GEOTECHNICAL INVESTIGATION REPORT

for

BOULDER BAY

Crystal Bay, Nevada

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INTRODUCTION

Submitted herewith are the results of Lumos and Associates, Inc. (Lumos) geotechnical investigation for the proposed Boulder Bay casino hotel project to be located in Crystal Bay, Nevada (Plate 1). The project site boundaries generally consist of Highway 28 to the east and south and Stateline Road to the west.

It is our understanding that the proposed Boulder Bay Hotel project will consist of a 6-story hotel, associated buildings, a parking garage and a parking area. We have assumed the buildings will be supported by conventional footings with concrete slab-on-grade and the parking area will utilize asphalt concrete paving. We have assumed structural loads for this project to not exceed 5-10 kips per lineal foot and 30-40 kips/ft^2 for continuous wall and isolated column loads, respectively. From the Tahoe Regional Planning Agency (TRPA) cut exhibit the final grades at the site will be from zero (0) to thirty-seven (37) feet below existing grades.

The purpose of our investigation was to characterize the site geology and soil conditions, describe the native soils, and determine their engineering properties as they relate to the proposed construction. The investigation was also intended to identify possible adverse geologic, soil, and or water table conditions. However, this study did not include an environmental assessment, a fault study, or an evaluation for soil and/or groundwater contamination at the site.

This report concludes with recommendations for site grading, foundations, footing area preparation, utility installation, asphalt concrete pavement, and Portland cement concrete.

In addition, information such as logs of all exploratory borings, test pits, laboratory test data, liquefaction potential of subsurface soils, allowable soil bearing capacities, estimated total and differential settlements based on static loads, lateral earth pressures and International Building Code (IBC) seismic site class designation are provided in this report.

The recommendations contained herein have been prepared based on our understanding of the proposed construction, as outlined above. Re-evaluation of the recommendations presented in this report should be conducted after the final site grading and construction plans are completed, if there are any variations from the assumptions described herein.

It is possible that subsurface discontinuities may exist between and beyond exploration points. Such discontinuities are beyond the evaluation of the Engineer at this time. No guarantee of the consistency of site geology and sub-surface conditions is implied or intended.

GEOLOGIC SETTING

Crystal Bay is located at the northern end of the Lake Tahoe Basin, a large fault-bounded valley within the eastern portion of the Sierra Nevada geomorphic province. Lake Tahoe is one of the world's largest and deepest alpine lakes, approximately 22 miles long and at least 1,600 feet deep. The Sierra Nevada is geographically characterized by a steep eastern slope that separates the Sierra Nevada and Great Basin geomorphic provinces and a gentle western slope that eases down into the Great Valley. Specifically, the site is mapped as being underlain by glacial deposits.

The surface geology of the project has been mapped by George J. Saucedo (2005). The mapping indicates that granite and granodiorite from the Cretaceous period underlie the site (Kgr). The mapping indicates that the deposits are part of the unnamed granitic rocks of the Sierra Nevada Batholith. The map also indicated the North Tahoe fault is located approximately 2000 feet east of the site. The fault is not within 50 feet of the proposed structure locations, the customary setback from a potentially active fault. Holocene faults (less than 12,000 years old) are considered active. This fault is not shown on the "Quaternary Fault Map of Nevada Reno Sheet" by John W. Bell (1984), therefore, we understand the North Tahoe Fault to be older than a Holocene.

The geologic evolution of the Sierra Nevada province is extremely complex and involved a long sequence of events. First, subduction and abduction of oceanic plates below and across the continental plate began. This interaction between the two plates created different metamorphic rock complexes at the collision area known as a trench. Then, the deep continental crust began to melt into granite magma and volcanoes began to erupt above the granite batholiths. The basin and range to the east began to widen and open. Finally, the Sierra Nevada began to rise and tilt a few degrees to the west.

Glaciers have played an active roll in shaping the Sierra Nevada Mountains, particularly during the past two (2) million years. Alpine glaciers were present around Lake Tahoe during much of this period and extended below the current level of the Lake along the west shoreline (i.e., at Emerald Bay). The large U-shaped valleys surrounding the Lake were carved out by ice and display typical glacial features such as polished rock, lateral moraines and glacial lakes (tarns).

SEISMIC CONSIDERATIONS

The Crystal Bay area, similar to many areas of the California—Nevada border, is located near active faults, which are capable of producing significant earthquakes. This area lies within Zone 3, as defined by the 1997 Uniform Building Code (UBC). This zone can be described as an area that may experience damage due to earthquakes having intensities of V or more when evaluated using the Modified Mercalli Intensity Scale of 1931 (Plate 3).

Crystal Bay is located within the Sierra Nevada-Great Basin seismic belt and at least two (2) major earthquakes, with magnitudes equal to or greater than 6.0 (Plate 4), have occurred historically within thirty miles of the site (DePolo and DePolo, 1999).

No evidence of Holocene faulting was found in the field or on published fault maps, which would indicate faulting on this site. However, the approximate location of the North Tahoe Fault (Saucedo, 2005) older than 1.6 million years (which is not considered active) is 2000 feet to the east of the site. It is worth noting that the potential for surface rupture at or near these faults is inferred to be low. The largest active fault in the area, however, is the Genoa Fault with its surface trace, located approximately 22 miles southeast of the site. The Genoa Fault System is reported to have had activity within the past five hundred (500) years and be capable of producing earthquakes with a maximum moment magnitude of 6.9 (California Department of Conservation, 1996).

The site is mapped within UBC Seismic Zone 3 and that criterion should be used as a minimum. Due to the site's proximity to the seismic Zone 4 boundary, located a few miles to the east of the site, and the relatively large magnitude of potential seismic events in the area, UBC Zone 4 design criteria may be considered by the owner and their design group as an option to further reduce the potential for damage from earthquakes. Ground shaking intensities should be estimated based on activity of the Genoa Fault using a maximum credible earthquake with a moment magnitude of 6.9 (Clark, et al, 1984). According to the USGS 2002 website the ground motion

corresponding to a 10% probability of exceedance in 50 years is 0.34g and the ground motion corresponding to a 2% probability of exceedance in 50 years is 0.59g (Appendix C).

Liquefaction is the phenomena where more commonly loose saturated sands or silty sands lose their shear strength when subjected to cyclic loading, and become unstable. Large earthquakes, as described above, may provide that type of cyclic loading. This condition was not encountered on this site during our field investigation. Ground water was not encountered and the sands encountered were dense to very dense during our field exploration. Therefore, in our opinion, the potential for liquefaction to occur at the site is negligible.

2006 IBC Design: The mapped maximum considered earthquake spectral response acceleration at short periods (S_S) is 1.46g corresponding to a 0.2 second spectral response acceleration at five percent (5%) of critical damping and for a Site Class B (IBC Figure 1615(3)). The mapped maximum considered earthquake spectral response acceleration at a 1-second period (S_1) is 0.55g corresponding to a 1.0 second spectral response acceleration at five percent (5%) of critical damping and for a Site Class B (IBC Figure 1615(4)). The site, according to the seismic shear wave report (Appendix F), is considered to be a very dense soil and soft rock, corresponding to a Site Class C (IBC Table 1615.1.1). Therefore, the spectral response accelerations must be adjusted for Site Class effects. The site coefficient for spectral response accelerations adjustment at short periods (F_a) is 1.0 (IBC Table 1615.1.2(1)). The site class effect for spectral response accelerations adjustment at 1-second periods (F_V) is 1.30 (IBC 1615.1.2(1)). The maximum considered earthquake spectral response acceleration parameter for short periods (S_{MS}) is 1.46g and for 1-second periods (S_{M1}) is 0.71g. This corresponds to design spectral response acceleration parameters of 0.97g for short periods (S_{DS}) and of 0.48g for 1-second periods (S_{D1}). A peak ground acceleration of 0.39g (S_{DS} /2.5) may be used for the project.

It is emphasized that the above values are the minimum requirements intended to maintain public safety during strong ground shaking. These minimum requirements are meant to safeguard against loss of life and major structural failures, but are not intended to prevent damage or insure the functionality of the structure during and/or after a large seismic event. Additionally, they do not protect against damage to non-structural components or the contents of the building.

SITE CONDITIONS AND FIELD EXPLORATION

At the time of our investigation, the site has an existing casino hotel, various buildings and associated asphalt parking areas. The site, in general, slopes downward from west to east.

Field exploration included a site reconnaissance, seismic shear wave investigation lines and subsurface soil-exploration. During the site reconnaissance, surface conditions were noted and the locations of the exploratory borings and test pits were determined. They were located using existing features and a conceptual plan available to Lumos as a guide. Locations and elevations of the seismic shear wave investigation lines, exploratory borings and test pits should be considered accurate only to the degree implied by the method used.

Three (3) seismic shear wave investigations were performed across the site. Nine (9) exploratory borings were excavated within the proposed improvement area to a maximum depth of 55.5 feet below-ground-surface (bgs). Six (6) test pits were excavated with the proposed improvement areas to a maximum depth of twelve (12) feet bgs. The approximate locations of the exploratory borings and test pits within the site are shown on Plate 2. The approximate locations of the seismic shear wave investigation lines are given in Appendix F. The subsurface soils were continuously logged and visually classified in the field by our Engineering Technician in accordance with the Unified Soil Classification System. Representative soil samples were collected at regular intervals within the exploratory borings and at each soil type for the test pits and subsequently transported to our Carson City geotechnical laboratory for testing and analysis.

The subsurface soils consisted generally of silty sands, silty sands with gravel, poorly graded sands with silt and well-graded sands with silt and gravel to depths ranging from about 55.5 feet below-ground-surface (bgs) in Boring #3 to 0.5 feet in Boring #2. Weathered granite bedrock was encountered in all borings at depths ranging from 0.5 feet to 9 feet bgs. Fill was encountered in Borings 5, 6, 7, 8, and 9 and in test pits 1, 3,

4, 5, and 6 and the percolation test pit. The depth of the fill ranged from zero (0) feet to a minimum of 12 feet in test pit #6. Compaction tests performed on the fill indicate the fill was compacted to a lesser density than specified later in the report.

Groundwater was not encountered in our exploratory borings or test pits at the time of our field investigation and is not expected to impact development of this site.

FIELD AND LABORATORY TEST DATA

Field and laboratory data was developed from samples taken and tests conducted during the field exploration and laboratory phases of this project. The borings were advanced by a B-47 Drill Rig. Representative samples were collected at 2.5 foot and 5 foot intervals using a 1.4-inch inside diameter Standard Penetration Testing (SPT) split spoon sampler. A 140-pound safety hammer powered by a rope/ cathead pulley system free falling 30 inches drove the samplers. The test pits were excavated using a Caterpillar 416B backhoe. Representative samples were collected at each soil change. Air rotary was used in boring #3 beginning at twelve (12) feet bgs, boring #5 beginning at ten (10) feet bgs and boring #8 beginning at fifteen (15) feet bgs. Representative samples were collected at 2.5 foot intervals during the air rotary drilling.

Laboratory tests performed on representative samples included sieve analysis (including fines content), Atterberg limits, moisture-density curve, R-value, soluble sulfates, pH value and resistivity. Much of this data is displayed on the "logs" of the exploratory borings and test pits to facilitate correlation. Field descriptions presented on the logs have been modified, where appropriate, to reflect laboratory test results. The logs of the exploratory borings and test pits are included in Appendix A of this report as Plates A-1 through A-15. Plate A-16 describes the various symbols and nomenclature shown on the logs.

Individual laboratory test results are presented in Appendix B as Plates B-1 through B-6. Laboratory testing was performed per ASTM standards, except when test procedures are briefly described and no ASTM standard is specifically referenced in the report. Atterberg limits were determined using the dry method of preparation (Plate B-2). Special testing conducted for this project are described below.

Analytical Testing: Atlas Consultants, out of Las Vegas, Nevada, conducted this testing. The testing included soluble sulfates, pH value and resistivity. Test results are included (on Atlas Consultants Inc. letterhead) in Plates B-5 and B-6.

The soil samples obtained during this investigation will be held in our laboratory for 30 days from the date of this report. The samples may be retained longer at an additional cost to the client or obtained from this office upon request.

DISCUSSION AND RECOMMENDATIONS

General

From a geotechnical viewpoint, the site is considered suitable for the proposed improvements when prepared as recommended herein.

During earthwork, any existing improvements within the proposed development area should be demolished and removed offsite, or salvaged if to remain. Demolition/ salvage activities, where applicable, should be conducted in general accordance with the specifications presented in Appendix E.

The following recommendations are based upon the construction and our understanding of this project, as outlined in the introduction of this report. If changes in the construction are proposed, they should be presented to Lumos, so that these recommendations can be reviewed and modified in writing, as necessary. As a minimum, final construction drawings should be submitted to Lumos for review prior to actual construction and verification that our geotechnical design recommendations have been implemented.

General Site Grading

Prior to placement of fill, the areas to receive fill shall be cleared of any existing asphalt concrete or Portland cement concrete to its full depth.

Root- or organic-laden soils encountered during excavations, should be stockpiled in a designated area on site for later use in landscaping, or removed off site as directed by the owner. Excavated soils free from any organics, debris or otherwise unsuitable material and with particles no larger than three (3) inches in maximum dimension may be stockpiled and moisture conditioned for later use as compacted fill provided it meets the criteria for structural fill soils.

All surfaces to receive fill, particularly those underneath foundations and slabs-on-grade, should be observed and approved by a Lumos representative prior to placement of fill. The surfaces shall be scarified to a minimum of twelve (12) inches; moisture conditioned to within two percent (2%) of optimum and re-compacted to at least ninety-five percent (95%) of the ASTM D1557 standard. Fill material should not be placed, spread or compacted while the ground is frozen or during unfavorable weather conditions. When site grading is interrupted by heavy rain or snow, grading or filling operations should not resume until a Lumos representative approves the moisture content and density conditions of the subgrade or previously placed fill.

Unstable conditions due to yielding and/or pumping soils are not anticipated on site. However, native soils may yield or pump under heavy equipment loads or where vibratory equipment draws up water. If yielding or pumping conditions are encountered, the soils should be scarified in place, allowed to dry as necessary and re-compacted, where applicable. Alternatively, the unsuitable or saturated soil should be removed, the exposed surface leveled and compacted/tamped as much as practical without causing further pumping, and covered (including the sides) with geotextile stabilizing fabric (Mirafi HP370 or other equivalent). The fabric should then be covered with at least 12 inches of 4- to 12inch **angular rock fill** with enough fines to fill the inter-rock pore spaces. Placement should be by end dumping. No traffic or other action should be allowed over the fabric, which may cause it to deflect/deform prior to cobble placement. Test sections should be used to determine the minimum thickness and/or number of layers required for stabilization.

Stabilization should be evaluated by proof-rolling standards commensurate with the equipment used, and approved by a Lumos representative. The placement of the stabilizing rock-fill may require additional over-excavation to maintain appropriate grading elevations. A filter fabric (Mirafi 180N or equal) should also be placed over the cobble rock fill to prevent piping of fines from covering soils into the stabilizing rock matrix.

Structural fill soils to be used for this project should consist of non-expansive material (LL less than 35 and/or a PI less than 12, and/or an Expansion Index less than 20), and should be free of contaminants, organics (less than two percent (2%)), rubble, or natural rock larger than three (3) inches in largest dimension. The structural fill shall also have a minimum "R-value" of 45 and meet the following gradation specifications (see Table 1). The soluble sulfate content shall also be less than 0.1%. Any import soils should be tested and approved prior to being placed or delivered on-site (seven day advanced notice).

TABLE 1

STRUCTURAL FILL GRADATION SPECIFICATION

Sieve Size	% Passing
3"	100
¾"	70-100
#40	15-65
#200	10-25

The on-site sands are suitable for use as structural fill and may provide direct structural support.

Compacted fill should be placed only on compacted sub-grade or on compacted fill in lifts not exceeding eight (8) inches in loose thickness, moisture conditioned to within two percent (2%) of optimum, and compacted to at least ninety-five percent (95%) relative compaction, as determined by the ASTM D1557 standard.

Landscaped areas should be cleared of all organic and objectionable material such as wood, root stumps, etc., if any. In cut areas, no other work is necessary except grading to proper elevation and drainage conditions. In landscape fill areas, fill should be placed in loose lifts not exceeding eight (8) inches, and compacted to at least ninety percent (90%) relative compaction to prevent erosion.

Water should not be allowed to pond on pavements or adjacent to structures, and measures should be taken to reduce surface water infiltration into the foundation soils.

A representative of Lumos should be present during all site clearing, excavation removals, and grading operations to ensure that any unforeseen or concealed conditions within the site are identified and properly mitigated, and to test and observe earthwork construction. This testing and observation is an integral part of our services as acceptance of earthwork construction and is dependent upon compaction and stability of the subgrade soils. The soils engineer may reject any material that does not meet acceptable fill, compaction, and stability requirements. Further, recommendations in this report are provided upon the assumption that earthwork construction will conform to recommendations set forth in this section of the report.

FOUNDATION DESIGN CRITERIA

Conventional spread footings shall be entirely founded on either properly compacted suitable native soil/structural fill material documented by Lumos or intact, undisturbed bedrock, but not a combination of the two. If there is a combination of materials, overexcavation to the more competent material and replacement with 2 sack concrete slurry will be required.

Spread footings: Footings should have a minimum embedment of 24 inches below lowest adjacent grade for frost protection. Footings founded on properly compacted structural fill material documented by Lumos may be designed for a net allowable bearing pressure of 2,500 pounds-per-square-foot (psf). Footings founded on properly compacted native cut subgrade soils may be designed for a net allowable bearing pressure of 2,500 psf. Footings founded on native cut highly weathered bedrock may be designed for a net allowable bearing pressure of 5,000 psf. Footings founded on native cut moderately weathered bedrock may be designed for a net allowable bearing pressure of 10,000 psf (refer to Table 2). Typically, weathering of the bedrock decreases with depth. If a higher bearing capacity for a particular building is desired, one option is to overexcavate down to less weathered bedrock and replacing the overexcavated material with 2 sack concrete slurry. Lumos has been supplied a TRPA cut exhibit sheet that shows anticipated soil removals by individual building and a preliminary grading plan. We have referenced our anticipated cut depths in Table 2 (next page) for allowable bearing pressure. Lumos also took into consideration the report from the seismic shear-wave investigation (Appendix F) to calculate the allowable bearing pressure for each particular building. We recommend a representative of Lumos and Associates review final grading plans prior to structural design to verify allowable bearing pressures. We also recommend a representative of Lumos inspect the footing excavations to verify the suitability of the bedrock/soil conditions.

If fill is placed to bring building pads to grade, no footings should be founded within a distance of at least one third of the total height of fill (H/3) placed from the face of the slope or equal to the depth of compacted fill below the bottom of footing, whichever is

greater. In drainage areas, no footings should be located or founded above a 1:1 (horizontal:vertical) plane drawn up from the toe of slopes, outside edge of drainage conduits or drainage ditches, to avoid loss of bearing strength of supporting soils. No drainage or water diverting conduits other than associated utilities should be allowed underneath building footprints.

TABLE 2
ALLOWABLE BEARING PRESSURE BY BUILDING

Building	Anticipated Minimum Cut Depth to Bottom of Footing	Anticipated Material Type at Bottom of Footing	Allowable Bearing Pressure
A	10′	Highly Weathered Bedrock	5,000 psf
B1	10′	Highly Weathered Bedrock	5,000 psf
B2	10′	Highly Weathered Bedrock	5,000 psf
B3	10′	Highly Weathered Bedrock	5,000 psf
C	20′	Moderately Weathered Bedrock	10,000 psf
D	20′	Moderately Weathered Bedrock	10,000 psf
E	20′	Moderately Weathered Bedrock	10,000 psf
F1	20′	Moderately Weathered Bedrock	10,000 psf
F2	20′	Moderately Weathered Bedrock	10,000 psf
F3	20′	Moderately Weathered Bedrock	10,000 psf
G	10′	Highly Weathered Bedrock	5,000 psf
H	5′	Cut Native Soil	*2,500 psf

*May choose to overexcavate this area to weathered bedrock and replacing with 2 sack concrete slurry to increase the allowable bearing pressures.

Footing Settlements: The maximum anticipated settlements for continuous or isolated footings bearing on properly compacted suitable native soil, bedrock or structural fill and designed for the appropriate bearing pressure is estimated at one (1) inch or less. Differential settlements are generally expected to be half of the total settlements. Settlements in granular soils are primarily expected to occur shortly after dead and sustained live loads are applied.

Lateral Loading: Resistance to lateral loads can be provided by friction acting at the base of foundations and by lateral earth resistance. A coefficient of friction of 0.45 may be assumed at the base of footings. An allowable passive earth resistance of 350 psf per foot of depth starting six (6) inches below lowest adjacent grade may be used for the sides of footings poured against properly compacted structural fill. Passive resistance should not exceed 2,500 psf. The at-rest lateral pressure can be calculated utilizing an equivalent fluid pressure of 60 pcf.

Dynamic Factors: Vertical and lateral bearing values indicated above are for total dead load and frequently applied live loads. If normal code requirements are applied for design, the above vertical bearing values may be increased by thirty-three percent (33%) for short duration loading due to wind or seismic forces. The additional Dynamic Lateral earth pressure can be calculated utilizing the following equation.

Dynamic Lateral Force = $18.5H^2$

H = height of wall

This force should be assumed to act at a height of 0.6H above the bottom of the wall.

CONCRETE SLAB DESIGN

Interior concrete slabs should be underlain with at least six (6) inches of Type 2 Aggregate Base, compacted to a minimum of ninety-five percent (95%) and supported on at least 12 inches of properly compacted structural fill / subgrade. We recommend the aggregate base be placed after utility trenches are excavated and backfilled. A vapor barrier should be provided for all interior concrete slabs where floor moisture is undesirable. The vapor barrier should be a synthetic plastic sheeting at least ten (10) mils thick placed below the aggregate base. The vapor barrier may be set on top of the base material and covered with approximately two (2) inches of clean medium sand. As an option to the owner, an additional one (1) inch of sand may be placed below the vapor barrier to help prevent puncture of this sheeting.

Slab thickness design should be based on a Modulus of Subgrade Reaction equal to two hundred (200) pounds-per-cubic-inch (pci) for construction on properly compacted structural fill / subgrade. Reinforcement of concrete slabs should be as specified by the Project Structural Engineer.

Exterior concrete slabs on grade should be underlain with at least six (6) inches of Type 2 aggregate base and at least 12 inches of properly compacted structural fill / subgrade. All subgrade and fill should be prepared and placed as described in the grading section of this report, while the aggregate base material should be compacted to at least ninety-five percent (95%) relative compaction as determined by the ASTM D1557 standard.

RETAINING WALLS

Retaining structures over three (3) feet in height, if used, will require local code compliance and engineered based on parameters described in this section of the report. Retaining structures should be designed to resist the appropriate lateral earth pressures. Cantilevered walls, which are able to deflect at least 0.01 radians, can be designed using an equivalent fluid (backfill) unit weight of 40 pounds-per-cubic-foot (pcf). However, if the wall is fixed against rotation, the wall should be designed using an equivalent fluid (backfill) unit weight of 60 pcf. These design parameters are based upon the assumption that walls will retain only level backfill and no hydrostatic pressure will be present. Any other surcharge pressures should be added to the above recommended lateral earth pressures. Retaining walls should be backfilled with free draining granular material that extends vertically to the bottom of the stem and laterally at least six (6) inches beyond the face of the stem (wall) and wrapped with a Mirafi 180N or equivalent non-woven filter fabric. Weep holes should be provided on the walls at regular intervals, or a slotted drainpipe placed at the bottom of the wall (bottom of granular material) to relieve any possible build-up of hydrostatic pressure. Backfill material within two (2) feet of the wall should be compacted with hand-held equipment only, and to at least ninety percent (90%) of the maximum ASTM D1557 standard.

PAVEMENT DESIGN

Asphalt pavement sections should be underlain by at least twelve (12) inches of structural fill / subgrade, moisture conditioned to within two percent (2%) of optimum, and compacted to at least ninety-five percent (95%) of the laboratory maximum dry density determined by the ASTM D1557 standard. Pavement structural sections for auto/light trucks and heavy trucks were determined for the driveway and parking areas utilizing an R-value of 45 (based on structural fill specifications) and are provided in Table 2, "Recommended Asphalt Pavement Sections". Traffic Index (TI) values of five (5) were assumed for auto pavement loads and a TI of six and a half (6.5) for heavier truckloads. Aggregate base should consist of Type 2, Class B material and meet the requirements of the Standard Specifications for Public Works Construction (SPPWC). Aggregate base material should be compacted to at least ninety-five percent (95%) of the laboratory maximum density, as determined by the ASTM D1557 standard.

TABLE 3
RECOMMENDED ASPHALT PAVEMENT SECTIONS

Parking / Driveway Pavement Area	Minimum Asphalt Pavement	Minimum Aggregate Base
Auto and Light Truck Loads (TI = 5)	3″	6″
Heavy Truck Loads (TI=6.5)	4″	6″

In all areas of the project, asphalt concrete should contain AC-20P, and Type 3 asphalt aggregate per the "Orange Book" standards. The selection of AC-20P will add about 5% – 10% to the paving costs, but will significantly reduce cracking and future maintenance cost. The mix design shall be a 50 blow Marshall mix that targets 3% air voids. Asphalt concrete, in any case, should be compacted to between ninety-two percent (92%) and ninety-seven percent (97%) of the Rice theoretical maximum density.

CORROSION AND CHEMICAL ATTACK

On-site soils have a negligible water soluble sulfate content of less than 0.10% (0.01% actual). No specific type of cement is required for concrete in direct contact with on-site soils, as required by the International Building Code. However, Type II cement (meeting ASTM C150) is recommended for concrete in direct contact with on-site soils.

All exterior concrete should have between 4.5 and 7.5 percent entrained air, a maximum water-cement ratio of 0.45, and comply with all other ACI recommendations for concrete placed in areas subject to freezing. A minimum compression strength of 4,000 psi is recommended for all external concrete. All interior concrete should also be placed pursuant to ACI recommendations.

Native soils have a pH of 9.06 and have a resistivity of 23,000 ohm-cm under saturated conditions. This indicates an essentially non-corrosive potential for ferrous metals in contact with the native soils. Corrosion mitigation measures, such as protective coatings, wrappings, and cathodic protection are not required but should be used as a precautionary measure. If protective coatings are used, the type and quantity will depend on the kind of steel and specific construction application. Steel and wire concrete reinforcement cover of at least three (3) inches where cast against soil, unformed, is recommended.

UTILITY EXCAVATIONS

On-site soils are anticipated to be excavatable with conventional construction equipment. Compliance with OSHA regulations should be enforced for Type C soils. Excavated soils may be suitable for backfill of utility trenches (outside structural zones) after screening any oversize material and debris. However, on-site soils will not meet the minimum requirements for Class A bedding and should be imported, where required. On-site bedrock may require special excavation techniques.

MOISTURE PROTECTION, EROSION AND DRAINAGE

The finish surfaces around all structures should slope away from the building and toward appropriate drop inlets or other surface drainage devices. It is recommended that within ten (10) feet of the buildings a minimum slope of five percent (5%) be used for soil subgrades and two percent (2%) be used for pavements. These grades should be maintained for the life of the structures.

Landscaping and downspouts should be planned to prevent discharge adjacent to buildings. Instead, water flow should be conveyed and re-routed to discharge areas away from any improvements.

Backfill adjacent to the proposed building perimeters should be properly compacted to minimize water infiltration into the foundation soils.

CONSTRUCTION SPECIFICATIONS

All work on-site shall be governed by the latest edition of the International Building Code as accepted by Washoe County, except where modified herein.

All work off-site shall be governed by the Standard Specifications and Standard Details for Public Works Construction, as distributed by Washoe County, except as modified herein.

LIMITATIONS

This report has been prepared in accordance with generally accepted engineering practices in Washoe County at this time. The analysis and recommendations are based upon exploration performed at the locations shown on the site plan and the proposed improvements, as described in the "Introduction" section of this report. Subsurface variations may occur between and beyond exploration points. If subsurface variations are found, they should be brought to the immediate attention of the Engineer. We recommend that a representative of Lumos be present to perform observations throughout all phases of this project, particularly where the recommendations of this report may be affected.

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References

Bowels, Joseph E., 1988 Foundation Analyses and Design

International Code Council, Inc. (ICC) 2002, 2006 International Building Code (IBC) County Club Hills, IL

Naval Facilities Engineering Command, 1986, Design Manual 7.01

Naval Facilities Engineering Command, 1986, Design Manual 7.02

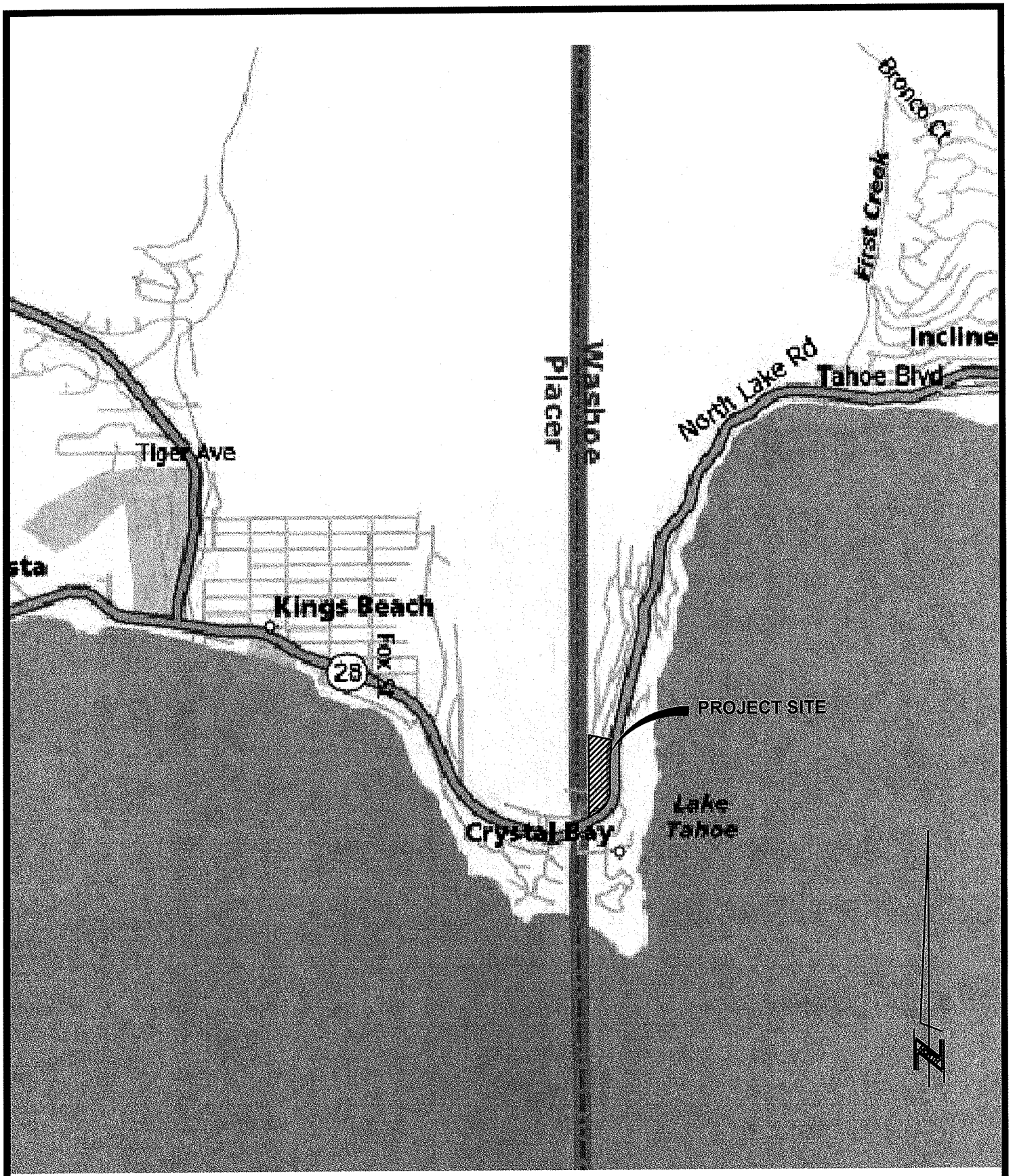
Occupational Safety and Health Administration (OSHA), 1995, Occupational Safety And Health Standards for the Construction Industry, Commerce Clearing House, Inc.

Roberge, Pierre R., 2000, Handbook of Corrosion Engineering

Saucedo, George J., 2005, Geologic Map of the Lake Tahoe Basin, California and Nevada, Nevada Bureau of Mines and Geology, Reno, NV

USGS 2002 Website, www.eqdesign.cr.usgs.gov

Washoe County, 2007, Standard Specifications for Public Works Construction, "Orange Book", Washoe County, NV



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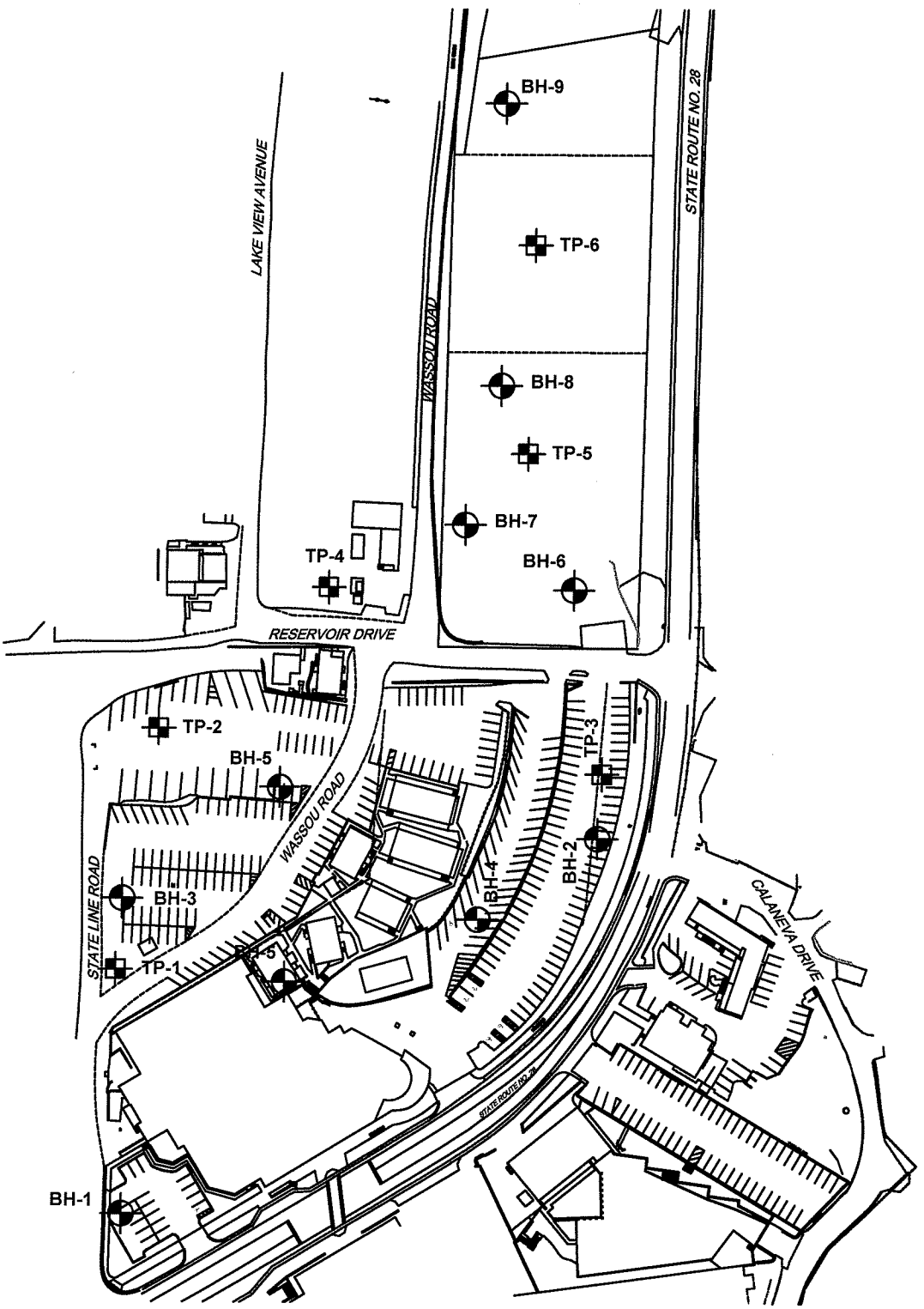
BOULDER BAY

VICINITY MAP

WASHOE COUNTY **NEVADA**

Date:	SEPT 2008
Scale:	N.T.S.
Job No:	7139.000
PLATE	1



LEGEND

TP– = APPROXIMATE EXPLORATORY TEST PIT LOCATION

BH– = APPROXIMATE EXPLORATORY BORING LOCATION

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BOULDER BAY

SITE MAP

WASHOE COUNTY NEVADA

Date:	SEPT. 2008
Scale:	N.T.S.
Job No:	7139.000
PLATE	2

MODIFIED MERCALLI INTENSITY SCALE

INTENSITY	EFFECTS
I	Not felt except by a very few under especially favorable circumstances.
II	Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
III	Felt quite noticeable indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration like passing of truck. Duration estimated.
IV	During the day felt indoors by many, outdoors by few. At night some awaken. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building; standing motor cars rock noticeably.
V	Felt by nearly everyone; many awakened. Some dishes, windows, etc., broken; a few instances of cracked plaster; unstable objects overturned. Disturbance of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop.
VI	Felt by all; many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight.
VII	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well- built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.
VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Disturbs persons driving motor cars.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.
X	Some well-built wooden structures destroyed; most masonry and frame structures with foundations destroyed; ground badly cracked. Rails bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud. Water splashed (sloped) over banks.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipe lines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.
XII	Damage total. Waves seen on ground surfaces. Lines of sight and level distorted. Objects thrown upward into the air.

From Wood and Newman, 1931, by U.S. Geological Survey, 1974, Earthquake Information Bulletin, v. 6, no. 5, p. 28

Richter Magnitude	Intensity (maximum expected Modified Mercalli)
3.0 - 3.9	II - III
4.0 - 4.9	IV - V
5.0 - 5.9	VI - VII
6.0 - 6.9	VII - VIII
7.0 - 7.9	IX - X
8.0 - 8.9	XI - XII

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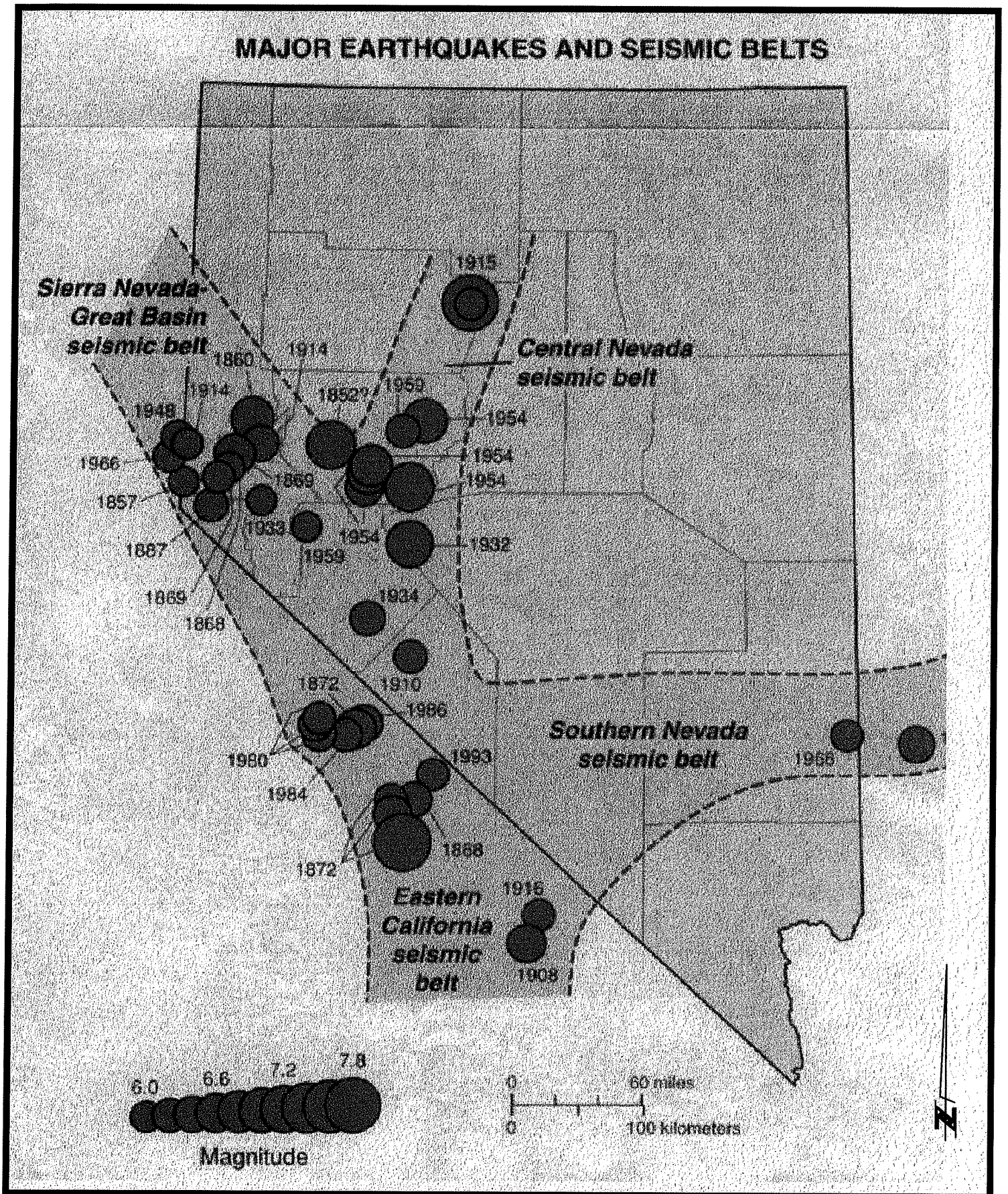
BOULDER BAY

MODIFIED MERCALLI SCALE

WASHOE COUNTY NEVADA

Date: SEPT. 2008
Scale: N.T.S.
Job No: 7139.000
PLATE 3



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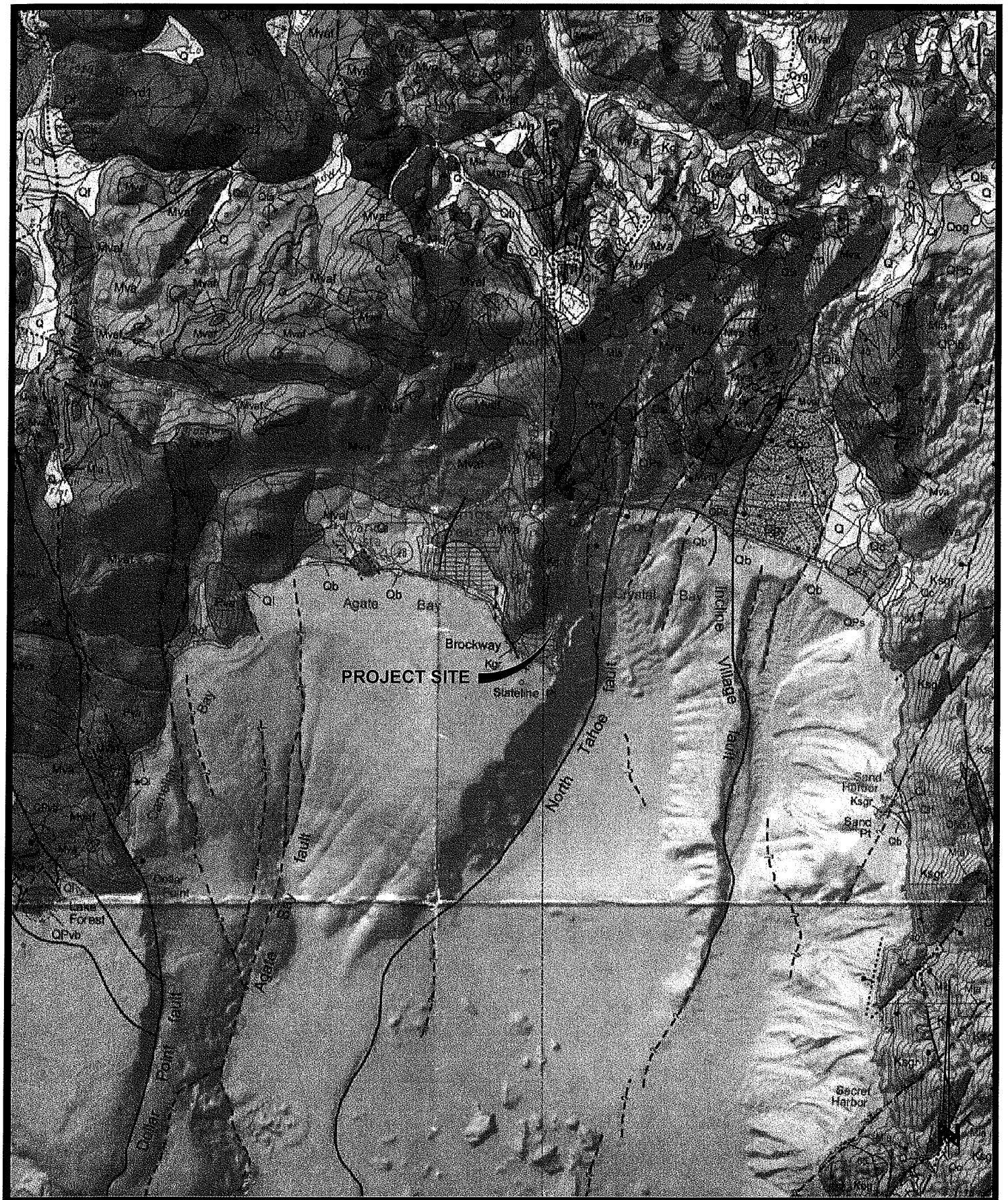
BOULDER BAY

MAJOR EARTHQUAKES/ SIESMIC BELTS

WASHOE COUNTY NEVADA

Date:	SEPT. 2008
Scale:	N.T.S.
Job No:	7139.000
PLATE	4



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BOULDER BAY

FAULT MAP

WASHOE COUNTY **NEVADA**

Date:	SEPT. 2008
Scale:	N.T.S.
Job No:	7139.000
PLATE	5

APPENDIX A

LUMOS
& ASSOCIATES

Sheet 1 of 1

BORING No. BH-01

Logged By:	**C. Borean**	Total Depth:	**25 feet**
Date Logged:	**8-19-2008**	Water Depth:	**No groundwater encountered**
Drill Type:	**Mobile Drill B-47**	Ground Elev.:	**Not Surveyed**

Sample Type: Shelby Tube; Split Spoon; Ziplock Sample; California; Bulk Sample; Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-VALUE	Other Tests (See Legend)
			Asphalt Concrete 0.3										
			Topsoil - Silty Sand, reddish brown, 5YR 4/3, slightly moist, soft, organics. 4.0	3									
5			Silty Sand (weathered granite), yellowish red, 10YR 5/6, slightly moist, moderately dense. 7.5	15									
			Silty Sand (weathered granite), brown, 7.5YR 5/4, slightly moist, very dense. 10.0	50+			NP	NP		81	19		
10			Silty Sand (weathered granite), light yellowish brown, 2.5Y 6/3, slightly moist, very dense, switch to air rotary drilling. 11.5	50+									
			Silty Sand (weathered granite), light yellowish brown, 2.5Y 6/3, very dense.										
15			1.75 minutes for 5 foot advancement.										
20			2.25 minutes for 5 foot advancement.										
25			2.75 minutes for 5 foot advancement. 25.0										

Boring terminated at 25 feet.
Boring backfilled with excavated soils and tamped at the surface

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Boulder Bay

LOG OF EXPLORATION

Job Number: 7139.000 Date: September 2008

PLATE A-1

Sheet 1 of 1

BORING No. BH-02

Logged By:	**C. Borean**	Total Depth:	**19.5 feet**
Date Logged:	**8-19-2008**	Water Depth:	**No groundwater encountered**
Drill Type:	**Mobile Drill B-47**	Ground Elev.:	**Not Surveyed**

Sample Type: Shelby Tube; Split Spoon; Ziplock Sample; California; Bulk Sample; Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-VALUE	Other Tests (See Legend)
			Asphalt Concrete. 0.3										
			Silty Sand, dark gray, slightly moist, soft. 0.5										
			Silty Sand (weathered granite), brownish yellow, 10YR 6/6, slightly moist, very dense.	50+									
5			Switch to air rotary drilling.	50+									
			Light brownish gray, 2.5Y 6/2.										
10			Grayish brown, 2.5Y 5/2. 2 minutes for 5 feet advancement.										
			Light yellowish brown, 2.5Y 6/3.										
15			Light brownish gray, 2.5Y 6/2. 3 minutes for 5 feet advancement. 17.5										
			Granite, gray, 2.5Y 5/1, very hard. Practical refusal, 52 minutes for two feet advancement. 19.5										

Boring terminated at 19.5 feet.
Boring backfilled with excavated soils and tamped at the surface

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LOG OF EXPLORATION

Job Number: 7139.000 Date: September 2008

PLATE A-2

Sheet 1 of 2

BORING No. BH-03

Logged By:	C. Borean	Total Depth:	55.5 feet
Date Logged:	8-15 -2008	Water Depth:	No groundwater encountered
Drill Type:	Mobile Drill B-47	Ground Elev.:	Not Surveyed

Shelby Tube | Split Spoon | Ziplock Sample | California | Bulk Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-VALUE	Other Tests (See Legend)
			Asphalt concrete. 0.3										
			Silty Sand with Gravel, brown, 7.5YR 5/4, dry to slightly moist, moderately dense.	16									
			4.5										
5			Silty Sand with Gravel, Cobbles and Boulders, Brown, 7.5YR 5/4, slightly moist, moderately dense.	21									
				22									
10													
			Auger refusal on boulder, switch to air rotary drilling.										
15			Sample to cobble, Silty Sand with Gravel, very dark grayish brown, 10YR 3/2, slightly moist, moderately dense.	50+									
			18.5										
20			Silty Sand (weathered granite), light yellowish brown, 2.5Y 6/3, very dense.										
25			Light brownish gray, 2.5Y 6/2, 2.75 minutes for 5 foot advancement.										
30			Boring terminated at 55.5 feet. Boring backfilled with excavated soils and tamped at the surface										

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Boulder Bay

LOG OF EXPLORATION

Job Number: 7139.000

Date: September 2008

PLATE

A-3.1

BORING No. BH-03 (CONT'D)

Logged By:	C. Borean	Total Depth:	55.5 feet
Date Logged:	8-15 -2008	Water Depth:	No groundwater encountered
Drill Type:	Mobile Drill B-47	Ground Elev.:	Not Surveyed

Shelby Tube | Split Spoon | Ziplock Sample | California | Bulk Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-VALUE	Other Tests (See Legend)
			2 minutes for 5 foot advancement.										
		Z											
		Z					NP	NP			24		
35			2.75 minutes for 5 foot advancement.										
		Z											
		Z											
40			Light yellowish brown, 2.5Y 6/3. 4 minutes for 5 foot advancement.										
		Z											
		Z											
45			Light brownish gray, 2.5Y 6/2. 5.5 minutes for 5 foot advancement.										
		Z											
			Grayish brown, 2.5Y 5/2										
		Z											
50			Light brownish gray, 2.5Y 6/2. 5 minutes for 5 foot advancement.										
		Z											
			Grayish brown, 2.5Y 5/2.										
		Z											
55			Light brownish gray, 2.5Y 6/2. 6.25 minutes for 5 foot advancement. 55.5										

Boring terminated at 55.5 feet.
Boring backfilled with excavated soils and tamped at the surface

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LOG OF EXPLORATION

Job Number: 7139.000 Date: September 2008

PLATE A-3.2

Sheet 1 of 2

BORING No. BH-04

Logged By:	C. Borean	Total Depth:	35 feet
Date Logged:	8-19-2008	Water Depth:	No groundwater encountered
Drill Type:	Mobile Drill B-47	Ground Elev.:	Not Surveyed

Sample Type: Shelby Tube; Split Spoon; Ziplock Sample; California; Bulk Sample; Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-VALUE	Other Tests (See Legend)
			Asphalt concrete. 0.3										
			Silty Sand, light yellowish brown 2.5Y 6/4, 4.0	20									
5			Silty Sand (weathered granite), light yellowish brown, 2.5Y 6/4, lsightly moist, moderately dense. Switch to air rotary drilling.	64			NP	NP			20		
			Light olive brown, 2.5Y 5/3.										
10			Light yellowish brown, 2.5Y 6/3. 2 minutes for 5 foot advancement.										
15			1.5 minutes for 5 foot advancement.										
			Light olive brown, 2.5Y 5/3.										
20			Light yellowish brown, 2.5Y 6/3. 3.25 minutes for 5 foot advancement.										
25			3 minutes for 5 foot advancement.										
30			Boring terminated at 35 feet. Boring backfilled with excavated soils and tamped at the surface										

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Boulder Bay

LOG OF EXPLORATION

Job Number: 7139.000

Date: September 2008

PLATE

A-4.1

BORING No. BH-04 (CONT'D)

Logged By:	C. Borean	Total Depth:	35 feet
Date Logged:	8-19-2008	Water Depth:	No groundwater encountered
Drill Type:	Mobile Drill B-47	Ground Elev.:	Not Surveyed

Shelby Tube | Split Spoon | Ziplock Sample | California | Bulk Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-VALUE	Other Tests (See Legend)
		Z	2.5 minutes for 5 foot advancement.										
			Light olive brown, 2.5Y 5/3.										
		Z	Light yellowish brown, 2.5Y 6/3. 3.5 minutes for 5 foot advancement. 35.0										
35													

Boring terminated at 35 feet.
Boring backfilled with excavated soils and tamped at the surface

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LOG OF EXPLORATION

Job Number: 7139.000 Date: September 2008

PLATE A-4.2

Sheet 1 of 2

BORING No. BH-05

Logged By:	C. Borean	Total Depth:	55 feet
Date Logged:	8-14-2008	Water Depth:	No groundwater encountered
Drill Type:	Mobile Drill B-47	Ground Elev.:	Not Surveyed

Sample Type: Shelby Tube; Split Spoon; Ziplock Sample; California; Bulk Sample; Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-VALUE	Other Tests (See Legend)
			Asphalt concrete. 0.3										
			Fill - Silty Sand with Gravel, light olive brown, 2.5Y 5/4, slightly moist, loose. 4.5	8									
5			Sandy Silt (weathered granite), light olive brown, 2.5Y 5/4, slightly moist, medium dense.	25									
			Light yellowish brown, 2.5Y 6/4, medium dense.	50+									
10			Light yellowish brown 2.5Y 6/3, very dense. @ 10' switch to air rotary drilling.	50+									
			Light olive brown, 2.5Y 5/3.										
15			Light yellowish brown, 2.5Y 6/3.										
			Light gray, 2.5Y 7/1.										
20			Light yellowish brown, 2.5Y 6/3.				NP	NP			27		
			Pale yellow, 2.5Y 7/3.										
25			Light yellow brown, 2.5Y 6/3. 6.25 minutes for 5 foot advancement.										
30			Boring terminated at 55 feet. Boring backfilled with excavated soils and tamped at the surface										

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LOG OF EXPLORATION

Job Number: 7139.000

Date: September 2008

PLATE

A-5.1

BORING No. BH-05 (CONT'D)

Logged By:	C. Borean	Total Depth:	55 feet
Date Logged:	8-14-2008	Water Depth:	No groundwater encountered
Drill Type:	Mobile Drill B-47	Ground Elev.:	Not Surveyed

Shelby Tube | Split Spoon | Ziplock Sample | California | Bulk Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-VALUE	Other Tests (See Legend)
		Z	Light brownish gray, 2.5Y 6/2. 7 minutes for 5 foot advancement.										
		Z	Light yellowish brown, 2.5Y 6/3.										
35			Light olive brown, 2.5Y 5/4. 6 minutes for 5 foot advancement.										
40			Light olive brown, 2.5Y 5/3. 8 minutes for 5 foot advancement.										
45			Light brownish gray, 2.5Y 6/2. 11 minutes for 5 foot advancement.										
50			Granite, light olive brown, 2.5Y 5/3, very hard. 11 minutes for 5 foot advancement.										
			Light yellow brown, 2.5Y 6/3.										
55			Light olive brown, 2.5Y 5/3. 22.5 minutes for 5 foot advancement. 55.0										

Boring terminated at 55 feet.
Boring backfilled with excavated soils and tamped at the surface

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LOG OF EXPLORATION

Job Number: 7139.000

Date: September 2008

PLATE

A-5.2

BORING No. BH-06

Logged By:	C. Borean	Total Depth:	45 feet
Date Logged:	8-12-2008	Water Depth:	No groundwater encountered
Drill Type:	Mobile Drill B-47	Ground Elev.:	Not Surveyed

Sample Type: Shelby Tube; Split Spoon; Ziplock Sample; California; Bulk Sample; Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-VALUE	Other Tests (See Legend)
			Fill - Sandy Silt with Gravel and Cobbles, dark brown, 7.5YR 5/3 to very dark brown, 7.5YR 2/5, dry, moderately dense, sample to cobble.	50+									
5			Dark yellowish brown, 10YR 3/6, slightly moist, moderately dense.	15									
			Yellowish brown, 10YR 5/8, moderately dense. 9.0	19									
			Sandy Silt (weathered granite), light brownish gray, 2.5Y 6/2, slightly moist, moderately dense.	30			NP	NP			16		
10			Light olive brown, 2.5Y 5/4, very dense.	50+									
15				50+									
			No recovery.	50+									
20			Light olive brown, 2.5Y 5/3.	50+									
25			No recovery.	50+									
30													

Boring terminated at 45 feet.
Boring backfilled with excavated soils and tamped at the surface

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LOG OF EXPLORATION

Job Number: 7139.000 Date: September 2008

PLATE A-6.1

BORING No. BH-06 (CONT'D)

Logged By:	C. Borean	Total Depth:	45 feet
Date Logged:	8-12-2008	Water Depth:	No groundwater encountered
Drill Type:	Mobile Drill B-47	Ground Elev.:	Not Surveyed

Shelby Tube | Split Spoon | Ziplock Sample | California | Bulk Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-VALUE	Other Tests (See Legend)
				50+									
35			Olive, 5Y 4/4.	50+									
40			No recovery.	50+									
45			45.0										

Boring terminated at 45 feet.
Boring backfilled with excavated soils and tamped at the surface

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LOG OF EXPLORATION

Job Number: 7139.000 Date: September 2008

PLATE A-6.2

Sheet 1 of 2

BORING No. BH-07

Logged By:	C. Borean	Total Depth:	55.5 feet
Date Logged:	8-11-2008	Water Depth:	No groundwater encountered
Drill Type:	Mobile Drill B-47	Ground Elev.:	Not Surveyed

Sample Type: Shelby Tube; Split Spoon; Ziplock Sample; California; Bulk Sample; Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-VALUE	Other Tests (See Legend)
			Fill - Silty Sand, very pale brown, 10YR 7/3, faint motteling ~20% yellow, 10YR 7/6, dry, dense.										
				35									
5			Sandy silt, very pale brown, 10YR 8/2, dry, moderately dense.	17									
			Light olive brown, slightly moist, dense.	32									
			9.0										
			Silty Sand (weathered granite), light yellow brown, 2.5Y 6/4, slightly moist, very dense.										
10				50+									
			Pale olive yellow, 2.5Y 6/6.	50+									
15				50+			NP	NP			23		
			Pale olive, 5Y 6/4	50+									
20				50+									
25			Olive, 5Y 5/4.	50+									
30													

Boring terminated at 55.5 feet.
Boring backfilled with excavated soils and tamped at the surface

LUMOS LOG ST BORING 7139.000 BOULDER BAY.GPJ US LAB.GDT 9/16/08

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LOG OF EXPLORATION

Job Number: 7139.000

Date: September 2008

PLATE

A-7.1

BORING No. BH-07 (CONT'D)

Logged By:	C. Borean	Total Depth:	55.5 feet
Date Logged:	8-11-2008	Water Depth:	No groundwater encountered
Drill Type:	Mobile Drill B-47	Ground Elev.:	Not Surveyed

Shelby Tube | Split Spoon | Ziplock Sample | California | Bulk Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-VALUE	Other Tests (See Legend)
35		California	No recovery.	50+									
40													
45		California	No recovery.	50+									
50													
55		California	55.3	50+									

Boring terminated at 55.5 feet.
Boring backfilled with excavated soils and tamped at the surface

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Carson City, Nevada 89706
775-883-7077
Fax: 775-883-7114

Boulder Bay

LOG OF EXPLORATION

Job Number: 7139.000 Date: September 2008

PLATE A-7.2

Sheet 1 of 2

BORING No. BH-08

Logged By:	C. Borean	Total Depth:	40 feet
Date Logged:	8-18-2008	Water Depth:	No groundwater encountered
Drill Type:	Mobile Drill B-47	Ground Elev.:	Not Surveyed

Sample Type: Shelby Tube; Split Spoon; Ziplock Sample; California; Bulk Sample; Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-VALUE	Other Tests (See Legend)
			Fill - Silty Sand, brownish yellow, 10YR 6/8, slightly moist, moderately dense.										
			4.0	19									
5			Silty Sand (weathered granite), light yellow brown, 2.5Y 6/4, slightly moist, medium dense.	15									
			Dense.	22									
10			Olive yellow, 2.5Y 6/6, Dense.	27									
			Yellowish brown, 2.5Y 6/4, very dense.	50+									
15			Switch to air rotary drilling.	50+									
			Light olive brown, 2.5Y 5/3										
20			2 minutes for 5 foot advancement.										
			Light brownish gray, 2.5Y 6/2.										
25			Pale yellow, 2.5Y 7/3. 3.25 minutes for 5 foot advancement.										
			Light yellowish brown, 2.5Y 6/3.										
30			Boring terminated at 40 feet. Boring backfilled with excavated soils and tamped at the surface										

LUMOS LOG ST BORING 7139.000 BOULDER BAY.GPJ US LAB.GDT 9/16/08

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Boulder Bay

LOG OF EXPLORATION

Job Number: 7139.000

Date: September 2008

PLATE

A-8.1

BORING No. BH-08 (CONT'D)

Logged By:	C. Borean	Total Depth:	40 feet
Date Logged:	8-18-2008	Water Depth:	No groundwater encountered
Drill Type:	Mobile Drill B-47	Ground Elev.:	Not Surveyed

Sample Type: Shelby Tube; Split Spoon; Ziplock Sample; California; Bulk Sample; Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-VALUE	Other Tests (See Legend)
		Z	4.25 minutes for 5 foot advancement										
		Z											
35		Z	6 minutes for 5 foot advancement.										
		Z	Light olive brown, 2.5Y 5/3.				NP	NP			12		
40			Light olive brown 2.5Y 4/3. 5.5 minutes for 5 foot advancement. 40.0										

Boring terminated at 40 feet.
Boring backfilled with excavated soils and tamped at the surface

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LOG OF EXPLORATION

Job Number: 7139.000 Date: September 2008

PLATE A-8.2

BORING No. BH-09

Logged By:	C. Borean	Total Depth:	37.5 feet
Date Logged:	8-15-2008	Water Depth:	No groundwater encountered
Drill Type:	Mobile Drill B-47	Ground Elev.:	Not Surveyed

Sample Type: Shelby Tube; Split Spoon; Ziplock Sample; California; Bulk Sample; Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-VALUE	Other Tests (See Legend)
			Fill - Sandy Silt with Gravel and Cobbles, brown, 7.5YR 4/4, dry to slightly moist, moderately dense.	37									
			4.5										
5			Silty Sand (weathered granite), pale olive, 5Y 6/3-4, slightly moist, very dense.	50+									
				50+									
10				50+									
15													
			Olive yellow, 2.5Y 6/6.										
20			Olive, 5Y 5/3. 3 minutes for 5 foot advancement.										
			Pale olive, 5Y 6/3.				NP	NP			13		
25			3 minutes for 5 foot advancement.										
30			Boring terminated at 37.5 feet. Boring backfilled with excavated soils and tamped at the surface										

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LOG OF EXPLORATION

Job Number: 7139.000

Date: September 2008

PLATE

A-9.1

BORING No. BH-09 (CONT'D)

Logged By:	C. Borean	Total Depth:	37.5 feet
Date Logged:	8-15-2008	Water Depth:	No groundwater encountered
Drill Type:	Mobile Drill B-47	Ground Elev.:	Not Surveyed

Shelby Tube | Split Spoon | Ziplock Sample | California | Bulk Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-VALUE	Other Tests (See Legend)
		Z	5 minutes for 5 foot advancement. 32.5										
35		Z	Granite, light gray, 5Y 7/2, very hard.										
		Z	10 minutes for 5 foot advancement.										
			Practical refusal. 38 minutes for 2.5 foot advancement. 37.5										

Boring terminated at 37.5 feet.
Boring backfilled with excavated soils and tamped at the surface

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Boulder Bay

LOG OF EXPLORATION

Job Number: 7139.000 Date: September 2008

PLATE A-9.2

TEST PIT No. TP-01

Logged By:	C. Borean	Total Depth:	8 feet
Date Logged:	8-13-2008	Water Depth:	No groundwater encountered
Drill Type:	CAT 416B	Ground Elev.:	Not Surveyed

Sample Type: Percolation Test; Split Spoon; Ziplock Sample; California Sampler; Bulk Sample; Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION		SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Expansion Index
			Asphalt concrete	0.2										
1		Z	FILL - Silty Sand with Gravel and Cobbles, dark brown, 10YR 3/3, slightly moist, loose.	1.4										
2		Z	Silty Sand with Gravel and Cobbles, dark yellowish brown, 10YR 4/4, slightly moist, moderately dense.	2.5										
3			Silty Sand with Gravel, common Cobbles, common Boulders, brownish yellow, 10YR 6/8, slightly moist, moderately dense.											
4														
5		Z												
6														
7														
8			Practical refusal, difficult digging, boulders, unsafe hole.	8.0										

Test pit terminated at 8 feet.
Test Pits backfilled without compaction verification

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LOG OF EXPLORATORY TEST PIT

Job Number: 7139.000

Date: September 2008

PLATE

A-10

TEST PIT No. TP-02

Logged By:	C. Borean	Total Depth:	6 feet
Date Logged:	8-13-2008	Water Depth:	No groundwater encountered
Drill Type:	CAT 416B	Ground Elev.:	Not Surveyed

Percolation Test | Split Spoon | Ziplock Sample | California Sampler | Bulk Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Expansion Index
			Asphalt Concrete 0.3										
1			Silty Sand (decomposed granite), pale olive, 5Y 6/3, slightly moist, dense, difficult digging.										
2													
3		B											
4													
5													
6			6.0										

Test pit terminated at 6 feet.
Test Pits backfilled without compaction verification

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LOG OF EXPLORATORY TEST PIT

Job Number: 7139.000 Date: September 2008

PLATE A-11

TEST PIT No. TP-03

Logged By: **C. Borean**
Date Logged: **8-13-2008**
Drill Type: **CAT 416B**

Total Depth: **2.6 feet**
Water Depth: **No groundwater encountered**
Ground Elev.: **Not Surveyed**

Percolation Test | Split Spoon | Ziplock Sample | California Sampler | Bulk Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION		SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Expansion Index
			Asphalt Concrete	0.3										
1		Z	FILL - Silty Sand with trace Grave, light yellowish brown, 2.5Y 6/4, slightly moist, moderately dense.	1.4										
2		Z	Silty Sand (decomposed granite), pale yellow, 2.5Y 7/3, slightly moist, very dense, difficult digging.	2.6				NP	NP	3.6	75.9	8.1		

Test pit terminated at 2.6 feet.
Test Pits backfilled without compaction verification

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LOG OF EXPLORATORY TEST PIT

Job Number: 7139.000 Date: September 2008

PLATE A-12

TEST PIT No. TP-04

Logged By:	C. Borean	Total Depth:	9.5 feet
Date Logged:	8-13-2008	Water Depth:	No groundwater encountered
Drill Type:	CAT 416B	Ground Elev.:	Not Surveyed

Sample Type: Percolation Test; Split Spoon; Ziplock Sample; California Sampler; Bulk Sample; Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Expansion Index
1, 2, 3		B	FILL - Silty Sand/Sandy Silt with some Gravel and Cobbles, light yellowish brown, 10YR 6/4, dry to slightly moist, moderately dense.				NP	NP	12.8	62.9	16.5	64	
4			4.0										
4, 5, 6, 7, 8, 9		Z	Silty Sand (decomposed granite), light yellowish brown, 2.5Y 6/4, slightly moist, moderately dense, difficult digging.										
			9.5										

Test pit terminated at 9.5 feet.
Test Pits backfilled without compaction verification

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LOG OF EXPLORATORY TEST PIT

Job Number: 7139.000 Date: September 2008

PLATE A-13

TEST PIT No. TP-05

Logged By:	C. Borean	Total Depth:	9.4 feet
Date Logged:	8-13-2008	Water Depth:	No groundwater encountered
Drill Type:	CAT 416B	Ground Elev.:	Not Surveyed

Sample Type: Percolation Test; Split Spoon; Ziplock Sample; California Sampler; Bulk Sample; Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Expansion Index
1			FILL - Silty Sand with Gravel, some Cobbles, light yellowish brown, 10YR 6/4, slightly moist, loose to moderately dense.										
2			Compaction Test Performed to 85%.										
3		B											
4													
5			5.2										
6			Silty Sand (decomposed granite), pale yellow, 5Y 7/4, slightly moist, dense.										
7		Z											
8													
9			9.4										

Test pit terminated at 9.4 feet.
Test Pits backfilled without compaction verification

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LOG OF EXPLORATORY TEST PIT

Job Number: 7139.000 Date: September 2008

PLATE A-14

TEST PIT No. TP-06

Logged By: **C. Borean**
Date Logged: **8-13-2008**
Drill Type: **CAT 416B**

Total Depth: **12 feet**
Water Depth: **No groundwater encountered**
Ground Elev.: **Not Surveyed**

Percolation Test | Split Spoon | Ziplock Sample | California Sampler | Bulk Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Expansion Index
1			FILL - Silty Sand with Gravel and Cobbles, light yellowish brown, 10YR 6/4, slightly moist, loose to moderately dense, lumber and metal pieces thought.										
2													
3		B	Compaction Test Performed to 86%			126.1							
4			4.0										
4		B	FILL - Silty Sand with Gravel and Cobbles, brown, 10YR 4/3, slightly moist, moderately dense, metal pieces. Compaction Test Performed to 90%										
5													
6													
7													
8													
9													
10													
11													
12			12.0										

Test pit terminated at 12 feet.
Test Pits backfilled without compaction verification

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LOG OF EXPLORATORY TEST PIT

Job Number: 7139.000

Date: September 2008

PLATE

A-15

TEST PIT No. PERC.

Logged By:	C. Borean	Total Depth:	3.4 feet
Date Logged:	8-13-2008	Water Depth:	No groundwater encountered
Drill Type:	CAT 416B	Ground Elev.:	Not Surveyed

Sample Type: Percolation Test; Split Spoon; Ziplock Sample; California Sampler; Bulk Sample; Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION		SPT (N) Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Expansion Index
1		Z	FILL - Silty Sand, dark yellowish brown, 10YR 4/4, slightly moist, soft.	1.3										
		Z	FILL - Silty Sand, yellowish red, 5YR 4/6, slightly moist, moderately dense.	1.8										
2		Z	Silty Sand (decomposed granite), olive yellow, 2.5Y 6/6, slightly moist, moderately dense.	3.4										
3			Percolation test result at this elevation is 3 min/in.	4.4										

Test pit terminated at 3.4 feet.
Test Pits backfilled without compaction verification

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LOG OF EXPLORATORY TEST PIT

Job Number: 7139.000 Date: September 2008

PLATE A-16

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO 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 (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT 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 SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

Other Tests

AN	ANALYTICAL TEST (pH, Soluble Sulfate, and Resistivity)
C	CONSOLIDATION TEST
DS	DIRECT SHEAR TEST
MD	MOISTURE DENSITY CURVE

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Boulder Bay

LEGEND

Job Number: 7139.000

Date: September 2008

PLATE

A-17

APPENDIX B

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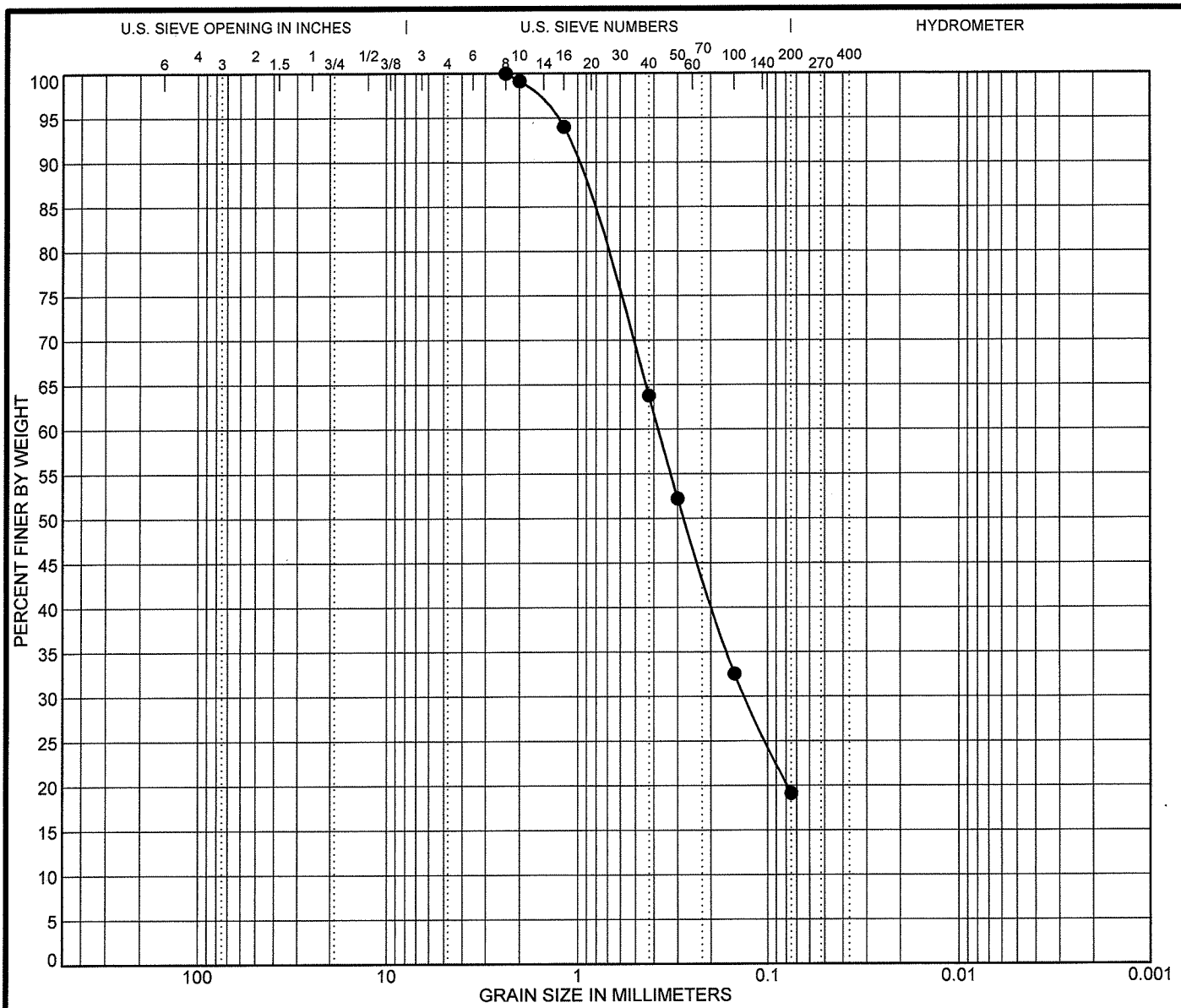

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Date: 8-18-08					
● **BH-01**	Classification	LL	PL	PI	Cc	Cu
Depth: 7.5	Silty SAND (SM)	NP	NP	NP		
Sample Location	BH-1 at 7.5'					
USCS	SM					
AASHTO						

Specimen Identification								
● **BH-01**	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
Depth: 7.5	2.36	0.379	0.131		0.0	80.9	19.1	
Natural Moisture	%		**S.E.**		**Absorption %**			
R-Value			**Durability Index**		**Soundness**			
Perctage of Wear (500 rev)	%		**Specific Gravity**		**Direct Shear**			

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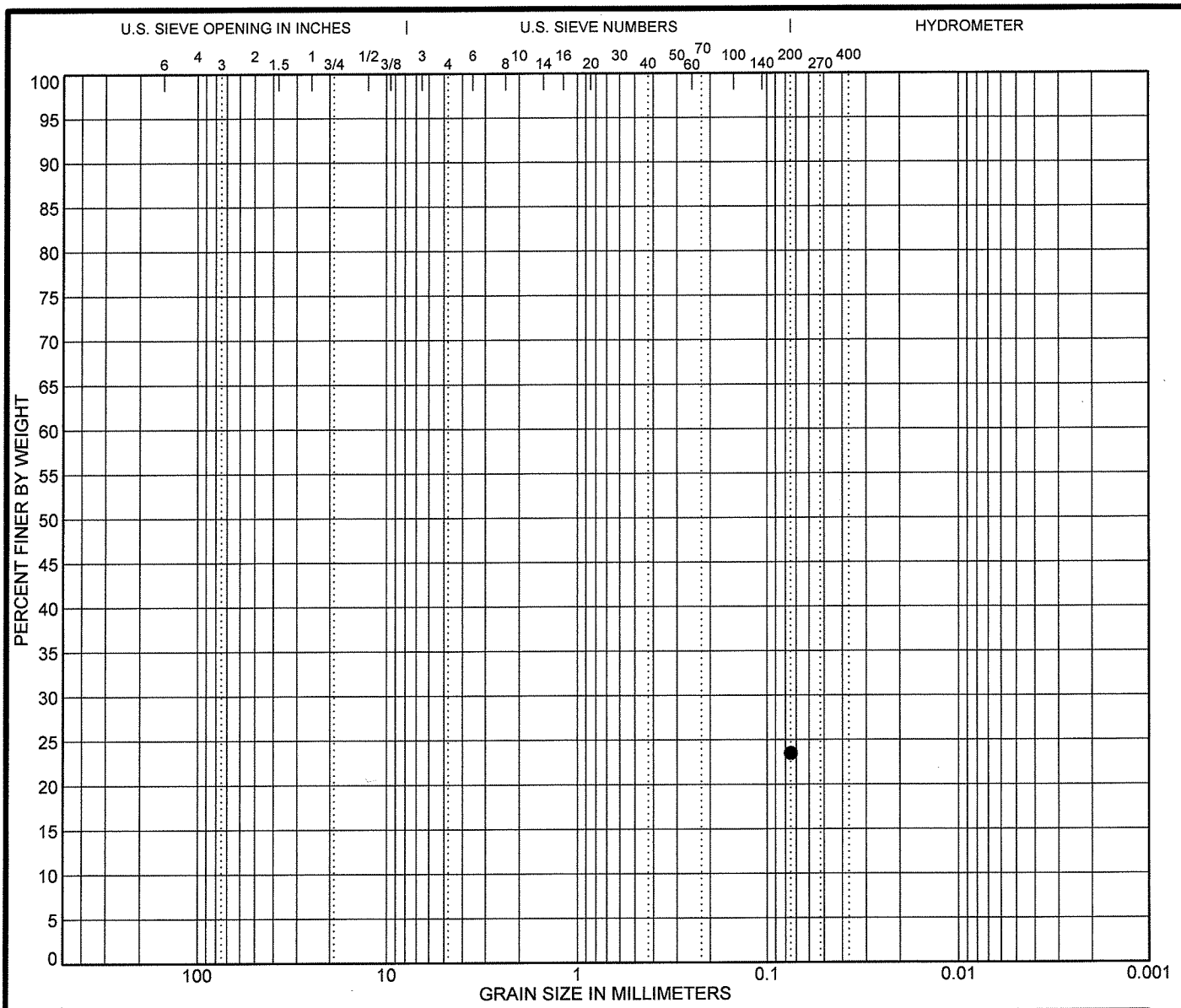
Boulder Bay

GRAIN SIZE DISTRIBUTION

Job Number: 7139.000 Date: September 2008

PLATE

B-1.1



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Date: 8-18-08					
●	**BH-03**	Classification	LL	PL	PI	Cc	Cu
	Depth32.5	Silty SAND (SM)	NP	NP	NP		
	Sample Location	BH-3 at 32.5'					
	USCS	SM					
	AASHTO						

	Specimen Identification								
●	**BH-03**	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
	Depth32.5	0.075				0.0	0.0	23.5	
	Natural Moisture	%		**S.E.**		**Absorption %**			
	R-Value			**Durability Index**		**Soundness**			
	Perctage of Wear (500 rev)	%		**Specific Gravity**		**Direct Shear**			

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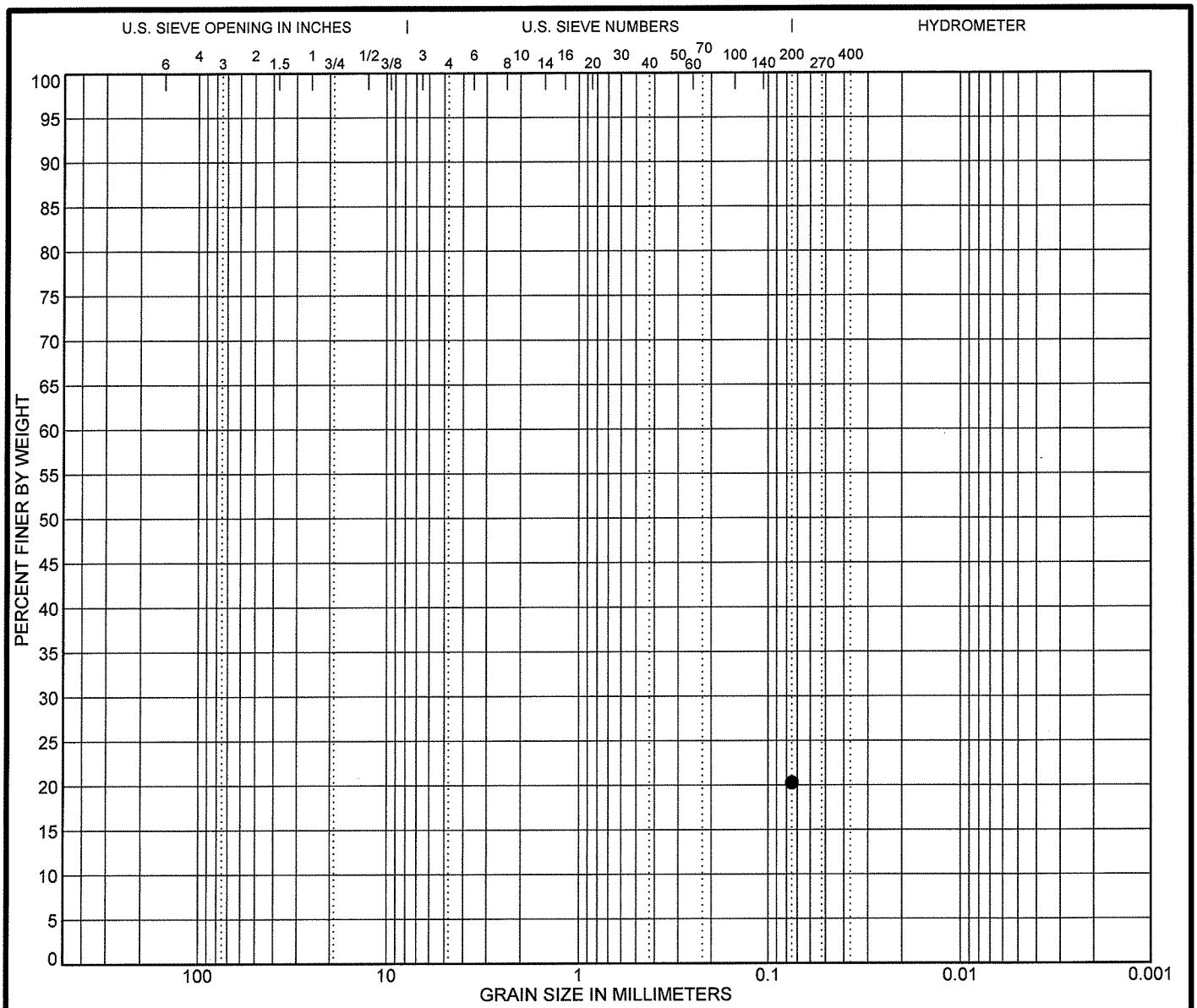
GRAIN SIZE DISTRIBUTION

Job Number: 7139.000 Date: September 2008

PLATE

B-1.2



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Date: 8-18-08					
●	**BH-04**	Classification	LL	PL	PI	Cc	Cu
	Depth: 5	Silty SAND (SM)	NP	NP	NP		
	Sample Location	BH-4 at 5.0'					
	USCS	SM					
	AASHTO						

	Specimen Identification								
●	**BH-04**	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
	Depth: 5	0.075				0.0	0.0	20.3	
	Natural Moisture	%		**S.E.**		**Absorption %**			
	R-Value			**Durability Index**		**Soundness**			
	Perctage of Wear (500 rev)	%		**Specific Gravity**		**Direct Shear**			

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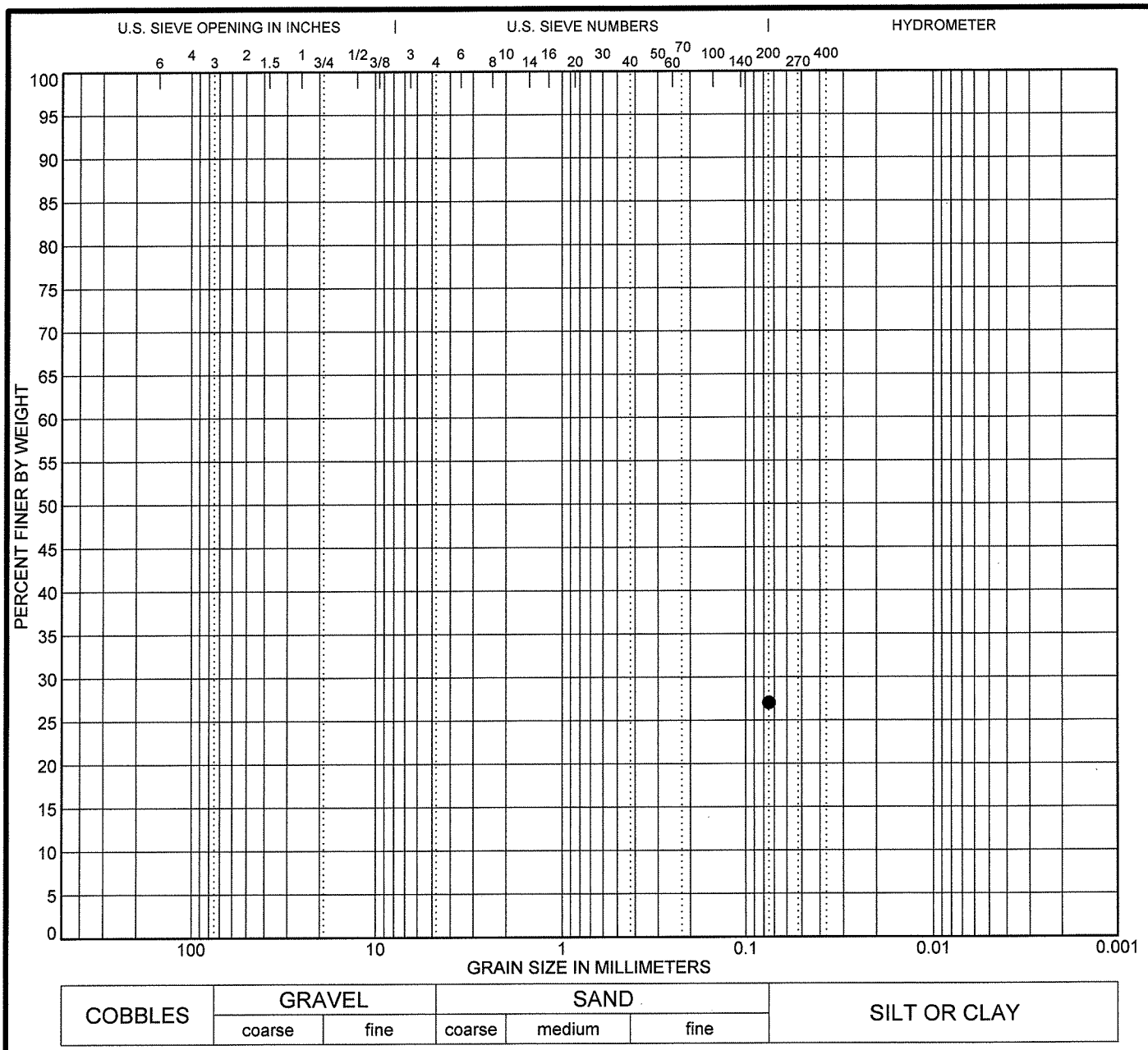
GRAIN SIZE DISTRIBUTION

Job Number: 7139.000 Date: September 2008

PLATE

B-1.3



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Date: 8-18-08					
●	**BH-05**	Classification	LL	PL	PI	Cc	Cu
	Depth: 20	Silty SAND (SM)	NP	NP	NP		
	Sample Location	BH-5 at 20.0'					
	USCS	SM					
	AASHTO						

	Specimen Identification								
●	**BH-05**	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
	Depth: 20	0.075				0.0	0.0	27.0	
	Natural Moisture	%		**S.E.**		**Absorption %**			
	R-Value			**Durability Index**		**Soundness**			
	Perctage of Wear (500 rev)	%		**Specific Gravity**		**Direct Shear**			

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GRAIN SIZE DISTRIBUTION

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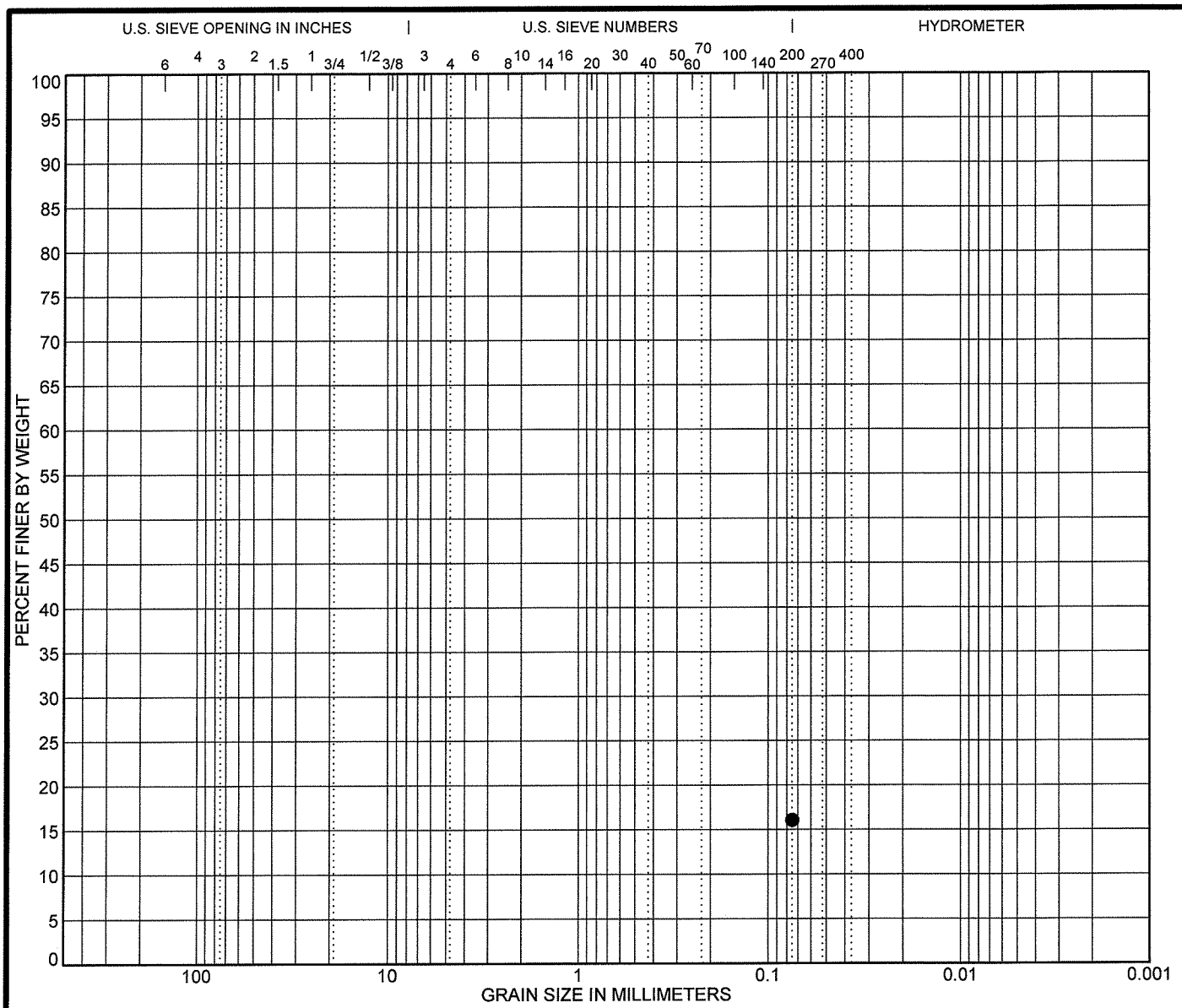
PLATE

B-1.4



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Date: 8-18-08					
●	**BH-06**	Classification	LL	PL	PI	Cc	Cu
	Depth: 10	Silty SAND (SM)	NP	NP	NP		
	Sample Location	BH-6 at 10.0'					
	USCS	SM					
	AASHTO						

	Specimen Identification								
●	**BH-06**	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
	Depth: 10	0.075				0.0	0.0	16.1	
	Natural Moisture	%		**S.E.**		**Absorption %**			
	R-Value			**Durability Index**		**Soundness**			
	Perctage of Wear (500 rev)	%		**Specific Gravity**		**Direct Shear**			

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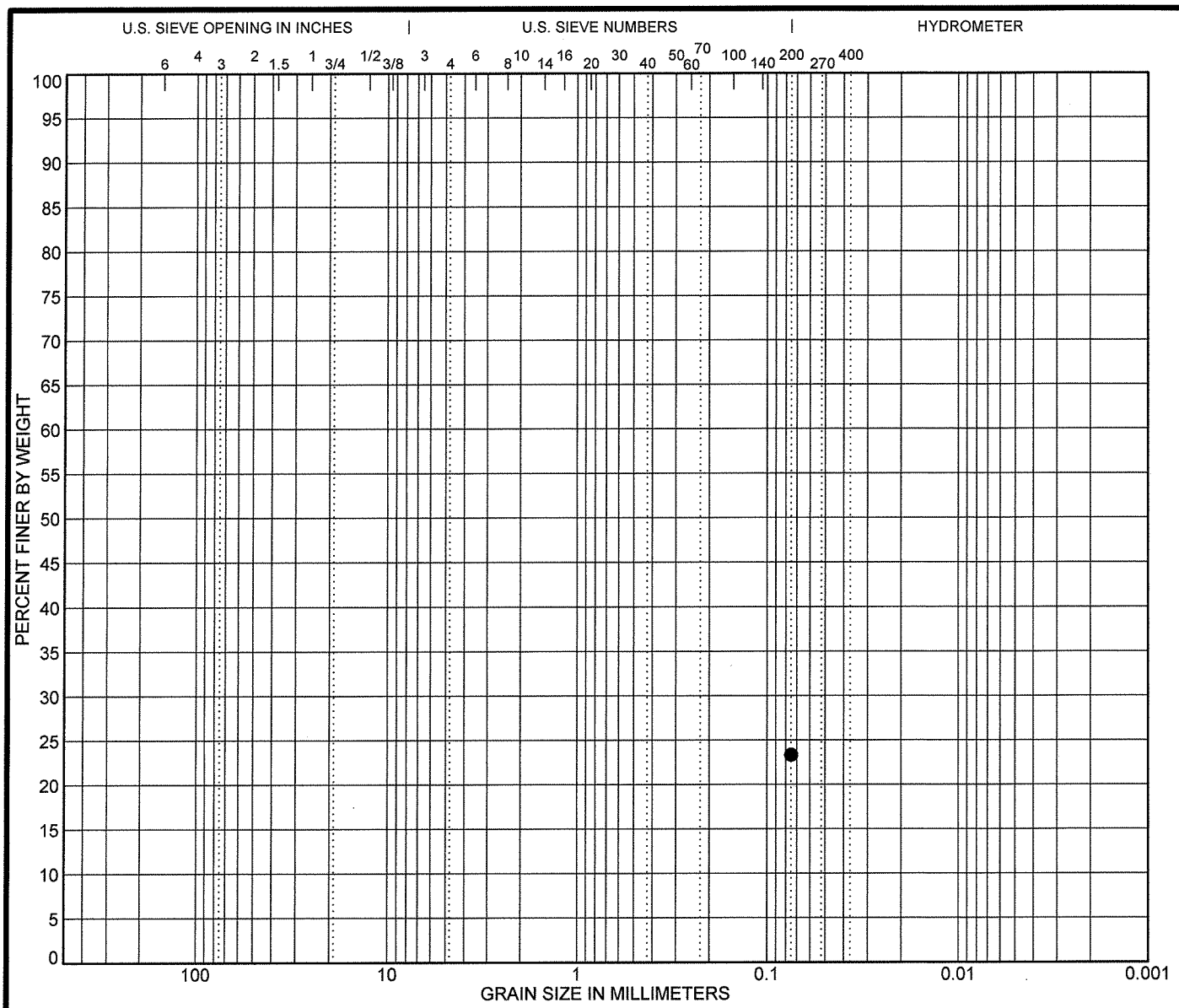
Boulder Bay

GRAIN SIZE DISTRIBUTION

Job Number: 7139.000 Date: September 2008

PLATE

B-1.5



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Date: 8-18-08					
● **BH-07**	Classification	LL	PL	PI	Cc	Cu
Depth: 15	Silty SAND (SM)	NP	NP	NP		
Sample Location	BH-7 at 15.0'					
USCS	SM					
AASHTO						

Specimen Identification								
● **BH-07**	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
Depth: 15	0.075				0.0	0.0	23.3	

Natural Moisture	%		**S.E.**		**Absorption %**		
R-Value			**Durability Index**		**Soundness**		
Perctage of Wear (500 rev)	%		**Specific Gravity**		**Direct Shear**		

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GRAIN SIZE DISTRIBUTION

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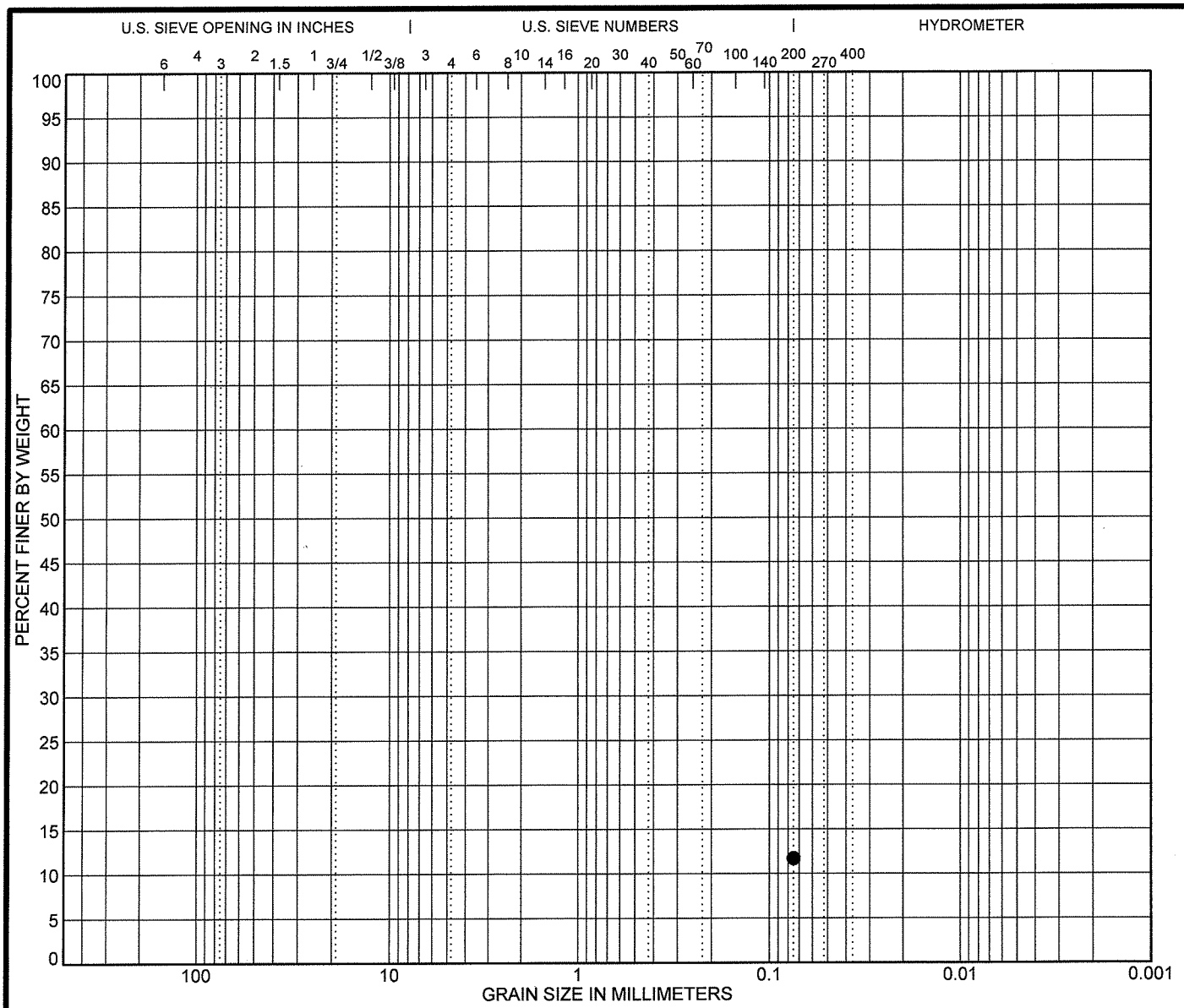
PLATE

B-1.6



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Date: 8-18-08					
●	**BH-08**	Classification	LL	PL	PI	Cc	Cu
	Depth 37.5	Poorly Graded SAND with Silt (SP-SM)	NP	NP	NP		
	Sample Location	BH-8 at 37.5'					
	USCS	SP-SM					
	AASHTO						

	Specimen Identification								
●	**BH-08**	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
	Depth 37.5	0.075				0.0	0.0	11.7	

Natural Moisture	%		**S.E.**		**Absorption %**		
R-Value			**Durability Index**		**Soundness**		
Perctage of Wear (500 rev)	%		**Specific Gravity**		**Direct Shear**		

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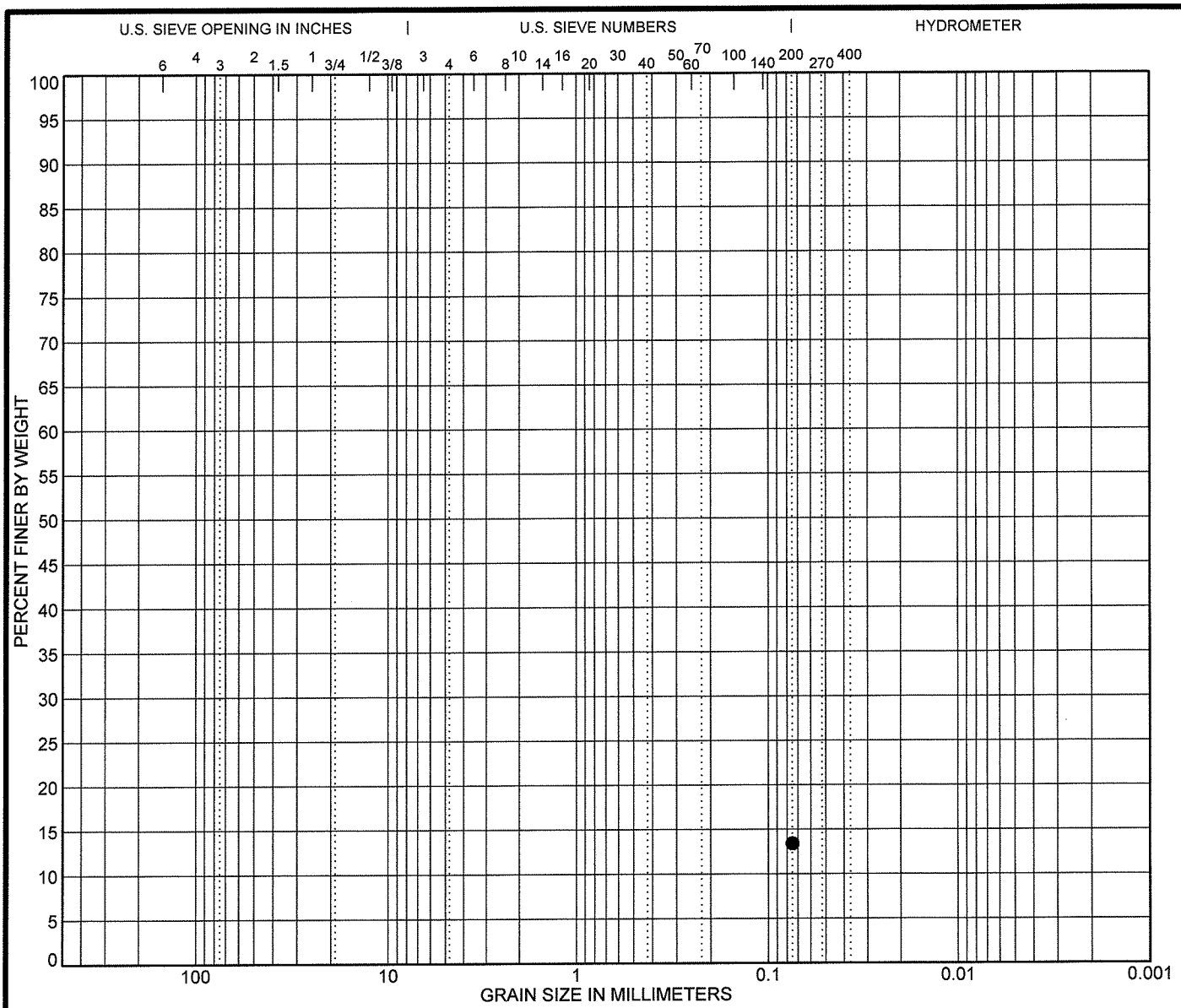
GRAIN SIZE DISTRIBUTION

Job Number: 7139.000

Date: September 2008

PLATE

B-1.7



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Date: 8-18-08					
● **BH-09**	Classification	LL	PL	PI	Cc	Cu
Depth 22.5	Silty SAND (SM)	NP	NP	NP		
Sample Location	BH-9 at 22.5'					
USCS	SM					
AASHTO						

Specimen Identification								
● **BH-09**	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
Depth 22.5	0.075				0.0	0.0	13.4	
Natural Moisture	%		**S.E.**		**Absorption %**			
R-Value			**Durability Index**		**Soundness**			
Perctage of Wear (500 rev)	%		**Specific Gravity**		**Direct Shear**			

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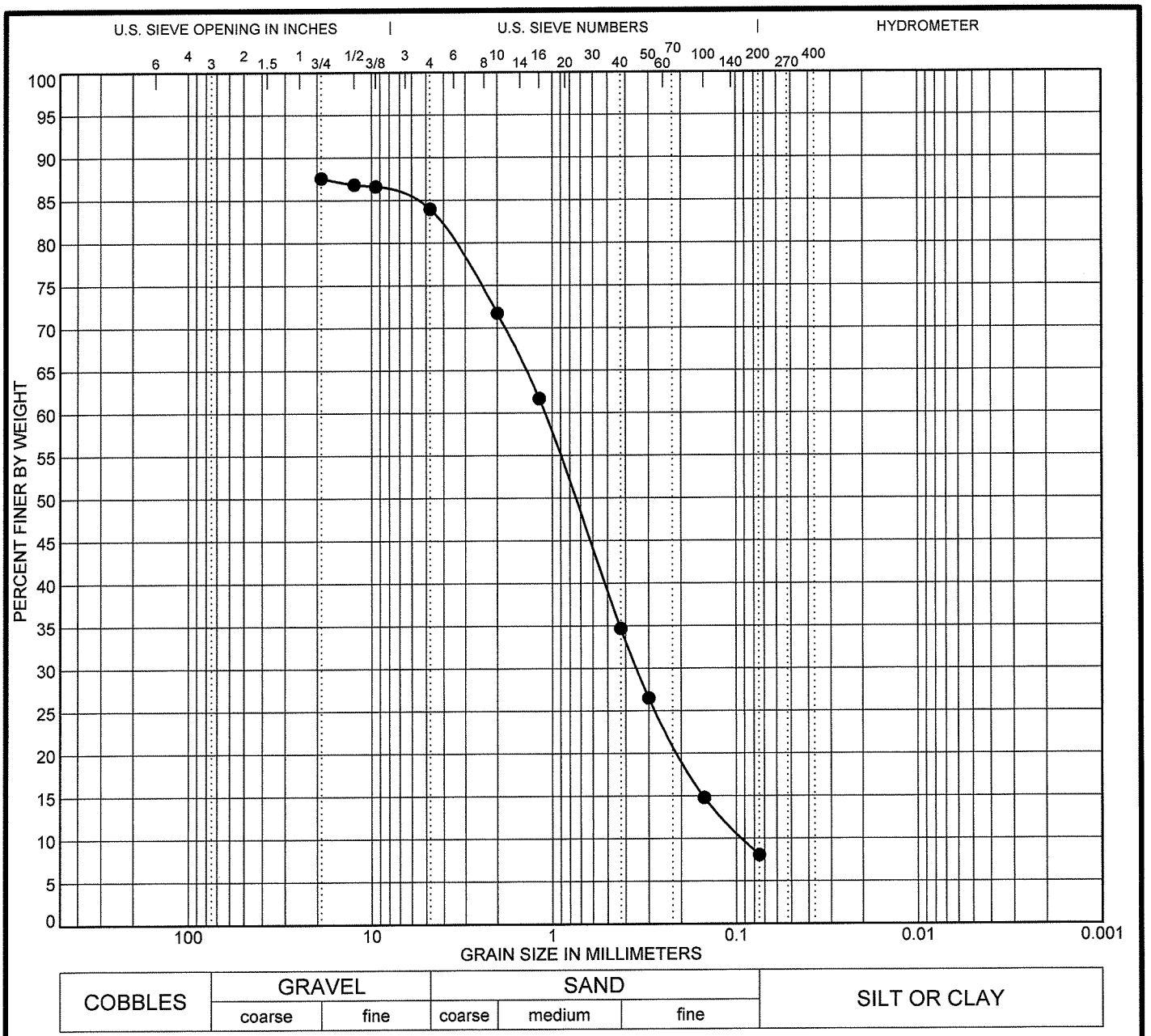
GRAIN SIZE DISTRIBUTION

Job Number: 7139.000 Date: September 2008

PLATE

B-1.8



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Date: 8-18-08					
● TP-03	Classification	LL	PL	PI	Cc	Cu
Depth: 1.4	Well-Graded SAND with Silt & Gravel (SW-SM)	NP	NP	NP	1.2	12.1
Sample Location	TP-3 at 1.4'					
USCS	SW-SM					
AASHTO						

Specimen Identification								
● TP-03	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
Depth: 1.4	19	1.107	0.348	0.091	3.6	75.9	8.1	

Natural Moisture	%		S.E.		Absorption %		
R-Value			Durability Index		Soundness		
Perctage of Wear (500 rev)	%		Specific Gravity		Direct Shear		

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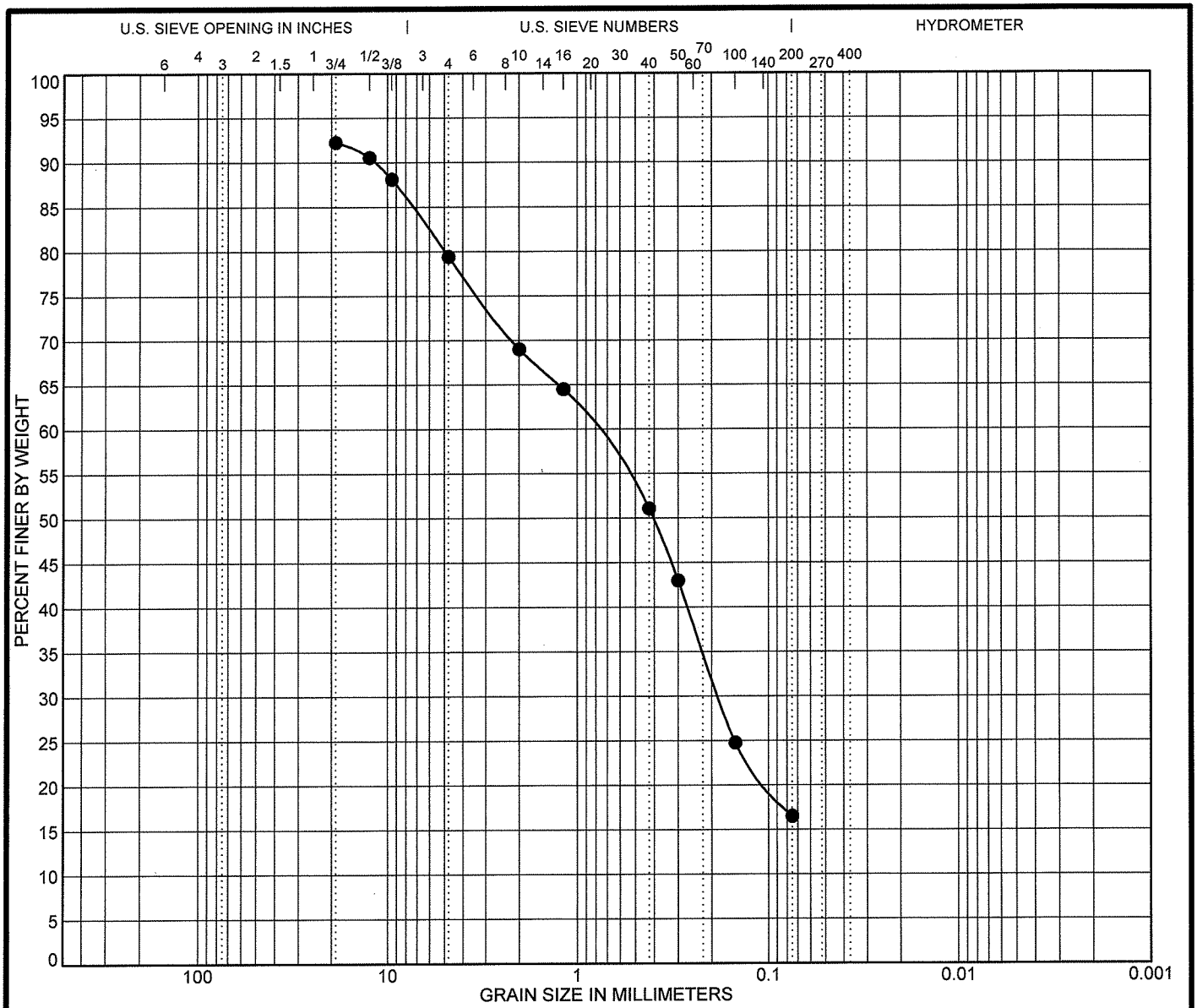
Boulder Bay

GRAIN SIZE DISTRIBUTION

Job Number: 7139.000 Date: September 2008

PLATE

B-1.9



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Date: 8-18-08					
● **TP-04**	Classification	LL	PL	PI	Cc	Cu
Depth: 0	Silty SAND with Gravel (SM)	NP	NP	NP		
Sample Location	TP-4 at 0.0'					
USCS	SM					
AASHTO						

Specimen Identification								
● **TP-04**	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
Depth: 0	19	0.838	0.183		12.8	62.9	16.5	
Natural Moisture	%		**S.E.**		**Absorption %**			
R-Value	64		**Durability Index**		**Soundness**			
Perctage of Wear (500 rev)	%		**Specific Gravity**		**Direct Shear**			

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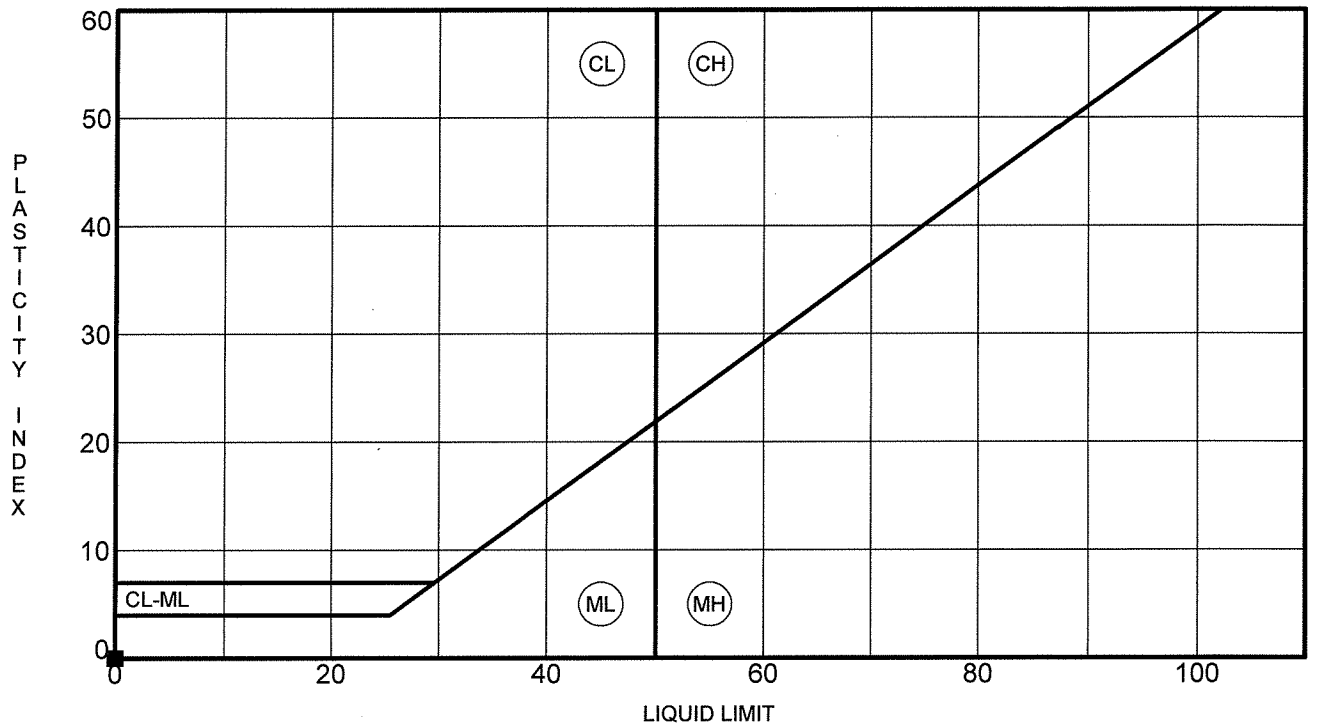
Boulder Bay

GRAIN SIZE DISTRIBUTION

Job Number: 7139.000 Date: September 2008

PLATE

B-1.10



	Specimen Identification		LL	PL	PI	Fines	Classification
●	BH-01	7.5	NP	NP	NP	19	Silty SAND (SM)
⊠	BH-03	32.5	NP	NP	NP	24	Silty SAND (SM)
▲	BH-04	5.0	NP	NP	NP	20	Silty SAND (SM)
★	BH-05	20.0	NP	NP	NP	27	Silty SAND (SM)
⊙	BH-06	10.0	NP	NP	NP	16	Silty SAND (SM)
✿	BH-07	15.0	NP	NP	NP	23	Silty SAND (SM)
○	BH-08	37.5	NP	NP	NP	12	Poorly Graded SAND with Silt (SP-SM)
△	BH-09	22.5	NP	NP	NP	13	Silty SAND (SM)
⊗	TP-03	1.4	NP	NP	NP	8	Well-Graded SAND with Silt & Gravel (SW-SM)
⊕	TP-04	0.0	NP	NP	NP	17	Silty SAND with Gravel (SM)

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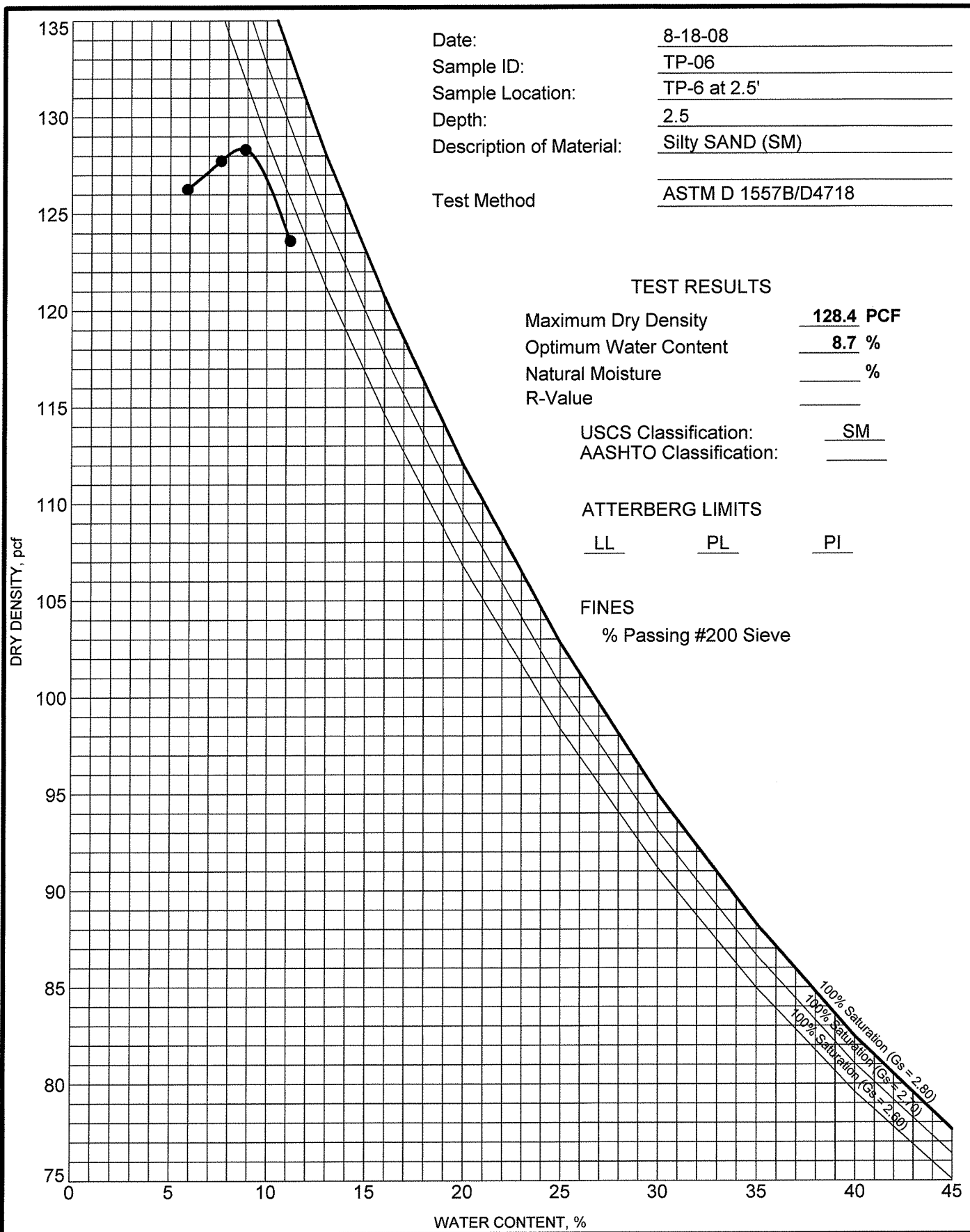
Boulder Bay

ATTERBERG LIMITS' RESULTS

Job Number: 7139.000 Date: September 2008

PLATE

B-2



Date:	8-18-08
Sample ID:	TP-06
Sample Location:	TP-6 at 2.5'
Depth:	2.5
Description of Material:	Silty SAND (SM)
Test Method	ASTM D 1557B/D4718

TEST RESULTS

Maximum Dry Density	**128.4**	**PCF**
Optimum Water Content	**8.7**	**%**
Natural Moisture		%
R-Value		

USCS Classification: SM
AASHTO Classification:

ATTERBERG LIMITS

LL PL PI

FINES

% Passing #200 Sieve

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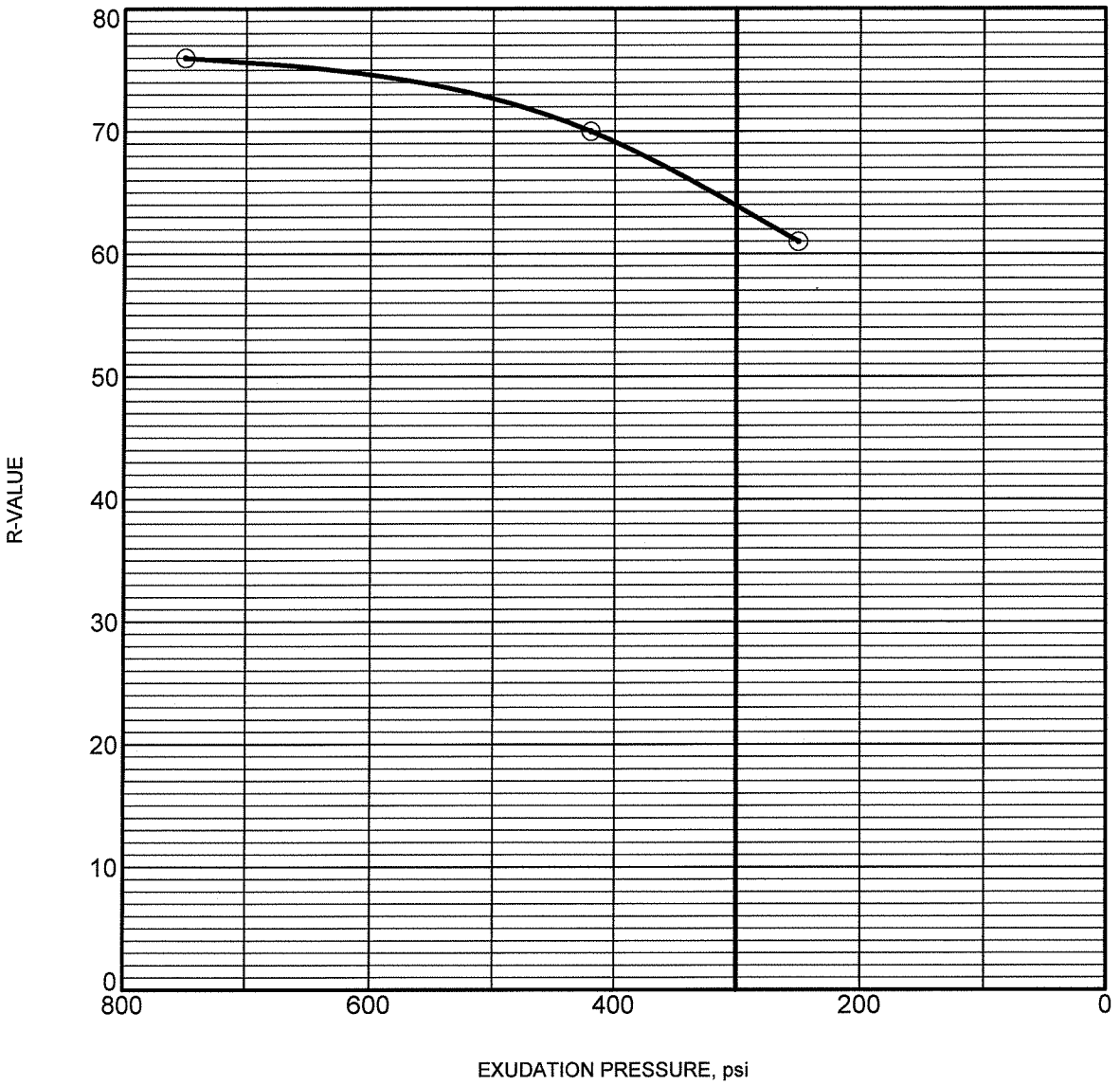
Boulder Bay

MOISTURE-DENSITY CURVE

Job Number: 7139.000 Date: September 2008

PLATE

B-3



Test Data

Specimen No.	Water Content (%)	Dry Density (pcf)	Expansion (psf)	Exudation (psi)	Test R-Value*
1	**9.0**		**0.3**	**750.0**	**76.0**
2	**9.8**		**0.0**	**250.0**	**61.0**
3	**9.5**		**0.0**	**420.0**	**70.0**

* Reported values have been corrected for sample height, where required.

Test Result

Specimen Identification		Classification	R-Value
TP-04	**0.0**	**Silty SAND with Gravel (SM)**	**64**

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Boulder Bay

RESISTANCE VALUE TEST

Job Number: 7139.000 Date: September 2008

PLATE

B-4

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(702) 383-1199 • Fax (702) 383-4983

CHEMICAL
PHYSICAL

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TESTING MATERIALS

ACT LAB NO:	15171(a)-2	**DATE:**	August 28, 2008
PROJECT NO:	7139.000	**P.O.:**	7159.000/TASKR/MTB
SUBMITTED BY:	Lumos & Associates	**LAB ID:**	
ANALYZED BY:	Kurt D. Ergun		

WATER SOLUBLE SALT ANALYSIS IN SOIL
1:5 (soil:water) Aqueous Extraction
AWWA 3500-Na D, AWWA 4500 E

SOIL SIEVE SIZE = -10 MESH

Sample No.	Location	Depth (feet)	Sodium (Percent)	Water Soluble Sulfate (SO_4) (Percent)	Total Available Water Soluble Sodium Sulfate (Na_2SO_4) (Percent)
	TP-3	0-1.4	<0.01	0.01	0.01

Kurt D. Ergun
LABORATORY DIRECTOR

Notes: The results for each constituent denote the percentage of that analyte, at a 1:5 (soil:water) extraction ratio, which is present in the soil. Sodium was determined by flame photometry, sulfate turbidimetrically, and sodium sulfate by calculation.

TOTAL P.02

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Boulder Bay

SOLUBLE SULFATE

Job Number: 7139.000 Date: September 2008

PLATE

B-5

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PHYSICAL

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LABORATORY NO:	15171(a)-1	**DATE:**	August 28, 2008
SAMPLE:	Soil	**P.O.:**	7159.000/TASKR/MTB
MARKED:	7139.000	**LAB ID:**	
SUBMITTED BY:	Lumos & Associates	**SOIL SIEVE**	-10
ANALYZED BY:	Kurt D. Ergun		

REPORT OF DETERMINATION

BORING NUMBER	TP-3					
DEPTH (feet)	0-1.4					
pH VALUE	9.06					
RESISTIVITY (Ohm-cm)	23,000					

Kurt D. Ergun

LABORATORY DIRECTOR

NOTES:

1. The soil:water extract ratio was 1:5, the results are in mg/Kg in the soil.
2. The standard methods used for the determinations are AWWA 4500 H/ pH Value, and ASTM G 57/Resistivity.

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Boulder Bay

pH VALUE / RESISTIVITY

Job Number: 7139.000 Date: September 2008

PLATE

B-6

APPENDIX C

LUMOS
& ASSOCIATES

Conterminous 48 States
2002 Data
Uniform Hazard Spectrum (UHS) for 2 % PE in 50 years

Latitude = 39.228328
Longitude = -120.0051
B/C Boundary
Data are based on a 0.05 deg grid spacing

Period (sec)	Sa (g)	Sd (inches)
0.000	0.590	0.000
0.100	1.255	0.123
0.200	1.461	0.571
0.300	1.293	1.137
0.500	0.970	2.370
1.000	0.549	5.359
2.000	0.261	10.209

Conterminous 48 States
2002 Data
Uniform Hazard Spectrum (UHS) for 10 % PE in 50 years

Latitude = 39.228328
Longitude = -120.0051
B/C Boundary
Data are based on a 0.05 deg grid spacing

Period (sec)	Sa (g)	Sd (inches)
0.000	0.335	0.000
0.100	0.701	0.069
0.200	0.812	0.317
0.300	0.722	0.635
0.500	0.515	1.257
1.000	0.281	2.744
2.000	0.137	5.364

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Boulder Bay
INTERPOLATED PROBABILISTIC GROUND MOTION
Job Number: 7139.000 Date: September 2008

PLATE C-1

Conterminous 48 States
2006 International Building Code
Latitude = 39.228328
Longitude = -120.0051
Spectral Response Accelerations Ss and S1
Ss and S1 = Mapped Spectral Acceleration Values
Site Class B - Fa = 1.0 ,Fv = 1.0
Data are based on a 0.01 deg grid spacing

Period (sec)	Sa (g)
0.2	1.461 (Ss, Site Class B)
1.0	0.549 (S1, Site Class B)

Conterminous 48 States
2006 International Building Code
Latitude = 39.228328
Longitude = -120.0051
Spectral Response Accelerations SMs and SM1
SMs = FaSs and SM1 = FvS1
Site Class C - Fa = 1.0 ,Fv = 1.3

Period (sec)	Sa (g)
0.2	1.461 (SMs, Site Class C)
1.0	0.713 (SM1, Site Class C)

Conterminous 48 States
2006 International Building Code
Latitude = 39.228328
Longitude = -120.0051
SDs = 2/3 x SMs and SD1 = 2/3 x SM1
Site Class C - Fa = 1.0 ,Fv = 1.3

Period (sec)	Sa (g)
0.2	0.974 (SDs, Site Class C)
1.0	0.475 (SD1, Site Class C)

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Boulder Bay

MAXIMUM CONSIDERED EARTHQUAKE GROUND MOTION

Job Number: 7139.000 Date: September 2008

PLATE C-2

APPENDIX D

LUMOS
& ASSOCIATES

Job # 7139.000
Client: Boulder Bay
Description: Pavement Calculations
By: B. Sexton

R Value for structural fill = 45
R Value for Gravel (Type II, Class B) = 70
T.I. = 5 (normal ESAL for light automobile traffic)
G_f = 2.50
T.I. = 6.5 (normal ESAL for heavy truck traffic)
G_f = 2.14

GE = 0.0032(TI)(100-R)
t_{layer} = GE/G_f

$GE_{AC(TI5)}$= 0.0032(5)(100-70) = 0.48′
t_{AC}= 0.48/(2.50)*(12″) = 2.3″ => **<u>use 3″ asphalt</u>**

$t_{AC(actual)}$= (3)(2.50)/12″ = 0.63′

$GE_{AB(64)}$= 0.0032(5)(100-45) = 0.88′
$t_{AB(TI5)}$= (0.88 – 0.63)(12″)/1.1 = 3″ => **<u>use 6″ aggregate base</u>**

$GE_{AC(TI6.5)}$= 0.0032(6.5)(100-70) = 0.62′
t_{AC}= 0.62/(2.14)*(12″) = 3.50″ => **<u>use 4″ asphalt</u>**

$t_{AC(actual)}$= (4)(2.14)/12″ = 0.71′

$GE_{AB(64)}$= 0.0032(6.5)(100-45) = 1.14′
$t_{AB(TI6.5)}$= (1.14– 0.71)(12″)/1.1 = 5″ => **<u>use 6″ aggregate base</u>**

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Boulder Bay

PAVEMENT DESIGN

Job Number: 7139.000 Date: September 2008

PLATE

D-1

APPENDIX E

LUMOS
& ASSOCIATES

SPECIFICATIONS FOR DEMOLITION

Demolition shall include the removal of all designated structures/improvements to be removed, i.e. concrete structures, asphalt pavements, utilities, pipes and unsuitable material within the project area. Excavations caused by removal of existing improvements and utilities shall be cleared of all wastes, debris, and any loose/soft soils, and backfilled with properly compacted fill, as specified under the General Site Grading section of this report. All fill compaction should be performed under observation and testing by the Geotechnical Engineer.

Broken concrete, asphalt, and other materials shall be considered waste and shall be removed from the site.

Any existing drain lines, wires, utilities, etc., which are to remain on the site shall be protected from damage. Buried drain lines, pipe conduits, utilities, etc. which are necessarily cut shall be either carefully and permanently capped at the property line as specified by the City Engineer or re-routed as necessary. Utility lines not specifically noted for disposition, but which are encountered in the work area shall be capped, extended, protected or re-routed as necessary for completion of the work, as directed.

All work shall be performed in accordance with the Federal Occupational Safety and Health Administration, the local Division of Occupational Safety and Health requirements, and applicable ordinances of the governing municipality.

Care shall be taken not to damage adjoining utilities or structures to remain after completion of the work. Finished work damaged by operations during demolition and site preparation shall be repaired or replaced to the satisfaction of the Owner at no cost to the Owner.

All materials resulting from demolition and site preparation not designated by the Owner to be recovered or to be relocated by the Contractor shall be removed promptly and disposed of off the site.

Upon completion of demolition and site preparation, the site shall be "raked clean" – if applicable – and all waste, rubble, debris, etc. shall be removed and disposed of off the site.

APPENDIX F

LUMOS
& ASSOCIATES

June 23, 2008

Mr. Mitch Burns
Lumos and Associates, Inc.
800 College Parkway
Carson City, Nevada 89701

Re: Report of Findings of the Surface ReMi™ Seismic Shear-Wave Investigation at the Boulder Bay Resort Project, Crystal Bay, Washoe County, Nevada
G&A Project No. 200-15.01

Dear Mr. Burns:

At your request and authorization, Gasch & Associates (G&A), has completed a surface refraction microtremor (ReMi™) seismic shear-wave investigation at the Boulder Bay Resort Project, Crystal Bay, Washoe County, Nevada (Figure 1).

This investigation involved the acquisition of three ReMi™ seismic lines, collected at locations field selected by Lumos & Associates, Inc. personnel. Approximate line locations, as well as their lengths and orientation are indicated on Figure 2.

Purpose

The purpose of this investigation was to determine the in-situ shear-wave (S-wave) velocities of the subsurface materials below each ReMi™ profile to a depth of at least 100 feet below ground surface (bgs). In addition, the Vs100-feet weighted average of the shear wave velocity, for each of the profiles, can be used to determine the International Building Code (IBC) site classification and/or the National Earthquake Hazard Reduction Program (NEHRP) soil classification.

Method and Instrumentation

The surface ReMi™ method entailed laying out a typical refraction seismic line at the selected field locations. For this investigation, geophones were spaced at either 20-foot or 25-foot intervals and the lines ranged from 400 to 575 lineal feet in length. Ten records of background noise were recorded with a duration of 60 seconds each at a sample rate of 4 milliseconds for each line. This data was acquired on June 17th and 18th, 2008.

G&A's seismic data acquisition system was a digital, distributed 24-bit instrument with data output to electronic media for later processing. Surface geophones were digital grade with a natural frequency of 4.5Hz.

The data was processed through the Optim Software and Data Solutions facility in Reno, Nevada utilizing the SeisOpt® ReMi™ software.

Findings

All three Vs Models provide average, one-dimensional shear-wave velocities to a depth of 200 feet bgs. The Vs100-feet shear wave velocity has been calculated for each profile utilizing the IBC equation and can be found in the upper right portion of each Vs Model (Figures 3, 4 and 5).

Data quality was very good and the velocities are consistent between the profiles with a slight increase from Profile 3 to Profile 1. Based on the IBC Vs100-feet calculation, all profiles fall within the IBC site 'C' classification which is defined as sites having shear-wave velocities between 1,200 to 2,500 feet/second.

We trust that this is the information you require; however, should you have comments or questions, please contact our Rancho Cordova office at your convenience. Thank you for this opportunity to be of service.

Sincerely,

GASCH & ASSOCIATES

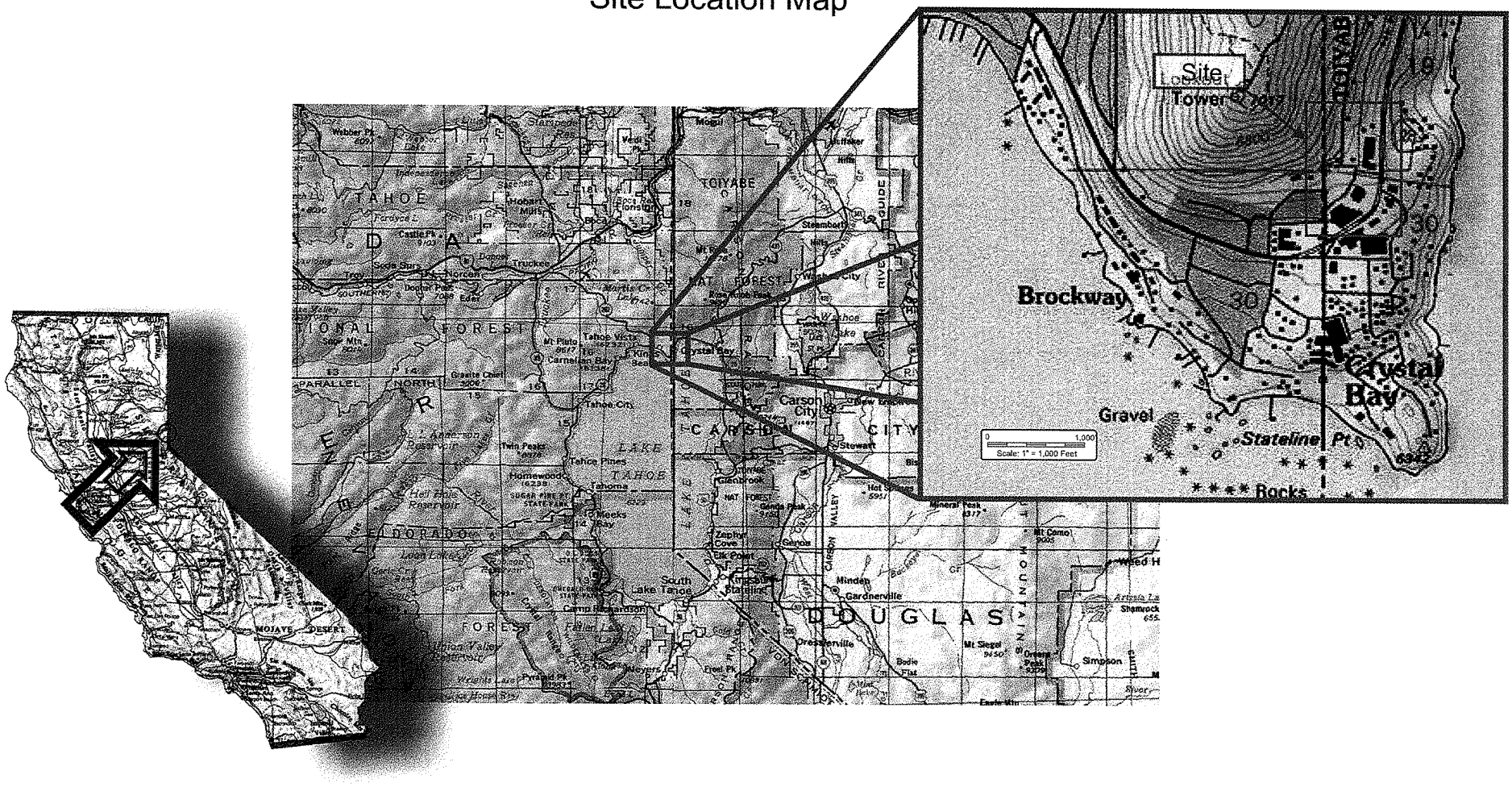
Kent L. Gasch
Professional Geophysicist No. 1061

Jerrie W. Gasch

Jerrie W. Gasch
Professional Geophysicist No. 516
Professional Geologist No. 450
Engineering Geologist No. 1203

Base Map Courtesy of: USGS

Site Location Map



0 5 10 15 20 miles
0 10 20 30 kilometers

North

CONSULTANTS IN GEOPHYSICS AND GEOLOGY FOR THE ENGINEERING, GROUNDWATER, ENVIRONMENTAL and MINING INDUSTRIES.
GASCH & ASSOCIATES
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Rancho Cordova, California 95742 U.S.A.
(916) 635-8906 • FAX (916) 635-8907
www.geogasch.com

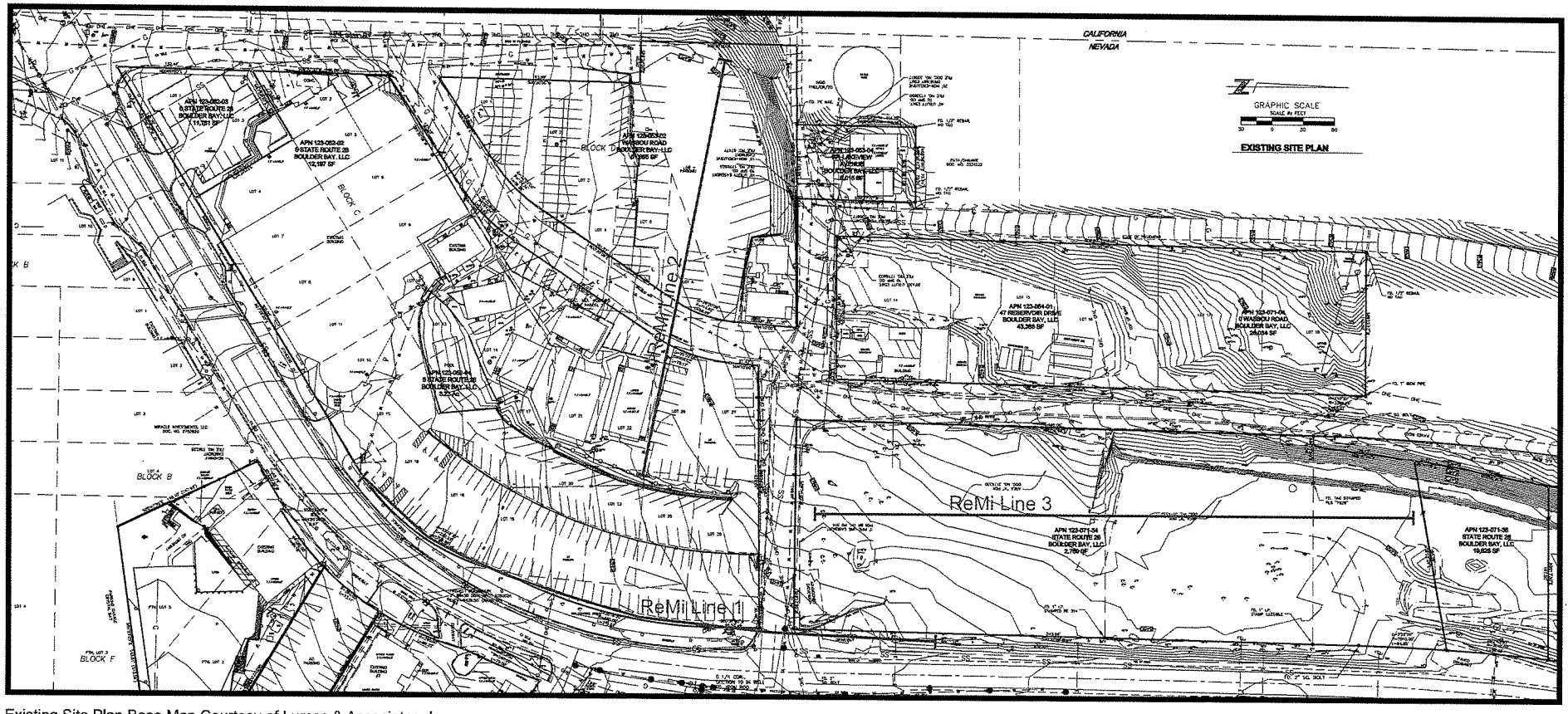
Figure 1

Boulder Bay Site:
Shear Wave Investigation

Prepared for: Lumos & Associates, Inc.

Project Number: 2008-15.01 *Date:* June, 2008

Shear Wave Investigation Line Location Map



Existing Site Plan Base Map Courtesy of Lumos & Associates, Inc.

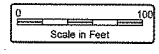


Figure 2

CONSULTANTS IN GEOPHYSICS AND GEOLOGY FOR THE ENGINEERING, GROUNDWATER, ENVIRONMENTAL and LEGAL PROFESSIONS.
GASCH & ASSOCIATES
3174 Luyung Drive, Building #2
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(916) 635-8906 • FAX (916) 635-8907

Boulder Bay Site:
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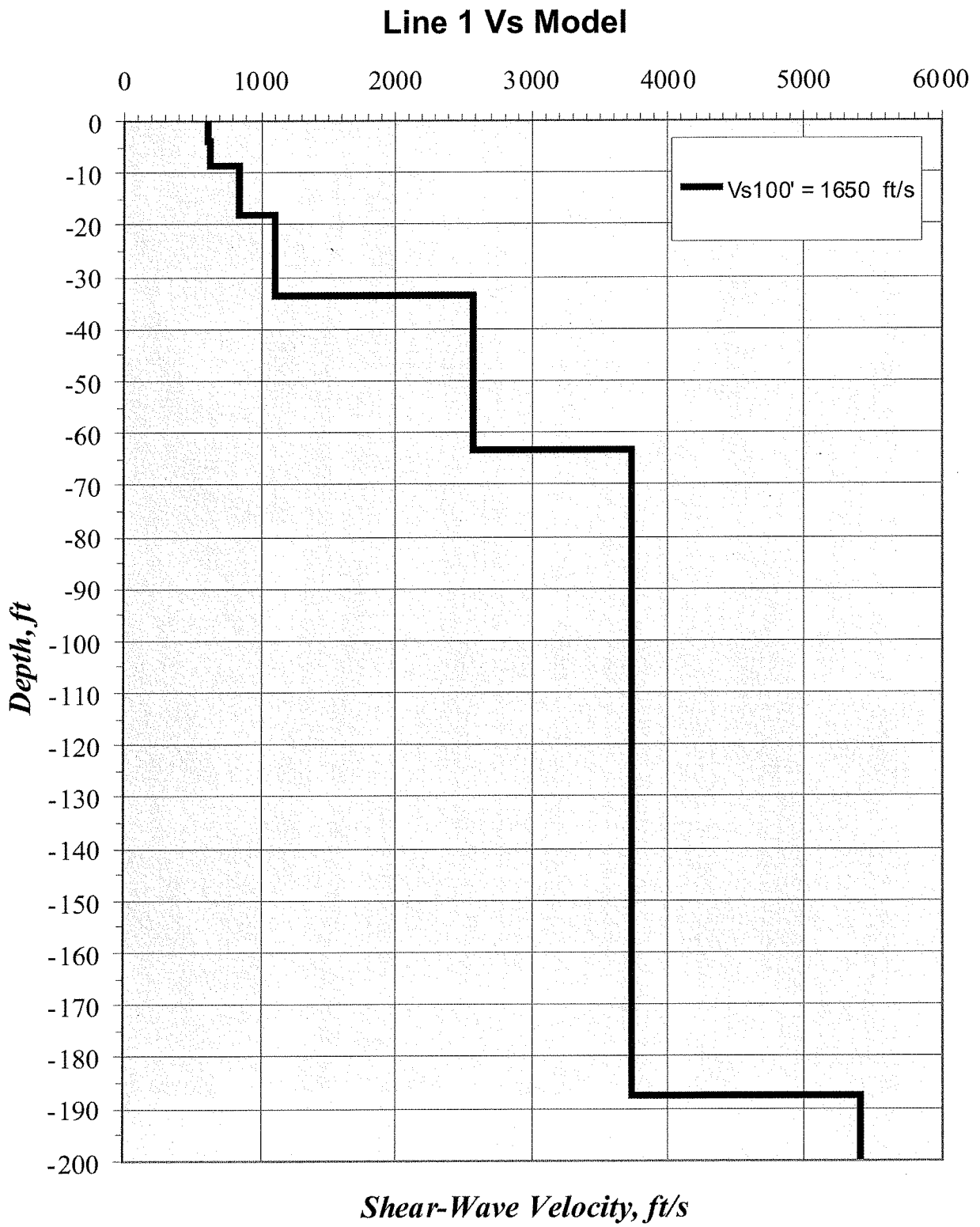

Figure 3

CONSULTANTS IN GEOPHYSICS AND GEOLOGY FOR THE ENGINEERING, GEOTECHNICAL ENVIRONMENTAL and LEGAL PROFESSIONS.
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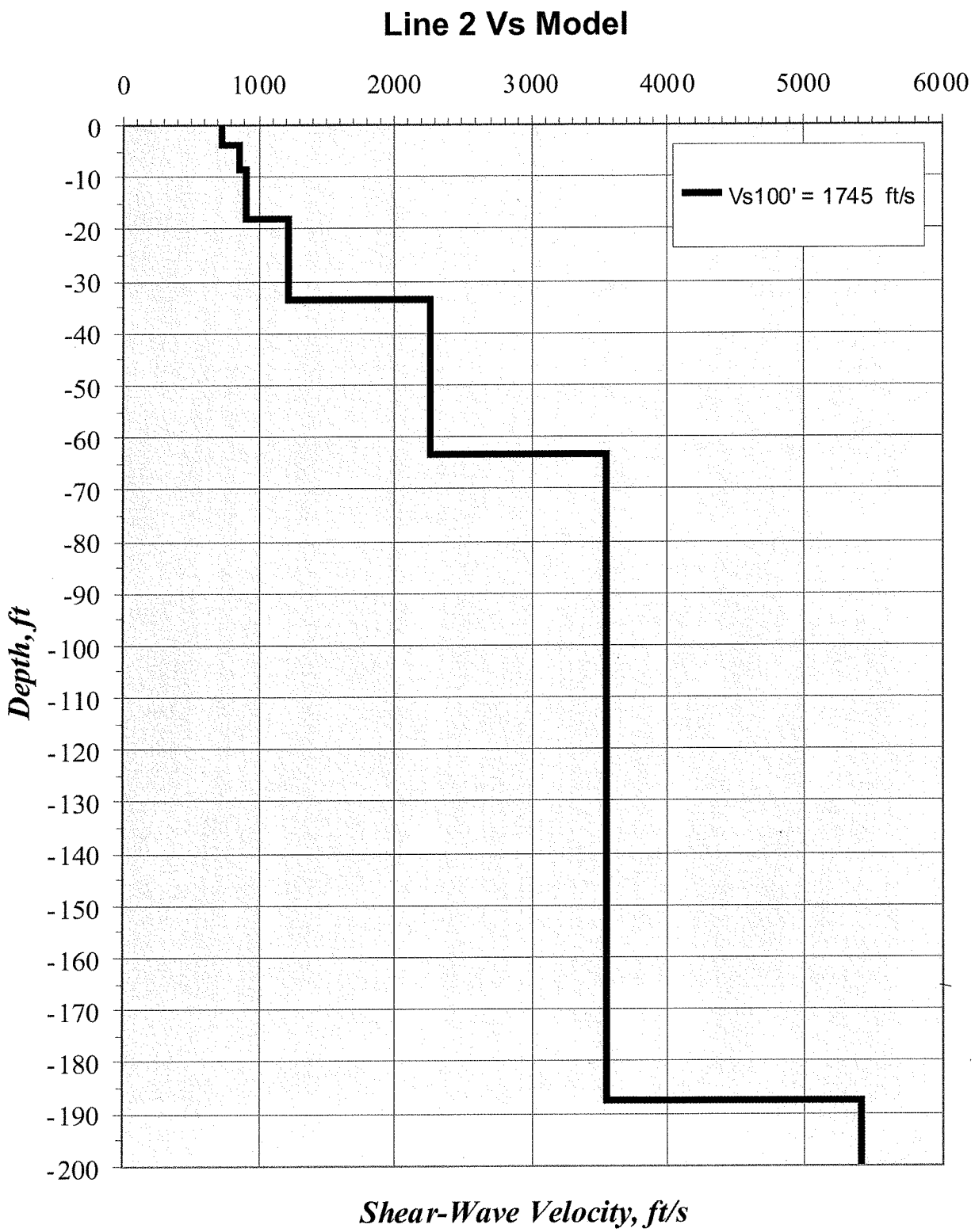

Figure 4

CONSULTANTS IN GEOPHYSICS AND GEOLOGY FOR THE ENGINEERING, GEOTECHNICAL ENVIRONMENTAL and LEGAL PROFESSIONS.
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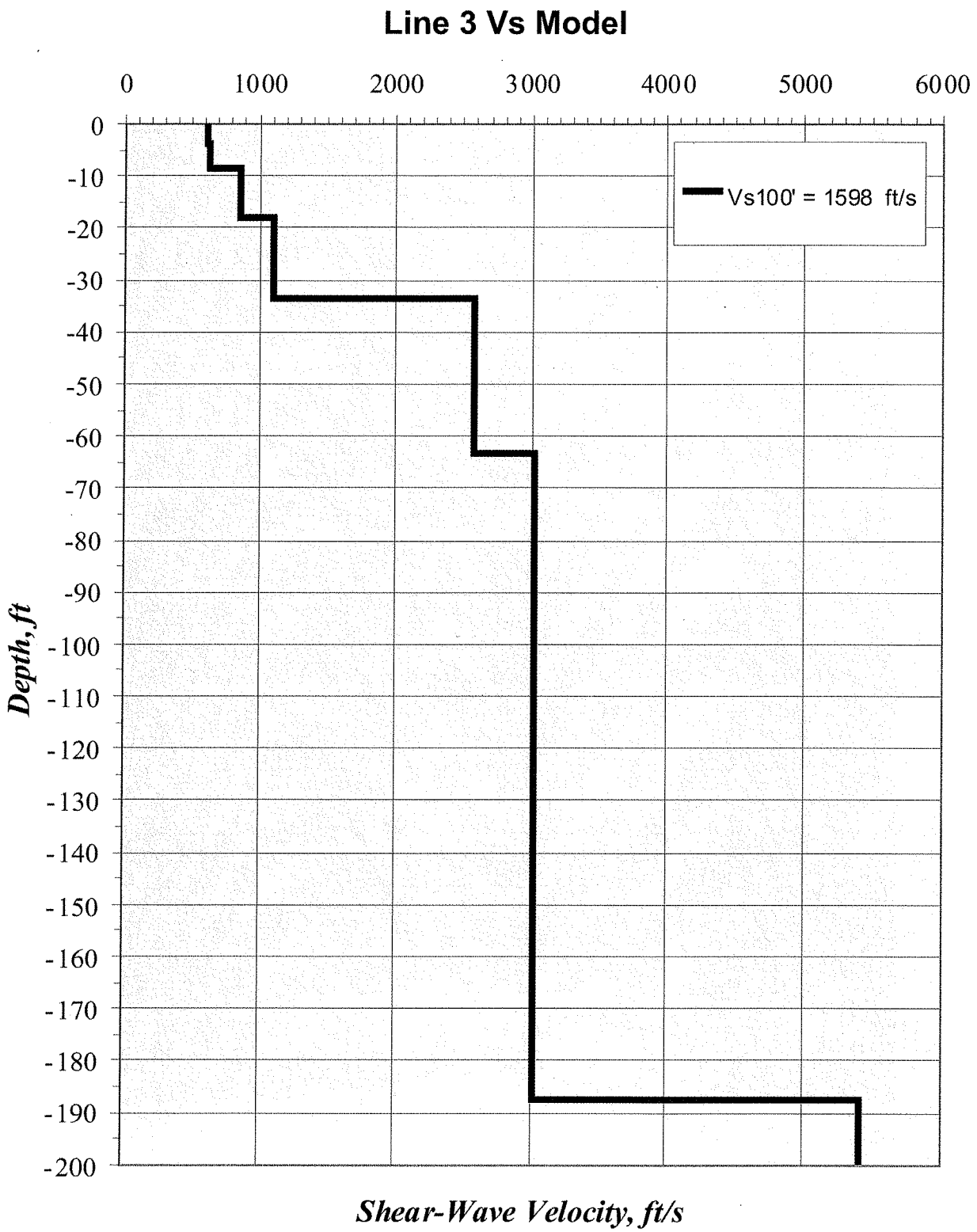

Figure 5

CONSULTANTS IN GEOPHYSICS AND GEOLOGY FOR THE ENGINEERING, GEOTECHNICAL ENVIRONMENTAL and LEGAL PROFESSIONS.
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