

APPENDIX D

***Geotechnical Reports:
Geotechnical Investigation
Infiltration Report
Drainage Report***



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August 5, 2015

MJW Investments, LLC
1278 Glenneyre, Suite 439
Laguna Beach, California 92651
Attention: Mr. Matthew J. Waken

Job No. 15369-3

Dear Mr. Waken:

This letter transmits four copies of the Geotechnical Investigation report prepared for the proposed 28-lot residential development in San Dimas, California.

We appreciate this opportunity to provide geotechnical services for this project. If you have questions or comments concerning this report, please contact us at your convenience.

Respectfully submitted,
CHJ CONSULTANTS


John S. McKeown, E.G.
Project Geologist

JSM:lb

Distribution: MJW Investments, LLC (4, in care of Mr. Stan Stringfellow)



**GEOTECHNICAL INVESTIGATION
PROPOSED 28-LOT RESIDENTIAL DEVELOPMENT
WEST OF SAN DIMAS AVENUE
BETWEEN WEST GLADSTONE STREET
AND ALLEN AVENUE
SAN DIMAS, CALIFORNIA
PREPARED FOR
MJW INVESTMENTS, LLC
JOB NO. 15369-3**



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August 5, 2015

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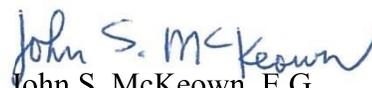
Dear Mr. Waken:

Attached is the Geotechnical Investigation report prepared for the proposed 28-lot residential development in San Dimas, California.

This report was based upon a scope of services generally outlined in our proposal dated July 1, 2015, and other electronic and verbal communications with Mr. Stan Stringfellow.

We appreciate this opportunity to provide geotechnical services for this project. If you have questions or comments concerning this report, please contact this firm at your convenience.

Respectfully submitted,
CHJ CONSULTANTS


John S. McKeown, E.G.
Project Geologist

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GEOTECHNICAL INVESTIGATION
PROPOSED 28-LOT RESIDENTIAL DEVELOPMENT
WEST OF SAN DIMAS AVENUE
BETWEEN WEST GLADSTONE STREET AND ALLEN AVENUE
SAN DIMAS, CALIFORNIA
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JOB NO. 15369-3

INTRODUCTION

During July and August 2015, a geotechnical investigation for a proposed 28-lot residential development in the City of San Dimas, California, was performed by this firm. The site consists of approximately 10 acres that include parcels listed as APNs 8392-013-029, 8392-013-031, 8392-013-032 and 8392-014-037. The purposes of this investigation were to explore and evaluate the geologic and geotechnical engineering conditions at the subject site and to provide appropriate geotechnical engineering recommendations for design and construction of the proposed structures and site improvements.

To orient our investigation a Conceptual Grading Plan and Grading Plan were furnished for our use. The plans depict a proposed development scheme, including tentative building pad and street elevations. References made to lot numbers within this report reflect lot numbers shown on the plans. The approximate location of the site is shown on the attached Index Map (Appendix "A").

The results of our investigation, together with our conclusions and recommendations, are presented in this report.

SCOPE OF SERVICES

The scope of services provided during this geologic and geotechnical investigation included the following:

- A geologic field reconnaissance of the site and surrounding area
- Geologic mapping of the site at a scale of 1 inch to 100 feet



- Marking of selected boring locations and notification of Underground Service Alert
- Logging and sampling of six hollow-stem auger borings for testing and evaluation
- Laboratory testing on selected samples
- Evaluation of the geotechnical engineering and geologic data to develop site-specific recommendations for site grading, foundation design, slope stability and mitigation of potential geologic constraints

PROJECT CONSIDERATIONS

The project plans depict 28 single-family residential lots with street access from San Dimas Avenue and a future secondary street to the west. A small retention basin is located near the western site boundary. Retaining walls are proposed along the southern site boundary at the base of a north-facing slope. Proposed pad elevations range from 971 to 982 feet above mean sea level (amsl) at the southwest and southeast portions of the site, respectively. A proposed west-facing slope dissects the site along a north-south trend. Sewage disposal will be via sanitary sewer connection; therefore, on-site disposal improvements are not required.

The grading plan indicates maximum fills on the order of 6 feet and cuts on the order of 2 feet for building pads. The proposed retention basin may require cuts on the order of 4 feet. Remedial grading is anticipated to increase the final fill thickness by 3 to 4 feet. Fill slopes are proposed at gradients of 2 horizontal (h) to 1 vertical (v) or less. Retaining walls are planned along the southern boundary of the site and vary from less than 4 feet to up to 6 feet in height. Boundary walls are also planned along the site perimeter.

Existing structures and related improvements, including retaining walls and outbuildings, are to be removed from the site.

The final project grading plan should be reviewed by the geotechnical engineer.



SITE DESCRIPTION

The site consists of approximately 10 acres of land as four parcels on relatively flat-lying terrain in the City of San Dimas, California. The site is accessed from 811 North San Dimas Avenue (Nursery) and 741 North San Dimas Avenue (Oak Valley). A north-facing slope, approximately 25 feet high, forms the southern development boundary. The southern portion of the site (Oak Valley) is presently occupied by an equestrian center including associated corrals and buildings. A single-family residence and associated out-buildings and garden areas occupy the northern portion (Nursery). The majority of the site is unpaved and includes some trees. Access to the existing structures is via San Dimas Avenue on the east. Soils and material stockpiles and material storage are present locally within the site.

A shallow tributary drainage of the San Dimas Wash traverses the site from east to west and consists of an unimproved channel with a storm drain outlet and adjacent sewer line along its north side.

The site is bounded by San Dimas Avenue on the east, residential lots at the top of the slope to the south, an electrical substation on the north, and residential and agrarian developments on the west. A residential structure and associated nursery is present in the east-central portion of the site. Several buildings and other improvements, including corrals, are associated with the equestrian area in the southern portion of the site. Other areas of the site have been used to store vehicles, boats and material.

The geologic materials underlying the site include alluvium and shallow bedrock near the southern boundary (Morton and Miller, 2006).

Historic aerial imagery was examined for this project. The photographs span the time period from 1948 through 2013. The site is visible as citrus grove in 1948 imagery with the existing residence in the northeast portion (Nursery). Grove trees are removed from the west-central portion of the site and a residence visible in the elongate parcel in the northern portion of the site. The grove is



removed from the residence area of the northeast portion of the site in 1972 imagery. The grove is removed from and an equestrian facility is visible in the southern portion of the site in 1978 imagery. The existing nursery is not present in 2005 imagery. It is anticipated that buried utility lines and on-site effluent disposal systems may exist within the site.

Evidence of geologic hazards, including landslides or landslide-related features or faults or fault-related features indicative of active faulting, was not observed on the aerial imagery.

FIELD INVESTIGATION

The soil conditions underlying the subject site were explored by means of six hollow-stem auger borings drilled to a maximum depth of approximately 51-1/2 feet below ground surface (bgs) using a truck-mounted CME 75 drill rig equipped for soil sampling. The approximate locations of our borings are indicated on the enclosed Site Plan and Geologic Map (Appendix "A").

Continuous logs of the subsurface conditions, as encountered within the exploratory borings, were recorded at the time of drilling by a geologist from this firm. Both a standard penetration test (SPT) sampler and a modified California sampler (3.0-inch outer diameter and 2.42-inch inner diameter) were utilized in our investigation. The penetration resistance was recorded on the boring logs as the number of hammer blows used to advance the sampler in 6-inch increments (or less if noted). The samplers were driven with an automatic hammer dropping a 140-pound weight 30 inches for each blow. After the required seating, samplers were advanced up to 18 inches, providing a set of up to three blowcounts at each sampling interval. The recorded blows are raw numbers without corrections for hammer type (automatic vs. manual cathead) or sampler size (ring sampler vs. SPT sampler). Both relatively undisturbed and bulk samples of typical soil types obtained were returned to the laboratory in sealed containers for testing and evaluation.



Our exploratory logs, including the uncorrected blowcount data for the hollow-stem auger borings, are presented in Appendix "B". The boundaries between strata presented on the logs represent approximate boundaries between soil types, which may include gradual transitions.

LABORATORY INVESTIGATION

Included in our laboratory testing program were field moisture content tests on all samples returned to the laboratory and field dry density tests on all relatively-undisturbed samples. The results are included on the exploratory boring logs. An optimum moisture content - maximum dry density relationship was established for a typical soil type in order that the relative compaction of the subsoils might be evaluated. Remolded direct shear testing was performed on a selected sample to provide shear strength parameters for slope stability, bearing capacity and earth pressure evaluations. Sieve analyses were performed on selected samples of soil for classification purposes. A selected sample of material was delivered to HDR, Inc. for preliminary corrosivity analysis.

Laboratory test results appear in Appendix "C". Soil classifications provided in our geotechnical investigation are generally as per the Unified Soil Classification System (USCS).

SITE GEOLOGY AND SUBSURFACE SOIL CONDITIONS

Morton and Miller (2006) depict the area of the site in geologic mapping (Enclosure "A-3") and include the site in an area of young alluvial fan sediments. As encountered in our exploratory borings, the site is underlain by alluvial fan sediments that consist of fine- to medium-grained and coarse-grained silty sand with gravel and few cobble-size clasts. Sandstone/siltstone of the Puente Formation was encountered at a depth of 23-1/2 feet bgs in the southwest corner of the site near the hill slope. It is anticipated that this slope is underlain by Puente Formation materials. The site is locally mantled by disturbed native soils, fills or stockpiled organic materials.



Groundwater was not encountered within the maximum 51-1/2-foot depth of the explorations within the site.

Fill was encountered to depths up to 3 feet bgs locally.

The on-site soils encountered during this investigation are generally granular and considered non-critically expansive.

More detailed descriptions of the subsurface soil conditions encountered are included within our exploratory boring logs (Appendix "B").

FAULTING

The site does not lie within or immediately adjacent to an Alquist-Priolo Earthquake Fault Zone, designated by the State of California to include traces of suspected active faulting. In addition, mapped active faults and/or evidence of active faulting within, or projecting toward the site was not observed on the geologic maps and aerial photographs examined for this investigation.

The tectonics of the Southern California area are dominated by the interaction of the North American Plate and the Pacific Plate, which are sliding past each other in a transform motion. Although some of the motion may be accommodated by rotation of crustal blocks such as the western Transverse Ranges (Dickinson, 1996), the San Andreas fault zone (SAFZ) is thought to represent the major surface expression of the tectonic boundary and to be accommodating most of the transform motion between the Pacific Plate and North American Plate. Some of the plate motion is accommodated along other northwest-trending strike-slip faults that are related to the San Andreas system, such as the Newport-Inglewood, San Jacinto and Elsinore faults. Local convergence related to a bend in the overall trend of SAFZ is accommodated along buried thrust faults within the Los Angeles basin, such as the Puente Hills Blind-Thrust system and the Northridge Thrust and exposed faults, including the Sierra Madre-Cucamonga fault system.



The Sierra Madre fault is mapped along the southern margin of the San Gabriel Mountains foothills approximately 1 mile north of the site. The Sierra Madre fault consists of several arcuate splays that characterize a system of frontal thrust faults that extend from the Santa Monica Mountains in the west to the Cucamonga fault zone and eastern San Gabriel Mountains known as the Transverse Ranges Frontal Fault system (TRFFS). The magnitude 5.8 Sierra Madre earthquake on June 28, 1991, occurred on the Clamshell-Sawpit Canyon fault, an offshoot of the Sierra Madre fault located approximately 8-1/2 miles northwest of the site. The February 9, 1971, San Fernando (Sylmar) earthquake (magnitude 6.6) occurred on the San Fernando fault, a member of the TRFFS.

The San Jose fault is located approximately 3-1/2 miles south-southwest of the site and trends from the southwestern San Jose Hills northeastward to the Upland-Claremont region. The San Jose fault was the source of a magnitude 4.7 earthquake on June 26, 1988, and a larger magnitude 5.4 earthquake on February 28, 1990, called the Upland earthquake, both epicentered northeast of the site.

The Cucamonga fault is located approximately 7-1/2 miles east-northeast of the site. The Cucamonga fault is part of a series of east-west trending, predominantly reverse and thrust faults coincident with the southern margin of the TRFFS. The San Fernando fault of this system ruptured during the 1971 moment magnitude 6.7 San Fernando earthquake. Evidence of recent activity on the Cucamonga fault includes fresh scarps, sag ponds and disrupted Holocene alluvium (Dutcher and Garrett, 1963; Yerkes, 1985; Morton and Yerkes, 1987).

The Mojave segment of the San Andreas fault zone is located along the northeast margin of the San Gabriel Mountains, approximately 19 miles northeast of the site. The San Andreas fault is characterized by youthful fault scarps, vegetational lineaments, springs and offset drainages. The ShakeOut scenario earthquake, used to model emergency response/preparedness in the southern California region, is based on a large event located along the southern reaches of the San Andreas fault. The 1857 Fort Tejon earthquake of approximately 7.9 M_w occurred on the Mojave segment of the San Andreas fault.



Other faults in the southern California region with a potential for producing seismic shaking at the site include the Chino-Central Avenue, Puente Hills blind thrust and Raymond faults, located 11 miles southeast, 14 miles southwest and 17 miles west of the site, respectively.

HISTORICAL EARTHQUAKES

The site is located within the seismically-active Southern California region. A map of recorded earthquake epicenters is included as Enclosure "A-5" (Epi Software, 2000). This map includes the California Institute of Technology database for earthquakes with magnitudes of 4.0 or greater from 1932 through 2013. Mitigation of the potential for damage due to seismic shaking is primarily through proper design and construction according to the current California Building Code (CBC).

2013 CALIFORNIA BUILDING CODE - SEISMIC PARAMETERS

Based on the geologic setting and anticipated earthwork for development of the proposed project, the soil profile underlying the site is classified as Site Class "D", stiff soil profile".

The seismic parameters are summarized in the following table.

Seismic Design Parameters	
Mapped Spectral Acceleration Parameters	$S_s = 2.47$ and $S_1 = 0.91$
Site Coefficients	$F_a = 1.0$ and $F_v = 1.5$
Adjusted Maximum Considered Earthquake (MCE) Spectral Response Parameters	$S_{MS} = 2.47$ and $S_{M1} = 1.36$
Design Spectral Acceleration Parameters	$S_{DS} = 1.65$ and $S_{D1} = 0.91$

The maximum considered geometric mean peak ground acceleration (MCE_G) for use in evaluating soil site effects according to the ASCE 7-10 is 0.89g.



SLOPE STABILITY

The site is not included within an area mapped as having a landslide or seismic slope stability hazard. A slope along the southern site boundary is depicted as a 3(h):1(v) slope and is proposed to be improved with retaining walls along the site boundary.

The flat-lying site is bounded to the south by a natural slope formed in Puente Formation bedrock and on the east by a road fill prism. These slopes exhibit gradients on the order of 2(h):1(v) or flatter and are mantled with grasses and mature trees. Landslides, soil slips or other indications of instability were not observed during field mapping or on historic aerial imagery. Site improvements include retaining/perimeter walls near the base of these slopes.

Engineered fill slopes within the proposed development area are proposed at inclinations of 2(h):1(v) or lesser, with heights up to approximately 5 feet.

Slope instability or landslide hazards are not anticipated for the project as proposed, provided that the project is designed and constructed in accordance with applicable grading and building codes and standards. Temporary slopes and excavations should be configured or supported according to applicable regulations including OSHA regulations.

GROUNDWATER

The site is located in portions of Section 3 of Township 1 South, Range 9 West, in the San Gabriel Valley groundwater basin. The area of the site is underlain by alluvium. Springs or seeps were not noted within the site. Groundwater was not encountered within the maximum 51-1/2-foot depth of our exploratory borings. Groundwater data for the site region are summarized in the following table.



Data ID	Date Measured	Depth to Water (feet)	Water Surface Elevation (feet)	Location of Well	Reference
4398A	12-18-1933	172	846	On site	LA County DPW (2015)
	11-09-1983	51	967		
	05-27-2009	102.6	915.4		
Contour Maps	1933	120	850	--	DWR (1966)
	1944	70	900		
	1960	70	900		
Contour Maps	01-2002	95	875	--	San Gabriel Basin Watermaster
	07-2002	95	875		
	01-2007	70	900		
	07-2007	80	890		
	01-2010	110	860		
	07-2010	100	870		

According to State of California DMG (1998), historic-high groundwater in the site area has occurred at depths from 30 to 50 feet bgs. A groundwater depth of 30 feet is recommended for evaluation of seismic effects on the soil column.

LIQUEFACTION POTENTIAL AND SEISMIC SETTLEMENT

The northwestern portion of the site is included within a State-designated Seismic Hazard Zone for liquefaction (CGS, 1999). The historic groundwater depth for the site area is depicted by CGS (1998) as 30 to 50 feet bgs.

Liquefaction is a process in which strong ground shaking causes saturated soils to lose their strength and behave as a fluid (Matti and Carson, 1991). Ground failure associated with liquefaction can result in severe damage to structures. Soil types susceptible to liquefaction include sand, silty sand,



sandy silt and silt, as well as soils having a plasticity index (PI) less than 7 (Boulanger and Idriss, 2006). For sandy soils, the geologic conditions for increased susceptibility to liquefaction are: 1) shallow groundwater (generally less than 50 feet in depth), 2) the presence of unconsolidated sandy alluvium, typically Holocene in age, and 3) strong ground shaking. All three of these conditions must be present for liquefaction to occur.

For this investigation, SPT blowcounts were obtained and utilized in the analysis. A depth to groundwater of 30 feet bgs was utilized to calculate the liquefaction potential in the area. The recommended design peak ground acceleration (PGA) of 0.89g and a deaggregated earthquake magnitude of 6.6 were utilized as input into the liquefaction analysis program GeoSuite[®], version 2.4 (Yi, 2015).

Liquefaction and seismic settlement potential was evaluated for the soil profiles encountered in Exploratory Boring Nos. 1 and 4, representing the northern (north of proposed A Street) and southern (south of proposed A Street) portions, respectively. The results are shown on Enclosures "D-1" and "D-2". Our calculations indicate that the potential for liquefaction is very low. The results indicate seismic settlement (including liquefaction-induced settlement and dry sand settlement) of approximately 1-3/4 inches in Exploratory Boring No. 1 and less than 0.1 inch in Exploratory Boring No. 4.

Based on the above results and other soil borings drilled using a ring sampler, it is the opinion of this firm that the potential for liquefaction at the site is negligible and the potential for seismic settlement is negligible for the south portion of the site. Seismic settlement may be on the order of 1-3/4 inches for the north portion of the site (north of proposed A Street). Recommendations for mitigating potential settlement are provided in the "Recommendations" section of this report.



HYDROCONSOLIDATION

As shown in Appendix "B", the soils encountered were generally granular and are considered to have a very low hydroconsolidation potential.

FLOODING AND EROSION

The central portion of the site is traversed by an elongate, east-west trending area defined as Zone X, having a 2 percent annual chance of flood, a 1 percent chance of flood with depths less than 1 foot or a leveed area protected from the 1 percent annual change flood (FEMA, 2008). Flooding is not anticipated, provided that site improvements are constructed according to accepted standards and practices generally utilized in design of similar improvements in the site region. Drainage structures/improvements are shown on the tentative tract map provided. The assessment and/or mitigation of flooding hazard to the site falls under the purview of others.

The native soils mantling the site are considered moderately susceptible to erosion. Positive drainage should be provided, and water should not be allowed to pond anywhere on the site. Water should not be allowed to flow over any graded or natural areas in such a way as to cause erosion. Finish graded areas should be protected from the effects of runoff.

CONCLUSIONS

On the basis of our field and laboratory investigations, it is the opinion of this firm that the proposed development is feasible from a geotechnical engineering and engineering geologic standpoint, provided the recommendations contained in this report are implemented during grading and construction.



Evidence of active faulting on or immediately adjacent to the site was not observed during the geologic field reconnaissance or on the aerial photographs reviewed. The site is not located within an Alquist-Priolo Earthquake Fault Zone.

Moderate to severe seismic shaking of the site can be expected during the lifetime of the proposed structures.

Groundwater was not encountered within the maximum 51-1/2-foot depth of the explorations within the site.

Fill was encountered to depths up to 3 feet bgs locally.

Refusal to further advancement of the drilling augers was not experienced.

Although caving was not experienced within the exploratory borings utilized for this investigation, trenches, larger-diameter borings or excavations that remain open for longer periods of time may be subject to significant caving.

Bedrock was encountered at depth of 23-1/2 feet in Exploratory Boring No. 6.

Evidence of historic flooding at the site was not observed.

Temporary excavations are anticipated to conform to local and State codes with regard to the geologic materials present at the site. Finished slope configurations are not anticipated to exceed 2(h):1(v); therefore, slope stability hazards are not anticipated.

Based on the historic depth of groundwater and dense nature of the sediments beneath the site, liquefaction is not a hazard to the site. Due to the locally existing loose, near-surface soils, seismic



settlement on the order of 1-3/4 inches is anticipated in the north portion of the site (north of proposed A Street).

Based upon our field investigation and test data, it is our opinion that the upper native soils and existing fills will not, in their present condition, provide uniform or adequate support for the proposed structures.

A compacted fill mat will provide a dense, uniform, high-strength soil layer to distribute the foundation loads over the underlying soils and bedrock. Conventional spread foundations, either individual spread footings and/or continuous wall footings, may be utilized in conjunction with a non-expansive compacted fill mat.

RECOMMENDATIONS

SEISMIC DESIGN CONSIDERATIONS:

Moderate to severe seismic shaking of the site can be expected during the lifetime of the proposed structures. Therefore, the proposed structures should be designed accordingly.

Based on the geologic setting and anticipated earthwork for development of the proposed project, the soil profile underlying the site is classified as Site Class "D", stiff soil profile".

The seismic parameters are summarized in the following table.

Seismic Design Parameters	
Mapped Spectral Acceleration Parameters	$S_s = 2.47$ and $S_1 = 0.91$
Site Coefficients	$F_a = 1.0$ and $F_v = 1.5$
Adjusted Maximum Considered Earthquake Spectral Response Parameters	$S_{MS} = 2.47$ and $S_{M1} = 1.36$
Design Spectral Acceleration Parameters	$S_{DS} = 1.65$ and $S_{D1} = 0.91$



The maximum considered geometric mean peak ground acceleration (MCE_G) for us in evaluating soil site effects according to the ASCE 7-10 is 0.89g.

GENERAL SITE GRADING:

It is imperative that no clearing and/or grading operations be performed without the presence of a representative of the geotechnical engineer. An on-site, pre-job meeting with the owner, the contractor and the geotechnical engineer should occur prior to all grading-related operations. Observation, testing, documenting and reporting of the grading operation should be performed by the geotechnical engineer of record. A final compaction report should be issued by the geotechnical engineer of record at the completion of the grading operation. Operations undertaken at the site without the geotechnical engineer present may result in exclusions of affected areas from the final compaction report for the project.

Grading of the subject site should be performed, at a minimum, in accordance with these recommendations and with applicable portions of the 2013 CBC. The following recommendations are presented for your assistance in establishing proper grading criteria.

INITIAL SITE PREPARATION:

All areas to be graded should be stripped of significant vegetation, debris and other deleterious materials. These materials should be removed from the site for disposal. Any existing utility lines should be traced, removed and rerouted or protected in place in areas to be graded.

Any existing undocumented fill encountered during grading should be completely removed from all areas to be graded; once cleaned of significant deleterious materials, the material may be reused as compacted fill.

To assist in the identification and removal of undocumented fill and/or loose native soil, it is our opinion that all areas to be graded should be subexcavated to a minimum depth of 12 inches. Due to the local presence of loose soil, it is our recommendation that the upper 5 feet of existing soil within



the building pad area in the northern portion of the site (north of proposed A Street) and the upper 3 feet of existing soil within the building pad area in the southern portion of the site (south of proposed A Street) be completely removed and cleaned of significant deleterious materials. The removal area should extend laterally beyond any footing line at the bottom of the excavation to a minimum distance of 10 feet, where possible. Further subexcavation may be necessary, depending on the density and condition of the underlying soils. The bottoms of all excavations should be observed and approved by the engineering geologist prior to refilling.

Cavities created by removal of subsurface obstructions should be thoroughly cleaned of loose soil, organic matter and other deleterious materials, shaped to provide access for construction equipment, and backfilled as recommended for site fill.

PREPARATION OF FILL AREAS:

Prior to placing fill, and after the mandatory subexcavation operation and the undocumented fill and loose soils have been removed, the surfaces of all areas to receive fill should be scarified to a depth of 12 inches or more. The scarified soils should be brought to near optimum moisture content and recompacted to a minimum relative compaction of 90 percent in accordance with ASTM D1557.

PREPARATION OF FOOTING AREAS:

If the site is prepared as recommended, spread footings should be appropriate for the subject project. Conventional spread footings should be established at a minimum depth of 12 inches below the finish grade and rest upon at least 24 inches of properly compacted fill. In areas where the required thickness of compacted fill is not accomplished by the mandatory subexcavation operation and by site grading, the footing areas should be further subexcavated to the required depth as mentioned above. The subexcavation should extend horizontally beyond the footing lines a distance of 10 feet, where possible. This distance should be measured at the bottom of the excavation. This subexcavation operation should include the minimum removal, even if planned filling will be sufficient to satisfy compacted fill thickness requirements. The bottom of this excavation should then be scarified to a depth of at least 12 inches, brought to at least optimum moisture and compacted to at



least 90 percent relative compaction in accordance with the current version of ASTM D1557, prior to refilling the excavation to grade as properly compacted fill.

COMPACTED FILLS:

The on-site soils should provide adequate quality fill material, provided they are free from roots, other organic matter and deleterious materials. Unless approved by the geotechnical engineer, rock or similar irreducible material with a maximum dimension greater than 3 inches should not be buried or placed in fills.

If utilized, import fill should be inorganic, non-expansive, granular soil free from rocks or lumps greater than 3 inches in maximum dimension. The contractor shall notify the geotechnical engineer of import sources sufficiently ahead of their use so that the sources can be observed and approved as to the physical characteristic of the import material. For all import material, the contractor shall also submit current verified reports from a recognized analytical laboratory indicating that the import has a "not applicable" (Class S0) potential for sulfate attack based upon current American Concrete Institute (ACI) criteria and is not corrosive to ferrous metal and copper. The reports shall be accompanied by a written statement from the contractor that the laboratory test results are representative of all import material that will be brought to the job.

Fill should be spread in near-horizontal layers, approximately 8 inches in thickness. Thicker lifts may be approved by the geotechnical engineer if testing indicates that the grading procedures are adequate to achieve the required compaction. Each lift should be spread evenly, thoroughly mixed during spreading to attain uniformity of the material and moisture in each layer, brought to at least optimum moisture content and compacted to a minimum relative compaction of 90 percent in accordance with the current version of ASTM D1557.

SHRINKAGE AND SUBSIDENCE:

Based upon the relative compaction of the native soils tested during this investigation and the relative compaction anticipated for compacted fill soils, we estimate a compaction shrinkage of



approximately 5 to 15 percent. Therefore, 1.05 to 1.15 cubic yards of in-place soil material would be necessary to yield 1 cubic yard of properly compacted fill material. In addition, we would anticipate subsidence of approximately 0.1 foot. These values are exclusive of losses due to stripping, tree removal or the removal of other subsurface obstructions, if encountered, and may vary due to differing conditions within the project boundaries and the limitations of this investigation.

Values presented for shrinkage and subsidence are estimates only. Final grades should be adjusted and/or contingency plans to import or export material should be made to accommodate possible variations in actual quantities during site grading.

It is crucial that the geotechnical engineer be present to observe the grading operations. Further recommendations may be made in the field, depending on the actual conditions encountered.

FOUNDATION DESIGN:

If the site is prepared as recommended, the proposed structures may be safely founded on conventional spread foundations, either individual spread footings and/or continuous wall footings, bearing on a minimum of 24 inches of properly compacted soil. Footings should be a minimum of 12 inches wide and should be established at a minimum depth of 12 inches below lowest adjacent final subgrade level. For the minimum width and depth, footings may be designed for a maximum safe net soil bearing pressure of 1,500 pounds per square foot (psf) for dead plus live loads. This maximum net allowable bearing pressure may be increased by 450 psf for each additional foot of width and by 1,100 psf for each additional foot of depth to a maximum safe soil bearing pressure of 5,000 pounds per square foot for dead plus live loads. Compacted fill was assumed to be of a wet unit weight of 130 pounds per cubic foot (pcf), internal frictional angle of 32 degrees and zero cohesion, based on our laboratory test results of on-site near-surface materials. A constrained modulus of 1,100 tons per square foot (tsf) was also assumed for recompacted fill. These parameters may be confirmed during grading.



The allowable net bearing pressures are based on a factor of safety of 3.0 against shear failure or an allowable settlement of 1/2 inch, whichever is less. The allowable bearing pressures are net values. The effective stress at the footing depth of $130 \times D$ psf, where D is footing depth, should be added to the net values to obtain total allowable bearing pressure, if needed.

These bearing values may be increased by one-third for wind or seismic loading.

Footings should be set back from all slopes in accordance with information contained in Appendix "E-3".

For footings thus designed and constructed, we would anticipate a maximum settlement (including static and seismic) of 1/2 inch or less. Differential settlement between similarly loaded adjacent footings is expected to be approximately one-half the total settlement.

LATERAL LOADING:

Resistance to lateral loads will be provided by passive earth pressure and base friction. For footings bearing against compacted fill, passive earth pressure may be considered to be developed at a rate of 420 psf per foot of depth. Base friction may be computed using a friction coefficient of 0.39 between cast-in-place concrete and compacted underlying soils. Base friction and passive earth pressure may be combined without reduction.

Other than conservative soil modeling, the lateral passive earth pressure and base friction values recommended do not include factors of safety. If the design is to be based on allowable lateral resistance values, we recommend that a minimum factor of safety of 1.5 be applied to the friction coefficient. For passive lateral earth pressure, a factor of safety of 1.5 or 2.0 may be applied. The resulting allowable lateral resistance values are:



Allowable Lateral Resistance			
Lateral Resistance	Ultimate	Allowable	Factor of Safety
Passive Lateral Earth Pressure (psf/ft)	420	280	1.5
Passive Lateral Earth Pressure (psf/ft)	420	210	2.0
Base Friction Coefficient	0.39	0.26	1.5

For preliminary retaining wall design or shoring design, a lateral active earth pressure developed at a rate of 40 psf per foot of depth should be utilized for unrestrained conditions.

For restrained conditions, an at-rest earth pressure of 61 psf per foot of depth should be utilized. The "at-rest" condition applies toward braced walls that are not free to tilt. The "active" condition applies toward unrestrained cantilevered walls where wall movement is anticipated. The structural designer should use judgment in determining the wall fixity and may utilize values interpolated between the "at-rest" and "active" conditions where appropriate.

For the design of tied-back or braced shoring, we recommend the use of a rectangularly distributed apparent earth pressure for calculating the total load. In cases where the grade is level behind the shoring, the recommended pressure distribution is rectangular, with the maximum pressure equal to $26H$ in pounds per square foot (Enclosure "D-3[e]"), where H is the height of the shoring in feet. The design engineer should refer to FHWA-IF-99-015 or the latest Caltrans "Trenching and Shoring Manual" for the recommended apparent earth pressure diagram.

For walls 10 feet high or less, a uniform construction surcharge load of 72 psf or an alternative traffic surcharge load of 100 psf should be applied in addition to active earth pressure. If the wall is higher than 10 feet, a uniform construction surcharge load of 72 psf or an alternative traffic surcharge load of 100 psf should be applied only up to 10 feet. The resulting additional surcharge pressure should be applied to the wall as a rectangular distribution, from top to bottom, or 10 feet, whichever is smaller.



These values should be verified prior to construction when the backfill materials and conditions have been determined. These values are applicable only to level, properly drained backfill with no additional surcharge loadings and do not include a factor of safety other than conservative modeling of the soil strength parameters. If inclined backfills are proposed, this firm should be contacted to develop appropriate active earth pressure parameters. If import material is to be utilized for backfill, an engineer from this firm should verify the backfill has equivalent or superior strength values.

Backfill behind retaining walls should consist of a soil of sufficient granularity that the backfill will properly drain. The granular soil should be classified per the USCS as GW, GP, SW, SP, SW-SM or SP-SM. Surface drainage should be provided to prevent ponding of water behind walls. A drainage system consisting of either of the following should be installed behind all retaining walls:

1. A 4-inch diameter perforated PVC (Schedule 40) pipe or equivalent at the base of the stem encased in 2 cubic feet of granular drain material per linear foot of pipe or
2. Synthetic drains such as Enkadrain, Miradrain, Hydraway 300 or equivalent.

Perforations in the PVC pipe should be 3/8 inch in diameter. Granular drain material should be wrapped with filter cloth, such as Mirafi 140 or equivalent, to prevent clogging of the drains with fines. Walls should be waterproofed to prevent nuisance seepage. Water should outlet to an approved drain.

SEISMIC LATERAL EARTH PRESSURE (CANTILEVERED WALL):

The seismic earth pressure acting on a cantilevered retaining wall was calculated by the Mononobe-Okabe ("M-O") method (Okabe, 1926; Mononobe and Matsuo, 1929). According to AASHTO (LRFD Bridge Design Specifications, Sixth Edition, 2012, Section C11.8.6.2 and A11.3.2), the resulting pseudostatic horizontal seismic coefficient, k_h , could be reduced by 50 percent when 1.0 to 2.0 inches of permanent ground deformation is permitted during the design seismic event, i.e., the



pseudostatic horizontal seismic coefficient (k_h) be taken equal to one-half of the PGA, which equates to 0.445g. The pseudostatic vertical seismic coefficient (k_v) is usually taken as 0.0g in accordance with AASHTO (2012). For retaining walls with on-site soils as backfill materials, a unit weight of 130 pcf and a friction angle of 32 degrees were utilized in the calculation. These values should be verified prior to construction when the backfill materials and conditions have been determined and are applicable only to level, properly drained backfill with no additional surcharge loadings.

The total lateral active seismic earth pressure (including static active earth pressure) developed at a rate of 93 psf per foot of depth should be utilized for unrestrained conditions. A triangular distribution of total seismic earth pressure (Enclosure "D-3[c]") should be used in the design (Atik & Sitar, 2010).

The above lateral earth pressures are for level backfill. If inclined backfills are proposed, this firm should be contacted.

SLOPE CONSTRUCTION:

Cut and fill slopes should be constructed no steeper than 2(h):1(v). Fill slopes should be overfilled during construction and then cut back to expose fully compacted soil. A suitable alternative would be to compact the slopes during construction and then roll the final slopes to provide dense, erosion-resistant surfaces.

Where fills are to be placed against existing slopes steeper than 5(h):1(v), the existing slopes should be benched to expose competent native materials to provide a series of level benches to seat the fill. The benches should be a minimum of 8 feet in width, constructed at approximately 4-foot vertical intervals. In addition, a shear key should be constructed across the toe of the slope. The shear key should be a minimum of 15 feet wide and should penetrate beneath the toe of the slope a minimum of 2 feet into approved bedrock material or approved firm competent soils.



Where fill over cut slope will occur, the cut portion should be overexcavated and replaced as compacted fill to a distance of at least 15 feet horizontally behind the slope face.

A typical shear key and slope benching detail is contained in Appendix "E-1".

SLOPE CREEP:

The outer, upper portions of cut and fill slopes will be subject to potential long-term movement due to creep or erosion forces. All proposed improvements planned near or on the top of slopes, including garden walls, flatwork and pools, should be designed and constructed to minimize the effects of this movement. Where possible, improvements should be designed as far from the top of slope as possible. At a minimum, footings should be designed so that there is a least a 5-foot separation from the face of the slope to the face of the footing. This may necessitate deepened footings. The actual design of such walls will be based on the wall-loading conditions and the earth pressure required to resist these loads. This will fall under the purview of the wall designer, who should consult this firm if actual earth pressure information is required.

SLOPE PROTECTION:

Inasmuch as the native materials are susceptible to erosion by wind and running water, it is our recommendation that the slopes at the project be planted as soon as possible after completion. The use of succulent ground covers, such as iceplant or sedum, is not recommended. If watering is necessary to sustain plant growth on slopes, then the watering operation should be monitored to assure proper operation of the water system and to prevent over watering. Measures should be provided to prevent surface water from flowing over slope faces.

SUBDRAINS:

Fill construction may involve placement of relatively permeable fill over bedrock. The result may be conditions conducive to ponding or perching of landscape irrigation water at the fill/bedrock interfaces. Subdrains may be recommended at the time of grading based on conditions observed by the engineering geologist. A typical subdrain design is included in Appendix "E-2" of this report.



If encountered, springs or seeps in cut areas or areas with a potential for springs and seeps should be evaluated on a case-by-case basis as to a requirement for mitigation. Recommendations for subdrains or alternative mitigation may be made by the engineering geologist at the time of grading.

SLABS-ON-GRADE:

With the mandatory removal and recompaction as recommended in "Initial Site Preparation" section, there should be adequate compacted soil to support concrete slabs-on-grade. Concrete slabs-on-grade should be a minimum of 4 inches in thickness. The soil should be compacted to 90 percent relative compaction. The final pad surfaces should be rolled to provide smooth, dense surfaces.

Slabs to receive moisture-sensitive coverings should be provided with a moisture vapor retarder. We recommend that a vapor retarder be designed and constructed according to the American Concrete Institute 302.1R, "Concrete Floor and Slab Construction", which addresses moisture vapor retarder construction. At a minimum, the vapor retarder/barrier should comply with ASTM E1745 and have a nominal thickness of at least 10 mils. The vapor retarder/barrier should be properly sealed, per the manufacturer's recommendations, and protected from punctures and other damage. Per the Portland Cement Association (www.cement.org/tech/cct_con_vapor_retarders.asp), for slabs with vapor-sensitive coverings, a layer of dry, granular material (sand) should be placed under the vapor retarder/barrier. For slabs in humidity-controlled areas, a layer of dry, granular material (sand) should be placed above the vapor retarder/barrier.

POTENTIAL EROSION:

The potential for erosion should be mitigated by proper drainage design. Water should not be allowed to flow over graded areas or natural areas so as to cause erosion. Graded areas should be planted or otherwise protected from erosion by wind or water.

EXPANSIVE SOILS:

Because all soils materials encountered during this investigation were sufficiently granular to be non-critically expansive, specialized construction procedures to specifically resist expansive soil forces



are not anticipated at this time. Requirements for reinforcing steel to satisfy structural criteria are not affected by this recommendation. Additional evaluation of soils for expansion potential may be conducted by the soils engineer during the grading operation.

SOIL CORROSION:

A selected sample of material was delivered to our subconsultant, HDR, for soil corrosivity testing. Laboratory testing consisted of pH, resistivity and major soluble salts commonly found in soils. The results of the laboratory tests appear in Enclosure "C-6". These tests have been performed in order to screen the site for potentially corrosive soils.

Resistivity values from the soil tested are considered "mildly corrosive" and "corrosive" corrosive to ferrous metals at the site at as-received and saturated conditions, respectively. Specific corrosion control measures, such as coating of pipe with non-corrosive material or alternative non-metallic pipe material, are considered to be needed if there is potential of saturation.

Results of the soluble sulfate testing indicate a "not applicable" (Class S0) anticipated exposure to sulfate attack in localized areas, as indicated on the enclosed test results. Based on the criteria from Table 4.2.1 of the "American Concrete Institute Manual of Concrete Practice (2011)", no special measures, such as specific cement types or water-cement ratios, will be needed for this "not applicable" exposure to sulfate attack.

Soluble chloride content of soil was not at levels high enough to be of concern with respect to corrosion of reinforcing steel. The results should be considered in combination with the soluble chloride content of the hardened concrete in determining the effect of chloride on the corrosion of reinforcing steel.

Testing indicated that ammonium content is not considered corrosive to copper, and nitrate content is corrosive to copper.



CHJ Consultants does not practice corrosion engineering. If further information concerning the corrosion characteristics or if interpretation of the results submitted herein is required, then a competent corrosion engineer should be consulted.

ADDITIONAL RECOMMENDATIONS

PRE-JOB CONFERENCE:

It is imperative that no clearing and/or grading operations be performed without the presence of a representative of the geotechnical engineer. An on-site pre-job meeting with the owner, the contractor and the geotechnical engineer should occur prior to all grading-related operations. It should be stressed that operations undertaken at the site without the presence of the geotechnical engineer may result in exclusions of affected areas from the final compaction report for the project.

CONSTRUCTION OBSERVATION:

All grading operations, including site clearing and stripping, should be observed by a representative of the geotechnical engineer. The geotechnical engineer's field representative will provide observation and field testing and will not supervise or direct any of the actual work of the contractor, his employees or agents. Neither the presence of the geotechnical engineer's field representative nor the observations and testing by the geotechnical engineer shall excuse the contractor in any way for defects discovered in his work. It is understood that the geotechnical engineer will not be responsible for job or site safety on this project, which will be the sole responsibility of the contractor.

LIMITATIONS

CHJ Consultants has striven to perform our services within the limits prescribed by our client and in a manner consistent with the usual thoroughness and competence of reputable geotechnical engineers and engineering geologists practicing under similar circumstances. No other representation, express or implied, and no warranty or guarantee is included or intended by virtue of the services performed or reports, opinion, documents, or otherwise supplied.



This report reflects the testing conducted on the site as the site existed during the investigation, which is the subject of this report. However, changes in the conditions of a property can occur with the passage of time, due to natural processes or the works of man on this or adjacent properties. Changes in applicable or appropriate standards may also occur whether as a result of legislation, application or the broadening of knowledge. Therefore, this report is indicative of only those conditions tested at the time of the subject investigation, and the findings of this report may be invalidated fully or partially by changes outside of the control of CHJ Consultants. This report is therefore subject to review and should not be relied upon after a period of one year.

The conclusions and recommendations in this report are based upon observations performed and data collected at separate locations, and interpolation between these locations, carried out for the project and the scope of services described. It is assumed and expected that the conditions between locations observed and/or sampled are similar to those encountered at the individual locations where observation and sampling was performed. However, conditions between these locations may vary significantly. Should conditions that appear different from those described herein be encountered in the field by the client or any firm performing services for the client or the client's assign, this firm should be contacted immediately in order that we might evaluate their effect.

If this report or portions thereof are provided to contractors or included in specifications, it should be understood by all parties that they are provided for information only and should be used as such.

The report and its contents resulting from this investigation are not intended or represented to be suitable for reuse on extensions or modifications of the project or for use on any other project.

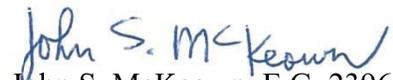


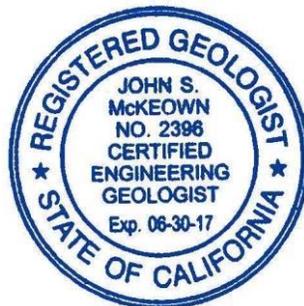
CLOSURE

We appreciate this opportunity to be of service and trust this report provides the information desired at this time. Should questions arise, please do not hesitate to contact this firm at your convenience.

Respectfully submitted,

CHJ CONSULTANTS


John S. McKeown, E.G. 2396
Project Geologist




Fred Yi, Ph.D., G.E. 2967
Chief Engineer




Robert J. Johnson, G.E. 443
President



JSM/FY/RJJ:lb



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AERIAL PHOTOGRAPHS EXAMINED

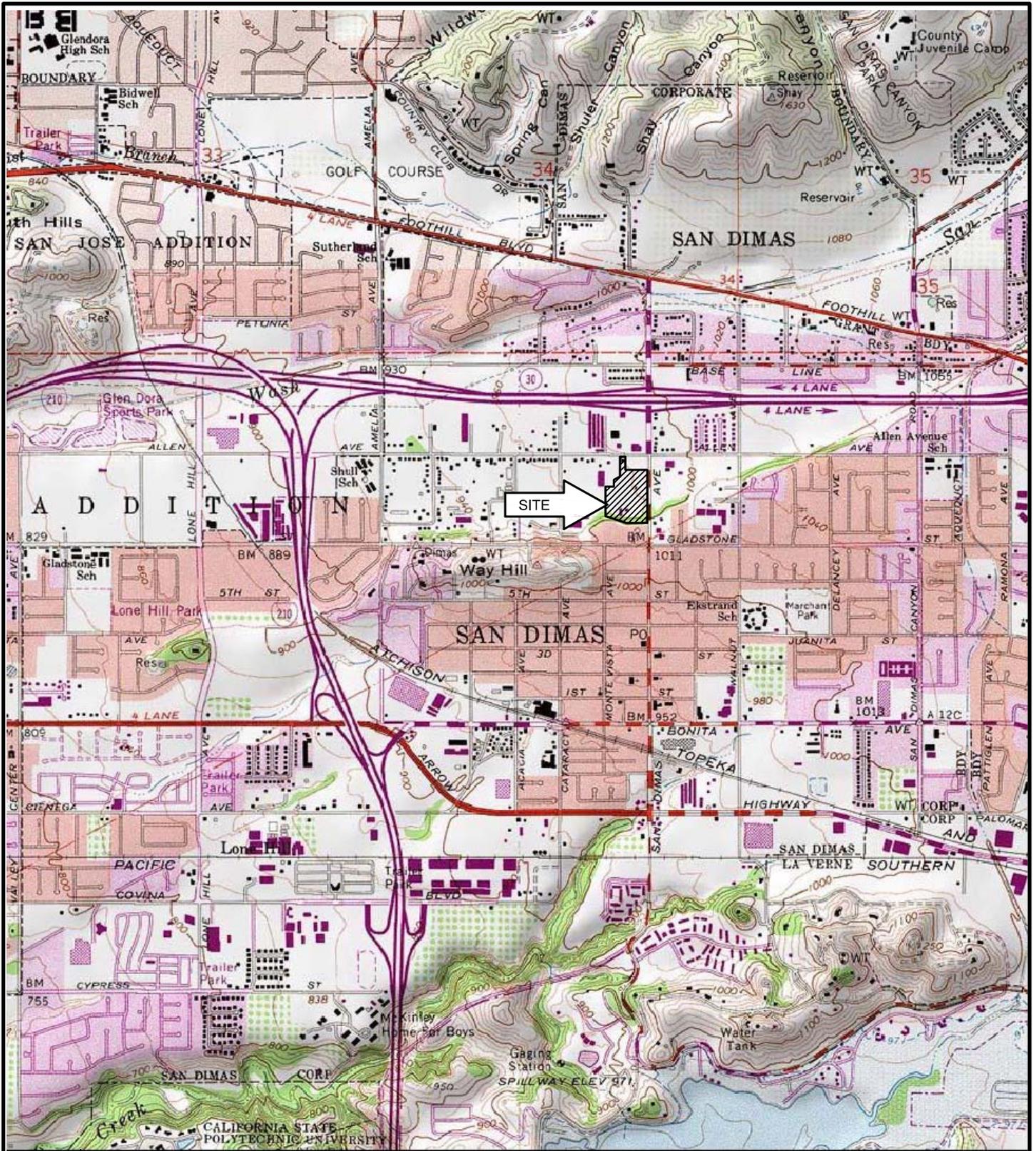
Google Earth web-based software application, 2015, aerial imagery dated May 31, 1994; June 4, 2002; November 30, 2003; August 18, 2005; March 15, 2006; October 22, 2007; March 7, 2011; April 16, 2013; April 23, 2014; and March 24, 2015

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APPENDIX "A"

GEOTECHNICAL MAPS



INDEX MAP

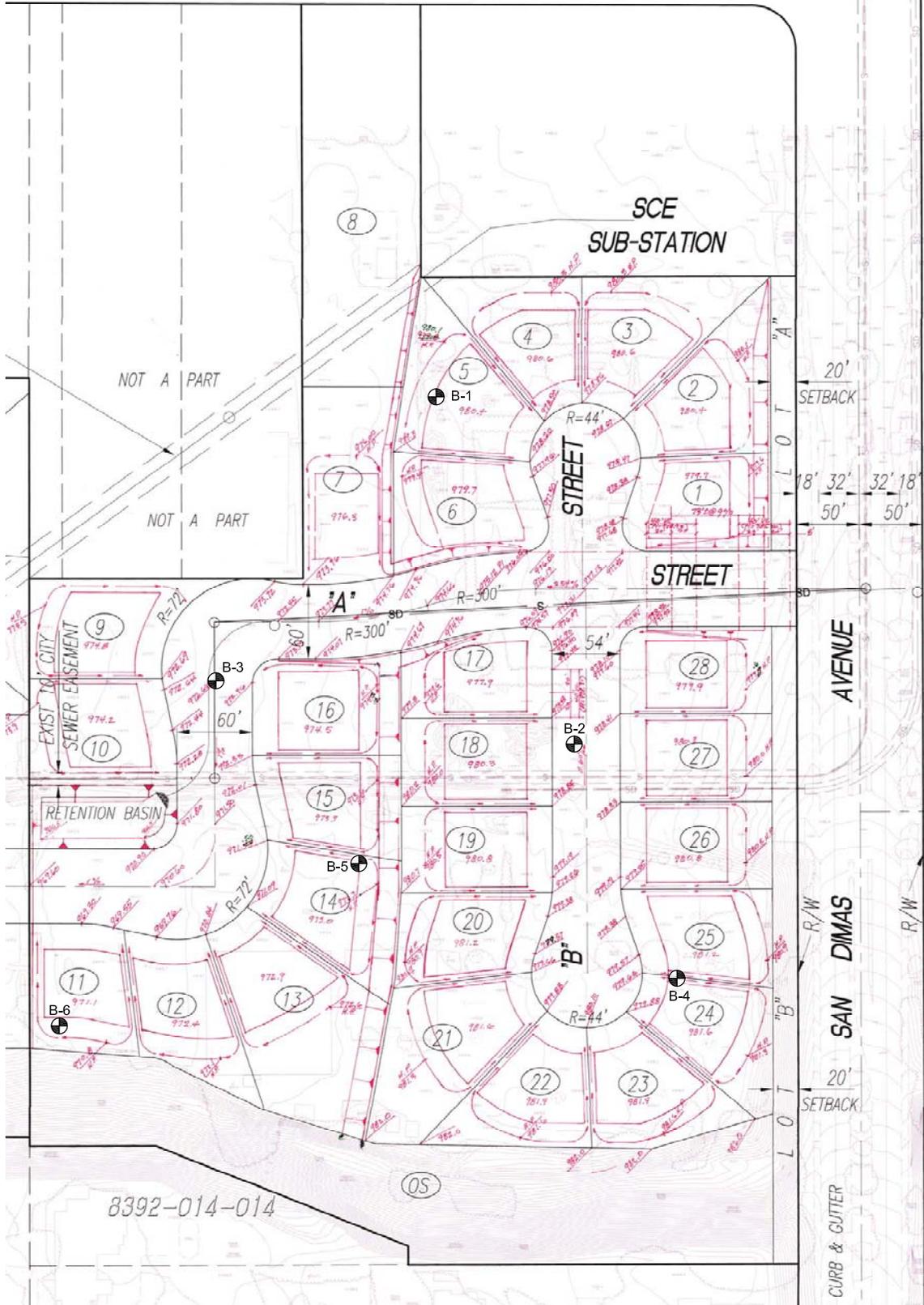
FOR: MJW INVESTMENTS, LLC
 DATE: JULY 2015

GEOTECHNICAL INVESTIGATION
 PROPOSED 28-LOT RESIDENTIAL DEVELOPMENT
 WEST OF SAN DIMAS AVENUE BETWEEN WEST
 GLADSTONE STREET AND ALLEN AVENUE
 SAN DIMAS, CALIFORNIA

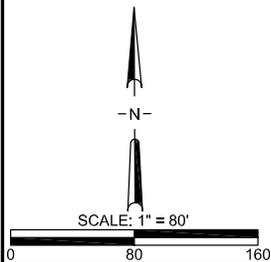
ENCLOSURE "A-1"
 JOB NUMBER 15369-3

SCALE: 1" = 2000'

ALLEN AVENUE



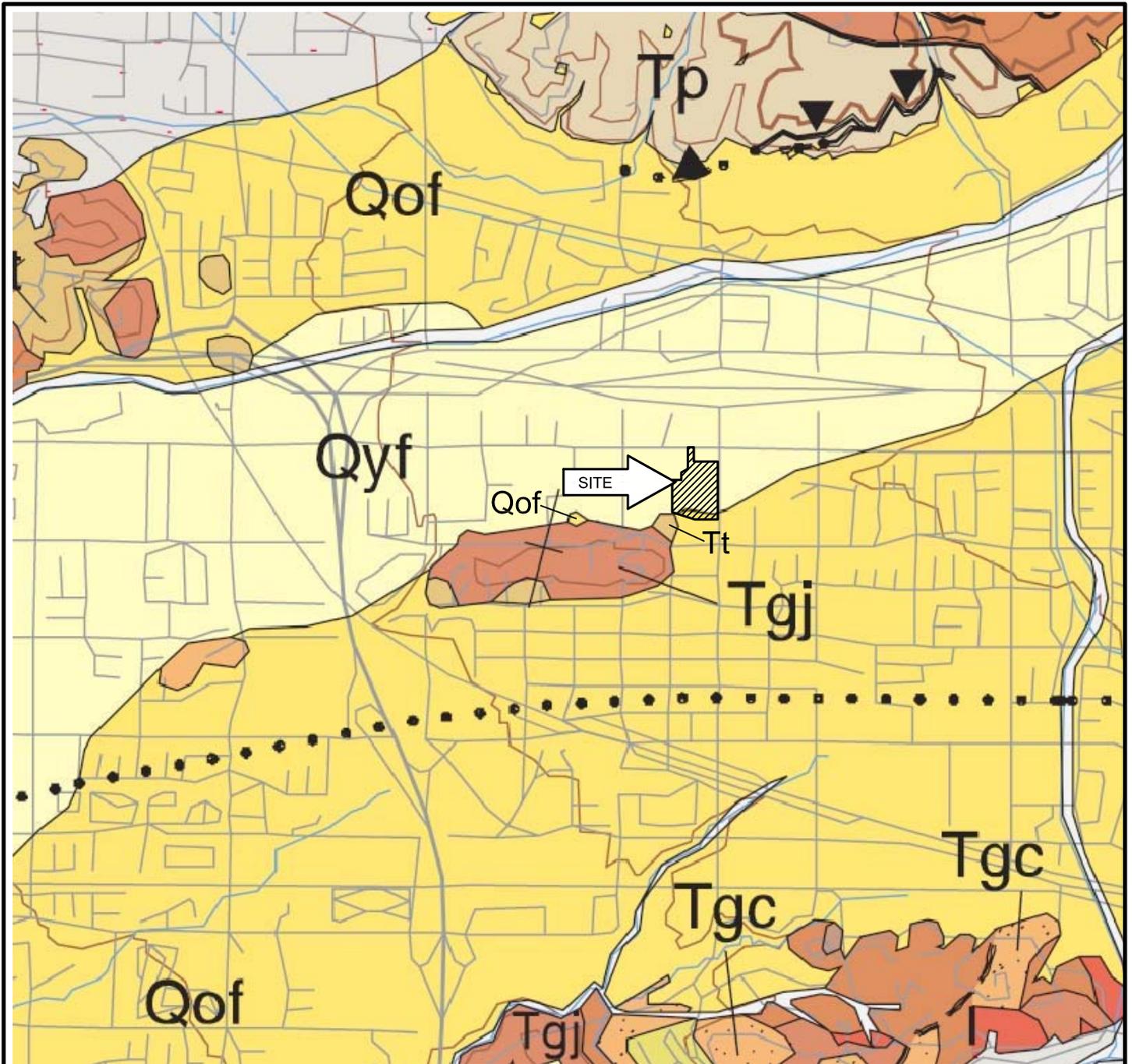
8392-014-014



LEGEND:

	B-6
	EXPLORATORY BORING

SITE PLAN		
FOR:	MJW INVESTMENTS, LLC	ENCLOSURE "A-2"
DATE:	JULY 2015	JOB NUMBER 15369-3
GEOTECHNICAL INVESTIGATION PROPOSED 28-LOT RESIDENTIAL DEVELOPMENT WEST OF SAN DIMAS AVENUE BETWEEN WEST GLADSTONE STREET AND ALLEN AVENUE SAN DIMAS, CALIFORNIA		

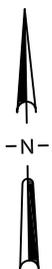


(Base Map: Morton & Miller, 2006)

GEOLOGIC UNITS:

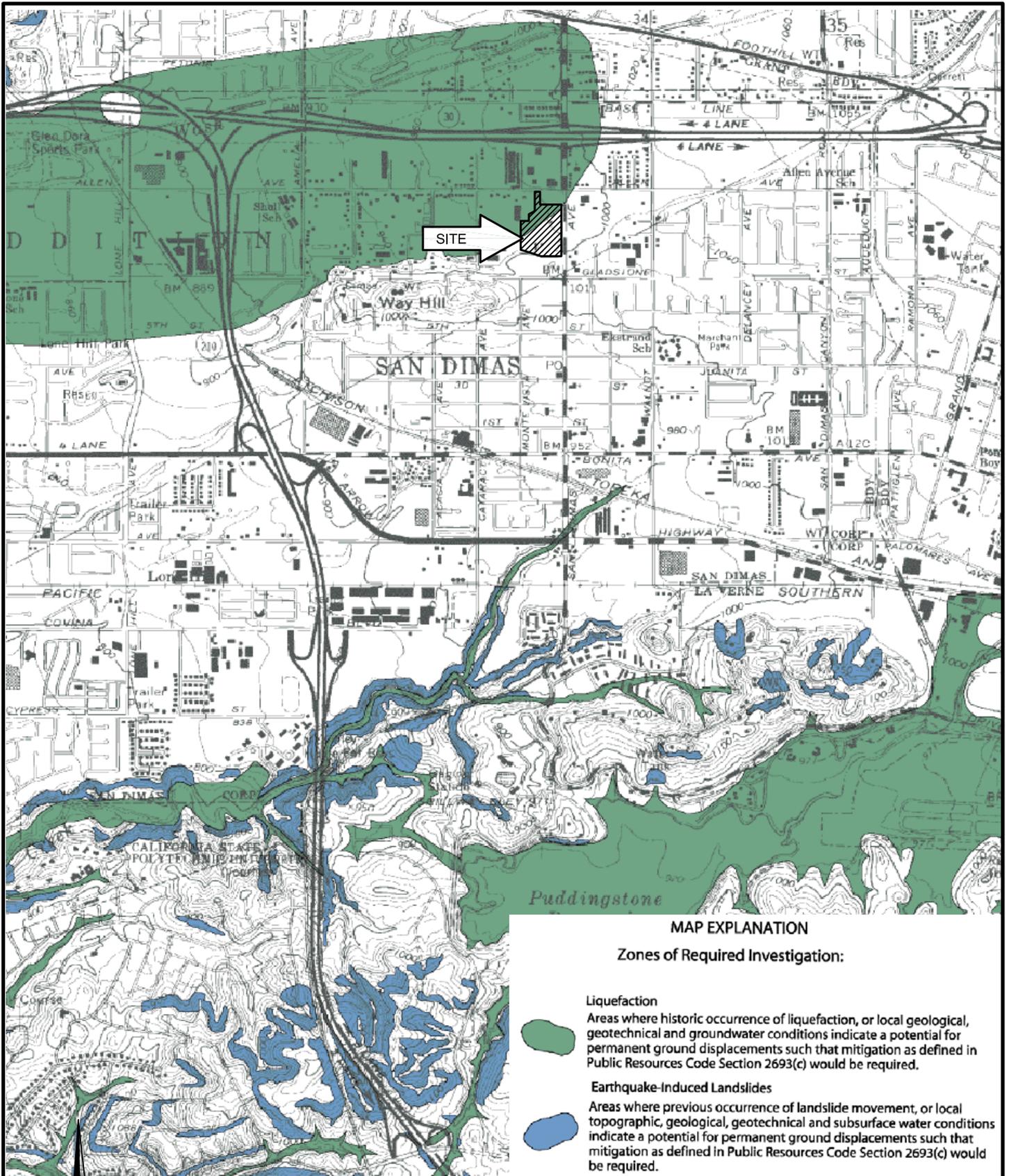
Tt - Topanga marine siltstone or
 Tp Puente Formation marine siltstone
 Qyf - young alluvial fan deposits
 Qof - old alluvial fan deposits
 Tgj - tuff breccia of Johnson Peak area

~~~~~ geologic contact  
 ..... postulated fault, concealed



SCALE: 1" = 2000'

| <b>GEOLOGIC INDEX MAP</b>           |                                                                                                                                                                                     |                              |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>FOR:</b><br>MJW INVESTMENTS, LLC | <b>GEOTECHNICAL INVESTIGATION</b><br>PROPOSED 28-LOT RESIDENTIAL DEVELOPMENT<br>WEST OF SAN DIMAS AVENUE BETWEEN WEST<br>GLADSTONE STREET AND ALLEN AVENUE<br>SAN DIMAS, CALIFORNIA | <b>ENCLOSURE</b><br>"A-3"    |
| <b>DATE:</b><br>JULY 2015           |                                                                                                                                                                                     | <b>JOB NUMBER</b><br>15369-3 |
|                                     |                                                                                                                                                                                     | <b>CHJ</b> Consultants       |



**MAP EXPLANATION**

**Zones of Required Investigation:**

- Liquefaction**  
 Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.
- Earthquake-Induced Landslides**  
 Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

**SEISMIC HAZARD ZONES MAP**

FOR:  
**MJW INVESTMENTS, LLC**

DATE:  
**JULY 2015**

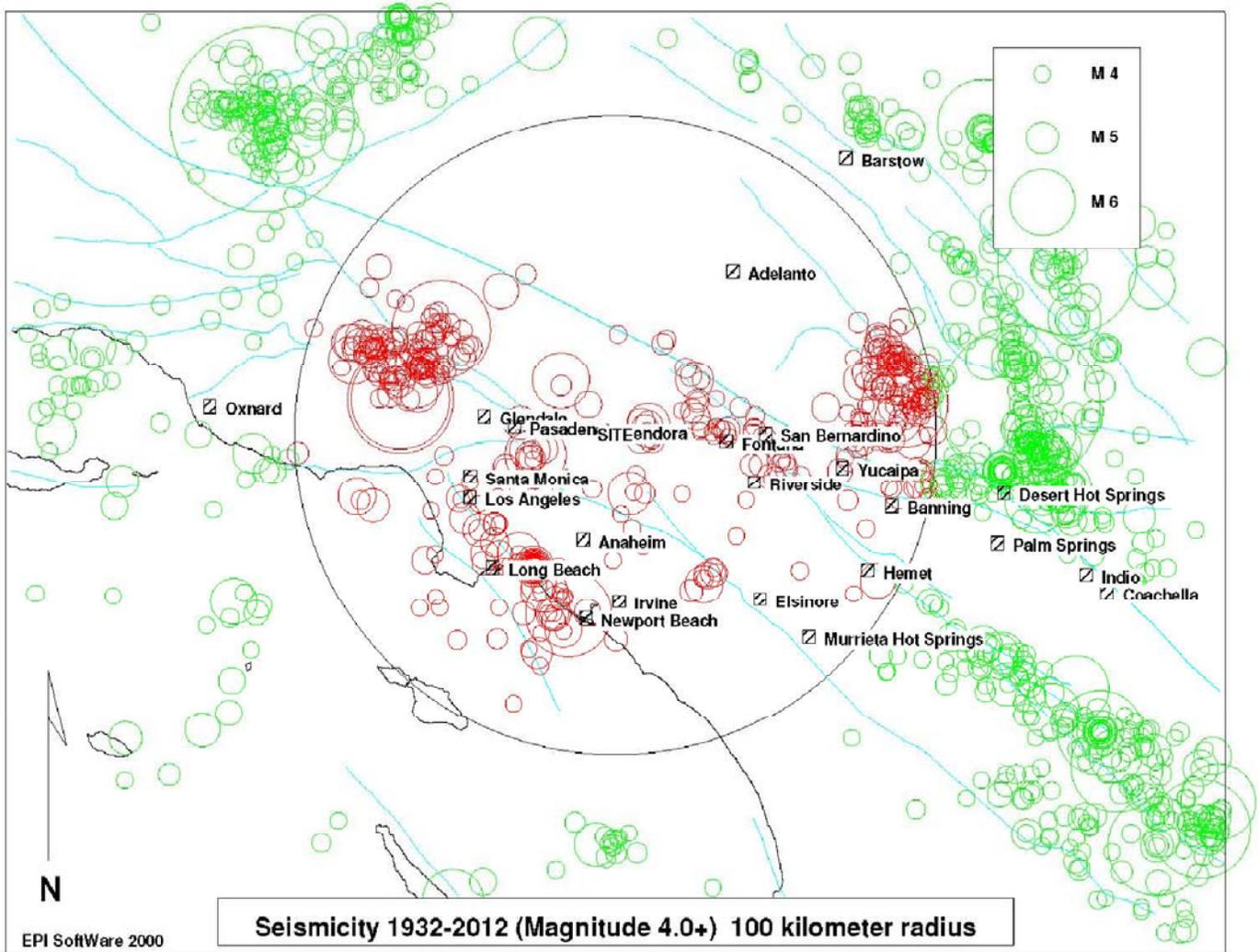
GEOTECHNICAL INVESTIGATION  
 PROPOSED 28-LOT RESIDENTIAL DEVELOPMENT  
 WEST OF SAN DIMAS AVENUE BETWEEN WEST  
 GLADSTONE STREET AND ALLEN AVENUE  
 SAN DIMAS, CALIFORNIA

ENCLOSURE  
**"A-4"**

JOB NUMBER  
**15369-3**



SCALE: 1" = 2000'



SITE LOCATION: 34.1160 LAT. -117.8082 LONG.

MINIMUM LOCATION QUALITY: C

TOTAL # OF EVENTS ON PLOT: 1419

TOTAL # OF EVENTS WITHIN SEARCH RADIUS: 503

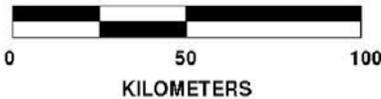
MAGNITUDE DISTRIBUTION OF SEARCH RADIUS EVENTS:

- 4.0- 4.9 : 452
- 5.0- 5.9 : 46
- 6.0- 6.9 : 5
- 7.0- 7.9 : 0
- 8.0- 8.9 : 0

CLOSEST EVENT: 4.8 ON TUESDAY, APRIL 17, 1990 LOCATED APPROX. 8 KILOMETERS EAST OF THE SITE

LARGEST 5 EVENTS:

- 6.7 ON MONDAY, JANUARY 17, 1994 LOCATED APPROX. 67 KILOMETERS WEST OF THE SITE
- 6.6 ON MONDAY, JANUARY 17, 1994 LOCATED APPROX. 67 KILOMETERS WEST OF THE SITE
- 6.6 ON TUESDAY, FEBRUARY 09, 1971 LOCATED APPROX. 63 KILOMETERS NORTHWEST OF THE SITE
- 6.4 ON SUNDAY, JUNE 28, 1992 LOCATED APPROX. 90 KILOMETERS EAST OF THE SITE
- 6.4 ON SATURDAY, MARCH 11, 1933 LOCATED APPROX. 57 KILOMETERS SOUTH OF THE SITE



## EARTHQUAKE EPICENTER MAP

|                                     |                                                                                                                                                                              |                           |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| FOR:<br><b>MJW INVESTMENTS, LLC</b> | GEOTECHNICAL INVESTIGATION<br>PROPOSED 28-LOT RESIDENTIAL DEVELOPMENT<br>WEST OF SAN DIMAS AVENUE BETWEEN WEST<br>GLADSTONE STREET AND ALLEN AVENUE<br>SAN DIMAS, CALIFORNIA | ENCLOSURE<br><b>"A-5"</b> |
| DATE:<br>JULY 2015                  |                                                                                                                                                                              | JOB NUMBER<br>15369-3     |



**APPENDIX "B"**

**EXPLORATORY LOGS**



## KEY TO LOGS

### LEGEND OF LAB/FIELD TESTS:

|           |                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Blows     | A measure of the penetration resistance of soil expressed as the number of hammer blows required to advance the indicated sampler 6 inches (or less if noted). Samplers are driven with an automatic hammer that drops a 140-pound weight 30 inches for each blow. After the required seating, samplers are advanced up to 18 inches ahead of the boring, providing a set of up to 3 blowcounts per drive. |
| Bulk      | Indicates Disturbed or Bulk Sample                                                                                                                                                                                                                                                                                                                                                                         |
| Cor.      | Chemical/Corrosivity Tests (ASTM G187)                                                                                                                                                                                                                                                                                                                                                                     |
| Dist.     | Indicates Disturbed Sample                                                                                                                                                                                                                                                                                                                                                                                 |
| DS        | Direct Shear Test (ASTM D 3080)                                                                                                                                                                                                                                                                                                                                                                            |
| MDC       | Maximum Density Optimum Moisture Test (ASTM D 1557)                                                                                                                                                                                                                                                                                                                                                        |
| N.R.      | Indicates No Recovery of Sample                                                                                                                                                                                                                                                                                                                                                                            |
| Pass #200 | Wash through #200 Screen (ASTM C117)                                                                                                                                                                                                                                                                                                                                                                       |
| Ring      | Indicates Relatively Undisturbed Ring Sample. The number of blows per 6 inches required to drive a "Modified California Sampler" (3.0" O.D. and 2.42" I.D.) 18 inches using a 140-pound weight falling 30 inches was recorded.                                                                                                                                                                             |
| SA        | Sieve Analysis (ASTM C 117/136)                                                                                                                                                                                                                                                                                                                                                                            |
| SPT       | Indicates a sample obtained with an unlined Standard Penetration Test sampler (2" O.D. and 1-3/8" I.D.)                                                                                                                                                                                                                                                                                                    |

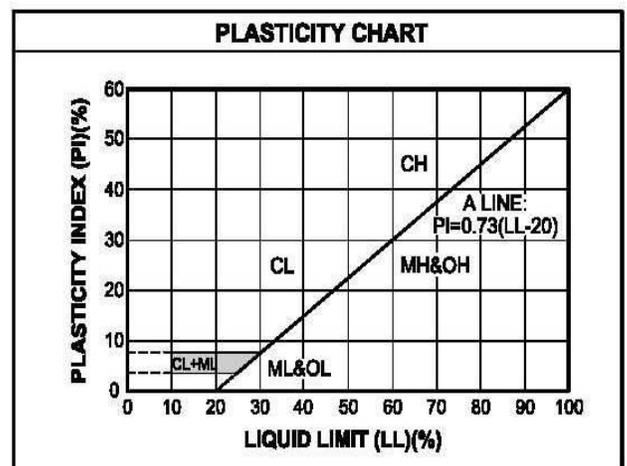


## UNIFIED SOIL CLASSIFICATION SYSTEM

| UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART                                                 |                                                                                                                              |  |
|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|--|
| <b>COARSE-GRAINED SOILS</b><br>(more than 50% of material is larger than No. 200 sieve size) |                                                                                                                              |  |
| Clean Gravels (Less than 5% fines)                                                           |                                                                                                                              |  |
| <b>GRAVELS</b><br>More than 50% of coarse fraction larger than No.4 sieve size               | <b>GW</b> Well-graded gravels, gravel-sand mixtures, little or no fines                                                      |  |
|                                                                                              | <b>GP</b> Poorly-graded gravels, gravel-sand mixtures, little or no fines                                                    |  |
|                                                                                              | Gravels with fines (More than 12% fines)                                                                                     |  |
|                                                                                              | <b>GM</b> Silty gravels, gravel-sand-silt mixtures                                                                           |  |
| <b>GC</b> Clayey gravels, gravel-sand-clay mixtures                                          |                                                                                                                              |  |
| Clean Sands (Less than 5% fines)                                                             |                                                                                                                              |  |
| <b>SANDS</b><br>50% or more of coarse fraction smaller than No.4 sieve size                  | <b>SW</b> Well-graded sands, gravelly sands, little or no fines                                                              |  |
|                                                                                              | <b>SP</b> Poorly graded sands, gravelly sands, little or no fines                                                            |  |
|                                                                                              | Sands with fines (More than 12% fines)                                                                                       |  |
|                                                                                              | <b>SM</b> Silty sands, sand-silt mixtures                                                                                    |  |
| <b>SC</b> Clayey sands, sand-clay mixtures                                                   |                                                                                                                              |  |
| <b>FINE-GRAINED SOILS</b><br>(50% or more of material is smaller than No. 200 sieve size)    |                                                                                                                              |  |
| <b>SILTS AND CLAYS</b><br>Liquid limit less than 50%                                         | <b>ML</b> Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts with slight plasticity |  |
|                                                                                              | <b>CL</b> Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays                  |  |
|                                                                                              | <b>OL</b> Organic silts and organic silty clays of low plasticity                                                            |  |
| <b>SILTS AND CLAYS</b><br>Liquid limit 50% or greater                                        | <b>MH</b> Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts                                |  |
|                                                                                              | <b>CH</b> Inorganic clays of high plasticity, fat clays                                                                      |  |
|                                                                                              | <b>OH</b> Organic clays of medium to high plasticity, organic silts                                                          |  |
| <b>HIGHLY ORGANIC SOILS</b>                                                                  | <b>PT</b> Peat and other highly organic soils                                                                                |  |

| LABORATORY CLASSIFICATION CRITERIA                                                                                                            |                                                                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| $GW \quad C_u = \frac{D_{60}}{D_{10}} \text{ greater than } 4; C_c = \frac{D_{30}^2}{D_{10} \times D_{60}} \text{ between } 1 \text{ and } 3$ |                                                                                                              |
| <b>GP</b> Not meeting all gradation requirements for GW                                                                                       |                                                                                                              |
| <b>GM</b> Atterberg limits below "A" line or P.I. less than 4                                                                                 | Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.                 |
| <b>GC</b> Atterberg limits above "A" line with P.I. greater than 7                                                                            |                                                                                                              |
| $SW \quad C_u = \frac{D_{60}}{D_{10}} \text{ greater than } 6; C_c = \frac{D_{30}^2}{D_{10} \times D_{60}} \text{ between } 1 \text{ and } 3$ |                                                                                                              |
| <b>SP</b> Not meeting all gradation requirements for SW                                                                                       |                                                                                                              |
| <b>SM</b> Atterberg limits below "A" line or P.I. less than 4                                                                                 | Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols. |
| <b>SC</b> Atterberg limits above "A" line with P.I. greater than 7                                                                            |                                                                                                              |

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size).  
 Coarse-grained soils are classified as follows:  
 Less than 5 percent.....GW, GP, SW, SP  
 More than 12 percent.....GM, GC, SM, SC  
 5 to 12 percent.....Borderline cases requiring dual symbols



# EXPLORATORY BORING NO. 1

Date Drilled: 7/22/15

Client: MJW Investments

Equipment: CME75 Truck Rig

Driving Weight / Drop / Sampler Size: 140lbs./30in./3.0" O.D.

Surface Elevation(ft): N/A

Logged by: JMcK

Measured Depth to Water(ft): N/A

| DEPTH (ft) | GRAPHIC LOG | VISUAL CLASSIFICATION                                                              | REMARKS             | SAMPLES |      | BLOWS/6 IN. | FIELD MOISTURE (%) | DRY UNIT WT. (pcf) | LAB/FIELD TESTS |
|------------|-------------|------------------------------------------------------------------------------------|---------------------|---------|------|-------------|--------------------|--------------------|-----------------|
|            |             |                                                                                    |                     | DRIVE   | BULK |             |                    |                    |                 |
|            |             | (SM) Silty Sand, fine to medium, dark brownish gray                                | Fill                | X       | X    |             | 5.2                |                    | SPT             |
|            |             |                                                                                    |                     | X       |      | 4           |                    |                    |                 |
|            |             |                                                                                    |                     | X       |      | 4           |                    |                    |                 |
|            |             |                                                                                    |                     | X       |      | 4           |                    |                    |                 |
| 5          |             | (SP-SM) Sand, fine to medium with coarse, with silt and gravel to 1/2", gray-brown | Native              | X       | X    |             | 2.8                |                    |                 |
|            |             |                                                                                    |                     | X       |      | 3           |                    |                    | Pass #200, SPT  |
|            |             |                                                                                    |                     | X       |      | 4           |                    |                    |                 |
|            |             |                                                                                    |                     | X       |      | 5           |                    |                    |                 |
| 10         |             |                                                                                    |                     | X       |      | 5           |                    |                    | Pass #200, SPT  |
|            |             |                                                                                    |                     | X       |      | 3           |                    |                    |                 |
|            |             |                                                                                    |                     | X       |      | 2           |                    |                    |                 |
| 15         |             |                                                                                    |                     | X       |      | 10          |                    |                    | Pass #200, SPT  |
|            |             |                                                                                    |                     | X       |      | 12          |                    |                    |                 |
|            |             |                                                                                    |                     | X       |      | 9           |                    |                    |                 |
| 20         |             |                                                                                    |                     | X       |      | 26          |                    |                    | Pass #200, SPT  |
|            |             |                                                                                    |                     | X       |      | 25          |                    |                    |                 |
|            |             |                                                                                    |                     | X       |      | 22          |                    |                    |                 |
| 25         |             |                                                                                    | Heavy Auger Chatter | X       |      | 30          |                    |                    | Pass #200, SPT  |
|            |             |                                                                                    |                     | X       |      | 50          |                    |                    |                 |
| 30         |             |                                                                                    |                     | X       |      | 50/5"       | N.R.               | N.R.               | Pass #200, SPT  |

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28-LOT RESIDENTIAL  
SAN DIMAS, CALIFORNIA

Job No. Enclosure  
15369-3 B-1a

# EXPLORATORY BORING NO. 1

Date Drilled: 7/22/15

Client: MJW Investments

Equipment: CME75 Truck Rig

Driving Weight / Drop / Sampler Size: 140lbs./30in./3.0" O.D.

Surface Elevation(ft): N/A

Logged by: JMcK

Measured Depth to Water(ft): N/A

| DEPTH (ft) | GRAPHIC LOG | VISUAL CLASSIFICATION                                                                  | REMARKS | SAMPLES |      | BLOWS/6 IN.    | FIELD MOISTURE (%) | DRY UNIT WT. (pcf) | LAB/FIELD TESTS |
|------------|-------------|----------------------------------------------------------------------------------------|---------|---------|------|----------------|--------------------|--------------------|-----------------|
|            |             |                                                                                        |         | DRIVE   | BULK |                |                    |                    |                 |
| 40         |             | (SP-SM) Sand, fine to medium with coarse, with silt and gravel to 1/2", gray-brown     |         | X       |      | 50/2"          | N.R.               | N.R.               | Pass #200, SPT  |
| 45         |             | (SM) Silty Sand, fine to coarse, red brown                                             |         | X       |      | 14<br>19<br>31 |                    |                    | Pass #200, SPT  |
| 50         |             |                                                                                        |         | X       |      | 36<br>50/3"    |                    |                    | Pass #200, SPT  |
| 55         |             | END OF BORING<br><br>NO REFUSAL, NO BEDROCK<br>NO GROUNDWATER<br>NO CAVING, FILL TO 3' |         | X       |      | 50             |                    |                    | Pass #200, SPT  |
| 60         |             |                                                                                        |         |         |      |                |                    |                    |                 |
| 65         |             |                                                                                        |         |         |      |                |                    |                    |                 |

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28-LOT RESIDENTIAL  
SAN DIMAS, CALIFORNIA

Job No. 15369-3  
Enclosure B-1b

# EXPLORATORY BORING NO. 2

Date Drilled:

Client: MJW Investments

Equipment:

Driving Weight / Drop / Sampler Size:

Surface Elevation(ft):

Logged by:

Measured Depth to Water(ft):

| DEPTH (ft) | GRAPHIC LOG                                                                 | VISUAL CLASSIFICATION | REMARKS | SAMPLES |                | BLOWS/6 IN. | FIELD MOISTURE (%) | DRY UNIT WT. (pcf) | LAB/FIELD TESTS |
|------------|-----------------------------------------------------------------------------|-----------------------|---------|---------|----------------|-------------|--------------------|--------------------|-----------------|
|            |                                                                             |                       |         | DRIVE   | BULK           |             |                    |                    |                 |
| 5          | (SM) Silty Sand, fine to medium with coarse, with gravel to 2", light brown | Disturbed Native      | X       | X       | 3<br>8<br>17   | 3.2         | Dist.              | Ring               |                 |
|            |                                                                             |                       | X       | X       | 5<br>12<br>11  | 2.9         | Dist.              | Ring               |                 |
|            |                                                                             |                       | X       | X       | 14<br>36<br>32 | N.R.        | N.R.               | Ring               |                 |
|            |                                                                             |                       | X       | X       | 21<br>25<br>26 | N.R.        | N.R.               | Ring               |                 |
|            |                                                                             |                       | X       | X       | 23<br>24<br>50 | N.R.        | N.R.               | Ring               |                 |
| 25         | END OF BORING                                                               | Auger Chatter         | X       | X       | 28<br>50/4"    | 1.7         | Dist.              | Ring               |                 |
| 30         | NO REFUSAL, NO BEDROCK<br>NO GROUNDWATER<br>NO CAVING, NO FILL              |                       |         |         |                |             |                    |                    |                 |

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SAN DIMAS, CALIFORNIA

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# EXPLORATORY BORING NO. 3

Date Drilled:

Client: MJW Investments

Equipment:

Driving Weight / Drop / Sampler Size:

Surface Elevation(ft):

Logged by:

Measured Depth to Water(ft):

| DEPTH (ft) | GRAPHIC LOG | VISUAL CLASSIFICATION                                                       | REMARKS             | SAMPLES |      | BLOWS/6 IN.    | FIELD MOISTURE (%) | DRY UNIT WT. (pcf) | LAB/FIELD TESTS   |
|------------|-------------|-----------------------------------------------------------------------------|---------------------|---------|------|----------------|--------------------|--------------------|-------------------|
|            |             |                                                                             |                     | DRIVE   | BULK |                |                    |                    |                   |
|            |             | (SM) Silty Sand, fine to medium, brown                                      | Native              |         | X    |                | 3.1                |                    | Cor., DS, MDC, SA |
| 5          |             |                                                                             |                     | X       |      | 7<br>24<br>28  | 1.5                | Dist.              | Ring              |
|            |             | (SM) Silty Sand, fine to medium with coarse, with gravel to 1", light brown |                     |         | X    |                | 2.0                |                    |                   |
| 10         |             |                                                                             |                     | X       |      | 16<br>24<br>25 | 2.4                | 123                | Ring              |
| 15         |             |                                                                             |                     | X       |      | 16<br>17<br>19 | 4.6                | 122                | Ring              |
| 20         |             |                                                                             | Heavy Auger Chatter | X       |      | 50             | N.R.               | N.R.               | Ring              |
| 25         |             |                                                                             |                     | X       |      | 26<br>33<br>45 | 2.4                | 119                | Ring              |
| 30         |             |                                                                             | Rock in Shoe        | X       |      | 50             | N.R.               | N.R.               | Ring              |
|            |             | END OF BORING                                                               |                     |         |      |                |                    |                    |                   |
|            |             | NO REFUSAL, NO BEDROCK<br>NO GROUNDWATER<br>NO CAVING, NO FILL              |                     |         |      |                |                    |                    |                   |

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SAN DIMAS, CALIFORNIA

Job No.    Enclosure  
15369-3    B-3

# EXPLORATORY BORING NO. 4

Date Drilled:

Client: MJW Investments

Equipment:

Driving Weight / Drop / Sampler Size:

Surface Elevation(ft):

Logged by:

Measured Depth to Water(ft):

| DEPTH (ft) | GRAPHIC LOG | VISUAL CLASSIFICATION                                                               | REMARKS                    | SAMPLES |      | BLOWS/6 IN.       | FIELD MOISTURE (%) | DRY UNIT WT. (pcf) | LAB/FIELD TESTS   |
|------------|-------------|-------------------------------------------------------------------------------------|----------------------------|---------|------|-------------------|--------------------|--------------------|-------------------|
|            |             |                                                                                     |                            | DRIVE   | BULK |                   |                    |                    |                   |
| 5          |             | (SM) Silty Sand, fine to medium, with cobbles to 6", brown                          | Disturbed Native           |         | X    |                   | 2.9                |                    | Cor., DS, MDC, SA |
|            |             | (SP-SM) Sand, fine to medium with coarse, with silt and gravel to 1/2", light brown |                            | X       | X    | 5<br>8<br>12      |                    |                    |                   |
| 10         |             | (SM) Silty Sand, fine to medium, with angular gravel to 1/2", light brown           |                            | X       |      | 12<br>21<br>30    |                    |                    | Pass #200, SPT    |
|            |             |                                                                                     |                            | X       |      |                   |                    |                    |                   |
| 15         |             |                                                                                     | Auger Chatter to 15' - 18' | X       |      | 16<br>30<br>28    |                    |                    | Pass #200, SPT    |
|            |             |                                                                                     |                            | X       |      |                   |                    |                    |                   |
| 20         |             |                                                                                     |                            | X       |      | 36<br>41<br>50/5" |                    |                    | Pass #200, SPT    |
|            |             |                                                                                     |                            | X       |      |                   |                    |                    |                   |
| 25         |             |                                                                                     |                            | X       |      | 15<br>50          |                    |                    | Pass #200, SPT    |
|            |             |                                                                                     |                            | X       |      |                   |                    |                    |                   |
| 30         |             |                                                                                     |                            | X       |      | 30<br>50/3"       |                    |                    | Pass #200, SPT    |
|            |             |                                                                                     |                            | X       |      |                   |                    |                    |                   |

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28-LOT RESIDENTIAL  
SAN DIMAS, CALIFORNIA

Job No.    Enclosure  
15369-3    B-4a

# EXPLORATORY BORING NO. 4

Date Drilled:

Client: MJW Investments

Equipment:

Driving Weight / Drop / Sampler Size:

Surface Elevation(ft):

Logged by:

Measured Depth to Water(ft):

| DEPTH (ft) | GRAPHIC LOG      | VISUAL CLASSIFICATION                                                     | REMARKS | SAMPLES |      | BLOWS/6 IN.    | FIELD MOISTURE (%) | DRY UNIT WT. (pcf) | LAB/FIELD TESTS |
|------------|------------------|---------------------------------------------------------------------------|---------|---------|------|----------------|--------------------|--------------------|-----------------|
|            |                  |                                                                           |         | DRIVE   | BULK |                |                    |                    |                 |
|            | [Dotted Pattern] | (SM) Silty Sand, fine to medium, with angular gravel to 1/2", light brown |         | X       |      | 50             |                    |                    | Pass #200, SPT  |
| 40         |                  |                                                                           |         | X       |      | 21<br>50/5"    |                    |                    | Pass #200, SPT  |
| 45         |                  |                                                                           |         | X       |      | 40<br>50/5"    |                    |                    | Pass #200, SPT  |
| 50         |                  |                                                                           |         | X       |      | 19<br>21<br>25 | N.R.               | N.R.               | Pass #200, SPT  |
|            |                  | END OF BORING                                                             |         |         |      |                |                    |                    |                 |
| 55         |                  | NO REFUSAL, NO BEDROCK<br>NO GROUNDWATER<br>NO CAVING, NO FILL            |         |         |      |                |                    |                    |                 |
| 60         |                  |                                                                           |         |         |      |                |                    |                    |                 |
| 65         |                  |                                                                           |         |         |      |                |                    |                    |                 |

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28-LOT RESIDENTIAL  
SAN DIMAS, CALIFORNIA

Job No.    Enclosure  
15369-3    B-4b

# EXPLORATORY BORING NO. 5

Date Drilled:

Client: MJW Investments

Equipment:

Driving Weight / Drop / Sampler Size:

Surface Elevation(ft):

Logged by:

Measured Depth to Water(ft):

| DEPTH (ft) | GRAPHIC LOG | VISUAL CLASSIFICATION                                                        | REMARKS             | SAMPLES |      | BLOWS/6 IN.       | FIELD MOISTURE (%) | DRY UNIT WT. (pcf) | LAB/FIELD TESTS |
|------------|-------------|------------------------------------------------------------------------------|---------------------|---------|------|-------------------|--------------------|--------------------|-----------------|
|            |             |                                                                              |                     | DRIVE   | BULK |                   |                    |                    |                 |
| 5          |             | (SM) Silty Sand, fine to medium, brown                                       | Disturbed Native    | X       |      | 20<br>14<br>15    | 3.1                | 118                | Ring            |
|            |             |                                                                              |                     |         | X    |                   | 3.6                | Cor., DS, MDC, SA  |                 |
| 10         |             | (SM) Silty Sand, fine to medium with coarse, with gravel to 1/2", gray brown |                     | X       |      | 9<br>13<br>15     | 1.7                | 123                | Ring            |
|            |             |                                                                              |                     |         | X    |                   | 2.2                |                    |                 |
| 15         |             | (SM) Silty Sand, fine to coarse, with gravel to 2-1/2", light brown          |                     | X       |      | 14<br>17<br>22    | 2.3                | 114                | Ring            |
|            |             |                                                                              |                     |         | X    |                   | 2.4                |                    |                 |
| 15         |             |                                                                              | Heavy Auger Chatter | X       |      | 17<br>33<br>50/1" | 2.2                | Dist.              | Ring            |
| 20         |             |                                                                              | Auger Chatter       | X       |      | 50/3"             | N.R.               | N.R.               | Ring            |
| 25         |             |                                                                              | Auger Bouncing      | X       |      | 50/2"             | N.R.               | N.R.               | Ring            |
| 30         |             | END OF BORING                                                                | Auger Bouncing      | X       |      |                   |                    |                    |                 |
|            |             | NO REFUSAL, NO BEDROCK<br>NO GROUNDWATER<br>NO CAVING, NO FILL               |                     |         |      |                   |                    |                    |                 |

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28-LOT RESIDENTIAL  
SAN DIMAS, CALIFORNIA

Job No. 15369-3    Enclosure B-5

# EXPLORATORY BORING NO. 6

Date Drilled:

Client: MJW Investments

Equipment:

Driving Weight / Drop / Sampler Size:

Surface Elevation(ft):

Logged by:

Measured Depth to Water(ft):

| DEPTH (ft) | GRAPHIC LOG | VISUAL CLASSIFICATION                                                          | REMARKS             | SAMPLES |      | BLOWS/6 IN.       | FIELD MOISTURE (%) | DRY UNIT WT. (pcf) | LAB/FIELD TESTS           |
|------------|-------------|--------------------------------------------------------------------------------|---------------------|---------|------|-------------------|--------------------|--------------------|---------------------------|
|            |             |                                                                                |                     | DRIVE   | BULK |                   |                    |                    |                           |
| 5          |             | (SM) Silty Sand, fine with medium, brown                                       | Disturbed<br>Native | X       | X    | 10<br>9<br>10     | 5.1                | 114                | Ring                      |
|            |             | (SM) Silty Sand, fine to medium with coarse, with gravel to 1", light brown    |                     | X       | X    | 7<br>15<br>18     | 4.9                | 121                | Cor., DS, MDC, SA<br>Ring |
| 10         |             | (SM) Silty Sand, fine to coarse, with gravel to 1-1/2", light brown            |                     | X       | X    | 12<br>26<br>50/5" | 3.0                | 129                | Ring                      |
|            |             |                                                                                |                     | X       | X    | 50/5"             | 1.7                |                    |                           |
| 15         |             |                                                                                |                     | X       | X    | 50/5"             | 3.5                | Dist.              | Ring                      |
| 20         |             |                                                                                |                     | X       | X    | 5<br>11<br>12     | 3.9                | 122                | Ring                      |
| 25         |             | (Tp) Puente Formation Sandstone, with steeply dipping silt beds, light brown   | Bedrock             | X       | X    | 17<br>50          | 9.3                | 99                 | Ring                      |
|            |             |                                                                                |                     | X       | X    | 50                | 7.5                | 99                 | Ring                      |
|            |             | END OF BORING                                                                  |                     |         |      |                   |                    |                    |                           |
|            |             | NO REFUSAL, NO CAVING<br>NO GROUNDWATER, NO FILL<br>SANDSTONE BEDROCK AT 23.5' |                     |         |      |                   |                    |                    |                           |

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28-LOT RESIDENTIAL  
SAN DIMAS, CALIFORNIA

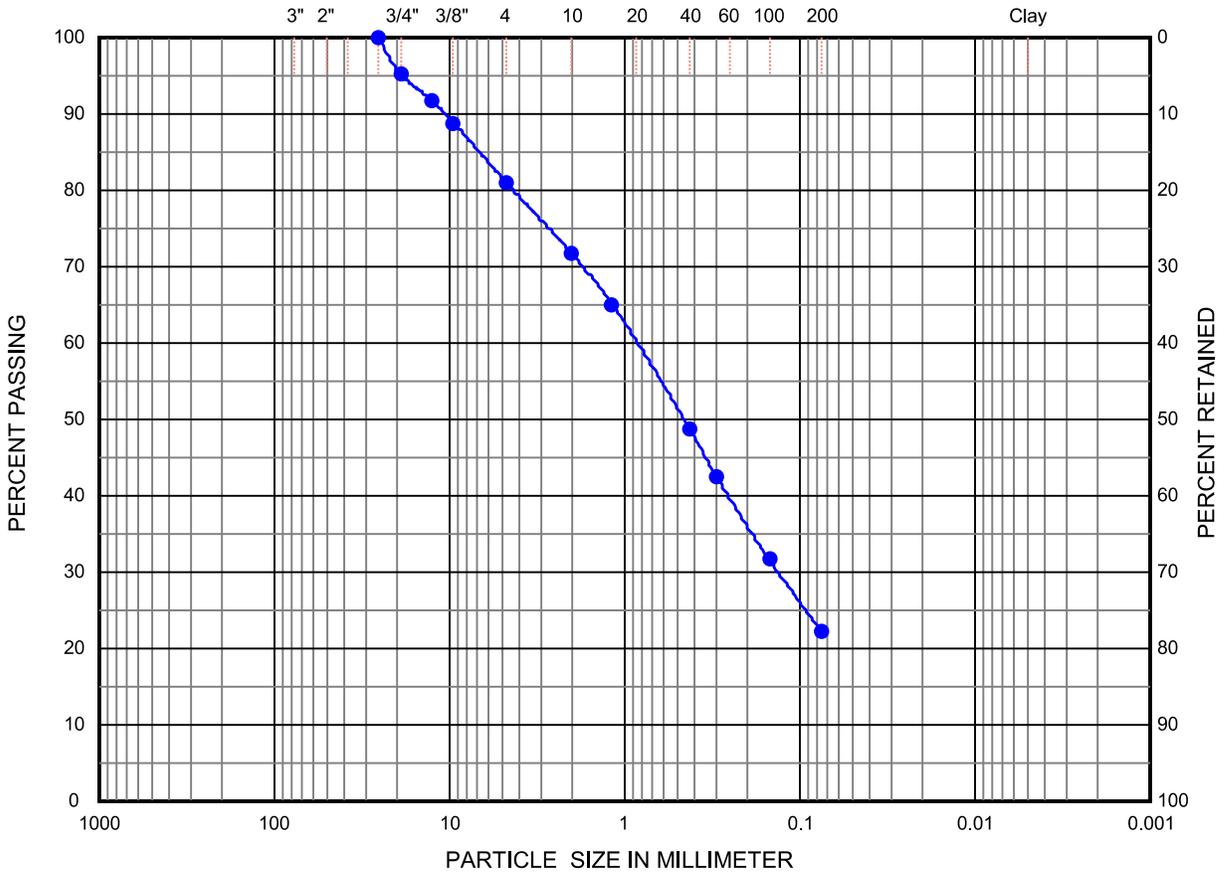
Job No.    Enclosure  
15369-3    B-6



**APPENDIX "C"**

**LABORATORY TESTING**

SCREEN (IN) / SIEVE NO. - U.S.A. Standard Series (ASTM D422)



|                    |        |      |        |        |      |      |      |
|--------------------|--------|------|--------|--------|------|------|------|
| Cobbles & Boulders | Gravel |      | Sand   |        |      | Silt | Clay |
|                    | Coarse | Fine | Coarse | Medium | Fine |      |      |

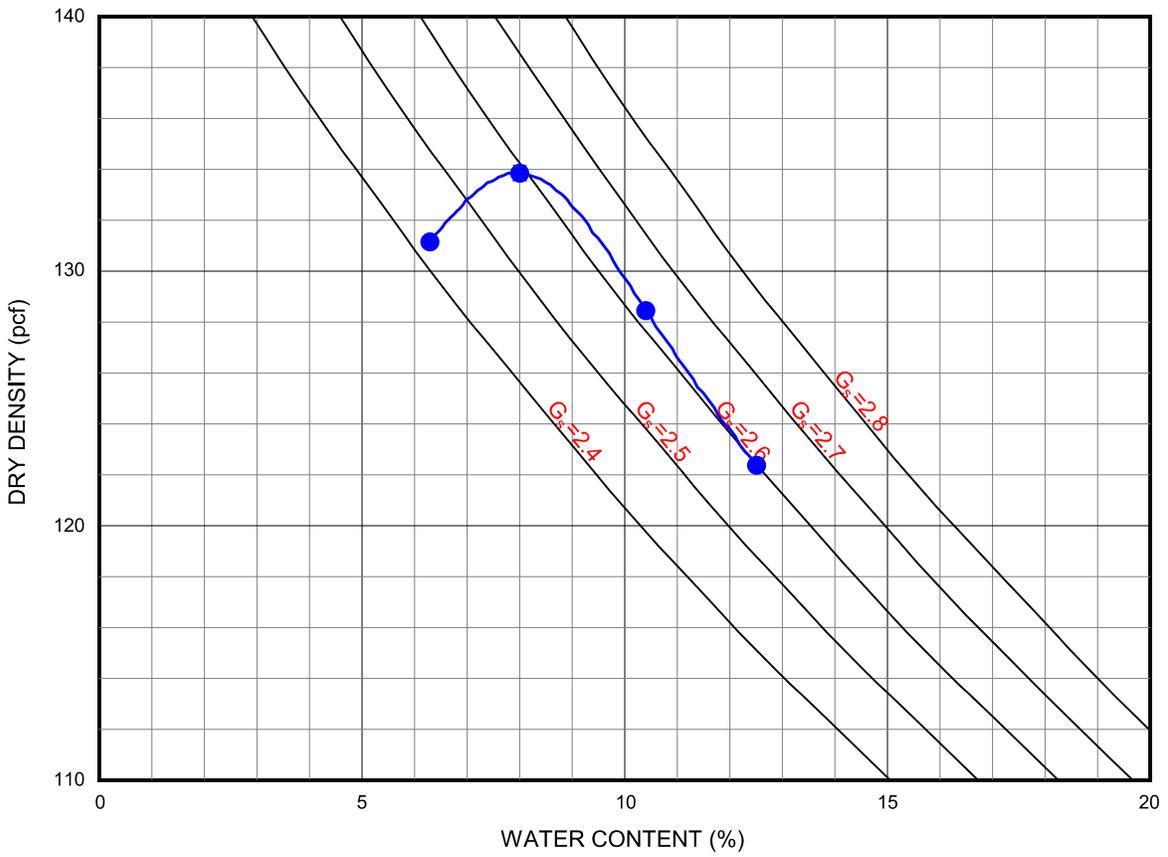
|   | Sample No.                  | Gravel | Sand | Fines | Clay | D <sub>10</sub> | D <sub>30</sub> | D <sub>50</sub> | D <sub>60</sub> | C <sub>u</sub> | C <sub>c</sub> |
|---|-----------------------------|--------|------|-------|------|-----------------|-----------------|-----------------|-----------------|----------------|----------------|
| ● | 2A to 6A (2 - 4 ft)         | 19.0   | 58.8 | 22.3  |      |                 | 0.133           | 0.459           | 0.841           |                |                |
|   | (SM) Silty sand with gravel |        |      |       |      |                 |                 |                 |                 |                |                |

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**PARTICLE SIZE DISTRIBUTION (ASTM D422)**

|             |                                                                            |           |    |            |     |
|-------------|----------------------------------------------------------------------------|-----------|----|------------|-----|
| Project:    | Proposed 28-Lot Residential Development                                    |           |    |            |     |
| Location:   | W. of San Dimas Avenue, Between W. Gladstone St & Allen Ave, San Dimas, CA |           |    |            |     |
| Job Number: | 15369-3                                                                    | Engineer: | fy | Enclosure: | C-1 |



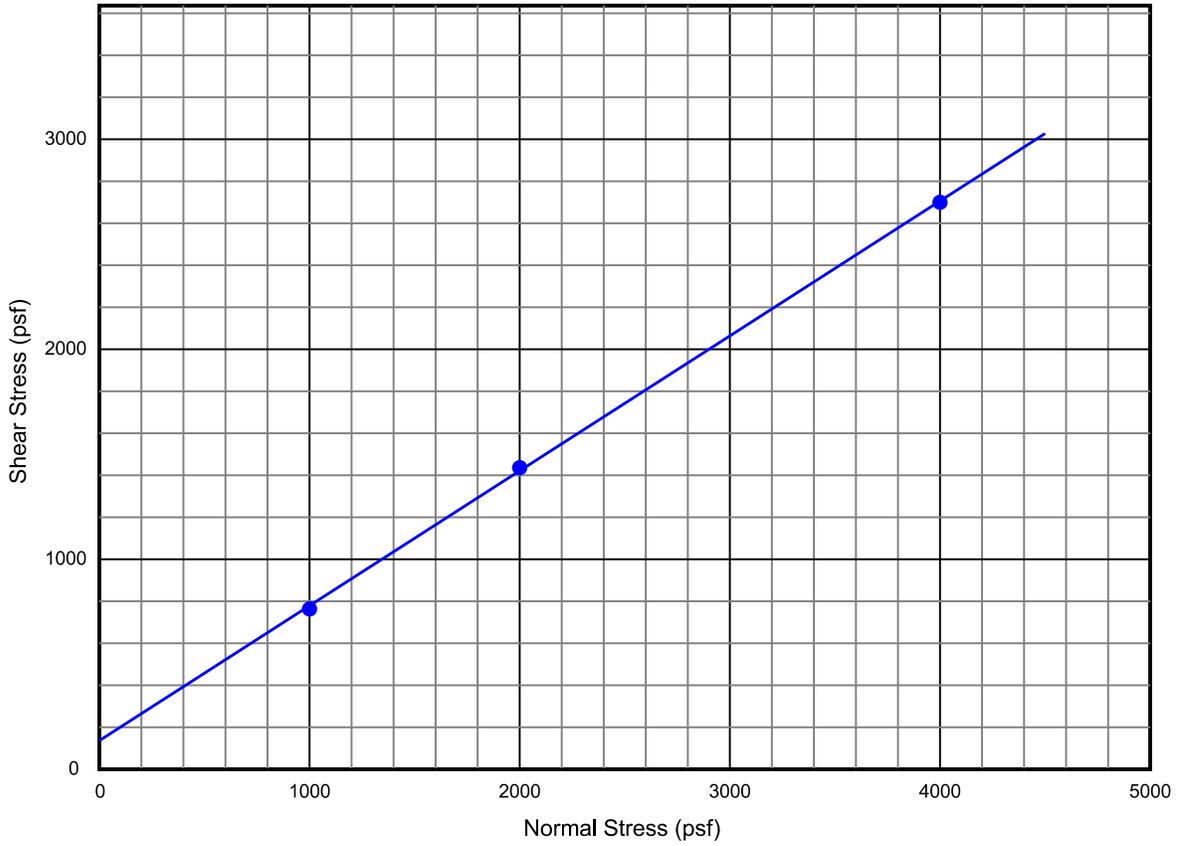
|   | Sample No.          | USCS Classification         | d <sub>max</sub> (pcf) | w <sub>o</sub> (%) |
|---|---------------------|-----------------------------|------------------------|--------------------|
| ● | 2A to 6A (2 - 4 ft) | (SM) Silty sand with gravel | 134.0                  | 8.0                |

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### COMPACTION CURVES (ASTM D1557)

|             |                                                                            |           |    |            |     |
|-------------|----------------------------------------------------------------------------|-----------|----|------------|-----|
| Project:    | Proposed 28-Lot Residential Development                                    |           |    |            |     |
| Location:   | W. of San Dimas Avenue, Between W. Gladstone St & Allen Ave, San Dimas, CA |           |    |            |     |
| Job Number: | 15369-3                                                                    | Engineer: | fy | Enclosure: | C-2 |



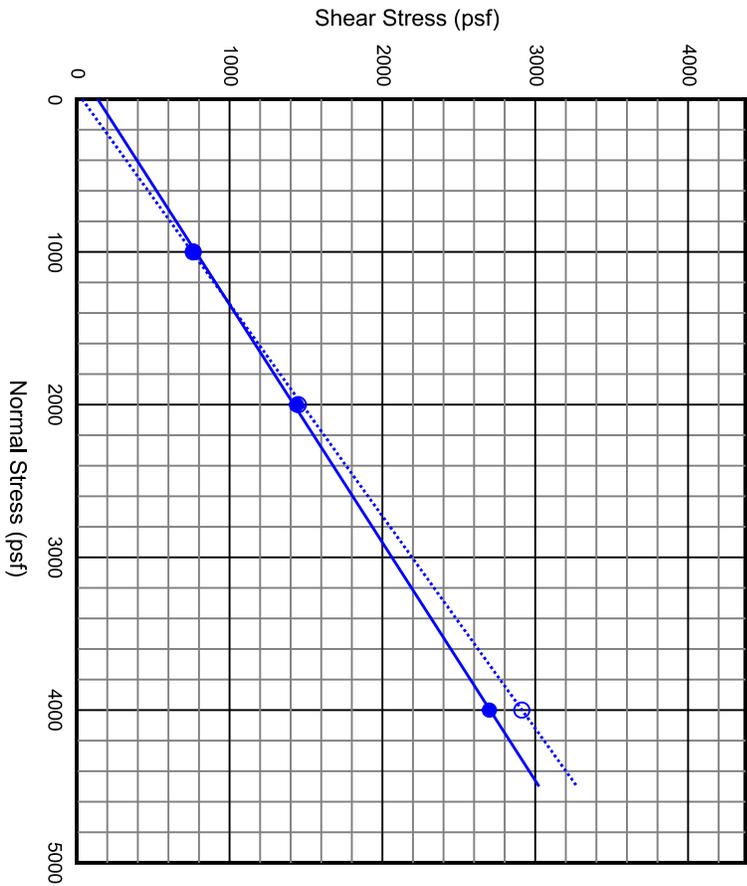
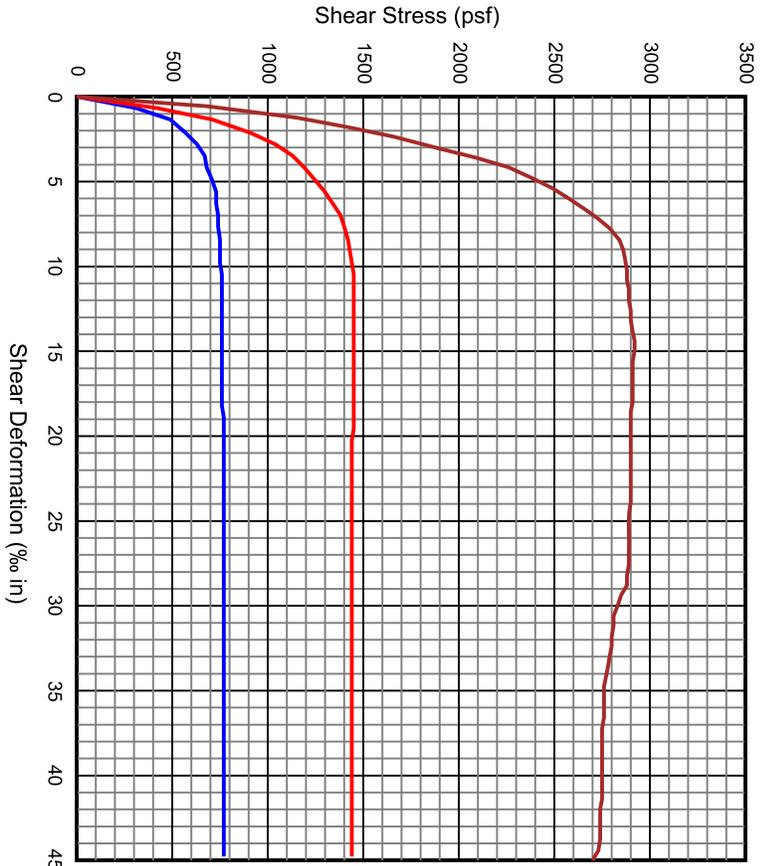
|   | Sample No.                                      | $d$ (pcf) | $w$ (%) | $C_{pk}$ (psf) | $\rho_k$ (°) | $C_{rs}$ (psf) | $r_s$ (°) |
|---|-------------------------------------------------|-----------|---------|----------------|--------------|----------------|-----------|
| ● | 2A to 6A (2 - 4 ft)                             | 120.6     | 8.5     | 33.0           | 35.7         | 139.2          | 32.7      |
|   | (SM) Silty sand with gravel / Remolded (RC=90%) |           |         |                |              |                |           |

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### DIRECT SHEAR TESTS (ASTM D3080)

|             |                                                                            |           |    |            |     |  |  |
|-------------|----------------------------------------------------------------------------|-----------|----|------------|-----|--|--|
| Project:    | Proposed 28-Lot Residential Development                                    |           |    |            |     |  |  |
| Location:   | W. of San Dimas Avenue, Between W. Gladstone St & Allen Ave, San Dimas, CA |           |    |            |     |  |  |
| Job Number: | 15369-3                                                                    | Engineer: | fy | Enclosure: | C-3 |  |  |



| Sample No.          | USCS                                            | d (pcf) | w (%) | C <sub>μk</sub> (psf) | μ <sub>k</sub> (°) | C <sub>γs</sub> (psf) | γ <sub>s</sub> (°) |
|---------------------|-------------------------------------------------|---------|-------|-----------------------|--------------------|-----------------------|--------------------|
| 2A to 6A (2 - 4 ft) | (SM) Silty sand with gravel / Remolded (RC=90%) | 120.6   | 8.5   | 33.0                  | 35.7               | 139.2                 | 32.7               |

**DIRECT SHEAR TESTS (ASTM D3080)**

|             |  |                                                                            |           |    |            |     |  |
|-------------|--|----------------------------------------------------------------------------|-----------|----|------------|-----|--|
| Project:    |  | Proposed 28-Lot Residential Development                                    |           |    |            |     |  |
| Location:   |  | W. of San Dimas Avenue, Between W. Gladstone St & Allen Ave, San Dimas, CA |           |    |            |     |  |
| Job Number: |  | 15369-3                                                                    | Engineer: | fy | Enclosure: | C-4 |  |



**CHJ** Consultants

### PARTICLE SIZE DISTRIBUTION

| Sample No. | Depth (ft)      | USCS            | Gravel          | Sand            | Fines          | Clay           |
|------------|-----------------|-----------------|-----------------|-----------------|----------------|----------------|
| 2A to 6A   | 2 - 4           | SM              | 19.0            | 58.8            | 22.3           | -              |
| Sample No. | D <sub>10</sub> | D <sub>30</sub> | D <sub>50</sub> | D <sub>60</sub> | C <sub>u</sub> | C <sub>c</sub> |
| 2A to 6A   | -               | 0.133           | 0.46            | 0.84            | -              | -              |

### DIRECT SHEAR TESTS (ASTM D3080)

| Sample No. | Depth (ft) | USCS | d (pcf) | w (%) | C <sub>pk</sub> (psf) | ϕ <sub>k</sub> (°) | C <sub>rs</sub> (psf) | ϕ <sub>rs</sub> (°) |
|------------|------------|------|---------|-------|-----------------------|--------------------|-----------------------|---------------------|
| 2A to 6A   | 2 - 4      | SM   | 120.6   | 8.5   | 33.0                  | 35.7               | 139.2                 | 32.7                |

### FINES CONTENT (ASTM C117)

| Boring No.        | 1     | 1     | 1       | 1       | 4     | 4       |
|-------------------|-------|-------|---------|---------|-------|---------|
| Depth (ft)        | 5     | 10    | 15 - 40 | 40 - 53 | 5     | 10 - 11 |
| Fine Contents (%) | 7.1   | 7.9   | 8.0     | 12.2    | 10.6  | 12.1    |
| Classification    | SP-SM | SP-SM | SP-SM   | SM      | SP-SM | SM      |

### COMPACTION CURVES (ASTM D1557)

| Sample No. | Depth (ft) | USCS | d <sub>max</sub> (pcf) | w <sub>o</sub> (%) |
|------------|------------|------|------------------------|--------------------|
| 2A to 6A   | 2 - 4      | SM   | 134.0                  | 8.0                |

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### TEST DATA SUMMARY

|             |                                                                            |           |    |            |     |
|-------------|----------------------------------------------------------------------------|-----------|----|------------|-----|
| Project:    | Proposed 28-Lot Residential Development                                    |           |    |            |     |
| Location:   | W. of San Dimas Avenue, Between W. Gladstone St & Allen Ave, San Dimas, CA |           |    |            |     |
| Job Number: | 15369-3                                                                    | Engineer: | fy | Enclosure: | C-5 |

**Table 1 - Laboratory Tests on Soil Samples**

*CHJ Consultants  
MJW Measurements  
Your #15369-3, HDR Lab #15-0579LAB  
30-Jul-15*

**Sample ID**

2A to 6A

| <b>Resistivity</b>       |                                | <b>Units</b> |           |
|--------------------------|--------------------------------|--------------|-----------|
| as-received              |                                | ohm-cm       | 4,400,000 |
| saturated                |                                | ohm-cm       | 1,400     |
| <b>pH</b>                |                                |              | 6.8       |
| <b>Electrical</b>        |                                |              |           |
| <b>Conductivity</b>      |                                | mS/cm        | 0.24      |
| <b>Chemical Analyses</b> |                                |              |           |
| <b>Cations</b>           |                                |              |           |
| calcium                  | Ca <sup>2+</sup>               | mg/kg        | 101       |
| magnesium                | Mg <sup>2+</sup>               | mg/kg        | 22        |
| sodium                   | Na <sup>1+</sup>               | mg/kg        | 49        |
| potassium                | K <sup>1+</sup>                | mg/kg        | 52        |
| <b>Anions</b>            |                                |              |           |
| carbonate                | CO <sub>3</sub> <sup>2-</sup>  | mg/kg        | ND        |
| bicarbonate              | HCO <sub>3</sub> <sup>1-</sup> | mg/kg        | 88        |
| fluoride                 | F <sup>1-</sup>                | mg/kg        | ND        |
| chloride                 | Cl <sup>1-</sup>               | mg/kg        | 64        |
| sulfate                  | SO <sub>4</sub> <sup>2-</sup>  | mg/kg        | 81        |
| phosphate                | PO <sub>4</sub> <sup>3-</sup>  | mg/kg        | 9.8       |
| <b>Other Tests</b>       |                                |              |           |
| ammonium                 | NH <sub>4</sub> <sup>1+</sup>  | mg/kg        | ND        |
| nitrate                  | NO <sub>3</sub> <sup>1-</sup>  | mg/kg        | 239       |
| sulfide                  | S <sup>2-</sup>                | qual         | na        |
| Redox                    |                                | mV           | na        |

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

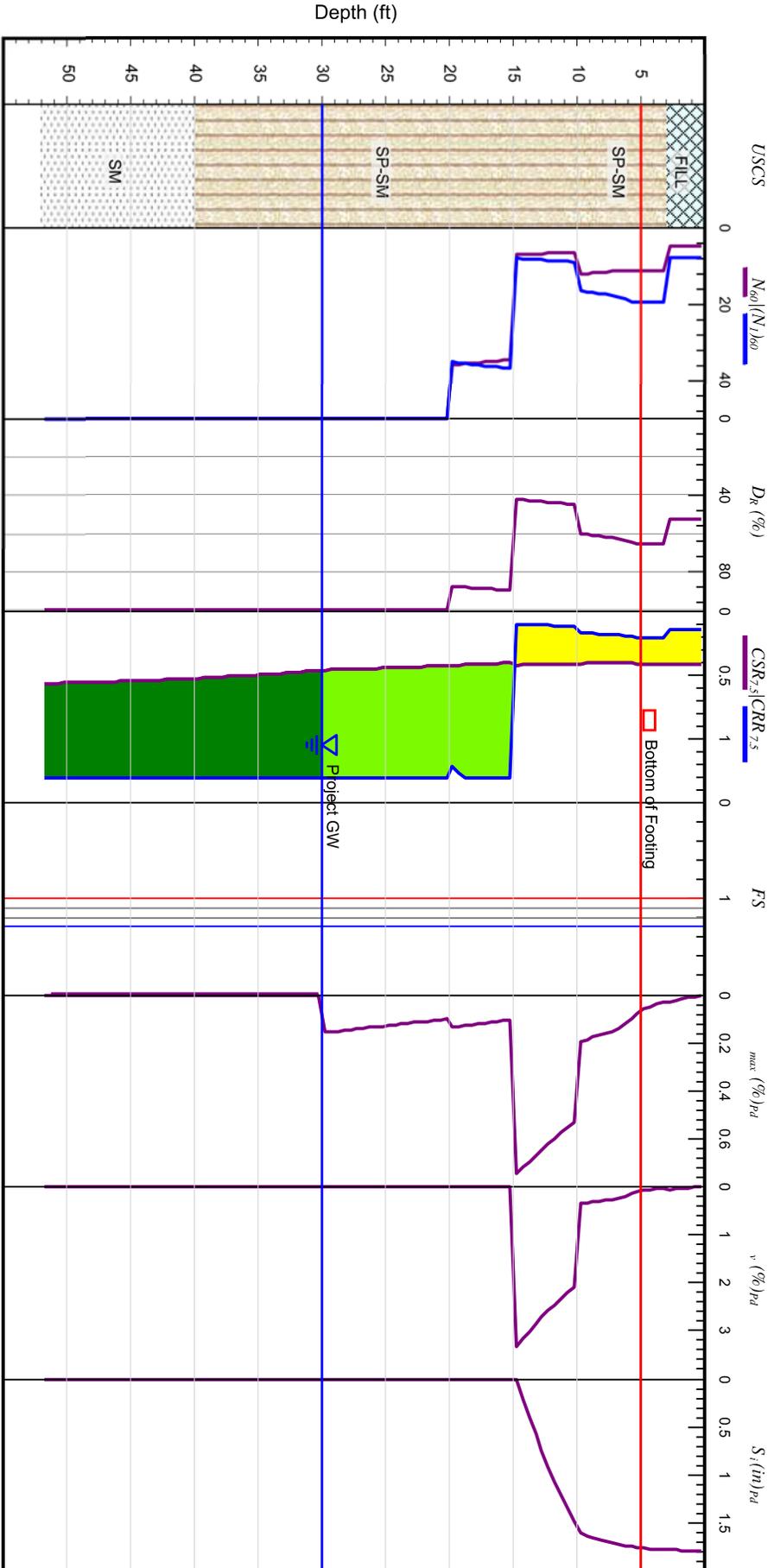
ND = not detected

na = not analyzed



**APPENDIX "D"**

**GEOTECHNICAL CALCULATIONS**



FILL  
SP-SM

SM

Earthquake & Groundwater Information:  
 Magnitude = 6.6  
 Max. Acceleration = 0.89 g  
 Project GW = 30 ft  
 Maximum Settlement = 1.79 in  
 Settlement at Bottom of Footing = 1.76 in

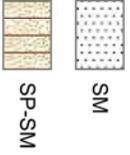
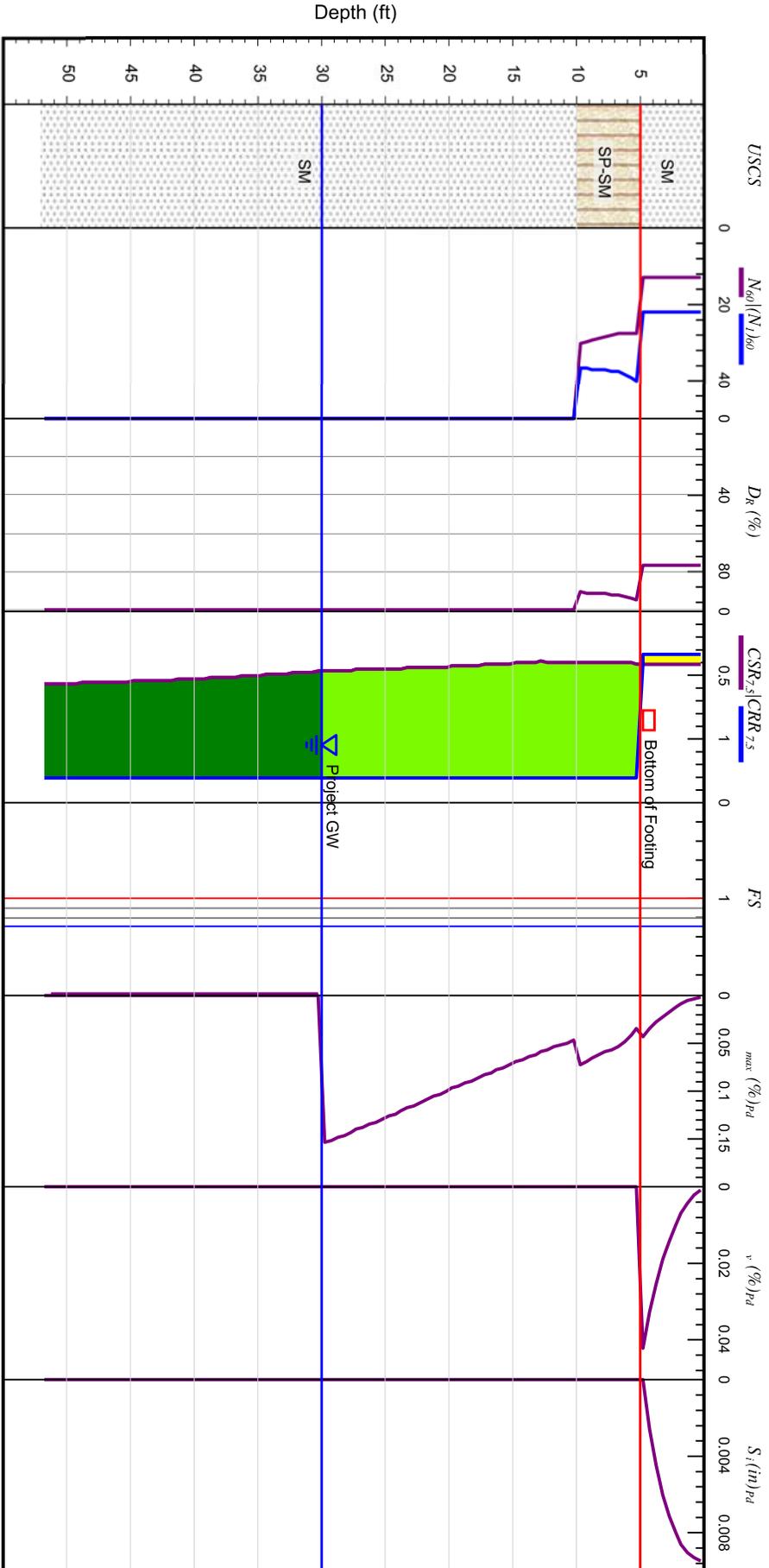
Liquefaction: Idriss & Boulanger (2008)  
 Sett.: Pradel (1989); [sat] Idriss & Boulanger (2008)  
 Lateral spreading: Idriss & Boulanger (2008)  
 M correction: [Sand] Boulanger & Idriss (2004)  
 cv correction: Idriss & Boulanger (2008)  
 Stress reduction: Idriss & Boulanger (2008)

**Seismic Settlement Potential - SPT Data**

|             |                                                                            |             |     |
|-------------|----------------------------------------------------------------------------|-------------|-----|
| Project:    | Proposed 28-Lot Residential Development                                    |             |     |
| Location:   | W. of San Dimas Avenue, Between W. Gladstone St & Allen Ave, San Dimas, CA |             |     |
| Job Number: | 15369-3                                                                    | Boring No.: | B-1 |
| Enclosure:  |                                                                            |             | D-1 |



**CHJ** Consultants



Earthquake & Groundwater Information:  
 Magnitude = 6.6  
 Max. Acceleration = 0.89 g  
 Project GW = 30 ft  
 Maximum Settlement = 0.01 in  
 Settlement at Bottom of Footing = 0.00 in

Liquefaction: Idriss & Boulanger (2008)  
 Sett.: Pradel (1989); [sat] Idriss & Boulanger (2008)  
 Lateral spreading: Idriss & Boulanger (2008)  
 M correction: [Sand] Boulanger & Idriss (2004)  
 cv correction: Idriss & Boulanger (2008)  
 Stress reduction: Idriss & Boulanger (2008)

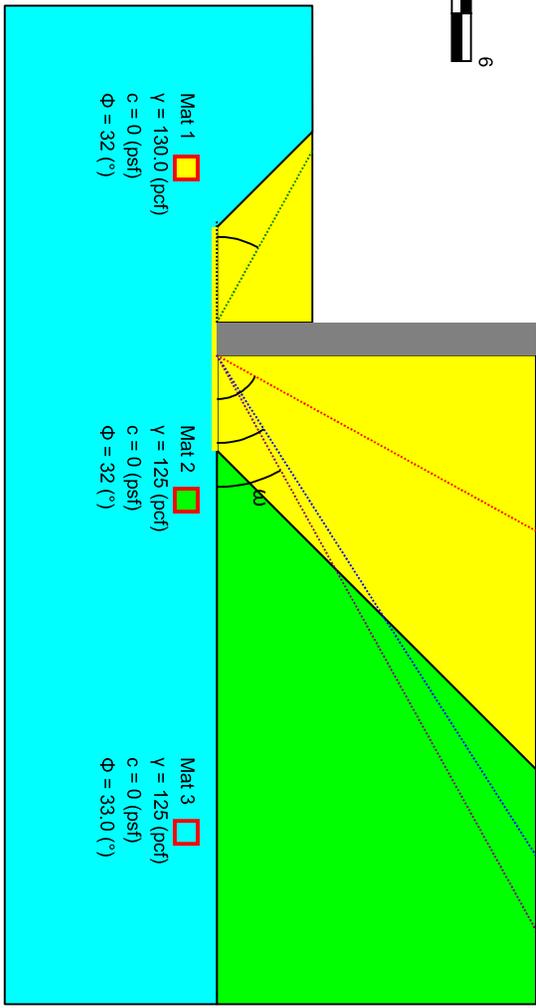
**Seismic Settlement Potential - SPT Data**

|             |                                                                            |             |     |
|-------------|----------------------------------------------------------------------------|-------------|-----|
| Project:    | Proposed 28-Lot Residential Development                                    |             |     |
| Location:   | W. of San Dimas Avenue, Between W. Gladstone St & Allen Ave, San Dimas, CA |             |     |
| Job Number: | 15369-3                                                                    | Boring No.: | B-4 |
|             |                                                                            | Enclosure:  | D-2 |

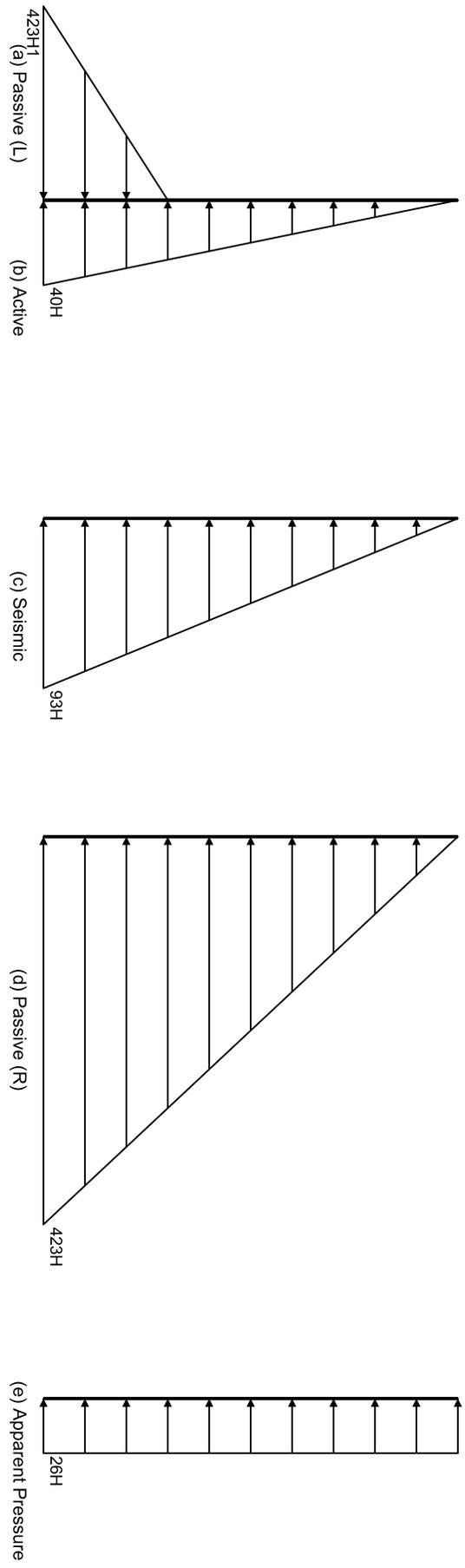




H=10 (ft)  
 H1=3 (ft)  
 $\alpha=0$  (°)  
 $\delta=0.0$  (°)  
 $k_1=0.445$   
 $k_v=0$



|                                    | $P_{pL}$ | $P_a$ | $P_{aE}$ | $P_{pR}$ |
|------------------------------------|----------|-------|----------|----------|
| H (ft)                             | 3        | 10    | 10       | 10       |
| $Z_c$ (ft)                         | -        | 0     | 0        | -        |
| Total                              | 423      | 40    | 93       | 423      |
| Hori.                              | 423      | 40    | 93       | 423      |
| Vert.                              | -        | 0     | 0        | -        |
| $\omega$ (°)                       | 29.00    | 61.00 | 32.50    | 29.00    |
| <b>Restrained (Level Backfill)</b> |          |       |          | 61       |
| <b>Base Friction Coefficient</b>   |          |       |          | 0.39     |



**Earth Pressures**

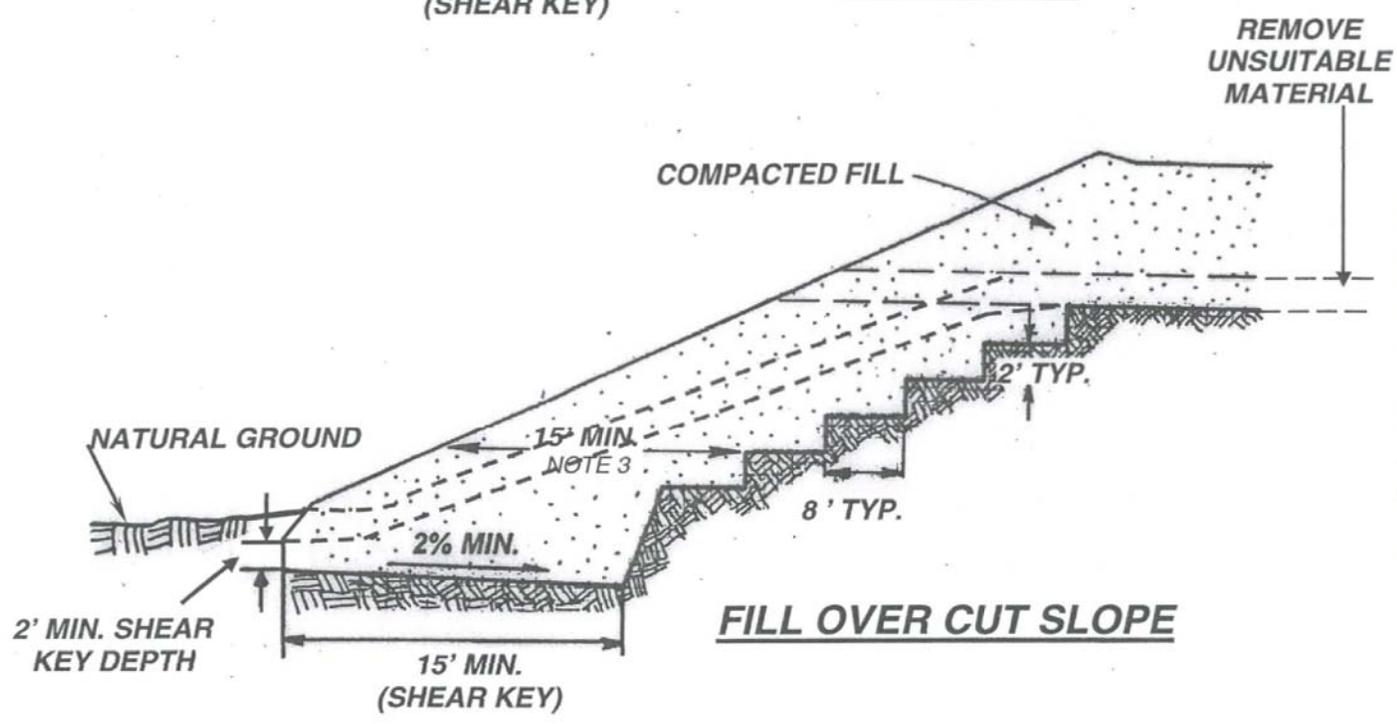
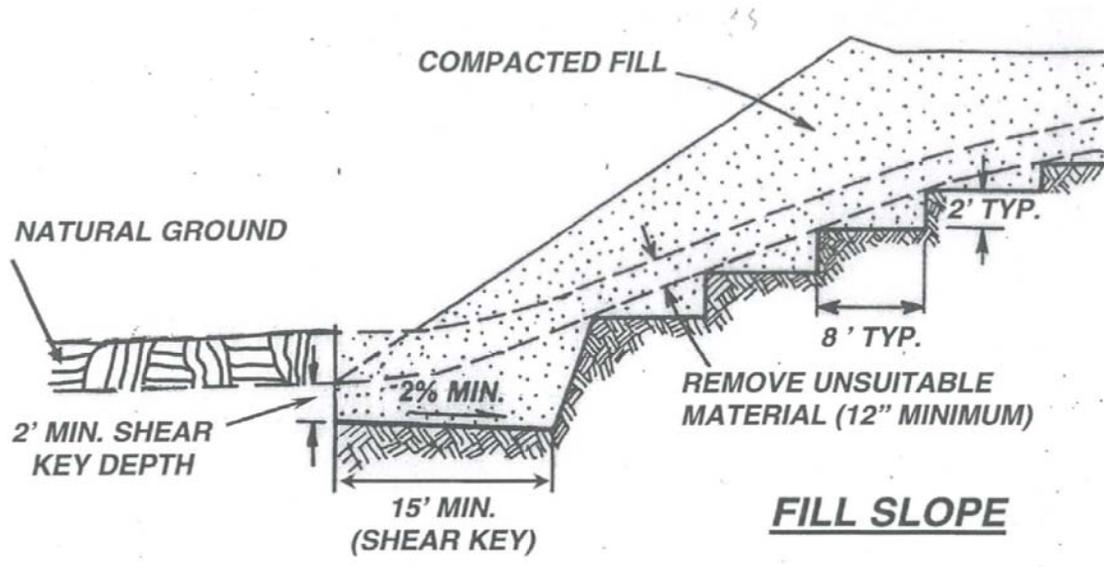
|             |                                                                            |             |     |            |     |
|-------------|----------------------------------------------------------------------------|-------------|-----|------------|-----|
| Project:    | Proposed 28-Lot Residential Development                                    |             |     |            |     |
| Location:   | W. of San Dimas Avenue, Between W. Gladstone St & Allen Ave, San Dimas, CA |             |     |            |     |
| Job Number: | 15369-3                                                                    | Boring No.: | B-1 | Enclosure: | D-3 |





**APPENDIX "E"**

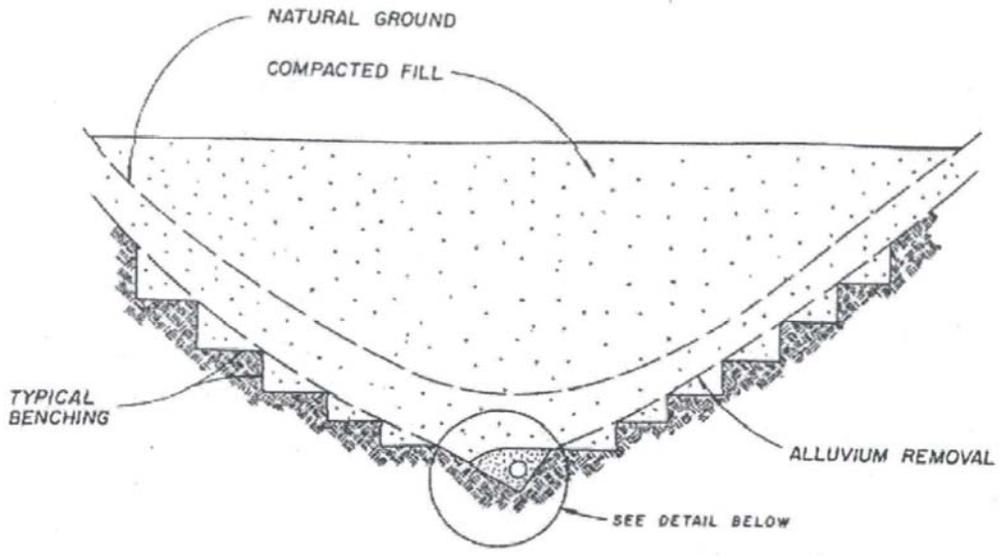
**GEOTECHNICAL DETAILS**



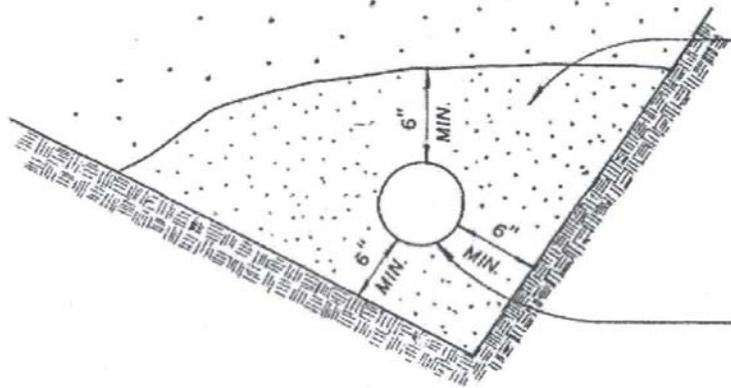
- NOTES:
- ① DIMENSIONS SHOWN SUBJECT TO FIELD CHANGE BASED ON ENGINEER'S JUDGEMENT
  - ② BENCHING REQUIRED WHEN FILLING OVER NATURAL GROUND STEPPER THAN 5H:1V
  - ③ WITHIN THE CUT PORTION OF THE SLOPE, HORIZONTAL THICKNESS SHOULD NOT BE GREATER AT THE TOP THAN AT THE BOTTOM

### KEY AND BENCHING DETAIL

|                                     |                                                                                                                                                                              |                              |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| FOR:<br><b>MJW INVESTMENTS, LLC</b> | GEOTECHNICAL INVESTIGATION<br>PROPOSED 28-LOT RESIDENTIAL DEVELOPMENT<br>WEST OF SAN DIMAS AVENUE BETWEEN WEST<br>GLADSTONE STREET AND ALLEN AVENUE<br>SAN DIMAS, CALIFORNIA | ENCLOSURE<br><b>"E-1"</b>    |
| DATE:<br><b>AUGUST 2015</b>         |                                                                                                                                                                              | JOB NUMBER<br><b>15369-3</b> |



NOTE: DOWNSTREAM 20' OF PIPE AT OUTLET SHALL BE NON-PERFORATED AND BACKFILLED WITH FINE GRAINED MATERIAL. OUTLET SHALL BE TO NON-NUISANCE AREA.



FILTER: USE GRAVEL, (1" BY # 4 CONC. AGGREGATE) MINIMUM OF NINE CUBIC FEET PER FOOT OF PIPE, ENCASED IN FILTER FABRIC. (MIRAFI 140 OR EQUAL). FILTER MATERIAL SHALL BE LAPPED PER THE MANUFACTURERS SPECIFICATIONS.

VARIABLE TO 8" DIA. SCH. 40 OR EQUIVALENT WITH CRUSHING STRENGTH OF AT LEAST 1000 LBS. WITH 8 UNIFORMLY SPACED PERFORATIONS PER FOOT OF PIPE INSTALLED WITH PERFORATION ON BOTTOM OF PIPE. CONSTRUCT SO AS TO DRAIN.

NOTE: PVC DIAMETER SIZE DEPENDS ON SURFACE GRADE AND CANYON SIZE, SUBJECT TO REVIEW BY GEOTECHNICAL ENGINEER.

Not To Scale

## SUBDRAIN DETAIL

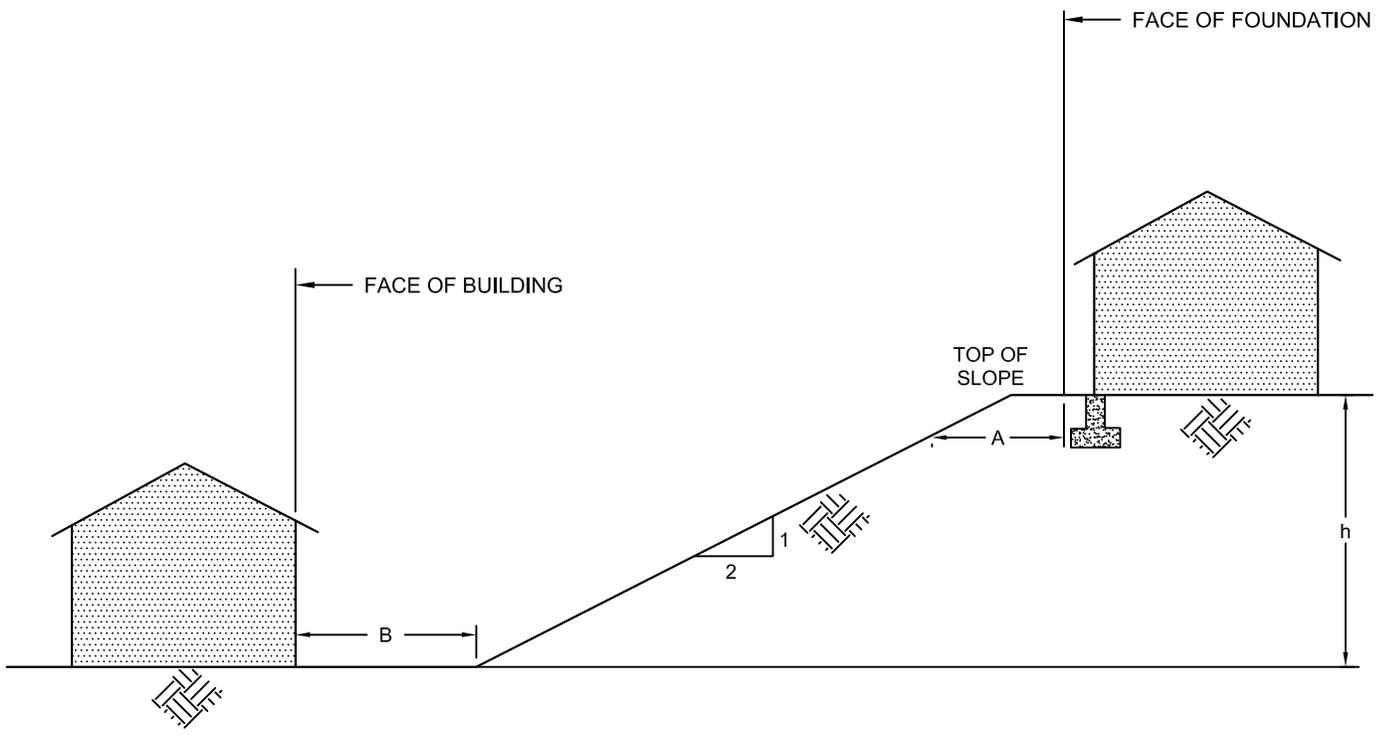
FOR: MJW INVESTMENTS, LLC

DATE: AUGUST 2015

GEOTECHNICAL INVESTIGATION  
 PROPOSED 28-LOT RESIDENTIAL DEVELOPMENT  
 WEST OF SAN DIMAS AVENUE BETWEEN WEST  
 GLADSTONE STREET AND ALLEN AVENUE  
 SAN DIMAS, CALIFORNIA

ENCLOSURE  
 "E-2"

JOB NUMBER  
 15369-3



TOE OF SLOPE  
 $B \Rightarrow \frac{h}{2}$  or 15'  
 whichever is smaller

TOP OF SLOPE  
 $A \Rightarrow \frac{h}{3}$  or 40'  
 whichever is smaller

As per section 1808.7.1 2013 CBC

| FOOTING SETBACK DETAIL       |                                                                                                                                                                              |                       |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| FOR:<br>MJW INVESTMENTS, LLC | GEOTECHNICAL INVESTIGATION<br>PROPOSED 28-LOT RESIDENTIAL DEVELOPMENT<br>WEST OF SAN DIMAS AVENUE BETWEEN WEST<br>GLADSTONE STREET AND ALLEN AVENUE<br>SAN DIMAS, CALIFORNIA | ENCLOSURE<br>"E-3"    |
| DATE:<br>AUGUST 2015         |                                                                                                                                                                              | JOB NUMBER<br>15369-3 |
|                              |                                                                                                                                                                              | CHJ Consultants       |