Appendix E

Geotech

GEOLOGIC SECTION OF EIR,
700 N. Sunnyside Avenue
(APN 5761-002-008),
City of Sierra Madre, California

for

New Urban West, Inc.

November 17, 2020 W.O. 6747

MDN 21806

GeoSoils Consultants Inc.

GeoSoils Consultants Inc.
GEOTECHNICAL GEOLOGIC ENVIRONMENTAL

November 17, 2020
W.O. 6747

NEW URBAN WEST, INC.
2001 Wilshire Boulevard, Suite 401
Santa Monica, California 90403

Attention: Mr. Jason Han

Subject: Geologic Section of EIR, 700 N. Sunnyside Avenue (APN 5761-002-008), City of Sierra Madre, California

INTRODUCION

As requested, GeoSoils Consultants, Inc. (GSC) has prepared the following Geologic Section for the EIR on the subject site. The purpose of this report is to describe the geologic conditions and constraints on the site, impact on the proposed development, and potential mitigation measures. Proposed development will consist of constructing 42 residential building lots, associated streets, and a park site on the property.

SITE LOCATION AND DESCRIPTION

The subject site is located at 700 North Sunnyside Avenue, Sierra Madre, California (Figure 1). The legal description is APN 5761-002-008, Mater Dolorosa Passionist Retreat Center (MDPRC). The southern 16.5 acres are addressed in this report. The remaining 28.39 acres will continue to be owned and used by the MDPRC.

The southern portion of the property will be developed for single-family residential structures. Currently, the property is a vacant grass field with a paved access road traversing the western 1/3 of the site. This road provides access for the MDPRC buildings to the north. An additional access road traverses the eastern property boundary but is

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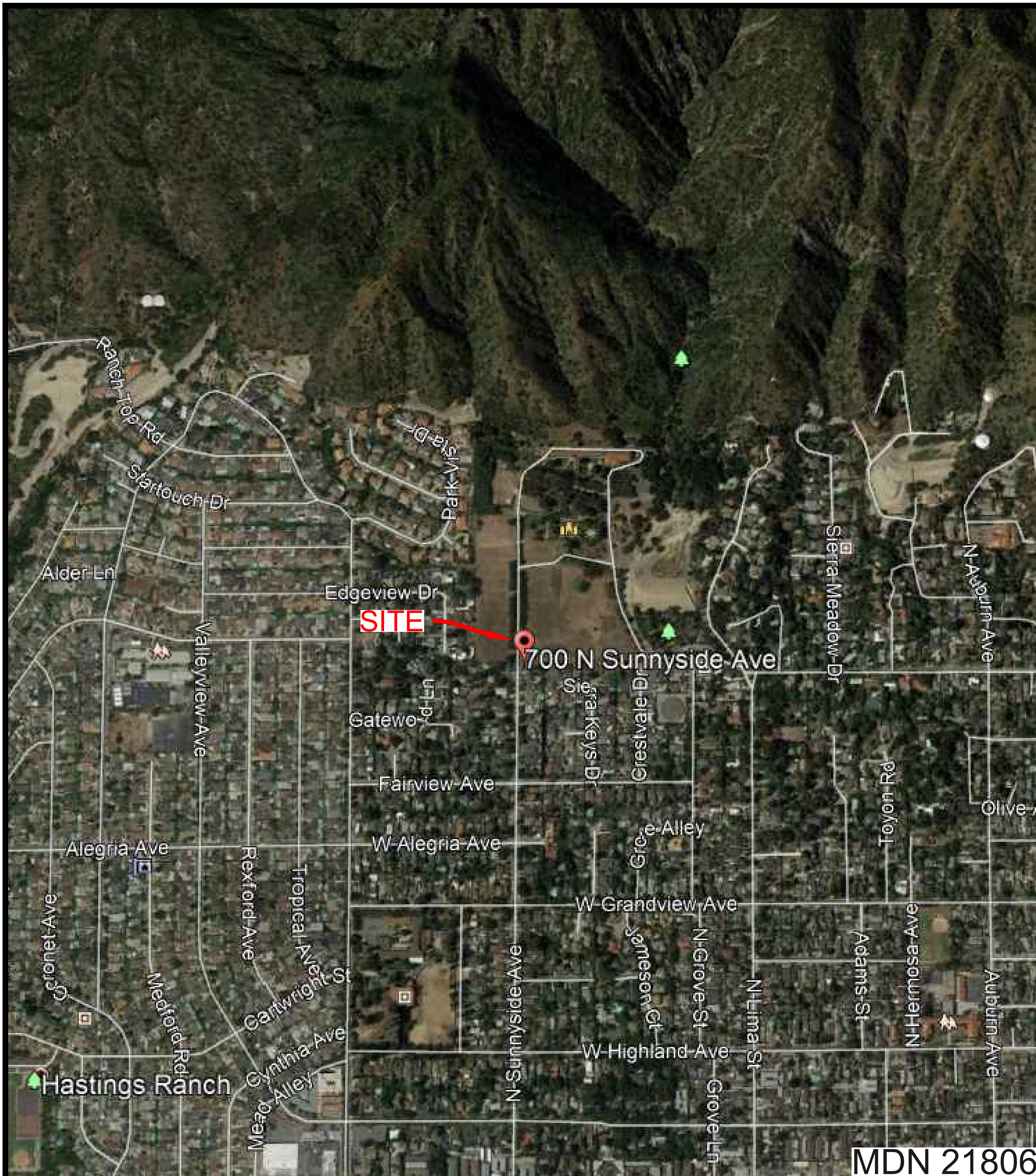

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SITE LOCATION MAP
APN:5761-002-008
700 NORTH SUNNYSIDE AVENUE
CITY OF SIERRA MADRE, CALIFORNIA
NEW URBAN WEST, INC.

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FIGURE 1

currently not in use. Large trees line both sides of the access roads and are also located across the northern portion of the site adjacent to another paved road that trend east west. Two graded planar pads have been created in the northwest and north-central portions of the site. The site gently tilts toward the south with a vertical elevation difference across the site of approximately 99 feet. An existing storm drain system runs through the site in a north-south direction and is shown on Plate 1, Geologic Map.

PROPOSED DEVELOPMENT

According to the preliminary conceptual plans, the site will be graded to create 41 lots for single-family residential structures and a park. The park site is proposed in the southern part of the site. Grading is anticipated to create level building areas, cut and fill slopes, and associated streets. Storm water retention areas may be planned along the southern property, within the area of the proposed park site. In addition, the existing storm drain will be removed as part of the proposed development.

GEOLOGIC SCOPE OF SERVICES

The following scope of services has been performed on the subject site by GSC:

1. Site reconnaissance and field mapping.
2. Review of regional geologic maps and seismic hazard zone maps.
3. Excavating, logging, and sampling of 12, 8-inch diameter hollow stem auger borings. The approximate locations of the borings are shown on Plate 1, Geologic Map, and boring logs are included in Appendix A.
4. Laboratory testing on samples retrieved from the borings. The results of the testing are included in Appendix B.
5. Preparation of this report.

GEOLGIC CONDITIONS

Regional Geologic Setting

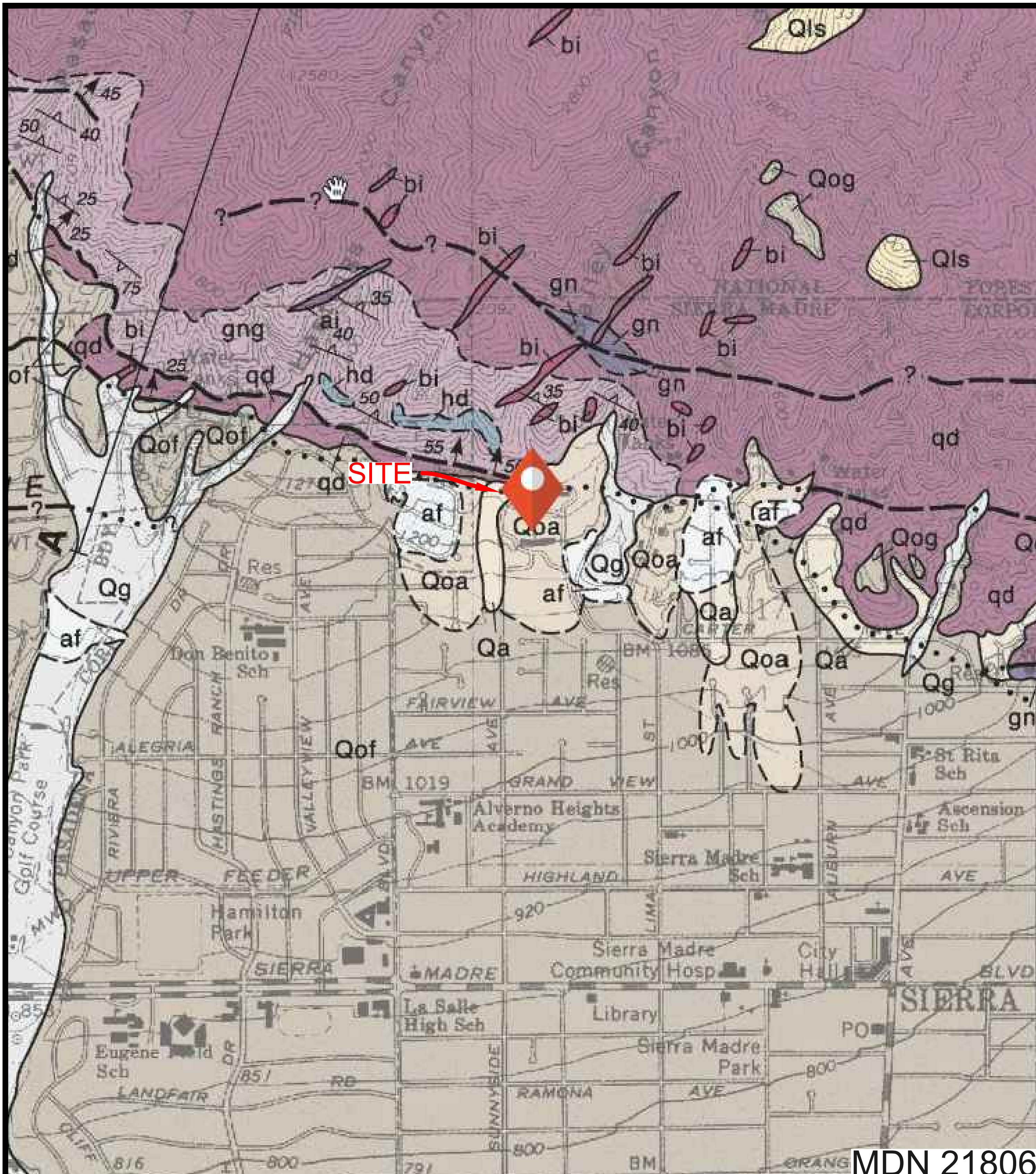
The subject property is located within the Transverse Ranges Geomorphic province of California. The Transverse Ranges consist of generally east-west trending mountains and valleys, which are in contrast to the north-northwest regional trend elsewhere in the state. The structure of the Transverse Ranges is controlled by the effects of north-south compressive deformation (crustal shortening), which is attributed to convergence between the big bend of the San Andreas Fault north of the San Gabriel Mountains and the motion of the Pacific Plate. The valleys and mountains of the Transverse Ranges are typically bounded by a series of east west trending, generally north dipping reverse faults with left-lateral oblique movement.

The Transverse Ranges are characterized by a very thick, nearly continuous sequence of Upper Cretaceous through Quaternary sedimentary rocks that has been deformed into a series of east-west trending folds associated with thrust and reverse faults. This deformation has created intrabasin highlands and intervening lowlands. The closest such fault to the site is the Sierra Madre Fault, located approximately 700 feet north of the area of proposed development. A Regional Geologic Map is included as Figure 2.

Local Geologic Setting

The Sierra Madre Fault zone forms the boundary to the San Gabriel Mountains to the north and San Gabriel Valley to the south (Figure 3). The San Gabriel Mountains rise very abruptly from the valley and reach elevations of more than 6,000 feet at San Gabriel Peak in the northwest corner of the Mount Wilson 7.5 Minute Quadrangle. These mountains are composed of igneous and metamorphic rocks that range in age from Precambrian through Cretaceous.

Streams draining from the San Gabriel Mountains have deposited several large, coalescing alluvial fans within the San Gabriel Valley and in the area of the subject site, creating a broad continuous alluvial fan deposit. Based on review of local geologic maps, the



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REGIONAL GEOLOGIC MAP
DIBBLEE, 1998
700 NORTH SUNNYSIDE AVENUE
CITY OF SIERRA MADRE, CALIFORNIA
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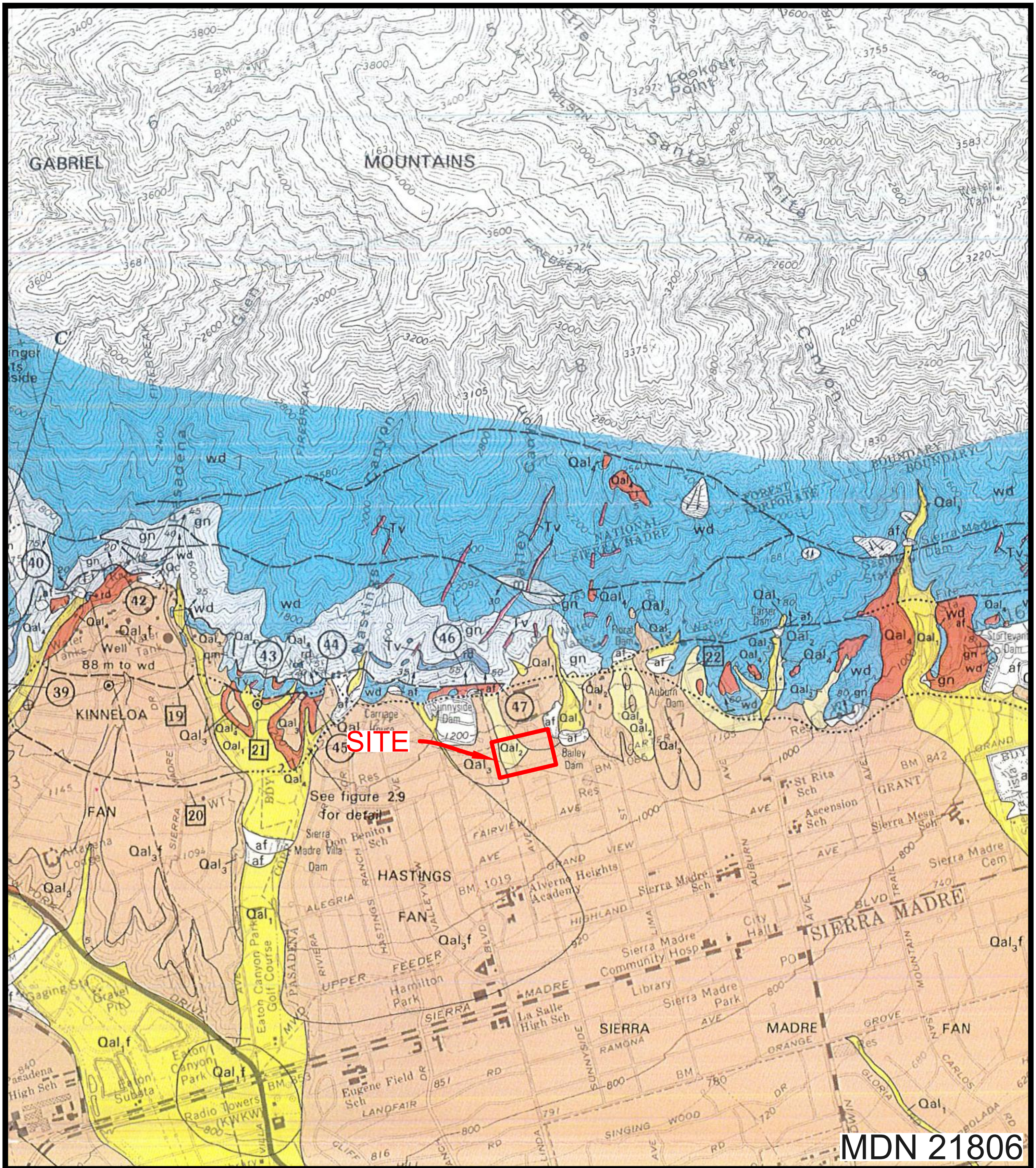
FIGURE 2



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SIERRA MADRE FAULT ZONE MAP
USGS, 1997
700 NORTH SUNNYSIDE AVENUE
CITY OF SIERRA MADRE, CALIFORNIA
NEW URBAN WEST, INC.

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FIGURE 3

northwestern part of the site is underlain by Holocene alluvium (Qal2) with an estimated age of 1,000 to 11,000 year (Figure 3). The eastern and southern areas of the site are underlain by Pleistocene alluvial deposits (Qal3) with an estimate age of 11,000 to 200,000 years (Figure 3).

Earth Units

Artificial fill and terrace deposits underlie the property. A brief description of the earth materials are as follows:

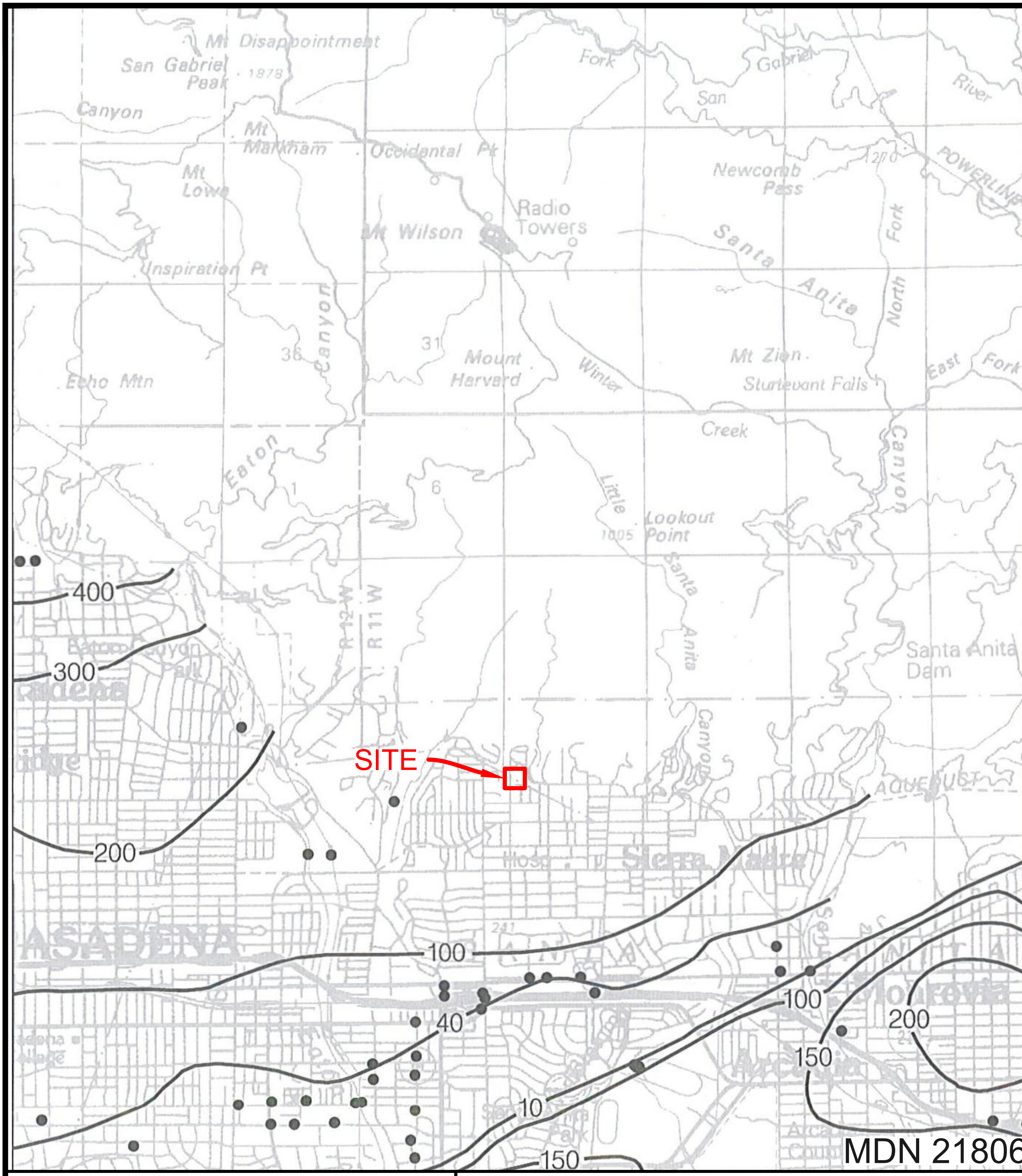
Artificial Fill (af): The artificial fill consisted of brown, silty, very fine sands and fine to coarse sands that were dry to damp, and loose to medium dense. The thickness of the fill ranged from 5 to 18 feet. The artificial fill is uncertified and unsuitable for structural support; therefore, is should be removed and recompacted in areas of proposed grading.

Terrace Deposits (Qt): The terrace deposits consisted of reddish brown, silty/clayey, fine to coarse sands with gravels that were damp to moist, medium dense to very dense. These deposits were derived from runoff of the adjacent San Gabriel Mountains and were deposited on the valley floor. The terrace deposits extend to the maximum depth explored of 30 feet.

Surface and Subsurface Water Conditions

Surface water on the site is limited to precipitation falling directly on the site. Springs or seeps were not observed on the site.

Groundwater was not encountered any of the borings. The groundwater maps from the Seismic Hazard Zone Report for the Mount Wilson 7.5 Minute Quadrangle (Figure 4) published by the California Geologic Survey indicate that the historic high groundwater is greater than 100 feet below existing ground surface.



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HISTORIC HIGH GROUNDWATER MAP
SHZR, 1998
700 NORTH SUNNYSIDE AVENUE
CITY OF SIERRA MADRE, CALIFORNIA
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FIGURE 4

GEOLOGIC CONSTRAINTS

Faulting and Seismicity

The proposed site is not within an Alquist-Priolo Earthquake Fault Zone and is not located within a Seismic Hazard Zone (Figure 5). There are faults in close enough proximity to the site to cause moderate to intense ground shaking during the lifetime of the proposed development.

Ground Shaking and Seismic Design Criteria

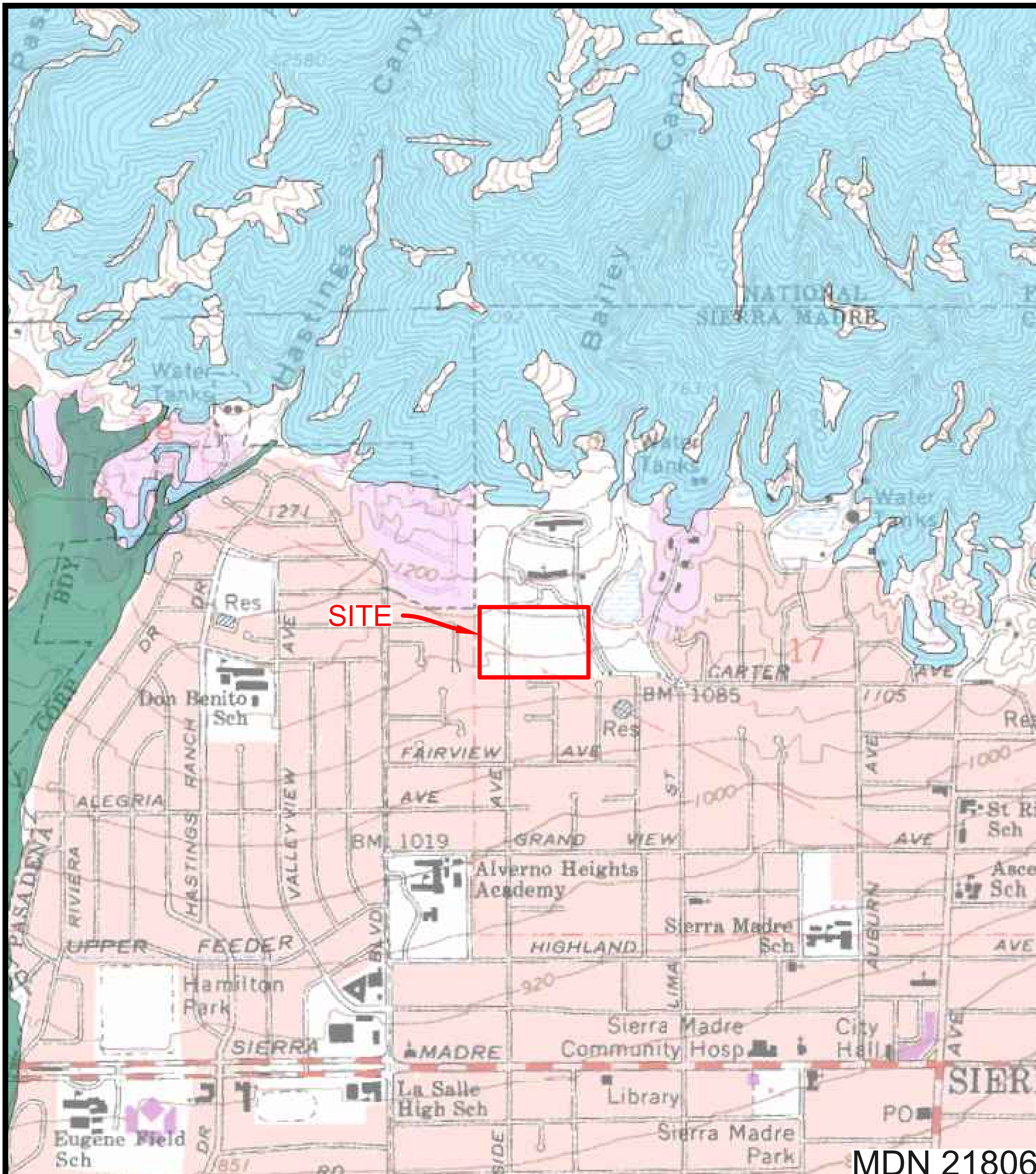
This site has experienced earthquake-induced ground shaking in the past and can be expected to experience further shaking in the future. The 2019 CBC (California Building Code) seismic coefficient criteria are provided here for structural design consideration as a mitigation for ground shaking.

Mitigation: Under the Earthquake Design Regulations of Chapter 16, Section 1613 of the CBC 2019, and based on the mapped values, the following coefficients and factors apply to the lateral-force design for the proposed structures at the site. Terrace deposits are at grade and Class D is recommended.

2019 CBC Section 1613, Earthquake Loads	
Site Class Definition	D
Mapped Spectral Response Acceleration Parameter, S_s (Table 1613.3.1 for 0.2	2.006
Mapped Spectral Response Acceleration Parameter, S_1 (Table 1613.3.1 for 1.0	0.75
Site Coefficient, F_a (Table 1613.3.3(1) short period)	1.0
Site Coefficient, F_v (Table 1613.3.3(2) 1-second period)	1.7
Adjusted Maximum Considered Earthquake Spectral Response Acceleration	2.006
Adjusted Maximum Considered Earthquake Spectral Response Acceleration	1.275
Design Spectral Response Acceleration Parameter, S_{DS} (Eq. 16-39)	1.337
Design Spectral Response Acceleration Parameter, S_{D1} (Eq. 16-40)	0.8500

Notes: Location: Longitude: 34.1710, Latitude: -118.0646
1. Site Class Designation: Class D is recommended based on subsurface condition.
2. Ss, SMs, and SDs are spectral response accelerations for the period of 0.2 second.
3. S1, SM1, and SD1 are spectral response accelerations for the period of 1.0 second.
4. These values may only be utilized where the value of the seismic response coefficient, Cs, satisfies equations 12.8.3 or 12.8.4 of the ASCE Standard 7-16.

Conformance to the above criteria for seismic excitation does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a maximum level earthquake occurs. The primary goal of seismic design is



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SEISMIC HAZARD ZONE MAP
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FIGURE 5

to protect life and not to avoid all damage, since such design may be economically prohibitive. Following a major earthquake, a building may be damaged beyond repair, yet not collapse.

Ground Rupture

Ground rupture occurs when movement on a fault breaks through to the surface. Surface rupture usually occurs along pre-existing fault traces where zones of weakness already exist. The State has established Earthquake Fault Zones for the purpose of mitigating the hazard of fault rupture by prohibiting the location of most human occupancy structures across the traces of active faults. Earthquake fault zones are regulatory zones that encompass surface traces of active faults with a potential for future surface fault rupture.

The California Geologic Survey (CGS) establishes criteria for faults as active, potentially active or inactive. Active faults are those that show evidence of surface displacement within the last 11,000 years (Holocene age). Potentially active faults are those that demonstrate displacement within the past 1.6 million years (Quaternary age). Faults showing no evidence of displacement within the last 1.6 million years may be considered inactive for most structures, except for critical or certain life structures. In 1972, the Alquist-Priolo Special Studies Zone Act (now known as the Alquist-Priolo Earthquake Fault Zone Act, 1994, or APEHA) was passed into law, requiring studies within 500 feet of mapped faults within a mapped Alquist-Priolo fault zone. Surface rupture caused by movement along a fault could likely result in catastrophic structural damage to buildings constructed along the fault trace. Consequently, the State of California via the APEHA prohibits the construction of occupied “habitable” structures within the designated fault zone and it must be demonstrated that the structure does not encroach on a 50-foot setback from the fault trace. Per the Alquist-Priolo legislation, no structure for human occupancy is permitted on the trace of an active fault. The term “structure for human occupancy” is defined as any structure used or intended for supporting or sheltering any use or occupancy, which is expected to have a human occupancy rate of more than 2,000 person-hours per year. Unless proven otherwise, an area within 50 feet of an active fault is presumed to be underlain by active branches of the fault. Local government agencies may identify additional faults, in addition to those faults mandated by the State, for which minimum construction setback requirements must be maintained.

The site is not located within an established Earthquake Fault Zone (Figure 5). The Sierra Madre Fault is mapped to the north of the site; however, this portion of the fault is not located in the Earthquake Fault Zone. This complex fault system is approximately 100 km long and runs along the southern boundary of the San Gabriel Mountains from San Fernando Pass to the west and Cajon Pass to the east. The most recent activity along the fault system occurred at the western portion during the 1971 San Fernando Earthquake. The fault appears to be less active to the east with late quaternary displacement. The fault zone consists of numerous north-dipping thrusts at the base of the mountain front. The portion of the fault within the Mount Wilson Quadrangle has not been zoned as active by the California Geological Survey. The southernmost mapped segment of the fault is located approximately 700 feet north of the northern part of the proposed development (Figure 3). There are no other mapped faults within the limits of the property.

The site is not located within a Fault Hazard Zone and there are no known active faults on the site; therefore, the potential for ground rupture on the site is considered low.

Mitigation: No additional mitigation is required.

Landsliding

Earthquake-induced landsliding often occurs in areas where previous landslides have moved and in areas where the topographic, geologic, geotechnical, and subsurface groundwater conditions are conducive to permanent ground displacements.

The site does not contain slopes susceptible to landsliding and is not located within a seismic hazard zone; therefore, the potential for earthquake-induced landsliding is considered low

Mitigation: No additional mitigation is required.

Seiches and Tsunamis

A seiche is the resonant oscillation of a body of water, typically a lake or swimming pool caused by earthquake shaking (waves). The hazard exists where water can be splashed out of the body of water and impact nearby structures. No bodies of constant water are near the site, therefore, the hazards associated with seiches are considered low.

Tsunamis are seismic sea waves generated by undersea earthquakes or landslides. When the ocean floor is offset or tilted during an earthquake, a set of waves are generated similar to the concentric waves caused by an object dropped in water. Tsunamis can have wavelengths of up to 120 miles and travel as fast as 500 miles per hour across hundreds of miles of deep ocean. Upon reaching shallow coastal waters, the once two-foot high wave can become up to 50 feet in height causing great devastation to structures within reach. Tsunamis can generate seiches as well. The site is not near the ocean; therefore, the tsunami hazard is considered very low.

Mitigation: No additional mitigation is required.

Liquefaction

Liquefaction describes a phenomenon where cyclic stresses, which are produced by earthquake-induced ground motion creates excess pore pressures in cohesionless soils. These soils may thereby acquire a high degree of mobility, which can lead to lateral sliding, consolidation and settlement of loose sediments, sand boils, and other damaging deformation. This phenomenon occurs only below the water table, but after liquefaction has developed, it can propagate upward into overlying, non-saturated soils as excess pore water escapes.

Liquefaction susceptibility is related to numerous factors and the following conditions must exist for liquefaction to occur: 1) sediments must be relatively young in age and must not have developed large amounts of cementation, 2) sediments must consist mainly of cohesionless sands and silts, 3) the sediments must not have a high relative density, 4) free groundwater must exist in the sediment, and 5) the site must be exposed to seismic events of a magnitude large enough to induce straining of soil particles.

This site is outside of the designated area of liquefaction potential presented on the State of California Seismic Hazard Zone map (Figure 5) and is underlain by older alluvium alluvium. Historic high groundwater levels are at least 100 feet below the ground surface (Figure 4). Therefore, liquefaction is not considered a potential hazard on this site.

Mitigation: No additional mitigation required.

Seismic Settlement

The site is underlain by dense terrace deposits that are not subject to seismically induced settlement; however, the upper 5 to 7 feet of soil are looser than the underlying soil.

Mitigation: Mitigation of seismically induced settlement consists of removing and recompacting the upper 7 feet of existing soil in areas of proposed grading.

Hydroconsolidation

The results of the borings excavated on the site and laboratory testing on samples retrieved from the borings indicate that the upper seven feet of terrace deposits on the site are subject to hydroconsolidation.

Mitigation: Mitigation measures to reduce the potential for hydroconsolidation to acceptable limits include removing and recompacting the upper seven feet of terrace deposits on the site.

Artificial Fill

Previously placed artificial fill on the site is not suitable for structural support and support of structural fill.

Mitigation: Removing and recompacting the artificial fill within the limits of proposed grading.

GRADING GUIDELINES

The following guidelines are intended to mitigation potential impacts from site grading.

Grading

Grading of the site will consist of a cut/fill operation to create building pads and associated streets. The grading will involve the removal and recompaction of artificial fill and loose terrace deposits, in addition to the mass-excavation. The following preliminary recommendations and construction considerations are provided for earthwork grading at the site.

General

Monitoring: All earthwork (i.e., clearing, site preparation, fill placement, etc.) should be conducted with engineering control under observation and testing by the Geotechnical Engineer and in accordance with the requirements within a site specific Geologic and Geotechnical Engineering Report.

Site Preparation

Existing Structure Location: The General Contractor should locate all surface and subsurface structures on the site or on the approved grading plan prior to preparing the ground.

Existing Structure Removal: Any underground structures (e.g., septic tanks, wells, pipelines, foundations, utilities, etc.) that have not been located prior to grading should be removed or treated in a manner recommended by the Geotechnical Engineer.

Clearing and Stripping: The construction areas should be cleared and stripped of all vegetation, trees, bushes, sod, topsoil, artificial fill, debris, asphalt, concrete and other deleterious material prior to fill placement.

Removals: Removals of suitable soil shall be performed on the site in accordance with the soils report.

Subgrade Preparation: Subgrade for foundations, pavement areas, overexcavations, and for those areas receiving any additional fill be prepared by scarifying the upper 12 inches and moisture conditioning, as required to obtain at least optimum moisture, but not greater than 120 percent of optimum. The scarified areas shall be compacted to at least 90 percent of the maximum laboratory density, as determined by ASTM D-1557-12 compaction method. All areas to receive fill should be observed by the Geotechnical Engineer prior to fill placement.

Subgrade Inspection: Prior to placing fill, the ground surface to receive fill should be observed, tested, and approved by the Geotechnical Engineer.

Fill Placement

Laboratory Testing: Representative samples of materials to be utilized as compacted fill should be analyzed in a laboratory to determine their physical properties. If any material other than that previously tested is encountered during grading, the appropriate analysis of this material should be conducted.

On-Site Fill Material: The on-site soils are adequate for re-use in controlled fills provided the soils do not contain any organic matter, debris, or any individual particles greater than 12 inches in diameter.

Rock Fragments: Rock fragments less than 12 inches in diameter may be utilized in the fill, provided they are not placed in concentrated pockets, surrounded with fine grained material, and the distribution of the rocks is supervised by the Geotechnical Engineer. Any rock fragments over 6 inches should be kept below a depth of 5 feet. Rocks greater than 12 inches in diameter should be taken off-site, placed in fill areas designated as suitable for rock disposal, or placed in accordance with the recommendations of the Geotechnical Engineer.

Subgrade Verification and Compaction Testing: Regardless of material or location, all fill material should be placed over properly compacted subgrades in accordance with the *Site Preparation* section of this report. The condition of all subgrades shall be verified by the Geotechnical Engineer before fill placement or earthwork grading begins. Earthwork monitoring and field density testing shall be performed during grading to provide a basis for opinions concerning the degree of soil compaction attained.

Fill Placement: Approved on-site material shall be evenly placed, watered, processed, and compacted in controlled horizontal layers not exceeding eight inches in loose thickness, and each layer should be thoroughly compacted with approved equipment. All fill material should be moisture conditioned, as required to obtain at least optimum moisture, but not greater than 120 percent of optimum moisture content. The fill should be placed and compacted in horizontal layers, unless otherwise recommended by the Geotechnical Engineer.

Compaction Criteria - Shallow Fills: For fills less than 40 feet in vertical thickness, each layer shall be compacted to at least 90 percent of the maximum laboratory density for material used as determined by ASTM D-1557-12. The field density shall be determined by the ASTM D-1556-07 method or equivalent. Where moisture content of the fill or density testing yields compaction results less than 90 percent, additional compaction effort and/or moisture conditioning, as necessary, shall be performed, until the fill material is in accordance with the requirements of the Geotechnical Engineer.

Fill Material - Moisture Content: All fill material placed must be moisture conditioned, as required to obtain at least optimum moisture, but not greater than 120 percent. If excessive moisture in the fill results in failing results or an unacceptable “pumping” condition, then the fill should be allowed to dry until the moisture content is within the necessary range to meet the required compaction requirements or reworked until acceptable conditions are obtained.

Keying and Benching: All fills should be keyed and benched through all topsoil, slopewash, alluvium or colluvium or creep material, into sound terrace deposits or firm material where the slope receiving fill is steeper than 5:1 (Horizontal: Vertical) or as determined by Geotechnical Engineer. The standard acceptable bench height is four feet into suitable material. The key for side hill fills should be a minimum of 15 feet within firm materials, with a minimum toe embankment of 2 feet into firm material, unless otherwise specified by the Geotechnical Engineer.

Drainage Devices: Drainage terraces and subdrainage devices should be constructed in compliance with the ordinances of the controlling governmental agency, or with the recommendations of the Geotechnical Engineer and Engineering Geologist.

Cut-Fill Transition: Where a cut-fill transition is present beneath planned structures, the cut area should be overexcavated three feet below the bottom of proposed footings and the excavated material should be replaced as compacted fill to reduce the transition condition. These guidelines should also be followed in areas where lots are underlain by soils or rock with differential expansion potential and also for lots located above descending buttress and stabilization fills.

Grading Control

Grading Inspection: Earthwork monitoring and field density testing shall be performed by the Geotechnical Engineer during grading to provide a basis for opinions concerning the degree of soil compaction attained. The Contractor should receive a copy of the Geotechnical Engineer's *Daily Field Engineering Report* which will indicate the results of field density tests for that day. Where failing tests occur or other field problems arise, the Contractor shall be notified of such conditions by written communication from the Geotechnical Engineer in the form of a conference memorandum, to avoid any misunderstanding arising from oral communication.

Subgrade Inspection: All processed ground to receive fill and overexcavations should be inspected and approved by the Geotechnical Engineer prior to placing any fill. The Contractor should be responsible for notifying the Geotechnical Engineer when such areas are ready for inspection. Inspection of the subgrade may also be required by the controlling governmental agency within the respective jurisdictions.

Subgrade Testing: Density tests should also be made on the prepared subgrade to receive fill, as required by the Geotechnical Engineer.

Density Testing Intervals: In general, density tests should be conducted at minimum intervals of 2 feet of fill height or every 500 cubic yards. Due to the variability that can occur in fill placement and different fill material characteristics, a higher number of density tests may be warranted to verify that the required compaction is being achieved.

Cut Slopes

Gradient: All cut slopes shall be designed at a gradient of 2:1 or less.

Observation: The Engineering Geologist should observe all cut slopes excavated in rock, lithified or formation material at vertical intervals not exceeding ten feet.

Change of Conditions: If any conditions not anticipated in the preliminary report such as perched water, seepage, lenticular or confined strata of a potentially adverse nature, unfavorably inclined bedding, joints or faults planes, or areas of unstable material are encountered during grading, these conditions should be analyzed by the Engineering Geologist and Geotechnical Engineer, and recommendations should be made to treat these problems.

Protection: Cut slopes that face in the same direction as the prevailing drainage should be protected from slopewash by a non-erosive interceptor swale placed at the top of the slope.

Criteria: Unless otherwise specified in the geotechnical and geological report, no cut slopes should be excavated higher or steeper than that allowed by the ordinances of controlling governmental agencies.

Drainage Devices: Drainage terraces should be constructed in compliance with the ordinances of controlling governmental agencies, or with the recommendations of the Geotechnical Engineer or Engineering Geologist.

Fill Slopes

Gradient: All fill slopes shall be designed at a gradient of 2:1 or less.

Slope Face - Compaction Criteria: The Contractor should be required to obtain a minimum relative compaction of 90 percent out to the finish slope face of fill slopes, buttresses and stabilization fills. This may be achieved by overbuilding the slope a minimum of five feet, and cutting back to the compacted core, or by direct compaction of the slope face with suitable equipment, or by any other procedure which produces the required compaction. If the method of achieving the required slope compaction selected by the Contractor fails to produce the necessary results, the Contractor should rework or rebuild such slopes until the required degree of compaction is obtained. Slope testing will include testing the outer six inches to three feet of the slope face during and after placement of the fill. In addition, during grading, density tests will be taken periodically on the flat surface of the fill three to five feet horizontally from the face of the slope.

Slope Face - Vegetation: All fill slopes should be planted or protected from erosion by methods specified in the geotechnical report, or required by the controlling governmental agency.

Utility Trenching and Backfill

Utility Trenching: Open excavations and excavations that are shored shall conform to all applicable Federal, State and local regulations.

Backfill Placement: Approved on-site or imported fill material shall be evenly placed, watered, processed, and compacted in controlled horizontal layers not exceeding eight inches in loose thickness, and each layer should be thoroughly compacted with approved equipment. All fill material should be moisture conditioned, as required to obtain at least optimum moisture, but not greater than 120 percent of optimum moisture content. The fill should be placed and compacted on a horizontal plane, unless otherwise recommended by the Geotechnical Engineer.

Backfill Compaction Criteria: Each layer of utility trench backfill shall be compacted to at least 90 percent of the maximum laboratory density determined by ASTM D-1557-12. The field density shall be determined by the ASTM D-1556-07 method or equivalent. Where moisture content of the fill or density testing yields compaction results less than 90 percent, additional compaction effort and/or moisture conditioning, as necessary, shall be performed, until the compaction criteria is reached.

Exterior Trenches Adjacent to Footings: Exterior trenches, paralleling a footing and extending below a 1H:1V plane projected from the outside bottom edge of the footing, should be compacted to 90 percent of the laboratory standard. Sand backfill, unless it is similar to the in-place fill, should not be allowed in these trench backfill areas. Density testing, along with probing, should be accomplished to verify the desired results.

Pipe Bedding: We recommend that a minimum of 6 inches of bedding material should be placed in the bottom of the utility trench. All bedding materials shall extend at least 4 inches above the top of utilities which require protection during subsequent trench backfilling. All trenches shall be wide enough to allow for compaction around the haunches of the pipe.

Groundwater Migration: Backfilled utility trenches may act as French drains to some extent, and considerable groundwater flow along utility bedding and backfill should be expected. Wherever buried utilities, or structures which they may intersect, could be adversely affected by such drainage, provisions shall be made to collect groundwater migrating along the trench lines. These situations include where buried utilities enter buildings, particularly where they enter below grade mechanical rooms, and where buried utilities enter junction boxes or switching stations that are intended to remain dry. Mitigation measures include, but are not limited to, placement of perforated drain pipes below and continuous with bedding materials, and placement of seepage barriers such as lean mix concrete or controlled density fill (CDF).

Construction Considerations

Erosion Control: Erosion control measures, when necessary, should be provided by the Contractor during grading and prior to the completion and construction of permanent drainage controls.

Compaction Equipment: It is also the Contractor's responsibility to have suitable and sufficient compaction equipment on the project site to handle the amount of fill being placed and the type of fill material to be compacted. If necessary, excavation equipment should be shut down to permit completion of compaction in accordance with the recommendations contained herein. Sufficient watering devices/equipment should also be provided by the Contractor to achieve optimum moisture content in the fill material.

Final Grading Considerations: Care should be taken by the Contractor during final grading to preserve any berms, drainage terraces, interceptor swales, or other devices of a permanent nature on or adjacent to the property.

Temporary Excavations

Where the necessary space is available, temporary unsurcharged embankments may be slope back without shoring. The slope should not be cut steeper than the following gradient:

Height	Temporary Gradient (Horizontal:Vertical)
0-5'	Near Vertical
above 5'	1:1

In areas where soils with little or no binder are encountered, shoring or flatter excavation slopes shall be made. The recommended temporary excavation slopes do not preclude local ravelling or sloughing. All applicable requirements of the California Construction and General Industry Safety Orders, the Occupational Safety and Health Act, and the Construction Safety Act should be met.

Where sloped embankments are used, the top of the slope should be barricaded to prevent equipment and heavy storage loads within five feet of the top of the slope. If the temporary construction embankments are to be maintained for long periods, berms should be constructed along the top of the slope to prevent runoff water from eroding the slope faces.

The soils exposed in the temporary backcut slopes during excavation should be observed by our personnel so that modifications of the slopes can be made if variations in the soil conditions occur.

On-site grading should not undermine support of existing offsite improvements.

Drainage/Landscape Maintenance

The southern park site area of the site may be used for stormwater infiltration. The site is underlain by mostly sandy soil, which have acceptable infiltration rates. However, additional subsurface exploration and infiltration testing will be required in this area to determine the actual soil infiltration rates for design purposes of the system used. Any infiltration systems shall be setback a sufficient distance from proposed structures and adjacent properties to avoid adverse impacts. These distances shall be determined with future studies.

In areas of residential development, water should not be allowed to pond or seep into the ground, or flow over slopes in a concentrated manner. Roof gutters and yard drains should be provided. Pad drainage should be directed toward the street or any approved watercourse area swale via non-erosive channel, pipe and/or dispersion devices.

The average annual rainfall in Southern California is less than 15 inches per year; however, studies have shown that the average Southern California homeowner applies at least 200 inches of equivalent rainfall to their yard each year. It is important than in addition to control of landscape watering, that pad drainage slopes away from structures. Placement of planters next to houses can also lead to increased moisture under pad areas.

FOUNDATION AND RETAINING WALL RECOMMENDATIONS

Conventional Foundation Recommendations

The following recommendations are provided for preliminary design purposes and the final expansion index should be determined following grading. In our opinion, conventional or post-tensioned foundations should be used to support the proposed structures. We offer the following site-specific recommendations and comments for purposes of footing design and construction. All footings should meet current slope setback requirements. Foundations should be designed for low expansive soil conditions.

Bearing Subgrades: The proposed improvements should be founded into competent terrace deposits or compacted fill.

Subgrade Verification: All footing subgrades for house foundations and retaining walls should consist of compacted fill or terrace material. Under no circumstances should footings be cast atop loose, soft, or slough, debris, existing artificial fill, topsoil, or surfaces covered by standing water. We recommend that a representative of GSC verify the condition of all subgrades before any concrete is placed.

Footing Depth and Width: Footings should be continuous and be founded at a minimum depth of 18 inches into compacted fill or terrace material and have a minimum width of 12 inches. Footings should be reinforced according to structural design.

Bearing Pressures: The allowable bearing capacity values shown in the following table include dead and live loads and may be used for design of footings and foundations. All foundations should be founded in compacted fill/terrace material and should be reinforced according to structural design. The allowable bearing capacity values may be increased by one-third when considering short duration loading conditions such as seismic or wind loads.

Bearing Subgrade	Embedment Depth (inches)	Allowable Bearing Capacity (psf)	Bearing Capacity Increase per Foot Deeper	Bearing Capacity Increase per Foot Wider	Maximum Allowable Bearing Capacity (psf)
Compacted Fill/Terrace Material	18	2,000	20	10	4,000

Lateral Capacity: To resist lateral loads, the allowable passive earth pressures shown in the following table, expressed as an equivalent fluid pressure, may be used on that portion of shallow foundations which have a minimum embedment depth as previously recommended. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.

Soil Type	Allowable Lateral Bearing Pressure (pcf)	Maximum Allowable Lateral Bearing Pressure (pcf)	Coefficient of Friction
Compacted Fill/Terrace Material	300	3,000	0.4

Post-Tensioned Slab Foundation

Post-tensioned slabs should be designed in accordance with the recommendations of either the California Foundation Slab Method or Post-Tensioning Institute. Based on review of laboratory data for the on-site materials, the average soil modulus of subgrade reaction K, to be used for design is 100 pounds per cubic inch. This is equivalent to a surface bearing value of 1,000 pounds per square foot.

1. **California Foundation Slab (Spanability) Method**

It is recommended that slabs be designed for a free span of 15 feet. From a soil expansion/shrinkage standpoint, a common contributing factor to distress of structures using post-tensioned slabs is fluctuation of moisture in soils underlying the perimeter of the slab, compared to the center, causing a "dishing" or "arching" of the slabs. To mitigate this possibility, a combination of soil presaturation and construction of a perimeter "cut off" wall should be employed.

All slab foundation areas should be moisture conditioned to at least optimum moisture, but no more than 5 percent above optimum moisture for a depth of at least 12 inches below subgrade. A continuous perimeter curtain wall should extend to a depth of at least 12 inches below exterior grade for low EI soils to preserve this moisture. The cut-off walls may be integrated into the slab design or independent of the slab and should be a minimum of six inches wide.

2. **Post-Tensioning Institute Method**

Post-tensioned slabs should have sufficient stiffness to resist excessive bending due to non-uniform swell and shrinkage of subgrade soils. The differential movement can occur at the corner, edge, or center of slab. The potential for differential uplift can be evaluated using the design specifications of the post-Tensioning Institute. The following table presents suggested minimum coefficients to be used in the Post-Tensioning Institute design method.

SUGGESTED COEFFICIENTS	
Thornthwaite Moisture Index	-20 in/yr
Depth to Constant Soil Suction	9 (feet)
Constant Soil Suction: (pf)	3.8

The coefficients are considered minimums and may not be adequate to represent worst case conditions such as adverse drainage, excess watering, and/or improper landscaping and maintenance. The above parameters are applicable provided structures have gutters and downspouts, yard drains, and positive drainage is maintained away from structure perimeters. Also, the values may not be adequate if the soils below the foundation become saturated or dry such that shrinkage occurs. The parameters are provided with the expectation that subgrade soils below the foundations are maintained in a relatively uniform moisture condition. Responsible irrigation of landscaping adjacent to the foundation must be practiced since over-irrigation of landscaping can cause problems. Therefore, it is important that information regarding drainage, site maintenance, settlements and effects of expansive soils be passed on to future homeowners.

Based on the above parameters, the following values were obtained from the Post Tension Institute Design manual. If a stiffer slab is desired, higher values of y_m may be warranted.

Expansion Index of Soil Subgrade	**Low EI (0-50)**
e_m center lift	9.0 feet
e_m edge lift	4.7 feet
Y_m center lift	0.34 inch
Y_m edge lift	0.48 inch

Deepened footings/edges around the slab perimeter must be used as indicated above to minimize non-uniform surface moisture migration (from an outside source) beneath the slab. An edge depth of at least 12 inches should be considered for low EI soil. The bottom of the deepened footing/edge should be designed to resist tension, using cable or reinforcement per the Structural Engineer. Other applicable recommendations presented under conventional foundation and the California Foundation Slab Method should be adhered to during the design and construction phase of the project.

General Recommendations

1. The above parameters are applicable provided structures have gutters and downspouts and positive drainage is maintained away from structures. Therefore, it is important that information regarding drainage and site maintenance be passed on to future homeowners. All slab foundation areas should be moisture conditioned to

at least optimum moisture, but no more than 5 percent above optimum moisture for a depth of at least 12 inches below subgrade for low EI soil. The post-tensioned slab designer should determine if the moisture penetration is sufficient for this design. The subgrade soil moisture should be observed by a Soil Engineer or his/her representative prior to pouring concrete. It is suggested the above stated moisture be obtained and maintained at least a suggested 2 days prior to pouring concrete.

2. A 10-mil Visqueen vapor barrier should be placed underneath habitable area slabs and/or slabs with floor coverings. This barrier can be placed directly on the subgrade soils, but should be overlain by a two-inch layer of imported sand. This vapor barrier shall be lapped and sealed (especially around the utility perforations) adequately to provide a continuous waterproof barrier under the entire slab.

3. The above recommendations assume, and GeoSoils Consultants, Inc. strongly recommends, that surface water will be kept from infiltrating into the subgrade adjacent to the house foundation system. This may include, but not be limited to rain water, roof water, landscape water and/or leaky plumbing. The lots are to be fine graded at the completion of construction to include positive drainage away from the structure and roof water will be collected via gutters, downspouts, and transported to the street in buried drain pipes. Homebuyers should be cautioned against constructing open draining planters adjacent to the houses, or obstructing the yard drainage in any way.

4. Utility trenches beneath the slabs should be backfilled with compacted native soil materials, free of rocks.

5. Subgrade soil beneath footings and slabs should be premoistened prior to placement of concrete.

6. Standard County of Los Angeles structural setback guidelines are applicable, except where superseded by specific recommendations by the Project Geologist and Geotechnical Engineer.

7. Building or structure footings shall be set back a horizontal distance, x, from the face of adjacent descending slope. The horizontal distance is calculated as x=H/3, where H is the height of slope. The distance x should not be less than 5 feet nor more than 40 feet. The distance x may be provided by deepening the footings.

8. Prior to placing concrete in the footing excavations, an inspection should be made by our representative to ensure that the footings are free of loose and disturbed soils and are embedded in the recommended material.

Retaining Walls

Retaining wall footings should be founded into compacted fill or dense terrace deposits. The near surface on site soils have a low expansion index and should be confirmed prior to foundation construction.

The equivalent fluid pressures recommended are based on the assumption of a uniform backfill and no build-up of hydrostatic pressure behind the wall. To prevent the build-up of lateral soil pressures in excess of the recommended design pressures, over compaction of the fill behind the wall should be avoided. This can be accomplished by placement of the backfill above a 45-degree plane projected upward from the base of the wall, in lifts not exceeding eight inches in loose depth, and compacting with a hand-operated or small, self-propelled vibrating plates. (Note: Placement of free-draining material in this zone could also prevent the build-up of lateral soils pressures.)

1. Conventional (Yielding) Retaining Walls

All recommendations for active lateral earth pressures contained herein assume that the anticipated retaining structures are in tight contact with the fill soil (or dense alluvium) that they are supposed to support. The earth support system must be sufficiently stiff to hold horizontal movements in the soil to less than one percent of the height of the vertical face, but should be free-standing to the point that they yield at the top at least 0.1 percent of the height of the wall.

2. Earth Pressures on Conventional (Yielding) Retaining Walls

The earth pressures on walls retaining permeable material, compacted fill, or natural soil shall be assumed equal to that exerted by an equivalent fluid having a density not less than that shown in the following table:

Backfill Slope (Horizontal to Vertical)	Equivalent Fill Fluid Density
Level	30
2:1	43
3:1	38
4:1	35

3. Restrained (Non-Yielding) Walls

Earth pressures will be greater on walls where yielding at the top of the wall is limited to less than 1/1000 the height of the wall either by stiffness (i.e., return walls, etc.) or structural floor network prior to backfilling. Utilizing the recommended backfill compaction of 90 percent Modified Proctor Density per ASTM D-1557-12, we recommend the following equivalent fluid density for non-yielding walls:

Backfill Slope (Horizontal to Vertical)	Equivalent Fluid Density
Level	45 pcf
2:1	65 pcf

4. Seismic Pressures For Retaining Walls

The following seismic design criteria must be incorporated into the design of retaining walls greater than 6 feet, the peak ground acceleration (PGA) is defined below.

The seismic load increment is determined by the following equations.

Cantilever (yielding) walls with level backfill:

Cantilever (unrestrained) wall with level backfill:

$$\Delta P_{ae} = 1/2_{\gamma}H^2 \text{ (0.42 } PGA/g = 22H^2$$

Cantilever (yielding) walls with sloping backfill no steeper than 2H:1V:

Cantilever (unrestrained) wall with sloping backfill:

$$\Delta P_{ae} = 1/2_{\gamma}H^2 \text{ (0.70 } PGA/g = 36.7H^2$$

The combined static and seismic load can be expressed using Seed and Whitman's (1970) notation where is the static load and is the seismic load increment:

The resultant force (static and seismic loading) acts 1/3H from the base of the wall (Lew et al. 2010).

General

Any anticipated superimposed loading (i.e., upper retaining walls, other structures etc.) within a 45 degree projection upward from the wall bottom, except retained earth, shall be considered as surcharge and provided in the design.

A vertical component equal to one-third of the horizontal force so obtained may be assumed at the application of force.

The depth of the retained earth shall be the vertical distance below the ground surface, measured at the wall face for stem design or measured at the heel of the footing for overturning and sliding.

The walls should be constructed with weep holes near the bottom, on five-foot centers or with perforated drainpipe in a gravel envelope at the bottom and behind the wall. A one-foot thick zone of clean granular, free-draining material should be placed behind the wall to within three feet of the surface. On-site soil may be used for the remainder of the backfill and should be compacted to 90 percent relative compaction as determined by ASTM Test Designation D-1557-12.

A concrete-lined swale is recommended behind retaining walls that can intercept surface runoff from upslope areas. The surface runoff shall be transferred to an approved drainage channel via non-erosive drainage devices.

CLOSURE

We appreciate this opportunity to be of service to you. If you have any questions regarding the content of this report or any other aspects of the project, please do not hesitate to contact us.

Very truly yours,

GEOSOILS CONSULTANTS, INC.

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Encl: References
Plate 1, Geologic Map
Appendix A, Field Exploration Procedures
Plates A-1 through A-13, Boring Logs
Appendix B, Laboratory Testing Procedures and Results
Plate SH-1, Shear Test Diagram
Plates C-1 through C-10, Conlidation Diagrams
Plate HDR-1, Chemical Test Results

cc: (1) Addressee (Email)

REFERENCES

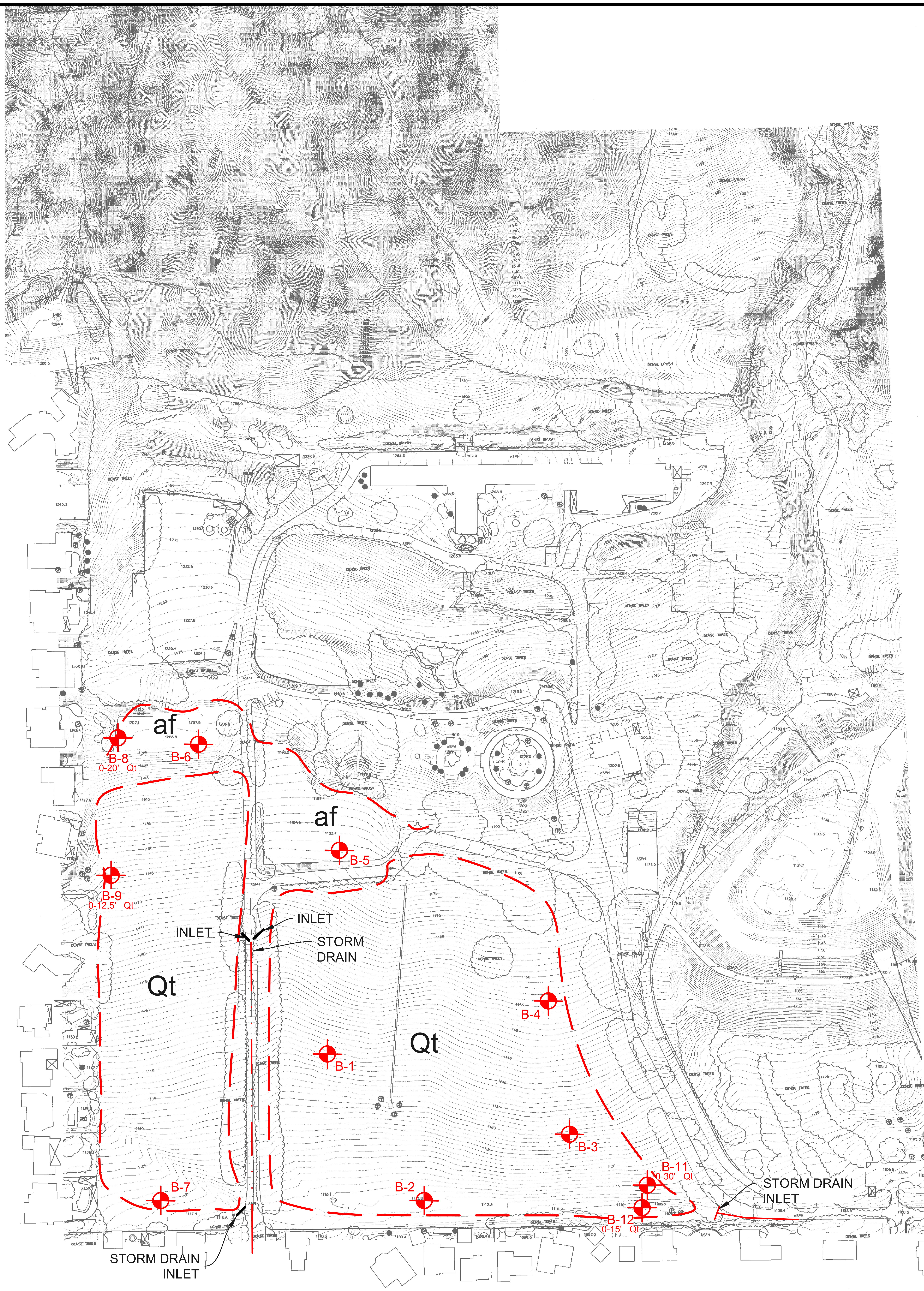
1. California Department of Conservation, Division of Mines and Geology, 1998, Seismic Hazard Zone Report for the Mt. Wilson 7.5-minute Quadrangle, Los Angeles County, California; Seismic Hazard Report 030.

2. California Geological Survey, Fault Evaluation Report FER 249, Treiman, Jerome, A. December 20, 2013, “The Sierra Madre Fault Zone in the Azusa Quadrangle, Los Angeles County, California”

3. Dibblee, T. W., 1998, “Geologic map of the Mt. Wilson and Azusa quadrangles Los Angeles County, California”

4. GeoSoils Consultants, Inc., dated July 7, 2014, “Geologic and Geotechnical Engineering Investigation, Mater Dolorosa Development Parcel, 700 N. Sunnyside Avenue (APN 5761-002-008), City of Sierra Madre, California

5. U.S. Geological Survey Professional Paper 1339, 1987, “Recent Reverse Faulting in the Transvers Ranges, California”



MDN 21806

EXPLANATION

af ARTIFICIAL FILL

Qt TERRACE DEPOSITS

APPROXIMATE GEOLOGIC CONTACT

B-12 APPROXIMATE LOCATION OF BORING

GSC GeoSoils Consultants Inc.
GEOTECHNICAL•GEOLOGIC•ENVIRONMENTAL
6634 Valjean Avenue
Van Nuys, CA 91406

GEOLOGIC MAP
APN:5761-002-008
700 NORTH SUNNYSIDE AVENUE
CITY OF SIERRA MADRE, CALIFORNIA
NEW URBAN WEST, INC.

WORK ORDER	DATE	SCALE
6747	11/2020	N.T.S.

REVISED

PLATE 1

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APPENDIX A

FIELD EXPLORATION PROCEDURES

APPENDIX A

FIELD EXPLORATION PROCEDURES

Twelve (12) exploratory borings were drilled with a truck-mounted drill rig operated by an independent drilling company working under subcontract to GSC. Drilling programs utilized an eight-inch diameter hollow-stem auger. Samples were obtained via the California ring sampler.

A representative from our firm continuously observed the borings, logged the subsurface conditions, and collected representative soil samples. All samples were stored in watertight containers and later transported to our laboratory for further visual examination and testing, as deemed necessary. After the boring was completed, the borehole was backfilled with soil cuttings.

The California ring samples were obtained at by means of the latest ASTM standard. The California ring sampling procedure consists of driving a standard 3-inch-diameter steel sampler with eighteen 1-inch wide rings, 12 inches into the soil with a 140-pound hammer free-falling 30 inches. The number of blows required to drive the sampler through each 6-inch interval is counted, and the total number of blows struck is recorded.

The enclosed Boring Logs, Plates A-1 through A-12, describe the vertical sequence of soils and materials encountered in each boring, based primarily on our field classifications and supported by our subsequent laboratory examination and testing. Where a soil contact was observed to be gradational, our log indicates the average contact depth. Where a soil type changed between sample intervals, we inferred the contact depth. Our log also graphically indicates the blow count, sample type, sample number, and approximate depth of each soil sample obtained from the borings, as well as any laboratory tests performed on these soil samples. If any groundwater was encountered in a borehole, the approximate groundwater depth is depicted on the boring log. Groundwater depth estimates are typically based on the moisture content of soil samples, the wetted height on the drilling rods, and the water level measured in the borehole after the auger has been extracted.

GEOTECHNICAL BORING LOG

PROJECT NAME	New Urban West - Sierra Madre	W.O. NO.	6747
DRILLING COMPANY	Choice	DATE STARTED:	6-9-14
BORING NO.	B-1	SHEET	1 OF 1
TYPE OF DRILL RIG	Truck Mounted	LOGGED BY	SMB
DRILLING METHOD	HSA	HAMMER WEIGHT (LBS)	140
GROUND ELEVATION (FT)			
DIAMETER OF HOLE	8	DROP (IN)	30
GW ELEVATION			
BORING LOCATION:			

DEPTH (FT)	SAMPLE TYPE	BLOWS/ 6 IN.	GEOTECHNICAL DESCRIPTION	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	OTHER TESTS
0–5	Bulk Sample		**0-25.5', TERRACE DEPOSITS (Qt)** Reddish brown, silty, very fine SAND, few angular gravel, dry, loose, roots, rodent burrows			
5	California Ring	12/15	@ 6', Dark reddish brown, silty, fine to medium SAND, few small angular gravels, moist, medium dense	6.4	118.6	
10	California Ring	11/20	@ 10', Dark reddish brown, silty, clayey, fine to medium SAND, moist, very dense, 1/8 to 1" angular gravel fragments (igneous origin), very hard drilling	9.1	117.0	Cons
15	California Ring	24/25	@ 15', Dark reddish brown, silty/clayey, fine to medium SAND, moist, very dense to hard, coarse sand in tip of sampler (adding water to aid drilling)	6.7	121.4	
20	California Ring	22/35	@ 20', Dark reddish brown, silty, fine to coarse SAND, moist, hard, occasional angular gravel	10.6	124.0	
25	California Ring	50	@ 25', Brown, silty, fine to coarse SAND, moist, hard, angular gravel	6.3	24.8	
			TD @ 25.5' No groundwater No caving			

LEGEND

- Standard Penetration Test
- California Ring
- Rock Core
- Bulk Sample
- Shelby Tube
- Water Seepage
- Groundwater

SIEVE:	GRAIN SIZE ANALYSIS
MAX:	MAXIMUM DRY DENSITY
DS:	DIRECT SHEAR
CONS:	CONSOLIDATION
HYDR:	HYDROMETER ANALYSIS
EXPAN:	EXPANSION INDEX
CHEM:	CHEMICAL TESTS

PLATE A-1

GeoSoils Consultants, Inc.
GEOTECHNICAL * GEOLOGIC * ENVIRONMENTAL

GEOTECHNICAL BORING LOG

PROJECT NAME	New Urban West - Sierra Madre	W.O. NO.	6747
DRILLING COMPANY	Choice	DATE STARTED:	6-9-14
BORING NO.	B-2		
TYPE OF DRILL RIG	Truck Mounted	LOGGED BY	SMB
SHEET	1 OF 2		
DRILLING METHOD	HSA	HAMMER WEIGHT (LBS)	140
GROUND ELEVATION (FT)			
DIAMETER OF HOLE	8	DROP (IN)	30
GW ELEVATION			

BORING LOCATION:

DEPTH (FT)	SAMPLE TYPE	BLOWS/ 6 IN.	GEOTECHNICAL DESCRIPTION	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	OTHER TESTS
			0-3', ALLUVIUM (Qal) Gray brown, silty, fine to coarse SAND with gravel, loose, roots, rodent burrows			
			3-30', TERRACE DEPOSITS (Qt)			
5	Bulk Sample (5-10'); California Ring	14/16	@ 5', Reddish brown, silty, fine to medium SAND, moist, dense, few small gravel (angular, igneous in origin)	5.3	110.7	Cons
10	California Ring	10/17	@ 10', Reddish brown, silty, fine SAND, damp, medium dense, small angular gravels	4.9	112.2	
			@ 13', Hard			
15	California Ring	29/35	@ 15', Dark reddish brown, silty/clayey, fine to medium SAND, moist, hard, granitic gravel (3")	6.6	120.3	
20	California Ring	16/24	@ 20', Brown, fine SAND, damp, hard	4.2	112.5	
25	California Ring	50 for 4"	@ 25', Brown, fine SAND, damp, hard, gravel	4.8	110.4	
	California Ring	50 for 3"	@ 29', No recovery			

LEGEND

- Standard Penetration Test
- California Ring
- Rock Core
- Bulk Sample
- Shelby Tube
- Water Seepage
- Groundwater

SIEVE: GRAIN SIZE ANALYSIS
MAX: MAXIMUM DRY DENSITY
DS: DIRECT SHEAR
CONS: CONSOLIDATION
HYDR: HYDROMETER ANALYSIS
EXPAN: EXPANSION INDEX
CHEM: CHEMICAL TESTS

PLATE A-2

GeoSoils Consultants, Inc.
GEOTECHNICAL * GEOLOGIC * ENVIRONMENTAL

GEOTECHNICAL BORING LOG

PROJECT NAME New Urban West - Sierra Madre
W.O. NO. 6747
DRILLING COMPANY Choice
DATE STARTED: 6-9-14
BORING NO. B-2
TYPE OF DRILL RIG Truck Mounted
LOGGED BY SMB
SHEET 2 OF 2
DRILLING METHOD HSA
HAMMER WEIGHT (LBS) 140
GROUND ELEVATION (FT)
DIAMETER OF HOLE 8
DROP (IN) 30
GW ELEVATION
BORING LOCATION:

DEPTH (FT)	SAMPLE TYPE	BLOWS/ 6 IN.	GEOTECHNICAL DESCRIPTION	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	OTHER TESTS
			TD @ 30' No groundwater No caving			
35						
40						
45						
50						
55						

LEGEND

- Standard Penetration Test
- California Ring
- Rock Core
- Bulk Sample
- Shelby Tube
- Water Seepage
- Groundwater

SIEVE: GRAIN SIZE ANALYSIS
MAX: MAXIMUM DRY DENSITY
DS: DIRECT SHEAR
CONS: CONSOLIDATION
HYDR: HYDROMETER ANALYSIS
EXPAN: EXPANSION INDEX
CHEM: CHEMICAL TESTS

PLATE A-3

GeoSoils Consultants, Inc.
GEOTECHNICAL * GEOLOGIC * ENVIRONMENTAL

GEOTECHNICAL BORING LOG

PROJECT NAME	New Urban West - Sierra Madre	W.O. NO.	6747
DRILLING COMPANY	Choice	DATE STARTED:	6-9-14
BORING NO.	B-3	SHEET	1 OF 1
TYPE OF DRILL RIG	Truck Mounted	LOGGED BY	SMB
DRILLING METHOD	HSA	HAMMER WEIGHT (LBS)	140
GROUND ELEVATION (FT)			
DIAMETER OF HOLE	8	DROP (IN)	30
GW ELEVATION			
BORING LOCATION:			

DEPTH (FT)	SAMPLE TYPE	BLOWS/ 6 IN.	GEOTECHNICAL DESCRIPTION	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	OTHER TESTS
0			**0-28.5', TERRACE DEPOSITS (Qt)** @ 0-2', Reddish brown, silty/clayey, fine to coarse SAND, damp, dense			
2.5	California Ring	11/17		8.1	115.2	
7.5	California Ring	32/50 for 4"	@ 7.5', Reddish brown and gray, coarse SAND, gravel, damp, hard (looks like weathered d.g. decomposed granite)	2.5	120.9	
12.5	California Ring	50 for 4"	@ 12.5', Reddish brown, gravelly, fine to coarse SAND, damp, hard	3.3	114.6	
17.5	California Ring	42/50	@ 17.5', Reddish brown, gravelly, fine to coarse SAND, damp, dense	4.7	118.8	
22.5	California Ring	50 for 5"	@ 22.5', Reddish brown, clayey/silty, gravelly, fine SAND, moist, hard	6.4	114.6	
28.5			TD @ 28.5' No groundwater No caving			

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

LEGEND

- Standard Penetration Test
- California Ring
- Rock Core
- Bulk Sample
- Shelby Tube
- Water Seepage
- Groundwater

SIEVE: GRAIN SIZE ANALYSIS
MAX: MAXIMUM DRY DENSITY
DS: DIRECT SHEAR
CONS: CONSOLIDATION
HYDR: HYDROMETER ANALYSIS
EXPAN: EXPANSION INDEX
CHEM: CHEMICAL TESTS

PLATE A-4

GeoSoils Consultants, Inc.
GEOTECHNICAL * GEOLOGIC * ENVIRONMENTAL

GEOTECHNICAL BORING LOG

PROJECT NAME New Urban West - Sierra Madre			W.O. NO. 6747
DRILLING COMPANY Choice		DATE STARTED: 6-9-14	BORING NO. B-4
TYPE OF DRILL RIG Truck Mounted		LOGGED BY SMB	SHEET 1 OF 1
DRILLING METHOD HSA		HAMMER WEIGHT (LBS) 140	GROUND ELEVATION (FT)
DIAMETER OF HOLE 8		DROP (IN) 30	GW ELEVATION

BORING LOCATION:

DEPTH (FT)	SAMPLE TYPE	BLOWS/ 6 IN.	GEOTECHNICAL DESCRIPTION	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	OTHER TESTS
			0-16', TERRACE DEPOSITS (Qt) Upper 1' brown, silty, fine SAND, dry, loose, roots, rodent burrows			
5	California Ring	14/20	@ 5', Reddish, brown, slightly clayey, silty, fine SAND, damp, dense, some gravel	5.0	111.0	Cons
10	California Ring	50 for 5"	@ 10', Reddish brown, silty, fine SAND, damp, hard, some gravel	4.3	106.2	
15	California Ring	50 for 5"	@ 15', Gray brown, gravelly, fine to coarse SAND, damp, hard	3.2	114.7	
			TD @ 16' No groundwater No caving			
20						
25						

LEGEND

- Standard Penetration Test
- California Ring
- Rock Core
- Bulk Sample
- Shelby Tube
- Water Seepage
- Groundwater

SIEVE: GRAIN SIZE ANALYSIS
MAX: MAXIMUM DRY DENSITY
DS: DIRECT SHEAR
CONS: CONSOLIDATION
HYDR: HYDROMETER ANALYSIS
EXPAN: EXPANSION INDEX
CHEM: CHEMICAL TESTS

PLATE A-5

GeoSoils Consultants, Inc.
GEOTECHNICAL * GEOLOGIC * ENVIRONMENTAL

GEOTECHNICAL BORING LOG

PROJECT NAME	New Urban West - Sierra Madre	W.O. NO.	6747
DRILLING COMPANY	Choice	DATE STARTED:	6-9-14
BORING NO.	B-5		
TYPE OF DRILL RIG	Truck Mounted	LOGGED BY	SMB
SHEET	1 OF 1		
DRILLING METHOD	HSA	HAMMER WEIGHT (LBS)	140
GROUND ELEVATION (FT)			
DIAMETER OF HOLE	8	DROP (IN)	30
GW ELEVATION			

BORING LOCATION:

DEPTH (FT)	SAMPLE TYPE	BLOWS/ 6 IN.	GEOTECHNICAL DESCRIPTION	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	OTHER TESTS
	Bulk Sample		**0-8.5', ARTIFICIAL FILL (af)**			
	California Ring	11/12	@ 2.5', Brown, silty, very fine SAND, dry to damp, medium dense	3.8	114.3	
5						
	California Ring	11/15	@ 7.5', Brown, silty, fine to coarse SAND, dry to damp, medium dense	3.4	112.2	
			8.5-23.5, TERRACE DEPOSITS (Qt)			
10						
	California Ring	16/33	@ 12.5', Reddish brown, slightly silty, fine to coarse SAND, damp, dense, angular gravel (easily disintegrates)	4.1	114.9	
15						
	California Ring	20/24	Dark reddish brown, gravelly, fine to coarse SAND, moist, dense	6.2	121.2	
20						
	California Ring	18/30	@ 22.5', Dark reddish brown, clayey, fine SAND, moist, hard	16.7	115.2	
25			TD @ 23.5' No groundwater No caving			

LEGEND

- Standard Penetration Test
- California Ring
- Rock Core
- Bulk Sample
- Shelby Tube
- Water Seepage
- Groundwater

SIEVE:	GRAIN SIZE ANALYSIS
MAX:	MAXIMUM DRY DENSITY
DS:	DIRECT SHEAR
CONS:	CONSOLIDATION
HYDR:	HYDROMETER ANALYSIS
EXPAN:	EXPANSION INDEX
CHEM:	CHEMICAL TESTS

PLATE A-6

GeoSoils Consultants, Inc.
GEOTECHNICAL * GEOLOGIC * ENVIRONMENTAL

GEOTECHNICAL BORING LOG

PROJECT NAME	New Urban West - Sierra Madre			W.O. NO.	6747
DRILLING COMPANY	Choice	DATE STARTED:	6-9-14	BORING NO.	B-6
TYPE OF DRILL RIG	Truck Mounted	LOGGED BY	SMB	SHEET 1 OF 1	
DRILLING METHOD	HSA	HAMMER WEIGHT (LBS)	140	GROUND ELEVATION (FT)	
DIAMETER OF HOLE	8	DROP (IN)	30	GW ELEVATION	

BORING LOCATION:

DEPTH (FT)	SAMPLE TYPE	BLOWS/ 6 IN.	GEOTECHNICAL DESCRIPTION	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	OTHER TESTS
			0-18', ARTIFICIAL FILL (af) Brown, silty, very fine SAND, gravel, dry, loose			
5	California Ring	12/15	@ 5', Brown, silty, fine to coarse SAND, moist	6.3	121.2	
10	California Ring	26/24	@ 10', Brown, silty, fine to coarse SAND, damp, very dense	3.3	114.9	
15	California Ring	10/11	@ 15', Brown, silty, fine to coarse SAND, damp, medium dense	4.6	107.5	
			18-26', TERRACE DEPOSITS (Qt) Reddish brown, silty, fine to medium SAND, moist, very dense			
20	California Ring	24/30		7.8	114.7	
25	California Ring	25/50 for 5"	@ 25, Reddish brown, slightly clayey, silty, fine to coarse SAND, moist, hard	7.1	124.1	
			TD @ 26' No groundwater No caving			

LEGEND

- Standard Penetration Test
- California Ring
- Rock Core
- Bulk Sample
- Shelby Tube
- Water Seepage
- Groundwater

SIEVE: GRAIN SIZE ANALYSIS
MAX: MAXIMUM DRY DENSITY
DS: DIRECT SHEAR
CONS: CONSOLIDATION
HYDR: HYDROMETER ANALYSIS
EXPAN: EXPANSION INDEX
CHEM: CHEMICAL TESTS

PLATE A-7

GeoSoils Consultants, Inc.
GEOTECHNICAL * GEOLOGIC * ENVIRONMENTAL

GEOTECHNICAL BORING LOG

PROJECT NAME New Urban West - Sierra Madre
W.O. NO. 6747
DRILLING COMPANY Choice
DATE STARTED: 6-9-14
BORING NO. B-7
TYPE OF DRILL RIG Truck Mounted
LOGGED BY SMB
SHEET 1 OF 1
DRILLING METHOD HSA
HAMMER WEIGHT (LBS) 140
GROUND ELEVATION (FT)
DIAMETER OF HOLE 8
DROP (IN) 30
GW ELEVATION
BORING LOCATION:

DEPTH (FT)	SAMPLE TYPE	BLOWS/ 6 IN.	GEOTECHNICAL DESCRIPTION	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	OTHER TESTS
			0-5', ARTIFICIAL FILL (af) Brown, very silty, very fine SAND, dry to damp, loose to medium dense, mottled			
	California Ring	17/20		5.3	116.3	
5			**5-23.5', TERRACE DEPOSITS (Qt)**			
	California Ring	10/12	@ 7.5', Reddish brown, silty, fine SAND, damp, medium dense	4.8	119.8	Cons
10						
	California Ring	10/11	@ 12.5', Reddish brown, silty, fine SAND, moist, medium dense	7.8	115.7	Cons
15						
	California Ring	16/45	@ 17.5', Reddish brown, silty, fine SAND, moist, dense to hard, small angular gravels interspersed	8.3	121.2	
20						
	California Ring	19/28	@ 22.5', Reddish brown, slightly clayey, silty, fine to coarse SAND, moist, dense	7.6	112.2	
25			TD @ 23.5' No groundwater No caving			

LEGEND

- Standard Penetration Test
- California Ring
- Rock Core
- Bulk Sample
- Shelby Tube
- Water Seepage
- Groundwater

SIEVE: GRAIN SIZE ANALYSIS
MAX: MAXIMUM DRY DENSITY
DS: DIRECT SHEAR
CONS: CONSOLIDATION
HYDR: HYDROMETER ANALYSIS
EXPAN: EXPANSION INDEX
CHEM: CHEMICAL TESTS

PLATE A-8

GeoSoils Consultants, Inc.
GEOTECHNICAL * GEOLOGIC * ENVIRONMENTAL

GEOTECHNICAL BORING LOG

PROJECT NAME	**New Urban West, Inc.**			**W.O.**	**6747**
DRILLING COMPANY	Choice	DATE STARTED	10/16/2020	BORING NO.	B-8
TYPE OF DRILL RIG	Truck Mounted	LOGGED BY	JM	SHEET	
DRILLING METHOD	Hollow Stem	HAMMER WT (lbs)	140	GROUND ELEV.	
DIAMETER OF HOLE (IN)	8	DROP (IN)	30	GW ELEV.	
Boring Location:					

Depth (ft)	Sample Type	Blows / 6"	GEOTECHNICAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	Other Tests
0	Bulk Sample		**0-20, TERRACE DEPOSITS (Qt)**			
5	California Ring	12/16/23	5', Reddish brown, gravelly, silty, medium to coarse grained SAND, angular gravels of granitic origin, slightly moist, dense	6.8	117.8	
10	California Ring	15/23/31	10', Reddish brown, gravelly, silty, medium to coarse grained SAND, angular gravels of granitic origin, slightly moist, dense, some clay binder	7.5	118.7	cons
15	California Ring	16/24/48	15', Reddish brown, gravelly, silty, medium to coarse grained SAND, angular gravels of granitic origin, slightly moist, dense, some clay binder	8.1	128.5	
20	California Ring	20/22/42	20', Reddish brown, gravelly, silty, medium to coarse grained SAND, angular gravels of granitic origin, slightly moist, dense, some clay binder			
			TD @ 20' No groundwater No caving			
25						
30						

LEGEND

- Standard Penetration Test
- California Ring
- Rock Core
- Bulk Sample

SIEVE: Grain Size Analysis
MAX: Maximum Dry Density
DS: Direct Shear
CONS: Consolidation
HYDR: Hydrometer Analysis
EXPAN: Expansion Index
CHEM: Chemical Tests

PLATE **A-9**

GSC GeoSoils Consultants Inc.
GEOTECHNICAL · GEOLOGIC · ENVIRONMENTAL

GEOTECHNICAL BORING LOG

PROJECT NAME	**New Urban West, Inc.**			**W.O.**	**6747**
DRILLING COMPANY	Choice	DATE STARTED	10/16/2020	BORING NO.	B-9
TYPE OF DRILL RIG	Truck Mounted	LOGGED BY	JM	SHEET	
DRILLING METHOD	Hollow Stem	HAMMER WT (lbs)	140	GROUND ELEV.	
DIAMETER OF HOLE (IN)	8	DROP (IN)	30	GW ELEV.	

Boring Location:

Depth (ft)	Sample Type	Blows / 6"	GEOTECHNICAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	Other Tests
0						
	Bulk Sample (approx. 2–8'); California Ring	11/11/12	2.5', Brown, gravelly, silty, medium to coarse grained SAND, slightly moist, dens	5.7	117.6	
5						
	California Ring	10/12/17	7.5', Reddish brown, gravelly, silty, medium to coarse grained SAND, angular gravels of granitic origin, slightly moist	8.9	118.6	cons
10						
	California Ring	15/22/38	12.5', Reddish brown, gravelly, silty, medium to coarse grained SAND, angular gravels of granitic origin, slightly moist	8	125.1	
			TD @ 12.5' No groundwater No caving			
15						
20						
25						
30						

LEGEND

- Standard Penetration Test
- California Ring
- Rock Core
- Bulk Sample

SIEVE: Grain Size Analysis
MAX: Maximum Dry Density
DS: Direct Shear
CONS: Consolidation
HYDR: Hydrometer Analysis
EXPAN: Expansion Index
CHEM: Chemical Tests

PLATE **A-10**

GSC GeoSoils Consultants Inc.
GEOTECHNICAL · GEOLOGIC · ENVIRONMENTAL

GEOTECHNICAL BORING LOG

PROJECT NAME	**New Urban West, Inc.**			**W.O.**	**6747**
DRILLING COMPANY	Choice	DATE STARTED	10/16/2020	BORING NO.	B-10
TYPE OF DRILL RIG	Truck Mounted	LOGGED BY	JM	SHEET	
DRILLING METHOD	Hollow Stem	HAMMER WT (lbs)	140	GROUND ELEV.	
DIAMETER OF HOLE (IN)	8	DROP (IN)	30	GW ELEV.	
Boring Location:					

Depth (ft)	Sample Type	Blows / 6"	GEOTECHNICAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	Other Tests
0			**0-10', TERRACE DEPOSITS (Qt)**			
5	California Ring	10/14/19	5', Orange brown, gravelly, medium to coarse grained SAND, slightly moist, den	3.7	119.2	
10	California Ring	7/9/11	10', Orange brown, gravelly, medium to coarse grained SAND, slightly moist, dense	10.1	121.8	
			TD @ 10' No groundwater No caving			
15						
20						
25						
30						

LEGEND

- Standard Penetration Test
- California Ring
- Rock Core
- Bulk Sample

SIEVE: Grain Size Analysis
MAX: Maximum Dry Density
DS: Direct Shear
CONS: Consolidation
HYDR: Hydrometer Analysis
EXPAN: Expansion Index
CHEM: Chemical Tests

PLATE **A-11**

GSC GeoSoils Consultants Inc.
GEOTECHNICAL · GEOLOGIC · ENVIRONMENTAL

GEOTECHNICAL BORING LOG

PROJECT NAME	**New Urban West, Inc.**	**W.O.**	**6747**
DRILLING COMPANY	Choice	DATE STARTED	10/16/2020
		BORING NO.	B-11
TYPE OF DRILL RIG	Truck Mounted	LOGGED BY	JM
		SHEET	
DRILLING METHOD	Hollow Stem	HAMMER WT (lbs)	140
		GROUND ELEV.	
DIAMETER OF HOLE (IN)	8	DROP (IN)	30
		GW ELEV.	
Boring Location:			

Depth (ft)	Sample Type	Blows / 6"	GEOTECHNICAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	Other Tests
0			**0-30, TERRACE DEPOSITS (Qt)**			
5						
10	California Ring	25/42/50 for 5"	10', Orange brown, gravelly, medium to coarse grained SAND, slightly moist, dense, some clay binder	5	121.2	
15	California Ring	39/50	15', Orange brown, gravelly, medium to coarse grained SAND, slightly moist, dense, some clay binder	5.3	123.8	
20	California Ring	45/50 for 1"	20', Orange brown, gravelly, medium to coarse grained SAND, slightly moist, dense, some clay binder	6	111.5	cons
25	California Ring	50 for 5"	20', Orange brown, gravelly, medium to coarse grained SAND, slightly moist, dense, some clay binder, poor recovery	4.4	129.8	
30	California Ring	50 for 4"	30', Orange brown, gravelly, medium to coarse grained SAND, slightly moist, dense, some clay binder, small cobble present	4.3	117.9	cons
			TD @ 30' No groundwater No caving			

LEGEND

- Standard Penetration Test
- California Ring
- Rock Core
- Bulk Sample

SIEVE: Grain Size Analysis
MAX: Maximum Dry Density
DS: Direct Shear
CONS: Consolidation
HYDR: Hydrometer Analysis
EXPAN: Expansion Index
CHEM: Chemical Tests

PLATE **A-12**

GSC GeoSoils Consultants Inc.
GEOTECHNICAL · GEOLOGIC · ENVIRONMENTAL

GEOTECHNICAL BORING LOG

PROJECT NAME	**New Urban West, Inc.**			**W.O.**	**6747**
DRILLING COMPANY	Choice	DATE STARTED	10/16/2020	BORING NO.	B-12
TYPE OF DRILL RIG	Truck Mounted	LOGGED BY	JM	SHEET	
DRILLING METHOD	Hollow Stem	HAMMER WT (lbs)	140	GROUND ELEV.	
DIAMETER OF HOLE (IN)	8	DROP (IN)	30	GW ELEV.	
Boring Location:					

Depth (ft)	Sample Type	Blows / 6"	GEOTECHNICAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	Other Tests
0			**0-15', TERRACE DEPOSITS (Qt)**			
3-8	Bulk Sample					
10	California Ring	18/30/46	10', Reddish brown, gravelly, medium to coarse grained SAND, dense, some small cobble, slightly moist, some clayey pods	5.9	119.6	
15	California Ring	48/50	15', Reddish brown, gravelly, medium to coarse grained SAND, dense, some small cobble, slightly moist, some clayey pods	4.0	124.5	cons
			TD @ 15' No groundwater No caving			

LEGEND

- Standard Penetration Test
- California Ring
- Rock Core
- Bulk Sample

SIEVE: Grain Size Analysis
MAX: Maximum Dry Density
DS: Direct Shear
CONS: Consolidation
HYDR: Hydrometer Analysis
EXPAN: Expansion Index
CHEM: Chemical Tests

PLATE **A-13**

GSC GeoSoils Consultants Inc.
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APPENDIX B

LABORATORY TESTING PROCEDURES AND RESULTS

APPENDIX B

LABORATORY TESTING PROCEDURES AND RESULTS

Moisture-Density

The in-situ moisture content and dry unit weights were determined for each of the undisturbed ring samples. The data obtained are shown on the Boring Logs, Plates A-1 through A-8.

Compaction Tests

One compaction test was performed to determine to moisture density relationships of the typical surficial soils encountered on the site. The laboratory standard used was in accordance with ASTM Test Designation D-1557-12. Summaries of the compaction test results are shown in Table B-1.

TABLE B-1 COMPACTION TEST RESULTS			
Boring and Sample Depth	Description	Maximum Dry Density (psf)	Optimum Moisture (%)
B-2 @ 5-10’	Reddish brown, silty, very fine to medium SAND	118.0	10.5
B-8 @ 0-5’	Reddish brown, slightly silty, fine to coarse SAND	129.5	9.5
B-9 @ 2.5-7.5’	Brown, silty, fine to coarse SAND	130.5	90.
B-10 @ 0-5’	Brown, silty, fine to coarse SAND	131.5	8.5
B-12 @ 3-8’	Reddish brown, slightly silty, fine to coarse SAND	132.0	8.5

Consolidation Tests

Five consolidation tests were performed on selected ring samples. The samples were inundated at an approximate load of one ton per square foot to monitor the hydroconsolidation. Loads were applied to the samples in several increments in geometric progression and resulting deformations were recorded at selected time intervals. Results of the consolidation tests are presented on Plates C-1 through C-10.

Appendix B

Direct Shear Tests

One remolded sample (remolded to 90 percent of the materials' maximum density) was sheared in a strain-control type Direct Shear Machine. The sample was sheared under varying confining loads in order to determine the Coulomb shear strength parameters: cohesion (c), and angle of internal friction (ϕ) for peak and residual strength conditions. The sample was tested in an artificially-saturated condition. The result is plotted and a linear approximation is drawn of the failure curve. Results are shown on the Shear Test Diagram, Plate SH-1 included in this appendix.

Expansion Index Test

To determine the expansion potential of the on-site soils, two expansion index tests were conducted in accordance with the ASTD D-4829 on samples from the terrace deposits. The ranges for expansion index potential are as follows:

0–20	Very Low
21–50	Low
51–90	Medium
91–130	High
>130	Very High

Table B-2 resents the results.

TABLE B-2 EXPANSION INDEX TEST RESULTS		
Sample	**Expansion Index**	**Expansion Potential**
B-2 @ 5-10'	2	Very low

Appendix B

Sulfates

Soluble sulfates react chemically with the hydrated lime and calcium aluminate of hardened cement to form calcium aluminate and calcium sulfo-aliminate. The effect is disintegration of the concrete. In addition to the potential detrimental effects of high concentrations of sulfate to certain admixtures of concrete, sulfates may catalyze reaction of certain clay minerals in soil columns which then undergo large, isolated volume changes which prove detrimental to some structures. Type V cement is normally used where sulfates are present. Testing for soluble sulfates was performed on three representative samples of the material concentrated within the subject site by HDR/Schiff (see Plate HDR-1 this appendix). The results indicate that the soluble sulfate content is 6 ppm within the terrace deposits; therefore, the soils will have negligible impact on the cement used at the site.

SULFATE EXPOSURE	RECOMMENDATIONS FOR CONCRETE IN SULFATE ENVIRONMENTS (AFTER TABLE 19-A-4)				
	SOLUBLE SULFATES IN SOIL, %	SULFATES IN WATER, PPM	CEMENT TYPE	MAXIMUM WATER/CEMENT RATIO	MINIMUM CEMENT CONTENT, LBS
Negligible	0-0.10	0-150			
Moderate	0.0.10-0.20	150-1,500	II	0.55	470
Severe	0.20-2.0	1,500-10,000	V	0.45	660
Very Severe	Over 2.0	Over 10,000	V + Pozzolan	0.45	660

Chemical Series

Other chemicals known to deteriorate building materials were tested as part of a chemical series (including sulfates described above). These tests indicate the on site soils are not corrosive to ferrous metals. Estimated years to perforation, based on the results are presented below for various gage (thickness) of steel.

Gage	18	16	14	12	10
Years to Perforation	35	45.5	56	77	98

New Urban West
W.O.: 6747

Date of Test: 6/14

Sample: **B-2 @ 5.0 - 10.0'**

GeoSoils Consultants, Inc.

Geotechnical Engineering * Engineering Geology

PLATE SH-1

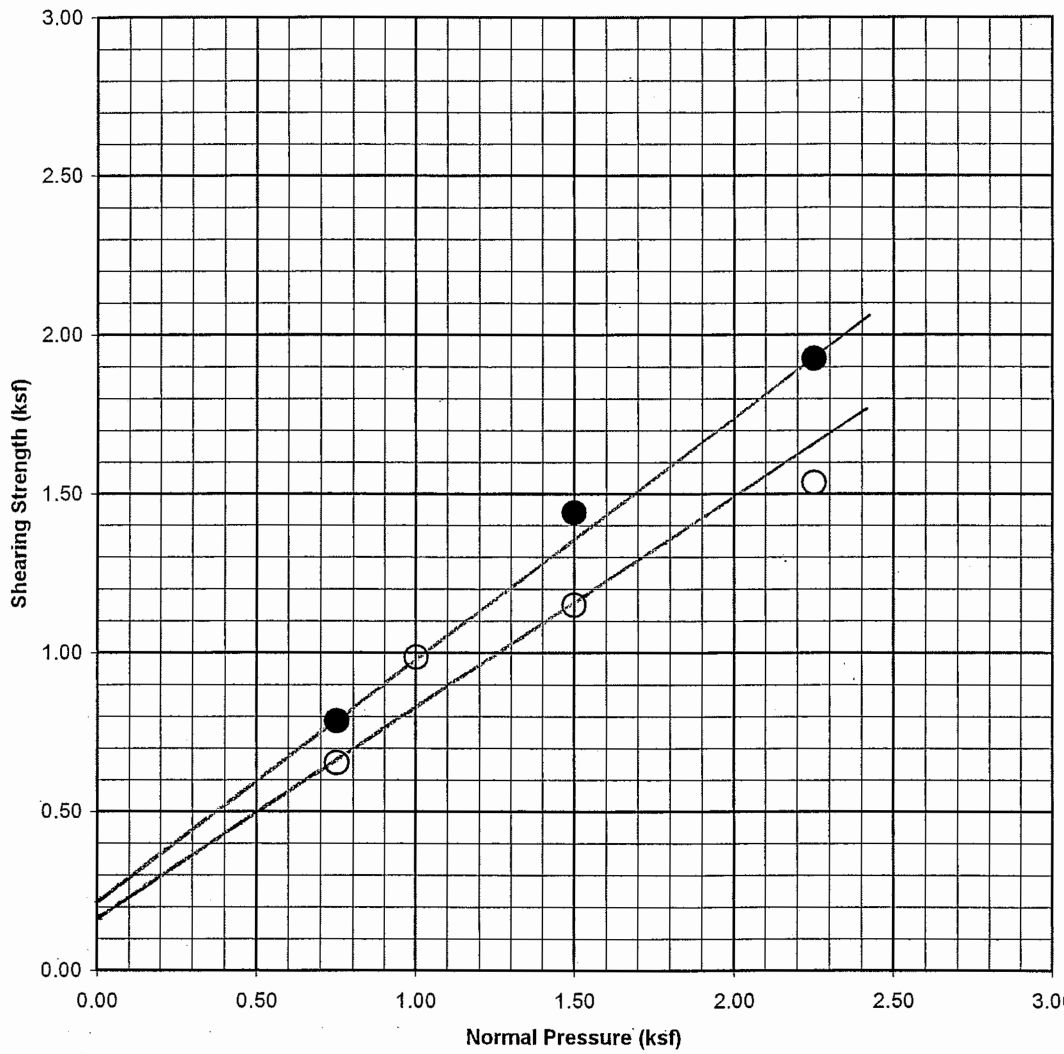
Shear Test Diagram

Peak

C(psf): **220** Phi (degrees): **37.0**

Reshear

C(psf): **180** Phi (degrees): **33.0**



Direct Shear, Peak / Reshear Speed: .005 in./min.

● Peak Values O Reshear Values

Sample **Remolded** to 90% Relative Density, saturated.
Rem Dry Den = 106.2 PCF

Or-brown, clayey, very fine to fine SAND.

MAX: 118 PCF: 10.5%

17.7% Saturated Moisture Content

6747.1

New Urban West (Sierra Madre)
W.O.:6747

Date of Test: 6/14

GeoSoils Consultants, Inc.

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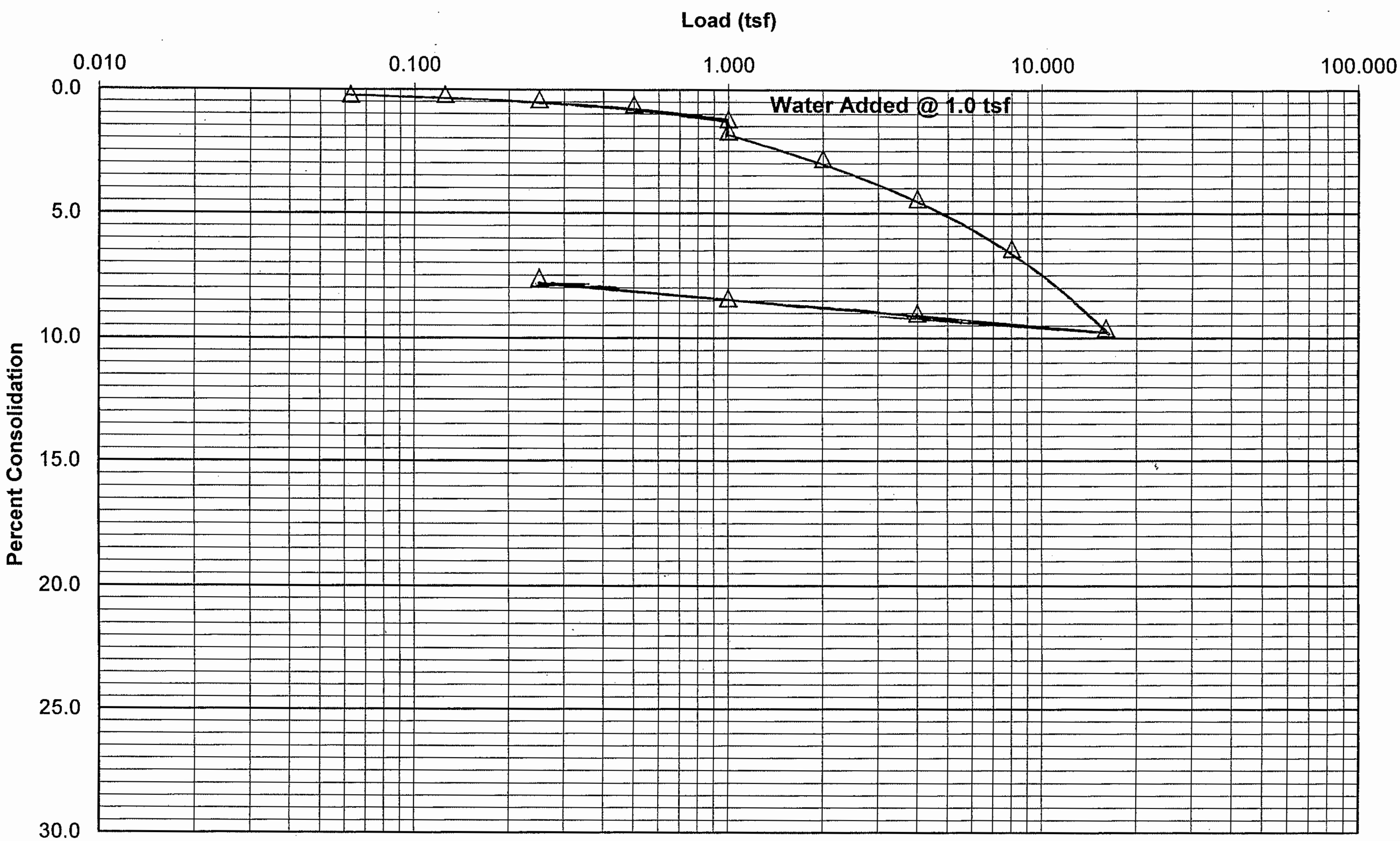
Moisture(%)
Before: 9.1 After: 13.7

Sample(in.)
Height: 1.00 Diameter: 2.36



B-1 @ 10.0'

Consolidation Diagram

Orange medium-brown, slightly clayey silty, very fine to coarse SAND, w/ some rock frag. C6747.1

Plate C-1

New Urban West (Sierra Madre)
W.O.:6747

Date of Test: 6/14

GeoSoils Consultants, Inc.

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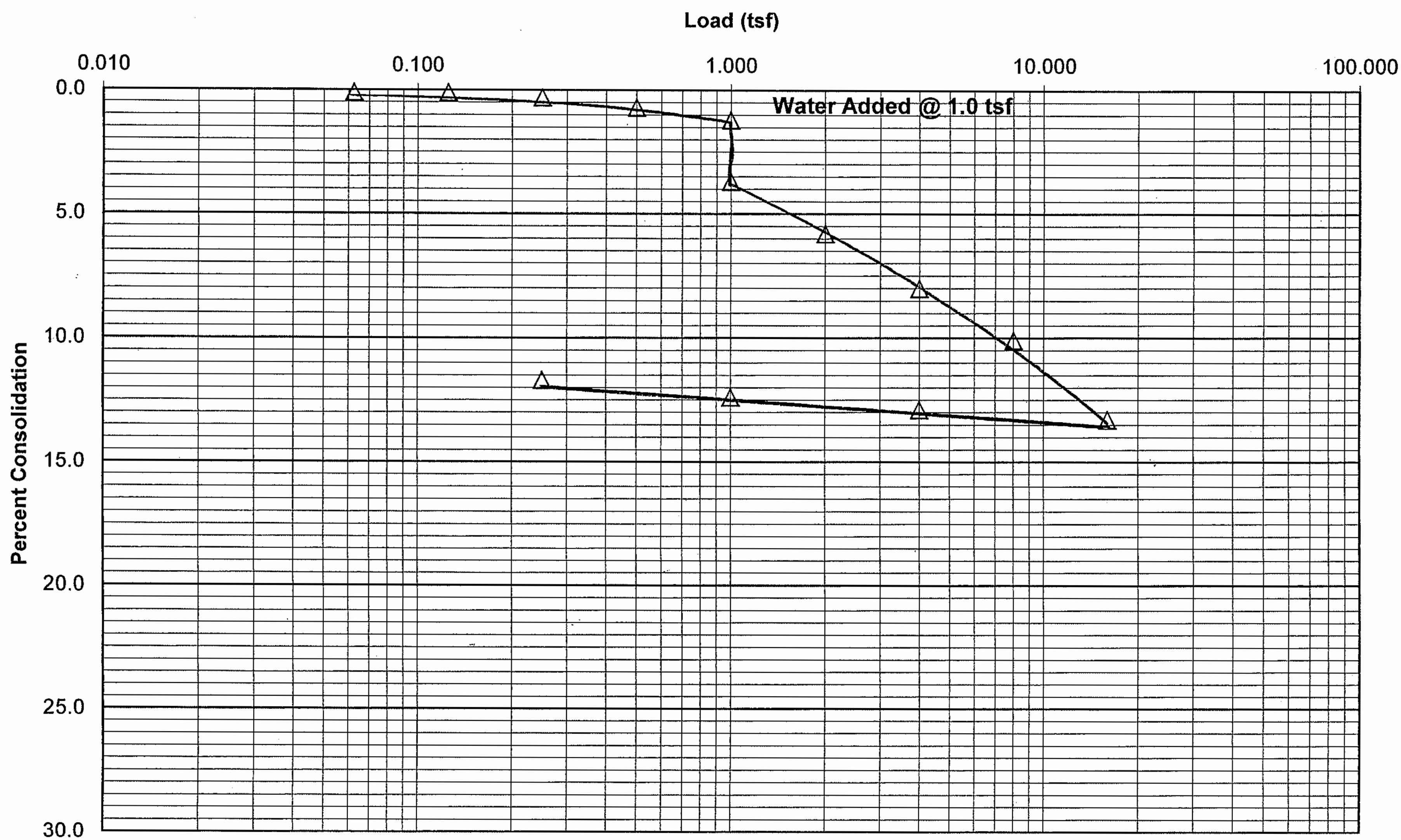
Moisture(%)
Before: 5.3 After: 12.7

Sample(in.)
Height: 1.00 Diameter: 2.36



B-2 @ 5.0'

Consolidation Diagram

Medium-brown, slightly clayey silty, very fine to coarse SAND, w/ some rock fragment. C6747.2

Plate C-2

New Urban West (Sierra Madre)
W.O.:6747

Date of Test: 6/14

GeoSoils Consultants, Inc.

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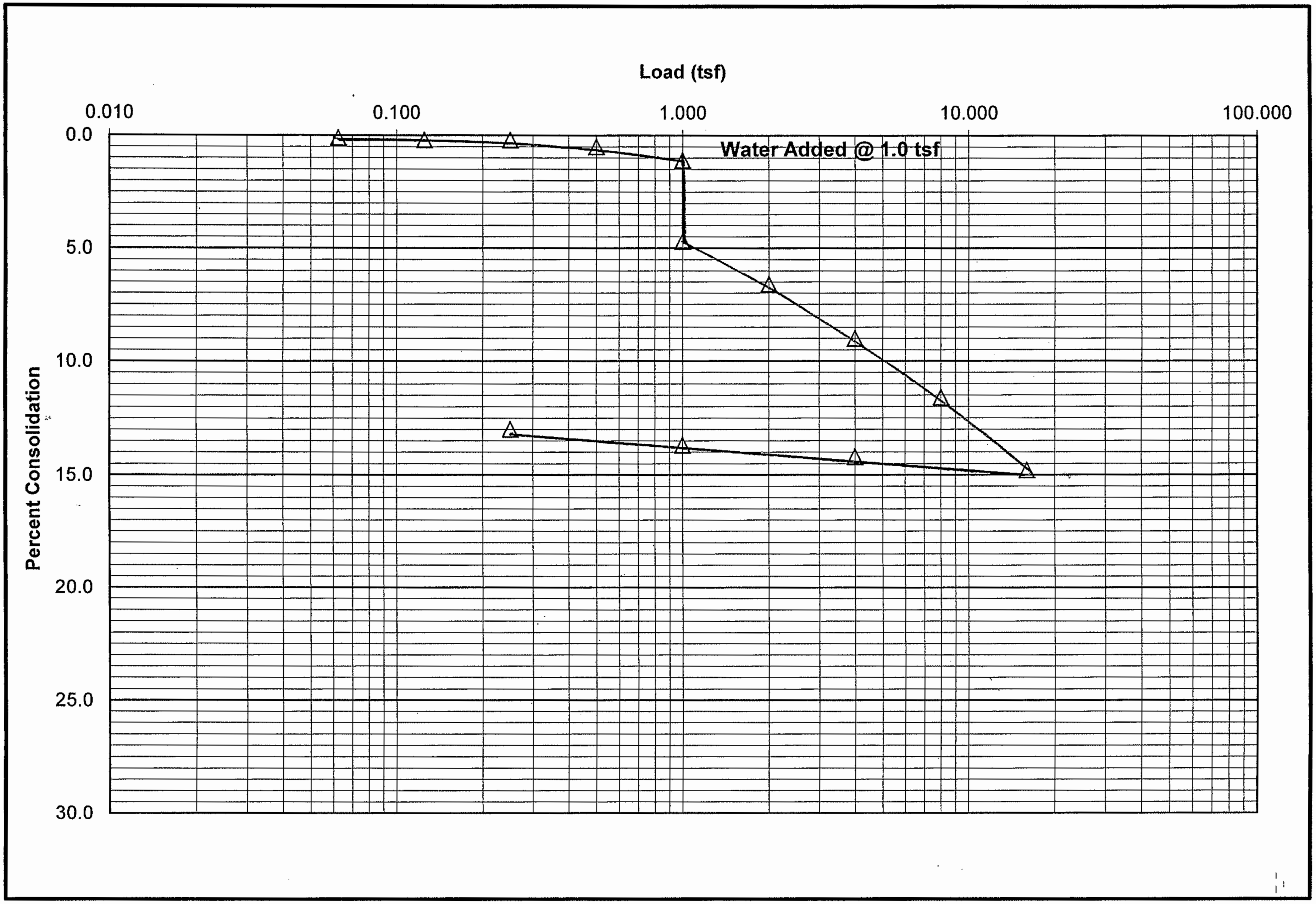
Moisture(%)
Before: 5.0 After: 12.4

Sample(in.)
Height: 1.00 Diameter: 2.36



B-4 @ 5.0'

Consolidation Diagram

Orange-brown, slightly clayey silty, very fine to coarse SAND, w/ some rock fragment. C6747.3

Plate C-3

New Urban West (Sierra Madre)
W.O.:6747

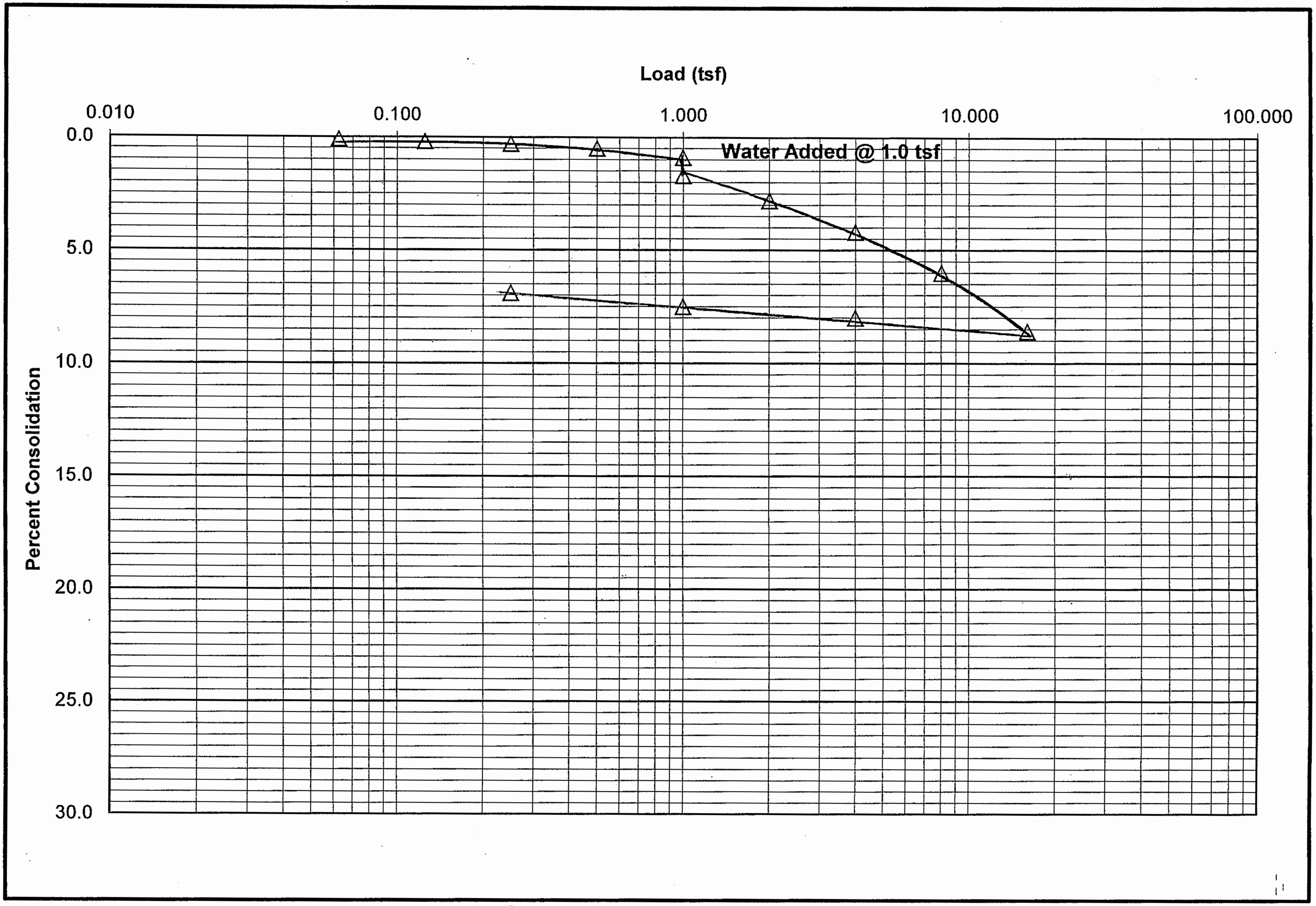
Date of Test: 6/14

GeoSoils Consultants, Inc.

Geotechnical Engineering * Engineering Geology

Moisture(%)
Before: 4.8 After: 11.8

Sample(in.)
Height: 1.00 Diameter: 2.36



B-7 @ 7.5'
Orange-brown, silty, very fine to coarse SAND, w/ rock fragment.

Consolidation Diagram

C6747.4

Plate C-4

New Urban West (Sierra Madre)
W.O.:6747

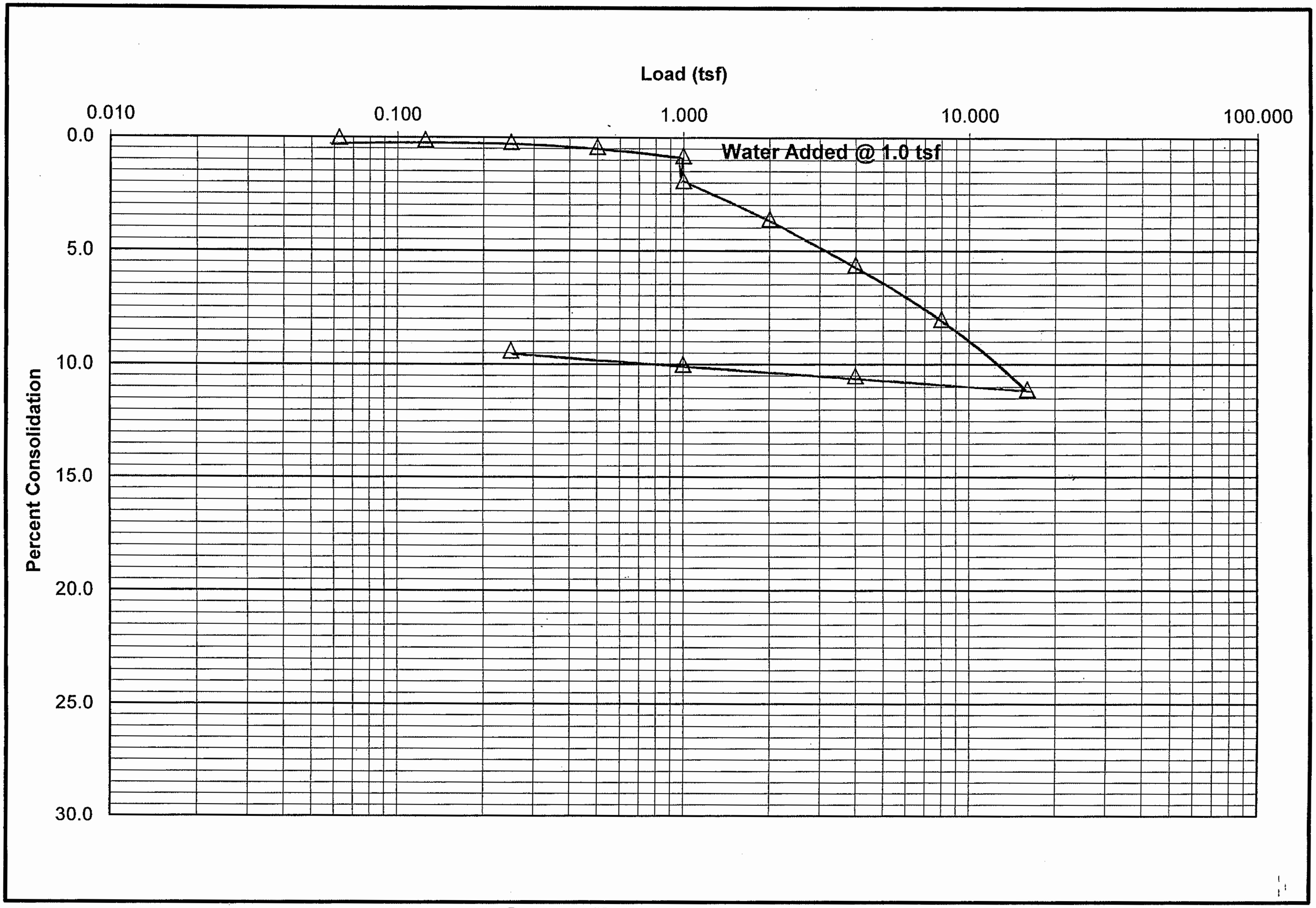
Date of Test: 6/14

GeoSoils Consultants, Inc.

Geotechnical Engineering * Engineering Geology

Moisture(%)
Before: 7.8 After: 11.6

Sample(in.)
Height: 1.00 Diameter: 2.36



B-7 @ 12.5'

Consolidation Diagram

Medium orange-brown, slightly clayey silty, very fine to coarse SAND, w/ rock fragment. C6747.5

Plate C-5

New Urban West (Sierra Madre)
W.O.:6747

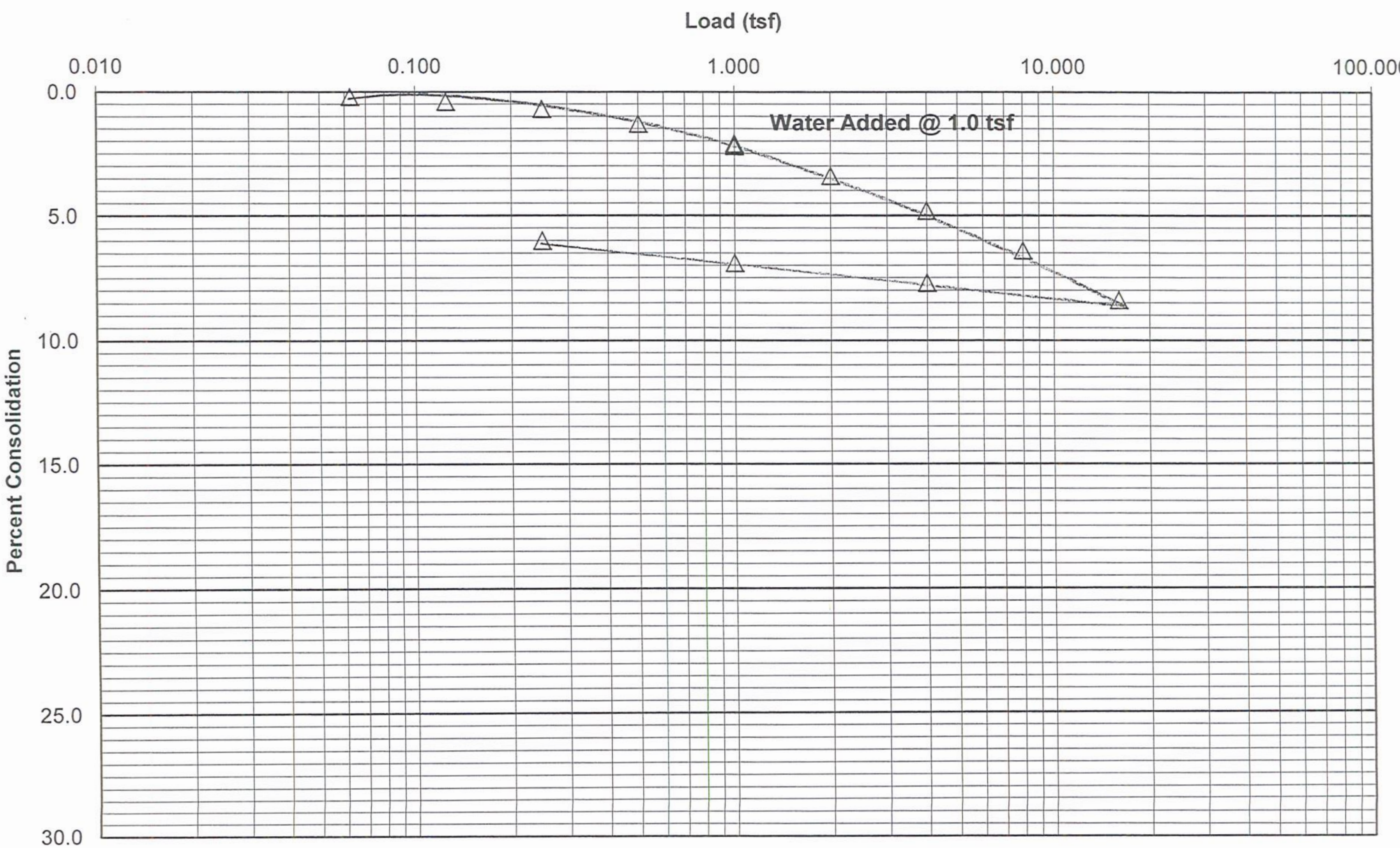
Date of Test: 10/20

GeoSoils Consultants, Inc.

Geotechnical Engineering * Engineering Geology

Moisture(%)
Before: 7.5 After: 14.5

Sample(in.)
Height: 1.00 Diameter: 2.36



Consolidation Diagram

C6747.6.xls

B-8 @ 10.0'
Orange brown slightly clayey sandy SILT.

Plate C-6

New Urban West (Sierra Madre)
W.O.:6747

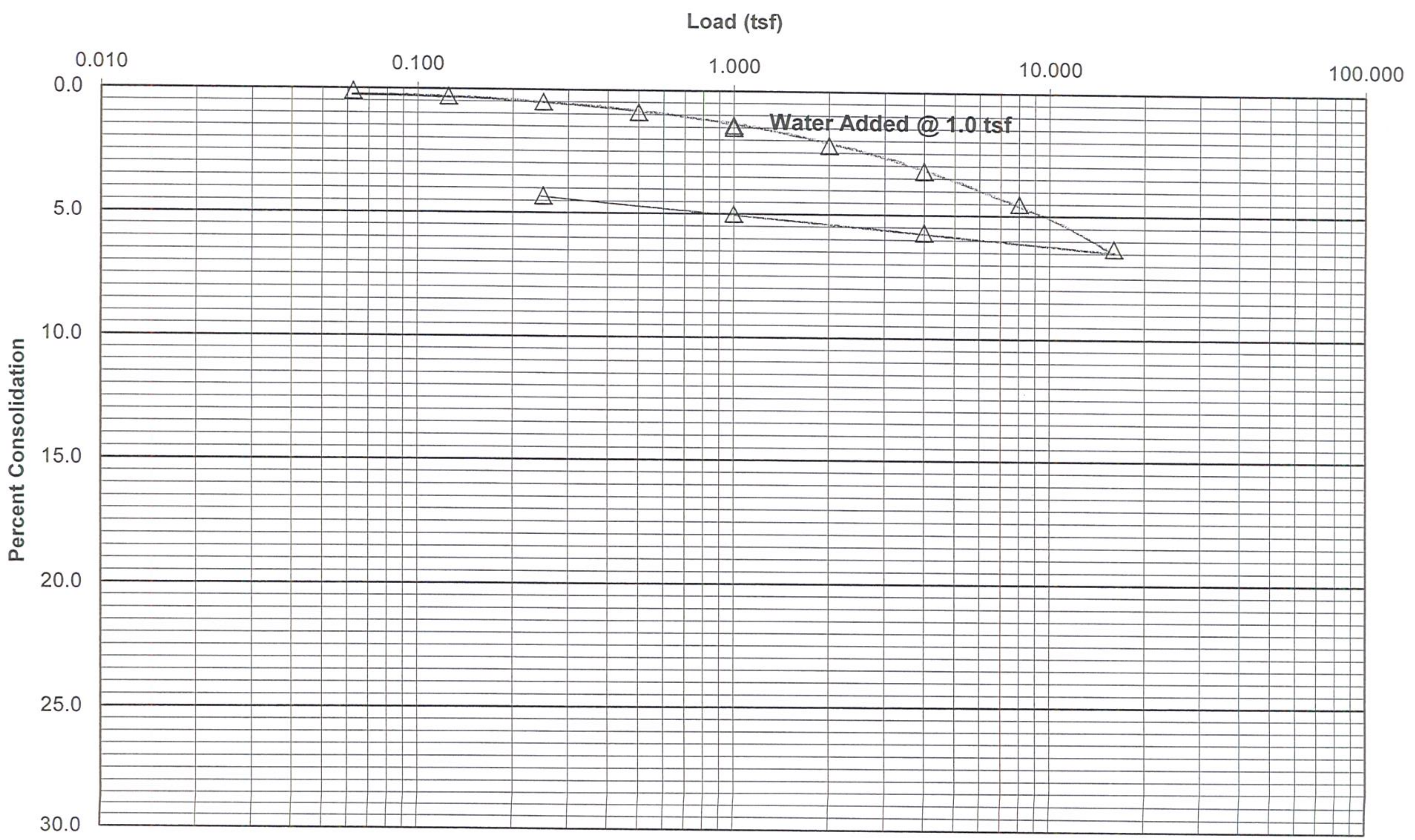
Date of Test: 10/20

GeoSoils Consultants, Inc.

Geotechnical Engineering * Engineering Geology

Moisture(%)
Before: 8.9 After: 12.4

Sample(in.)
Height: 1.00 Diameter: 2.36



B-9 @ 7.5'
Brown slightly clayey sandy SILT.

Consolidation Diagram

C6747.7.xls

Plate C-7

New Urban West (Sierra Madre)
W.O.:6747

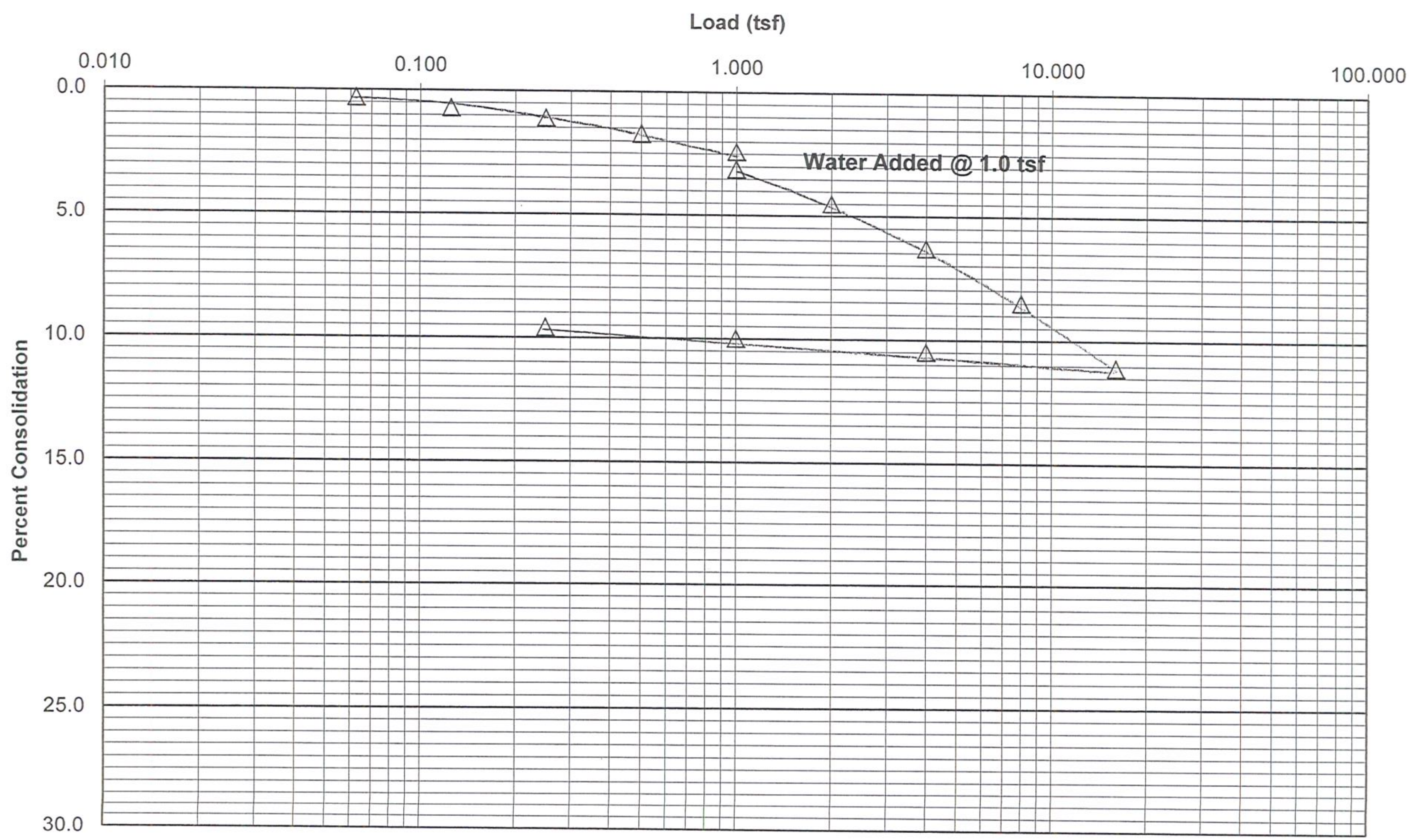
Date of Test: 10/20

GeoSoils Consultants, Inc.

Geotechnical Engineering * Engineering Geology

Moisture(%)
Before: 6.0 After: 8.6

Sample(in.)
Height: 1.00 Diameter: 2.36



B-11 @ 20.0'
Brown slightly clayey silty fine to coarse SAND with decomposed granite.

Consolidation Diagram

C6747.8.xls

Plate C-8

New Urban West (Sierra Madre)
W.O.:6747

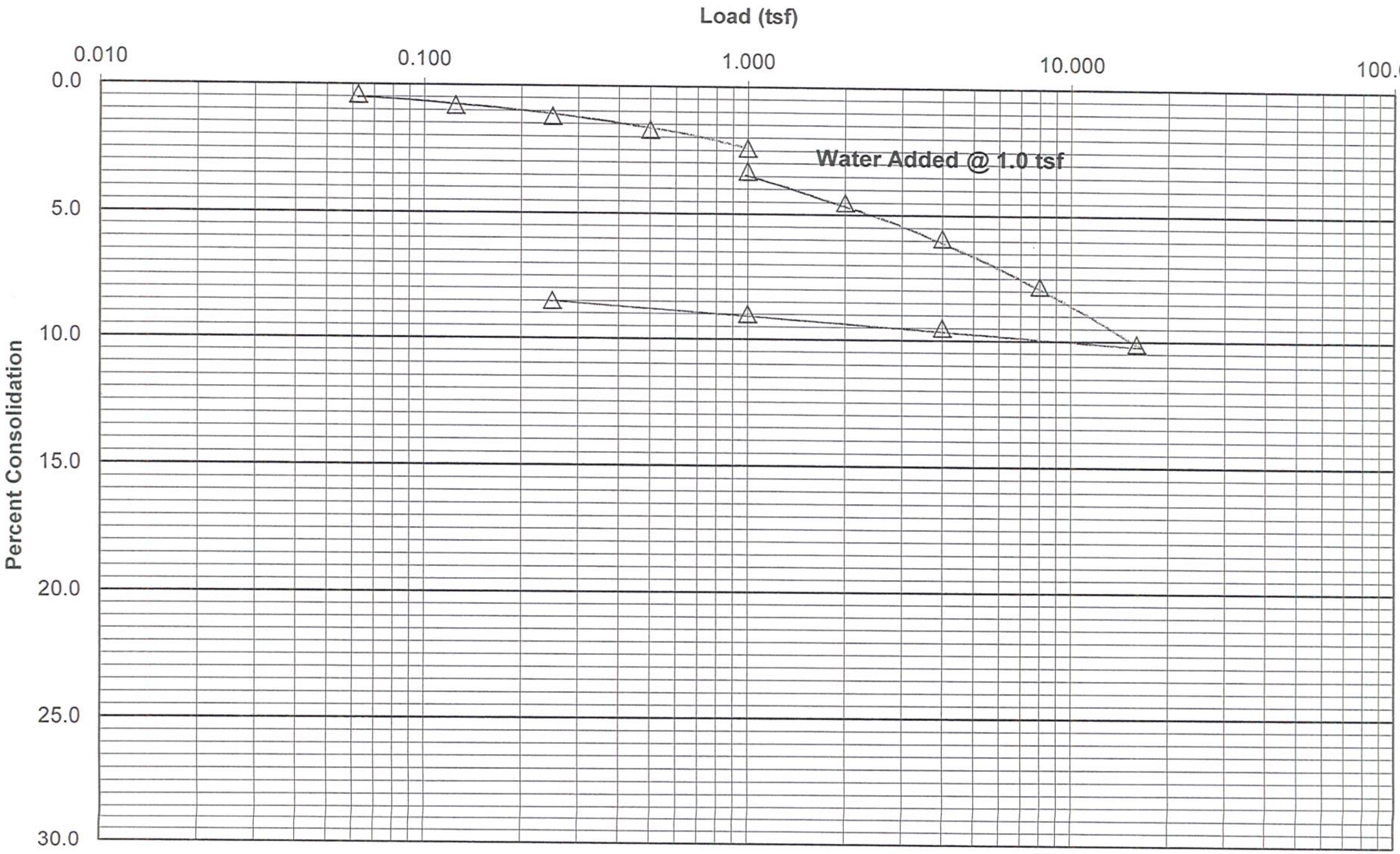
Date of Test: 10/20

GeoSoils Consultants, Inc.

Geotechnical Engineering * Engineering Geology

Moisture(%)
Before: 4.3 After: 13.7

Sample(in.)
Height: 1.00 Diameter: 2.36



B-11 @ 30.0'
Light brown to brown silty fine to coarse SAND with decomposed granite.

Consolidation Diagram

C6747.9.xls

Plate C-9

New Urban West (Sierra Madre)
W.O.:6747

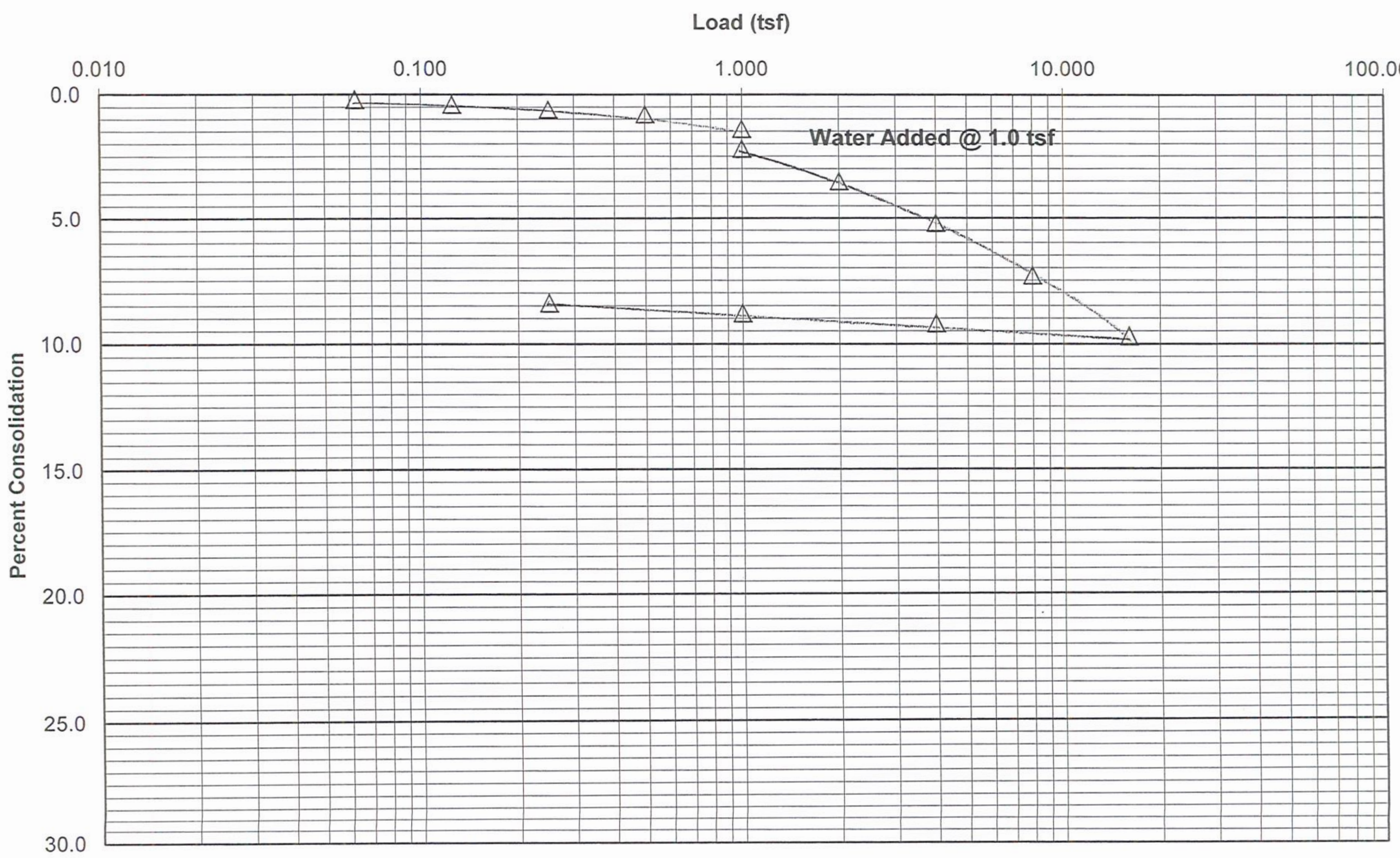
Date of Test: 10/20

GeoSoils Consultants, Inc.

Geotechnical Engineering * Engineering Geology

Moisture(%)
Before: 4.0 After: 14.5

Sample(in.)
Height: 1.00 Diameter: 2.36



B-12 @ 15.0'
Brown slightly silty fine to coarse SAND with decomposed granite.

Consolidation Diagram

C6747.10.xls

Plate C-10

HDR | SCHIFF

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Corrosion Control and Condition Assessment (C3A) Department

Table 1 - Laboratory Tests on Soil Samples

GeoSoils Consultants, Inc.
N.U.W.
Your #6747, HDR|Schiff #14-0416LAB
12-Jun-14

Sample ID			B-2 @ 5-10'
Resistivity		**Units**	
as-received		ohm-cm	200,000
minimum		ohm-cm	11,625
pH			7.2
Electrical Conductivity		mS/cm	0.03
Chemical Analyses			
Cations			
calcium	Ca^{2+}	mg/kg	20
magnesium	Mg^{2+}	mg/kg	1.4
sodium	Na^{1+}	mg/kg	17
potassium	K^{1+}	mg/kg	7.6
Anions			
carbonate	CO_3^{2-}	mg/kg	ND
bicarbonate	HCO_3^{1-}	mg/kg	61
fluoride	F^{1-}	mg/kg	1.9
chloride	Cl^{1-}	mg/kg	1.4
sulfate	SO_4^{2-}	mg/kg	6.0
phosphate	PO_4^{3-}	mg/kg	4.5
Other Tests			
ammonium	NH_4^{1+}	mg/kg	ND
nitrate	NO_3^{1-}	mg/kg	5.9
sulfide	S^{2-}	qual	na
Redox		mV	na

Minimum resistivity per CTM 643, Chlorides per CTM 422, Sulfates per CTM 417
Electrical conductivity in millisiemens/cm and chemical analysis were made on a 1:5 soil-to-water extract.
mg/kg = milligrams per kilogram (parts per million) of dry soil.
Redox = oxidation-reduction potential in millivolts
ND = not detected
na = not analyzed

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PLATE HDR-1