APPENDIX E

Geotechnical Report

GEOTECHNICAL EVALUATION FOR EIR PURPOSES
PROPOSED TENTATIVE TRACT NO. 70583
APPROXIMATELY 300-ACRE SITE
SAN DIMAS FOOTHILLS
SAN DIMAS, CALIFORNIA
PREPARED FOR
NJD, LTD.
CHJ JOB NO. 10389-3

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INTRODUCTION

This report presents the results of our geotechnical evaluation for EIR purposes for the proposed residential development designated as Tentative Tract No. 70583. The tract is located in the foothills of the San Gabriel Mountains in the northwest portion of the City of San Dimas. This report is based in part on field investigations performed during July and August 2009 and on available geotechnical reports, maps, aerial photographs, and documents.

The assessment of site environmental conditions with regard to presence of soil or groundwater contaminants was beyond the scope of this evaluation.

To orient our evaluation of the site, we utilized a 60-scale Tentative Tract Map No. 70583 & Conceptual Grading Plan, prepared by Fuscoe Engineering, dated June 15, 2009, and revised plans dated August 25, 26, and 28, 2009. 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 Tentative Tract Map. The approximate location of the site is shown on the attached Index Map (Appendix "A").

The results of our evaluation, including a description of geotechnical conditions, potential hazards, and mitigation measures, are presented in this report.

PROJECT CONSIDERATIONS

As we understand it, the project is to consist of development of approximately 125 acres of the 300-acre site. The developed portion of the site will include 61 single-family residential lots and associated infrastructure. It is proposed to construct a main access road to the planned residences from the northern terminus of existing Cataract Avenue along the west fork of Shuler Canyon. Roads within the development will provide access to the various clusters of building lots.

A water tank pad is proposed for Lot F that occupies a ridge in the northeast portion of the development area. The development is proposed to be connected to a sewer system.

The conceptual grading plan indicates maximum cut depths of 64 feet and 40 feet for residential pads and the water tank pad, respectively. Maximum fill depths are proposed as 75 feet, 60 feet, 55 feet, and 50 feet for residential pads, an embankment, a retention basin, and a roadway embankment, respectively.

At the time of our field investigation in July and August 2009, the site consisted of approximately 300 acres of hillside land that was primarily undeveloped. Dirt roads provided access to limited areas of the site. Elevations range from 1,860 feet above mean sea level (amsl) to 1,025 feet amsl in the northeastern and southwestern portions of the site, respectively. The majority of the site was heavily vegetated with grasses and annual plants. Chaparral-type plants were common in drainage bottoms and on slopes. North- and northwest-facing slopes and canyon bottoms included areas of dense vegetation including trees and tall shrubs. South-facing slopes and ridge tops tended to be less heavily vegetated. Large patches of cactus were present within the site and occurred primarily within the volcanic bedrock areas of the site.

The topography of the site is formed in a sedimentary and volcanic bedrock upland area that is dissected by several natural drainages flanked by steep-sided slopes. The site also includes areas of relatively flat-lying topography formed on ridgelines and within a canyon area previously utilized for

corrals. Natural drainages within the site include west and east branches of Shuler Canyon and several short tributaries that drain the majority of the southern portion of the site, Shay Canyon that drains the eastern portion of the site, and Wildwood Canyon and small tributaries that drain the northwestern portion of the site. Local relief within canyons is on the order of 200 to 225 feet. A portion of Sycamore Canyon is located within the northeast corner of the site – outside of the area proposed for development. Natural slopes within the site exhibit typical gradients ranging from 2 horizontal to 1 vertical [2(h):1(v)] to 1.5(h) to 1(v). Natural slopes also include areas as steep as 1.25(h) to 1(v) and locally steeper in areas of erosion and debris flow formation underlain by steep-standing bedrock. Several prominent hills and ridges with elevations as high as 1,357 feet above mean sea level (amsl) and 1,450 feet amsl are included within the proposed development area. A maximum site elevation of 1,880 feet amsl occurs in the northeast corner of the site outside of the development area and a minimum site elevation of 1,010 feet amsl occurs near the southwestern site boundary.

Prior development within the site was limited to a former "corral/stables" area in the west-central portion of the site where an abandoned building and several paddock remnants were located and an existing structure in the east-central portion of the site. A series of abandoned power poles were present near the western site boundary. It is assumed that a septic-type disposal system was utilized in the area of the corral/stables building. A large steel water tank and buried steel water line were present on a ridge west of the former corral/stables. Various fences and gates were located within and around the site perimeter.

GEOTECHNICAL CONDITIONS

GEOLOGIC SETTING:

Regionally, the site is located within the San Gabriel Mountains of the Transverse Ranges geomorphic province. This province includes several discreet mountain ranges and intervening valleys including the Santa Monica, San Gabriel, and San Bernardino Mountains and is so named because structural trends, such as the Sierra Madre fault zone located near the southern boundary of the site, are oriented east-west in relation to the dominant northwest-southeast trend of adjoining

provinces. The Transverse Ranges province extends from the Channel Islands eastward to the Eagle and Cottonwood Mountains of the Mojave desert.

The site is located in the foothills of the San Gabriel Mountains in an area underlain by Pliocene and Miocene age sedimentary and volcanic rocks. These rocks have been folded and tilted by tectonic action, and several landslides were identified within and near the site boundaries.

The relationship of the site to local geologic features is depicted on Enclosure "A-3", Geologic Index Map.

SOILS:

Based on soils mapping performed by U.S. Department of Agriculture available from Los Angeles County Department of Public Works (2010) and a prior report by Robert Bein, William Frost & Associates (1999), the project site is underlain by several soils types including Yolo, Vista-Amargosa, Soper-Ramona, Gilroy, and Rockland. These soils vary in depth, depending on slope aspect (with deeper soils occurring on areas of lower gradient), degree of permeability (with less permeable soils derived from parent materials/bedrock having clay-forming mineralogies) and susceptibility to erosion. Indications of significant historic agricultural utilization of the site area was not observed.

GEOLOGIC MATERIALS:

The site is underlain by two bedrock units separated by an inactive fault that trends approximately east-west through the central portion of the site. The bedrock units include sedimentary rocks of the Puente Formation and extrusive rocks of the Glendora Volcanics. The bedrock units are mantled by fill, young alluvium, colluvium, debris flow deposits, older terrace deposits, and landslide debris of variable thickness. Streitz (1966), Dibblee (2002), and Morton and Miller (2003) included the area of the site in geologic mapping.

Fill (f):

Fill (unit symbol f) is present locally within the site and is associated with grading of roads and development of the southern portion of the flat-lying corral area located in the west-central portion of

the site. Roadway fill is derived from local materials including the bedrock units and colluvium and is limited to the area immediately adjacent to roads within the site. A larger area of roadway fill is located at the topographic saddle between Lots 19 and 21. Fill in the corral area includes abundant concrete and asphalt debris with lesser metal, glass, and wood debris. The corral area fill was encountered to a depth of 17 feet in Exploratory Boring No. HSA-1, where refusal occurred on large debris. The corral area fill is estimated to be up to 40 feet thick at the head of the west branch of Shuler Canyon and thins toward a daylight line in the central portion of the corral area based on topographic relations and data from site explorations. A smaller area of fill debris, including concrete fragments, was encountered in the southern portion of Lot 21. Refusal was encountered at a depth of 9 feet below the ground surface (bgs) in Test Pit No. TP-31 within this area. The undocumented fill generally consists of silty sands, clayey sands, and silts and range from loose to medium dense states. The undocumented fill and debris is considered unsuitable for support of structures.

Alluvium (Qya):

Alluvium (unit symbol Qya) consisting of unconsolidated silty sand and clayey sand in loose to medium dense states was encountered at the mouth of Shuler Canyon. The lower portion of this unit contained gravel to 3 inches in size.

Colluvium (Qcol):

Colluvium (unit symbol Qcol) consisting of sandy silty clay and silty clayey sand in loose to medium dense states, derived from weathering and gravity transport of the bedrock materials, is present on ridge tops, on slopes, and in ravines and drainages within the site. This is the most widely distributed surficial material within the site; however, due to its limited thickness, is mapped only in areas where thicker accumulations were observed. Thick accumulations of colluvium occur locally within the narrow drainage/ravine bottoms in the site. The unconsolidated colluvium is subject to gravity creep on slopes and is considered a typical source for debris flow-type slope failures triggered by heavy precipitation events.

Older Terrace Deposits (Qt):

Older terrace deposits (unit symbol Qt) were observed in two areally-limited ridge top locations capping Puente Formation bedrock. These deposits consist of weathered, well-rounded gravel and cobbles of volcanic and gneissic lithologies in an orange-brown sandy matrix. The elevation difference between these two areas suggests deposition by a west-flowing drainage system.

Landslide Deposits (Qls):

Landslide deposits (unit symbol Qls) were observed in the northwest portion of the site and locally within the west-central and southwestern portions of the site. The presence of landside deposits is based on evaluation of the topographic map of the site, review of aerial photographs, prior mapping by others, and observation of rock outcrops and geomorphology at the site. Landslide debris derived from the Glendora Volcanics unit is anticipated to consist of materials ranging in composition from pervasively crushed and sheared rock material that is highly weathered to relatively intact, hard and durable angular boulder-size clasts that are difficult to excavate. Landslide debris derived from the Puente Formation unit is anticipated to consist of a mixture of angular siltstone and sandstone fragments in a matrix of sandy clayey silt.

Debris Flow Deposits (Qdf):

Debris flow deposits of variable age (based on degree of cementation) were observed in a road cut and in test pits located in the Wildwood Canyon area. These materials consist of clast-supported, poorly-sorted, sub-rounded to angular gravel and cobble clasts in a silty sand matrix. The debris flow deposits exposed in the road cut include boulder-size clasts of Glendora Volcanics up to 5 feet in size. These materials are typically mantled by colluvium (unit Qcol).

Puente Formation (Tp):

The Puente Formation (unit symbol Tp) consists primarily of whitish to tan, thinly- and well-bedded siltstone and more thickly-bedded sandstone. The siltstone and sandstone weather to a dark gray clay-bearing soil mantle and erode to form a more subdued topography relative to the volcanic materials. Bedding attitudes within the Puente Formation strike primarily along an east-west axis and dip toward the north and south. Bedding is locally folded or overturned near faults and fold

structures. Dibblee (2002) mapped a series of folds within the southern portion of the site that are expressed as alternately north- and south-dipping beds. Hard, cemented siliceous beds were observed in limited areas of the site and in bucket-auger borings. Jointing formed oblique to bedding is common within the siltstone units. Gypsum fillings along beds and fractures were observed locally in the Puente Formation.

Glendora Volcanics (Tgv):

The Glendora Volcanics (unit symbol Tgv) as designated for this investigation includes andesite flows and tuff breccia and locally a fine-grained basalt member that together comprise a steep-weathering formation exposed in road cut and limited natural outcrops. The andesite is fine-grained and locally porphyritic with primarily discontinuous, pervasive joints. The tuff breccia contains abundant rounded cobbles and angular andesite rock fragments and forms durable outcrops that stand at steep angles. The basalt member is limited in areal extent in natural exposures and appeared more regularly jointed than the other volcanic units. For the purposes of this investigation, the volcanic units are mapped as a single unit. The Glendora Volcanics weather to clay-bearing, slope-mantling sandy sediments that form the soil cover within the northern portion of the site. Large boulders (up to 5 feet in size) derived from the volcanic units were noted locally as rock fall below steep outcrops within the site. Outcrop patterns within the volcanics are less predictable than in the siltstone, due to the mechanics of extrusion and emplacement. Geologic structure in the volcanics is generally massive with pervasive small-scale jointing predominating over less common well-developed joints formed in fine-grained exposures. No consistent orientation of structure was observed.

MINERAL RESOURCES:

The mineral resource potential for the area of the site is addressed in a report titled, "Mineral Land Classification of the Greater Los Angeles Area" (CDMG, 1987). The report addresses the sand and gravel resource potential according to the presence or absence of significant sand and gravel deposits for use in construction grade aggregate. The resource quality of surrounding lands – including urbanized areas – was reported according to the following Mineral Resource Zone (MRZ) classification system:

- **MRZ-1:** Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.
- **MRZ-2:** Areas where adequate information indicates mineral deposits are present, or where it is judged that a high likelihood for their presence exists.
- **MRZ-3:** Areas containing mineral deposits, the significance of which cannot be evaluated from available data.
- **MRZ-4:** Areas where available information is inadequate for assignment to any other MRZ.

The project site lies within MRZ-3. The site is situated in a primarly bedrock terrain underlain by fine-grained sediments of the Puente Formation and Glendora Volcanics. No economically significant sources of aggregate material were observed within the site, and no aggregate mining currently occurs in similar geologic terrain in the immediate project vicinity.

LANDSLIDES:

Enclosure "A-2" presents our current understanding of known landslide deposits within proposed building areas of the site. The conclusions with regard to existing landslides within the site are based on geomorphic relations, review of aerial photographs, observations of existing road-cut exposures, and explorations limited to relatively shallow depths due to the hard character of the Glendora Volcanic unit and limited access to Shuler Canyon in the southern portion of the site. The depth of currently recognized landslide deposits was estimated using balanced cross sections and topographic relations and, during grading, may be found to be greater or less than estimated. In addition, previously unrecognized landslide deposits may be encountered during grading of the site that will require mitigation by removal or stabilization. In contrast, previously mapped landslide areas may be found to be underlain by intact bedrock during grading.

The area of Lots 49 through 52 are underlain by mapped landslide deposits or suspected landslide deposits. The landslides consist of west and southwest failing rock masses that exhibit steepened, arcuate source scarps and debris areas of moderately sloping topography that exhibit "hummocky"

morphology. Portions of these deposits are visible in road-cut exposures at the northern boundary of Lots 51 and 52 and at the western boundary of Lot 49.

Loose rock blocks and a low scarp area were observed at the top of the slope above a landslide located north of and adjacent to Lots 51 and 52, suggesting continued creep of rock in the head scarp. This landslide is visible on aerial photographs of the site taken in multiple years. Road cuts formed through the slide mass expose pervasively sheared and crushed rock material that is highly weathered and lacks intact rock material or blocks. It is anticipated that this feature will be exposed in the proposed cut slope located northeast of Lot No. 52 and may present a hazard to Lot No. 52.

The toe of a large, previously mapped landslide is located in the northwest corner of the site. This landslide extends offsite toward the northeast, approximately one mile to its source area. This landslide is not located within the development area and is not anticipated to affect the proposed improvements.

A landslide underlying the area of Lot No. 49 and a portion of Lot No. 50 is identified based on aerial photographs and topographic relations. This landslide is visible on aerial photographs of the site taken in multiple years. Road cuts formed through the slide mass expose apparently intact rock material that is overlain by a thick colluvium/soil profile and locally by debris flow deposits.

Two landslides, identified on aerial photographs and by geomorphic and topographic relations, "toe" into the west branch of Shuler Canyon within the alignment of a proposed roadway in the southwestern portion of the site. Based on the orientation of bedding measured within Test Pit TP-39, it appears that a shallow out-of-slope component of dip may contribute to instability of slopes in this area.

Additional landslides are present in the east branch of Shuler Canyon; however, development is not planned in this area of the site. Several landslides are mapped on the flanks of slopes in the area of

Lots 19 and 20 and west of the ridge of Lots 54 through 56. The downslope toe areas of these landslides do not underlie or project toward areas proposed for development.

DEBRIS FLOWS:

Debris flow scars are present within the site in areas of steep canyon topography, primarily in the "head" areas of steeper drainages. The locations of debris flow scars identified during the engineering geologic investigation are shown on Enclosure "A-2".

SOIL CHEMICAL TESTS AND CORROSION POTENTIAL:

Chemical tests performed for our prior site investigation indicate values that are considered potentially "mildly" corrosive to ferrous metals at as-received condition and "severely" corrosive at saturated condition.

Ammonium and nitrate levels did not indicate a concern as to corrosion of buried copper.

Results of the soluble sulfate tests indicated a "negligible" anticipated exposure to sulfate attack.

The soluble chloride content of the soils tested was not at levels high enough to be of concern with respect to corrosion of reinforcing steel.

GROUNDWATER:

The site is located in portions of Sections 27 and 34 of Township 1 North, Range 9 West, north of the San Gabriel Valley groundwater basin. The area of the site is underlain by bedrock formations at shallow depths and is not considered a groundwater-production area. Springs or seeps were not noted within the site; however, a spring is shown on the U.S. Geological Survey 7.5-minute topographic map near the western boundary of the site within proposed Lot "E". Groundwater was encountered within clayey sand in Exploratory Boring No. HSA-4 at a depth of 42 feet bgs, but not in Exploratory Boring Nos. HSA-2, HSA-3, or HSA-5, suggesting that this occurrence is localized. Groundwater may occur in the subsurface within bedrock fractures or as "perched" water on the bedrock/colluvium

interface and/or bedrock/alluvium interface locally. The site is not located within a groundwater production area, and no active wells are known to exist within the site.

FAULTS:

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 proposed residential development portions of the site, was not observed on the geologic maps and aerial photographs reviewed for this investigation. Enclosure "A-7" provides a list of faults in the southern California region with the distance from the site and fault parameters.

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 (PHT) system and the Northridge Thrust, and exposed faults including the Sierra Madre-Cucamonga fault system.

A bedrock fault that separates Puente Formation (Tp) from Glendora Volcanics (Tgv) trends roughly east-west through the site (Enclosure "A-2"). This fault was measured to strike N42W and dip to the northeast at an angle of 52 degrees during our prior investigation. Prior work by Leighton & Associates (2000) included trenching across this fault trace in the area of Lot No. 59 where a thick cumilic soil profile and highly weathered channel deposits were observed to be developed/emplaced over the fault zone. Lack of shear planes or faulting within these overlying sediments, estimated to

be pre-Holocene in age, indicate that this fault has not ruptured since before Holocene time. Therefore, this fault is considered inactive for planning purposes.

The Sierra Madre fault is mapped along the southern margin of the foothills within and near the southern boundary of the site (Enclosure "A-2"). This area of the site does not include proposed occupancy structures. 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 M_L 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 7 miles west of the site. The February 9, 1971 San Fernando (Sylmar) earthquake (M_W 6.6) occurred on the San Fernando fault; a member of the TRFFS.

The Cucamonga fault is located approximately 4 miles east 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 San Gabriel Mountains known as the Transverse Ranges frontal fault system. The San Fernando fault of this system ruptured during the 1971 moment magnitude (**M**) 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 San Jose fault is located approximately five miles south of the site and trends from the southwestern San Jose Hills northeastward to the Upland-Claremont region. The San Jose fault is the source of a M_L 4.7 earthquake on June 26, 1988 and a larger M_L 5.4 earthquake on February 28, 1990 called the Upland earthquake, both epicentered northeast of the site.

The Mojave segment of the San Andreas fault zone is located along the northeast margin of the San Gabriel Mountains, approximately 18 miles northeast of the site. The San Andreas fault is characterized by youthful fault scarps, vegetational lineaments, springs, and offset drainages. The

1857 Fort Tejon earthquake of approximate 7.9 M_W occurred on the Mojave segment of the San Andreas fault. The Working Group on California Earthquake Probabilities (1995) tentatively assigned a 28 percent (± 13 percent) probability to a major earthquake (moment magnitude 7.0 to 7.9) occurring on the San Bernardino Mountains segment of the San Andreas fault between 1994 and 2024.

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, Raymond, and Whittier faults, located 8 miles southeast, 9-1/2 miles southwest, 10-1/2 miles west, and 13-1/2 miles south 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-6" (Epi Software, 2000). This map includes data from the California Institute of Technology database for earthquakes with magnitudes of 4.0 or greater from 1932 through 2009. The following table summarizes the historic seismic events in the site region.

Event Name	**Date**	**Magnitude**	**Distance to epicenter (km)**	**Direction from Site**
Fort Tejon	January 9, 1857	7.9	290	NW
Long Beach	March 10, 1933	6.4	59	SW
Tehachapi (Kern)	July 21, 1952	7.3	150	NW
San Fernando	February 9, 1971	6.6	62	NW
Whittier Narrows	October 1, 1987	5.9	26	WSW
Sierra Madre	June 28, 1991	5.8	24	NW
Landers	June 28, 1992	7.3	126	E
Big Bear	June 28, 1992	6.4	90	E
Northridge	January 17, 1994	6.7	67	WNW
Hector Mine	October 16, 1999	7.1	152	E

Upland	June 26, 1988	4.7	8.9	ENE
Upland	February 28, 1990	5.4	9.5	ENE
Chino Hills	July 19, 2008	5.4	18	SSE

GEOTECHNICAL HAZARDS

FAULT RUPTURE:

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 proposed residential development portions of the site, was not observed on the geologic maps and aerial photographs reviewed for this investigation.

A bedrock fault that separates Puente Formation (Tp) from Glendora Volcanics (Tgv) trends roughly east-west through the site (Enclosure "A-2"). This fault was measured to strike N42W and dip to the northeast at an angle of 52 degrees during our prior investigation. Prior work by Leighton & Associates (2000) included trenching across this fault trace in the area of Lot No. 59 where a thick cumilic soil profile was observed to be developed over the fault zone. This fault is considered inactive for planning purposes.

SEISMICITY:

The site is located within a seismically active region; therefore, strong ground shaking may occur during the design life of the proposed project.

SLOPE STABILITY AND LANDSLIDES:

Portions of the site are identified as being susceptible to soil slip (Enclosure "A-4", Morton et al., 2003) or as having a potential for seismically-induced landsliding or slope failure (Enclosure "A-5", CGS, 1999).

Natural slopes also include areas as steep as 1.25 horizontal to 1 vertical [1.25(h):1(v)] and locally steeper in areas of erosion and debris flow formation underlain by steep-standing bedrock. Several landslides, suspected landslides, and debris flow scars are present within the project area.

Loose rock blocks and a low scarp area were observed at the top of the slope above a landslide located north of and adjacent to Lots 51 and 52, suggesting continued creep of rock in the head scarp. This landslide is visible on aerial photographs of the site taken in multiple years. Road cuts formed through the slide mass expose pervasively sheared and crushed rock material that is highly weathered and lacks intact rock material or blocks. It is anticipated that this feature will be exposed in the proposed cut slope located northeast of Lot No. 52 and may present a hazard to Lot No. 52.

The toe of a large, previously mapped landslide is located in the northwest corner of the site. This landslide extends offsite toward the northeast, approximately one mile to its source area. This landslide is not located within the development area, is not anticipated to affect the proposed improvements, and is not considered a significant hazard to the proposed project.

A landslide underlying the area of Lot No. 49 and a portion of Lot No. 50 is identified based on aerial photographs and topographic relations. This landslide is visible on aerial photographs of the site taken in multiple years. Road cuts formed through the slide mass expose apparently intact rock material that is overlain by a thick colluvium/soil profile and locally by debris flow deposits. Settlement and future slippage are potential hazards associated with this feature.

Two landslides, identified on aerial photographs and by geomorphic and topographic relations, "toe" into the west branch of Shuler Canyon within the alignment of a proposed roadway in the southwestern portion of the site. Based on the orientation of bedding measured within Test Pit TP-39, it appears that a shallow out-of-slope component of dip may contribute to instability of slopes in this area. Mitigation of the these features will be required during grading to reduce the potential adverse impacts to a less than significant level.

Additional landslides are present in the east branch of Shuler Canyon; however, development is not planned in this area of the site. Several landslides are mapped on the flanks of slopes in the area of Lots 19 and 20 and west of the ridge of Lots 54 through 56. The downslope toe areas of these landslides do not underlie or project toward areas proposed for development. Landslides in east Shuler Canyon are not considered a significant hazard to the proposed project.

Slope stability analysis results indicate that proposed slopes would be stable as long as mitigation measures, including deepened wall heights and buttress fills for locally adverse conditions, are included in the design and construction of the project infrastructure.

DEBRIS FLOWS:

The site is located in an area identified as locally having a moderate to high potential for generation of debris flows (Enclosure "A-4", Morton et al., 2003). Debris flow scars are present within the site in areas of steep canyon topography, primarily in the "head" areas of drainages. Debris flow and rock fall hazards exist on the site where development is proposed at the base of the natural slopes and at the mouth of the canyons. Structures and property within the paths of substantial debris can be severely damaged if such hazards occur. The locations of debris flow scars identified during the engineering geologic investigation are shown on Enclosure "A-2". Mitigation of debris flow effects will be required. Adequate debris basin storage should be included in the project design in order to accommodate the storm water runoff as well as the debris volume that will be generated during a "design" storm event. The design of these basins is the purview of the project civil engineer.

EROSION:

The native soils mantling the site are considered moderately susceptible to erosion.

LIQUEFACTION AND SEISMIC-INDUCED SETTLEMENT:

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. 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.

The site is not located within an area identified as having a potential for liquefaction by the California Geological Survey (p.k.a. State of California Division of Mines and Geology, 1999). Based on the anticipated groundwater conditions within the site and the dense nature of the sediments and bedrock underlying the site, liquefaction is not considered a hazard at the site.

Based on the dense nature of the sediments and bedrock underlying the site, seismic settlement is not considered a hazard at the site.

TSUNAMIS, INUNDATION, SEICHES, AND FLOODING:

The site is not located in a coastal area; therefore, tsunamis are not considered a hazard at the site.

A water storage tank is proposed for Lot F that may be subject to rupture in the event of earthquake-induced seiches. Water released from the tank is anticipated to be directed toward the Lot F access road and downslope away from areas of the site developed with residential structures. Therefore, the level of significance to occupied structures is considered low.

The site is located in an area in which flood hazards are "undetermined but possible" (FEMA, 2008). It is anticipated that site improvements will be constructed according to accepted standards and practices generally utilized in design of similar improvements in the site region. Drainage and impound structures/improvements are included in the tentative tract map and are designed to control flow of surface water within the site. Flooding is not considered a significant hazard to the site.

SUBSIDENCE:

The site is not located in an area of known subsidence associated with groundwater or petroleum fluid withdrawal, peat oxidation, or hydroconsolidation.

Density tests and blowcount data from our prior investigation indicates that soils are generally in medium dense to very dense or stiff to hard states and are considered to have very low hydroconsolidation potential.

SETTLEMENT POTENTIAL OF EXISTING FILL AND PROPOSED DEEP FILL:

Based upon our prior 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. These conditions may cause unacceptable differential and/or overall settlement upon application of the anticipated foundation loads.

EXPANSIVE AND CORROSIVE SOILS:

The results of expansion index (E.I.) tests performed during our prior investigation range from 18 to 101, indicating a "very low" to "high" potential expansion classification according to the 2007 California Building Code (CBC). Soils with an E.I. of 21 or greater require special consideration for foundation design to mitigate potential detrimental effects of expansive soils. Soils with an E.I. of 21 or greater will be encountered during grading.

Chemical tests performed for our prior site investigation indicate values that are considered potentially "mildly" corrosive to ferrous metals at as-received condition and "severely" corrosive at saturated condition. Ammonium and nitrate levels did not indicate a concern as to corrosion of buried copper.

Results of the soluble sulfate tests indicated a "negligible" anticipated exposure to sulfate attack. The soluble chloride content of the soils tested was not at levels high enough to be of concern with respect to corrosion of reinforcing steel.

VOLCANIC HAZARDS:

The site is not subject to any known volcanic hazards.

MINERAL RESOURCES:

As the project area is not presently used for mineral resource extraction and does not contain identified sources of aggregate materials, the proposed project will not result in the loss of availability of any known mineral resources. Thus, no significant impacts are anticipated.

WASTEWATER:

Use of septic tanks or other wastewater disposal systems is not proposed for the subject project.

OFF-SITE IMPACTS:

Potential geotechnical impacts to off-site areas are not anticipated due to requirements regarding grading permitting, erosion control, and avoidance of non-permitted disturbance to off-site areas required by local regulations.

MITIGATION MEASURES FOR POTENTIAL GEOTECHNICAL HAZARDS

GENERAL:

As a part of mitigation for the project on a general basis, the proposed residential structures and site infrastructure and improvements will be designed and constructed in compliance with applicable building codes. The City of San Dimas will require that local building code requirements and project considerations be met prior to issuance of a building permit. Proper design and construction in conformance with the recommendations of the prior geotechnical investigations for the project, and compliance with applicable building codes, will reduce the potential adverse impacts of identified geotechnical hazards.

SEISMICITY AND GROUND SHAKING:

The potential for strong ground shaking at the site during the design life of the proposed project is high. The proposed improvements and structures will be designed according to seismic design parameters and procedures presented in the applicable building code for earthquake ground motions that are expected to occur in the site region as determined during the prior geotechnical

investigations. While potential impacts of ground shaking that could affect the proposed development will be reduced with proper design and construction, adverse effects due to ground shaking could occur.

SLOPE STABILITY:

Portions of the site are identified as being susceptible to soil slip or as having a potential for seismically-induced landsliding or slope failure.

Natural slopes also include areas as steep as 1.25(h):1(v) and locally steeper in areas of erosion and debris flow formation underlain by steep-standing bedrock. Several landslides, suspected landslides, and debris flow scars are present within the project area. Proper design, grading and construction in accordance with the recommendations presented in the prior geotechnical investigations for the subject project will mitigate the impact from existing landslides to a less than significant level.

Slope stability analysis results based the geometry of slopes presented in the project plans indicate that proposed slopes would be stable as long as mitigation measures, including deepened wall heights and buttress fills for locally adverse conditions, are included in the design and construction of the project infrastructure.

Loose rock blocks and a low scarp area were observed at the top of the slope above a landslide located north of and adjacent to Lots 51 and 52, suggesting continued creep of rock in the head scarp. This landslide is visible on aerial photographs of the site taken in multiple years. Road cuts formed through the slide mass expose pervasively sheared and crushed rock material that is highly weathered and lacks intact rock material or blocks. It is anticipated that this feature will be exposed in the proposed cut slope located northeast of Lot No. 52 and may present a hazard to Lot No. 52. Mitigation will require removal of landslide debris or construction of a stabilization fill that will mitigate the potential impact from this existing landslide to a less than significant level.

A landslide underlying the area of Lot No. 49 and a portion of Lot No. 50 is identified based on aerial photographs and topographic relations. This landslide is visible on aerial photographs of the site

taken in multiple years. Road cuts formed through the slide mass expose apparently intact rock material that is overlain by a thick colluvium/soil profile and locally by debris flow deposits. Settlement and future slippage are potential hazards associated with this feature. Mitigation measures, including removal of landslide debris or construction of a stabilization fill or both, will be required to reduce the potential adverse impact of this feature to a less than significant level. Based on the estimated thickness of the landslide deposit, up to approximately 35 feet of material (including the overlying colluvium) would need to be removed for mitigation by removal and replacement. Alternatively, construction of the proposed fill slope located west of Lot No. 49 as a stabilization fill could mitigate the potential for future movement of this slide mass.

Two landslides, identified on aerial photographs and by geomorphic and topographic relations, "toe" into the west branch of Shuler Canyon within the alignment of a proposed roadway in the southwestern portion of the site. Based on the orientation of bedding measured within Test Pit TP-39, it appears that a shallow out-of-slope component of dip may contribute to instability of slopes in this area. Mitigation measures, including removal of landslide debris or construction of a stabilization fill, or both, will be required to reduce the potential adverse impact of this feature to a less than significant level.

DEBRIS FLOWS:

Design of mitigation for debris flow hazards falls under the purview of the civil engineer. Based on the Tentative Tract Map, mitigation of debris flow potential is addressed by inclusion of debris basins in areas of potential debris flow movement including the areas north of Lots 28-33, 50 and 53. Review and approval of project grading plans, including debris flow mitigation measures, by the City of San Dimas is also required prior to issuance of a grading or building permit. This mitigation measure is designed to ensure that recognized engineering measures are implemented to ensure a level of safety consistent with the construction of homes.

EROSION:

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 so as to reduce the potential impact from erosion to a less than significant level.

EXPANSIVE AND CORROSIVE SOILS:

It is our recommendation that soils utilized beneath structures consist of granular, non-clay-bearing soils. Removal and replacement of the expansive soil or mixing of the expansive soil with on-site or imported non-expansive material to lower it's E.I. to less than 20 may be performed to reduce the potential adverse effects to a less than significant level. The depth of removal and replacement or mixing of the expansive soil below the proposed foundation system should be sufficient to ensure a constant moisture content in the remaining fill. Structures and site improvements should be designed to resist the effects of expansive soils in order to reduce the potential adverse effects to a less than significant level.

Chemical tests performed for our prior site investigation indicate values that are considered potentially "mildly" corrosive to ferrous metals at as-received condition and "severely" corrosive at saturated condition. Ammonium and nitrate levels did not indicate a concern as to corrosion of buried copper. Results of the soluble sulfate tests indicated a "negligible" anticipated exposure to sulfate attack. The soluble chloride content of the soils tested was not at levels high enough to be of concern with respect to corrosion of reinforcing steel. Steel and concrete materials should be selected and utilized in accordance with applicable standards to resist anticipated levels of soil corrosivity to reduce the potential impact to a less than significant level.

SETTLEMENT OF EXISTING FILL AND PROPOSED DEEP FILL:

Based upon our prior 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. These conditions may cause unacceptable differential and/or overall settlement upon application of the anticipated foundation loads. The following measures should be applied during site

grading to mitigate the potential adverse impacts of settlement of existing and proposed deep fills to a less than significant level.

Because of site conditions, it will be necessary to remove the upper 24 inches of existing soil in all areas to be graded. Further sub-excavation may be necessary, depending on the density of the underlain soils or the presence of undocumented fill.

In the area of Exploratory Boring No. HSA-7, it appears that deeper removal of younger alluvium (Qya) soil may be necessary. Removal depth in this area may exceed 15 feet bgs.

In addition, the corral area fill is estimated to be up to 40 feet thick at the head of the west branch of Shuler Canyon and thins toward a daylight line in the central portion of the corral area based on topographic relations and data from site explorations. Removals in this area are anticipated to be in excess of 40 feet bgs.

Other smaller areas of road fill and loose alluvium exist throughout the site. Removals of all unsuitable material should be performed and the subsequent excavation bottom approved by the engineering geologist prior to placement of any fill.

Utilizing the maximum anticipated fill and alluvial depths, our calculations indicated settlement of approximately 9 inches for the area of Lot Nos. 1 through 5, 14, and 58 through 61.

Removal and replacement of the alluvial material in the area of Lot Nos. 1 through 5, 14, and 58 through 61 should be performed to remove the consolidatable material. Maximum removals on the order of 60 feet bgs should be anticipated.

Settlement monitoring of fills greater than 40 feet thick (measured vertically) should be performed in order to verify substantial completion of compression of the fill.

The measures, if performed according to applicable standards and as described in the geotechnical report, are anticipated to mitigate the potential adverse effects of settlement/compression of fills and existing soils under foundation loads to a less than significant level.

MINERAL RESOURCES:

As the project area is not presently used for oil or natural gas extraction, and as no further mineral resources have been identified on or adjacent to the project area, the proposed project will not result in the loss of availability of any known mineral resources. Thus, no significant impacts are anticipated.

LIMITATIONS

C.H.J., Incorporated 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 evaluation and testing conducted for 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 C.H.J., Incorporated. 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 be encountered in the field, by the client or any firm performing services for the client or the client's assign, that appear different than those described herein, 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 office.

Respectfully submitted,

C.H.J., INCORPORATED

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

Jay J. Martin, E.G. 1529
Vice President

JSM/JJM:ndt

REFERENCES

American Society of Civil Engineers (ASCE), 2006, Minimum design loads for buildings and other structures, ASCE standard 7-05.

California Division of Mines and Geology, 1987, Mineral Land Classification of the Greater Los Angeles Area, Special Report 143; Part IV.

California Geologic Survey, 1998, Seismic Hazard Zone Report for the Glendora 7.5-minute quadrangle, Los Angeles County, California, SHZR 025.

California Geologic Survey, 1999, Seismic Hazard Zone Map for the Glendora 7.5-minute quadrangle, Los Angeles County, California, released March 25, 1999.

C.H.J., Incorporated, 2009, Geotechnical Investigation, Tentative Tract No. 70583, Approximately 300-Acre Site, Sam Dimas Foothills, San Dimas, California, dated August 20, 2009, Job. No. 09355-3.

C.H.J., Incorporated, 2009, Engineering Geologic Investigation, Tentative Tract No. 70583, Approximately 30-Acre Site, Sam Dimas Foothills, San Dimas, California, dated June 24, 2009, Job. No. 09301-8.

Dibblee, T. W., Jr., 2002, Geologic Map of the Glendora quadrangle, Los Angeles County, California, Dibblee Foundation Map No. DF-89.

Dickinson, W. R., 1996, Kinematics of transrotational tectonism in the California Transverse Ranges and its contribution to cumulative slip along the San Andreas transform fault system: Geological Society of America Special Paper 305.

Dutcher, L. C., and Garrett, A. A., 1963, Geologic and hydrologic features of the San Bernardino area, California, with reference to underflow across the San Jacinto fault: U.S. Geological Survey Water Supply Paper 1419.

Epi Software, 2000, Epicenter Plotting Program.

Federal Emergency Management Agency (FEMA), 2008, Flood Hazard Map Panel No. 06037C1445F, dated September 26, 2008.

Leighton and Associates, 2000, Revised Report of Supplemental Geotechnical Investigation, in Support of The Environmental Impact Report, Proposed Canyon Oaks Development, Wildwood Canyon Area, City of Glendora, California, dated June 28, 2000, project no. 2980169-004.

REFERENCES

Los Angeles, County of, 2008, Draft General Plan.

Los Angeles County Department of Public Works, 2010, http://dpw.lacounty.gov/wrd/publication.

Matti, J. C., and Carson, S. E., 1991, Liquefaction susceptibility in the San Bernardino Valley and vicinity, southern California, A regional evaluation: U.S. Geological Survey Bulletin 1898.

Morton, D. M., Alvarez, R. M., and Campbell, R. H., 2003, Preliminary Soil-Slip Susceptibility Maps, Southwestern California, U.S. Geological Survey Open-File Report 03-17.

Morton, D. M. and Miller, F. K., 2003, Preliminary geologic map of the San Bernardino 30 x 60 minute quadrangle, U.S. Geological Survey Open-File Report 03-293.

Morton, D. M. and Streitz, R., 1969, Preliminary Reconnaissance Map of Major Landslides, San Gabriel Mountains, California, California Division of Mines and Geology Map Sheet 51.

Morton, D. M., and Yerkes, R. F., 1987, Introduction to surface faulting in the Transverse Ranges, California, *in* Morton, D. M., and Yerkes, R. F., eds.: Recent reverse faulting in the Transverse Ranges, California: U.S. Geological Survey Professional Paper 1339, p. 1-5.

Petersen, Mark D., Frankel, Arthur D., Harmsen, Stephen C., Mueller, Charles S., Haller, Kathleen M., Wheeler, Russell L., Wesson, Robert L., Zeng, Yuehua, Boyd, Oliver S., Perkins, David M., Luco, Nicolas, Field, Edward H., Wills, Chris J., and Rukstales, Kenneth S., 2008, Documentation for the 2008 Update of the United States National Seismic Hazard Maps: U.S. Geological Survey Open-File Report 2008–1128, 61 p.

Risk Engineering, Inc., 2010, EZ-FRISK computer program, version 7.40.

Robert Bein, William Frost & Associates, 1999, Program Environmental Impact Report, Northern Foothills Implementation Program, dated June 1999. r

Streitz, R., 1966, Preliminary geologic map of the southeast quarter of the Glendora 7.5-minute quadrangle, Los Angeles County, California, California Division of Mines and Geology Open-File Report 66-1.

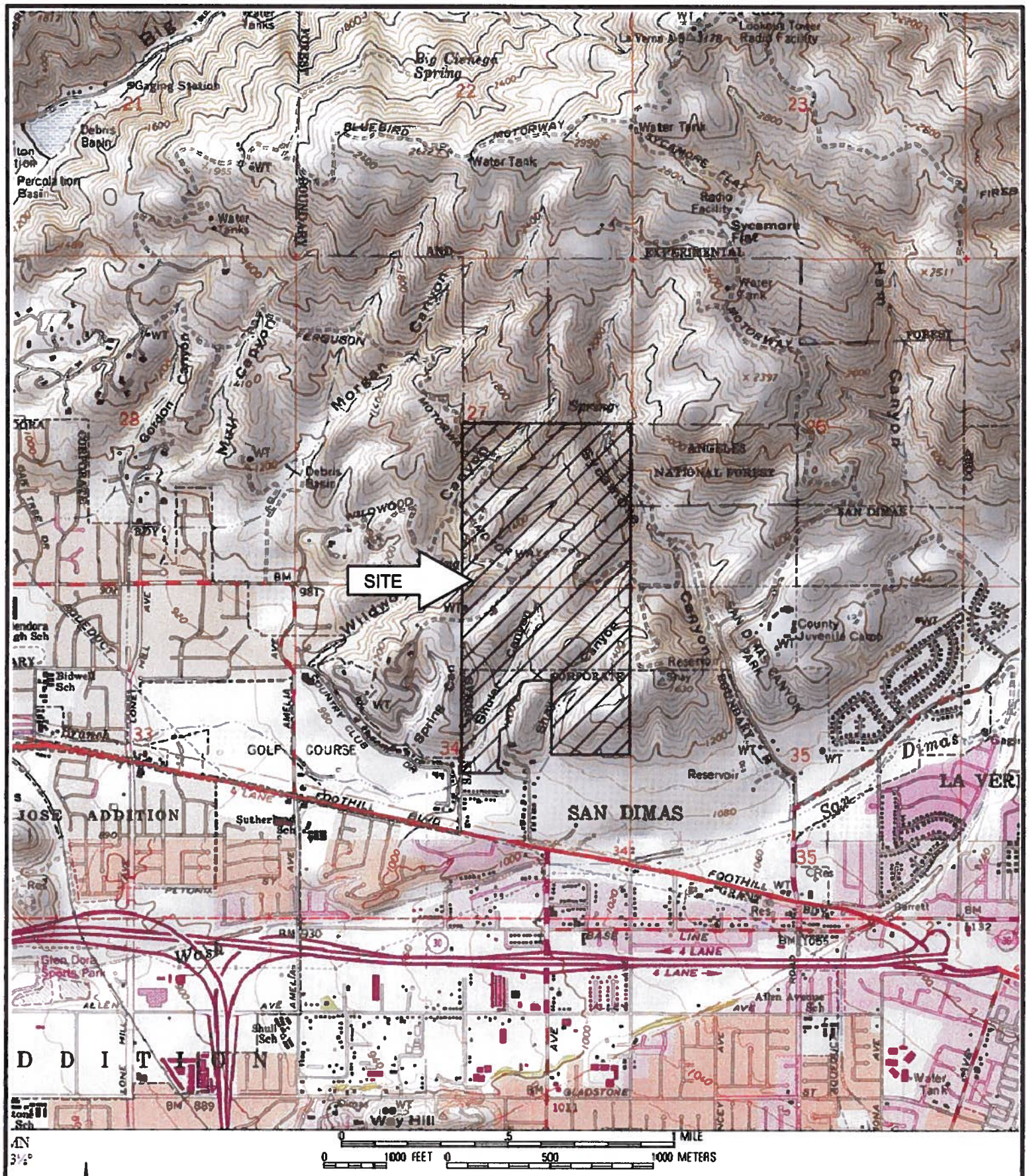
Working Group on California Earthquake Probabilities, 1995, Seismic hazards in southern California: Probable earthquakes, 1994 to 2024: Bulletin of the Seismological Society of America, v. 85, no. 2, p. 379-439.

Yerkes, R. F., 1985, Earthquake and surface faulting sources - Geologic and seismologic setting, *in* Ziony, J. I., ed., Evaluating earthquake hazards in the Los Angeles region: U.S. Geological Survey Professional Paper 1360, p. 25-41.

Enclosure "B" (1of2)
Job No. 09355-3

APPENDIX "A"

GEOTECHNICAL MAPS



AN
3½°

-N-

SCALE: 1" = 2,000'

INDEX MAP

FOR: NJD, LTD.	GEOTECHNICAL EVALUATION FOR EIR PURPOSES PROPOSED TENTATIVE TRACT NO. 70583 APPROIMATELY 300-ACRE SITE, SAN DIMAS FOOTHILLS SAN DIMAS, CALIFORNIA	ENCLOSURE "A-1"
DATE: JULY 2010		JOB NUMBER 10389-3

C.H.J. Incorporated

GEOLOGIC UNITS:

f - fill derived from local materials, along roadways (not shown) and including imported concrete and asphalt debris at head of West branch Shuler Canyon.

Qya - Younger alluvium, limited to mouth of Shuler Canyon.

Qcol - Colluvium, areas of thicker colluvium derived from slope wash and gravity creep.

Qdf - Debris flow deposits, clast-supported cobble/gravel conglomerate, fine-to medium-grained silty sand matrix, buried by Qcol, exposed in test pits in Wildwood Canyon area.

Qt - Older terrace deposit, including rounded cobbles/gravel of volcanic and gneissic lithologies in sandy matrix capping Puente Formation.

Qls - Landslide deposits, identified based on evaluation of topography, aerial photographs, prior mapping by others, and observation of rock outcrops and geomorphology of the site.

Tp - Puente Formation siltstone, thinly bedded, white to orange brown, locally cemented, forms dark gray clayey colluvium (soil cover) with tabular siltstone fragments. Includes areas of colluvium at bottoms of ravines and drainages.

Tgv - Glendora Volcanics, andesite flows and flow breccias, dark gray to purple, locally regularly jointed, typically pervasively fractured. Forms red-brown clayey colluvium on slopes and in drainages.

LEGEND:

geologic contact

Fault — ? — ? — Location based on FER map (not investigated for this project)

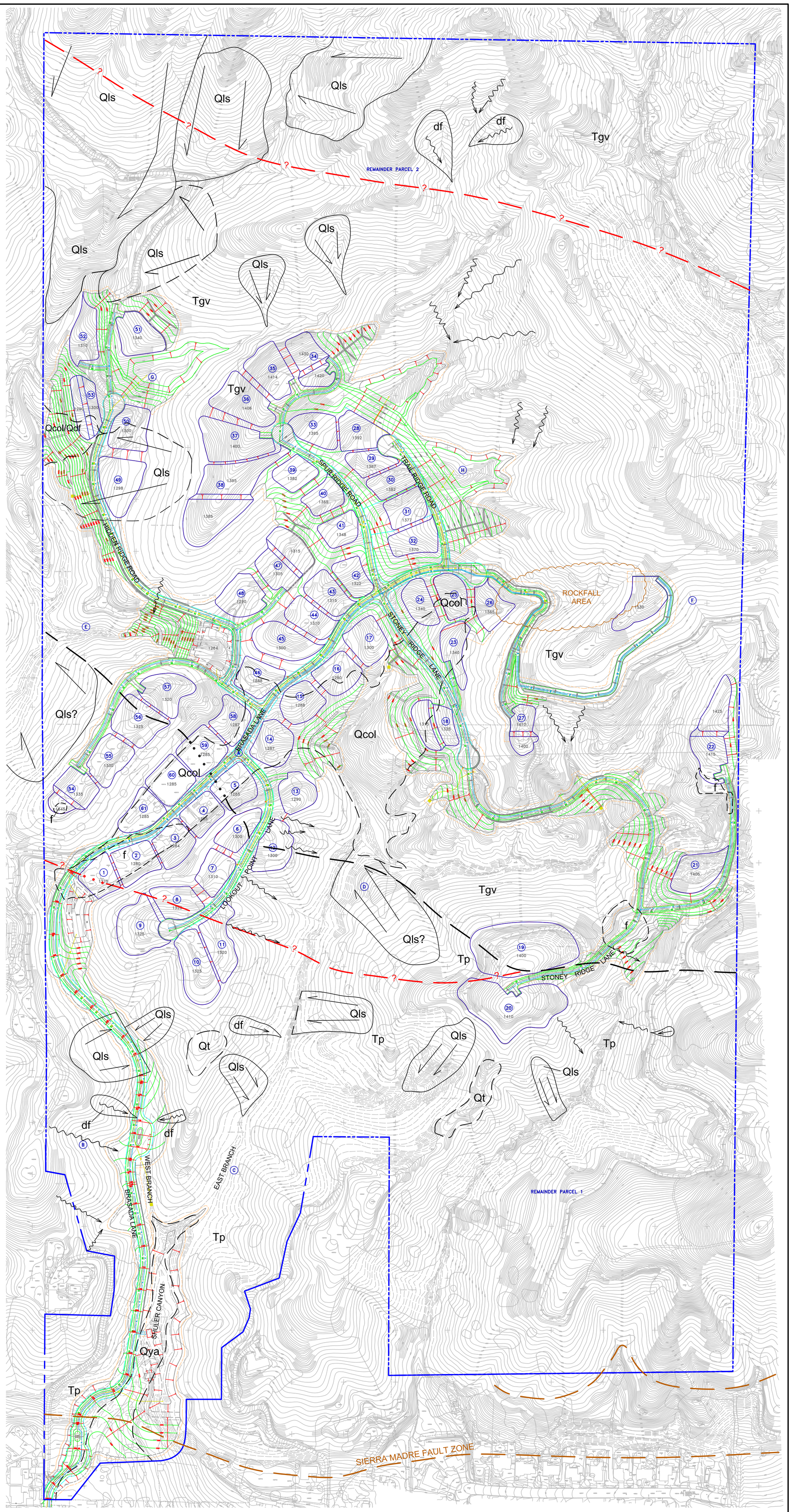
Fault — Location based on field evidence

Fault — Location based on USGS/CGS (2010)

Qls — approximate margins of landslide deposits based on photographic review, field mapping, interpretation of topographic contour map; queried where uncertain

df — debris flow scar

Area of steep topography associated with erosion along steep, narrow channels; defines areas of potential debris sources, based on photo review and field mapping, not all such areas shown.



N

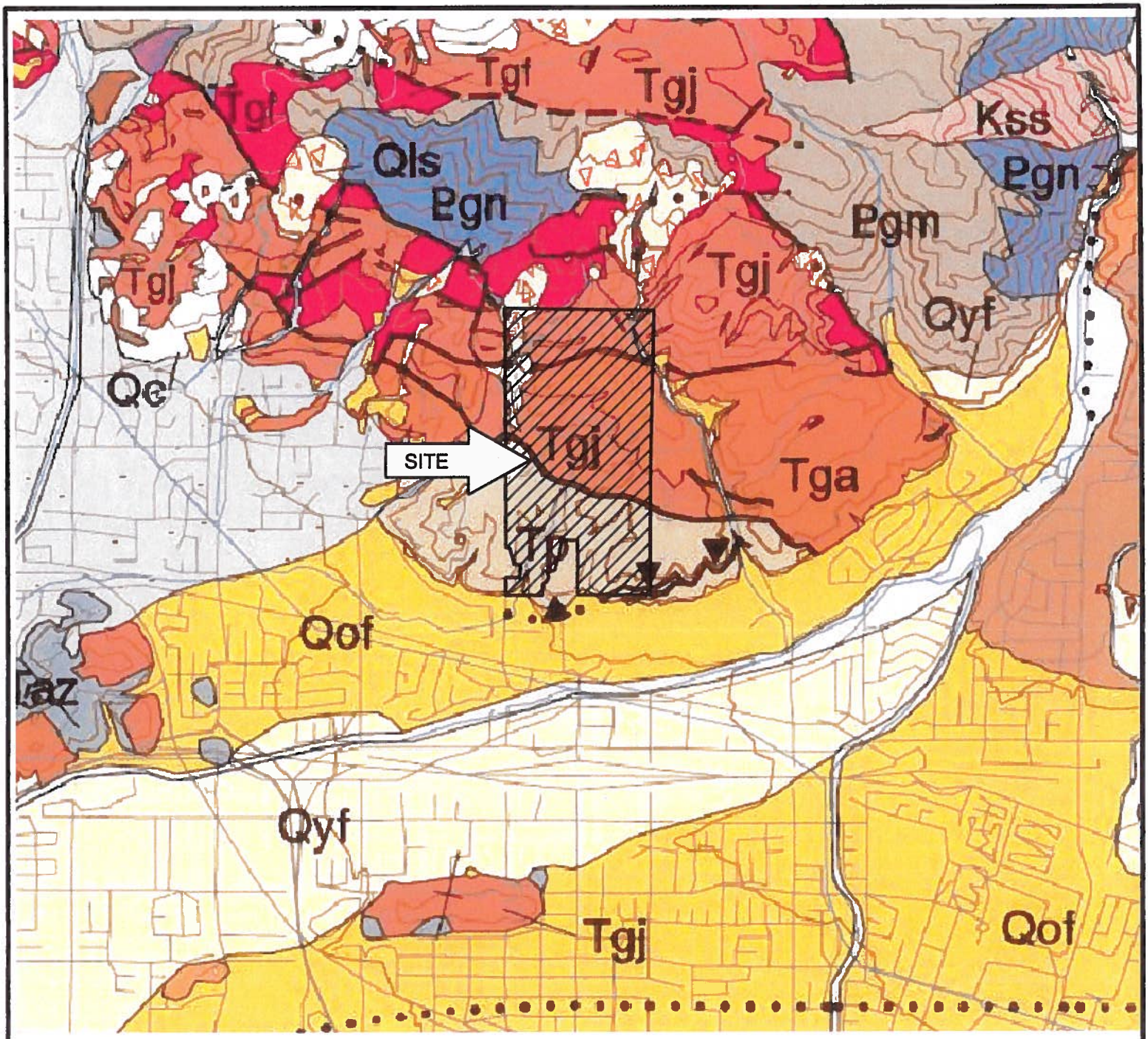
SCALE: 1"=180'

0 180 360

GEOLOGIC MAP AND SITE PLAN

FOR: NJD, LTD.	GEOTECHNICAL EVALUATION FOR EIR PURPOSES PROPOSED TENTATIVE TRACT NO. 70583 APPROIMATELY 300-ACRE SITE, SAN DIMAS FOOTHILLS SAN DIMAS, CALIFORNIA	ENCLOSURE "A-2"
DATE: JULY 2010		JOB NUMBER 10389-3

C.H.J. Incorporated



GEOLOGIC UNITS:

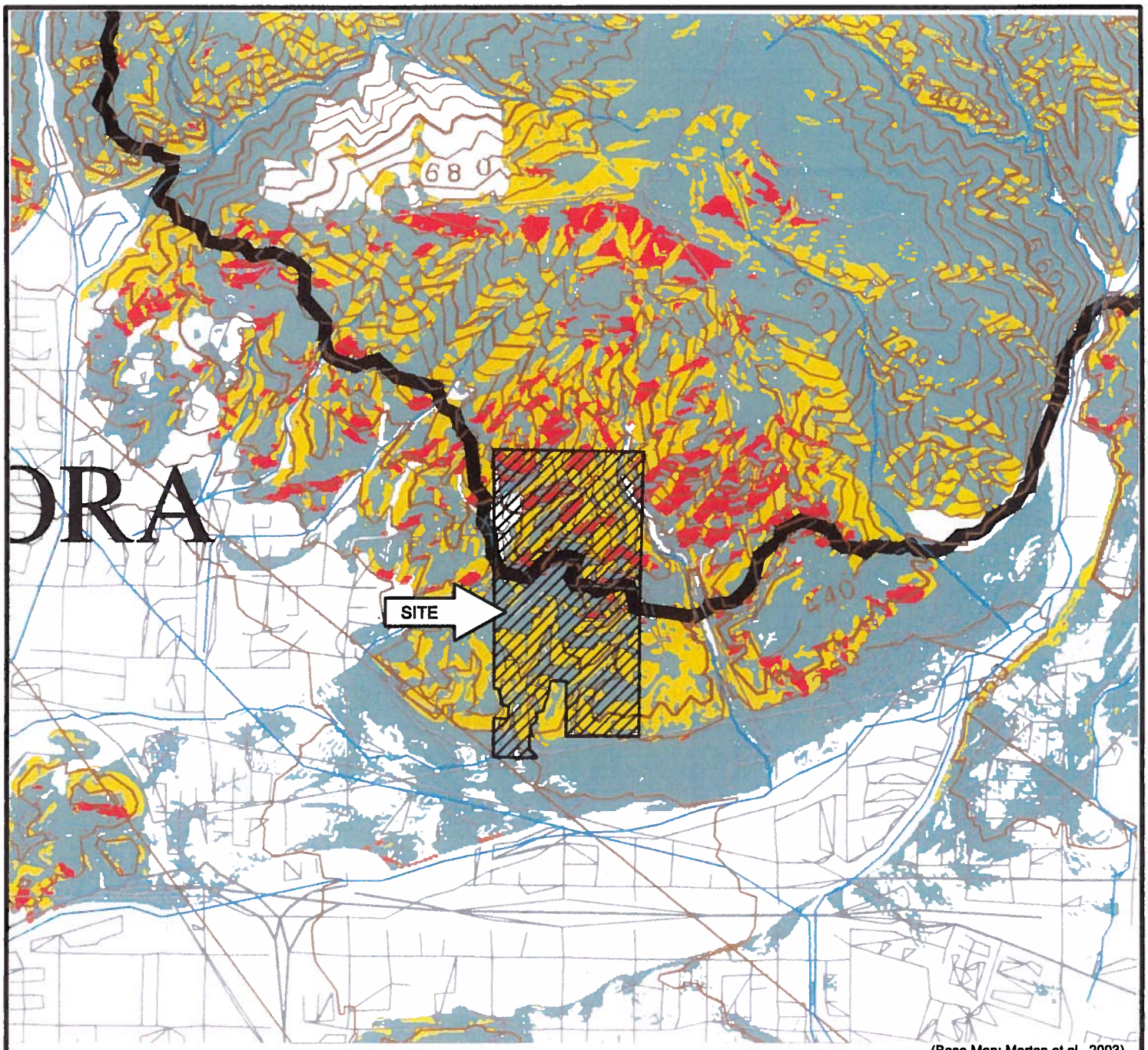
Qc - Very young colluvial deposits (late Holocene)
Qls - Very young landslide deposits (late Holocene)
Qyf - Young alluvial fan deposits (Holocene and late Pleistocene)
Qof - Old alluvial fan deposits (late to middle Pleistocene)
Tp - Puente Formation, undifferentiated (early Pliocene and Miocene)
Tga - Glendora volcanics andesite flows (Miocene)
Tgf - Glendora volcanics fine grained andesite flows (Miocene)
Tgj - Glendora volcanics tuff breccia (Miocene)

geologic contact

-N-

SCALE: 1" = 1 MILE

GEOLOGIC INDEX MAP		
FOR: NJD, LTD.	GEOTECHNICAL EVALUATION FOR EIR PURPOSES PROPOSED TENTATIVE TRACT NO. 70583 APPROIMATELY 300-ACRE SITE, SAN DIMAS FOOTHILLS SAN DIMAS, CALIFORNIA	ENCLOSURE "A-3"
DATE: JULY 2010		JOB NUMBER 10389-3
		C.H.J. Incorporated



(Base Map: Morton et al., 2003)

LOW SUSCEPTIBILITY

MODERATE SUSCEPTIBILITY

HIGH SUSCEPTIBILITY

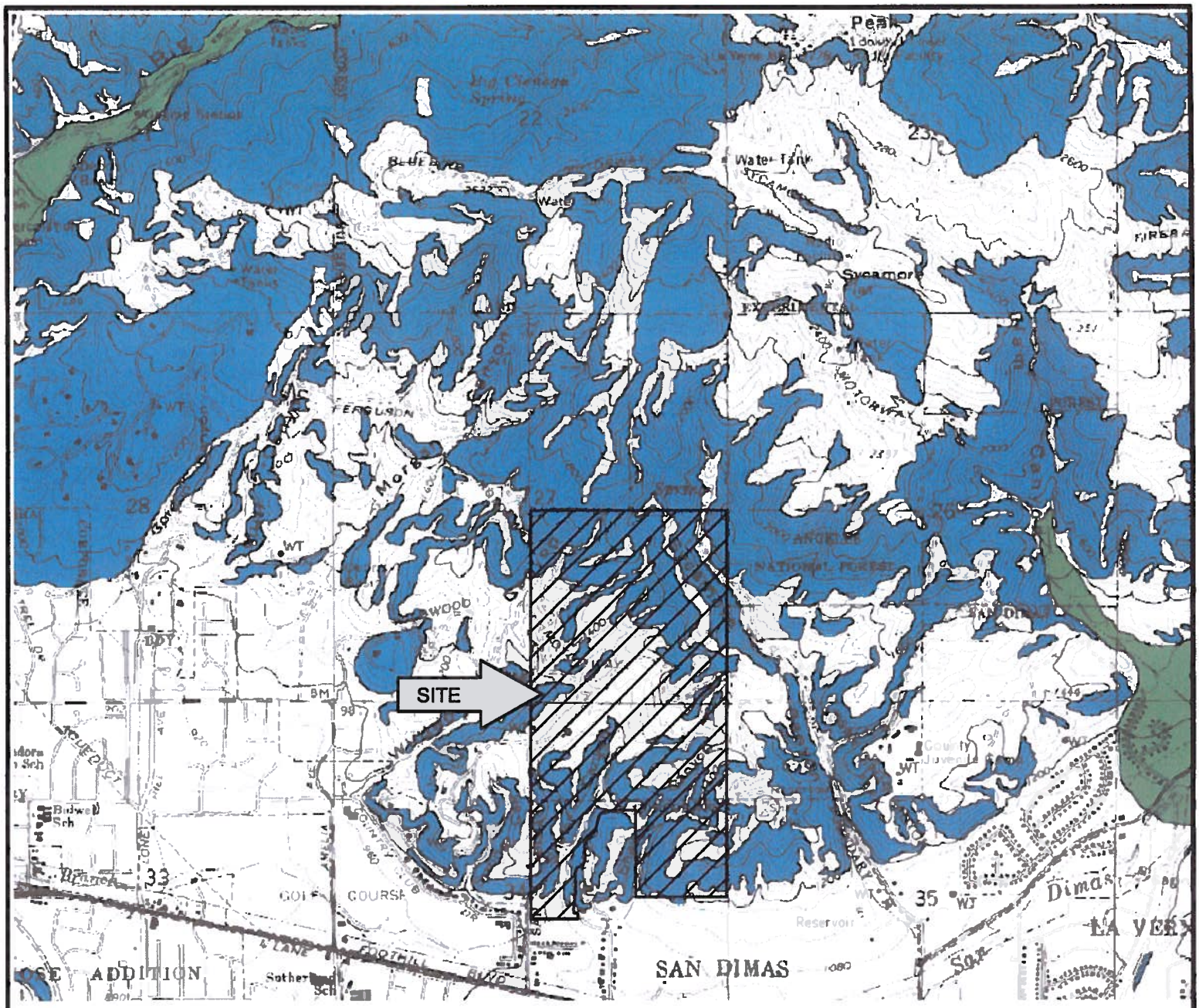
N

SCALE: 1" = 1/2 MILE

SOIL SLIP SUSCEPTIBILITY MAP

FOR: NJD, LTD.	GEOTECHNICAL EVALUATION FOR EIR PURPOSES PROPOSED TENTATIVE TRACT NO. 70583 APPROIMATELY 300-ACRE SITE, SAN DIMAS FOOTHILLS SAN DIMAS, CALIFORNIA	ENCLOSURE "A-4"
DATE: JULY 2010		JOB NUMBER 10389-3

C.H.J. Incorporated



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.

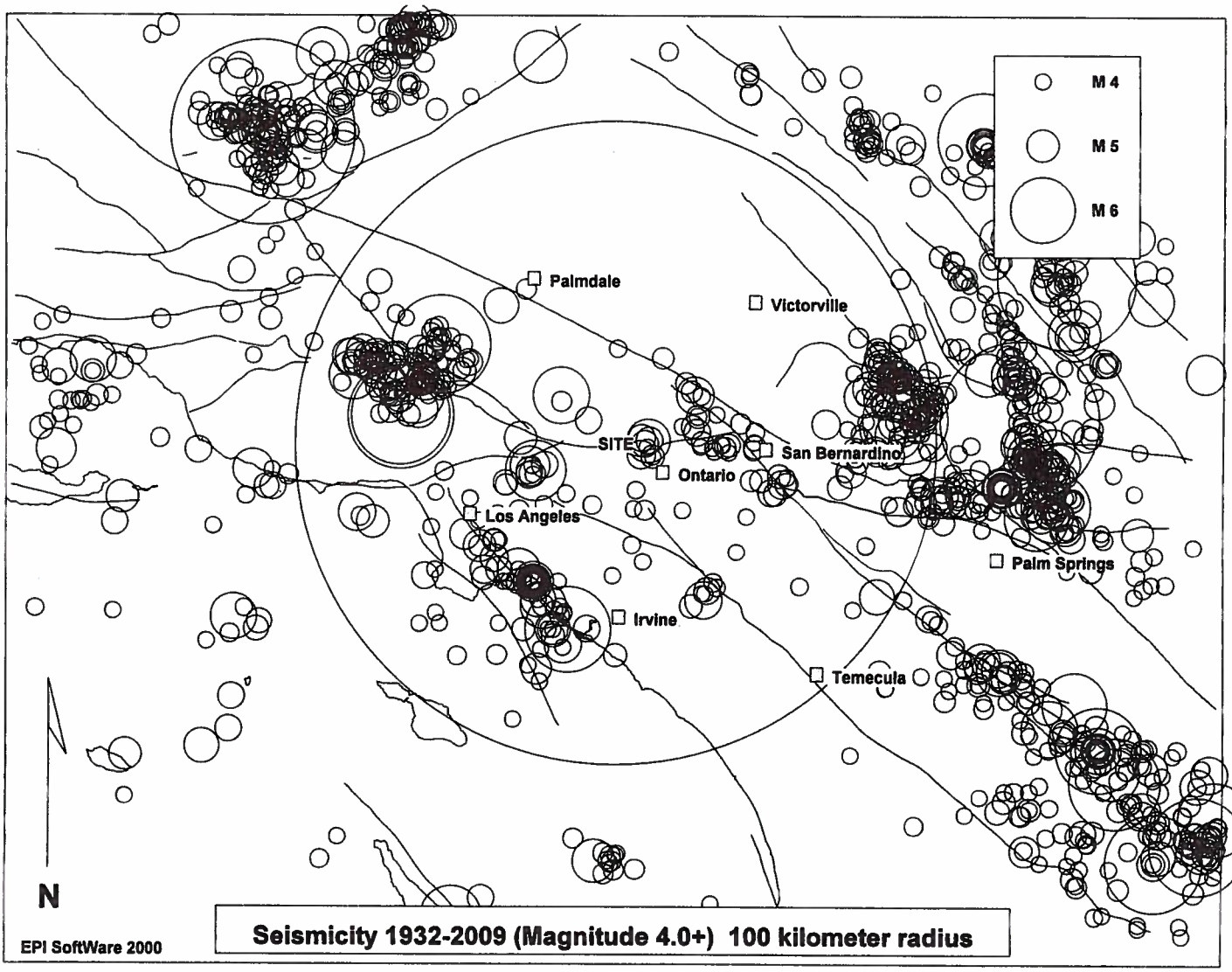
Earthquake-Induced Landslides

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.

-N-

SCALE: 1" = 2,000'

SEISMIC HAZARD ZONES MAP		
FOR: NJD, LTD.	GEOTECHNICAL EVALUATION FOR EIR PURPOSES PROPOSED TENTATIVE TRACT NO. 70583 APPROIMATELY 300-ACRE SITE, SAN DIMAS FOOTHILLS SAN DIMAS, CALIFORNIA	ENCLOSURE "A-5"
DATE: JULY 2010		JOB NUMBER 10389-3
		C.H.J. Incorporated



SITE LOCATION: 34.1355 LAT. -117.8074 LONG.

MINIMUM LOCATION QUALITY: C

TOTAL # OF EVENTS ON PLOT: 1388

TOTAL # OF EVENTS WITHIN SEARCH RADIUS: 485

MAGNITUDE DISTRIBUTION OF SEARCH RADIUS EVENTS:

4.0- 4.9 : 435
5.0- 5.9 : 45
6.0- 6.9 : 5
7.0- 7.9 : 0
8.0- 8.9 : 0

CLOSEST EVENT: 4.7 ON THURSDAY, MARCH 01, 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. 62 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. 59 KILOMETERS SOUTH OF THE SITE

0 50 100
KILOMETERS

EARTHQUAKE EPICENTER MAP

FOR: NJD, LTD.	GEOTECHNICAL EVALUATION FOR EIR PURPOSES PROPOSED TENTATIVE TRACT NO. 70583 APPROIMATELY 300-ACRE SITE, SAN DIMAS FOOTHILLS SAN DIMAS, CALIFORNIA	ENCLOSURE "A-6"
DATE: JULY 2010		JOB NUMBER 10389-3

C.H.J. Incorporated

Enclosure "A-7"
Job No. 10389-3

FAULT TABLE - TENTATIVE TRACT NO. 70583				
Fault Name	Distance (km)[2]	Fault Area (km^2)[1]	Maximum Magnitude[1]	Slip Rate (mm/year)[1]
Sierra Madre	0.1	1012	7.2	2.0
San Jose	6.7	322.8	6.7	0.5
Cucamonga	7.1	308.8	6.7	5.0
Clamshell - Sawpit	12.1	293.3	6.7	0.5
Chino - Central Avenue (Elsinore)	12.5	424	6.7	1.0
Puente Hills Blind Thrust	15	835.7	7.1	0.7
Raymond	17	357.2	6.8	1.5
Whittier	22	562.4	6.8	2.5
Upper Elysian Park Thrust	28	315.7	6.7	1.3
San Jacinto-San Bernardino	29	725.7	7.06	12.0
San Andreas - South Mojave	29	1279	7.31	30.0
Verdugo	30	513.5	6.9	0.5
San Andreas- North San Bernardino	32	451.9	6.86	24.0
Cleghorn	38	391.9	6.8	3.0
Elsinore - Glen Ivy	39	488.6	6.8	5.0
Hollywood	39	309.9	6.7	1.0
Santa Monica	44	267.4	6.6	1.0
Sierra Madre - San Fernando	47	332.6	6.7	2.0
San Gabriel	47	1198.7	7.3	1.0
San Joaquin Hills Thrust	49	730.1	7.1	0.5
Newport-Inglewood (L.A. Basin)	49	980.1	7.2	1.0
North Frontal Fault Zone (West)	54	1043	7.2	1.0
San Andreas- South San Bernardino	54	555.5	6.94	24.0
San Jacinto-San Jacinto Valley	54	686.7	7.04	12.0
Northridge	56	546.4	6.9	1.5
Palos Verdes	59	1347.9	7.3	3.0
Newport-Inglewood (Offshore)	61	677.5	7.0	1.5
Elsinore-Temecula	65	734.9	7.07	5.0
Santa Susana	67	540.7	6.9	5.0
Malibu Coast	67	652.4	7.0	0.3
Anacapa-Dume	69	1115.8	7.2	3.0
San Jacinto - Anza	70	1193.9	7.28	12.0
Holser	75	430.1	6.8	0.4
Helendale-S. Lockhart	82	1459.2	7.4	0.6
Oak Ridge (onshore)	84	1001.4	7.1	4.0
Simi-Santa Rosa	84	501.8	6.8	1.0
San Andreas (north Mojave)	90	556.5	6.8	30
North Frontal Fault Zone (East)	93	678	7.0	0.5
San Cayetano	94	1005	7.1	6
San Andreas - Banning/Garnet Hill	95	843	7.13	3.0
Coronado Bank	95	1602.2	7.3	3.0
Pinto Mountain	100	1147.8	7.3	2.5

1 Petersen et al., 2008. 2 EZFRISK version 7.42 (2010)