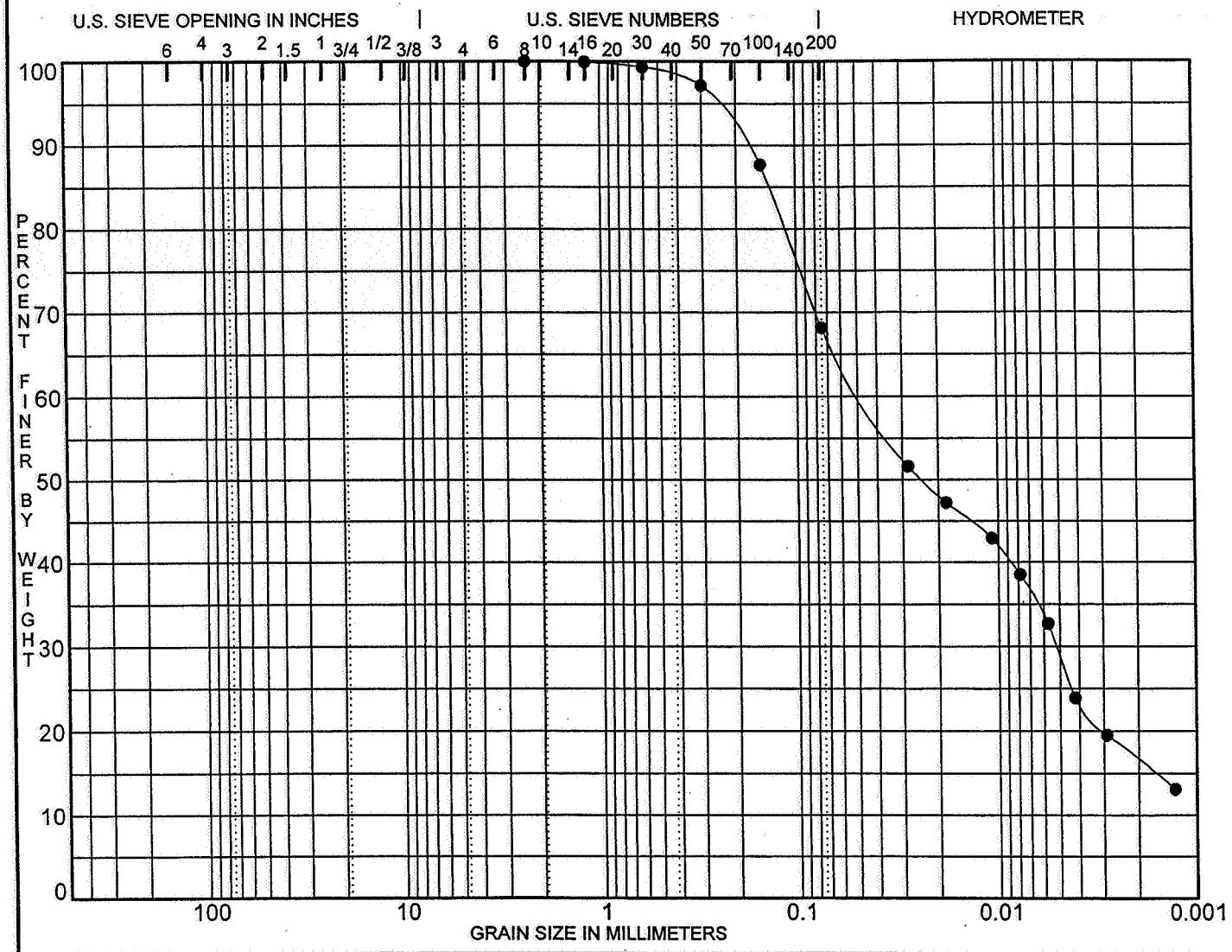
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	B- 1	35.0	Silty Sand (SM)						

	Specimen Identification		D100	D60	D30	D50	%Gravel	%Sand	%Silt	%Clay
●	B- 1	35.0	4.75	0.12		0.0900	0.0	56.5	43.5	

GRAIN SIZE - V1 463-05.GPJ PETRA.GDT 9/16/05

J.N. 463-05	**GRAIN SIZE ANALYSIS**	September, 2005
PETRA GEOTECHNICAL, INC.		PLATE B-2



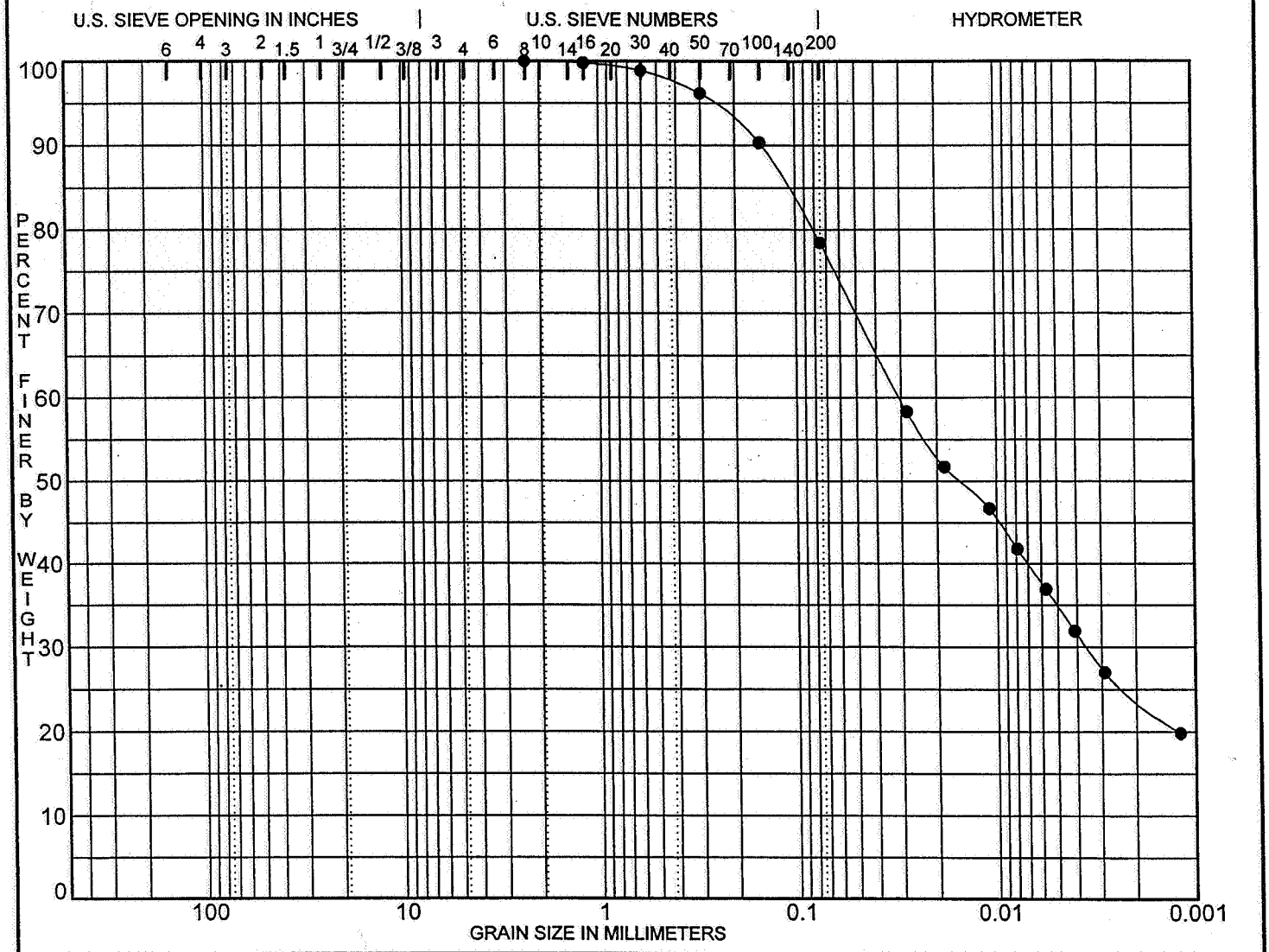
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	B- 1	45.0	~~Clayey Sand (SC)~~ Sandy Clay (CL)						

	Specimen Identification		D100	D60	D30	D50	%Gravel	%Sand	%Silt	%Clay
●	B- 1	45.0	2.36	0.05	0.005	0.0241	0.0	31.8	39.2	28.9

GRAIN SIZE - V1 463-05.GPJ PETRA.GDT 9/16/05

J.N. 463-05	**GRAIN SIZE ANALYSIS**	September, 2005
PETRA GEOTECHNICAL, INC.		PLATE B-3



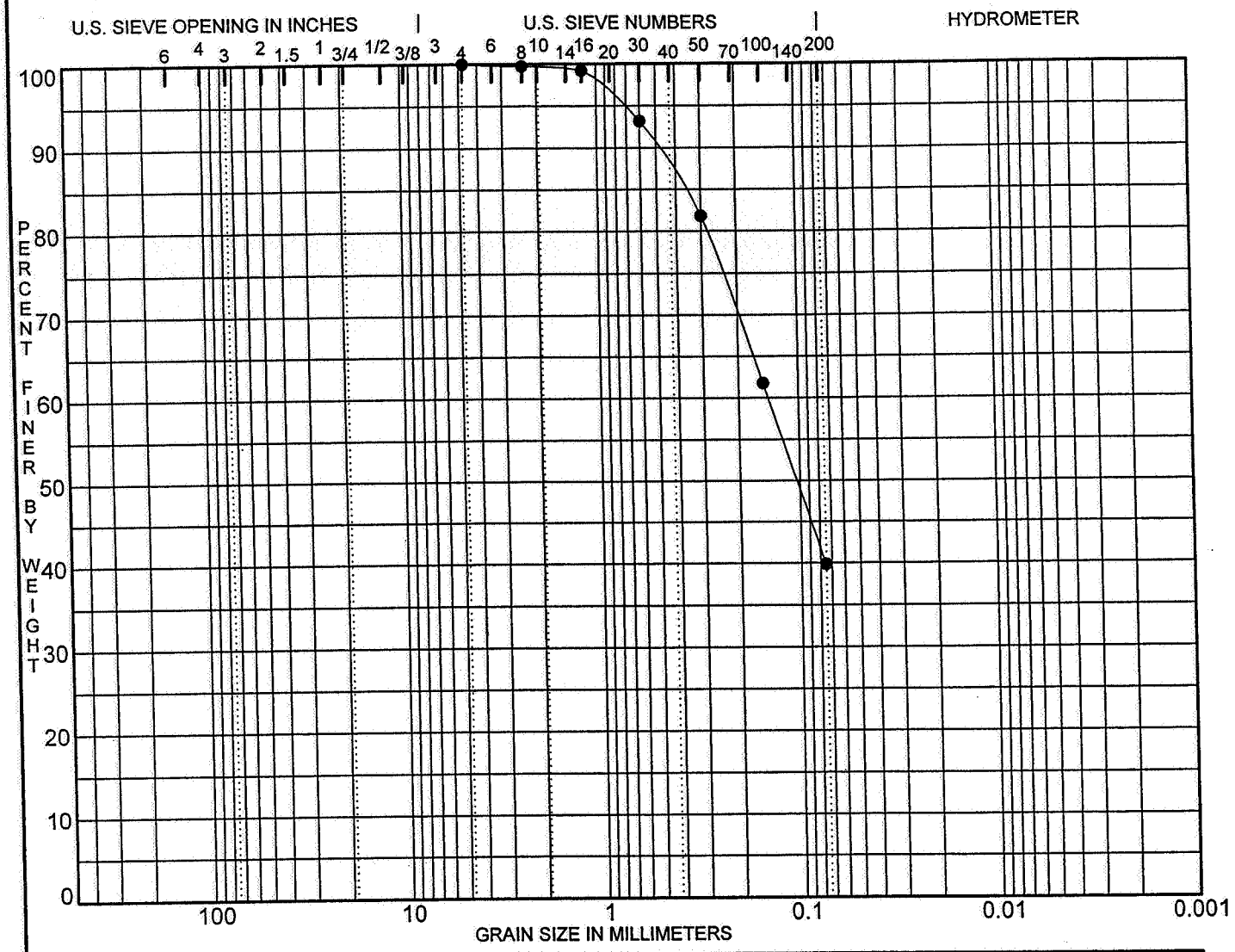
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	B- 6	30.0	Silty Clay (CL)		30	18	12		

	Specimen Identification		D100	D60	D30	D50	%Gravel	%Sand	%Silt	%Clay
●	B- 6	30.0	2.36	0.03	0.004	0.0154	0.0	21.6	43.5	34.9

GRAIN SIZE - V1 463-05.GPJ PETRA.GDT 9/16/05

J.N. 463-05	GRAIN SIZE ANALYSIS	September, 2005
PETRA GEOTECHNICAL, INC.		PLATE B-4



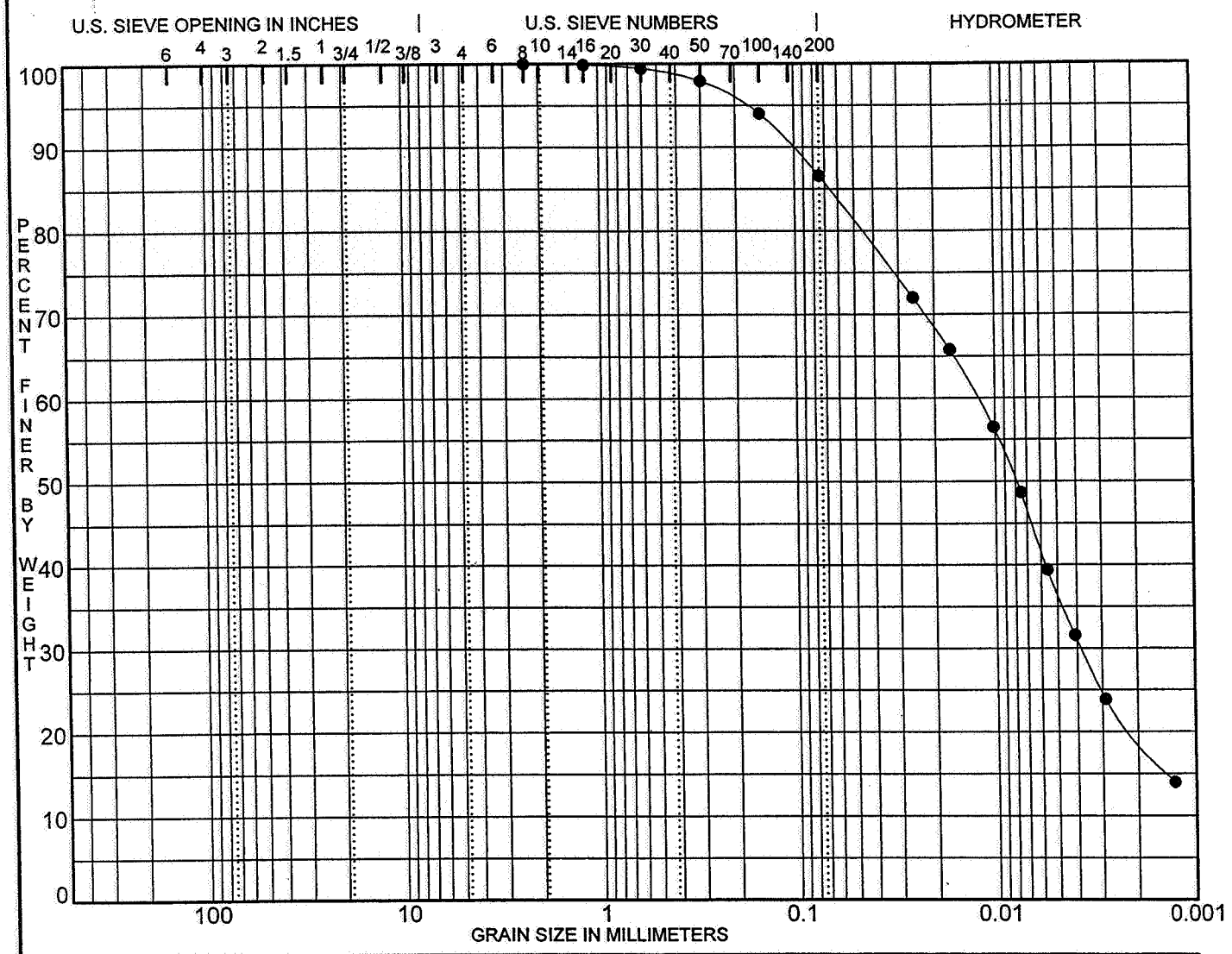
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	B- 6	40.0	Silty Sand (SM)						

	Specimen Identification		D100	D60	D30	D50	%Gravel	%Sand	%Silt	%Clay
●	B- 6	40.0	4.75	0.14		0.1034	0.0	60.1	39.9	

GRAIN SIZE - V1 463-05.GPJ PETRA.GDT 9/16/05

J.N. 463-05	**GRAIN SIZE ANALYSIS**	September, 2005
PETRA GEOTECHNICAL, INC.		PLATE B-5



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

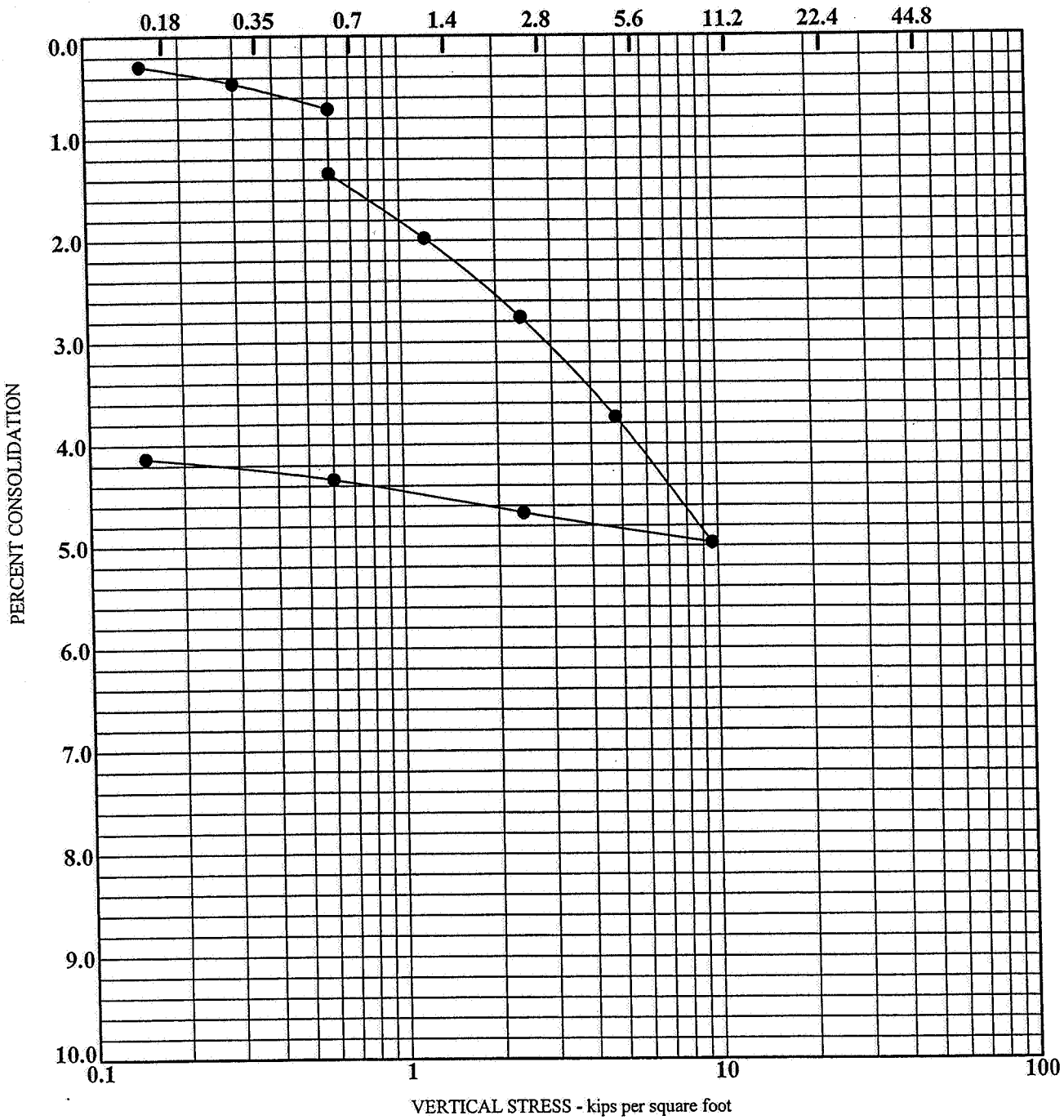
	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	B- 9	35.0	Silty Clay (CL)						

	Specimen Identification		D100	D60	D30	D50	%Gravel	%Sand	%Silt	%Clay
●	B- 9	35.0	2.36	0.01	0.004	0.0079	0.0	13.4	50.0	36.6

J.N. 463-05	**GRAIN SIZE ANALYSIS**	September, 2005
PETRA GEOTECHNICAL, INC.		PLATE B-6

GRAIN SIZE - V1 463-05.GPJ PETRA.GDT 9/27/05

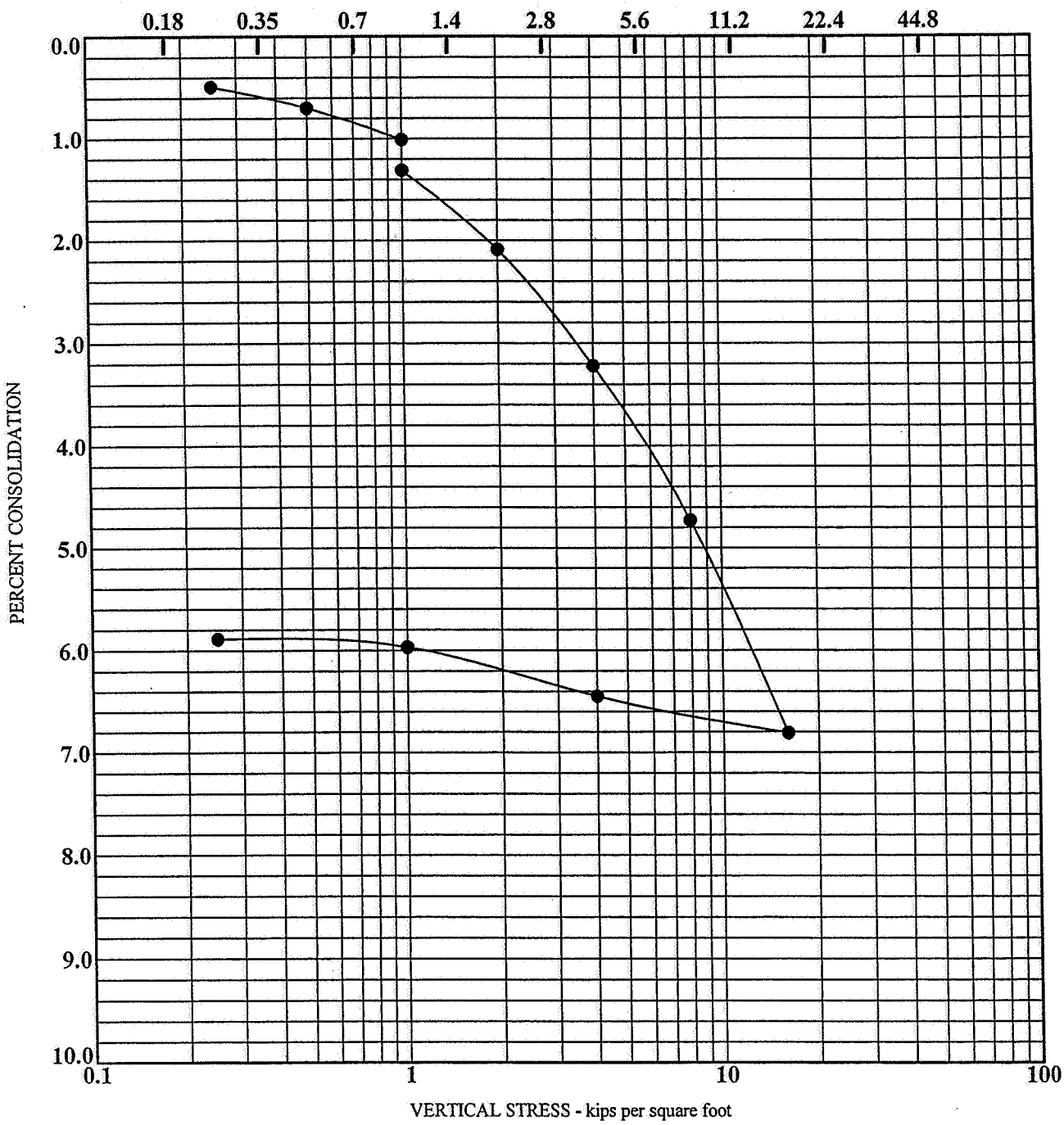
SAMPLE LOCATION	MATERIAL DESCRIPTION	INITIAL			INUNDATED
		DENSITY (pcf)	MOISTURE (%)	SATURATION (%)	LOAD (ksf)
● B-1 @ 5.0	Silty Sand (SM)	103.6	6.1	26	0.60



CONSOLIDATION - STRAIN 463-05.GPJ PETRA.GDT 9/16/05

J.N. 463-05	CONSOLIDATION TEST RESULTS	September, 2005
PETRA GEOTECHNICAL, INC.		PLATE B-7

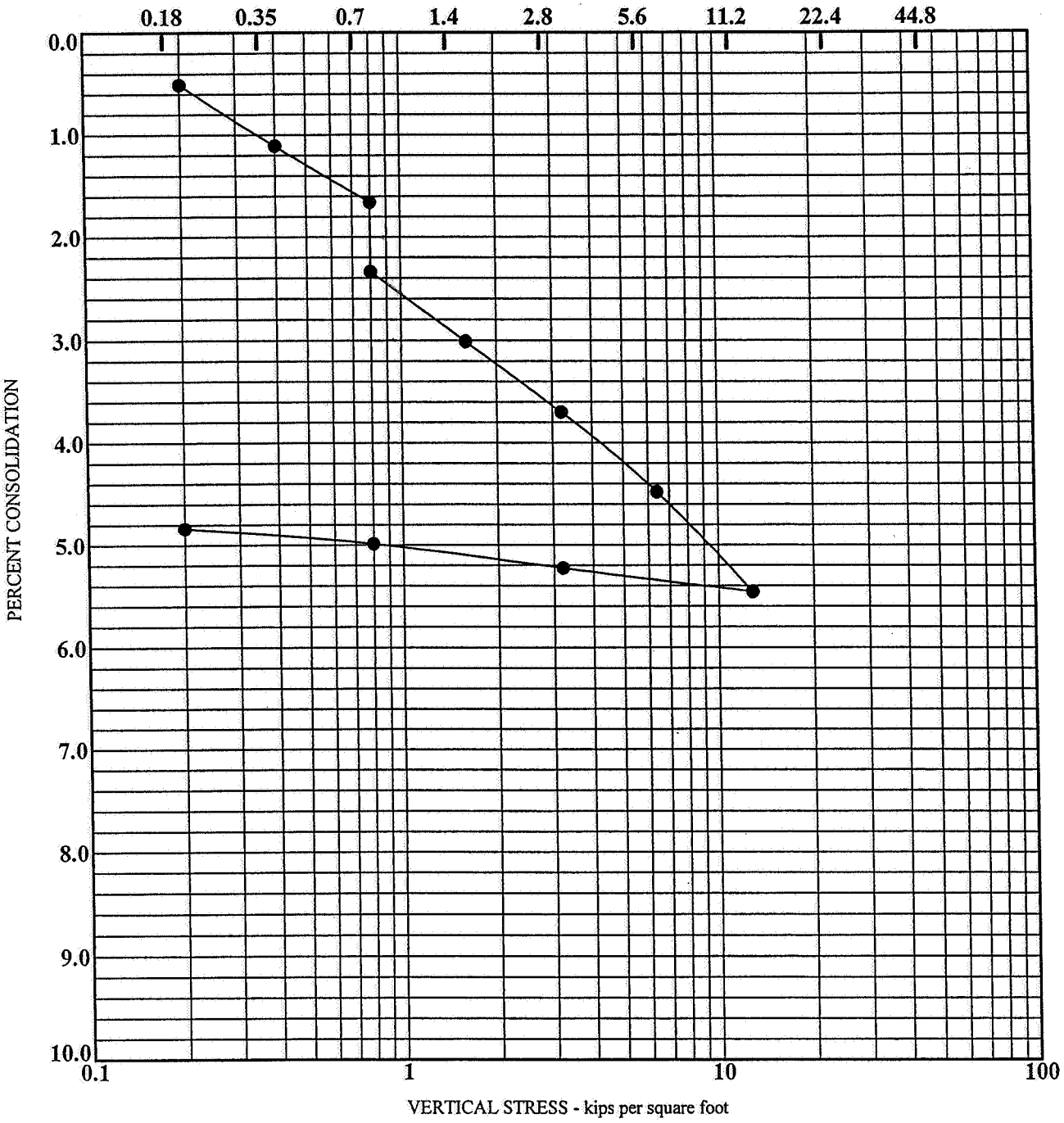
SAMPLE LOCATION	MATERIAL DESCRIPTION	INITIAL			INUNDATED
		DENSITY (pcf)	MOISTURE (%)	SATURATION (%)	LOAD (ksf)
● B- 2 @ 9.0	Silty Sand (SM)	100.3	10.6	42	1.00



CONSOLIDATION - STRAIN 463-05.GPJ PETRA.GDT 9/16/05

J.N. 463-05	CONSOLIDATION TEST RESULTS	September, 2005
PETRA GEOTECHNICAL, INC.		PLATE B-8

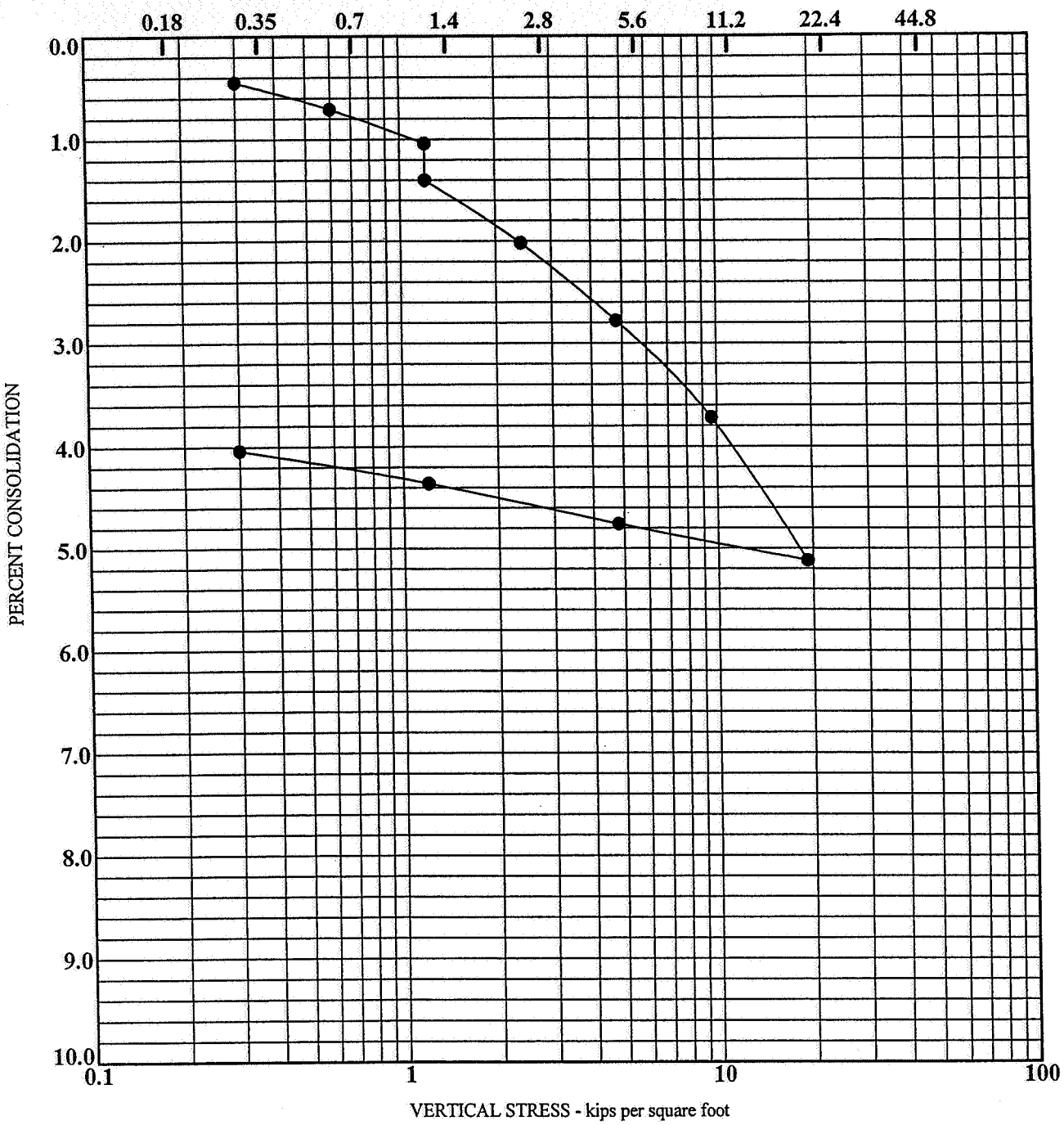
SAMPLE LOCATION	MATERIAL DESCRIPTION	INITIAL			INUNDATED
		DENSITY (pcf)	MOISTURE (%)	SATURATION (%)	LOAD (ksf)
● B- 4 @ 7.0	Sand w/ Silt (SP-SM)	100.6	1.8	7	0.80



CONSOLIDATION - STRAIN 463-05.GPJ PETRA.GDT 9/16/05

J.N. 463-05	CONSOLIDATION TEST RESULTS	September, 2005
PETRA GEOTECHNICAL, INC.		PLATE B-9

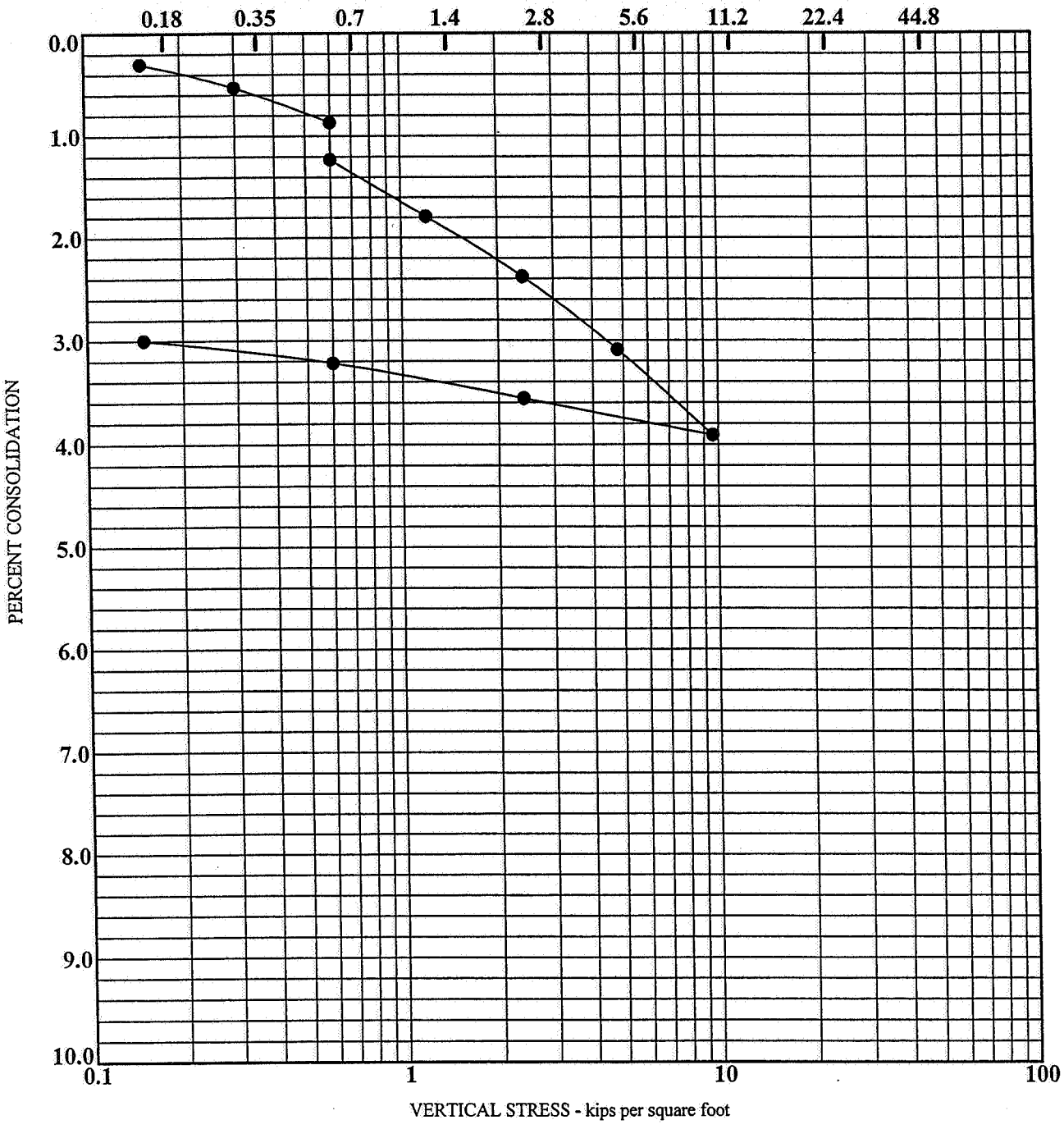
SAMPLE LOCATION	MATERIAL DESCRIPTION	INITIAL			INUNDATED
		DENSITY (pcf)	MOISTURE (%)	SATURATION (%)	LOAD (ksf)
● B-6 @ 11.0	Silty Sand (SM)	95.4	7.7	27	1.20



J.N. 463-05	CONSOLIDATION TEST RESULTS	September, 2005
PETRA GEOTECHNICAL, INC.		PLATE B-10

CONSOLIDATION - STRAIN 463-05.GPJ PETRA.GDT 9/16/05

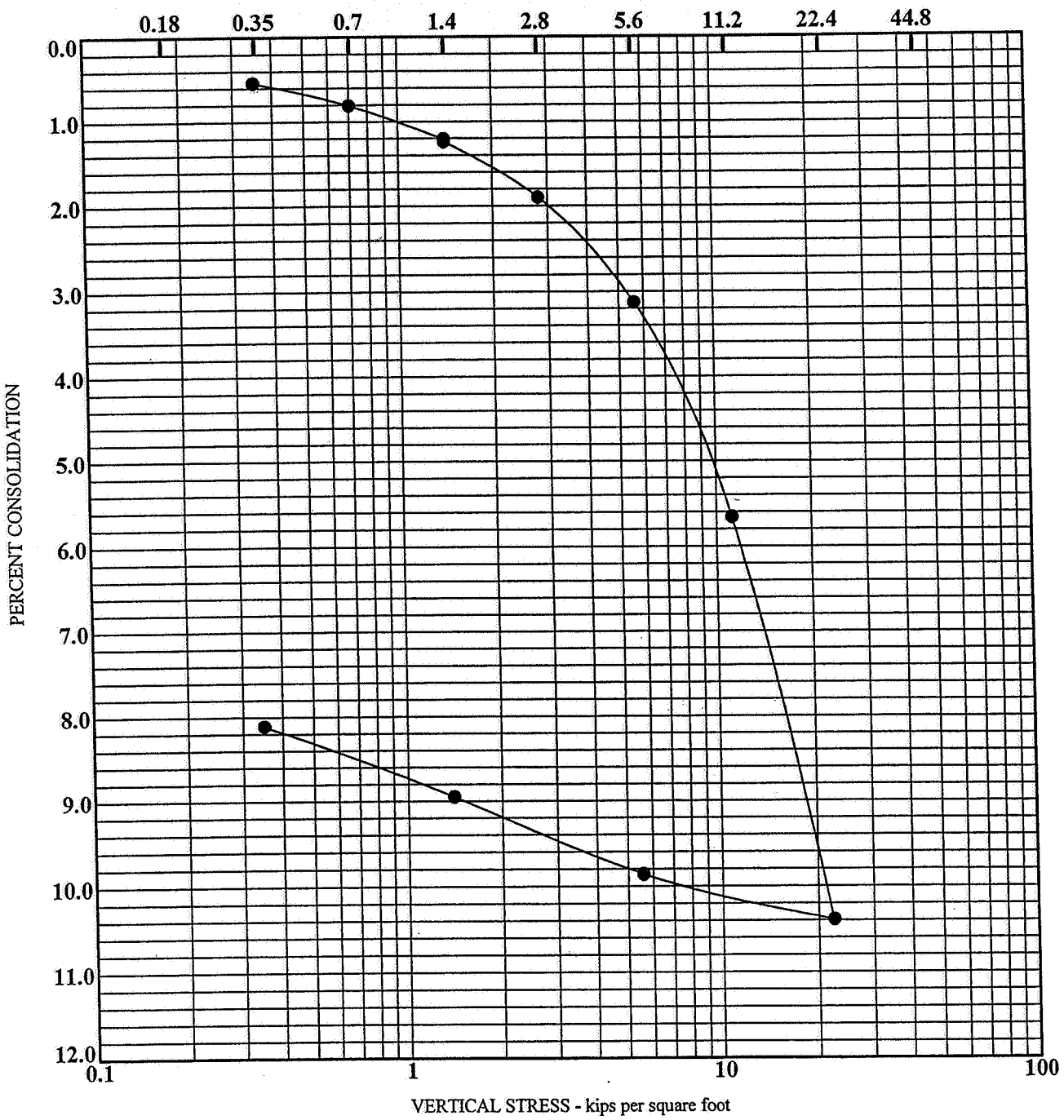
SAMPLE LOCATION	MATERIAL DESCRIPTION	INITIAL			INUNDATED
		DENSITY (pcf)	MOISTURE (%)	SATURATION (%)	LOAD (ksf)
● B-7 @ 6.0	Sand w/ Silt (SP-SM)	92.7	4.2	14	0.60



CONSOLIDATION - STRAIN 463-05.GPJ PETRA.GDT 9/16/05

J.N. 463-05	CONSOLIDATION TEST RESULTS	September, 2005
PETRA GEOTECHNICAL, INC.		PLATE B-11

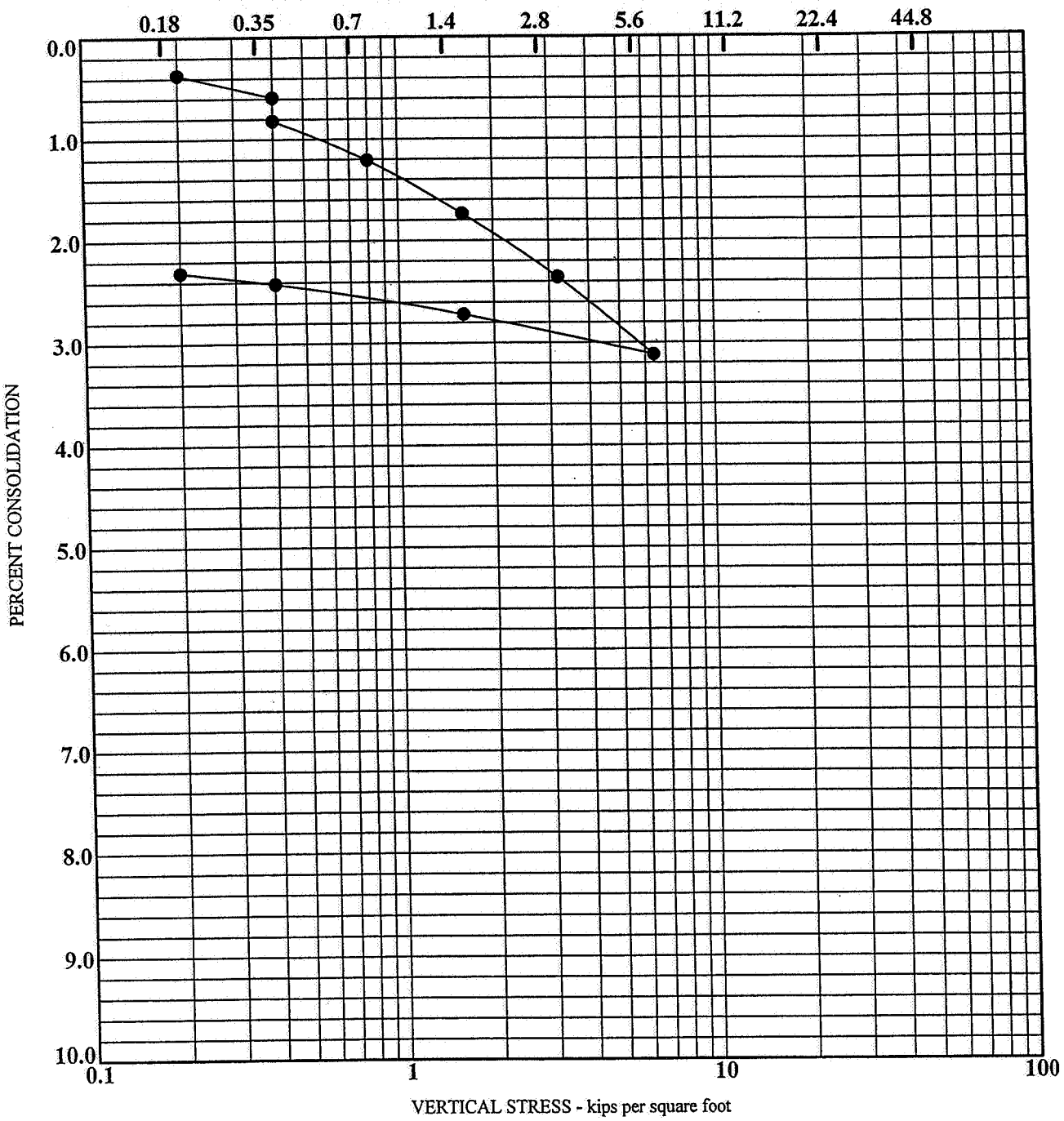
SAMPLE LOCATION	MATERIAL DESCRIPTION	INITIAL			INUNDATED
		DENSITY (pcf)	MOISTURE (%)	SATURATION (%)	LOAD (ksf)
● B- 7 @ 12.0	Sandy Clay (CL)	92.1	24.8	81	1.40



CONSOLIDATION - STRAIN 463-05.GPJ PETRA.GDT 9/16/05

J.N. 463-05	CONSOLIDATION TEST RESULTS	September, 2005
PETRA GEOTECHNICAL, INC.		PLATE B-12

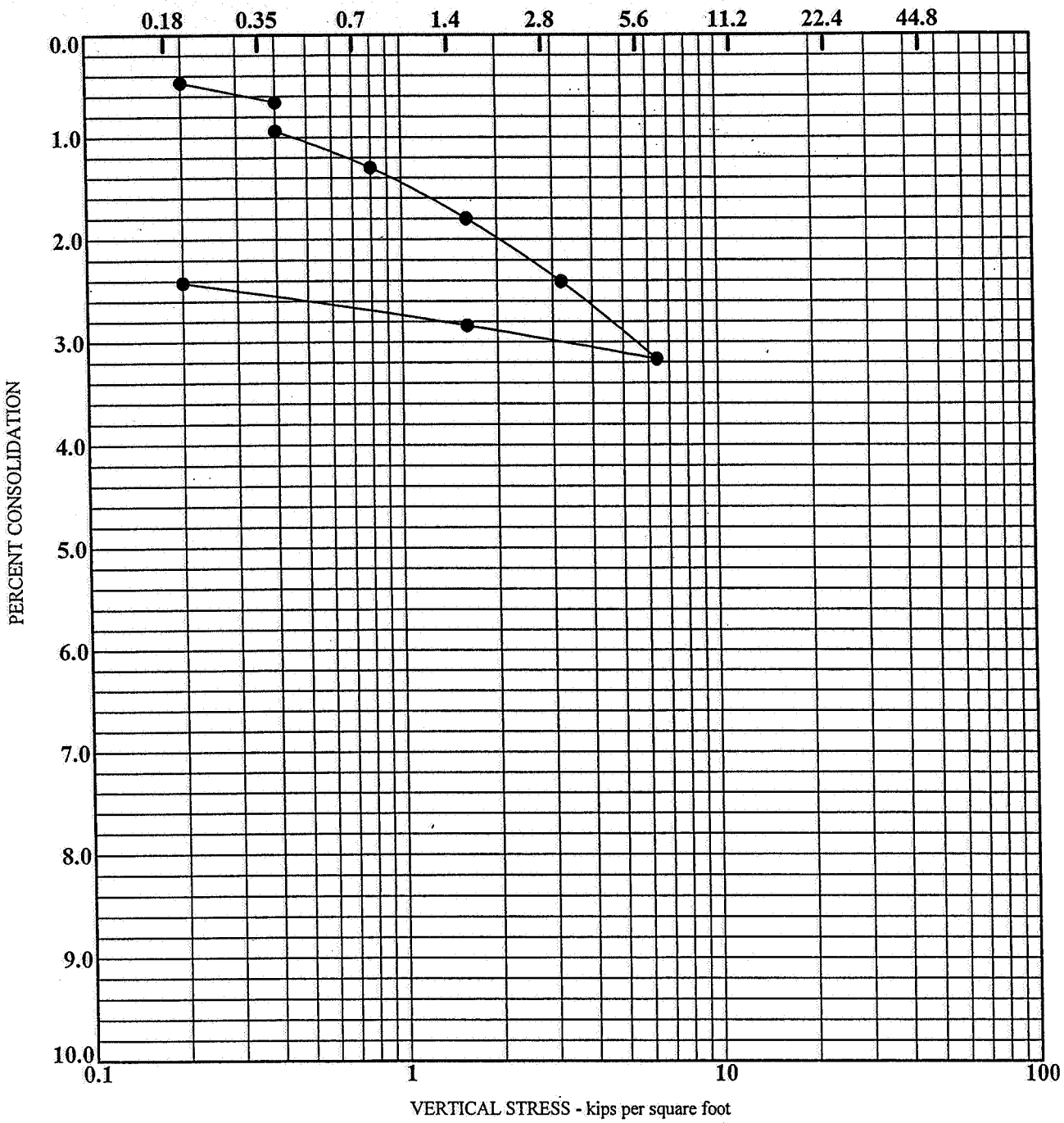
SAMPLE LOCATION	MATERIAL DESCRIPTION	INITIAL			INUNDATED
		DENSITY (pcf)	MOISTURE (%)	SATURATION (%)	LOAD (ksf)
● B-8 @ 3.0	Silty Sand (SM)	100.2	5.4	21	0.40



CONSOLIDATION - STRAIN 463-05.GPJ PETRA.GDT 9/16/05

J.N. 463-05	CONSOLIDATION TEST RESULTS	September, 2005
PETRA GEOTECHNICAL, INC.		PLATE B-13

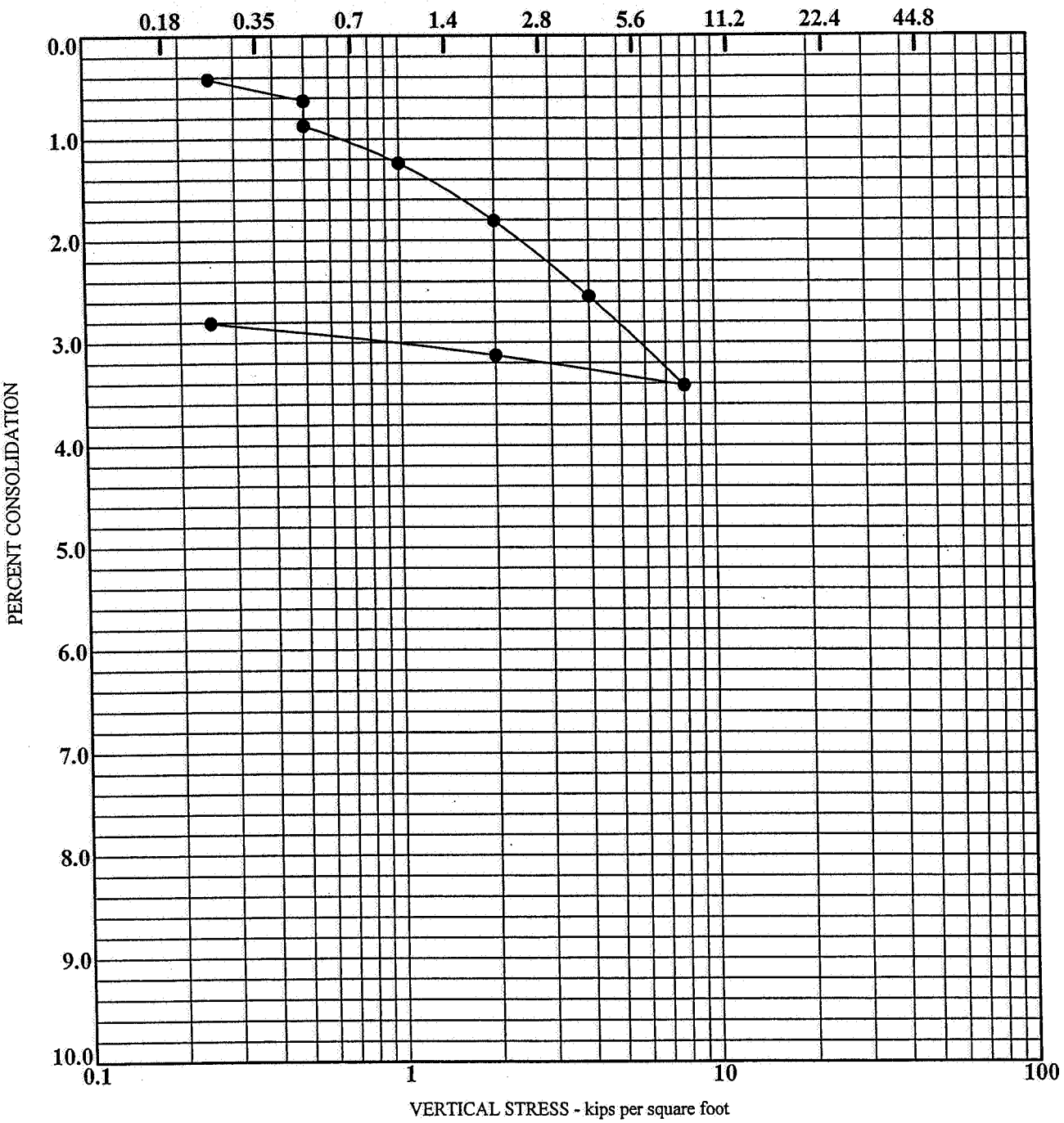
SAMPLE LOCATION	MATERIAL DESCRIPTION	INITIAL			INUNDATED
		DENSITY (pcf)	MOISTURE (%)	SATURATION (%)	LOAD (ksf)
● B-13 @ 3.0	Silty Sand (SM)	101.5	6.2	25	0.40



CONSOLIDATION - STRAIN 463-05.GPJ PETRA.GDT 9/16/05

J.N. 463-05	CONSOLIDATION TEST RESULTS	September, 2005
PETRA GEOTECHNICAL, INC.		PLATE B-14

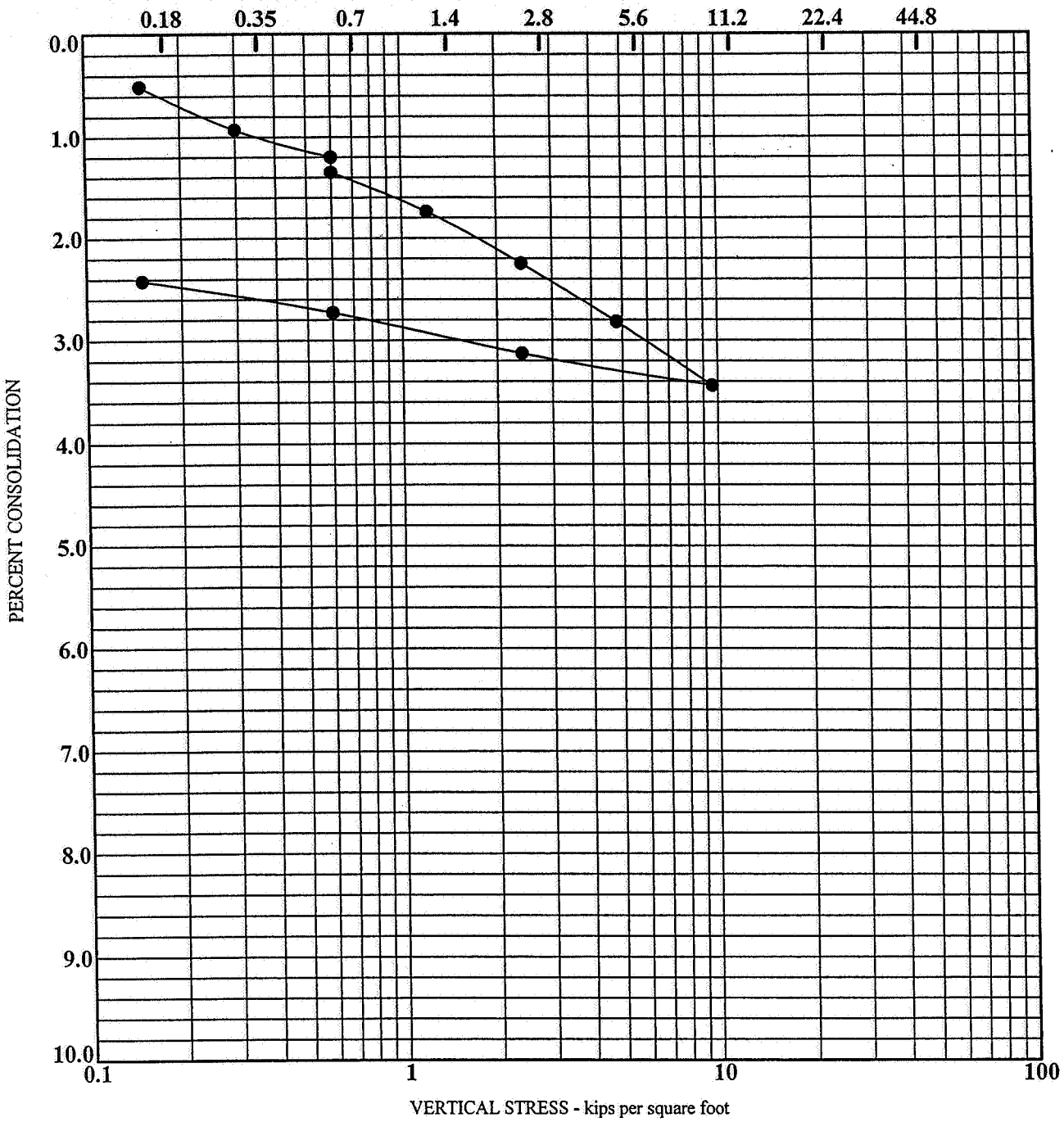
SAMPLE LOCATION	MATERIAL DESCRIPTION	INITIAL			INUNDATED
		DENSITY (pcf)	MOISTURE (%)	SATURATION (%)	LOAD (ksf)
● TP- 5 @ 4.0	Sand w/ Silt (SP-SM)	100.5	5.2	21	0.50



CONSOLIDATION - STRAIN 463-05.GPJ PETRA.GDT 9/16/05

J.N. 463-05	CONSOLIDATION TEST RESULTS	September, 2005
PETRA GEOTECHNICAL, INC.		PLATE B-15

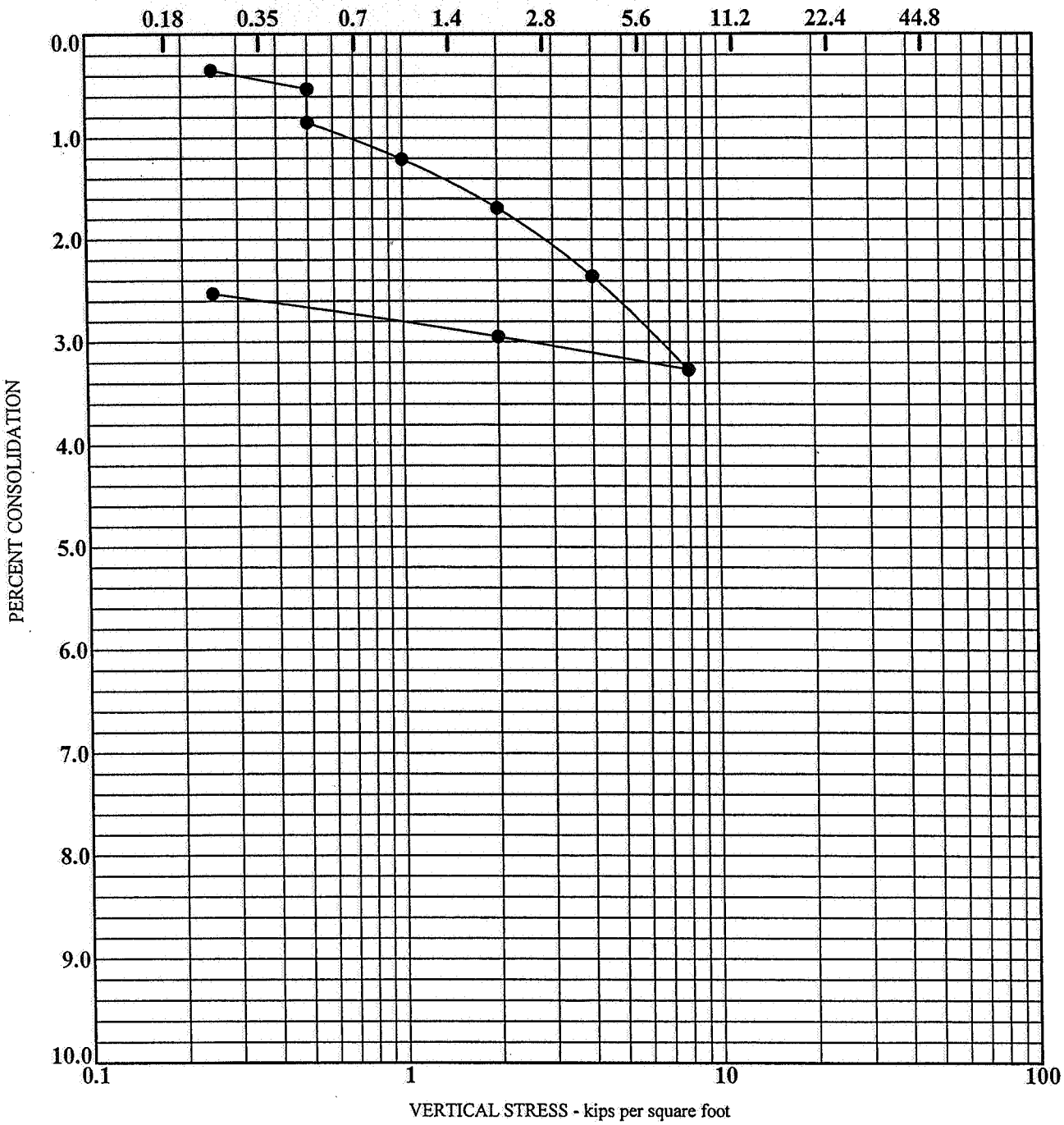
SAMPLE LOCATION	MATERIAL DESCRIPTION	INITIAL			INUNDATED
		DENSITY (pcf)	MOISTURE (%)	SATURATION (%)	LOAD (ksf)
● TP- 6 @ 5.0	Silty Sand (SM)	104.6	9.8	43	0.60



CONSOLIDATION - STRAIN 463-05.GPJ PETRA.GDT 9/16/05

J.N. 463-05	CONSOLIDATION TEST RESULTS	September, 2005
PETRA GEOTECHNICAL, INC.		PLATE B-16

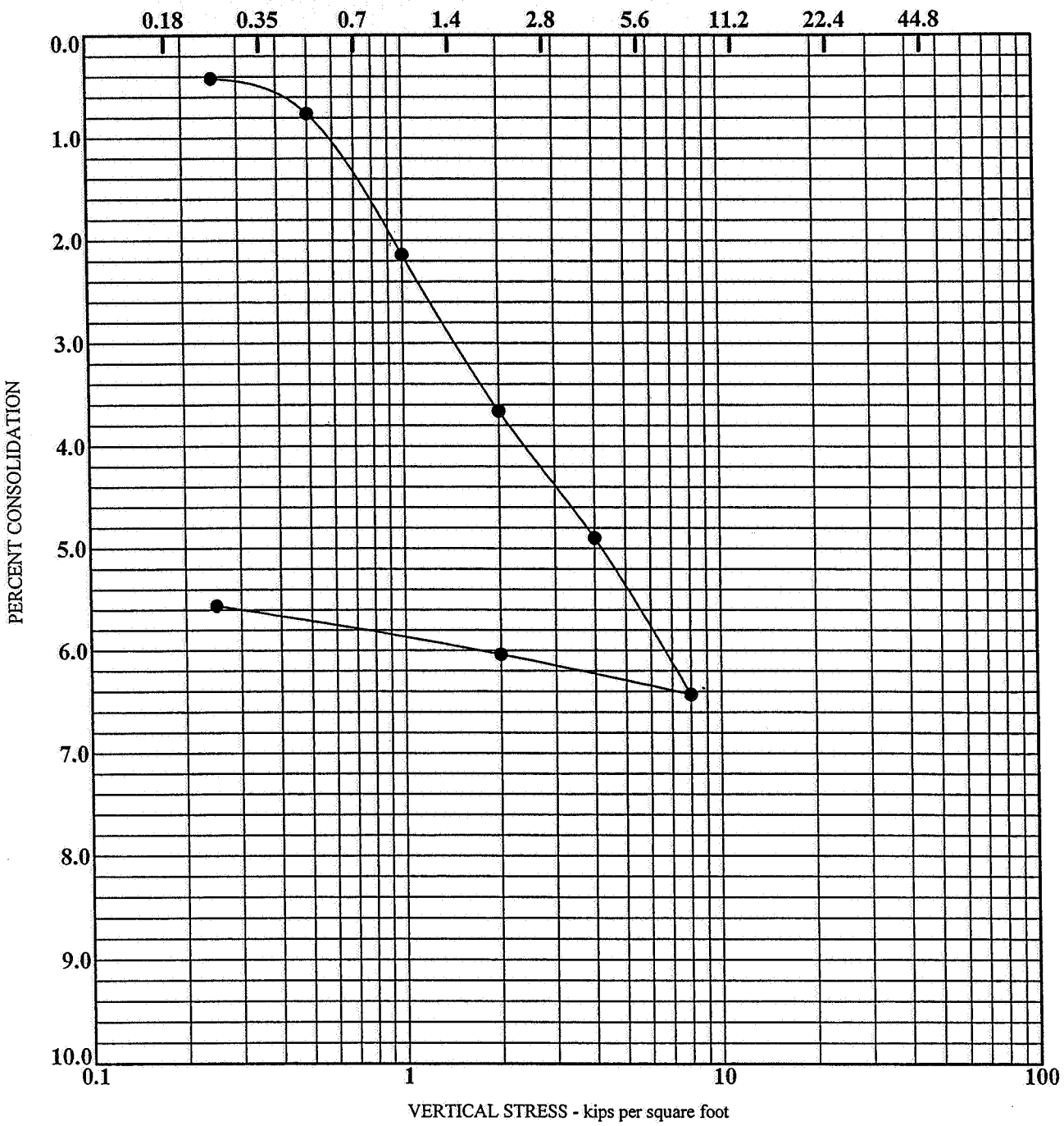
SAMPLE LOCATION	MATERIAL DESCRIPTION	INITIAL			INUNDATED
		DENSITY (pcf)	MOISTURE (%)	SATURATION (%)	LOAD (ksf)
● TP- 9 @ 4.0	Silty Sand (SM)	97.7	5.1	19	0.50



CONSOLIDATION - STRAIN 463-05.GPJ PETRA.GDT 9/16/05

J.N. 463-05	CONSOLIDATION TEST RESULTS	September, 2005
PETRA GEOTECHNICAL, INC.		PLATE B-17

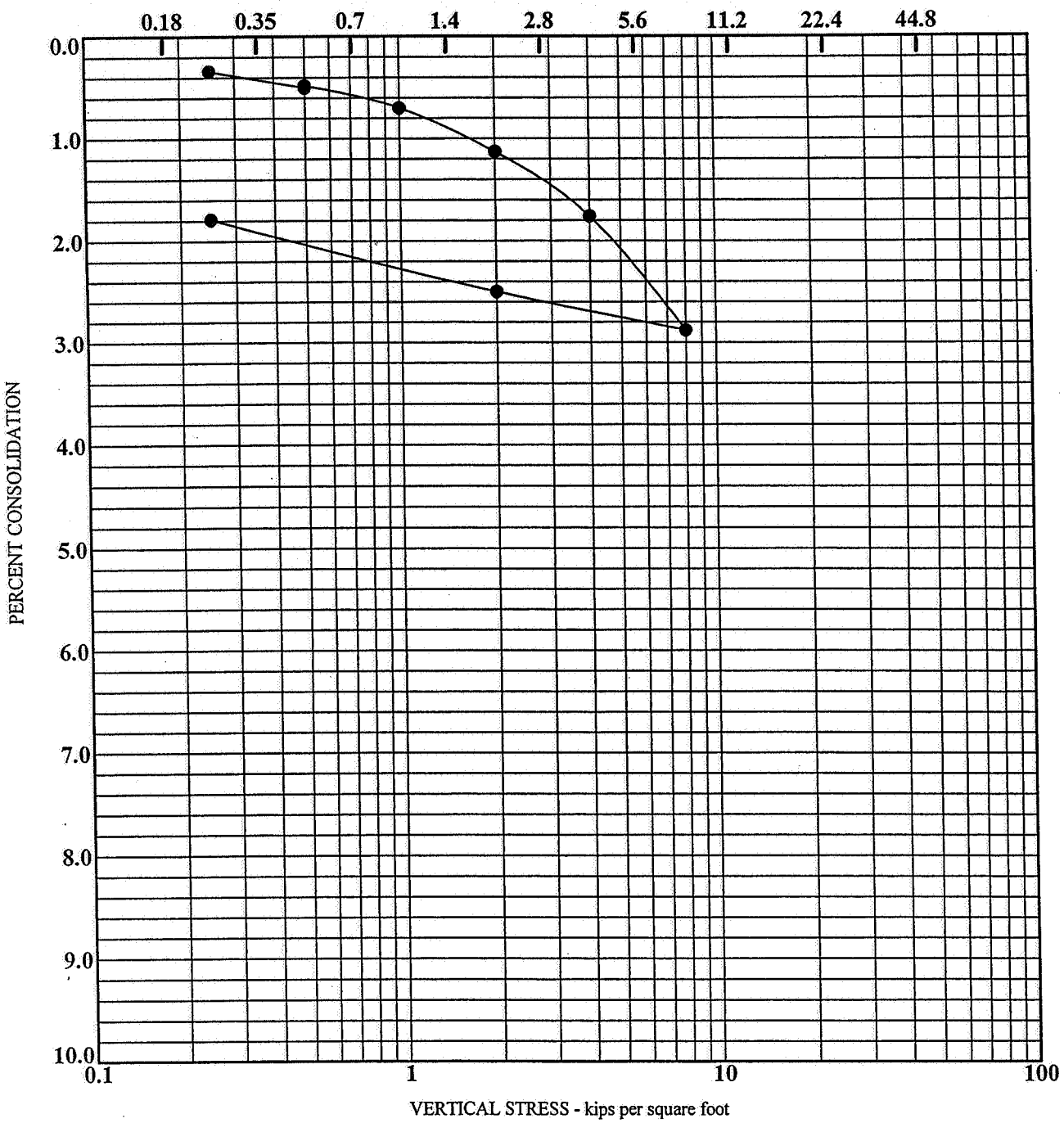
SAMPLE LOCATION	MATERIAL DESCRIPTION	INITIAL			INUNDATED
		DENSITY (pcf)	MOISTURE (%)	SATURATION (%)	LOAD (ksf)
● TP-10 @ 4.0	Silty Sand (SM)	99.8	6.7	26	0.50



CONSOLIDATION - STRAIN 463-05.GPJ PETRA.GDT 9/16/05

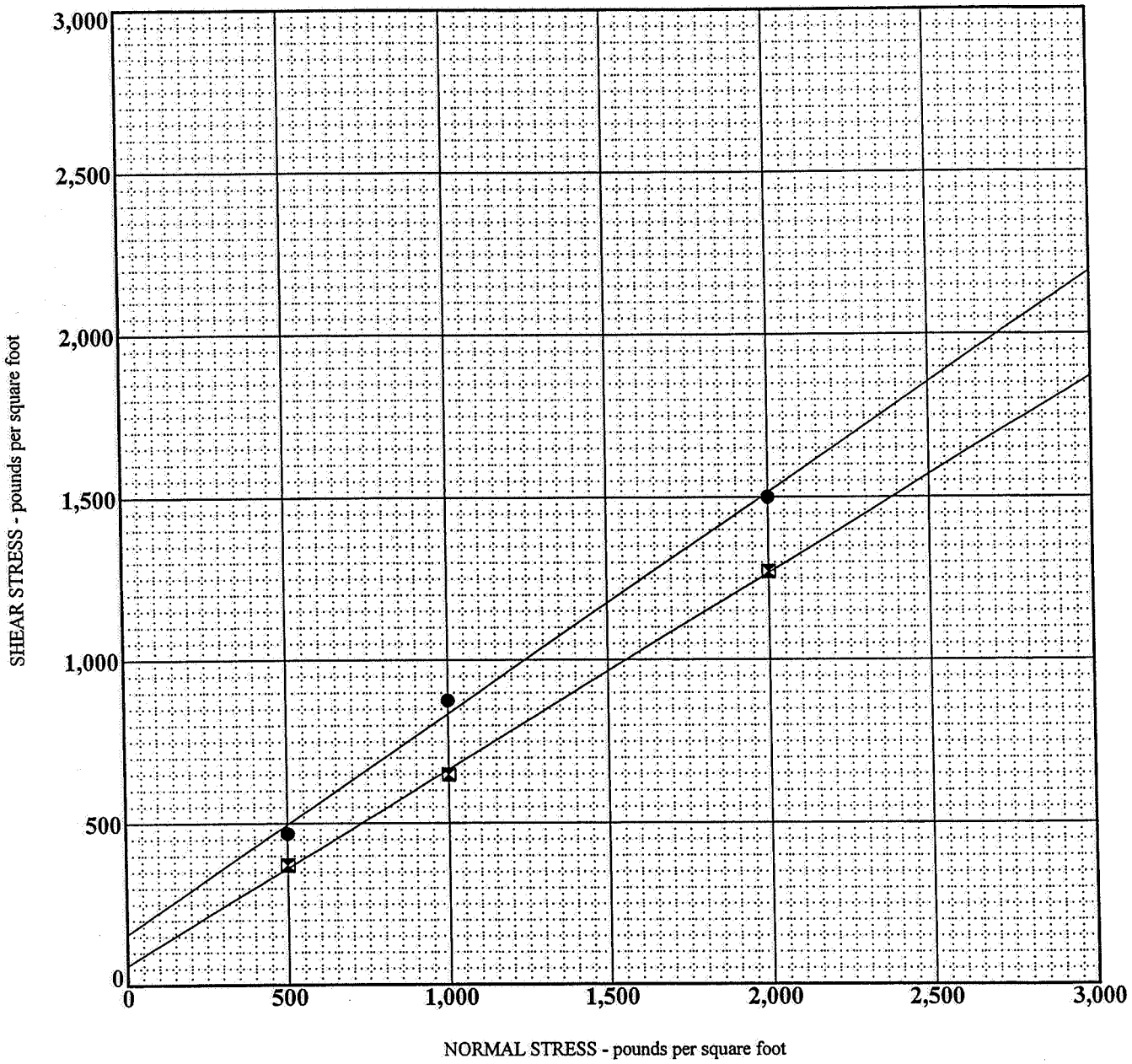
J.N. 463-05	CONSOLIDATION TEST RESULTS	September, 2005
PETRA GEOTECHNICAL, INC.		PLATE B-18

SAMPLE LOCATION	MATERIAL DESCRIPTION	INITIAL			INUNDATED
		DENSITY (pcf)	MOISTURE (%)	SATURATION (%)	LOAD (ksf)
● TP-14 @ 4.0	Silty Sand (SM)	107.8	13.0	62	0.50



CONSOLIDATION - STRAIN 463-05.GPJ PETRA.GDT 9/16/05

J.N. 463-05	CONSOLIDATION TEST RESULTS	September, 2005
PETRA GEOTECHNICAL, INC.		PLATE B-19



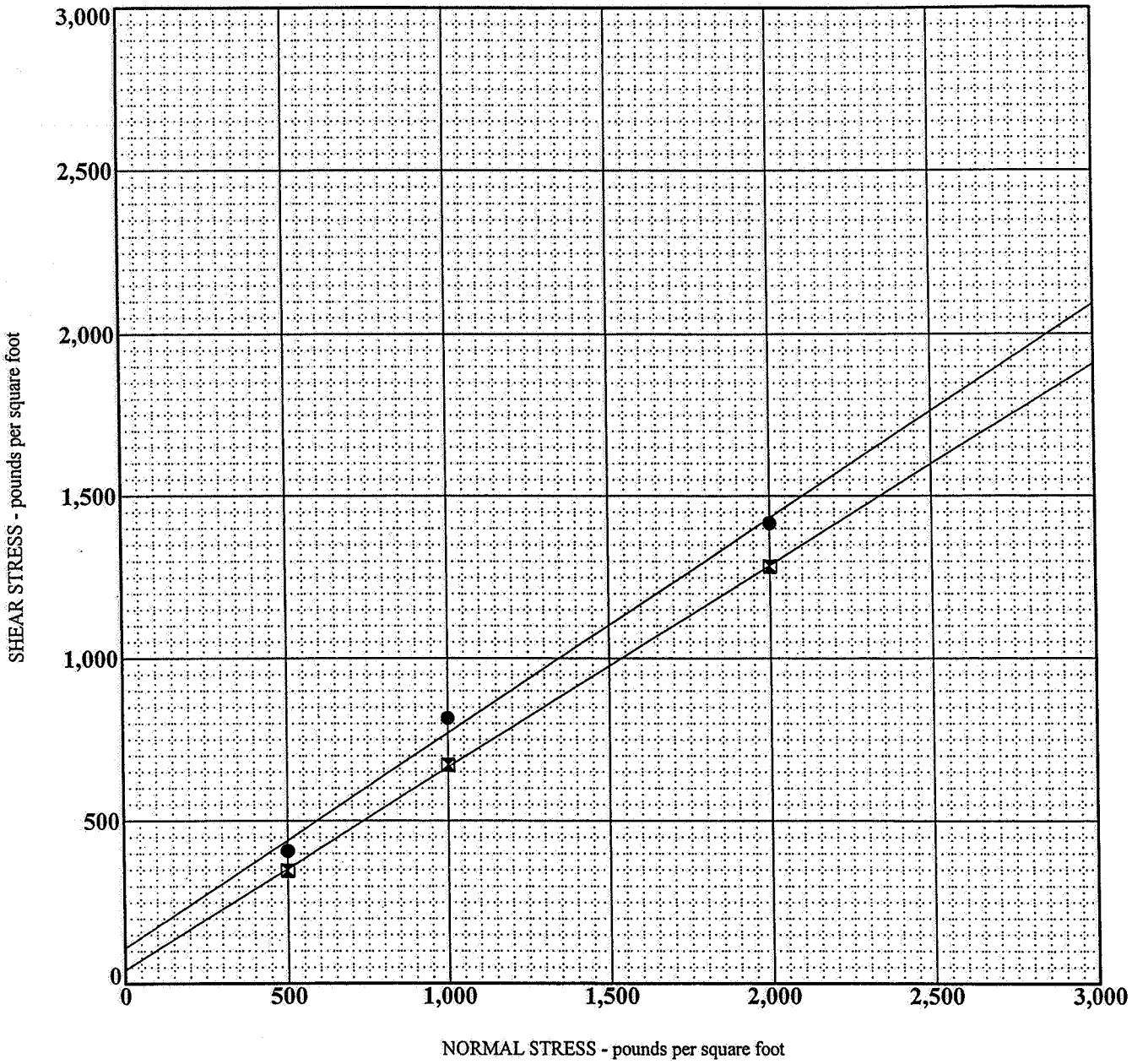
SAMPLE LOCATION	DESCRIPTION	FRICTION ANGLE (°)	COHESION (PSF)
● B-12 @ 0.0 - 5.0	Poorly Graded Sand (SP) - Peak	34	160
⊠ B-12 @ 0.0 - 5.0	Poorly Graded Sand (SP) - Ultimate	31	60

NOTES:

Samples Remolded to 90% of Maximum Dry Density
All Samples Were Inundated Prior to Shearing

J.N. 463-05	DIRECT SHEAR TEST DATA	September, 2005
PETRA GEOTECHNICAL, INC.	REMOLDED TEST SAMPLES	PLATE B-20

DIRECT SHEAR 463-05.GPJ PETRA.GDT 9/16/05



SAMPLE LOCATION	DESCRIPTION	FRICTION ANGLE (°)	COHESION (PSF)
● TP- 1 @ 0.0 - 5.0	Silty Sand (SM) - Peak	35	110
⊠ TP- 1 @ 0.0 - 5.0	Silty Sand (SM) - Ultimate	32	40

NOTES:

Samples Remolded to 90% of Maximum Dry Density
All Samples Were Inundated Prior to Shearing

J.N. 463-05	DIRECT SHEAR TEST DATA	September, 2005
PETRA GEOTECHNICAL, INC.	REMOLDED TEST SAMPLES	PLATE B-21

DIRECT SHEAR 463-05.GPJ PETRA.GDT 9/16/05