MT. SAN JACINTO COMMUNITY COLLEGE DISTRICT

ADDENDUM NO. 1

BID NO. 2019-023

MATERIAL AND SPECIAL INSPECTIONS AT TEMECULA VALLEY CAMPUS

May 30, 2019

Owner:

Mt. San Jacinto Community College District

1499 N. State Street

San Jacinto, CA 92583

RECEIPT OF THIS ADDENDUM MUST BE ACKNOWLEDGED ON PROPOSAL WHEN SUBMITTED

QUESTIONS

Q1. The project documents on PlanetBids did not include the DSA 103 Form or a DSA number. Will the number and document be available prior to the proposal submittal date?

A1. We have the DSA numbers. The project is being done in increments. DSA #04-118420 – 1 Increment #1 (Seismic rehabilitation and demo), DSA #04-118420-2 Increment #2 Building G renovation, DSA # - TBD Increment #3 (Building F and Central Plant Rehabilitation). The DSA 103 Form will not be available prior to proposal submittal date.

Q2. I do not see a location called out in the RFP or project documents for the steel shop fabrication. Does the District know the location of steel fabricator?

A2. Bidders should assume the manufacturer will be local.

Q3. The project schedule provided is fairly detailed but there is no duration on the steel fabrication schedule. Is there an estimated steel fabrication timeframe for construction?

A3. Bidders should assume the manufacturing time will be 3 months,

Q4. Will any of the ADA Site Work, listed on the schedule, require Inspections/Testing (such as ramp retaining wall, soil backfill, etc.)? If so, are these plans available?

A4. Site plans are part of the 50% CD drawing set. Please see attached Site plans. There is no retaining wall or back filling.

Q5. Will the District be requiring geotechnical monitoring of soil backfilling, etc. to be included in this proposal submittal? IF so, will the geotechnical report be provided via PlanetBids?

A5. The report doesn't require any over-ex for the foundation strengthening shown on the plan. However, the geotechnical consultant should verify the suitability of the subgrade soils once exposed. If disturbed during excavation, the exposed surface should be scarified and re-compacted to firm/unyielding condition.

Q6. There are two different submission requirements of the RFP, First on page 5, Section 2. Proposal Submission, a cover letter, approach, project team, relevant projects, and a Lump Sum fee are required. There are also selection criteria detailed on Page 6, Section 3. Then Section 10.0 starting on page 12, details a new set of sections for inclusion in the proposal with exhibits, a request for an all-inclusive fixed fee, and another section detailing the Evaluation Criteria on Page 13, Section 10.6

Please clarify the content of the proposal and what should be included as well as the evaluation and selection criteria.

A6. Please use the proposal statement section 10.0 which includes 10.6 and Exhibits.,-

Q7. Can you please provide a link to the Soil Report, so we can review the Over Excavation requirements?

A7. The Soil Report documents are attached.

Q8. If available, please provide a list of the contractors so we can determine if the Heavy Steel and Rebar shops are local to the inland empire.

A8. The steel and rebar contractors have not been pre-qualified yet.

Q9. When available, please provide the DSA-103 for review.

A9. The DSA 103 Form will not be available prior to proposal submittal date.

GEOTECHNICAL/GEOLOGIC HAZARD REPORT
SEISMIC RETROFIT FOR EXISTING BUILDINGS F, G, AND CENTRAL PLANT
PROPOSED MSJCC TEMECULA CAMPUS (FORMERLY ABBOTT VASCULAR)
41888 MOTOR CAR PARKWAY TEMECULA, CALIFORNIA

Prepared for

MT. SAN JACINTO COMMUNITY COLLEGE
1499 N. State Street
San Jacinto, California 92583

Project No. 12202.001

March 13, 2019

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

January 25, 201
Updated March 13, 2019

Project No. 12202.001

Mt. San Jacinto Community College
1499 N. State Street
San Jacinto, California 92583

Attention: Ms. Carol Ward

Subject: Geotechnical/Geologic Hazard Report
Seismic Retrofit for Existing Buildings F, G, and Central Plant
Proposed MSJCC Temecula Campus (Formerly Abbott Vascular)
41888 Motor Car Parkway, Temecula, California

In accordance with your request and authorization, we understand that this geohazard report is needed in support of the proposed seismic retrofit for the Mt. San Jacinto Community College (MSJCC) new campus located in the City of Temecula, California. This report is based primarily on in-house data and site-specific geologic/geotechnical reports available to us. Based on the results of our review and analyses, it is our opinion that the site is suitable for the intended use provided the recommendations included herein are implemented during design and construction. This report is prepared in general accordance with CGS Note 48.

If you have any questions regarding this report, please do not hesitate to contact the undersigned. We appreciate this opportunity to be of service on this project.

Respectfully submitted,

LEIGHTON CONSULTING, INC.

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TABLE OF CONTENTS

Section Page

1.0 INTRODUCTION 1

1.1 Purpose and Scope 1
1.2 Site and Project Description 1
1.3 Previous Reports 2

2.0 PREVIOUS EXPLORATIONS AND LABORATORY TESTING 3

2.1 Previous Explorations 3
2.2 Laboratory Testing 3

3.0 GEOTECHNICAL AND GEOLOGIC FINDINGS 4

3.1 Regional Geology 4
3.2 Site Specific Geology 4
3.2.1 Earth Materials 4
3.3 Groundwater and Surface Water 5
3.4 Faulting 5
3.5 Spectral Response Acceleration / Site-Specific Seismic Analysis 5
3.6 Secondary Seismic Hazards 8
3.6.1 Dynamic Settlement (Liquefaction and Dry Settlement) 8
3.6.2 Lateral Spreading 8
3.6.3 Ground Rupture 8
3.6.4 Seiches, Tsunamis, Inundation Due to Large Water Storage Facilities 8
3.6.5 Slope Stability and Landslides 8
3.6.6 Dam Inundation/Flood Hazard 8
3.6.7 Subsidence 8

4.0 CONCLUSIONS AND RECOMMENDATIONS 9

4.1 General 9
4.2 Earthwork 9
4.2.1 Subgrade Preparation and Remedial Grading 9
4.2.2 Underpinning 9
4.2.3 Suitability of Site Soils for Fills 10
4.2.4 Import Soils 10
4.2.5 Utility Trenches 10
4.2.6 Drainage 11
4.3 Foundation Design / Bearing Capacity Values 11
4.4 Mircropiles 12
4.4.1 Downward Pile Capacity: 12
4.4.2 Uplift Pile Capacity: 12
4.4.3 Verification Testing 12
4.5 Retaining Walls 13
4.6 Sulfate Attack 14

5.0 GEOTECHNICAL CONSTRUCTION SERVICES 15

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6.0 LIMITATIONS **16**
REFERENCES **17**

Accompanying Tables, Figures, Plates and Appendices

Tables

Table 1. 2016 CBC Site-Specific Seismic Coefficients (ASCE 7-10) 6
Table 2. Specific Seismic Coefficients – ASCE 41-13............ 7
Table 3. Peak Horizontal Ground Accelerations............ 7
Table 4. Retaining Wall Design Earth Pressures (Static, Drained)............ 13

Figures (end of text)

Figure 1 – Site Location Map
Figure 2 – Boring Location Plan
Figure 3a & 3b – Geologic Cross-Sections
Figure 4 – Regional Geology Map
Figure 5 – Fault Zones and Liquefaction Hazards
Figure 6 – Dam Inundation Map
Figure 7a – Nominal Axial Capacity, 8-inch and 12-inch Diameter Micropile- Type A
Figure 7b – Nominal Axial Capacity, 8-inch and 12-inch Diameter Micropile- Type B

Appendices

Appendix A – Logs of Exploratory Borings (Previous)
Appendix B – Geotechnical Laboratory Test Results (Previous)
Appendix C – Site-Specific Seismic Analysis (ASCE 7-10) and Site Class Calculations
Appendix D – Ground Motion Time History Evaluation (GeoPentech, 2019)
Appendix E – Earthwork and Grading Specifications
Appendix F – GBA – Important Information About This Geotechnical Report

1.0 INTRODUCTION

1.1 Purpose and Scope

This geotechnical/geologic hazard report is for the proposed MSJCC new campus located at the northwest corner of Margarita Road and Solana Way, City of Temecula, California (*see Figure 1, Site Location Map*). Our scope of services included the following:

- Review of available site-specific geologic information, including previous geotechnical reports listed in the references at the end of this report.
- A site reconnaissance to observe existing site conditions.
- Geotechnical engineering analyses performed or as directed by a California registered Geotechnical Engineer (GE) and reviewed by a California Certified Engineering Geologist (CEG).
- Preparation of this report which presents our geotechnical conclusions and recommendations regarding the seismic retrofit to proposed structures.

This report is not intended to be used as an environmental assessment (Phase I or other), or foundation plan review.

1.2 Site and Project Description

The project site is currently occupied by the Abbott Vascular Temecula East Campus located on an approximately 27-acre parcel at the northwest corner of Margarita Road and Solana Way, Temecula (see Figure 1). More specifically, the site is located at 117.15206° North Longitude and 33.51727° West Latitude. The new MSJCC campus will be comprised of existing two 5-story buildings (Building F & G) joined by a 4- story Lobby Building for a total foot print of about 72,000 square-feet. In addition, a stand-alone Central Plant Utility Building located south of the main buildings with a footprint of about 9,300 square feet will be part of this new campus. These existing buildings were constructed/completed in 2009 and located on a relatively elevated pad compared to surrounding terrain. Since this project was designed and built as office buildings for a private developer, we understand that some modifications and seismic retrofit may be needed to comply with applicable DSA requirements for a school/college campus.

1.3 Previous Reports

A separate geotechnical report was prepared by Petra in 2006 for each of the three buildings (see References). The results of these investigations indicate that the site is covered by up to 15 feet of artificial fill, which in turn is underlain by dense Pleistocene aged Pauba formation. Although no documentation was available or referenced in Petra's reports regarding the placement of the artificial fill, they concluded that this fill is generally suitable for foundation support unless soft and yielding materials is found during the scarification and re-compaction process of exposed surface. In addition, the buildings were designed based on a total settlement of ¾ of an inch (differential settlement is half of total settlement).

Leighton also completed a preliminary fault hazard investigation (Leighton, 1991) for a portion of the property where a fault lineament was projected into the southwest corner of the overall site. Based on that study, it was concluded that this lineament was not fault related and therefore, a potential fault rupture hazard does not exist onsite. However, this site is close to the active Temecula Segment of the Elsinore Fault Hazard Zone and the site can be subject to strong ground shaking.

2.0 PREVIOUS EXPLORATIONS AND LABORATORY TESTING

2.1 Previous Explorations

Petra Geotechnical, Inc. (PGI) had previously performed three separate subsurface geotechnical investigations for the planned and now constructed Building F, Building G and the Central Plant building (Petra, 2006, see references). The previous explorations included the excavation of five borings for Building F, five borings for Building G, and two borings for the Central Plant Building. The exploration logs from these explorations are included in Appendix A.

2.2 Laboratory Testing

Selected samples were tested during the previous investigations to determine the following parameters: particle size, in-situ moisture and density, consolidation, direct shear, and corrosion testing. The results of previous laboratory testing are included in Appendix B.

3.0 GEOTECHNICAL AND GEOLOGIC FINDINGS

3.1 Regional Geology

The site is located within a prominent natural geomorphic province in southwestern California known as the Peninsular Ranges. This province is characterized by steep, elongated ranges and valleys that trend northwestward. More specifically, the site is situated within the southern portion of the Perris Block, an eroded mass of Cretaceous and older crystalline rock.

The Perris Block is approximately 20 miles by 50 miles in extent, is bounded by the San Jacinto Fault Zone to the northeast, the Elsinore Fault Zone to the southwest, the Cucamonga Fault Zone to the northwest, and the Temecula Basin to the south. The Perris Block has had a complex tectonic history, apparently undergoing relative vertical land-movements of several thousand feet in response to movement on the Elsinore and San Jacinto Fault Zones. Thin sedimentary and volcanic materials locally mantle crystalline bedrock. Young and older alluvial deposits fill the lower valley areas, as mapped regionally on Figure 4, *Regional Geology Map*.

3.2 Site Specific Geology

3.2.1 Earth Materials

Our observations and review of the pertinent literature indicate that the site is underlain by dense formational materials locally known as Pauba formation. A relatively thin veneer of artificial fill mantles the site. The following is a summary of the geologic conditions:

- **Artificial Fill:** Artificial fill soils were encountered within the upper 15 feet below ground surface (BGS). As encountered, these fills consist moist, dense, silty to clayey sand and sandy clay. Based on the recorded blow counts (N-values), the fill is medium dense to dense.

- **Pauba Formation:** Pleistocene aged Pauba formation was encountered in all borings throughout the site. As encountered in the exploratory excavations, these materials consist of moist, medium dense to very dense, poorly-to well-graded sands/siltstone and siltstone. Based on our previous experience in this area, the Pauba formation is expected to possess very slight collapse potential.

3.3 Groundwater and Surface Water

No standing or surface water was observed on the site at the time of our site visit. Groundwater was not encountered in any of the previous borings except in Boring B-4 (Building G) where perched groundwater was encountered at a depth of about 30 feet below ground surface.

3.4 Faulting

The subject site, like the rest of Southern California, is located within a seismically active region as a result of being located near the active margin between the North American and Pacific tectonic plates. The principal source of seismic activity is movement along the northwest-trending regional fault systems such as the San Andreas, San Jacinto, and Elsinore Fault Zones. Based on published geologic maps, this site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone or Riverside county Fault Hazard Zone. No indications of faulting or fault related fissuring or fracturing was observed onsite during this evaluation or previous site studies (see references). The nearest known active fault is the Temecula Segment of the Elsinore Fault Zone located within a 0.6 mile southwest of the site (see Figure 5).

Leighton previously completed a preliminary fault hazard investigation for a portion of the property where a fault lineament was projected in the southwest corner of the property (Leighton, 1991). Based on that study, it was concluded that this lineament was not fault related and therefore, a potential fault rupture hazard does not exist onsite.

3.5 Spectral Response Acceleration / Site-Specific Seismic Analysis

Since the mapped spectral response acceleration at 1-second period (S_1) is greater than 0.75, a site-specific ground motion analysis is required per CGS Note 48. In accordance with Section 1803A.6 of the 2016 California Building Code (CBC), this analysis is to follow the procedures of ASCE 7-10 Publication, Section 21.2.

As presented in Appendix C, our site-specific ground motion analysis was performed using the computer program EZ-FRISK (Risk Engineering, 2018) to estimate peak horizontal ground acceleration (PHGA) that could occur at the site, and to develop design response spectra. For the probabilistic seismic hazard analysis, various probabilistic density functions were used to assess uncertainty inherent in these calculations with respect to magnitude, distance and ground motion. An averaging of

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the following three next-generation attenuation (NGA) relationships were used with equal weights to calculate site-specific PHGA and spectra:

- Boore-Atkinson (2008),
- Campbell-Bozorgnia (2008), and
- Chiou-Youngs (2007)

The design response spectrum shown on Figure C-1, Appendix C, is derived from a comparison of probabilistic Maximum Considered Earthquake (MCE) and the 150 percent of the deterministic MCE. In accordance with the 2016 CBC, peak ground accelerations are estimated based on maximum considered earthquake ground motion having a 2 percent probability of exceedance in 50 years or site specific seismic hazard analysis (ASCE, 2010). The site-specific seismic coefficients based on both the USGS General procedure and EZ-Frisk analyses are presented in Table 1 below. We recommend the higher of the S_{DS} *and* S_{D1} values be used in the structural design of the buildings.

Table 1. 2016 CBC Site-Specific Seismic Coefficients (ASCE 7-10)

CBC Categorization/Coefficient		USGS General Procedure (g)*	EZ-Frisk Procedure (g)
Site Longitude (decimal degrees)	-117.15206		
Site Latitude (decimal degrees)	33.51727		
Site Class Definition	**C**		
Mapped Spectral Response Acceleration at 0.2s Period, S_s		**1.98**	**2.03**
Mapped Spectral Response Acceleration at 1s Period, S_1		**0.81**	**0.84**
Short Period Site Coefficient at 0.2s Period, F_a		**1.00**	**1.00**
Long Period Site Coefficient at 1s Period, F_v		**1.30**	**1.30**
Adjusted Spectral Response Acceleration at 0.2s Period, S_{MS}		**1.98**	**2.03**
Adjusted Spectral Response Acceleration at 1s Period, S_{M1}		**1.05**	**1.09**
Design Spectral Response Acceleration at 0.2s Period, S_{DS}		**1.32**	**1.35**
Design Spectral Response Acceleration at 1s Period, S_{D1}		**0.70**	**0.72**

*g- Gravity acceleration
***S_{D1} is calculated based on 2xSa* at 2s

The General Procedure seismic coefficients were calculated utilizing an online program provided by United States Geological Survey (USGS). The probabilistic seismic hazard analysis using the computer program EZ-FRISK was based on a site specific Vs30. A review of the site borings and our analysis of shear wave velocity based on average N-value of 36 for the upper 100 feet of soils indicate an average Vs30 of 530 m/s which reflects a site Class C. Further, a regional study performed for CGS (GeoVision, 2016) determined that shear (S) wave velocity of the upper 30 m underlain by similar Pauba formation materials in this locality indicate a Vs30 of 547 (m/s) with an estimated error of 55 m/s (Class C Site). The results of this study confirms our calculated Vs30 of 530 m/s.

In accordance with our conversations with the project structural engineer, ground motions are also needed to be scaled at two different intensity levels (BSE-1E and BSE-2N). Results of the response spectrum for each level using USGS General Procedure are included in Appendix D. A summary of the response spectrum accelerations is provided in table below.

Table 2. Specific Seismic Coefficients – ASCE 41-13

Coefficient BSE-1E	USGS General Procedure (g)	Coefficient BSE-2N	USGS General Procedure (g)
$S_{s,20/50}$	**0.63**	$S_{S,BSE\text{-}2N}$	**1.98**
$S_{1,20/50}$	**0.24**	$S_{1,BSE\text{-}2N}$	**0.81**
$S_{XS,BSE\text{-}1E}$	**0.72**	$S_{XS,BSE\text{-}2N}$	**1.98**
$S_{X1,BSE\text{-}1E}$	**0.37**	$S_{X1,BSE\text{-}2N}$	**1.05**

For consideration in evaluation of the geologic hazards at the site, the peak horizontal ground accelerations (PHGA) have been evaluated for BSE-1 and BSE-2 events as described in ASCE 41-13. Specifically, the PHGA in Table 3 below were determined using the USGS deaggregation website which provides the geometric mean ground motion of the MCE.

Table 3. Peak Horizontal Ground Accelerations

BSE-1		BSE-2
10% in 50 year event	2/3 (MCE) 10% in 50 year event	MCE 2% in 50 year event
0.22g	**0.58g**	**0.87g**

In addition, we understand that ground motion time-history evaluation will be needed for an advanced structural design to support the nonlinear response history analysis. In accordance with ASCE 41-13, Section 2.4.2.2, eleven spectrally-matched time history pairs have been developed for both BSE-2N and BSE-1E levels. The results of this analysis are include in Appendix D.

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3.6 Secondary Seismic Hazards

Ground shaking can induce “secondary” seismic hazards such as liquefaction, dynamic densification, and differential subsidence along ground fissures, seiches and tsunamis, as discussed in the following subsections:

3.6.1 Dynamic Settlement (Liquefaction and Dry Settlement)

Liquefaction-induced or dynamic dry settlement is not considered a hazard at this site due to the lack of shallow groundwater and dense underlying Pauba formation. The seismic differential settlement is expected to be less than 0.5 inch in a 40-foot horizontal distance within this site.

3.6.2 Lateral Spreading

The potential for lateral spreading is considered non-existent on this site.

3.6.3 Ground Rupture

Since no active faults are known to cross the site, the possibility of damage due to ground surface-fault-rupture at this site is considered very low.

3.6.4 Seiches, Tsunamis, Inundation Due to Large Water Storage Facilities

Due to the great distance to large bodies of water, the possibility of seiches and tsunamis impacting the site is considered remote. This report does not address conventional flood hazard risk.

3.6.5 Slope Stability and Landslides

Due to the relatively modest relief across the site, the risk of deep-seated slope failure on this site or adjacent sites is considered non-existent. The site is not considered susceptible to seismically induced landslides.

3.6.6 Dam Inundation/Flood Hazard

This report does not address conventional flood hazard risk associated with this site. However, per the official FEMA Flood Hazard Areas Map (FIRM Panel 06065C2740G), this site is located in Zone X – “Areas determined to be outside the 0.2% chance of annual flood.” In accordance with Figure 6, the site is not located within a dam inundation zone.

3.6.7 Subsidence

In accordance with County of Riverside Geologic Hazard Maps (Riverside, 2018), the site is located within an area susceptible to subsidence. However, based on the results of our subsurface evaluation and lack of evidence of differential subsidence or associated ground fissuring, we consider the potential for differential subsidence on this site to be very low.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 General

Based on the results of our evaluation, the site appears feasible from a geotechnical viewpoint for the intended used. Seismic retrofit, if any, should incorporate our recommendations included in this report.

4.2 Earthwork

Earthwork, if any, should be performed in accordance with our recommendations provided below and the *Earthwork and Grading Specifications* included in Appendix E. In case of conflict, the following recommendations should supersede those included in Appendix E. The contract between the Owner and the earthwork contractor should be worded such that it is the responsibility of the contractor to place fill properly and in accordance with recommendations presented in this report, notwithstanding the testing and observation of the geotechnical consultant during construction.

4.2.1 Subgrade Preparation and Remedial Grading

For any new structural improvement areas (i.e. all-structural fill areas, pavement areas, buildings, etc.), the site should be cleared of surface and subsurface obstructions, any vegetation, roots and debris and disposed of offsite. Voids created by removal of buried material should be backfilled with properly compacted soil in general accordance with the recommendations of this report.

After completion of the above removal and prior to fill placement or foundation construction, the exposed surface should be scarified to a minimum depth of 8-inches, moisture conditioned as necessary to near optimum moisture content and recompacted using heavy compaction equipment to an unyielding condition. All structural fill within the building footprints should be compacted throughout to 90 percent of the ASTM D 1557 laboratory maximum density, at or slightly above optimum moisture.

4.2.2 Underpinning

For any new foundation to be constructed adjacent to an existing foundation, the excavation should not undermine or encroach to within the zone of influence of existing foundations or any other settlement sensitive structures. The zone of influence is defined as an imaginary 1:1 line sloping down and away from the bottom edge of existing foundations. Special excavation procedures (i.e. ABC slot cutting) or shoring may be required if excavation is to encroach within the zone of influence of existing foundation. This condition will need to be further evaluated based on prevailing subsurface conditions during construction.

4.2.3 Suitability of Site Soils for Fills

Topsoil and vegetation layers, root zones, and similar surface materials should be striped and stockpiled for either reuse in landscape surface areas or removed from the site. Site fill or Pauba formation should be considered suitable for re-use as compacted fills provided the recommendations contained herein are followed. If cobbles/boulders larger than 6-inches in largest diameter and expansive soils (EI>21) are encountered, these materials should not be placed with the upper 3 feet of subgrade soils.

4.2.4 Import Soils

Import soils and/or borrow sites, if needed, should be evaluated by us prior to import. Import soils should be uncontaminated, granular in nature, free of organic material (loss on ignition less-than 2 percent), have very low expansion potential (with an Expansion Index less than 21) and have a low corrosion impact to the proposed improvements.

4.2.5 Utility Trenches

Utility trenches should be backfilled with compacted fill in accordance with the *Standard Specifications for Public Works Construction,* ("Greenbook"), 2018 Edition. Fill material above the pipe zone should be placed in lifts not exceeding 8 inches in uncompacted thickness and should be compacted to at least 90 percent relative compaction (ASTM D 1557) by mechanical means only. Site soils may generally be suitable as trench backfill provided these soils are screened of rocks over 1½ inches in diameter and organic matter. The upper 6 inches of backfill in all pavement areas should be compacted to at least 95 percent relative compaction.

Excavation of utility trenches should be performed in accordance with the project plans, specifications and the *California Construction Safety Orders* (most current). The contractor should be responsible for providing a "competent person" as defined in Article 6 of the *California Construction Safety Orders*. Contractors should be advised that sandy soils (such as fills generated from the onsite alluvium) could make excavations particularly unsafe if all safety precautions are not properly implemented. In addition, excavations at or near the toe of slopes and/or parallel to slopes may be highly unstable due to the increased driving force and load on the trench wall. Spoil piles from the excavation(s) and construction equipment should be kept away from the sides of the trenches. Leighton Consulting, Inc. does not consult in the area of safety engineering.

4.2.6 Drainage

All drainage should be directed away from structures and pavements by means of approved permanent/temporary drainage devices. Adequate storm drainage of any proposed pad should be provided to avoid wetting of foundation soils. Irrigation adjacent to buildings should be avoided when possible. As an option, sealed-bottom planter boxes and/or drought resistant vegetation should be used within 5-feet of buildings.

4.3 Foundation Design / Bearing Capacity Values

Footings should be embedded at least 12-inches below lowest adjacent grade for the proposed structure. Footing embedment should be measured from lowest adjacent finished grade, considered as the top of interior slabs-on-grade or the finished exterior grade, excluding landscape topsoil, whichever is lower. Footings located adjacent to utility trenches or vaults should be embedded below an imaginary 1:1 (horizontal:vertical) plane projected upward and outward from the bottom edge of the trench or vault, up towards the footing.

- **Bearing Capacity**: A net allowable bearing capacity of 2,500 pounds per square foot (psf) may be used for design assuming that footings have a minimum base width of 18 inches for continuous wall footings and a minimum bearing area of 3 square feet (1.75-ft by 1.75-ft) for pad foundations (a minimum FS of 3 was considered). The bearing pressure value may be increased by 250 psf for each additional foot of embedment or each additional foot of width to a maximum vertical bearing value of 6,000 psf. These bearing values may also be increased by one-third when considering short-term seismic or wind loads.

- **Lateral loads**: Lateral loads may be resisted by friction between the footings and the supporting subgrade. A maximum allowable frictional resistance of 0.4 may be used for design. In addition, lateral resistance may be provided by passive pressures acting against foundations poured neat against properly compacted granular fill. We recommend that an allowable passive pressure based on an equivalent fluid pressure of 300 pounds-per-cubic-foot (pcf) be used in design. These friction and passive values have already been reduced by a factor-of-safety of 1.5.

- **Subgrade Reaction**: A vertical modulus of subgrade reaction (K) of 230 pounds-per-cubic-inch (pci) may be used in the design of mat foundations supported by the onsite dense fill or Pauba formation. This value is a unit value (1 square-footing) and should be reduced in accordance with the following equation for larger foundations:

$$K_R = K\left[\frac{B+1}{2B}\right]^2$$

where: K_R = reduced subgrade modulus
K = unit subgrade modulus
B = foundation width (in feet)

The thickness of and reinforcement for the mat foundation should be designed by the project structural engineer.

4.4 Mircropiles

We understand that mircropiles may be required for the proposed seismic retrofit. For the purpose of design and construction of these piles, the following should be considered:

4.4.1 Downward Pile Capacity:

Pile capacity typically vary based on selected pile diameter and depth. Figures 7a and 7b present nominal axial capacity charts for 8- and 12-inch diameter piles based on method of installation (Type A and Type B) and assumed depth. These capacities presented are nominal loads based on center-to-center pile spacing of at least 3 pile diameters.

4.4.2 Uplift Pile Capacity:

For evaluation of the uplift capacity of a group of micropiles placed at center-to-center spacing of at least 3 diameters, we recommend the group uplift capacity be the lesser of:

- The individual uplift capacity multiplied by the number of elements in the group; or
- Two-thirds of the effective weight of the prism of soil contained within a block defined by the perimeter of the group and the length of the micropiles plus two-thirds of the ultimate shear resistance/bondage along the block premier multiplied by the surface area:

$$Q = W + \alpha \times A_s$$

where,
W = weight of block based on a unit weight of 30 pcfd
α = 2.2 ksf grout-to-ground bond strength
A_s = surface area of block

4.4.3 Verification Testing

Micropile testing should be performed before and over the course of construction to verify design capacities. Testing should include the following:

- At least two pre-production tests performed by ASTM D1143 or D3689.
- At least one proof test for each pile group per ASTM D1143 or D3689.

Results of pre-production and proof test should be evaluated for acceptance using a 0.025 in/kip load-displacement curve slope at the maximum test load.

4.5 Retaining Walls

Retaining wall earth pressures are a function of the amount of wall yielding horizontally under load. If the wall can yield enough to mobilize full shear strength of backfill soils, then the wall can be designed for "active" pressure. If the wall cannot yield under the applied load, the shear strength of the soil cannot be mobilized and the earth pressure will be higher. Such walls should be designed for "at rest" conditions. If a structure moves toward the soils, the resulting resistance developed by the soil is the "passive" resistance. Retaining walls backfilled with non-expansive soils should be designed using the following equivalent fluid pressures:

Table 4. Retaining Wall Design Earth Pressures (Static, Drained)

Loading Conditions	Equivalent Fluid Density (pcf)	
	Level Backfill	2:1 Backfill
Active	36	50
At-Rest	55	85
Passive*	300	150 (2:1, sloping down and away from footing)

* This assumes level condition in front of the wall will remain for the duration of the project, not to exceed 4,500 psf at depth.

Unrestrained (yielding) cantilever walls should be designed for the active equivalent-fluid weight value provided above for very low expansive soils that are free draining. In the design of walls restrained from movement at the top (non-yielding) such as basement or elevator pit/utility vaults, the at-rest equivalent fluid weight value should be used. Total depth of retained earth for design of cantilever walls should be measured as the vertical distance below the ground surface measured at the wall face for stem design, or measured at the heel of the footing for overturning and sliding calculations. Should a sloping backfill other than a 2:1 (horizontal:vertical) be constructed above the wall (or a backfill is loaded by an adjacent surcharge load), the equivalent fluid weight values provided above should be re-evaluated on an individual case basis by us. Non-standard wall designs should also be reviewed by us prior to construction to check that the proper soil parameters have been incorporated into the wall design.

All retaining walls should be provided with appropriate drainage. The outlet pipe should be sloped to drain to a suitable outlet. Wall backfill should be non-expansive (EI $\leq$ 21) sands compacted by mechanical methods to a minimum of 90 percent relative compaction (ASTM D 1557). Clayey site soils should not be used as wall backfill. Walls should not be backfilled until wall concrete attains the 28-day compressive strength and/or as determined by the Structural Engineer that the wall is structurally capable of supporting backfill. Lightweight compaction equipment should be used, unless otherwise approved by the Structural Engineer.

4.6 Sulfate Attack

The results of previous laboratory testing indicate that the onsite soils have soluble sulfate content of less than 2,000 ppm. Type II cement or similar may be used for design of concrete structures in contact with the onsite soils.

5.0 GEOTECHNICAL CONSTRUCTION SERVICES

Geotechnical review is of paramount importance in engineering practice. Poor performances of many foundation and earthwork projects have been attributed to inadequate construction review. We recommend that Leighton Consulting, Inc. be provided the opportunity to review the grading plan and foundation plan(s) prior to bid.

Reasonably-continuous construction observation and review during site grading and foundation installation allows for evaluation of the actual soil conditions and the ability to provide appropriate revisions where required during construction. Geotechnical conclusions and preliminary recommendations should be reviewed and verified by Leighton Consulting, Inc. during construction, and revised accordingly if geotechnical conditions encountered vary from our findings and interpretations. Geotechnical observation and testing should be provided:

- During remedial grading,
- During compaction of all fill materials,
- After excavation of all footings and prior to placement of concrete,
- During utility trench backfilling and compaction,
- During micropile installation, and
- When any unusual conditions are encountered.

Additional geotechnical exploration and analysis may be required based on final development plans, for reasons such as significant changes in proposed structure locations/footprints. We should review grading (civil) and foundation (structural) plans, and comment further on geotechnical aspects of this project.

6.0 LIMITATIONS

This report was based in part on data obtained from a limited number of observations, site visits, soil excavations, samples and tests. Such information is, by necessity, incomplete. The nature of many sites is such that differing soil or geologic conditions can be present within small distances and under varying climatic conditions. Changes in subsurface conditions can and do occur over time. Therefore, our findings, conclusions and recommendations presented in this report are based on the assumption that we (Leighton Consulting, Inc.) will provide geotechnical observation and testing during construction as the Geotechnical Engineer of Record for this project.

This report was prepared for the sole use of Client and their design team, for application to design of the Proposed MSJCC Temecula Campus (Formerly Abbott Vascular) , Seismic Retrofit for Existing Buildings F, G, and Central Plant, in accordance with generally accepted geotechnical engineering practices at this time in California. In addition, since this is a public school project, our report may be subject to review by the California Geological Survey (CGS) / California Division of the State Architect (DSA) or appointed peer review panel by the District. As such, we recommend that geologic/geotechnical data in this report be only used in the design of this project after review and approval by CGS or peer review panel. Any premature (before approval) or unauthorized use of or reliance on this report constitutes an agreement to defend and indemnify Leighton Consulting, Inc. from and against any liability which may arise as a result of such use or reliance, regardless of any fault, negligence, or strict liability of Leighton Consulting, Inc.

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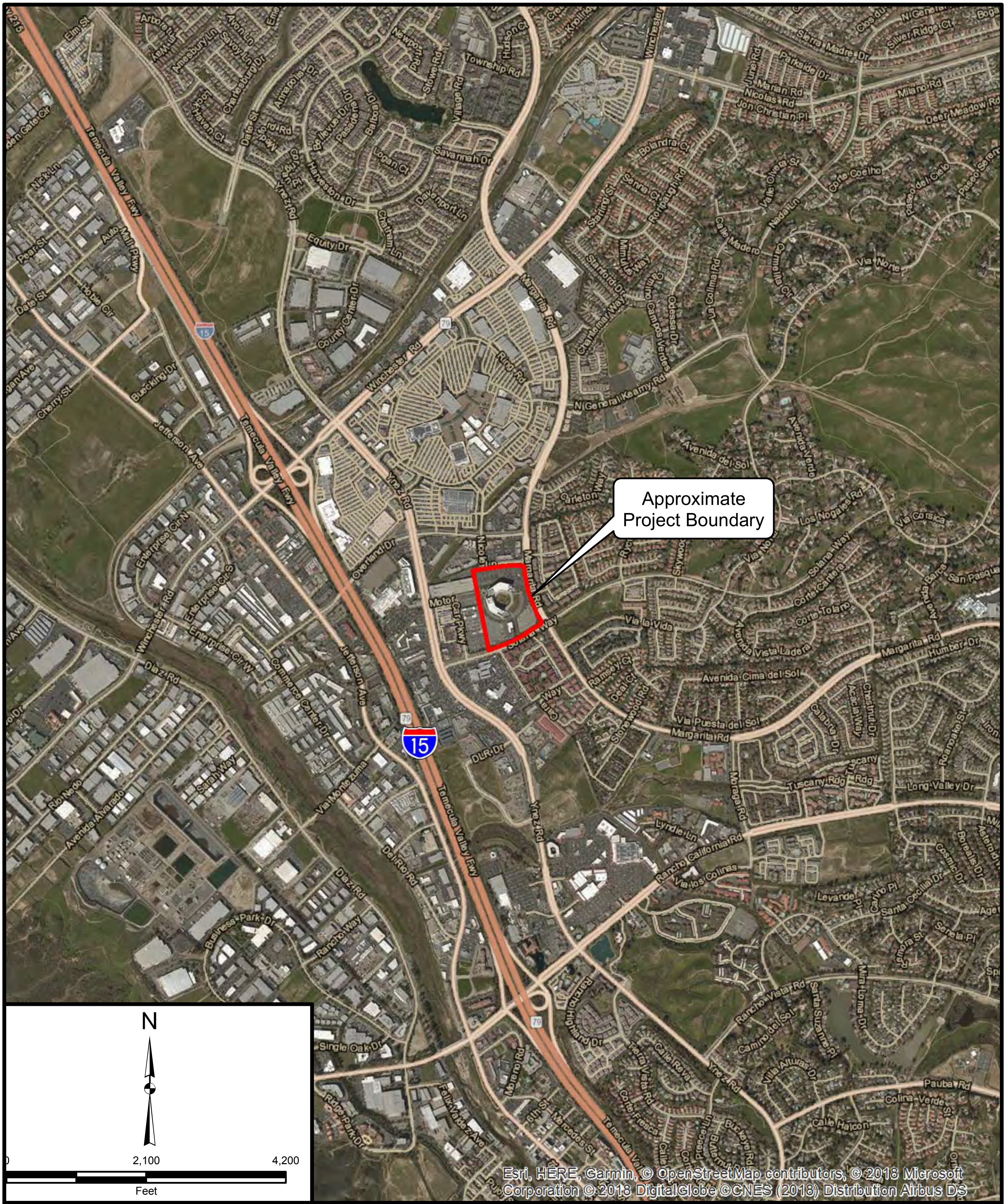

Project: 12202.001	Eng/Geol: SIS/RFR
Scale:1 " = 2,000 feet	Date: November 2018

Base Map: ESRI ArcGIS Online 2018
Thematic Information: Leighton
Author: Leighton Geomatics (btran)

SITE LOCATION MAP

Seismic Retrofit
MSJCC - Temcula Campus
Temecula California

Figure 1

Leighton

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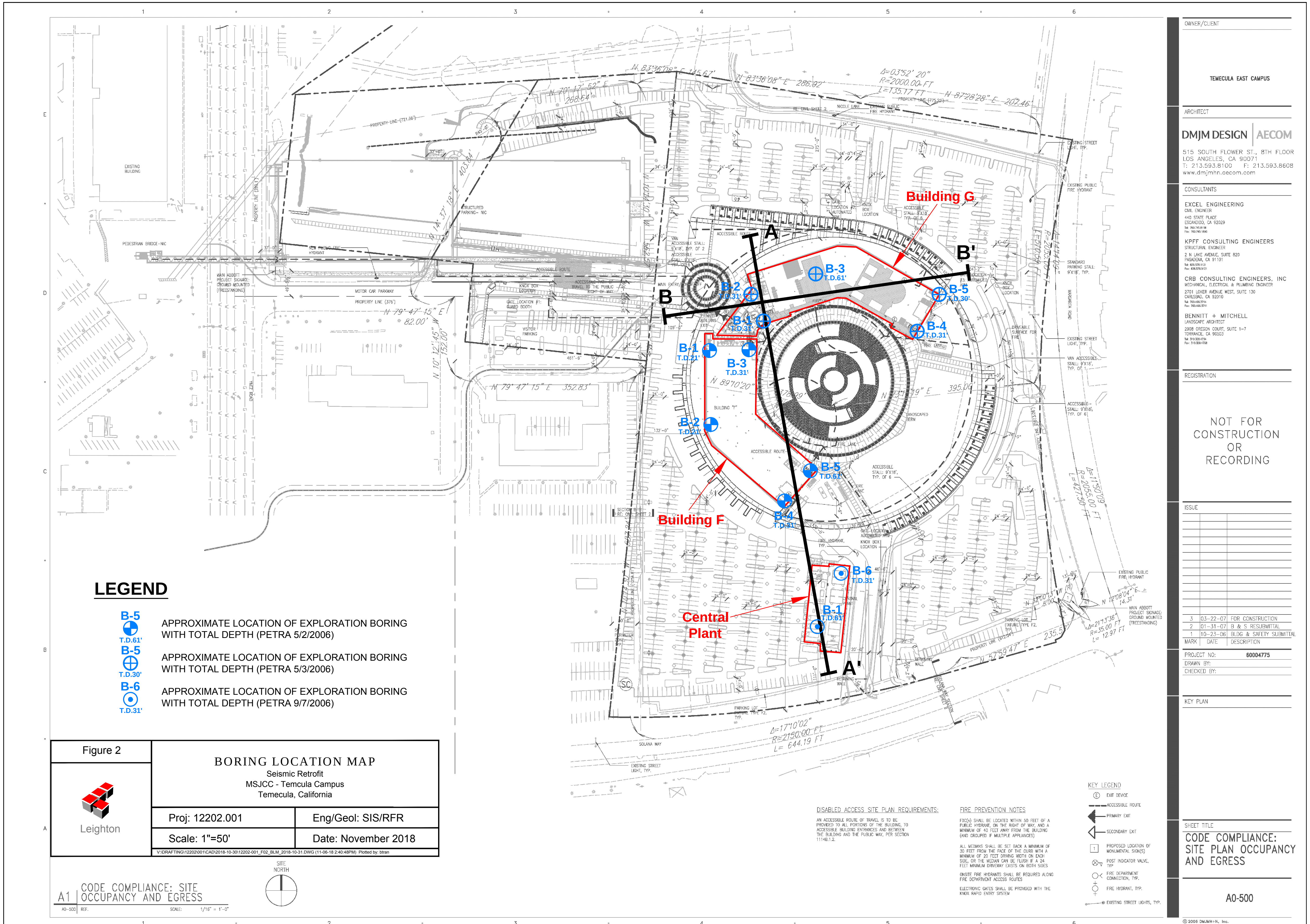

Figure 2

Leighton

BORING LOCATION MAP

Seismic Retrofit
MSJCC - Temcula Campus
Temecula, California

Proj: 12202.001	Eng/Geol: SIS/RFR
Scale: 1"=50'	Date: November 2018

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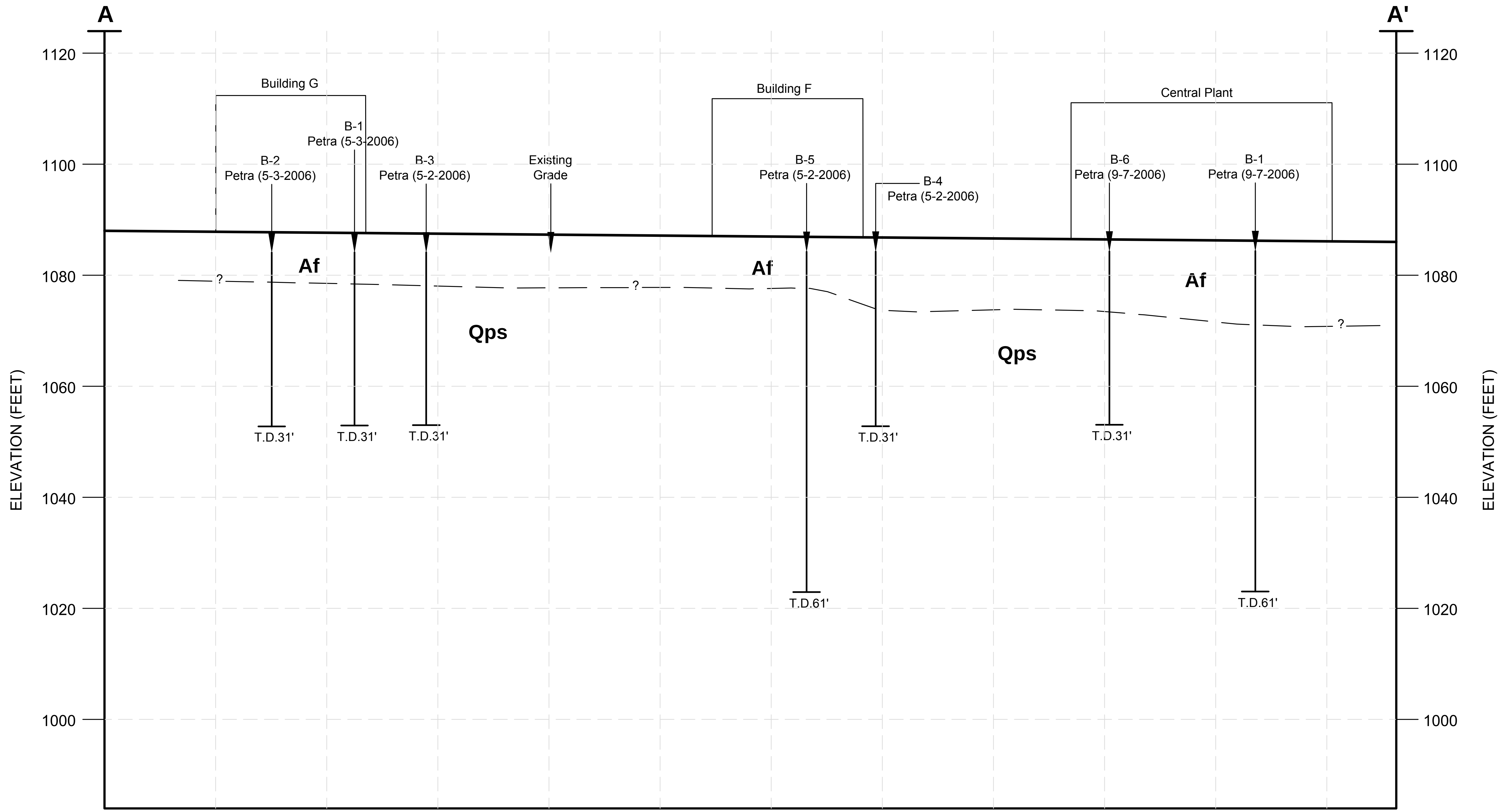

Af Artificial Fill

Qps Pauba Formation

GEOLOGIC CROSS SECTIONS A-A' Seismic Retrofit MSJCC - Temcula Campus Temecula, California		Figure 3a
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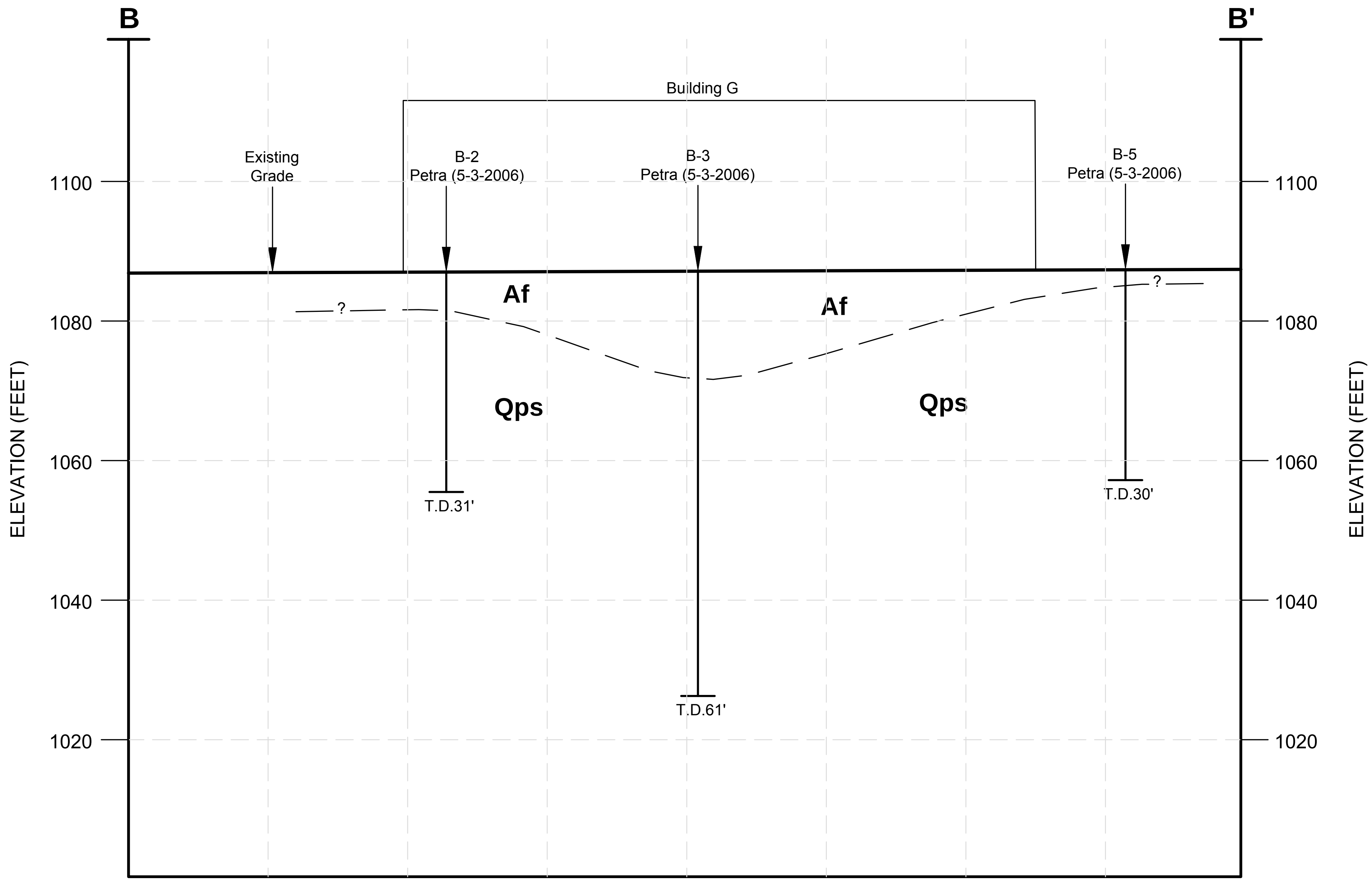
Scale: 1"=20'	Date: November 2018	
Drafted By: BQT / Checked By: BQT	V:\DRAFTING\12202\001\CAD\2018-10-30\12202-001_F03AB_CS_2018-11-15.DWG (11-15-18 9:17:52AM) Plotted by: btran	



Af Artificial Fill

Qps Pauba Formation

GEOLOGIC CROSS SECTIONS B-B' Seismic Retrofit MSJCC - Temcula Campus Temecula, California		Figure 3b
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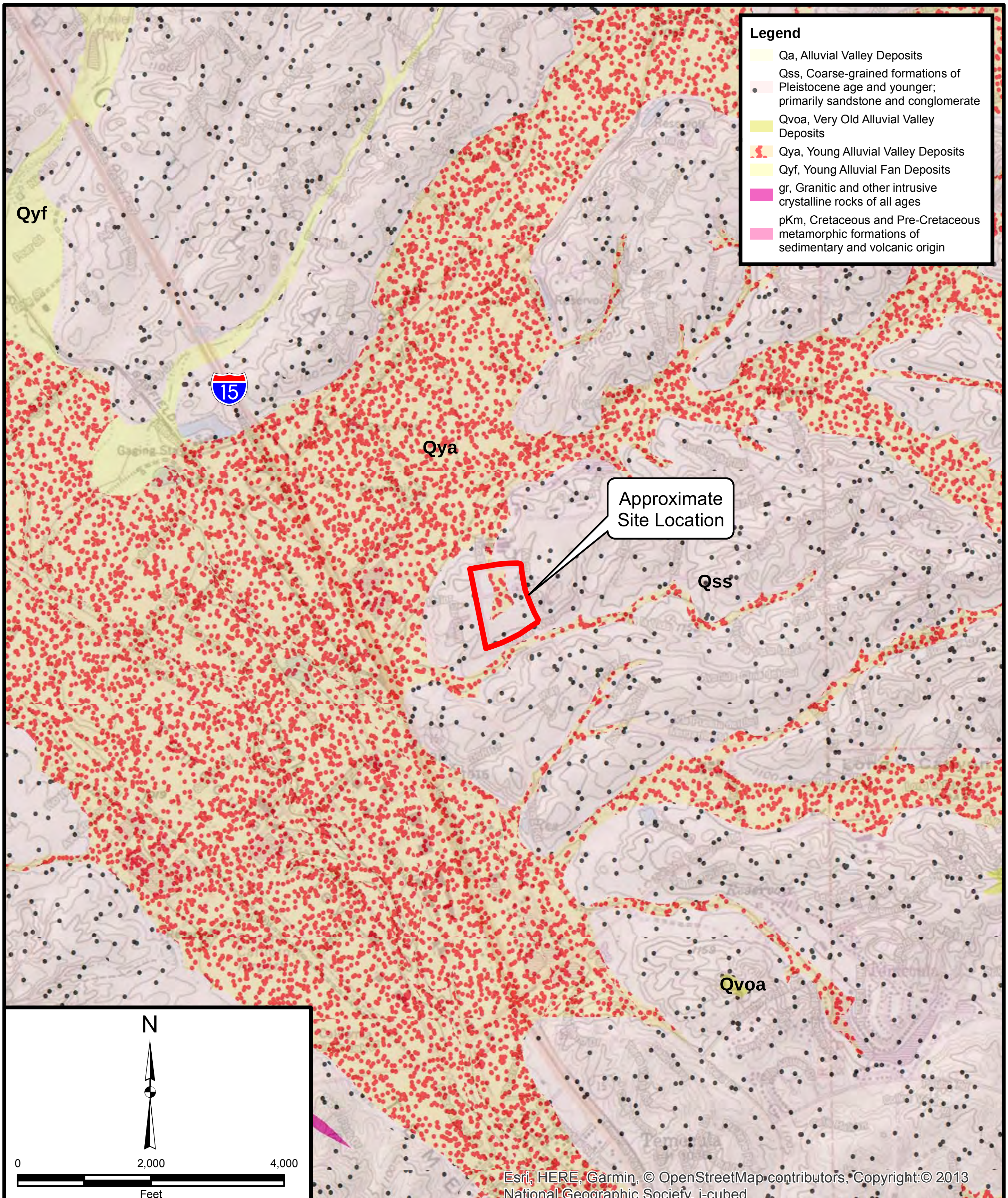
Scale: 1"=20'	Date: November 2018	
Drafted By: BQT	Checked By: BQT	



Project: 12202.001	Eng/Geol: SIS/RFR
Scale:1 " = 2,000 '	Date: October 2018

Base Map: ESRI ArcGIS Online 2018
Thematic Information: Leighton, USGS
Author: Leighton Geomatics (btran)

REGIONAL GEOLOGY MAP

Seismic Retrofit
MSJCC - Temcula Campus
Temecula, California

Figure 4

Leighton

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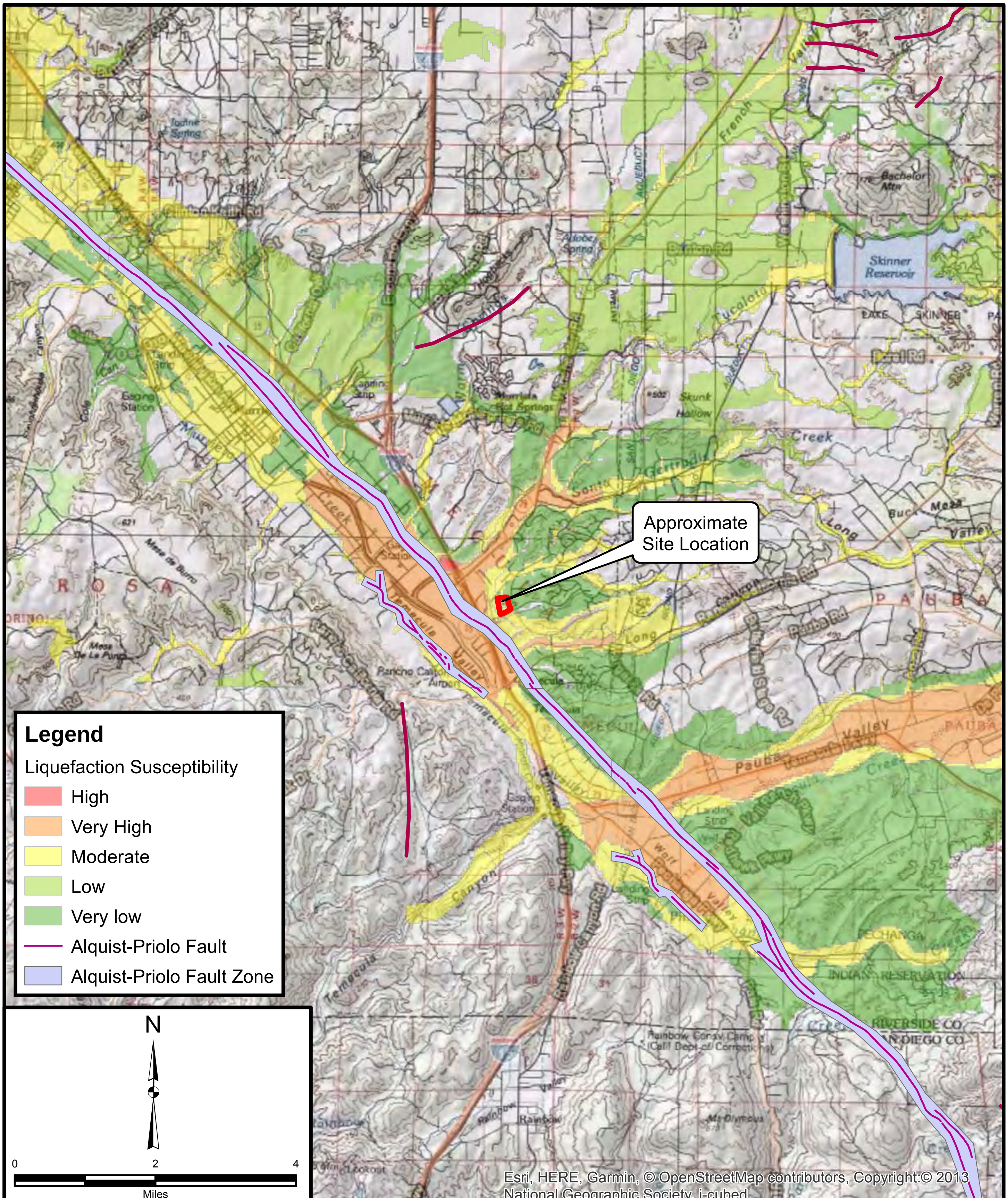

Project: 12202.001	Eng/Geol: SIS/RFR	FAULT ZONE AND LIQUEFACTION HAZARDS	Figure 5
Scale:1 " = 2 miles	Date: October 2018	Seismic Retrofit	
Base Map: ESRI ArcGIS Online 2018 Thematic Information: Leighton, CGS Author: Leighton Geomatics (btran)		MSJCC - Temcula Campus Temecula, California	Leighton

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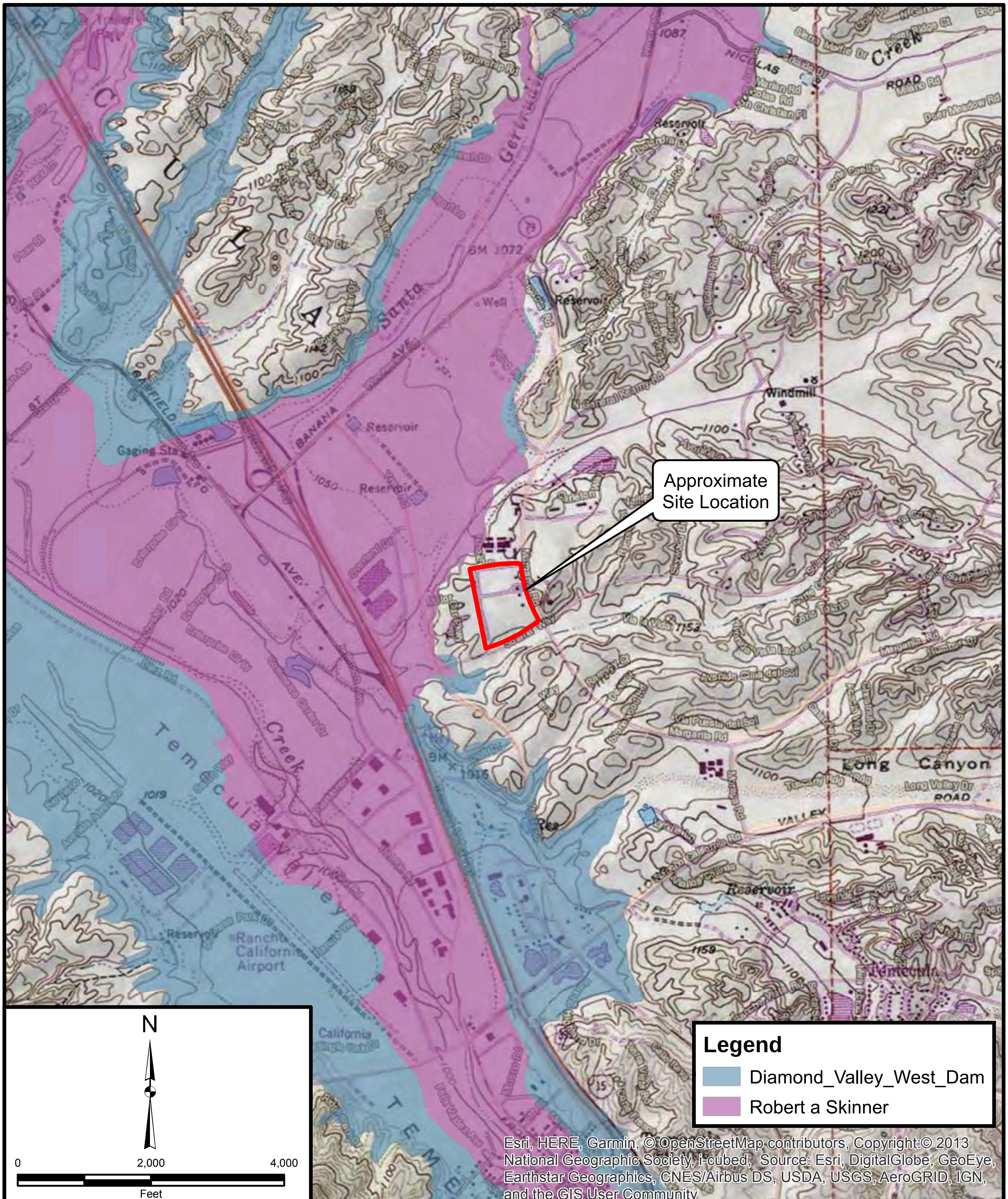

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Scale:1 " = 2,000 '	Date: October 2018

Base Map: ESRI ArcGIS Online 2018
Thematic Information: Leighton, CA DWR, FEMA
Author: Leighton Geomatics (btran)

DAM INUNDATION MAP

Seismic Retrofit
MSJCC - Temcula Campus
Temecula, California

Figure 6

Leighton

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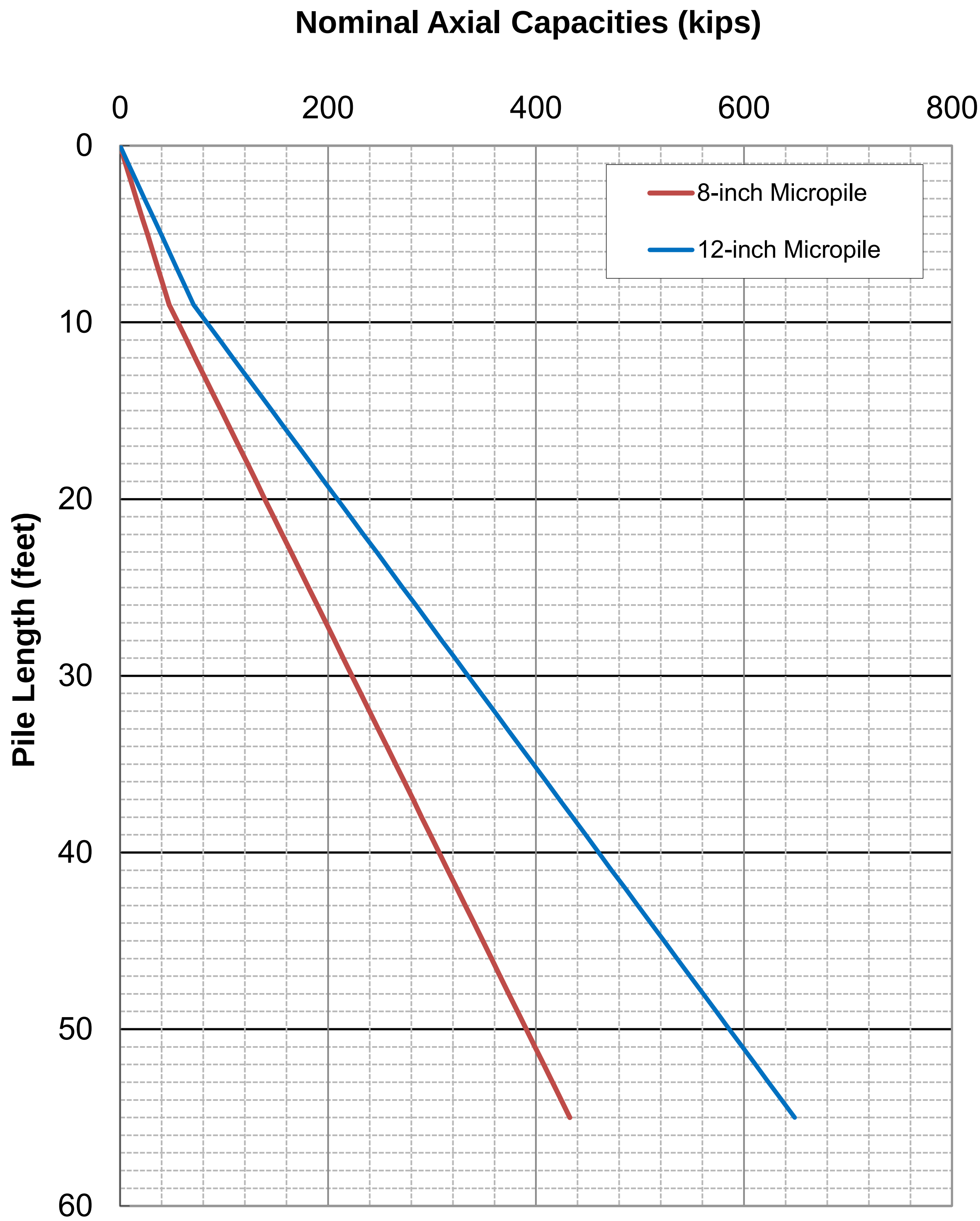
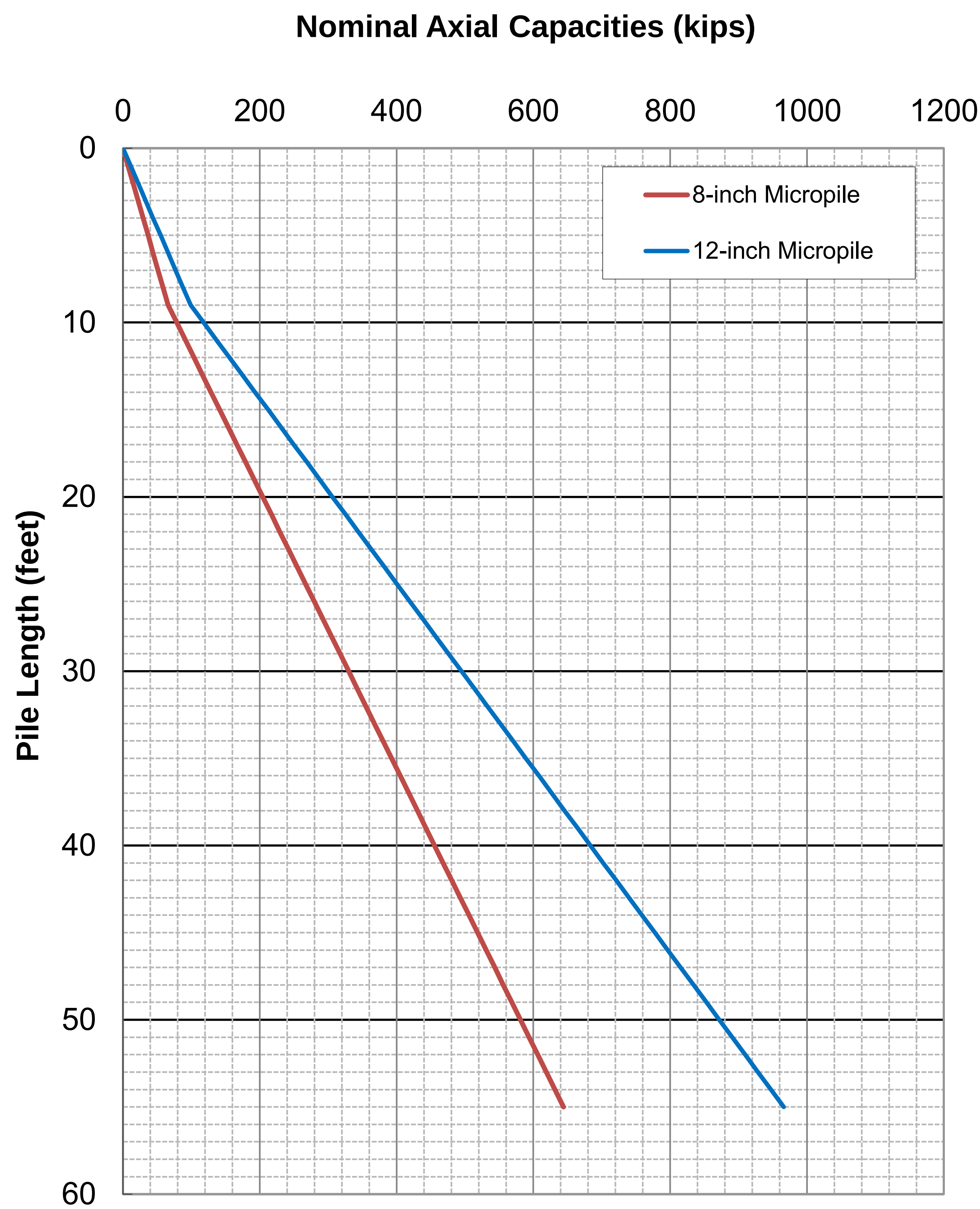


Notes:
1- We recommend a minimum factor of safety (FS) of 2.0 and 1.1 be applied to estimate allowable capacities for static and seismic loading conditions, respectively.
2- The above capacities are for Type A mircropiles (gravity grout) with center-to-center pile spacing of at least 3 pile diameter. Group reduction may be applied for closer spacing in compression.
3- Higher loads should be anticipated for other methods of installation (i.e. pressure grouting, etc.).
4- Nominal capacity in tension should be assumed at 2/3 the nominal capacity in compression.
5- Load-displacement tests should be performed for both tensile and compressive capacities to verify above loads.

NOMINAL AXIAL CAPACITY **8-INCH AND 12-INCH DIAMETER** MICROPILE TYPE A	PROJECT NAME : MSJCC Temecula PROJECT NUMBER : 12202.001 DESIGNED/CHECKED BY: BSS/SIS DATE: 1/3/2019	**Figure 7a**



Notes:
1- We recommend a minimum factor of safety (FS) of 2.0 and 1.1 be applied to estimate allowable capacities for static and seismic loading conditions, respectively.
2- The above capacities are for Type B mircropiles (pressure grouting through casing) with center-to-center pile spacing of at least 3 pile diameter. Group reduction may be applied for closer spacing in compression.
3- Higher loads should be anticipated for other methods of installation
4- Nominal capacity in tension should be assumed at 2/3 the nominal capacity in compression.
5- Load-displacement tests should be performed for both tensile and compressive capacities to verify above loads.

NOMINAL AXIAL CAPACITY **8-INCH AND 12-INCH DIAMETER** MICROPILE TYPE B	PROJECT NAME : MSJCC Temecula PROJECT NUMBER : 12202.001 DESIGNED/CHECKED BY: BSS/SIS DATE: 1/3/2019	**Figure 7b**

APPENDIX A

LOGS OF EXPLORATORY BORINGS (PREVIOUS)

Key to Soil and Bedrock Symbols and Terms

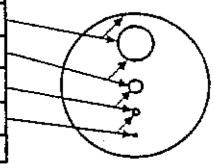
PETRA

Unified Soil Classification System

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

Grain Size

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



Laboratory Test Abbreviations

MAX	Maximum Dry Density	MA	Mechanical (Partical Size) Analysis
EXP	Expansion Potential	AT	Atterberg Limits
SO4	Soluble Sulfate Content	#200	#200 Screen Wash
RES	Resistivity	DSU	Direct Shear (Undisturbed Sample)
pH	Acidity	DSR	Direct Shear (Remolded Sample)
CON	Consolidation	HYD	Hydrometer Analysis
SW	Swell	SE	Sand Equivalent

Modifiers

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

Sampler and Symbol Descriptions

∇	Approximate Depth of Seepage
▼	Approximate Depth of Standing Groundwater
■	Modified California Split Spoon Sample
▨	Standard Penetration Test
░	Bulk Sample
◫	No Recovery in Sampler

Bedrock Hardness

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

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

EXPLORATION LOG

Project: **Proposed Building F**		Boring No.:	**B-1**
Location: **Temecula, CA**		Elevation:	**1,083± ft msl**
Job No.: **158-06**	Client: **Guidant Corporation**	Date:	**2/17/06**
Drill Method: **8-inch hollow-stem**	Driving Weight: **140 lbs / 30 in**	Logged By:	**M McConnell**

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
0		**BASE/ASPHALTIC CONCRETE.**							
		ARTIFICIAL FILL (af) Silty SAND (SM): dark brown, moist, dense.							
5		Silty SAND (SM): dark brown, moist, dense.		53	■	■	8.9	131.9	corr
10		**BEDROCK: PAUBA FORMATION (Qps)** SANDSTONE: light yellow orange grey, damp, moderately hard; fine- to coarse-grained, slightly friable.		59	■		5.6	120.5	
15		Clayey SANDSTONE: orange brown, damp, moderately hard; fine- to coarse-grained, manganese staining.		55	■		6.8	112.9	
20		Silty SANDSTONE: light brown, damp, moderately hard; fine-grained, slightly micaceous.		83	■		6.4	109.3	corr
		TOTAL DEPTH = 21.5' NO GROUNDWATER ENCOUNTERED NO CAVING ENCOUNTERED BORING BACKFILLED.							

PLATE A-1

EXPLORATION LOG

Project: **Proposed Building F**		Boring No.:	**B-2**
Location: **Temecula, CA**		Elevation:	**1,082.5± ft msl**
Job No.: **158-06**	Client: **Guidant Corporation**	Date:	**2/17/06**
Drill Method: **8-inch hollow-stem**	Driving Weight: **140 lbs / 30 in**	Logged By:	**M McConnell**

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
0		**ASPHALTIC CONCRETE.**							
		ARTIFICIAL FILL (af) Silty SAND (SM): light brown, damp, medium dense.							
5		Silty SAND (SM): light brown, dense.		57	■		9.6	130.0	
		BEDROCK: PAUBA FORMATION (Qps) Clayey SANDSTONE: light yellow brown, damp, moderately hard; with gravel.							
10		@ 10.0 feet: light yellow brown; fine- to coarse-grained.		63	■	■	7.6	115.5	
15		Clayey SANDSTONE: light orange brown, moist, soft; fine- to coarse-grained, with silt.		48	■		17.0	115.1	shear
20		Silty SANDSTONE: light orange yellow brown, moist, moderately hard; fine- to coarse-grained.		68	■	■	7.8	101.1	

TOTAL DEPTH = 21.5'
NO GROUNDWATER ENCOUNTERED
NO CAVING ENCOUNTERED
BORING BACKFILLED.

EXPLORATION LOG - V2 158-06.GPJ PETRA.GDT 5/1/06

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: **Proposed Building F**		Boring No.: **B-3**	
Location: **Temecula, CA**		Elevation: **1,084± ft msl**	
Job No.: **158-06**	Client: **Guidant Corporation**	Date: **2/17/06**	
Drill Method: **8-inch hollow-stem**	Driving Weight: **140 lbs / 30 in**	Logged By: **M McConnell**	

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		BASE/ASPHALTIC CONCRETE.							
		ARTIFICIAL FILL (af) Silty SAND (SM): medium brown, damp, medium dense.							
5		**BEDROCK: PAUBA FORMATION (Qps)** Clayey SANDSTONE: yellow orange grey brown, moist, soft to moderately hard; medium- to coarse-grained.		47			7.8	125.2	
10		Silty SANDSTONE: light yellow brown, moist, moderately hard; fine- to medium-grained, micaceous, manganese staining.		56			6.1	109.9	
15		Silty SANDSTONE: light yellow orange grey brown, moist, moderately hard; fine- to medium-grained, slightly micaceous.		54			10.7	108.2	cnsol

PLATE A-3

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: **Proposed Building F**		Boring No.: **B-3**
Location: **Temecula, CA**		Elevation: **1,084± ft msl**
Job No.: **158-06**	Client: **Guidant Corporation**	Date: **2/17/06**
Drill Method: **8-inch hollow-stem**	Driving Weight: **140 lbs / 30 in**	Logged By: **M McConnell**

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Silty SANDSTONE: brown, moist, soft; fine- to medium-grained.		28			20.2	108.3	shear
25		Sandy SILTSTONE: light brown, moist, soft; fine- to medium-grained, micaceous, with clay.		26					
30		Silty SANDSTONE: light orange brown, moist, moderately hard; fine- to medium-grained, micaceous.		32 50/ 5"					
		TOTAL DEPTH = 31.5' NO GROUNDWATER ENCOUNTERED NO CAVING ENCOUNTERED BORING BACKFILLED.							

PLATE A-4

EXPLORATION LOG

Project: Proposed Building F		Boring No.: B-4
Location: Temecula, CA		Elevation: 1,083.5± ft msl
Job No.: 158-06	Client: Guidant Corporation	Date: 2/17/06
Drill Method: 8-inch hollow-stem	Driving Weight: 140 lbs / 30 in	Logged By: M McConnell

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ASPHALTIC CONCRETE.							
		ARTIFICIAL FILL (af) Silty SAND (SM): dark orange brown, moist, medium dense.							
5		Clayey SAND (SC): dark orange brown, moist, medium dense; with silt.		29			9.0	126.5	sieve
10		**BEDROCK: PAUBA FORMATION (Qps)** Clayey SANDSTONE: yellow orange brown, moist, soft to moderately hard; fine- to medium-grained.		34			9.9	127.5	
15				49			9.5	123.2	shear

PLATE A-5

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: **Proposed Building F**		Boring No.: **B-4**	
Location: **Temecula, CA**		Elevation: **1,083.5± ft msl**	
Job No.: **158-06**	Client: **Guidant Corporation**	Date: **2/17/06**	
Drill Method: **8-inch hollow-stem**	Driving Weight: **140 lbs / 30 in**	Logged By: **M McConnell**	

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Silty SANDSTONE: light orange brown, damp, moderately hard; fine- to medium-grained, micaceous.		64			2.8	120.6	cnsol
25		Clayey SANDSTONE: light brown, moist, soft; fine-grained.		21					
30		Clayey SANDSTONE: light brown, moist, soft to moderately hard; with orange staining.		42					
		@ 31.5 feet: light grey brown, moist, soft to moderately hard; fine- to coarse-grained, micaceous.							
		TOTAL DEPTH = 31.5' NO GROUNDWATER ENCOUNTERED NO CAVING ENCOUNTERED BORING BACKFILLED.							

EXPLORATION LOG - V2 158-06.GPJ PETRA.GDT 5/1/06

EXPLORATION LOG

Project: **Proposed Building F**		Boring No.:	**B-5**
Location: **Temecula, CA**		Elevation:	**1,084± ft msl**
Job No.: **158-06**	Client: **Guidant Corporation**	Date:	**2/17/06**
Drill Method: **8-inch hollow-stem**	Driving Weight: **140 lbs / 30 in**	Logged By:	**M McConnell**

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
0		**ARTIFICIAL FILL (af)** Silty SAND (SM): dark brown, moist, medium dense.							
5		Silty SAND (SM): dark brown, moist, dense.		45			8.9	133.1	
		BEDROCK: PAUBA FORMATION (Qps) dark grey moist, soft to moderately hard; fine- to coarse-grained.							
10		Clayey SANDSTONE: grey yellow orange brown, moist, moderately hard; fine- to coarse-grained, well-indurated.		67			13.5	113.9	corr shear
15		Gravelly SANDSTONE: orange brown, damp, moderately hard.		56			8.8	113.2	
20		Silty SANDSTONE: brown, moist, soft; fine-grained, micaceous.		32			18.6	109.9	

PLATE A-7

Petra Geotechnical, Inc.

EXPLORATION LOG - V2 158-06.GPJ PETRA.GDT 5/1/06

EXPLORATION LOG

Project:	Proposed Building F			Boring No.:	B-5
Location:	Temecula, CA			Elevation:	1,084± ft msl
Job No.:	158-06	Client:	Guidant Corporation	Date:	2/17/06
Drill Method:	8-inch hollow-stem	Driving Weight:	140 lbs / 30 in	Logged By:	M McConnell

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Silty SANDSTONE: light orange brown, moist, soft; fine-grained, micaceous.		45					
30		Sandy SILTSTONE: medium brown, moist, soft; fine-grained, micaceous.		15					
35									
40		Silty SANDSTONE: light brown, moist, soft; fine-grained.		38					
45									

EXPLORATION LOG - V2 158-06.GPJ PETRA.GDT 5/1/06

PLATE A-8

EXPLORATION LOG

Project: **Proposed Building F**		Boring No.: **B-5**	
Location: **Temecula, CA**		Elevation: **1,084± ft msl**	
Job No.: **158-06**	Client: **Guidant Corporation**	Date: **2/17/06**	
Drill Method: **8-inch hollow-stem**	Driving Weight: **140 lbs / 30 in**	Logged By: **M McConnell**	

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		SANDSTONE: light grey brown, damp, moderately hard; fine- to coarse-grained, friable.		50/ 6"					
55									
60				41					
		TOTAL DEPTH = 61.5' NO GROUNDWATER ENCOUNTERED NO CAVING ENCOUNTERED BORING BACKFILLED.							

EXPLORATION LOG - V2 158-06.GPJ PETRA.GDT 5/1/06

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: Proposed Building G		Boring No.: B-1
Location: Temecula, CA		Elevation: 1,085± ft msl
Job No.: 159-06	Client: Guidant Corporation	Date: 2/21/06
Drill Method: 8-inch hollow-stem	Driving Weight: 140 lbs / 30 in	Logged By: M McConnell

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ASPHALTIC CONCRETE.							
		ARTIFICIAL FILL (af) Clayey SAND (SC): medium orange brown, damp, medium dense.							
5		**BEDROCK: PAUBA FORMATION (Qps)** Clayey SANDSTONE: orange brown, moist, soft; fine- to coarse-grained.		36			9.6	112.8	sieve
10		Clayey SANDSTONE: light orange brown, moist, moderately hard; fine- to coarse-grained.		57			6.5	109.9	shear
15		Silty SANDSTONE: light yellow brown, moist, moderately hard; fine- to coarse-grained, micaceous.		75			8.6	117.3	

EXPLORATION LOG - V2 159-06.GPJ PETRA.GDT 5/2/06

PLATE A-1

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: Proposed Building G		Boring No.: B-1
Location: Temecula, CA		Elevation: 1,085± ft msl
Job No.: 159-06	Client: Guidant Corporation	Date: 2/21/06
Drill Method: 8-inch hollow-stem	Driving Weight: 140 lbs / 30 in	Logged By: M McConnell

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Silty SANDSTONE: light brown, soft; fine- to coarse-grained, micaceous.		34					
25		Sandy SILTSTONE: light brown, moist, soft; fine-grained, micaceous.		25			18.0	113.0	
30		Silty SANDSTONE: light brown ,moist, moderately hard; fine- to medium-grained, micaceous.		26 50/ 6"					
		TOTAL DEPTH = 31.0' NO GROUNDWATER ENCOUNTERED NO CAVING ENCOUNTERED BORING BACKFILLED.							

PLATE A-2

Petra Geotechnical, Inc.

EXPLORATION LOG - V2 159-06.GPJ PETRA.GDT 5/2/06

EXPLORATION LOG

Project: Proposed Building G	Boring No.: B-2
Location: Temecula, CA	Elevation: 1,085± ft msl
Job No.: 159-06 / Client: Guidant Corporation	Date: 2/22/06
Drill Method: 8-inch hollow-stem / Driving Weight: 140 lbs / 30 in	Logged By: M McConnell

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ASPHALT CONCRETE/BASE.							
		ARTIFICIAL FILL (af) Clayey SAND (SC): medium orange brown, damp, medium dense.							
5		**BEDROCK: PAUBA FORMATION (Qps)** Clayey SANDSTONE: orange brown, moist, moderately hard; fine- to coarse-grained.		61			5.6	129.4	
10		Silty SANDSTONE: orange yellow grey, moist, moderately hard; fine- to coarse-grained, with clay.		76			6.5	130.5	corr
15		Clayey SANDSTONE: light brown, moist, moderately hard; fine- to medium-grained, micaceous, with silt.		66			8.8	123.6	

PLATE A-3

EXPLORATION LOG - V2 159-06.GPJ PETRA.GDT 5/2/06

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: Proposed Building G		Boring No.: B-2
Location: Temecula, CA		Elevation: 1,085± ft msl
Job No.: 159-06	Client: Guidant Corporation	Date: 2/22/06
Drill Method: 8-inch hollow-stem	Driving Weight: 140 lbs / 30 in	Logged By: M McConnell

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Clayey SANDSTONE: light yellow brown, moist, soft; fine- to coarse-grained.		32					
		Sandy CLAYSTONE: light brown, moist, soft; fine- to medium-grained.							
25		Silty SANDSTONE: light yellow brown, damp, moderately hard; fine- to medium-grained, friable.		42 50/ 5"					
30		Sandy CLAYSTONE: orange brown, moist, moderately hard; fine-grained, micaceous.		59			14.9	114.1	
		TOTAL DEPTH = 31.5' NO GROUNDWATER ENCOUNTERED NO CAVING ENCOUNTERED BORING BACKFILLED.							

EXPLORATION LOG - V2 159-06.GPJ PETRA.GDT 5/2/06

PLATE A-4

EXPLORATION LOG

Project: **Proposed Building G**		Boring No.: **B-3**	
Location: **Temecula, CA**		Elevation: **1,086± ft msl**	
Job No.: **159-06**	Client: **Guidant Corporation**	Date: **2/22/06**	
Drill Method: **8-inch hollow-stem**	Driving Weight: **140 lbs / 30 in**	Logged By: **M McConnell**	

Depth (Feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		GRASS SOD.							
		ARTIFICIAL FILL (af) Silty SAND (SM): dark brown, moist, loose to medium dense; with clay.							
5		Silty SAND (SM): dark brown, moist, medium dense; with clay.		34			12.5	123.2	corr
10		Silty SAND (SM): brown, moist, dense; fine- to medium.		41			10.0	130.9	
15		**BEDROCK: PAUBA FORMATION (Qps)** Clayey SANDSTONE: orange yellow brown, moist, soft; fine- to coarse-grained.		21			9.2	118.0	shear
20		Silty SANDSTONE: light brown, moist, soft; fine-grained, micaceous.		31					

EXPLORATION LOG - V2 159-06.GPJ PETRA.GDT 5/2/06

PLATE A-5

EXPLORATION LOG

Project: Proposed Building G		Boring No.: B-3
Location: Temecula, CA		Elevation: 1,086± ft msl
Job No.: 159-06	Client: Guidant Corporation	Date: 2/22/06
Drill Method: 8-inch hollow-stem	Driving Weight: 140 lbs / 30 in	Logged By: M McConnell

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Silty SANDSTONE: orange brown, moist, soft; fie-grained, micaceous.		22			34.1	88.7	cnsol
30		Silty SANDSTONE: light brown, moist, moderately hard; fine-grained, micaceous.		64					
35		Silty SANDSTONE: light brown, moist, soft, micaceous.		26					
40		Sandy CLAYSTONE: medium brown, moist, moderately hard; fine- to medium-grained.		50/ 5.5"					
45									

PLATE A-6

EXPLORATION LOG

Project: Proposed Building G		Boring No.: B-3
Location: Temecula, CA		Elevation: 1,086± ft msl
Job No.: 159-06	Client: Guidant Corporation	Date: 2/22/06
Drill Method: 8-inch hollow-stem	Driving Weight: 140 lbs / 30 in	Logged By: M McConnell

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Sandy CLAYSTONE: light yellow brown, moist, moderately hard; manganese staining.		50/ 5.5"					
55									
60		SANDSTONE: light brown, moist, moderately hard; fine- to coarse-grained.		48					
		Silty SANDSTONE: light brown, moist, moderately hard.							

TOTAL DEPTH = 61.5'
NO GROUNDWATER ENCOUNTERED
NO CAVING ENCOUNTERED
BORING BACKFILLED.

EXPLORATION LOG - V2 159-06.GPJ PETRA.GDT 5/2/06

PLATE A-7

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: **Proposed Building G**		Boring No.: **B-4**
Location: **Temecula, CA**		Elevation: **1,087± ft msl**
Job No.: **159-06**	Client: **Guidant Corporation**	Date: **2/22/06**
Drill Method: **8-inch hollow-stem**	Driving Weight: **140 lbs / 30 in**	Logged By: **M McConnell**

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
0		**ARTIFICIAL FILL (af)** Sandy CLAY (CL): orange brown, moist, dense; fine to coarse.							
5				42			7.5	124.7	corr
		BEDROCK: PAUBA FORMATION (Qps) Silty SANDSTONE: moist, soft.							
10		Silty SANDSTONE: light brown, moist, soft; fine-grained, micaceous.		46			21.7	109.2	
15		Silty SANDSTONE: light brown, moist, soft; fine- to medium-grained, micaceous.		53			15.1	119.4	shear

PLATE A-8

EXPLORATION LOG

Project: Proposed Building G		Boring No.: B-4
Location: Temecula, CA		Elevation: 1,087± ft msl
Job No.: 159-06	Client: Guidant Corporation	Date: 2/22/06
Drill Method: 8-inch hollow-stem	Driving Weight: 140 lbs / 30 in	Logged By: M McConnell

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Sandy SILTSTONE: light brown, moist, soft; fine-grained, micaceous.		10					
25		Silty CLAYSTONE: brown, moist, soft; fine-grained, micaceous.		44					
30		@ 29.8 feet: groundwater.	∇						
		Silty SANDSTONE: grey brown, wet, soft; fine- to medium-grained, micaceous.		32					

TOTAL DEPTH = 31.5'
GROUNDWATER ENCOUNTERED @ 29.8'
NO CAVING ENCOUNTERED
BORING BACKFILLED.

EXPLORATION LOG - V2 159-06.GPJ PETRA.GDT 5/2/06

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: **Proposed Building G**		Boring No.:	**B-5**
Location: **Temecula, CA**		Elevation:	**1,087± ft msl**
Job No.: **159-06**	Client: **Guidant Corporation**	Date:	**2/22/06**
Drill Method: **8-inch hollow-stem**	Driving Weight: **140 lbs / 30 in**	Logged By:	**M McConnell**

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ARTIFICIAL FILL (af) Clayey SAND (SC): medium orange brown, damp, medium dense.							
		BEDROCK: PAUBA FORMATION (Qps) Sandy CLAYSTONE: orange brown, moist, moderately hard.							
5		Sandy CLAYSTONE: orange brown, moist, moderately hard; fine- to coarse-grained.		67			6.8	118.8	
10		Sandy CLAYSTONE: orange brown, moist, moderately hard; fine- to medium-grained.		52			19.0	111.1	shear sieve
15		Silty SANDSTONE: brown, moist, moderately hard; fine-grained, micaceous.		46			11.2	103.4	

EXPLORATION LOG - V2 159-06.GPJ PETRA GDT 5/2/06

PLATE A-10

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: Proposed Building G		Boring No.: B-5
Location: Temecula, CA		Elevation: 1,087± ft msl
Job No.: 159-06	Client: Guidant Corporation	Date: 2/22/06
Drill Method: 8-inch hollow-stem	Driving Weight: 140 lbs / 30 in	Logged By: M McConnell

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Sandy SILTSTONE: light brown, moist, soft; fie-grained, micaceous.		19			31.8	93.6	
25		Sandy SILTSTONE: dark brown, wet, woft, fine-grained, micaceous.		40			29.1	97.6	
30		Silty CLAYSTONE: brown, moist, moderately hard; fie-grained, micaceous.		50/ 6"					

TOTAL DEPTH = 30.5'
NO GROUNDWATER ENCOUNTERED
NO CAVING ENCOUNTERED
BORING BACKFILLED.

EXPLORATION LOG - V2 159-06.GPJ PETRA.GDT 5/2/06

PLATE A-11

EXPLORATION LOG

Project: **Proposed Plant Building**		Boring No.: **B-6**	
Location: **Temecula, CA**		Elevation: **1,084± ft msl**	
Job No.: **158-06**	Client: **Abbott Vascular - TEC**	Date: **8/11/06**	
Drill Method: **8-inch hollow-stem**	Driving Weight: **140 lbs / 30 in**	Logged By: **D Johnston**	

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per 6"	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
0		**ARTIFICIAL FILL (afc)** Silty SAND (SM): brown, moist, medium dense; fine to coarse.							
5		Silty SAND (SM): grey brown, moist, medium dense; fine to medium.		29	■		14.7	117.3	
10		**BEDROCK: PAUBA FORMATION (Qps)** SANDSTONE: light brownish yellow, moist, moderately hard to hard; medium- to coarse-grained, thinly bedded, trace silt.		41	■		6.2	108.4	So4 chlor pH res
15		Silty SANDSTONE: light yellow, moist, moderately hard to hard; fine- to medium-grained, very thinly bedded, trace clayey sand.		62	■		6.9	108.0	

EXPLORATION LOG - V3 158-06 PLANT.GPJ PETRA.GDT 9/6/06

PLATE A-1

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: Proposed Plant Building		Boring No.: B-6
Location: Temecula, CA		Elevation: 1,084± ft msl
Job No.: 158-06	Client: Abbott Vascular - TEC	Date: 8/11/06
Drill Method: 8-inch hollow-stem	Driving Weight: 140 lbs / 30 in	Logged By: D Johnston

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per 6"	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Sandy SILTSTONE: olive, moist, moderately hard; fine-grained, micaceous, thinly bedded.		33			14.3	107.9	shear
25		Sandy CLAYSTONE: olive, moist, moderately hard; micaceous, mottled, very thinly bedded to laminated.		33			15.8	115.3	
30		SANDSTONE: light grey, moist, moderately hard; micaceous, thinly bedded, trace silt.		38			8.4	93.2	
		Clayey SANDSTONE: grey brown, moist, moderately hard; highly micaceous, very thinly bedded.							
		TOTAL DEPTH = 31.5' NO GROUNDWATER ENCOUNTERED NO CAVING ENCOUNTERED BORING BACKFILLED.							

EXPLORATION LOG - V3 158-06 PLANT.GPJ PETRA.GDT 9/6/06

PLATE A-2

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: Proposed Parking Structure 2		Boring No.: B-1
Location: Temecula, CA		Elevation: 1,083± ft msl
Job No.: 157-06	Client: Guidant Corporation	Date: 2/15/06
Drill Method: 8-inch hollow-stem	Driving Weight: 140 lbs / 30 in	Logged By: M McConnell

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per 6"	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
0		**ARTIFICIAL FILL (af)** Silty SAND (SM): brown, moist, dense; fine to coarse.							
5				60			10.8	128.0	
10		Silty SAND (SM): light brown, moist, dense; fine to medium.		52			8.5	110.6	shear
		BEDROCK: PAUBA FORMATION (Qps) Silty SANDSTONE: orange brown, moist, soft to moderately hard; fine- to coarse-grained, micaceous, manganese staining.							
15				31 50/ 6"			6.1	112.1	
20		Silty SANDSTONE: yellow brown, moist, soft to moderately hard; fine- to medium-grained, micaceous.		45 50/ 6"			6.1	106.3	

PLATE A-1

Petra Geotechnical, Inc.

EXPLORATION LOG - V3 157-06.GPJ PETRA.GDT 9/6/06

EXPLORATION LOG

Project:	Proposed Parking Structure 2			Boring No.:	B-1
Location:	Temecula, CA			Elevation:	1,083± ft msl
Job No.:	157-06	Client:	Guidant Corporation	Date:	2/15/06
Drill Method:	8-inch hollow-stem	Driving Weight:	140 lbs / 30 in	Logged By:	M McConnell

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per 6"	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Sandy SILTSTONE: light brown, moist, soft; fine-grained, micaceous.		46			21.5	108.5	
30		Sandy SILTSTONE: medium brown, moist, soft; fine-grained, micaceous.		21			28.3	98.1	
35		Sandy SILTSTONE: medium brown, moist, soft to moderately hard; fine-grained, micaceous.		49			23.0	104.1	shear
40		Sandy CLAYSTONE: dark brown, moist, soft to moderately hard; fine-grained.		54			16.2	118.3	
45		SANDSTONE: grey yellow, dry, moderately hard; fine- to coarse-grained, friable.		50/ 6"			4.3	98.8	

PLATE A-2

EXPLORATION LOG - V3 157-06.GPJ PETRA.GDT 9/6/06

Petra Geotechnical, Inc.

EXPLORATION LOG

Project: Proposed Parking Structure 2		Boring No.: B-1
Location: Temecula, CA		Elevation: 1,083± ft msl
Job No.: 157-06	Client: Guidant Corporation	Date: 2/15/06
Drill Method: 8-inch hollow-stem	Driving Weight: 140 lbs / 30 in	Logged By: M McConnell

Depth (Feet)	Lithology	Material Description	Water	Samples: Blows Per 6"	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		SANDSTONE: light yellow, dry, moderately hard; fine- to coarse-grained, friable.		50/ 6"	■		6.0	101.4	
55									
60		Gravelly SANDSTONE: light orange yellow, damp, moderately hard; fine- to coarse-grained, well-indurated.		37 50/ 3"	■				

TOTAL DEPTH = 60.75'
NO GROUNDWATER ENCOUNTERED
NO CAVING ENCOUNTERED
BORING BACKFILLED.

PLATE A-3

Petra Geotechnical, Inc.

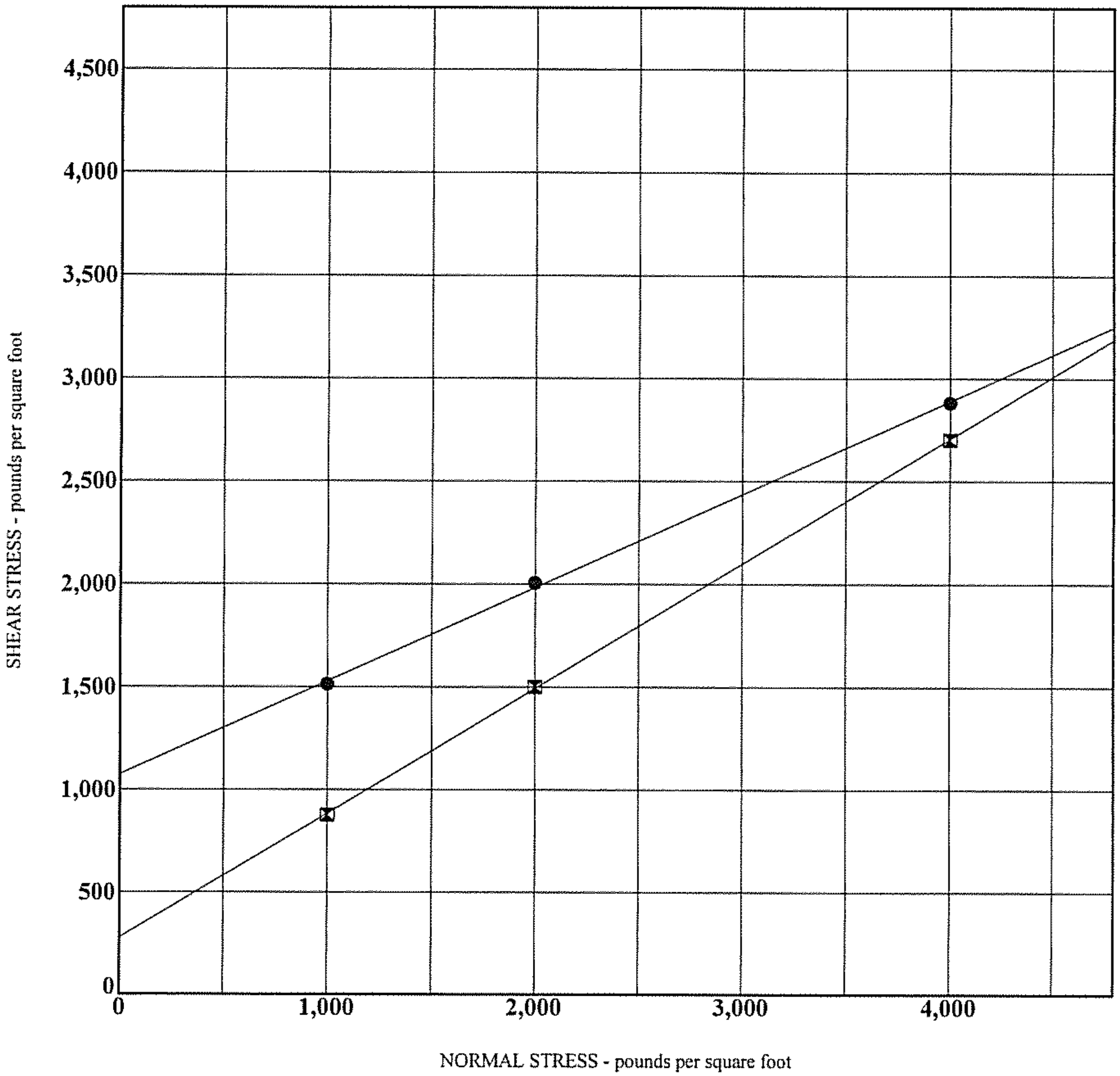
APPENDIX B

GEOTECHNICAL LABORATORY TESTS RESULTS (PREVIOUS)

CORROSION TESTS

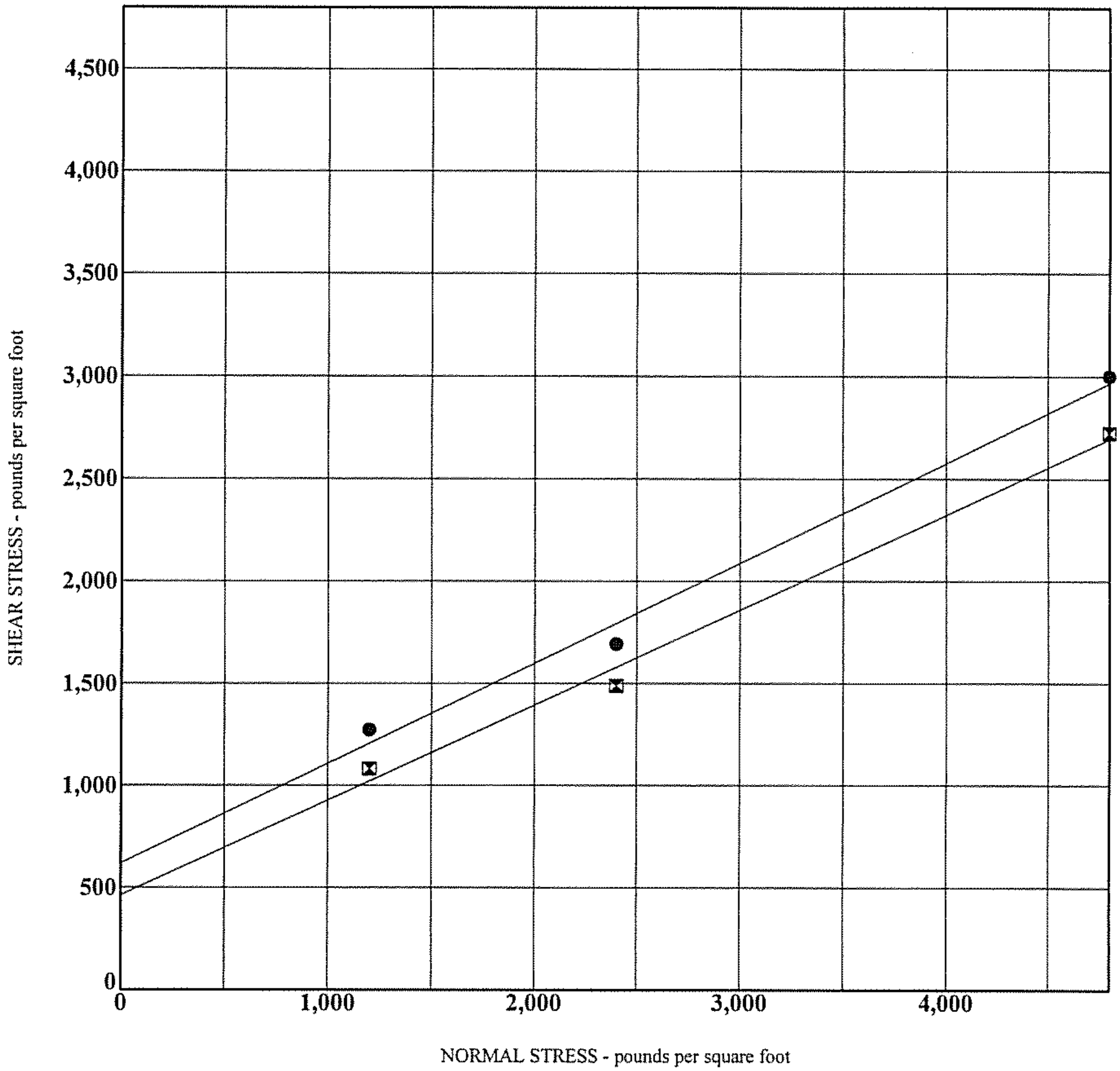
Boring/ Depth (feet)	Sulfate[1] (%)	Chloride[2] (ppm)	pH[3]	Resistivity3 (ohm-cm)	Corrosivity Potential
B-1 @ 5.0	0.012	215	7.9	1,700	concrete: negligible steel: moderate
B-1 @ 20.0	0.004	135	7.9	5,200	concrete: negligible steel: moderate
B-5 @ 10.0 - 12.0	0.008	140	7.7	1,600	concrete: negligible steel: moderate

(1) PER CALIFORNIA TEST METHOD NO. 417
(2) PER CALIFORNIA TEST METHOD NO. 422
(3) PER CALIFORNIA TEST METHOD NO. 643



SAMPLE LOCATION (feet)	DESCRIPTION	FRICTION ANGLE (°)	COHESION (PSF)
● B-2 @ 15.0	Clayey SANDSTONE - Peak	24	1070
⊠ B-2 @ 15.0	Clayey SANDSTONE - Ultimate	31	275

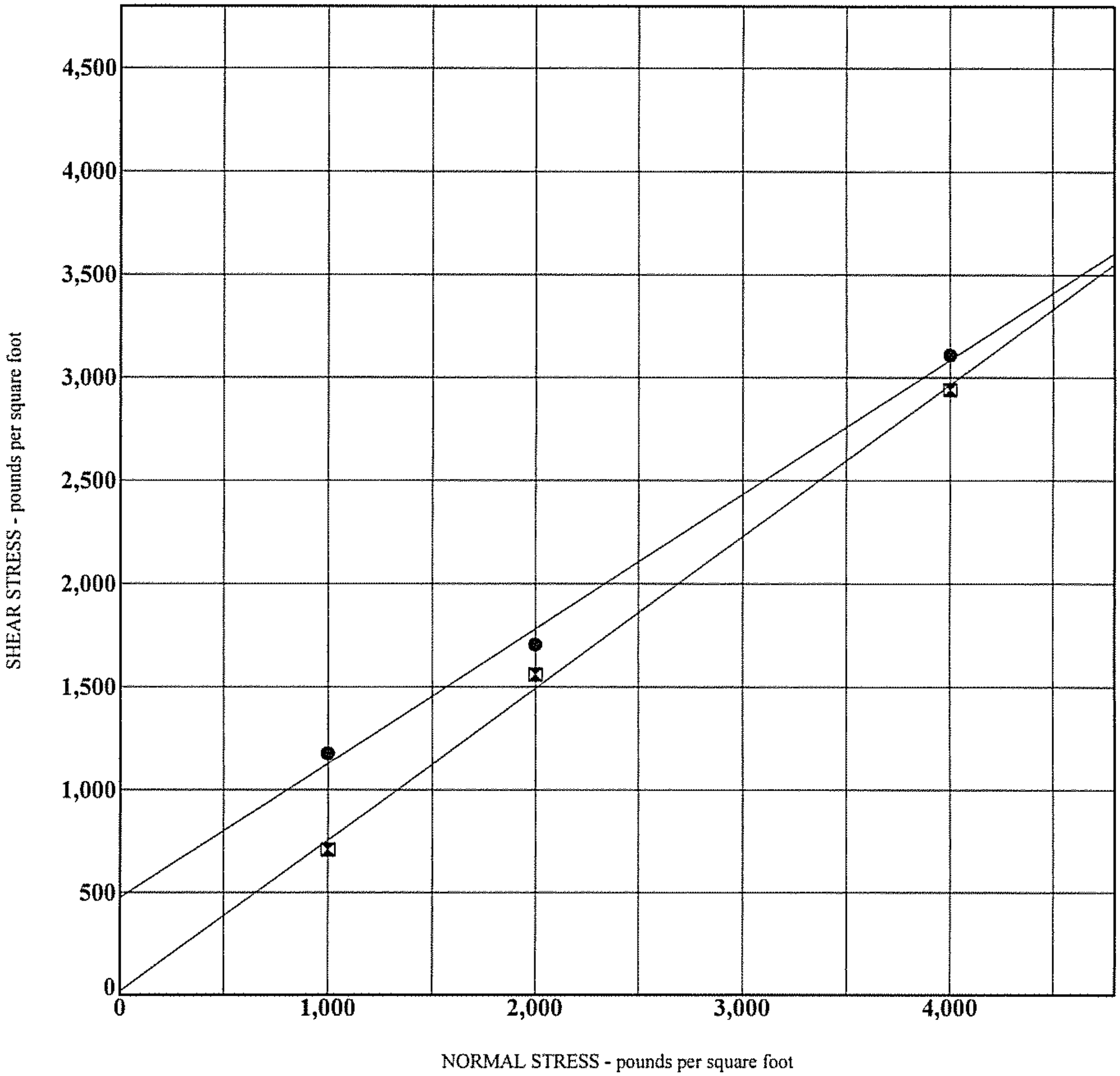
J.N. 158-06	DIRECT SHEAR TEST DATA	April, 2006
PETRA GEOTECHNICAL, INC.	UNDISTURBED TEST SAMPLES	PLATE B-2



SAMPLE LOCATION (feet)	DESCRIPTION	FRICTION ANGLE (°)	COHESION (PSF)
● B-3 @ 20.0	Silty SANDSTONE - Peak	26	615
⊠ B-3 @ 20.0	Silty SANDSTONE - Ultimate	25	460

DIRECT SHEAR 158-06.GPJ PETRA.GDT 4/19/06

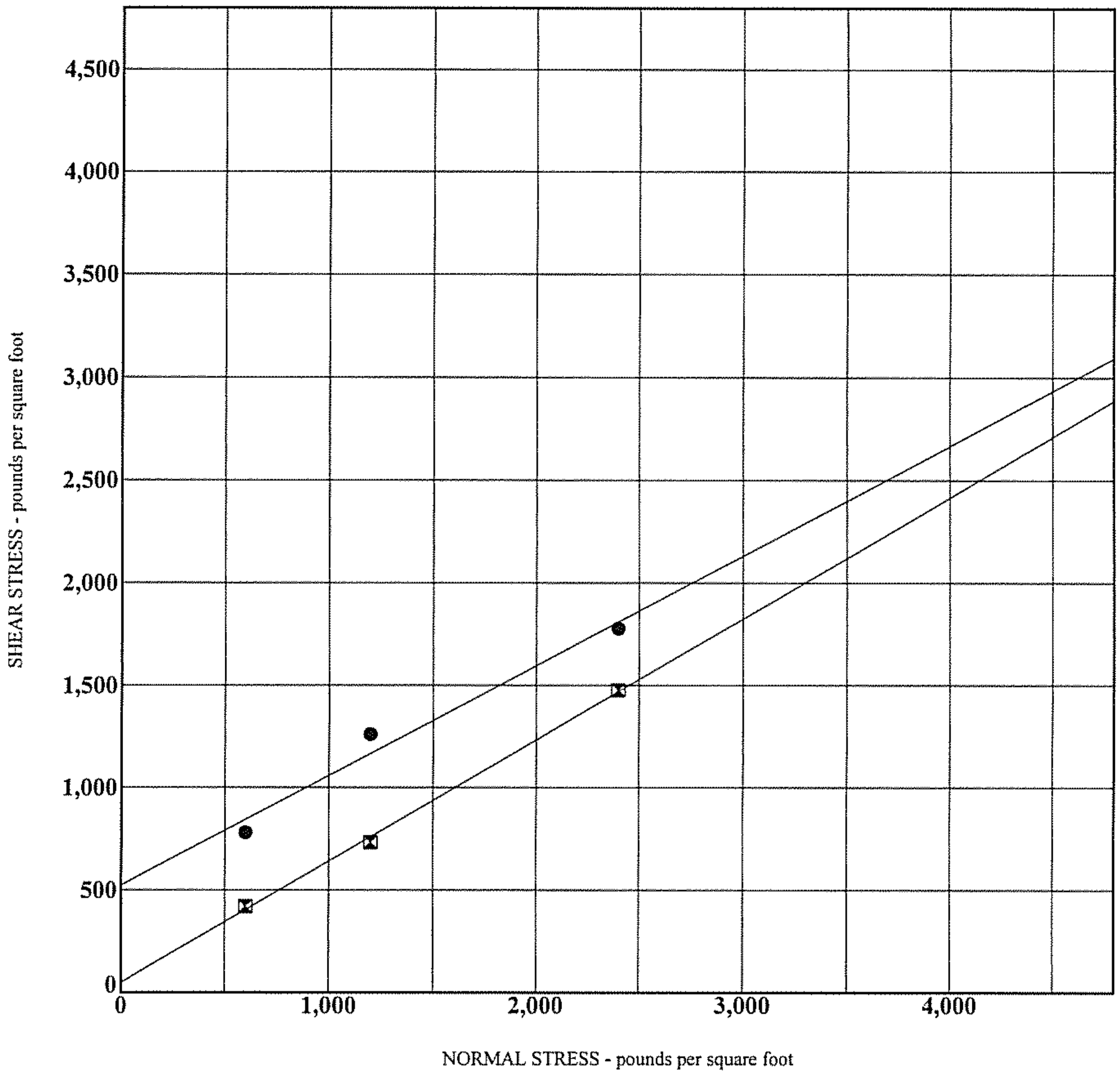
J.N. 158-06	DIRECT SHEAR TEST DATA	April, 2006
PETRA GEOTECHNICAL, INC.	UNDISTURBED TEST SAMPLES	PLATE B-3



SAMPLE LOCATION (feet)	DESCRIPTION	FRICTION ANGLE (°)	COHESION (PSF)
● B-4 @ 15.0	Clayey SANDSTONE - Peak	33	470
⊠ B-4 @ 15.0	Clayey SANDSTONE - Ultimate	36	15

DIRECT SHEAR 158-06.GPJ PETRA.GDT 4/19/06

J.N. 158-06	DIRECT SHEAR TEST DATA	April, 2006
PETRA GEOTECHNICAL, INC.	UNDISTURBED TEST SAMPLES	PLATE B-4

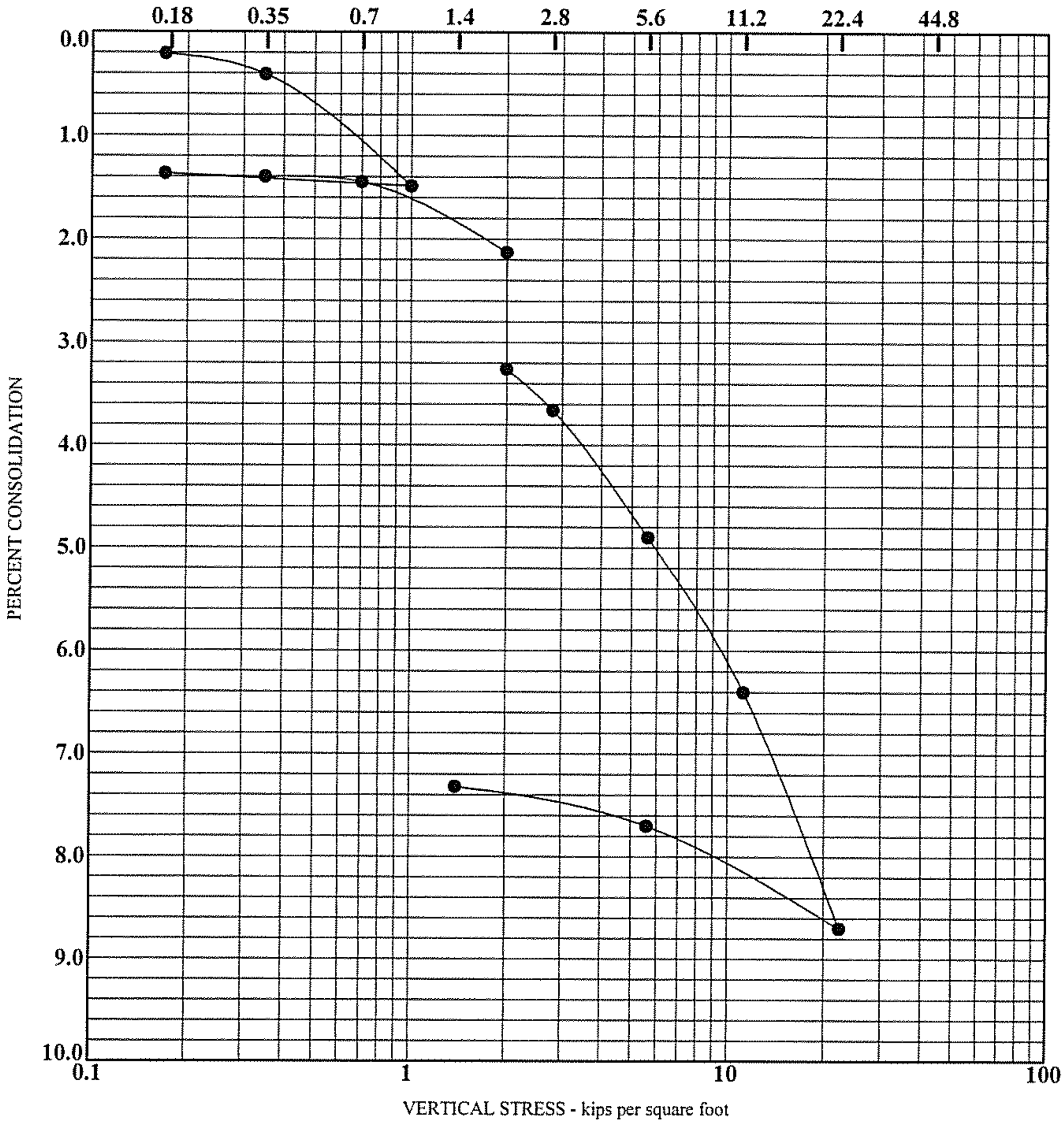


SAMPLE LOCATION (feet)	DESCRIPTION	FRICTION ANGLE (°)	COHESION (PSF)
● B-5 @ 10.0	Clayey SANDSTONE - Peak	28	520
⊠ B-5 @ 10.0	Clayey SANDSTONE - Ultimate	31	45

DIRECT SHEAR 158-06.GPJ PETRA.GDT 4/19/06

J.N. 158-06	**DIRECT SHEAR TEST DATA**	April, 2006
PETRA GEOTECHNICAL, INC.	**UNDISTURBED TEST SAMPLES**	PLATE B-5

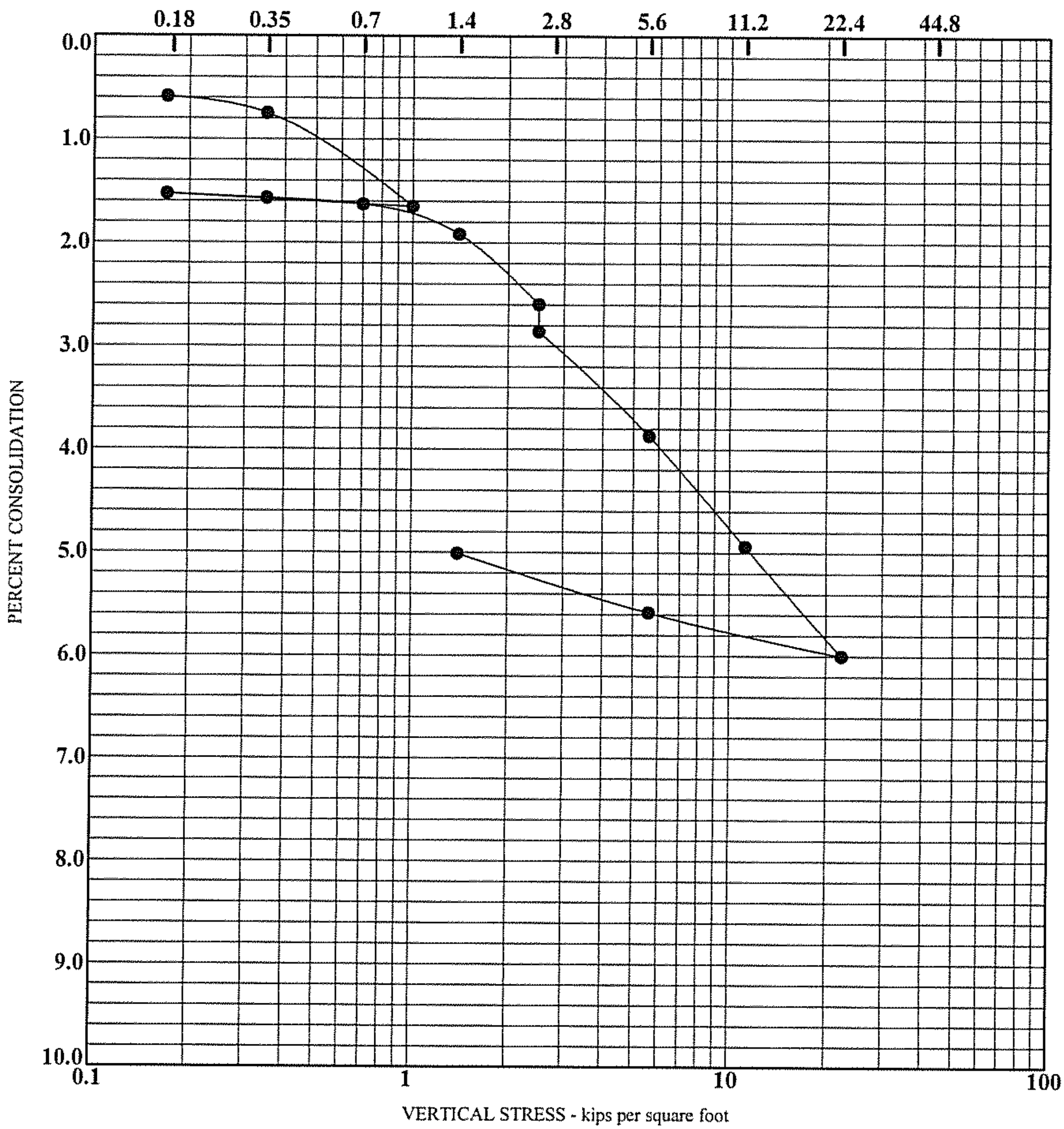
SAMPLE LOCATION (feet)	MATERIAL DESCRIPTION	INITIAL DENSITY (pcf)	INITIAL MOISTURE (%)	INITIAL SATURATION (%)	INUNDATED LOAD (ksf)
● B-3 @ 15.0	Silty SANDSTONE	104.5	9.7	43	2.00



CONSOLIDATION - STRAIN 158-06.GPJ PETRA.GDT 4/19/06

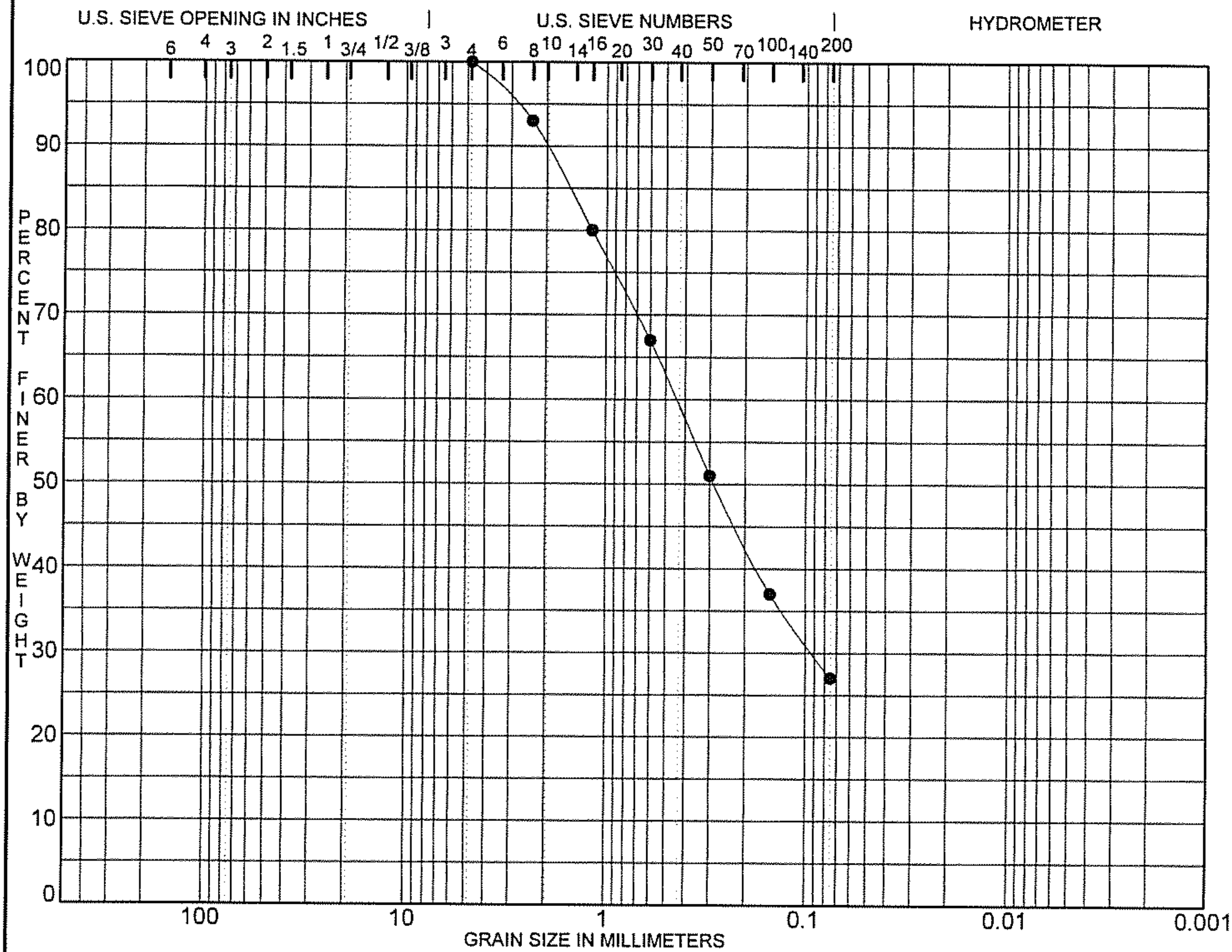
J.N. 158-06	CONSOLIDATION TEST RESULTS	April, 2006
PETRA GEOTECHNICAL, INC.		PLATE B-6

SAMPLE LOCATION (feet)	MATERIAL DESCRIPTION	INITIAL			INUNDATED
		DENSITY (pcf)	MOISTURE (%)	SATURATION (%)	LOAD (ksf)
● B-4 @ 20.0	Silty SANDSTONE	105.9	12.7	58	2.50



CONSOLIDATION - STRAIN 158-06.GPJ PETRA.GDT 4/19/06

J.N. 158-06	CONSOLIDATION TEST RESULTS	April, 2006
PETRA GEOTECHNICAL, INC.		PLATE B-7



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification (ft)	Classification	MC%	LL	PL	PI	Cc	Cu
●	B-4 @ 5.0	Clayey SAND	9					

	Specimen Identification (ft)	D100	D60	D30	D50	%Gravel	%Sand	%Silt	%Clay
●	B-4 @ 5.0	4.75	0.44	0.092	0.2855	0.0	73.0	27.0	

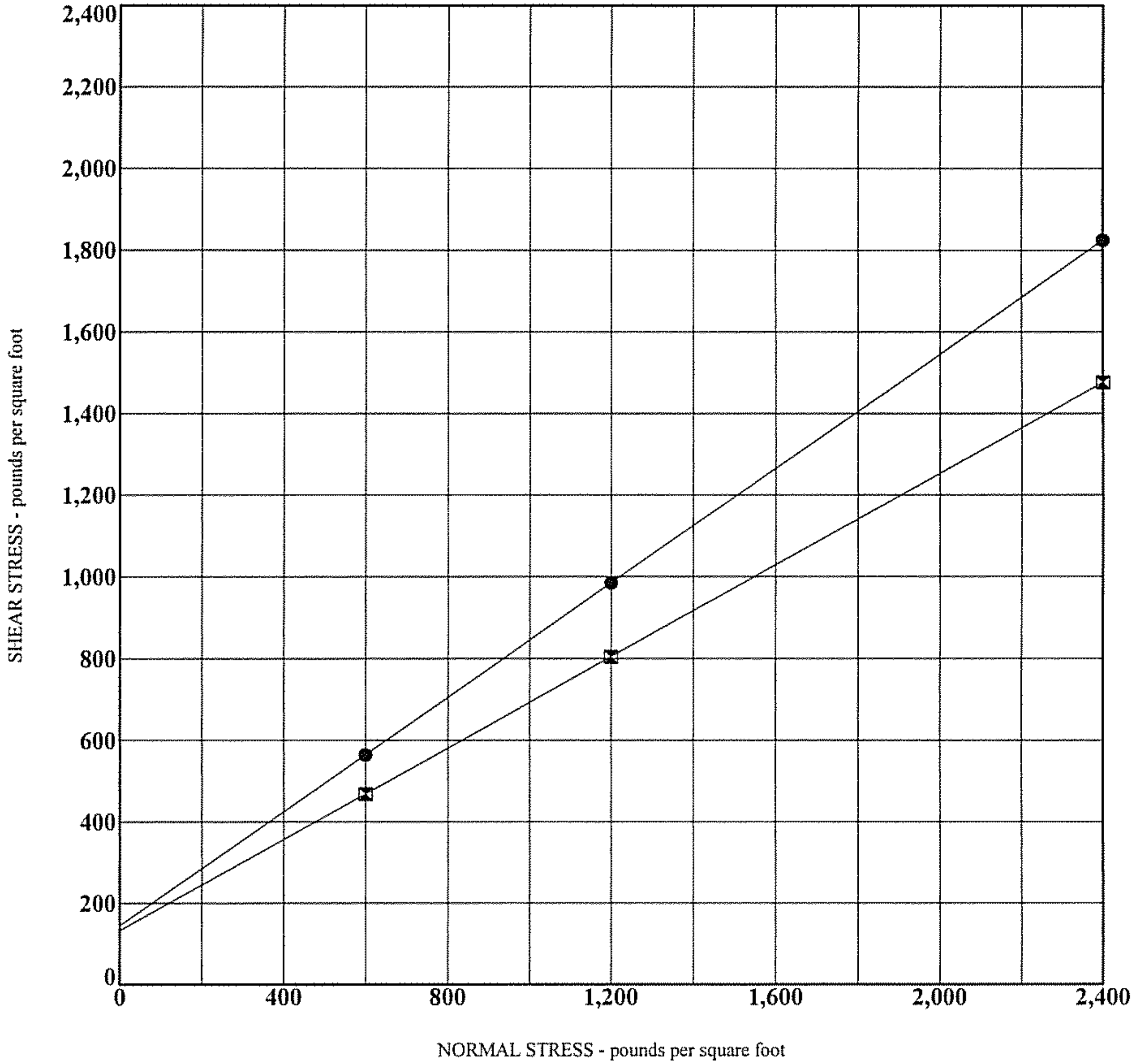
GRAIN SIZE - V1 158-06.GPJ PETRA.GDT 4/19/06

J.N. 158-06	GRAIN SIZE ANALYSIS	April, 2006
PETRA GEOTECHNICAL, INC.		PLATE B-8

CORROSION TESTS

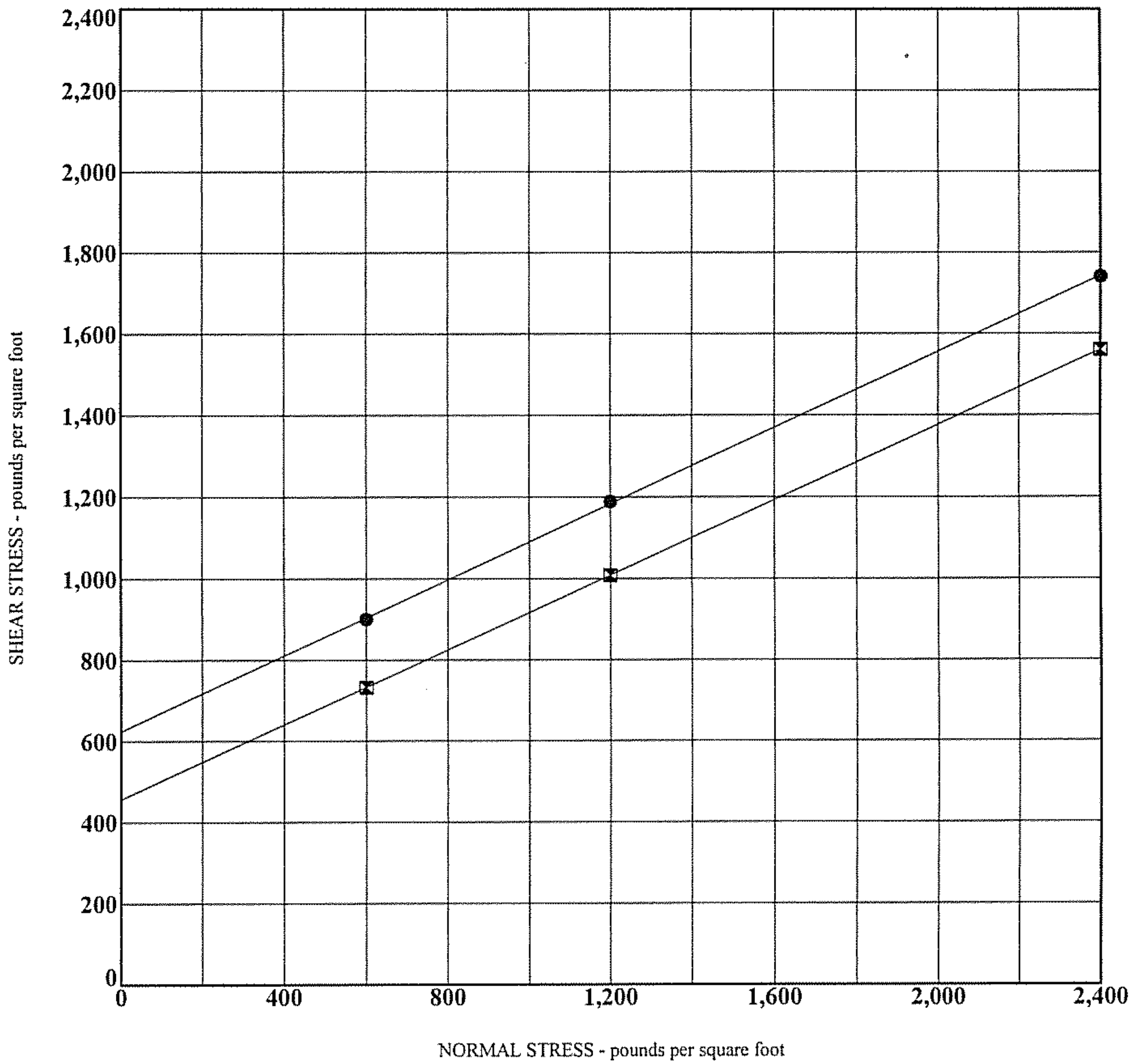
Boring/Depth (feet)	Sulfate[1] (%)	Chloride[2] (ppm)	pH[3]	Resistivity[3] (ohm-cm)	Corrosivity Potential
B-2 @ 10.0 - 12.0	0.004	120	7.1	1,600	concrete: negligible steel: moderately
B-3 @ 5.0	0.036	235	7.7	1,800	concrete: negligible steel: moderate
B-4 @ 5.0	0.065	200	6.9	3,100	concrete: negligible steel: moderate

(1) PER CALIFORNIA TEST METHOD NO. 417
(2) PER CALIFORNIA TEST METHOD NO. 422
(3) PER CALIFORNIA TEST METHOD NO. 643



SAMPLE LOCATION (feet)	DESCRIPTION	FRICTION ANGLE (°)	COHESION (PSF)
● B-1 @ 10.0	Clayey SANDSTONE - Peak	35	140
⧗ B-1 @ 10.0	Clayey SANDSTONE - Ultimate	29	130

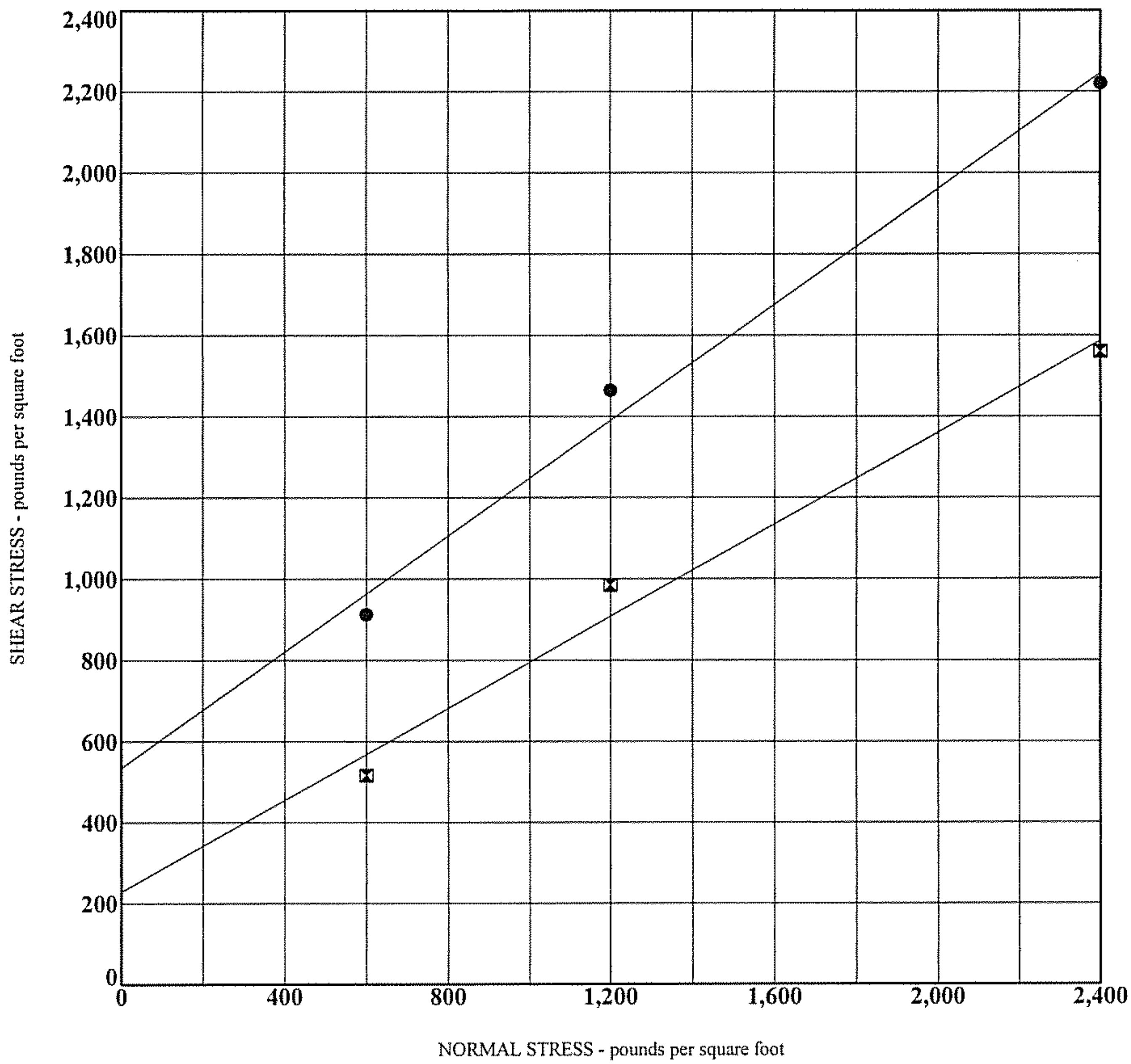
J.N. 159-06	DIRECT SHEAR TEST DATA	May, 2006
PETRA GEOTECHNICAL, INC.	UNDISTURBED TEST SAMPLES	PLATE B-2



SAMPLE LOCATION (feet)	DESCRIPTION	FRICTION ANGLE (°)	COHESION (PSF)
● B-3 @ 15.0	Clayey SANDSTONE - Peak	25	620
⊠ B-3 @ 15.0	Clayey SANDSTONE - Ultimate	25	455

DIRECT SHEAR 159-06.GPJ PETRA.GDT 5/2/06

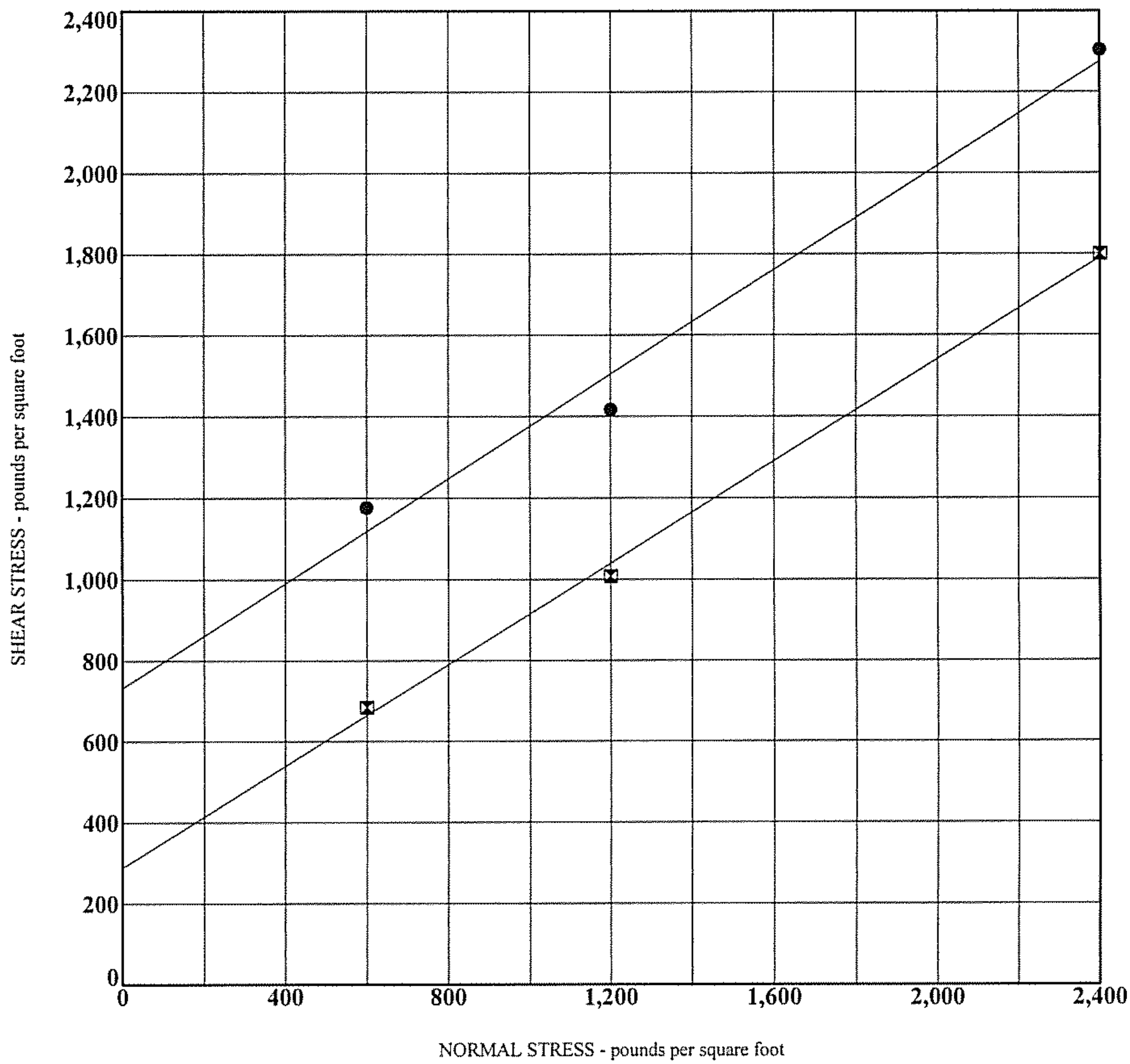
J.N. 159-06	**DIRECT SHEAR TEST DATA**	May, 2006
PETRA GEOTECHNICAL, INC.	**UNDISTURBED TEST SAMPLES**	PLATE B-3



SAMPLE LOCATION (feet)	DESCRIPTION	FRICTION ANGLE (°)	COHESION (PSF)
● B-4 @ 15.0	Silty SANDSTONE - Peak	35	530
⊠ B-4 @ 15.0	Silty SANDSTONE - Ultimate	29	225

J.N. 159-06	DIRECT SHEAR TEST DATA	May, 2006
PETRA GEOTECHNICAL, INC.	UNDISTURBED TEST SAMPLES	PLATE B-4

DIRECT SHEAR 159-06.GPJ PETRA.GDT 5/2/06

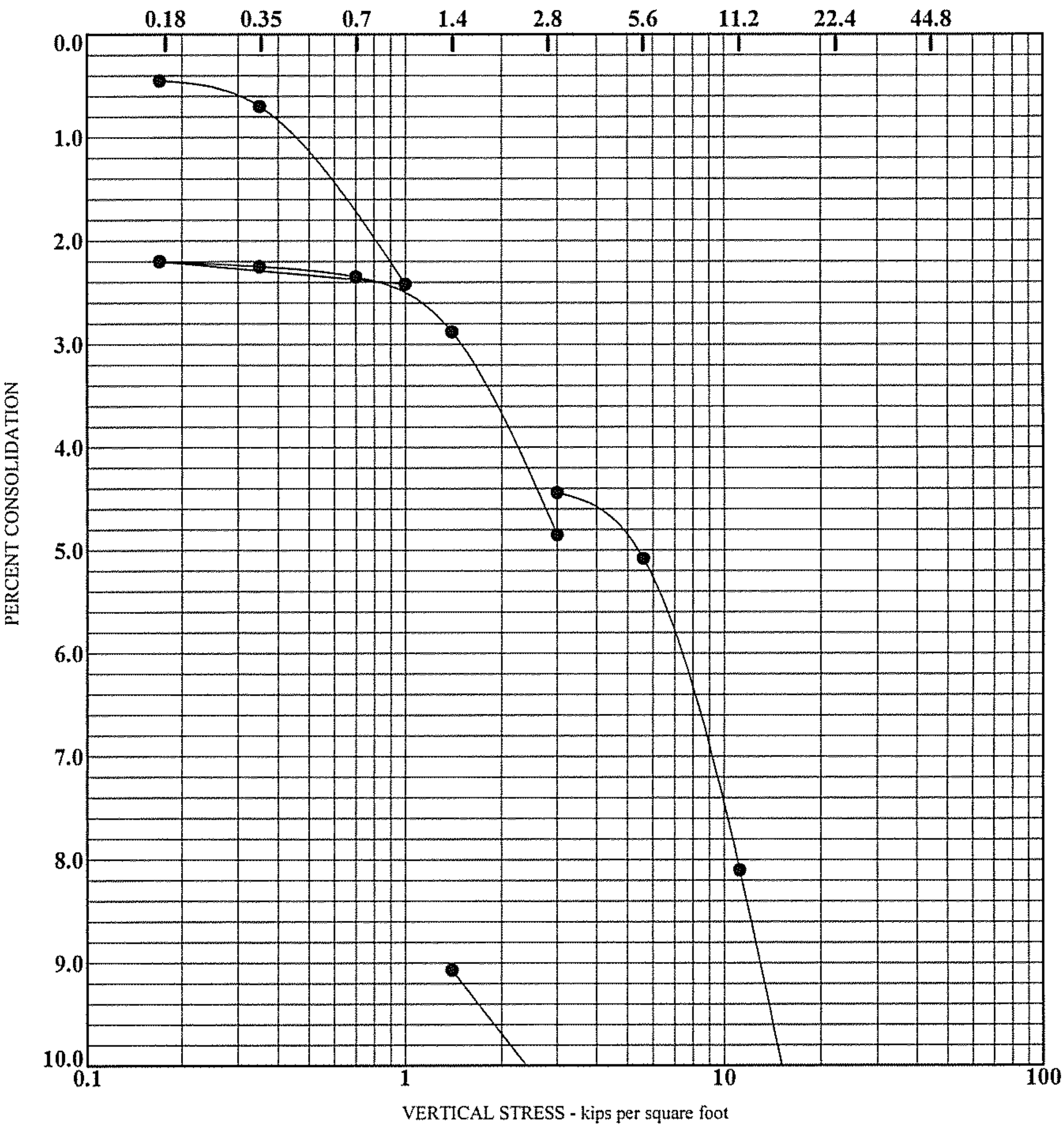


SAMPLE LOCATION (feet)	DESCRIPTION	FRICTION ANGLE (°)	COHESION (PSF)
● B-5 @ 10.0	Sandy CLAYSTONE - Peak	33	730
⊠ B-5 @ 10.0	Sandy CLAYSTONE - Ultimate	32	285

DIRECT SHEAR 159-06.GPJ PETRA.GDT 5/2/06

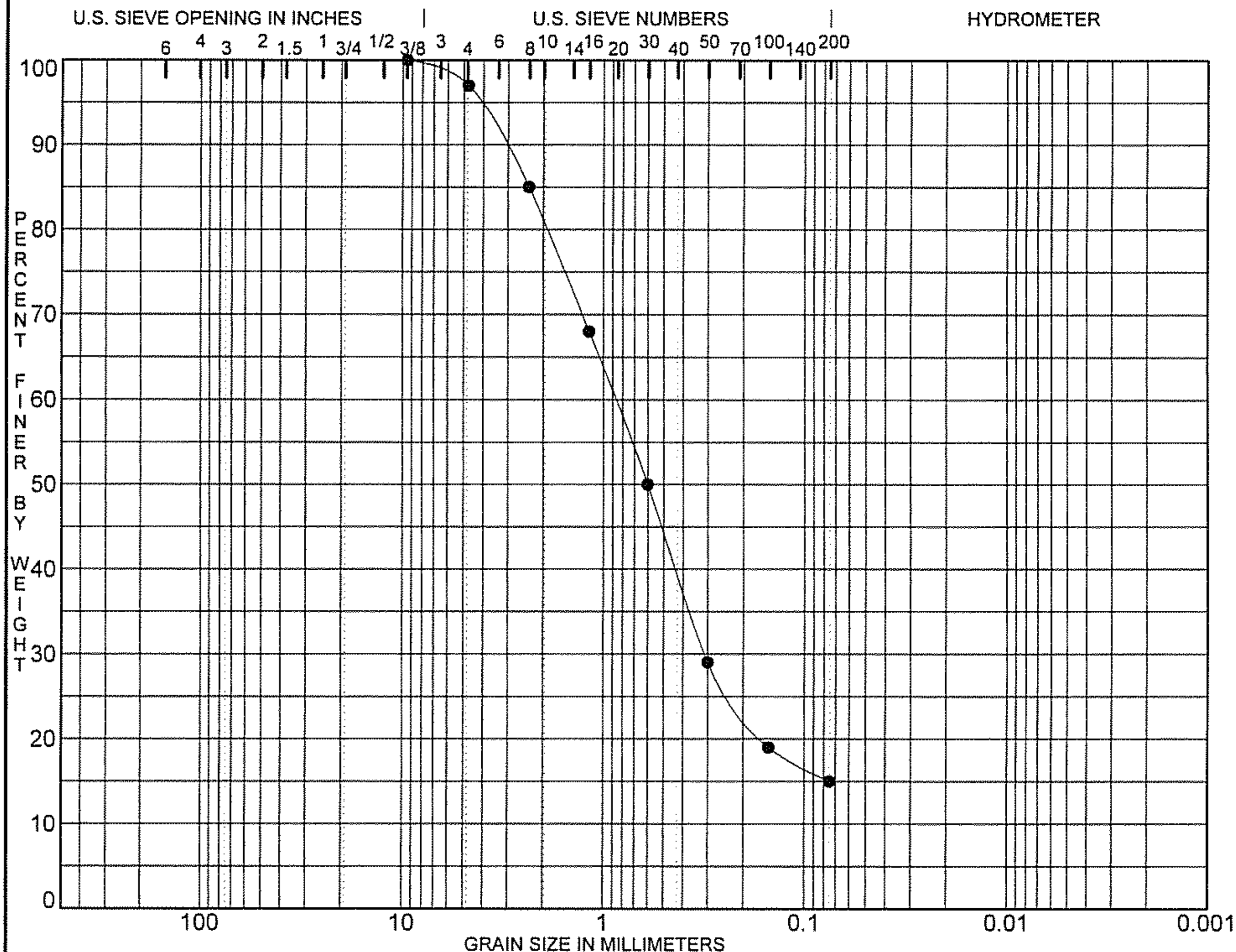
J.N. 159-06	DIRECT SHEAR TEST DATA	May, 2006
PETRA GEOTECHNICAL, INC.	UNDISTURBED TEST SAMPLES	PLATE B-5

SAMPLE LOCATION (feet)	MATERIAL DESCRIPTION	INITIAL			INUNDATED
		DENSITY (pcf)	MOISTURE (%)	SATURATION (%)	LOAD (ksf)
● B-3 @ 25.0	Silty SANDSTONE	89.2	34.6	105	3.00



CONSOLIDATION - STRAIN 159-06.GPJ PETRA.GDT 5/2/06

J.N. 159-06	CONSOLIDATION TEST RESULTS	May, 2006
PETRA GEOTECHNICAL, INC.		PLATE B-6



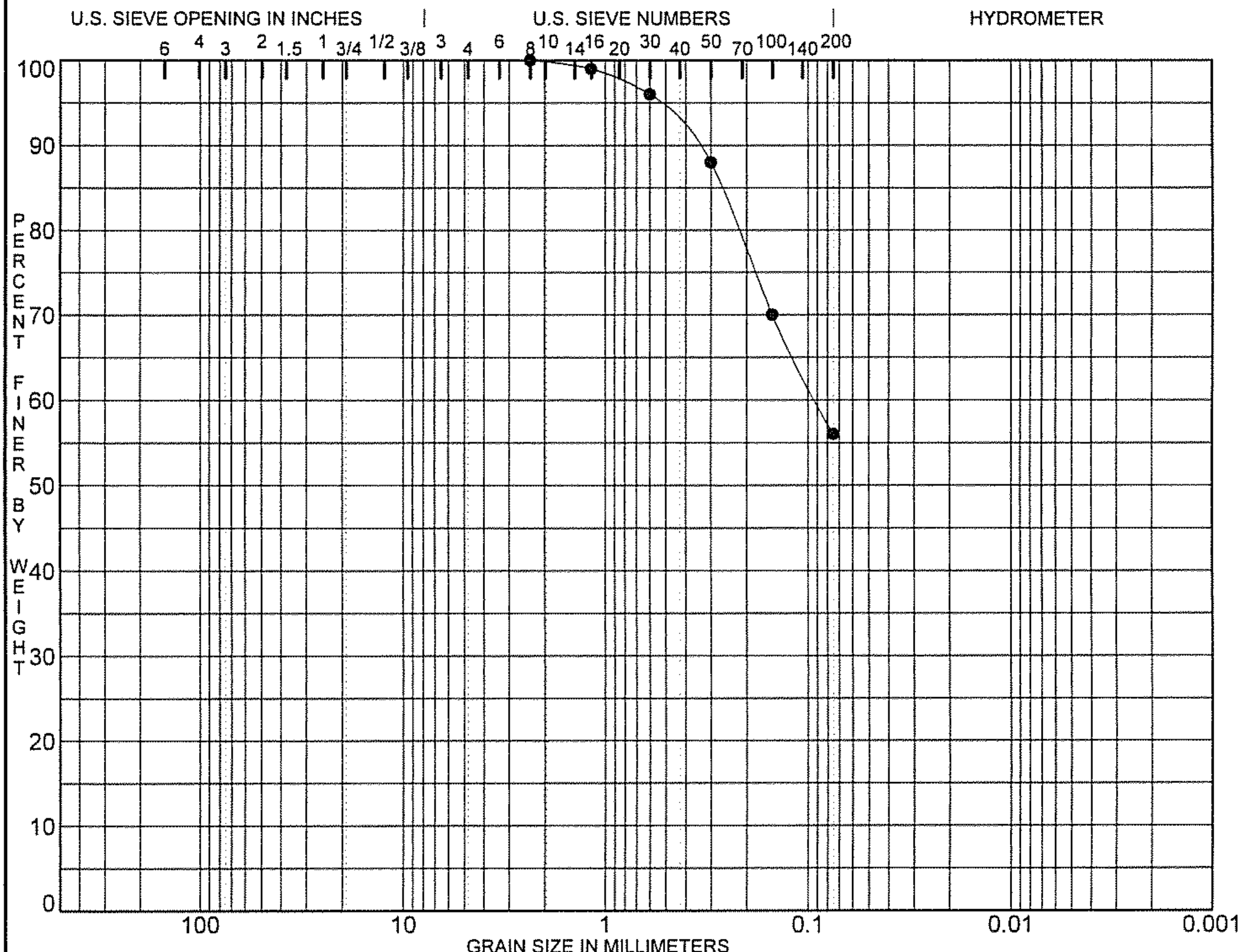
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification (ft)		Classification	MC%	LL	PL	PI	Cc	Cu
●	B-1 @ 5.0	Clayey SANDSTONE	10					

Specimen Identification (ft)		D100	D60	D30	D50	%Gravel	%Sand	%Silt	%Clay
●	B-1 @ 5.0	9.50	0.87	0.310	0.6000	3.0	82.0	15.0	

J.N. 159-06	GRAIN SIZE ANALYSIS	May, 2006
PETRA GEOTECHNICAL, INC.		PLATE B-7

GRAIN SIZE - V1 159-06.GPJ PETRA.GDT 5/2/06



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification (ft)		Classification	MC%	LL	PL	PI	Cc	Cu
●	B-5 @	10.0	Sandy CLAYSTONE	19					

	Specimen Identification (ft)		D100	D60	D30	D50	%Gravel	%Sand	%Silt	%Clay
●	B-5 @	10.0	2.36	0.09			0.0	44.0	56.0	

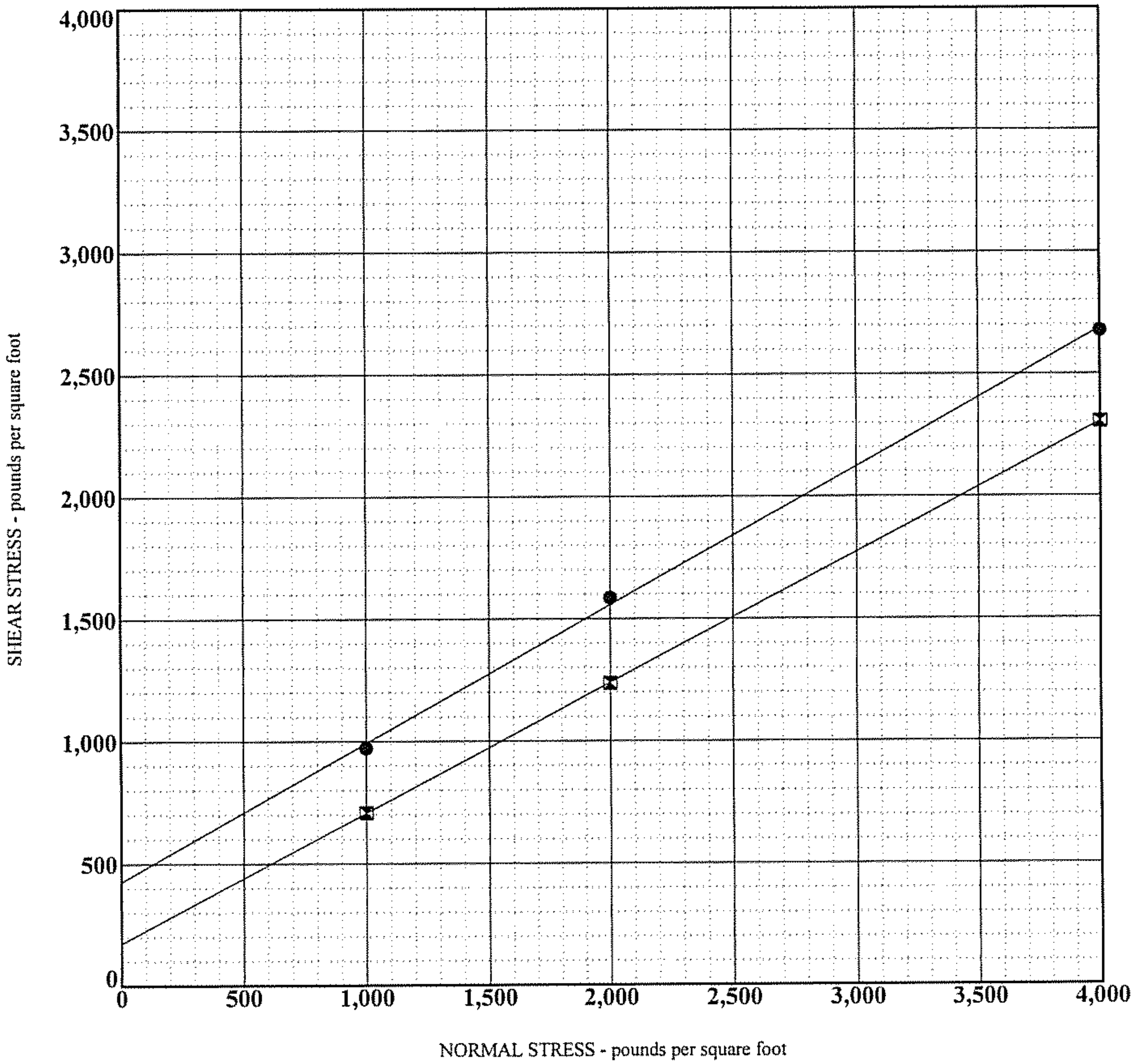
GRAIN SIZE - V1 159-06.GPJ PETRA.GDT 5/2/06

J.N. 159-06	GRAIN SIZE ANALYSIS	May, 2006
PETRA GEOTECHNICAL, INC.		PLATE B-8

CORROSION TESTS

Boring/ Depth (feet)	Sulfate[1] (%)	Chloride[2] (ppm)	pH[3]	Resistivity3 (ohm-cm)	Corrosivity Potential
B-6 @ 10.0	0.004	140	7.2	1,700	concrete: negligible steel: moderate

(1) PER CALIFORNIA TEST METHOD NO. 417
(2) PER CALIFORNIA TEST METHOD NO. 422
(3) PER CALIFORNIA TEST METHOD NO. 643



SAMPLE LOCATION (feet)	DESCRIPTION	FRICTION ANGLE (°)	COHESION (PSF)
● B-6 @ 20.0	Sandy SILTSTONE - Peak	29	425
⊠ B-6 @ 20.0	Sandy SILTSTONE - Ultimate	28	170

DIRECT SHEAR 158-06 PLANT.GPJ PETRA.GDT 9/6/06

J.N. 158-06	**DIRECT SHEAR TEST DATA**	September, 2006
PETRA GEOTECHNICAL, INC.	**UNDISTURBED TEST SAMPLES**	PLATE B-2

APPENDIX C

SITE-SPECIFIC SEISMIC ANALYSIS (ASCE 7-10) AND SITE CLASS CALCULATIONS

USGS Design Maps Summary Report

User–Specified Input

Report Title MSJC
Wed November 14, 2018 20:15:38 UTC

Building Code Reference Document ASCE 7-10 Standard
(which utilizes USGS hazard data available in 2008)

Site Coordinates 33.5173°N, 117.152°W

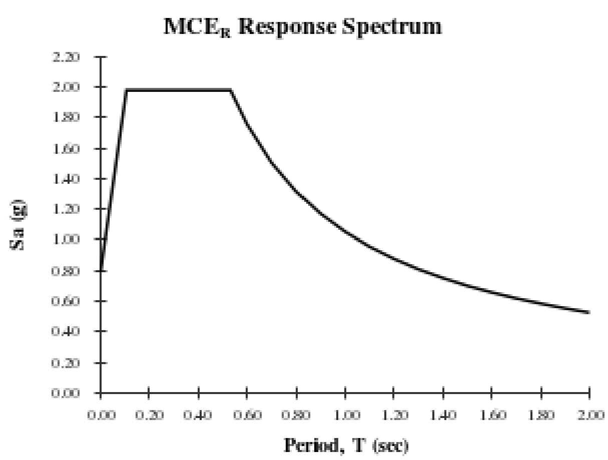
Site Soil Classification Site Class C – "Very Dense Soil and Soft Rock"

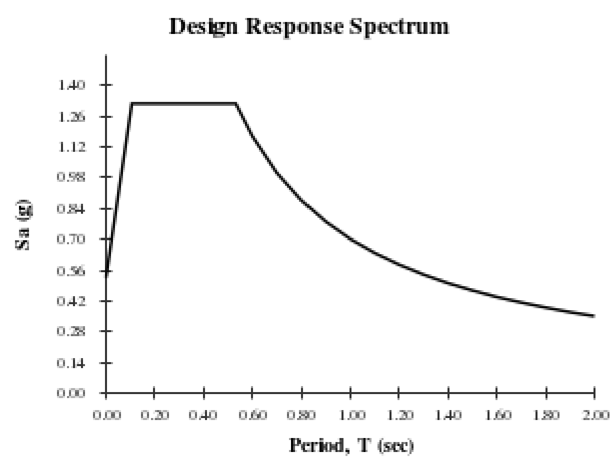
Risk Category IV (e.g. essential facilities)

USGS–Provided Output

S_S =	1.977 g	S_{MS} =	1.977 g	S_{DS} =	1.318 g
S_1 =	0.809 g	S_{M1} =	1.052 g	S_{D1} =	0.701 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.





For PGA_M, T_L, C_{RS}, and C_{R1} values, please view the detailed report.

USGS Design Maps Detailed Report

ASCE 7-10 Standard (33.5173°N, 117.152°W)

Site Class C – “Very Dense Soil and Soft Rock”, Risk Category IV (e.g. essential facilities)

Section 11.4.1 — Mapped Acceleration Parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_S) and 1.3 (to obtain S_1). Maps in the 2010 ASCE-7 Standard are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

From Figure 22-1 [1] $S_S = 1.977$ g

From Figure 22-2 [2] $S_1 = 0.809$ g

Section 11.4.2 — Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class C, based on the site soil properties in accordance with Chapter 20.

Table 20.3–1 Site Classification

Site Class	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index *PI* > 20, • Moisture content *w* ≥ 40%, and • Undrained shear strength $\bar{s}_u$ < 500 psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 11.4.3 — Site Coefficients and Risk–Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters

Table 11.4–1: Site Coefficient F_a

Site Class	Mapped MCE $_R$ Spectral Response Acceleration Parameter at Short Period				
	$S_S \le 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \ge 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_S

For Site Class = C and S_S = 1.977 g, F_a = 1.000

Table 11.4–2: Site Coefficient F_v

Site Class	Mapped MCE $_R$ Spectral Response Acceleration Parameter at 1–s Period				
	$S_1 \le 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \ge 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_1

For Site Class = C and S_1 = 0.809 g, F_v = 1.300

Equation (11.4–1): $S_{MS} = F_aS_S = 1.000 \times 1.977 = 1.977$ g

Equation (11.4–2): $S_{M1} = F_vS_1 = 1.300 \times 0.809 = 1.052$ g

Section 11.4.4 — Design Spectral Acceleration Parameters

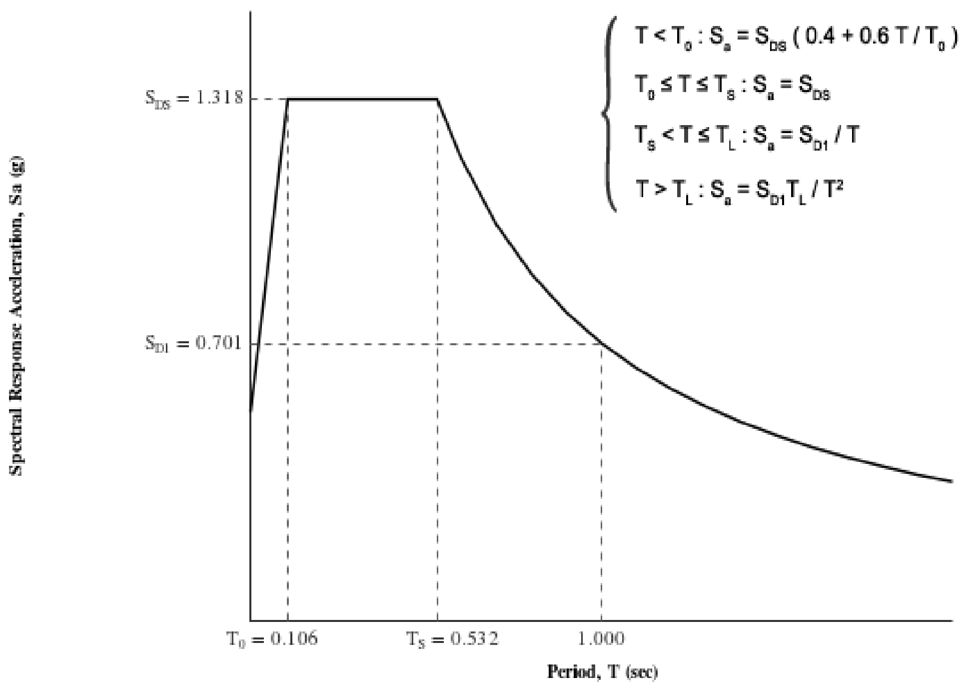
Equation (11.4–3): $S_{DS} = ⅔\ S_{MS} = ⅔ \times 1.977 = 1.318$ g

Equation (11.4–4): $S_{D1} = ⅔\ S_{M1} = ⅔ \times 1.052 = 0.701$ g

Section 11.4.5 — Design Response Spectrum

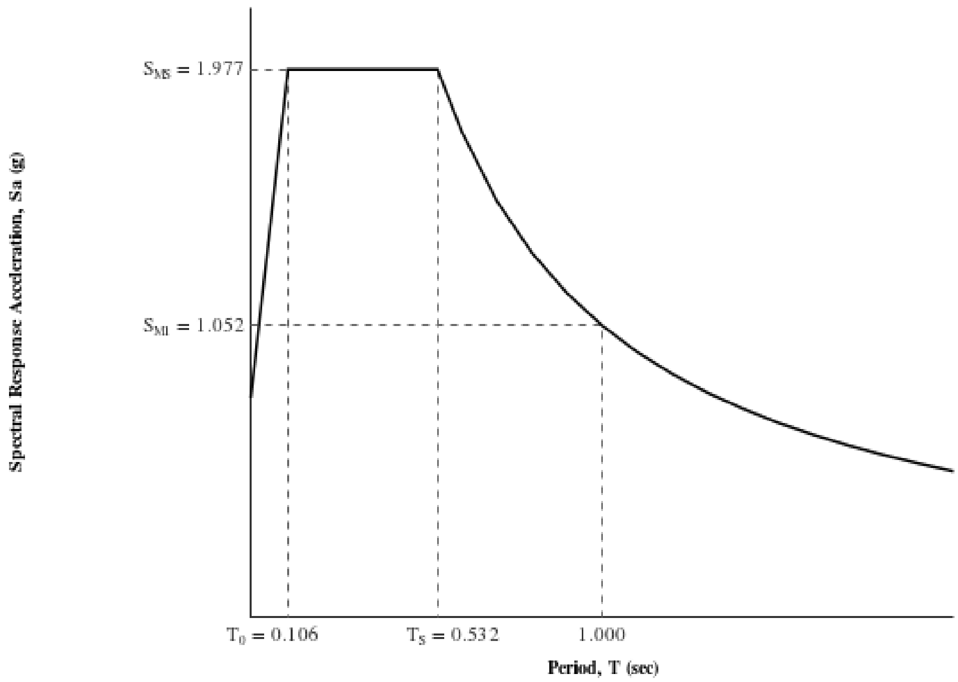
From Figure 22-12 [3] T_L = 8 seconds

Figure 11.4–1: Design Response Spectrum



Section 11.4.6 — Risk-Targeted Maximum Considered Earthquake (MCE_R) Response Spectrum

The MCE_R Response Spectrum is determined by multiplying the design response spectrum above by 1.5.



Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

From Figure 22-7 [4] PGA = 0.813

Equation (11.8–1): $PGA_M = F_{PGA}PGA = 1.000 \times 0.813 = 0.813$ g

Table 11.8–1: Site Coefficient F_{PGA}

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of PGA

For Site Class = C and PGA = 0.813 g, F_{PGA} = 1.000

Section 21.2.1.1 — Method 1 (from Chapter 21 – Site-Specific Ground Motion Procedures for Seismic Design)

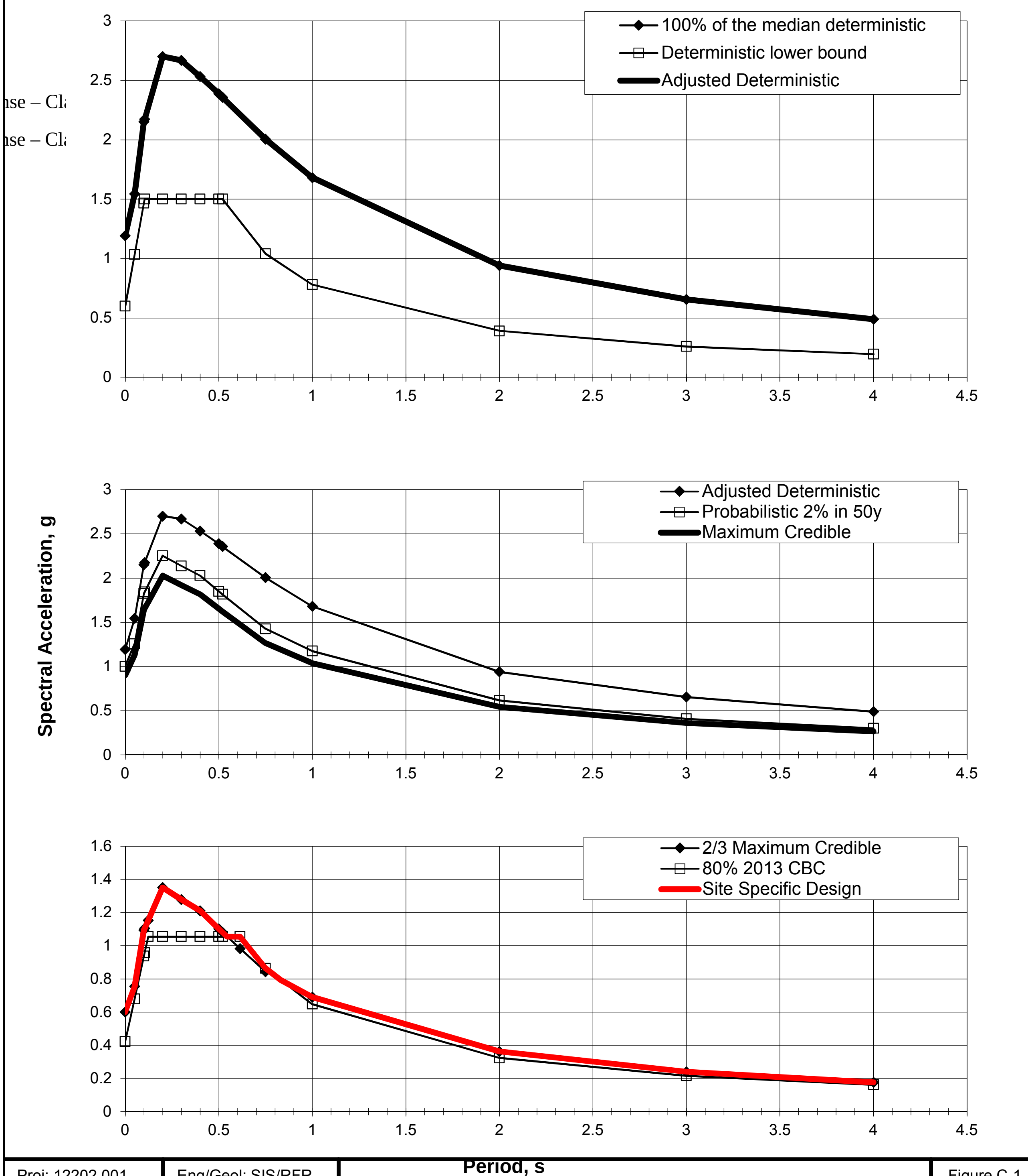
From Figure 22-17 [5] C_{RS} = 0.900

From Figure 22-18 [6] C_{R1} = 0.882

Site Specific Response Spectrum

Project Name: MSJCC Temecula Campus
Project No.: 12202.001

Parameter	Value
Spectral Response – Class C (short), S_S	2.028
Spectral Response – Class C (1 sec), S_1	0.835
Site Coefficient, F_a	1
Site Coefficient, F_v	1.3
Maximum Considered Earthquake Spectral Response Acceleration (short), S_{MS}	2.028
Maximum Considered Earthquake Spectral Response Acceleration – (1 sec), S_{M1}	1.086
5% Damped Design Spectral Response Acceleration (short), S_{DS}	1.352
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.724



Proj: 12202.001	Eng/Geol: SIS/RFR
Scale: NTS	Date: 11/2018
Reference:	

SITE-SPECIFIC RESPONSE SPECTRA

Mount San Jacinto Community College
Proposed Temecula Campus
Temecula, California

Figure C-1

Leighton

```
*********************************************
*****              EZ-FRISK             *****
***** SEISMIC HAZARD ANALYSIS DEFINITION *****
*****        FUGRO CONSULTANTS, INC.     *****
*****         WALNUT CREEK, CA  USA      *****
*********************************************
```

PROGRAM VERSION
  EZ-FRISK 8.00 beta Build 000

ANALYSIS TITLE:
  Seismic Hazard Analysis 1

ANALYSIS TYPE:
  Single Site Analysis

SITE COORDINATES
  Latitude 33.5173
  Longitude -117.152

INTENSITY TYPE: Maximum Rotated Component of Spectral Response @ 5% Damping

HAZARD DEAGGREGATION
  Status: OFF

SOIL AMPLIFICATION
  Method: Do not use soil amplification

ATTENUATION EQUATION SITE PARAMETERS
  Depth[Vs=1000m/s] (m): 40
  Estimate Z1 from Vs30 for CY NGA: 1
  Vs30 (m/s): 540
  Vs30 Is Measured: 1
  Z25 (km): 2

AMPLITUDES - Acceleration (g)
  0.0001
  0.001
  0.01
  0.02
  0.05
  0.07
  0.1
  0.2
  0.3

```
  0.4
  0.5
  0.7
  1
  2
  3

PERIODS (s)
  PGA
  0.05
  0.1
  0.2
  0.3
  0.4
  0.5
  0.75
  1
  2
  3
  4

DETERMINISTIC FRACTILES
  0.5
  0.84

PLOTTING PARAMETERS
  Period at which to plot PGA: 0.005

CALCULATIONAL PARAMETERS
  Fault Seismic Sources -
    Maximum inclusion distance           :   100 km
    Down dip integration increment       :   1 km
    Horizontal integration increment     :   1 km
    Number rupture length per earthquake :   1
  Subduction Interface Seismic Sources -
    Maximum inclusion distance           :   1000 km
    Down dip integration increment       :   5 km
    Horizontal integration increment     :   20 km
    Number rupture length per earthquake :   1
  Subduction Slab Seismic Sources -
    Maximum inclusion distance           :   1000 km
    Down dip integration increment       :   5 km
    Horizontal integration increment     :   20 km
    Number rupture length per earthquake :   1
  Area Seismic Sources -
```

```
    Maximum inclusion distance           :   200 km
    Vertical integration increment       :   3 km
    Number of rupture azimuths           :   3
    Minimum epicentral distance step     :   0.5 km
    Maximum epicentral distance step     :   10 km
  Gridded Seismic Sources -
    Maximum inclusion distance            :   200 km
    Default number of rupture azimuths    :   20
    Maximum distance for default azimuths :   40 km
    Minimum distance for one azimuth      :   150
    Use binned calcuations if possible    :   true
    Bins per decade in distance (km)      :   20
  All Seismic Sources -
    Magnitude integration step           :   0.1 M
    Apply magnitude scaling              :   NO
    Include near-source directivity      :   NO
```

ATTENUATION EQUATIONS

```
  Name: Boore-Atkinson (2008) NGA USGS 2008 MRC
  Database: C:\Program Files (x86)\EZ-FRISK 8.00\Files\standard.bin-attendb
  Base: FEMA P-750 Table C21.2-1
  Truncation Type: No Truncation
  Truncation Value: 0
  Magnitude Scale: Moment Magnitude
  Distance Type: Distance To Rupture

  Name: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
  Database: C:\Program Files (x86)\EZ-FRISK 8.00\Files\standard.bin-attendb
  Base: FEMA P-750 Table C21.2-1
  Truncation Type: No Truncation
  Truncation Value: 0
  Magnitude Scale: Moment Magnitude
  Distance Type: Distance To Rupture

  Name: Chiou-Youngs (2007) NGA USGS 2008 MRC
  Database: C:\Program Files (x86)\EZ-FRISK 8.00\Files\standard.bin-attendb
  Base: FEMA P-750 Table C21.2-1
  Truncation Type: No Truncation
  Truncation Value: 0
  Magnitude Scale: Moment Magnitude
  Distance Type: Distance To Rupture
```

SEISMIC SOURCE SUMMARY TABLE

Deterministic Spectra Results using EZ-FRISK 8.00 beta Build 000

Largest Amplitudes of Ground Motions Considering All Sources Calculated using Weighted Mean of Attenuation Equations

Amplitude Units: Acceleration (g)

Fractile: 0.5

Period	Amplitude	Magnitude	Closest Distance(km)	Region	Controlling Source
PGA	6.579e-001	7.85 Mw	0.63	USGS 2008 California	Elsinore
0.05	8.515e-001	7.85 Mw	0.63	USGS 2008 California	Elsinore
0.1	1.184e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore
0.2	1.491e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore
0.3	1.468e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore
0.4	1.408e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore
0.5	1.315e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore
0.75	1.078e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore
1	8.931e-001	7.85 Mw	0.63	USGS 2008 California	Elsinore
2	4.805e-001	7.85 Mw	0.63	USGS 2008 California	Elsinore
3	3.326e-001	7.85 Mw	0.63	USGS 2008 California	Elsinore
4	2.461e-001	7.85 Mw	0.63	USGS 2008 California	Elsinore

Fractile: 0.84

Period	Amplitude	Magnitude	Closest Distance(km)	Region	Controlling Source
PGA	1.192e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore
0.05	1.543e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore
0.1	2.152e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore

```
         0.2     2.701e+000   7.85 Mw      0.63   USGS 2008 California
Elsinore
         0.3     2.669e+000   7.85 Mw      0.63   USGS 2008 California
Elsinore
         0.4     2.532e+000   7.85 Mw      0.63   USGS 2008 California
Elsinore
         0.5     2.388e+000   7.85 Mw      0.63   USGS 2008 California
Elsinore
        0.75     2.005e+000   7.85 Mw      0.63   USGS 2008 California
Elsinore
           1     1.681e+000   7.85 Mw      0.63   USGS 2008 California
Elsinore
           2     9.397e-001   7.85 Mw      0.63   USGS 2008 California
Elsinore
           3     6.553e-001   7.85 Mw      0.63   USGS 2008 California
Elsinore
           4     4.889e-001   7.85 Mw      0.63   USGS 2008 California
Elsinore


Largest Amplitudes of Ground Motions Considering Sources Calculated with Boore-
Atkinson (2008) NGA USGS 2008 MRC
  Amplitude Units: Acceleration (g)

  Fractile: 0.5
       Period    Amplitude   Magnitude   Closest      Region
Controlling Source
                                       Distance(km)
         PGA     6.341e-001   7.85 Mw      0.63   USGS 2008 California
Elsinore
        0.05     8.089e-001   7.85 Mw      0.63   USGS 2008 California
Elsinore
         0.1     1.160e+000   7.85 Mw      0.63   USGS 2008 California
Elsinore
         0.2     1.441e+000   7.85 Mw      0.63   USGS 2008 California
Elsinore
         0.3     1.403e+000   7.85 Mw      0.63   USGS 2008 California
Elsinore
         0.4     1.319e+000   7.00 Mw      5.00   USGS 2008 California
California Gridded
         0.5     1.165e+000   7.00 Mw      5.00   USGS 2008 California
California Gridded
        0.75     9.334e-001   7.85 Mw      0.63   USGS 2008 California
Elsinore
           1     7.255e-001   7.85 Mw      0.63   USGS 2008 California
```

```
Elsinore
           2     4.346e-001   7.85 Mw      0.63   USGS 2008 California
Elsinore
           3     3.612e-001   7.85 Mw      0.63   USGS 2008 California
Elsinore
           4     2.753e-001   7.85 Mw      0.63   USGS 2008 California
Elsinore

  Fractile: 0.84
       Period    Amplitude   Magnitude   Closest      Region
Controlling Source
                                       Distance(km)
         PGA     1.149e+000   7.85 Mw      0.63   USGS 2008 California
Elsinore
        0.05     1.466e+000   7.85 Mw      0.63   USGS 2008 California
Elsinore
         0.1     2.124e+000   7.85 Mw      0.63   USGS 2008 California
Elsinore
         0.2     2.611e+000   7.85 Mw      0.63   USGS 2008 California
Elsinore
         0.3     2.568e+000   7.85 Mw      0.63   USGS 2008 California
Elsinore
         0.4     2.402e+000   7.00 Mw      5.00   USGS 2008 California
California Gridded
         0.5     2.147e+000   7.00 Mw      5.00   USGS 2008 California
California Gridded
        0.75     1.773e+000   7.85 Mw      0.63   USGS 2008 California
Elsinore
           1     1.381e+000   7.85 Mw      0.63   USGS 2008 California
Elsinore
           2     8.717e-001   7.85 Mw      0.63   USGS 2008 California
Elsinore
           3     7.210e-001   7.85 Mw      0.63   USGS 2008 California
Elsinore
           4     5.511e-001   7.85 Mw      0.63   USGS 2008 California
Elsinore


Largest Amplitudes of Ground Motions Considering Sources Calculated with
Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
  Amplitude Units: Acceleration (g)

  Fractile: 0.5
       Period    Amplitude   Magnitude   Closest      Region
Controlling Source
```

```
                                          Distance(km)
         PGA     6.041e-001   7.85 Mw       0.63   USGS 2008 California
Elsinore
        0.05     7.801e-001   7.85 Mw       0.63   USGS 2008 California
Elsinore
         0.1     9.737e-001   7.85 Mw       0.63   USGS 2008 California
Elsinore
         0.2     1.253e+000   7.85 Mw       0.63   USGS 2008 California
Elsinore
         0.3     1.276e+000   7.85 Mw       0.63   USGS 2008 California
Elsinore
         0.4     1.294e+000   7.85 Mw       0.63   USGS 2008 California
Elsinore
         0.5     1.322e+000   7.85 Mw       0.63   USGS 2008 California
Elsinore
        0.75     1.148e+000   7.85 Mw       0.63   USGS 2008 California
Elsinore
           1     1.014e+000   7.85 Mw       0.63   USGS 2008 California
Elsinore
           2     5.775e-001   7.85 Mw       0.63   USGS 2008 California
Elsinore
           3     3.733e-001   7.85 Mw       0.63   USGS 2008 California
Elsinore
           4     2.794e-001   7.85 Mw       0.63   USGS 2008 California
Elsinore

  Fractile: 0.84
       Period    Amplitude   Magnitude   Closest      Region
Controlling Source
                                          Distance(km)
         PGA     1.095e+000   7.85 Mw       0.63   USGS 2008 California
Elsinore
        0.05     1.414e+000   7.85 Mw       0.63   USGS 2008 California
Elsinore
         0.1     1.764e+000   7.85 Mw       0.63   USGS 2008 California
Elsinore
         0.2     2.271e+000   7.85 Mw       0.63   USGS 2008 California
Elsinore
         0.3     2.312e+000   7.85 Mw       0.63   USGS 2008 California
Elsinore
         0.4     2.310e+000   7.85 Mw       0.63   USGS 2008 California
Elsinore
         0.5     2.377e+000   7.85 Mw       0.63   USGS 2008 California
Elsinore
        0.75     2.110e+000   7.85 Mw       0.63   USGS 2008 California
```

```
Elsinore
            1     1.884e+000   7.85 Mw      0.63   USGS 2008 California
Elsinore
            2     1.107e+000   7.85 Mw      0.63   USGS 2008 California
Elsinore
            3     7.163e-001   7.85 Mw      0.63   USGS 2008 California
Elsinore
            4     5.369e-001   7.85 Mw      0.63   USGS 2008 California
Elsinore
```

Largest Amplitudes of Ground Motions Considering Sources Calculated with Chiou-Youngs (2007) NGA USGS 2008 MRC

Amplitude Units: Acceleration (g)

Fractile: 0.5

Period	Amplitude	Magnitude	Closest Distance(km)	Region	Controlling Source
PGA	7.355e-001	7.85 Mw	0.63	USGS 2008 California	Elsinore
0.05	9.654e-001	7.85 Mw	0.63	USGS 2008 California	Elsinore
0.1	1.417e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore
0.2	1.777e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore
0.3	1.726e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore
0.4	1.620e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore
0.5	1.483e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore
0.75	1.151e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore
1	9.395e-001	7.85 Mw	0.63	USGS 2008 California	Elsinore
2	4.295e-001	7.85 Mw	0.63	USGS 2008 California	Elsinore
3	2.632e-001	7.85 Mw	0.63	USGS 2008 California	Elsinore
4	1.836e-001	7.85 Mw	0.63	USGS 2008 California	Elsinore

Fractile: 0.84

Period	Amplitude	Magnitude	Closest Distance(km)	Region	Controlling Source
PGA	1.333e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore
0.05	1.749e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore
0.1	2.567e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore
0.2	3.221e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore
0.3	3.127e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore
0.4	2.901e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore
0.5	2.686e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore
0.75	2.134e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore
1	1.777e+000	7.85 Mw	0.63	USGS 2008 California	Elsinore
2	8.408e-001	7.85 Mw	0.63	USGS 2008 California	Elsinore
3	5.286e-001	7.85 Mw	0.63	USGS 2008 California	Elsinore
4	3.787e-001	7.85 Mw	0.63	USGS 2008 California	Elsinore

Largest Amplitudes of Ground Motions for Each Source

Source: Brawley Gridded, Strike Slip
Region: USGS 2008 California
Closest Distance: 103.74 km
Amplitude Units: Acceleration (g)
Magnitude: 6.50 Mw
Fractile: 0.50
Column 1: Spectral Period
Column 2: Acceleration (g) for: Weighted Mean of Attenuation Equations
Column 3: Acceleration (g) for: Boore-Atkinson (2008) NGA USGS 2008 MRC
Column 4: Acceleration (g) for: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Column 5: Acceleration (g) for: Chiou-Youngs (2007) NGA USGS 2008 MRC

1	2	3	4	5

PGA	2.895e-002	3.103e-002	3.165e-002	2.417e-002
0.05	3.366e-002	3.518e-002	3.758e-002	2.821e-002
0.1	4.686e-002	4.898e-002	5.219e-002	3.940e-002
0.2	6.588e-002	7.452e-002	7.056e-002	5.256e-002
0.3	6.443e-002	7.319e-002	6.875e-002	5.135e-002
0.4	5.966e-002	6.782e-002	6.309e-002	4.807e-002
0.5	5.370e-002	6.087e-002	5.650e-002	4.373e-002
0.75	3.939e-002	4.537e-002	3.960e-002	3.318e-002
1	3.099e-002	3.684e-002	2.967e-002	2.648e-002
2	1.355e-002	1.744e-002	1.210e-002	1.110e-002
3	7.958e-003	1.028e-002	7.483e-003	6.115e-003
4	5.563e-003	7.231e-003	5.557e-003	3.901e-003

Fractile: 0.84
Column 1: Spectral Period
Column 2: Acceleration (g) for: Weighted Mean of Attenuation Equations
Column 3: Acceleration (g) for: Boore-Atkinson (2008) NGA USGS 2008 MRC
Column 4: Acceleration (g) for: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Column 5: Acceleration (g) for: Chiou-Youngs (2007) NGA USGS 2008 MRC

1	2	3	4	5
PGA	5.246e-002	5.623e-002	5.735e-002	4.379e-002
0.05	6.100e-002	6.375e-002	6.810e-002	5.116e-002
0.1	8.563e-002	8.967e-002	9.458e-002	7.265e-002
0.2	1.202e-001	1.350e-001	1.279e-001	9.759e-002
0.3	1.180e-001	1.340e-001	1.246e-001	9.557e-002
0.4	1.086e-001	1.235e-001	1.126e-001	8.965e-002
0.5	9.859e-002	1.122e-001	1.016e-001	8.195e-002
0.75	7.396e-002	8.617e-002	7.276e-002	6.295e-002
1	5.872e-002	7.009e-002	5.511e-002	5.095e-002
2	2.671e-002	3.498e-002	2.319e-002	2.196e-002
3	1.575e-002	2.051e-002	1.436e-002	1.238e-002
4	1.108e-002	1.448e-002	1.068e-002	8.090e-003

Source: Brawley Gridded,Normal
Region: USGS 2008 California
Closest Distance: 103.74 km
Amplitude Units: Acceleration (g)
Magnitude: 6.50 Mw
Fractile: 0.50
Column 1: Spectral Period
Column 2: Acceleration (g) for: Weighted Mean of Attenuation Equations
Column 3: Acceleration (g) for: Boore-Atkinson (2008) NGA USGS 2008 MRC

Column 4: Acceleration (g) for: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Column 5: Acceleration (g) for: Chiou-Youngs (2007) NGA USGS 2008 MRC

1	2	3	4	5
PGA	2.366e-002	2.414e-002	2.810e-002	1.875e-002
0.05	2.771e-002	2.783e-002	3.340e-002	2.189e-002
0.1	3.938e-002	4.009e-002	4.739e-002	3.067e-002
0.2	5.769e-002	6.200e-002	6.981e-002	4.124e-002
0.3	5.668e-002	6.043e-002	6.877e-002	4.082e-002
0.4	5.263e-002	5.597e-002	6.309e-002	3.884e-002
0.5	4.761e-002	5.038e-002	5.650e-002	3.594e-002
0.75	3.385e-002	3.372e-002	3.960e-002	2.823e-002
1	2.622e-002	2.595e-002	2.967e-002	2.303e-002
2	1.116e-002	1.144e-002	1.210e-002	9.945e-003
3	6.453e-003	6.366e-003	7.483e-003	5.511e-003
4	4.605e-003	4.736e-003	5.557e-003	3.523e-003

Fractile: 0.84
Column 1: Spectral Period
Column 2: Acceleration (g) for: Weighted Mean of Attenuation Equations
Column 3: Acceleration (g) for: Boore-Atkinson (2008) NGA USGS 2008 MRC
Column 4: Acceleration (g) for: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Column 5: Acceleration (g) for: Chiou-Youngs (2007) NGA USGS 2008 MRC

1	2	3	4	5
PGA	4.288e-002	4.374e-002	5.093e-002	3.398e-002
0.05	5.023e-002	5.043e-002	6.053e-002	3.973e-002
0.1	7.197e-002	7.338e-002	8.593e-002	5.660e-002
0.2	1.052e-001	1.124e-001	1.265e-001	7.663e-002
0.3	1.038e-001	1.106e-001	1.246e-001	7.602e-002
0.4	9.569e-002	1.019e-001	1.126e-001	7.248e-002
0.5	8.729e-002	9.287e-002	1.016e-001	6.738e-002
0.75	6.346e-002	6.404e-002	7.276e-002	5.358e-002
1	4.960e-002	4.938e-002	5.511e-002	4.431e-002
2	2.193e-002	2.294e-002	2.319e-002	1.968e-002
3	1.274e-002	1.271e-002	1.436e-002	1.116e-002
4	9.154e-003	9.481e-003	1.068e-002	7.306e-003

Source: Imp Extensional Gridded, Char, Normal
Region: USGS 2008 California
Closest Distance: 5.00 km
Amplitude Units: Acceleration (g)
Magnitude: 7.00 Mw

Probabilistic Spectra results for EZ-FRISK 8.00 beta Build 000

ANNUAL FREQUENCY OF EXCEEDANCE: 2.107e-003
RETURN PERIOD: 474.6
PROBABILITY OF EXCEEDENCE: 10.0% IN 50.0 YEARS
Column 1: Spectral Period
Column 2: Acceleration (g) for: Mean
Column 3: Acceleration (g) for: Boore-Atkinson (2008) NGA USGS 2008 MRC
Column 4: Acceleration (g) for: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Column 5: Acceleration (g) for: Chiou-Youngs (2007) NGA USGS 2008 MRC

1	2	3	4	5
PGA	4.552e-001	4.479e-001	4.369e-001	4.840e-001
0.05	5.832e-001	5.464e-001	5.692e-001	6.378e-001
0.1	8.467e-001	7.824e-001	8.265e-001	9.371e-001
0.2	1.014e+000	9.391e-001	9.999e-001	1.108e+000
0.3	9.093e-001	8.557e-001	8.742e-001	1.006e+000
0.4	8.253e-001	7.982e-001	7.888e-001	8.956e-001
0.5	7.428e-001	7.142e-001	7.294e-001	7.907e-001
0.75	5.704e-001	5.692e-001	5.587e-001	5.848e-001
1	4.621e-001	4.609e-001	4.588e-001	4.673e-001
2	2.368e-001	2.544e-001	2.397e-001	2.089e-001
3	1.563e-001	1.746e-001	1.591e-001	1.287e-001
4	1.151e-001	1.277e-001	1.223e-001	8.990e-002

ANNUAL FREQUENCY OF EXCEEDANCE: 1.026e-003
RETURN PERIOD: 974.8
PROBABILITY OF EXCEEDENCE: 5.0% IN 50.0 YEARS
Column 1: Spectral Period
Column 2: Acceleration (g) for: Mean
Column 3: Acceleration (g) for: Boore-Atkinson (2008) NGA USGS 2008 MRC
Column 4: Acceleration (g) for: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Column 5: Acceleration (g) for: Chiou-Youngs (2007) NGA USGS 2008 MRC

1	2	3	4	5
PGA	6.588e-001	6.390e-001	6.161e-001	7.242e-001
0.05	8.494e-001	7.924e-001	8.047e-001	9.580e-001
0.1	1.199e+000	1.127e+000	1.113e+000	1.368e+000
0.2	1.458e+000	1.372e+000	1.345e+000	1.676e+000
0.3	1.338e+000	1.260e+000	1.228e+000	1.546e+000
0.4	1.240e+000	1.192e+000	1.152e+000	1.390e+000
0.5	1.135e+000	1.070e+000	1.100e+000	1.247e+000
0.75	8.956e-001	8.509e-001	8.750e-001	9.721e-001
1	7.258e-001	6.828e-001	7.249e-001	7.784e-001

2	3.693e-001	3.780e-001	3.777e-001	3.486e-001
3	2.427e-001	2.625e-001	2.477e-001	2.124e-001
4	1.789e-001	1.926e-001	1.903e-001	1.475e-001

ANNUAL FREQUENCY OF EXCEEDANCE: 4.041e-004
RETURN PERIOD: 2474.9
PROBABILITY OF EXCEEDENCE: 2.0% IN 50.0 YEARS
Column 1: Spectral Period
Column 2: Acceleration (g) for: Mean
Column 3: Acceleration (g) for: Boore-Atkinson (2008) NGA USGS 2008 MRC
Column 4: Acceleration (g) for: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Column 5: Acceleration (g) for: Chiou-Youngs (2007) NGA USGS 2008 MRC

1	2	3	4	5
PGA	1.002e+000	9.671e-001	9.082e-001	1.097e+000
0.05	1.258e+000	1.186e+000	1.164e+000	1.420e+000
0.1	1.825e+000	1.735e+000	1.556e+000	2.148e+000
0.2	2.253e+000	2.171e+000	1.975e+000	2.625e+000
0.3	2.138e+000	2.041e+000	1.864e+000	2.482e+000
0.4	2.029e+000	1.946e+000	1.790e+000	2.277e+000
0.5	1.850e+000	1.686e+000	1.738e+000	2.096e+000
0.75	1.426e+000	1.323e+000	1.388e+000	1.573e+000
1	1.175e+000	1.070e+000	1.176e+000	1.283e+000
2	6.156e-001	6.052e-001	6.374e-001	6.048e-001
3	4.080e-001	4.280e-001	4.169e-001	3.740e-001
4	3.007e-001	3.150e-001	3.162e-001	2.620e-001

ANNUAL FREQUENCY OF EXCEEDANCE: 1.054e-003
RETURN PERIOD: 949.1
PROBABILITY OF EXCEEDENCE: 10.0% IN 100.0 YEARS
Column 1: Spectral Period
Column 2: Acceleration (g) for: Mean
Column 3: Acceleration (g) for: Boore-Atkinson (2008) NGA USGS 2008 MRC
Column 4: Acceleration (g) for: Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
Column 5: Acceleration (g) for: Chiou-Youngs (2007) NGA USGS 2008 MRC

1	2	3	4	5
PGA	6.499e-001	6.306e-001	6.085e-001	7.149e-001
0.05	8.380e-001	7.819e-001	7.950e-001	9.439e-001
0.1	1.184e+000	1.113e+000	1.103e+000	1.350e+000
0.2	1.439e+000	1.353e+000	1.330e+000	1.651e+000
0.3	1.319e+000	1.242e+000	1.213e+000	1.522e+000
0.4	1.223e+000	1.176e+000	1.138e+000	1.368e+000

0.5	1.120e+000	1.056e+000	1.086e+000	1.228e+000
0.75	8.806e-001	8.383e-001	8.606e-001	9.539e-001
1	7.145e-001	6.729e-001	7.135e-001	7.649e-001
2	3.633e-001	3.725e-001	3.713e-001	3.422e-001
3	2.389e-001	2.586e-001	2.437e-001	2.087e-001
4	1.760e-001	1.897e-001	1.872e-001	1.448e-001

B-5 (BLDG F) - NCEER (2001)

Borehole No	B-5 (BLDG F)		A_{max}	0.80	g	Energy Ratic	80	%		
Ground Elevation (NAVD 88)	1084.00	ft	M_w	6.80		Settlement F	1.0			
Water Depth (Exploration)	100.00	ft	MSF	1.28	Triggering	Finished Gra	1084.00	ft		
Water Depth (Design)	100.00	ft	MSF_{Vol}	#REF!	Settlement		User Input			

Borehole diameter (mm)	Correction C_B
115	1
150	1.05
200	1.15

Top of Gaspur Formation (No liquefaction below this depth)
-70.0

Elevation	SPT Depth	CPT Corrected Depth	Thickness	Design Depth	Design Depth	Soil Parameters			Soil Stress			Demand		Bore Hole			Blow Counts (N)		Blow Count Correction Factors				
						γ	Soil Type	FC	σ_{v0}	u	σ_{v0}'	$\sigma_{v0}'_{design}$	r_d	Diameter	Diameter	Sampler	Uncorrected	Sampler Corrected	C_E	C_B	C_R	C_S	N_{60}
ft	ft	ft	ft	ft	m	pcf		%	psf	psf	psf	psf		in	mm								
1079	5	5	5.0	5	1.5	144	SM		720	0	720	720	0.99	4.0	102	MC	45	22	1.33	1.15	0.75	1.0	25
1074	10	10	5.0	10	3.0	129	SC		1,365	0	1,365	1,365	0.98	4.0	102	MC	67	33	1.33	1.15	0.80	1.0	40
1069	15	15	5.0	15	4.6	123	SM		1,980	0	1,980	1,980	0.97	4.0	102	MC	56	27	1.33	1.15	0.85	1.0	36
1064	20	20	5.0	20	6.1	130	SM		2,630	0	2,630	2,630	0.96	4.0	102	MC	32	16	1.33	1.15	0.95	1.0	23
1059	25	25	5.0	25	7.6	130	SM		3,280	0	3,280	3,280	0.94	4.0	102	MC	45	22	1.33	1.15	0.95	1.0	32
1054	30	30	7.5	30	9.1	120	ML		3,880	0	3,880	3,880	0.92	4.0	102	SPT	15	15	1.33	1.15	0.95	1.2	26
1044	40	40	10.0	40	12.2	123	SM		5,110	0	5,110	5,110	0.85	4.0	102	MC	38	19	1.33	1.15	1.00	1.0	29
1034	50	50	10.0	50	15.2	130	SM		6,410	0	6,410	6,410	0.75	4.0	102	MC	50	25	1.33	1.15	1.00	1.0	38
1024	60	60	5.0	60	18.3	130	SM		7,710	0	7,710	7,710	0.66	4.0	102	SPT	41	41	1.33	1.15	1.00	1.2	75

All Soils			Sands						Clays			Silt	All Soils			Sands							Clays				Silt	
Imai and Tonouchi (1982)	Ohta and Goto (1978) QA	Ohsaki and Iwasaki (1973)	Lee (1992)	Seed et al. (1983)	Sykora and Stokoe	Pitilakis et al. (1999)	Ohta and Goto (1978) Med. Q	Ohta and Goto (1978) Fine Q	Pitilakis et al. (1999)	Lee (1992)	Ohta and Goto (1978) QA	Lee (1992)	Imai and Tonouchi (1982)	Ohta and Goto (1978)	Ohsaki and Iwasaki	Lee (1992)	Seed et al. (1983)	Sykora and Stokoe	Pitilakis et al. (1999)	Ohta and Goto (1978)	Ohta and Goto (1978) Fine Q	Average	Pitilakis et al. (1999)	Lee (1992)	Ohta and Goto (1978)	Average	Lee (1992)	Profile Layer Thickness/Vs
255.28	254.55	275.23	260.08	284.01	256.91	259.48	235.05	260.56					0.0196	0.0196	0.0182	0.0192	0.0176	0.0195	0.0193	0.0213	0.0192	0.0194						0.01937
294.64	299.29	329.64	298.80	357.91	293.80	282.01	275.08	304.94					0.0170	0.0167	0.0152	0.0167	0.0140	0.0170	0.0177	0.0182	0.0164	0.0167						0.01673
283.99	287.11	314.73	288.34	337.29	283.85	276.05	264.20	292.88					0.0176	0.0174	0.0159	0.0173	0.0148	0.0176	0.0181	0.0189	0.0171	0.0174						0.01736
247.14	245.41	264.23							298.13	282.50	238.72		0.0202	0.0204	0.0189								0.0168	0.0177	0.0209	0.0185		0.01847
274.69	276.51	301.81							326.87	305.52	268.06		0.0182	0.0181	0.0166								0.0153	0.0164	0.0187	0.0168		0.01677
257.94	257.55	278.84	262.70	288.80	259.42	261.05	237.74	263.55					0.0291	0.0291	0.0269	0.0285	0.0260	0.0289	0.0287	0.0315	0.0285	0.0287						0.02874
264.84	265.34	288.26	269.50	301.36	265.91	265.08	244.72	271.29					0.0378	0.0377	0.0347	0.0371	0.0332	0.0376	0.0377	0.0409	0.0369	0.0373						0.03730
288.36	292.09	320.82	292.63	345.68	287.93	278.50	268.65	297.82					0.0347	0.0342	0.0312	0.0342	0.0289	0.0347	0.0359	0.0372	0.0336	0.0342						0.03419
357.93	372.82	421.07	360.71	489.87	352.45	315.74	340.52	377.49					0.0140	0.0134	0.0119	0.0139	0.0102	0.0142	0.0158	0.0147	0.0132	0.0138						0.01375
																												0.202684
																												493.38

B-3 (BLDG G) - NCEER (2001)

Borehole No	B-3 (BLDG G)	
Ground Elevation (NAVD 88)	1086.00	ft
Water Depth (Exploration)	100.00	ft
Water Depth (Design)	100.00	ft

A_{max}	0.80	g
M_w	6.80	
MSF	1.28	Triggering
MSF_{Vol}	#REF!	Settlement

Energy Ratio	80	%
Settlement F	1.0	
Finished Gra	1086.00	ft
	User Input	

Borehole diameter (mm)	Correction C_B
115	1
150	1.05
200	1.15

Top of Gaspur Formation (No liquefaction below this depth)
-70.0

Elevation	SPT Depth	CPT Corrected Depth	Thickness	Design Depth	Design Depth	Soil Parameters			Soil Stress			Demand		Bore Hole			Blow Counts (N)		Blow Count Correction Factors				
						γ	Soil Type	FC	σ_{v0}	u	σ_{v0}'	$\sigma_{v0}'_{design}$	r_d	Diameter	Diameter	Sampler	Uncorrected	Sampler Corrected	C_E	C_B	C_R	C_S	N_{60}
ft	ft	ft	ft	ft	m	pcf		%	psf	psf	psf	psf		in	mm								
1081	5	5	5.0	5	1.5	138	SM		690	0	690	690	0.99	4.0	102	MC	34	17	1.33	1.15	0.75	1.0	19
1076	10	10	5.0	10	3.0	144	SM		1,410	0	1,410	1,410	0.98	4.0	102	MC	41	20	1.33	1.15	0.80	1.0	25
1071	15	15	5.0	15	4.6	128	SM		2,050	0	2,050	2,050	0.97	4.0	102	MC	21	10	1.33	1.15	0.85	1.0	13
1066	20	20	5.0	20	6.1	128	SM		2,690	0	2,690	2,690	0.96	4.0	102	SPT	31	31	1.33	1.15	0.95	1.2	54
1061	25	25	5.0	25	7.6	119	SM		3,285	0	3,285	3,285	0.94	4.0	102	MC	22	11	1.33	1.15	0.95	1.0	16
1056	30	30	5.0	30	9.1	120	SM		3,885	0	3,885	3,885	0.92	4.0	102	MC	64	31	1.33	1.15	0.95	1.0	46
1051	35	35	5.0	35	10.7	119	SM		4,480	0	4,480	4,480	0.89	4.0	102	MC	26	13	1.33	1.15	1.00	1.0	20
1046	40	40	7.5	40	12.2	118	CL		5,070	0	5,070	5,070	0.85	4.0	102	MC	100	49	1.33	1.15	1.00	1.0	100
1036	50	50	10.0	50	15.2	118	CL		6,250	0	6,250	6,250	0.75	4.0	102	MC	100	49	1.33	1.15	1.00	1.0	100
1026	60	60	5.0	60	18.3	120	SM		7,450	0	7,450	7,450	0.66	4.0	102	SPT	48	48	1.33	1.15	1.00	1.2	88

All Soils			Sands						Clays			Silt	All Soils			Sands							Clays				Silt	
Imai and Tonouchi (1982)	Ohta and Goto (1978) QA	Ohsaki and Iwasaki (1973)	Lee (1992)	Seed et al. (1983)	Sykora and Stokoe	Pitilakis et al. (1999)	Ohta and Goto (1978) Med. Q	Ohta and Goto (1978) Fine Q	Pitilakis et al. (1999)	Lee (1992)	Ohta and Goto (1978) QA	Lee (1992)	Imai and Tonouchi (1982)	Ohta and Goto (1978)	Ohsaki and Iwasaki	Lee (1992)	Seed et al. (1983)	Sykora and Stokoe	Pitilakis et al. (1999)	Ohta and Goto (1978)	Ohta and Goto (1978) Fine Q	Average	Pitilakis et al. (1999)	Lee (1992)	Ohta and Goto (1978)	Average	Lee (1992)	Profile Layer Thickness/Vs
234.03	230.77	246.73	239.11	246.87	236.86	246.71	213.68	236.88					0.0214	0.0217	0.0203	0.0209	0.0203	0.0211	0.0203	0.0234	0.0211	0.0212						0.02119
253.03	252.02	272.18	257.86	279.98	254.80	258.15	232.78	258.05					0.0198	0.0198	0.0184	0.0194	0.0179	0.0196	0.0194	0.0215	0.0194	0.0195						0.01954
209.53	203.68	214.69	214.84	206.54	213.58	231.37	189.28	209.83					0.0239	0.0245	0.0233	0.0233	0.0242	0.0234	0.0216	0.0264	0.0238	0.0238						0.02378
323.03	332.05	370.10							376.45	345.15	320.22		0.0155	0.0151	0.0135								0.0133	0.0145	0.0156	0.0145		0.01446
220.04	215.25	228.31							269.44	259.59	210.16		0.0227	0.0232	0.0219								0.0186	0.0193	0.0238	0.0205		0.02054
306.38	312.79	346.25	310.31	381.20	304.73	288.48	287.13	318.30					0.0163	0.0160	0.0144	0.0161	0.0131	0.0164	0.0173	0.0174	0.0157	0.0161						0.01608
235.44	232.34	248.60	240.50	249.28	238.19	247.58	215.10	238.45					0.0212	0.0215	0.0201	0.0208	0.0201	0.0210	0.0202	0.0232	0.0210	0.0211						0.02106
390.61	411.47	470.00	392.53	564.00	382.47	332.18	374.77	415.45					0.0192	0.0182	0.0160	0.0191	0.0133	0.0196	0.0226	0.0200	0.0181	0.0189						0.01892
390.61	411.47	470.00	392.53	564.00	382.47	332.18	374.77	415.45					0.0256	0.0243	0.0213	0.0255	0.0177	0.0261	0.0301	0.0267	0.0241	0.0252						0.02523
375.85	393.97	447.77	378.18	530.04	368.94	324.83	359.27	398.27					0.0133	0.0127	0.0112	0.0132	0.0094	0.0136	0.0154	0.0139	0.0126	0.0131						0.01310
																												0.193897
																												515.74

B-1 (CENTRAL PLANT) - NCEER (2001)

Borehole No	B-1		A_{max}	0.80	g	Energy Ratio	80	%
Ground Elevation (NAVD 88)	1086.00	ft	M_w	6.80		Settlement F	1.0	
Water Depth (Exploration)	100.00	ft	MSF	1.28	Triggering	Finished Gra	1086.00	ft
Water Depth (Design)	100.00	ft	MSF_{Vol}	#REF!	Settlement		User Input	

Borehole diameter (mm)	Correction C_B
115	1
150	1.05
200	1.15

Top of Gaspur Formation (No liquefaction below this depth)
-70.0

Elevation	SPT Depth	CPT Corrected Depth	Thickness	Design Depth	Design Depth	Soil Parameters			Soil Stress			Demand		Bore Hole			Blow Counts (N)		Blow Count Correction Factors				
						γ	Soil Type	FC	σ_{v0}	u	σ_{v0}'	$\sigma_{v0}'_{design}$	r_d	Diameter	Diameter	Sampler	Uncorrected	Sampler Corrected	C_E	C_B	C_R	C_S	N_{60}
ft	ft	ft	ft	ft	m	pcf		%	psf	psf	psf	psf		in	mm								
1081	5	5	5.0	5	1.5	145	SM		725	0	725	725	0.99	4.0	102	MC	60	29	1.33	1.15	0.75	1.0	34
1076	10	10	5.0	10	3.0	120	SM		1,325	0	1,325	1,325	0.98	4.0	102	MC	52	25	1.33	1.15	0.80	1.0	31
1071	15	15	5.0	15	4.6	119	SM		1,920	0	1,920	1,920	0.97	4.0	102	MC	81	40	1.33	1.15	0.85	1.0	52
1066	20	20	5.0	20	6.1	113	SM		2,485	0	2,485	2,485	0.96	4.0	102	MC	95	47	1.33	1.15	0.95	1.0	68
1061	25	25	5.0	25	7.6	131	ML		3,140	0	3,140	3,140	0.94	4.0	102	MC	46	23	1.33	1.15	0.95	1.0	33
1056	30	30	5.0	30	9.1	125	ML		3,765	0	3,765	3,765	0.92	4.0	102	MC	21	10	1.33	1.15	0.95	1.0	15
1051	35	35	5.0	35	10.7	128	ML		4,405	0	4,405	4,405	0.89	4.0	102	MC	49	24	1.33	1.15	1.00	1.0	37
1046	40	40	5.0	40	12.2	137	CL		5,090	0	5,090	5,090	0.85	4.0	102	MC	54	26	1.33	1.15	1.00	1.0	41
1041	45	45	5.0	45	13.7	103	SM		5,605	0	5,605	5,605	0.80	4.0	102	MC	100	49	1.33	1.15	1.00	1.0	100
1036	50	50	7.5	50	15.2	108	SM		6,145	0	6,145	6,145	0.75	4.0	102	MC	100	49	1.33	1.15	1.00	1.0	100
1026	60	60	5.0	60	18.3	120	SM		7,345	0	7,345	7,345	0.66	4.0	102	MC	87	43	1.33	1.15	1.00	1.0	65

All Soils			Sands						Clays			Silt	All Soils			Sands							Clays				Silt	
Imai and Tonouchi (1982)	Ohta and Goto (1978) QA	Ohsaki and Iwasaki (1973)	Lee (1992)	Seed et al. (1983)	Sykora and Stokoe	Pitilakis et al. (1999)	Ohta and Goto (1978) Med. Q	Ohta and Goto (1978) Fine Q	Pitilakis et al. (1999)	Lee (1992)	Ohta and Goto (1978) QA	Lee (1992)	Imai and Tonouchi (1982)	Ohta and Goto (1978)	Ohsaki and Iwasaki	Lee (1992)	Seed et al. (1983)	Sykora and Stokoe	Pitilakis et al. (1999)	Ohta and Goto (1978)	Ohta and Goto (1978) Fine Q	Average	Pitilakis et al. (1999)	Lee (1992)	Ohta and Goto (1978)	Average	Lee (1992)	Profile Layer Thickness/Vs
279.09	281.52	307.91	283.52	327.95	279.27	273.27	259.20	287.34					0.0179	0.0178	0.0162	0.0176	0.0152	0.0179	0.0183	0.0193	0.0174	0.0177						0.01767
272.37	273.88	298.62	276.92	315.31	272.98	269.44	252.37	279.77					0.0184	0.0183	0.0167	0.0181	0.0159	0.0183	0.0186	0.0198	0.0179	0.0181						0.01812
318.42	326.70	363.46	322.11	405.65	315.92	295.01	299.52	332.04					0.0157	0.0153	0.0138	0.0155	0.0123	0.0158	0.0169	0.0167	0.0151	0.0155						0.01546
346.29	359.16	403.92							399.94	363.85	345.59		0.0144	0.0139	0.0124								0.0125	0.0137	0.0145	0.0136		0.01357
276.56	278.65	304.41							328.82	307.07	270.07		0.0181	0.0179	0.0164								0.0152	0.0163	0.0185	0.0167		0.01667
216.89	211.77	224.21	222.13	218.36	220.58	236.05	196.57	217.91					0.0231	0.0236	0.0223	0.0225	0.0229	0.0227	0.0212	0.0254	0.0229	0.0229						0.02294
286.56	290.04	318.31	290.86	342.21	286.25	277.49	266.82	295.78					0.0174	0.0172	0.0157	0.0172	0.0146	0.0175	0.0180	0.0187	0.0169	0.0172						0.01721
295.32	300.07	330.60	299.46	359.25	294.43	282.39	275.78	305.71					0.0169	0.0167	0.0151	0.0167	0.0139	0.0170	0.0177	0.0181	0.0164	0.0167						0.01669
390.61	411.47	470.00	392.53	564.00	382.47	332.18	374.77	415.45					0.0128	0.0122	0.0106	0.0127	0.0089	0.0131	0.0151	0.0133	0.0120	0.0126						0.01261
390.61	411.47	470.00	392.53	564.00	382.47	332.18	374.77	415.45					0.0192	0.0182	0.0160	0.0191	0.0133	0.0196	0.0226	0.0200	0.0181	0.0189						0.01892
342.37	354.58	398.18	345.53	455.99	338.10	307.70	324.33	359.53					0.0146	0.0141	0.0126	0.0145	0.0110	0.0148	0.0162	0.0154	0.0139	0.0144						0.01438
																												0.184239
																												542.77

APPENDIX D

GROUND MOTION TIME HISTORY EVALUATION (ASCE 41-13)

MT. SAN JACINTO COLLEGE
BUILDINGS F & G
GROUND MOTION TIME HSITORY EVALUATION
TEMECULA, CALIFORNIA

Prepared for

Mr. Simon I. Saiid
Leighton Consulting, Inc.
41715 Enterprise Cir. N. # 103
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January 25, 2019

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January 25, 2019
Project No.: 18079A

Mr. Simon I. Saiid, P.E., G.E.
Leighton Consulting, Inc.
41715 Enterprise Circle North
Suite #103
Temecula, CA 92590

Subject: **Ground Motion Time History Evaluation Report**
Mt. San Jacinto College – Buildings F & G
Temecula, California

Dear Mr. Saiid:

In general accordance with the provisions of our agreement for professional services, we have developed earthquake acceleration time histories for the subject project and have documented our findings in the accompanying report. This final report contains two suites of spectrally-matched, two horizontal component earthquake acceleration time histories for the Basic Safety Earthquake (BSE) levels of interest for the project, based on the BSE spectra developed by your team at Leighton Consulting.

We trust that this report meets the present needs of the project. If you should have any questions, please contact us.

Very truly yours,

Andrew Dinsick

Andrew Dinsick, PE
Associate Engineer

Alexandra Sarmiento, PE, CEG
Project Engineer/Geologist

TABLE OF CONTENTS

1. INTRODUCTION 2
2. CODE-BASED VALUES 2
3. SITE-SPECIFIC RESPONSE SPECTRA 3
   3.1 Site-Specific MCE_R Response Spectrum 3
   3.2 Site-Specific BSE-2N Response Spectra 3
   3.3 Site-Specific BSE-2E Response Spectra 4
   3.4 Site-Specific BSE-1N Response Spectra 4
   3.5 Site-Specific BSE-1E Response Spectra 5
4. ACCELERATION TIME HISTORY ANALYSIS 5
   4.1 Seed Time History Selection 5
   4.2 Spectral Matching of Time Histories for the BSE-2N Level 7
   4.3 Spectral Matching of Time Histories for the BSE-1E Level 8
   4.4 Digital Earthquake Acceleration Time History Files 8
5. LIMITATIONS 9
6. REFERENCES 9

Appendix A: Seed & Spectrally-Matched Earthquake Time Histories, BSE-2N Level

Appendix B: Seed & Spectrally-Matched Earthquake Time Histories, BSE-1E Level

Digital Attachments:

- One suite of eleven two-component, spectrally-matched earthquake acceleration time histories for BSE-2N
- One suite of eleven two-component, spectrally-matched earthquake acceleration time histories for BSE-1E

1. INTRODUCTION

This report presents the ground motion time history evaluation for Buildings F & G of the Mt. San Jacinto College (MSJC) Temecula, California campus. Specifically, these buildings are being evaluated for seismic retrofit. The existing buildings are five stories above grade and connected by a four-story lobby. The foundation elevations are understood to be the same for both buildings.

We understand from discussions with the Geotechnical Engineer of Record (GEOR; Leighton Consulting) and the Structural Engineer of Record (SEOR; KPFF Consulting Engineers) that the seismic design for the retrofit will be in accordance with ASCE 41-13 and the 2016 Edition of the California Building Code (CBC). Specifically, it is our understanding that both the Basic Safety Earthquake Level 2 for New Structures (BSE-2N) response spectrum and Basic Safety Earthquake Level 1 for Existing Structures (BSE-1E) response spectrum will be used in the seismic evaluation. The BSE-2N response spectrum represents a "Collapse Prevention" performance level corresponding to a 1% probability of collapse in 50 years. (i.e., a 2,475-yr return period modified for risk). The BSE-1E response spectrum represents a "Life Safety" performance level corresponding to a 20% probability of exceedance in 50 years. (i.e., a 225-yr return period).

This evaluation provides the recommended site-specific BSE response spectra (BSE-2N and BSE-1E), developed per ASCE 41-13 Section 2.4.2.1, based on the site-specific response spectra (MCE_R and probabilistic uniform hazard spectra) developed by Leighton (2018) using the ASCE 7-10 standard. Because the site is within 5 km of the controlling fault, the spectra are specified as Fault Normal and Fault Parallel ordinates. To support the nonlinear response history analysis of Buildings F & G, earthquake time histories have also been developed in agreement with ASCE 41-13 Section 2.4.2.2. Specifically, 11 spectrally-matched time history pairs have been developed for the BSE-2N level, and 11 pairs are provided for the BSE-1E level.

In preparing this report, we used the site-specific spectra developed recently by Leighton (2018). If the site location or site conditions change appreciably, the ground motions presented herein would need to be re-evaluated. It is noted that the subject site is within one kilometer of a mapped, active fault of the Elsinore Fault System; however, evaluation of the activity of fault and evaluation of the potential for surface rupture hazard at the subject site are beyond the scope of this report. This report addresses ground motion design only (i.e., response spectra and acceleration time histories) and does not evaluate any potential for surface rupture hazard.

2. CODE-BASED VALUES

Given the site latitude and longitude (located near 33.51727°N, 117.15206°W) and site shear wave velocity of 530 m/s (Leighton, 2018), mapped seismic hazard values were queried from the USGS online seismic design map application at http://earthquake.usgs.gov/designmaps/us/application.php and https://seismicmaps.org/. The general procedure ground motion analysis carried out in accordance with ASCE 41-13 results in general design spectral acceleration parameters $S_{XS,BSE\text{-}2N}$ and $S_{X1,\ BSE\text{-}2N}$ of 1.977 g and 1.052 g, respectively for the BSE-2N level and spectral acceleration parameters $S_{XS,BSE\text{-}1E}$ and $S_{X1,\ BSE\text{-}1E}$ of

0.720 g and 0.374 g, respectively for the BSE-1E level. These values are superseded by the site-specific values presented in this report but are provided here for completeness.

3. SITE-SPECIFIC RESPONSE SPECTRA

To support the seismic retrofit evaluation of the subject site, two site-specific response spectra are required:

- A "Collapse Prevention" performance level uniform hazard spectrum at 5% damping, referred to as the BSE-2N spectrum in ASCE 41-13 (corresponding to a 1% probability of collapse in 50 years; i.e., a 2,475-yr return period modified for risk)
- A "Life Safety" performance level uniform hazard spectrum at 5% damping, referred to as the BSE-1E spectrum in ASCE 41-13 (corresponding to a 20% probability of exceedance in 50 years; i.e., a 225-yr return period)

For completion, the companion spectra (BSE-1N and BSE-2E) are also presented. As discussed in more detail in the subsections below, the development of the BSE-level spectra is based on the site-specific MCE_R response spectrum at 5% damping, the 975-yr Probabilistic Seismic Hazard Analysis (PSHA) results, and/or the 225-yr PSHA results. The site-specific MCE_R, 975-yr, and 225-yr spectra developed by Leighton (2018) were used herein to develop the BSE-level spectra in accordance with ASCE 41-13.

3.1 Site-Specific MCE_R Response Spectrum

The left panel of Figure 1 shows the site-specific MCE_R spectrum from Leighton (2018). The MCE_R spectral ordinates are listed in the third column in Table 1. It is our understanding that the MCE_R spectrum was developed in accordance with ASCE 7-10, Section 21.2. Specifically, we understand that the Probabilistic and Deterministic Seismic Hazard Analyses (PSHA and DSHA) completed in Leighton (2018) used the EZ-FRISK v8.00 software, which applies a seismic source characterization consistent with the 2014 NSHM model, and the 2008 NGA ground motion models.

Using ASCE 7-10, Section 21.4, the site-specific seismic design parameters, as reported by Leighton (2018) are defined as follows:

- S_{DS} = 1.352 g, based on the spectral acceleration at a period of 0.2 seconds
- S_{D1} = 0.724 g, based on twice the spectral acceleration at a period of 2.0 seconds
- S_{MS} = 2.028 g, based on 1.5 times S_{DS}
- S_{M1} = 1.086 g, based on 1.5 times S_{D1}

3.2 Site-Specific BSE-2N Response Spectra

The BSE-2N spectrum corresponds to the site-specific MCE_R (per ASCE 41-13, Section 2.4.1.1), but no less than 80% of the code-based general spectrum (ASCE 41-13, Section 2.4.2.1.2). The code-minimum check for the BSE-2N spectrum is shown on the left panel of Figure 1 and tabulated in Table 1, Columns 3 through 6.

Because the site is within 5 km of a controlling source, the BSE-2N spectrum is provided with Fault Normal (FN) and Fault Parallel (FP) ordinates. As the MCE_R spectrum represents the maximum-rotated (100th percentile) demand, this spectrum is treated as the FN component. The FN ordinates were adjusted from the maximum rotation to the average horizontal (50th percentile) rotation using the period-dependent adjustment factors in Shahi and Baker (2014), as shown in Table 1, columns 6 through 8. (It is noted that the Shahi and Baker ratios supersede the NEHRP ratios identified in ASCE 41-13, Section 2.4.2.1.) The average horizontal BSE-2N ordinates are the recommended BSE-2N FP spectrum. Both the BSE-2N FN and FP spectra are plotted together on Figure 4 and tabulated on Table 2.

Using ASCE 41-13, Section 2.4.2.1, the site-specific seismic design parameters are defined below. The BSE-2N parameters correspond to the ASCE 7-10 MCE_R site-specific parameters.

- $S_{XS,BSE\text{-}2N}$ = 2.028 g, based on the spectral acceleration at a period of 0.2 seconds
- $S_{X1,BSE\text{-}2N}$ = 1.086 g, based on twice the spectral acceleration at a period of 2.0 seconds

3.3 Site-Specific BSE-2E Response Spectra

As defined in ASCE 41-13, Section 2.4.2.1.5, the BSE-2E response spectrum is the minimum of the maximum-rotated 975-yr uniform hazard spectrum and the BSE-2N spectrum, but no less than 80% of the code-based general spectrum.

Maximum-rotated ordinates for the probabilistic 975-year uniform hazard spectrum were provided by Leighton and are plotted in the right panel of Figure 1. The code-based general response spectrum was developed in accordance with Section 2.4.1.7 of ASCE 41-13, using the mapped seismic hazard values obtained from the online seismic design map application for the site latitude, longitude, and shear wave velocity. Development of the BSE-2E response spectrum is shown in the right panel of Figure 1 and tabulated in Table 1, Columns 9 through 12.

Because the site is within 5 km of a controlling source, the BSE-2E spectrum is provided with Fault Normal (FN) and Fault Parallel (FP) ordinates. Development of the BSE-2E spectrum is based on site-specific, maximum-rotated probabilistic ordinates; therefore, the BSE-2E spectrum shown on the right panel of Figure 1 is considered to be the maximum-rotated or FN component. The average horizontal component was calculated using the same rotation factors described in Section 3.2 above, and the average horizontal component represents the FP spectrum. The final site-specific FN and FP BSE-2E ordinates are tabulated in Table 2 and plotted together on Figure 4.

Using ASCE 41-13, Section 2.4.2.1, the site-specific seismic design parameters are defined as follows:

- $S_{XS,BSE\text{-}2E}$ = 1.458 g, based on the spectral acceleration at a period of 0.2 seconds
- $S_{X1,BSE\text{-}2E}$ = 0.7386 g, based on the spectral acceleration at a period of 1.0 second

3.4 Site-Specific BSE-1N Response Spectra

As defined in ASCE 41-13, Section 2.4.2.1.4, the BSE-1N response spectrum corresponds to ⅔ of the BSE-2N spectrum, but no less than 80% of the code-based general spectrum.

The code-based general response spectrum was developed in accordance with Section 2.4.1.7 of ASCE 41-13, using the mapped seismic hazard values obtained from the online seismic design map application. Development of the BSE-1N response spectrum is shown in the left panel on Figure 2 and tabulated in Table 1, Columns 14 through 18.

Because the site is within 5 km of a controlling source, the BSE-1N spectra are also provided with Fault Normal (FN) and Fault Parallel (FP) ordinates. The FP ordinates were developed as described in Section 3.3 above. The final site-specific BSE-N spectra are shown as the FN and FP components on Figure 4 and tabulated in Table 2.

Using ASCE 41-13, Section 2.4.2.1, the site-specific seismic design parameters are defined as follows:

- $S_{XS,BSE\text{-}1N}$ = 1.352 g, based on the spectral acceleration at a period of 0.2 seconds
- $S_{X1,BSE\text{-}1N}$ = 0.724 g, based on twice the spectral acceleration at a period of 2.0 seconds

3.5 Site-Specific BSE-1E Response Spectra

As defined in ASCE 41-13, Section 2.4.2.1.5, the BSE-1E response spectrum corresponds to the maximum-rotated 225-yr uniform hazard spectrum, but no less than 80% of the code-based general spectrum.

Maximum-rotated ordinates for the probabilistic 225-year uniform hazard spectrum were provided by Leighton and are plotted in the right panel of Figure 2. The code-based general response spectrum was developed in accordance with Section 2.4.1.7 of ASCE 41-13, using the mapped seismic hazard values obtained from the online seismic design map application for the site latitude, longitude, and shear wave velocity. Development of the BSE-1E response spectrum is shown in the right panel of Figure 2 and tabulated in Table 1, Columns 20 through 23.

Finally, because the site is within 5 km of a controlling source, the BSE-1E spectrum is provided with Fault Normal (FN) and Fault Parallel (FP) ordinates. The FP ordinates were developed as described in Section 3.3 above. The final site-specific BSE-1E spectra are shown together as FN and FP components on Figure 4 and tabulated in Table 2.

Using ASCE 41-13, Section 2.4.2.1, the site-specific seismic design parameters are defined as follows:

- $S_{XS,BSE\text{-}1E}$ = 0.680 g, based on the spectral acceleration at a period of 0.2 seconds
- $S_{X1,BSE\text{-}1E}$ = 0.301 g, based on twice the spectral acceleration at a period of 2.0 seconds

4. ACCELERATION TIME HISTORY ANALYSIS

4.1 Seed Time History Selection

A multi-step screening effort was carried out to identify existing recordings from earthquakes that have characteristics similar to the events that control the hazard in the period range of interest at the BSE-2N and BSE-1E hazard levels, in accordance with ASCE 41-13, Section 2.4.2.2. Based on the deaggregation information provided by Leighton (2018), as well as the USGS 2014 maps dynamic deaggregation tool results for the site location and a V_{S30} of 537 m/s (very similar to the site V_{S30} reported by Leighton), the hazard at the site for the fundamental period of the structure (approximately 1.0-seconds) is controlled by the characteristic event on the nearby Elsinore Fault for both the 225-yr hazard and the 2,475-yr hazard. Contributions from distant, high slip rate sources such as the San Jacinto or San Andreas faults, are collectively less than 10% at the spectral period of interest. Therefore, eleven local records were selected using the screening methods outlined below.

The records initially considered for the time history analysis included all 3,551 records in the PEER Ground Motion Database (PEER, 2013). This database contains records from 173 shallow crustal earthquakes with magnitudes ranging from 4.2 to 7.9 and closest distances ranging from 0.07 to 473 km. The database was further supplemented with over 400 records from the 2010 M_W 7.0 Darfield, 2010 M_W 7.2 El Mayor-Cucapah, and 2011 M_W 6.2 Christchurch earthquakes. To select recordings from sites with reasonably similar local site conditions, recordings from rock (Site Class A) and soft soil (Site Class E and F) sites were eliminated from consideration. Events with only one horizontal component recording were also eliminated. Finally, a few events included in the PEER database as crustal earthquakes could be intraslab earthquakes at subduction zones; these debatable events have also been removed.

Figure 5 shows the remaining PEER Ground Motion Records for which the Joyner-Boore Distance metric is available, plotted by this distance and the magnitude. Earthquake recordings with magnitudes greater than 6.8 and with closest distances within 20 km of the recording site were selected for further assessment. This magnitude-distance screening identified a subset of 170 records from 19 earthquakes.

The earthquake recording subsets identified on Figure 5 were then further reduced to identify the most appropriate records for spectral matching. Records with a longest usable period shorter than 6.0-seconds were eliminated from consideration because filtering of the records by PEER has depleted them of their original long period energy. Records requiring a scale factor to match the target PGA greater than approximately four were also screened out to avoid excessive scaling-up of the ground motions. This screening process is illustrated on Figure 6. At the end of this screening process, a total of 70 candidate seed time histories from 26 earthquakes remained.

To further refine the selection, the next screening was developed to identify records with a Peak Ground Velocity (PGV) similar to the PGV for the controlling event at the site. PGV is used a metric to try to capture records that have appropriate velocity pulses due to the proximity of the site to the local sources. Because of the correlation between PGA and PGV, a modified PGV for each record was calculated after scaling the record to the target PGA. The scaled PGVs were then compared to the design event (a magnitude 7.1 at a distance of 1 km). Using the available ground motion models, the PGV for the design local event would be expected to have a 50th percentile velocity of about 82 cm/s, an 84th percentile velocity of about 140 cm/s, and a 95th percentile of about 240 cm/s. Based on the epsilon range for the design event contained in the deaggregation information and observed distribution of the data within the PEER database, the PGVs of the most desirable records for analysis are between the 50th and 84th percentiles for the design event.

To complete the selection for the local events, the final screening aimed to identify records with spectral shapes similar to the target spectrum. To address spectral shape, a goodness-of-fit was calculated between the target spectrum and the geometric mean of the horizontal components of the as-recorded seed time histories, scaled to the target PGA. The goodness-of-fit (GOF) was calculated as the Sum of the Square of Errors (SSE) in natural log units between the scaled seed time history and the target response spectrum. Thus, the records with the smallest GOF have as-recorded shapes closest to the target spectrum. Figure 7 shows the final screening steps (PGV and GOF) for the design event.

To capture directivity effects on the nearby Elsinore Fault, a representative number of earthquake seed time histories with pulse-like characteristics (i.e., seed records with time-domain characteristics that reflect near-field motions) was identified from the available records on Figure 7. This approach is used herein to incorporate directivity effects in the nonlinear response history analysis. Based on the Shahi and Baker (2013) pulse probability model for source-to-site geometry, about 70% of the earthquakes on the fault would be expected to produce a pulse. Therefore, at least 70% of the selected design event seed time histories have a pulse to capture the directivity effects. Section 4.4 below provides recommendations on the directions the ground motion components should be applied.

From the plot on Figure 7, eleven records have been selected. It is noted that the time domain characteristics of the seeds were inspected as part of the selection process. Specifically, the acceleration, velocity, displacement, and Husid plots for each set of components were visually inspected to ensure the selected records displayed appropriate time-domain characteristics. The as-recorded horizontal components for the selected seed events for the BSE-2N spectra are shown on Figures 8a and 8b. These spectra scaled to match the target PGA are also shown on the figures. Similarly, the spectra for the BSE-1E level are shown on Figure 9a and 9b.

The records and key qualities of the selected design local events are listed in Table 3. Care was taken to select only one set of recordings from a given earthquake per suite so as to broaden the characteristics of the recorded events in the analysis. Table 3 also identifies the seeds and matching targets for both the BSE-2N and BSE-1E levels, satisfying the required number of time history pairs in ASCE 41-13, Table 7.1.

4.2 Spectral Matching of Time Histories for the BSE-2N Level

Spectral matching of each recording from the 11 sets of BSE-2N time histories was performed using the program RspMatch, developed by Dr. Norm Abrahamson (Abrahamson, 1992). The program iteratively arrives at an acceleration time history with a reasonable spectral match by adding tapered cosine wavelets to the seed time history in the time domain. This approach has fast convergence properties and allows for efficient and consistent modification of acceleration time histories. For this project, the time history matching of both suites targeted a tight spectral match over a period range of 0.01-second to 4.0-seconds.

As listed on Table 3, one horizontal component of each of the 11 pairs of earthquake acceleration time histories was spectrally matched to the BSE-2N FN spectrum, and the other component matched to the BSE-2N FP spectrum. The acceleration, velocity, displacement, and Husid time histories for each seed (as-recorded) and spectrally-matched component are shown in Appendix A for visual inspection. As observed on these figures, the time domain characteristics of the seed records were preserved throughout the matching process. In particular, velocity pulses in the seed records were retained in the matching, as evidenced by the velocity traces and Husid plots.

It is our understanding that the key period range of interest ranges from about 0.18-seconds (90% mass participation, based on communication with the SEOR) to 1.8-seconds (twice the fundamental period). Response spectra for each matched record were computed, and Figure 10 compares the matched FN spectra to the site-specific BSE-2N FN target across the period range of interest. As shown on Figure 10, the average of the spectrally-matched FN spectra exceed the site-specific BSE-2N spectrum across the period range of interest, as stipulated in Section 2.4.2.2 of ASCE 41-13 for sites within 5 km of a controlling seismic source. It is noted that by satisfying the requirement that the average of the FN spectra exceeds the target spectrum, the square-root-sum-of-squares (SRSS) requirement for sites that are not near-field is also implicitly satisfied.

4.3 Spectral Matching of Time Histories for the BSE-1E Level

Spectral matching of each recording from the eleven sets of BSE-1E time histories was also performed using the program RspMatch, targeting a tight spectral match over a period range of 0.01-second to 4.0-seconds.

Each component was spectrally-matched to the target BSE-1E spectrum listed on Table 3. The acceleration, velocity, displacement, and Husid time histories for each seed (as-recorded) and spectrally-matched component are shown in Appendix B for visual inspection. As observed on these figures, the time domain characteristics of the seed records were preserved throughout the matching process. In particular, velocity pulses in the seed records were retained in the matching, as evidenced by the velocity traces and Husid plots.

Response spectra for each matched record were computed, and Figure 11 compares the matched FN (H1) spectra to the site-specific BSE-1E FN target across the period range of interest (as described above in Section 4.2). As shown on Figure 11, the average of the spectrally-matched FN (H1) spectra exceed the site-specific BSE-1E spectrum across the period range of interest, as stipulated in Section 2.4.2.2 of ASCE 41-13 for sites within 5 km of a controlling seismic source.

4.4 Digital Earthquake Acceleration Time History Files

One suite composed of 11 two-component, spectrally-matched earthquake time histories are provided digitally for use in the nonlinear response analysis for the BSE-2N level. Each set is composed of compatible FN and FP components. The "H1" component is the FN direction, and the "H2" component is the FP direction.

Similarly, one suite of eleven two-component, spectrally-matched time histories are also provided digitally for the BSE-1E level nonlinear response analysis. The "H1" component should be applied to the FN direction, and the "H2" component should be applied to the FP direction.

For the purpose of structural analysis for this project site, it is recommended that the FN and FP orientations be considered as shown on Figure 12.

5. LIMITATIONS

Conclusions and recommendations presented in this report are based upon GeoPentech's understanding of the project and the assumption that the subsurface conditions do not deviate appreciably from those disclosed by the field exploration, which was performed by others. This addendum addresses ground motion design only (i.e., response spectra and earthquake time histories) and does not evaluate any potential for surface rupture hazard, liquefaction, or other earthquake-related phenomena.

Professional judgments presented in this report are based on an evaluation of the technical information gathered and GeoPentech's general experience in the field of geotechnical engineering. GeoPentech does not guarantee the performance of the project in any respect, only that the engineering work and judgment rendered meet the standard of care of the geotechnical profession at this time.

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TABLE 1
BSE-LEVEL SITE-SPECIFIC SPECTRA DEVELOPMENT CALCULATION SHEET
MSJC - SEISMIC RETROFIT FOR EXISTING BUILDINGS F & G

Column 1	Column 2	Column 3	Column 4	Column 5	**Column 6**	Column 7	**Column 8**	Column 9	Column 10	Column 11	Column 12
		Final Site-Specific MCE $_R$	*Code General Spectrum for BSE-2N*	*80% of Code General Spectrum for BSE-2N*	***Final Site-Specific BSE-2N FN Component***	*Max. Orientation Scaling Factors*	***Final Site-Specific BSE-2N FP Component***	*Max. Rotated 975-yr UHS*	*Code General Spectrum for BSE-2E*	*80% of Code General Spectrum for BSE-2E*	*Final Site-Specific BSE-2E FN Component*
Period	***Frequency***	*GMRotI100*	*GMRotI50*	*GMRotI50*	***GMRotI100***	-	***GMRotI50***	*GMRotI100*	*GMRotI50*	*GMRotI50*	*GMRotI100*
(sec)	(Hz)	(g)	(g)	(g)	**(g)**	-	**(g)**	(g)	(g)	(g)	(g)
0.01	100	0.902	0.903	0.722	**0.902**	1.190	**0.758**	0.659	0.647	0.518	0.659
0.02	50	1.080	1.014	0.811	**1.080**	1.190	**0.908**	0.735	0.729	0.584	0.735
0.03	33.333	1.201	1.126	0.900	**1.201**	1.190	**1.009**	0.784	0.812	0.650	0.784
0.05	20	1.372	1.348	1.079	**1.372**	1.190	**1.153**	0.849	0.976	0.781	0.849
0.075	13.333	1.524	1.626	1.301	**1.524**	1.190	**1.281**	1.039	1.182	0.946	1.039
0.10	10	1.643	1.904	1.524	**1.643**	1.190	**1.381**	1.199	1.388	1.110	1.199
0.15	6.667	1.846	1.974	1.580	**1.846**	1.200	**1.538**	1.344	1.409	1.127	1.344
0.2	5	2.028	1.974	1.580	**2.028**	1.210	**1.676**	1.458	1.409	1.127	1.458
0.25	4	1.967	1.974	1.580	**1.967**	1.230	**1.599**	1.391	1.409	1.127	1.391
0.3	3.333	1.919	1.974	1.580	**1.919**	1.240	**1.548**	1.338	1.409	1.127	1.338
0.4	2.5	1.817	1.974	1.580	**1.817**	1.250	**1.454**	1.240	1.409	1.127	1.240
0.5	2	1.653	1.974	1.580	**1.653**	1.250	**1.322**	1.135	1.409	1.127	1.135
0.545	1.835	1.583	1.927	1.541	**1.583**	1.252	**1.264**	1.079	1.325	1.060	1.079
0.614	1.629	1.475	1.710	1.368	**1.475**	1.255	**1.175**	1.007	1.177	0.941	1.007
0.75	1.333	1.266	1.400	1.120	**1.266**	1.260	**1.005**	0.896	0.963	0.771	0.896
1	1	1.036	1.050	0.840	**1.036**	1.270	**0.816**	0.726	0.722	0.578	0.726
1.5	0.667	0.710	0.700	0.560	**0.710**	1.260	**0.563**	0.489	0.482	0.385	0.489
2	0.5	0.543	0.525	0.420	**0.543**	1.270	**0.428**	0.369	0.361	0.289	0.369
3	0.333	0.360	0.350	0.280	**0.360**	1.280	**0.281**	0.243	0.241	0.193	0.243
4	0.25	0.269	0.263	0.210	**0.269**	1.300	**0.207**	0.179	0.181	0.144	0.179

Column 1	Column 13	Column 14	Column 15	Column 16	Column 17	Column 18	Column 19	Column 20	Column 21	**Column 22**	Column 23
	Final Site-Specific BSE-2E FP Component	*Code General Spectrum for BSE-1N*	*80% of Code General Spectrum for BSE-1N*	*⅔ of Final BSE-2N FN Component*	*Final Site-Specific BSE-1N FN Component*	*Final Site-Specific BSE-1N FP Component*	*Max. Rotated 225-yr UHS*	*Code General Spectrum for BSE-1E*	*80% of Code General Spectrum for BSE-1E*	***Final Site-Specific BSE-1E FN Component***	***Final Site-Specific BSE-1E FP Component***
Period	*GMRotI50*	*GMRotI50*	*GMRotI50*	*GMRotI100*	*GMRotI100*	*GMRotI50*	*GMRotI100*	*GMRotI50*	*GMRotI50*	***GMRotI100***	***GMRotI50***
(sec)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	**(g)**	**(g)**
0.01	0.554	0.602	0.482	0.601	0.601	0.505	0.307	0.329	0.263	**0.307**	**0.258**
0.02	0.618	0.676	0.541	0.720	0.720	0.605	0.340	0.370	0.296	**0.340**	**0.286**
0.03	0.658	0.750	0.600	0.801	0.801	0.673	0.361	0.411	0.329	**0.361**	**0.303**
0.05	0.714	0.899	0.719	0.914	0.914	0.768	0.389	0.494	0.395	**0.395**	**0.332**
0.075	0.873	1.084	0.867	1.016	1.016	0.854	0.487	0.597	0.478	**0.487**	**0.409**
0.10	1.008	1.270	1.016	1.095	1.095	0.920	0.570	0.700	0.560	**0.570**	**0.479**
0.15	1.120	1.316	1.053	1.231	1.231	1.026	0.632	0.717	0.574	**0.632**	**0.527**
0.2	1.205	1.316	1.053	1.352	1.352	1.117	0.680	0.717	0.574	**0.680**	**0.562**
0.25	1.131	1.316	1.053	1.312	1.312	1.066	0.635	0.717	0.574	**0.635**	**0.517**
0.3	1.079	1.316	1.053	1.279	1.279	1.032	0.601	0.717	0.574	**0.601**	**0.485**
0.4	0.992	1.316	1.053	1.211	1.211	0.969	0.538	0.717	0.574	**0.574**	**0.459**
0.5	0.908	1.316	1.053	1.102	1.102	0.882	0.483	0.717	0.574	**0.574**	**0.459**
0.545	0.862	1.284	1.028	1.055	1.055	0.843	0.456	0.685	0.548	**0.548**	**0.438**
0.614	0.802	1.140	0.912	0.983	0.983	0.783	0.421	0.608	0.487	**0.487**	**0.388**
0.75	0.711	0.933	0.747	0.844	0.844	0.670	0.369	0.498	0.398	**0.398**	**0.316**
1	0.571	0.700	0.560	0.691	0.691	0.544	0.299	0.374	0.299	**0.299**	**0.235**
1.5	0.388	0.467	0.373	0.473	0.473	0.376	0.200	0.249	0.199	**0.200**	**0.159**
2	0.291	0.350	0.280	0.362	0.362	0.285	0.150	0.187	0.149	**0.150**	**0.119**
3	0.190	0.233	0.187	0.240	0.240	0.188	0.098	0.125	0.100	**0.100**	**0.078**
4	0.138	0.175	0.140	0.179	0.179	0.138	0.073	0.093	0.075	**0.075**	**0.057**

Note: Significant figures are provided for computational purposes only and do not necessarily reflect accuracies to those significant figures.

Key

Column 1	= Spectral period in seconds.
Column 2	= Spectral frequency (inverse of spectral period) in Hertz.
Column 3	= Final risk-targeted, maximum considered earthquake (MCE_R) ground motion spectral ordinates in units of g for 5% damping; from Leighton (2018).
Column 4	= Code-based general response spectrum (ASCE 41-13, Sections 2.4.1.1 & 2.4.1.7) spectral ordinates in units of g for 5% damping for BSE-2N.
Column 5	= Code-based (ASCE 41-13, Section 2.4.2.1.2) minimum design ground motion spectral ordinates in units of g for 5% damping for BSE-2N; 80% of the value in Column 4.
Column 6	= Basic Safety Earthquake-2 for new buildings (BSE-2N), ground motion spectral ordinates in g for 5% damping, maximum-rotated (Fault Normal) component; equivalent to site-specific MCE_R in Column 3.
Column 7	= Scale factor to obtain maximum-oriented spectral acceleration; from Shahi and Baker (2014).
Column 8	= BSE-2N ground motion spectral ordinates in g for 5% damping, Fault Pormal (FP) component; obtained by dividing BSE-2N FN component in Column 6 by period-dependent rotation factors in Column 7.
Column 9	= Maximum-rotated uniform hazard spectral ordinates for 975-yr average return period in units of g for 5% damping, from Leighton (2018); GMRotI100 and RotD100 are produced by NGA West 1 and West2, respectively.
Column 10	= Code-based general response spectrum (ASCE 41-13, Sections 2.4.1.3 & 2.4.1.7) spectral ordinates in units of g for 5% damping for BSE-2E.
Column 11	= Code-based (ASCE 41-13, Section 2.4.2.1.2) minimum design ground motion spectral ordinates in units of g for 5% damping for BSE-2E; 80% of the value in Column 10.
Column 12	= Basic Safety Earthquake-2 for existing buildings (BSE-2E), ground motion spectral ordinates in g for 5% damping, maximum-rotated (Fault Normal) component; minimum value from Columns 6 and 9, but no less than code minimum in Column 11.
Column 13	= BSE-2E ground motion spectral ordinates in g for 5% damping, Fault Pormal (FP) component; obtained by dividing BSE-2E FN component in Column 12 by period-dependent rotation factors in Column 7.
Column 14	= Code-based general response spectrum (ASCE 41-13, Sections 2.4.1.2 & 2.4.1.7) spectral ordinates in units of g for 5% damping for BSE-1N.
Column 15	= Code-based (ASCE 41-13, Section 2.4.2.1.2) minimum design ground motion spectral ordinates in units of g for 5% damping for BSE-1N; 80% of the value in Column 14.
Column 16	= ⅔ of BSE-2N (Column 6) ground motion spectral ordinates in g for 5% damping.
Column 17	= Basic Safety Earthquake-1 for new buildings (BSE-1N), ground motion spectral ordinates in g for 5% damping, maximum-rotated (Fault Normal) component; value from Column 16, but no less than code minimum in Column 15.
Column 18	= BSE-1N ground motion spectral ordinates in g for 5% damping, Fault Pormal (FP) component; obtained by dividing BSE-1N FN component in Column 17 by period-dependent rotation factors in Column 7.
Column 19	= Maximum-rotated uniform hazard spectral ordinates for 225-yr average return period in units of g for 5% damping, from Leighton (2018); GMRotI100 and RotD100 are produced by NGA West 1 and West2, respectively.
Column 20	= Code-based general response spectrum (ASCE 41-13, Sections 2.4.1.4 & 2.4.1.7) spectral ordinates in units of g for 5% damping for BSE-1E.
Column 21	= Code-based (ASCE 41-13, Section 2.4.2.1.2) minimum design ground motion spectral ordinates in units of g for 5% damping for BSE-1E; 80% of the value in Column 20.
Column 22	= Basic Safety Earthquake-1 for existing buildings (BSE-1E), ground motion spectral ordinates in g for 5% damping, maximum-rotated (Fault Normal) component; value from Column 19, but no less than code minimum in Column 21.
Column 23	= BSE-1E ground motion spectral ordinates in g for 5% damping, Fault Pormal (FP) component; obtained by dividing BSE-1E FN component in Column 22 by period-dependent rotation factors in Column 7.

TABLE 2
BSE-LEVEL SITE-SPECIFIC SPECTRA SUMMARY
MSJC - SEISMIC RETROFIT FOR EXISTING BUILDINGS F & G

Column 1	Column 2	**Column 3**	**Column 4**	Column 5	Column 6	Column 7	Column 8	**Column 9**	**Column 10**
		Final Site-Specific BSE-2N FN Component	***Final Site-Specific BSE-2N FP Component***	*Final Site-Specific BSE-2E FN Component*	*Final Site-Specific BSE-2E FP Component*	*Final Site-Specific BSE-1N FN Component*	*Final Site-Specific BSE-1N FP Component*	***Final Site-Specific BSE-1E FN Component***	***Final Site-Specific BSE-1E FP Component***
Period	***Frequency***	***GMRotI100***	***GMRotI50***	*GMRotI100*	*GMRotI50*	*GMRotI100*	*GMRotI50*	***GMRotI100***	***GMRotI50***
(sec)	(Hz)	**(g)**	**(g)**	(g)	(g)	(g)	(g)	**(g)**	**(g)**
0.01	100	**0.902**	**0.758**	0.659	0.554	0.601	0.505	**0.307**	**0.258**
0.02	50	**1.080**	**0.908**	0.735	0.618	0.720	0.605	**0.340**	**0.286**
0.03	33.333	**1.201**	**1.009**	0.784	0.658	0.801	0.673	**0.361**	**0.303**
0.05	20	**1.372**	**1.153**	0.849	0.714	0.914	0.768	**0.395**	**0.332**
0.075	13.333	**1.524**	**1.281**	1.039	0.873	1.016	0.854	**0.487**	**0.409**
0.10	10	**1.643**	**1.381**	1.199	1.008	1.095	0.920	**0.570**	**0.479**
0.15	6.667	**1.846**	**1.538**	1.344	1.120	1.231	1.026	**0.632**	**0.527**
0.2	5	**2.028**	**1.676**	1.458	1.205	1.352	1.117	**0.680**	**0.562**
0.25	4	**1.967**	**1.599**	1.391	1.131	1.312	1.066	**0.635**	**0.517**
0.3	3.333	**1.919**	**1.548**	1.338	1.079	1.279	1.032	**0.601**	**0.485**
0.4	2.5	**1.817**	**1.454**	1.240	0.992	1.211	0.969	**0.574**	**0.459**
0.5	2	**1.653**	**1.322**	1.135	0.908	1.102	0.882	**0.574**	**0.459**
0.545	1.835	**1.583**	**1.264**	1.079	0.862	1.055	0.843	**0.548**	**0.438**
0.614	1.629	**1.475**	**1.175**	1.007	0.802	0.983	0.783	**0.487**	**0.388**
0.75	1.333	**1.266**	**1.005**	0.896	0.711	0.844	0.670	**0.398**	**0.316**
1	1	**1.036**	**0.816**	0.726	0.571	0.691	0.544	**0.299**	**0.235**
1.5	0.667	**0.710**	**0.563**	0.489	0.388	0.473	0.376	**0.200**	**0.159**
2	0.5	**0.543**	**0.428**	0.369	0.291	0.362	0.285	**0.150**	**0.119**
3	0.333	**0.360**	**0.281**	0.243	0.190	0.240	0.188	**0.100**	**0.078**
4	0.25	**0.269**	**0.207**	0.179	0.138	0.179	0.138	**0.075**	**0.057**

Note: Significant figures are provided for computational purposes only and do not necessarily reflect accuracies to those significant figures.

Key

Column 1	= Spectral period in seconds.
Column 2	= Spectral frequency (inverse of spectral period) in Hertz.
Column 3	= Basic Safety Earthquake-2 for new buildings (BSE-2N), ground motion spectral ordinates in g for 5% damping, maximum-rotated (Fault Normal) component.
Column 4	= BSE-2N ground motion spectral ordinates in g for 5% damping, Fault Pormal (FP) component.
Column 5	= Basic Safety Earthquake-2 for existing buildings (BSE-2E), ground motion spectral ordinates in g for 5% damping, maximum-rotated (Fault Normal) component.
Column 6	= BSE-2E ground motion spectral ordinates in g for 5% damping, Fault Pormal (FP) component.
Column 7	= Basic Safety Earthquake-1 for new buildings (BSE-1N), ground motion spectral ordinates in g for 5% damping, maximum-rotated (Fault Normal) component.
Column 8	= BSE-1N ground motion spectral ordinates in g for 5% damping, Fault Pormal (FP) component.
Column 9	= Basic Safety Earthquake-1 for existing buildings (BSE-1E), ground motion spectral ordinates in g for 5% damping, maximum-rotated (Fault Normal) component.
Column 10	= BSE-1E ground motion spectral ordinates in g for 5% damping, Fault Pormal (FP) component.

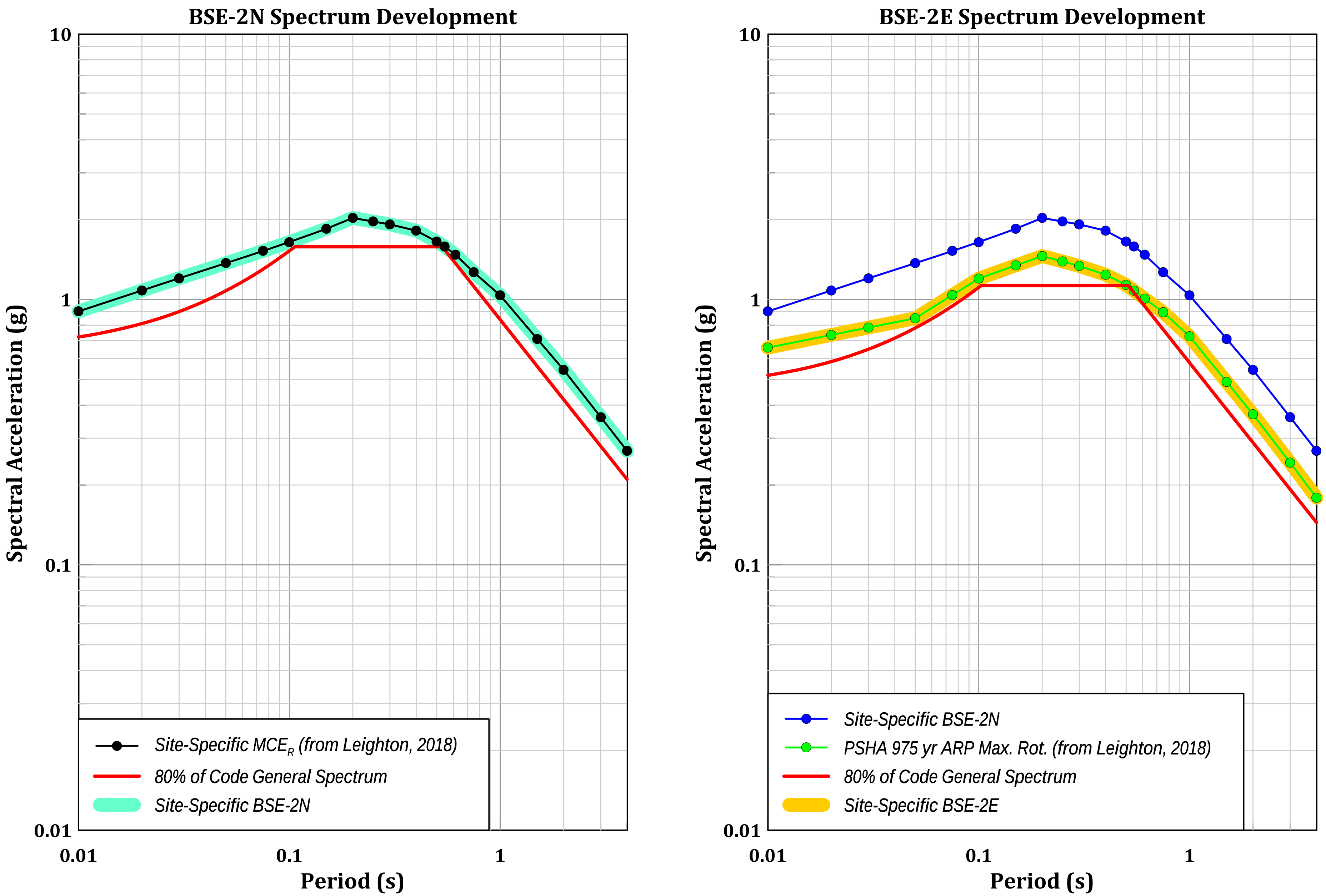
TABLE 3
CHARACTERISTICS OF GROUND MOTION RECORDS SELECTED FOR SPECTRAL MATCHING
MSJC - SEISMIC RETROFIT FOR EXISTING BUILDINGS F & G

Event Seed Time History Records

Analysis Record No.	*Earthquake Name*	*Station Name*	*PEER NGA Record No.*	*H1* (deg)	*H2* (deg)	*Date*	*Earthquake Magnitude*	*Rupture Mechanism*	*Closest Distance* (km)	*NEHRP Site Class/V_{S30}* (m/s)	*PGA* (g)	*D_{a5-95}* (sec)	*T_L* (sec)	*T_P* (sec)	*BSE-2N Target Spectrum*	*BSE-1E Target Spectrum*
GM1	Landers	Lucerne	879	260 (FN)	345 (FP)	6/28/1992	7.28	SS	2.2	C – 685	0.72	13.5	10.00	4.4 - 5.1	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM2	Tabas, Iran	Tabas	143	240 (FN)	330 (FP)	9/16/1978	7.35	RV	2.1	B – 767	0.81	16.3	16.00	4.7, 5.3, 6.2	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM3	Loma Prieta	Saratoga - Aloha Ave	802	000	090	10/18/1989	6.93	RV/OBL	8.5	C – 371	0.38	8.8	8.00	4.5, 6.2	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM4	Denali, Alaska	TAPS Pump Station #10	2114	047	317	11/3/2002	7.9	SS	2.7	D – 329	0.32	23.9	40.00	2.3, 3.2	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM5	Kobe, Japan	KJMA	1106	000	090	1/16/1995	6.9	SS	1.0	D – 312	0.71	8.9	16.00	0.8 - 1.1	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM6	Chi-Chi, Taiwan	TCU089	1521	090 (FN)	000 (FP)	9/20/1999	7.62	RV/OBL	8.9	C – 553	0.29	24.5	11.43	n/a	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM7	Darfield, New Zealand	DFHS	6893	163	253	9/3/2010	7	SS	11.9	D – 344	0.45	21.1	6.15	n/a	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM8	El Mayor-Cucapah	Michoacan de Ocampo	5827	000	090	4/4/2010	7.2	SS	15.9	D – 242	0.43	33.6	16.00	n/a	H1 = FN, H2 = FP	H1 & H2 = FP
GM9	Hector Mine	Hector	1787	000	090	10/16/1999	7.13	SS	11.7	C – 685	0.31	10.6	26.67	n/a	H1 = FN, H2 = FP	H1 & H2 = FP
GM10	Kocaeli, Turkey	Yarimca	1176	060	330	8/17/1999	7.51	SS	4.8	D – 297	0.31	15.5	11.43	4.4, 4.9, 7.7	H1 = FN, H2 = FP	H1 & H2 = FP
GM11	Loma Prieta	Gilroy Array #3	767	000	090	10/18/1989	6.93	RV/OBL	12.8	D – 350	0.46	8.5	8.00	2.0, 2.6	H1 = FN, H2 = FP	H1 & H2 = FP

Earthquake Characteristic Key

Earthquake Name	= The common name of earthquake; usually includes the name of the general area or country where earthquake occurred.
Station Name	= The unique name of strong-motion station.
PEER NGA Record No.	= An arbitrary unique number assigned to each strong-motion record in the NGA database for identification purposes.
H1	= The orientation of the H1 component, if orientation is within 5 degrees of fault normal or fault parallel, denoted with (FN) or (FP).
H2	= The orientation of the H2 component, if orientation is within 5 degrees of fault normal or fault parallel, denoted with (FN) or (FP).
Date	= Date of earthquake.
Earthquake Magnitude	= Moment magnitude of earthquake.
Rupture Mechanism	= Mechanism based on rake angle, SS = Strike-slip, RV = Reverse, RV/OBL = Reverse-Oblique, UNSP = Unspecified.
Closest Distance	= Closest distance from the recording site to the ruptured area (km).
NEHRP Site Class/V_{S30}	= The preferred NEHRP site class determined based on the preferred VS30 values (m/s).
PGA	= Peak ground acceleration of the selected record (g).
D_{a5-95}	= Significant duration of the selected record as defined by the 5th to 95th percentile of Arias intensity (sec).
T_L	= Longest usable period, inverse of lowest usable frequency indicated by PEER; minimum of two components listed (sec).
T_P	= Pulse period(s) of record, based on Baker (2007), Hayden et al. (2014), Lu & Panagiotou (2014) and PEER (2014); NA if no pulse in record (sec).
Target Spectrum	= Recommended target MCE spectrum for spectral matching for each component (H1 and H2).

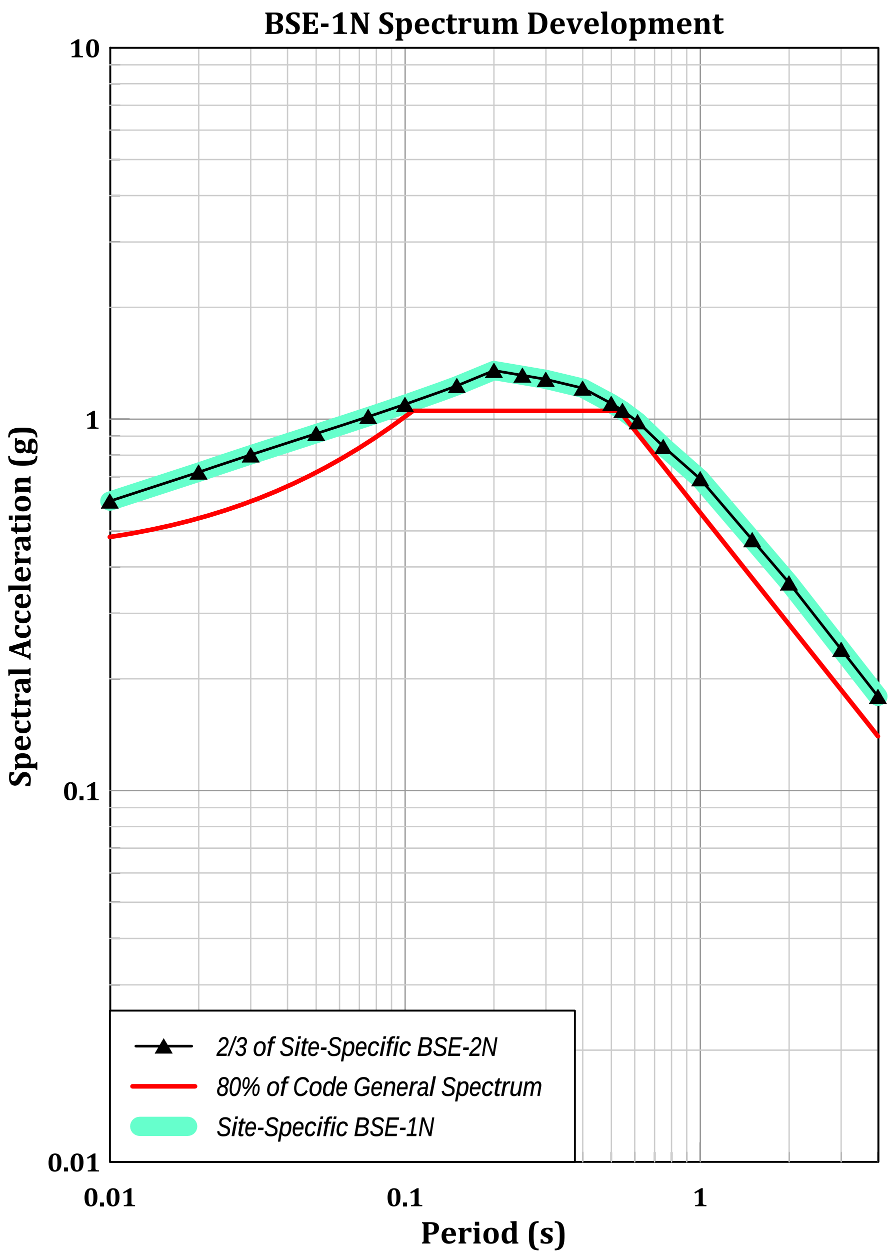


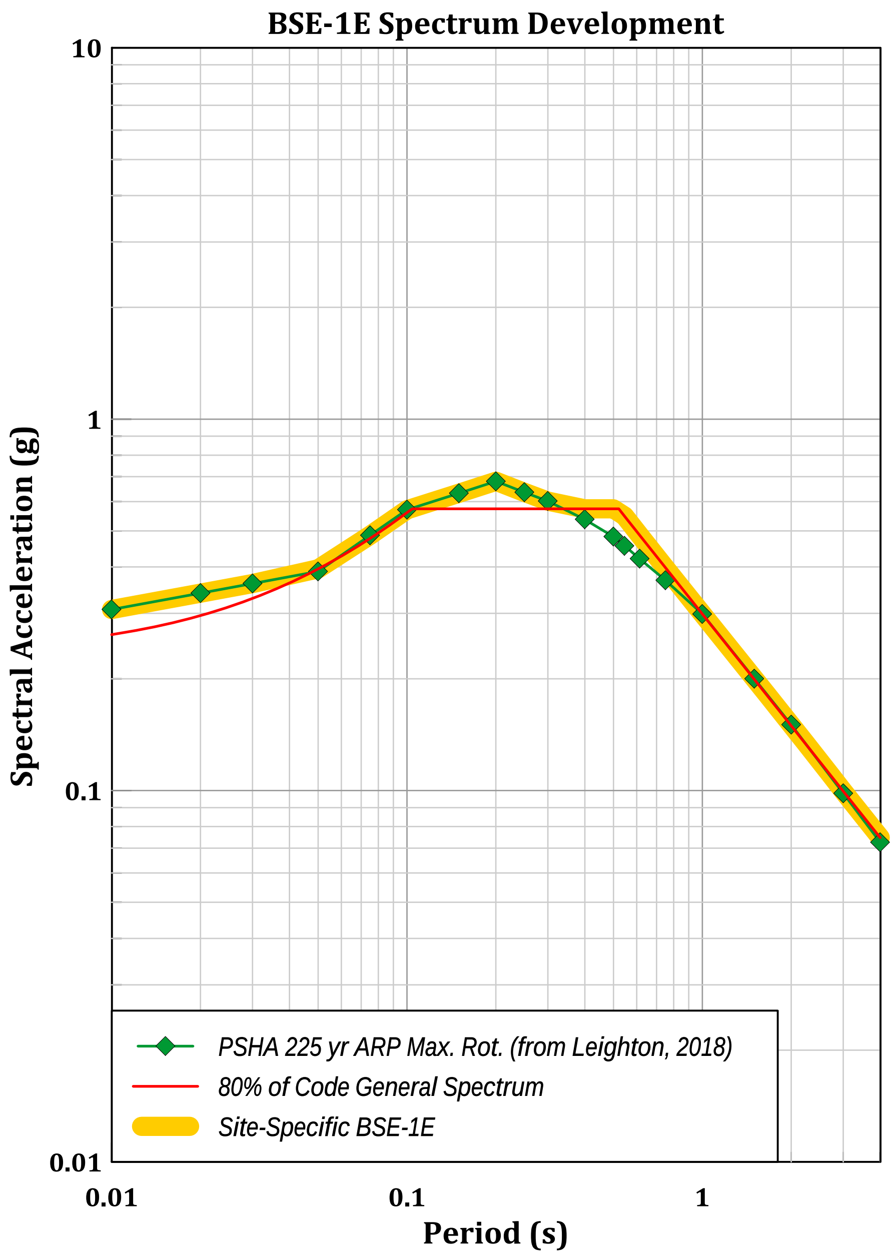
Note: All spectra are for Damping (β) = 5.0% unless otherwise noted.

DEVELOPMENT OF SITE-SPECIFIC BSE-2 SPECTRA

Date: JAN 2019	Project No.: 18079A	Project: MSJC - SEISMIC RETROFIT FOR EXISTING BUILDINGS F & G	Figure 1

GeoPentech



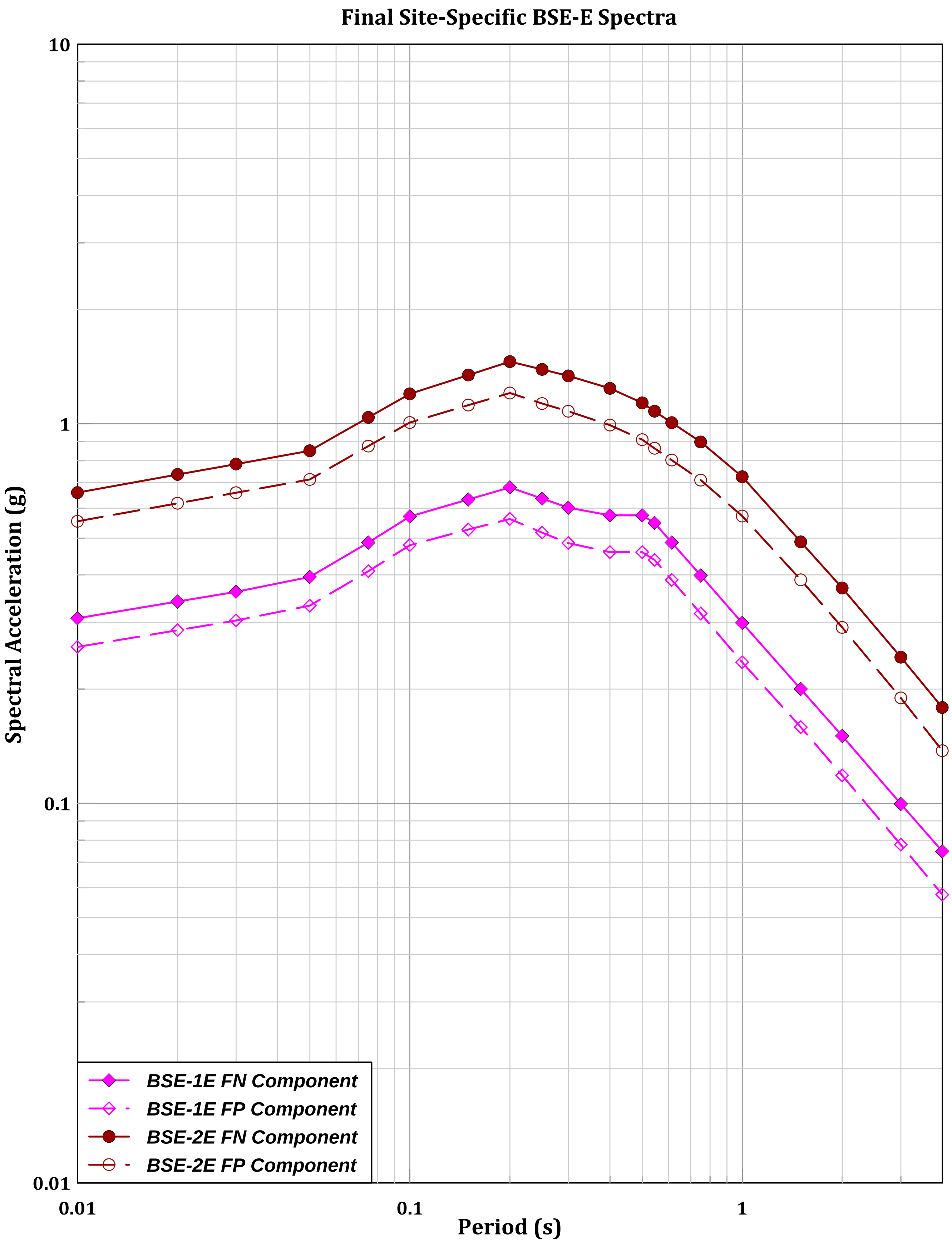


Note: All spectra are for Damping (β) = 5.0% unless otherwise noted.

DEVELOPMENT OF SITE-SPECIFIC BSE-1 SPECTRA

Date: JAN 2019	Project No.: 18079A	Project: MSJC - SEISMIC RETROFIT FOR EXISTING BUILDINGS F & G	Figure 2

GeoPentech

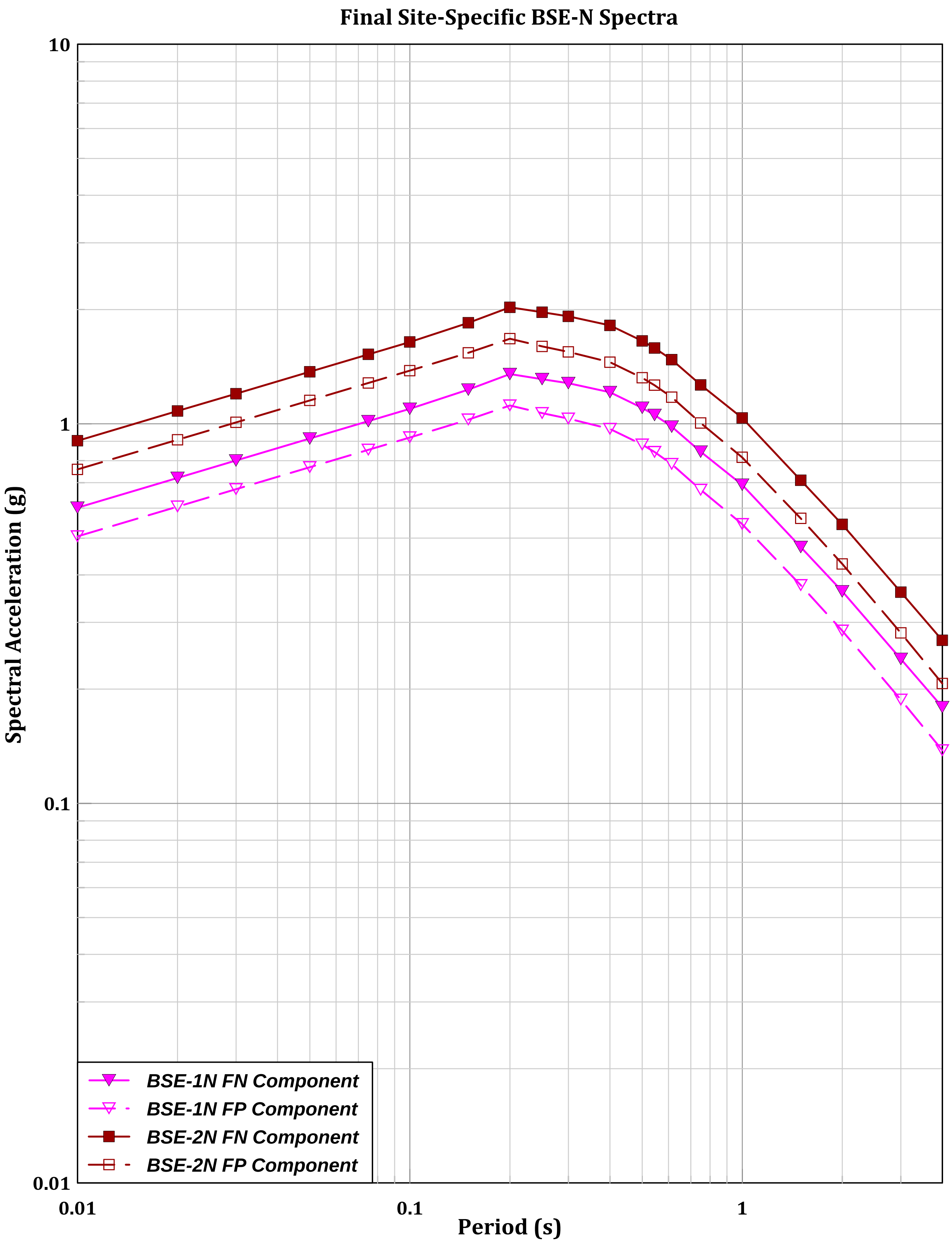


Note: All spectra are for Damping (β) = 5.0% unless otherwise indicated.

FINAL SITE-SPECIFIC BSE-E SPECTRA

Project No.: 18079A	Project: MSJC - SEISMIC RETROFIT FOR EXIST. BLDGS.	Date: JAN 2019	Figure 3

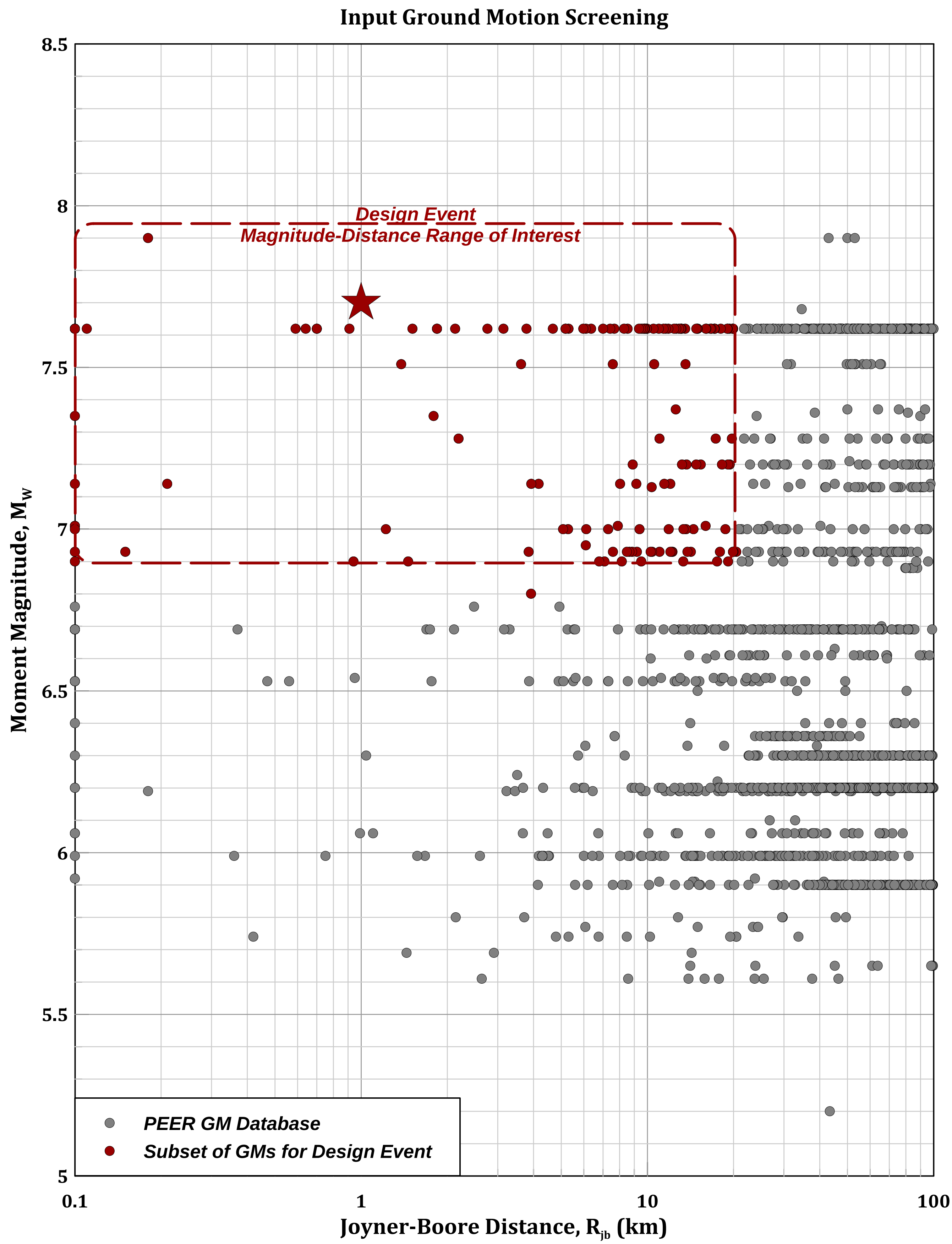
GeoPentech



Note: All spectra are for Damping (β) = 5.0% unless otherwise indicated.

FINAL SITE-SPECIFIC BSE-N SPECTRA			
Project No.: 18079A	Project: MSJC - SEISMIC RETROFIT FOR EXIST. BLDGS.	Date: JAN 2019	Figure 4

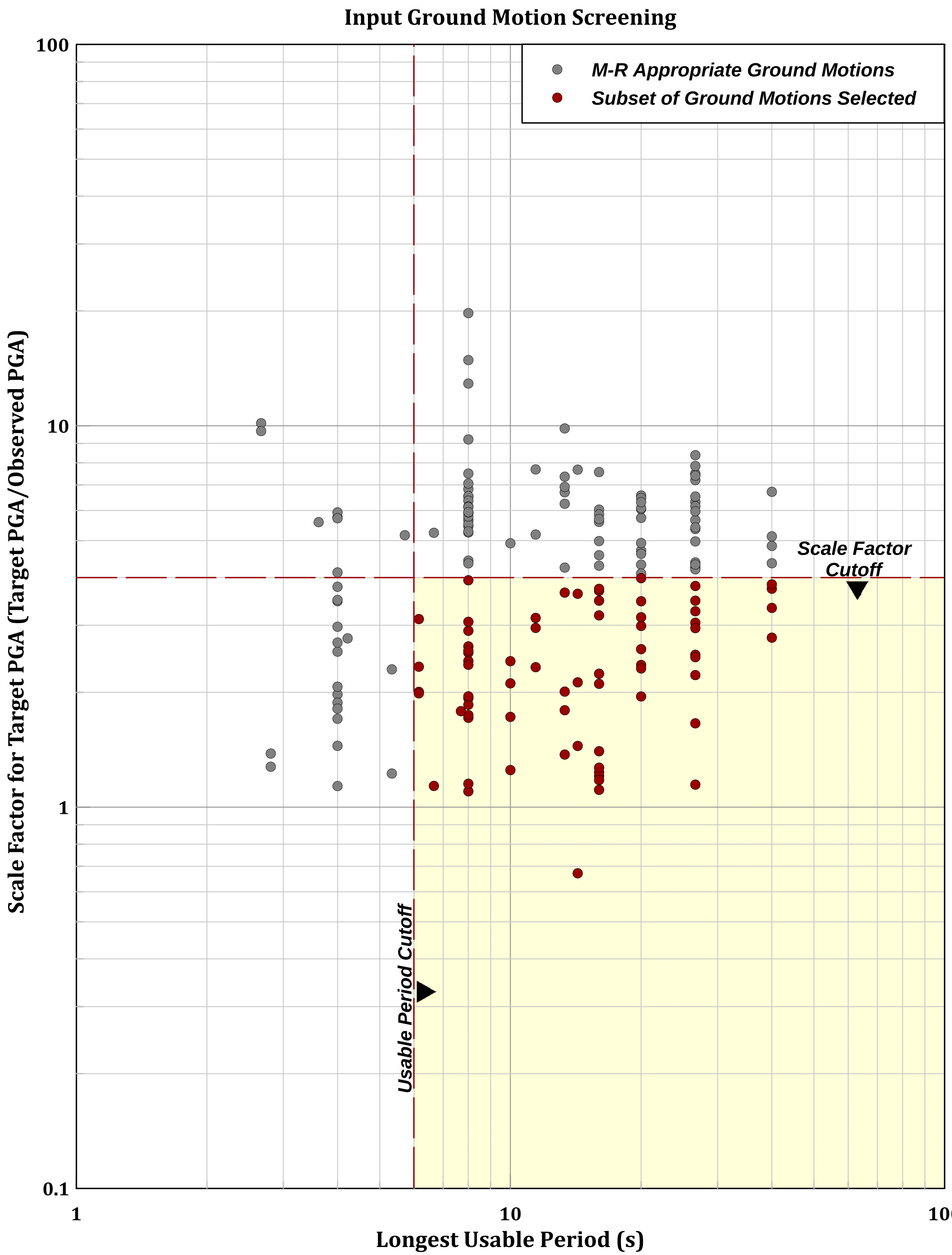
GeoPentech



MAGNITUDE AND DISTANCE SCREENING

Project No.: 18079A	Project: MSJC - SEISMIC RETROFIT FOR EXIST. BLDGS.	Date: JAN 2019	Figure 5

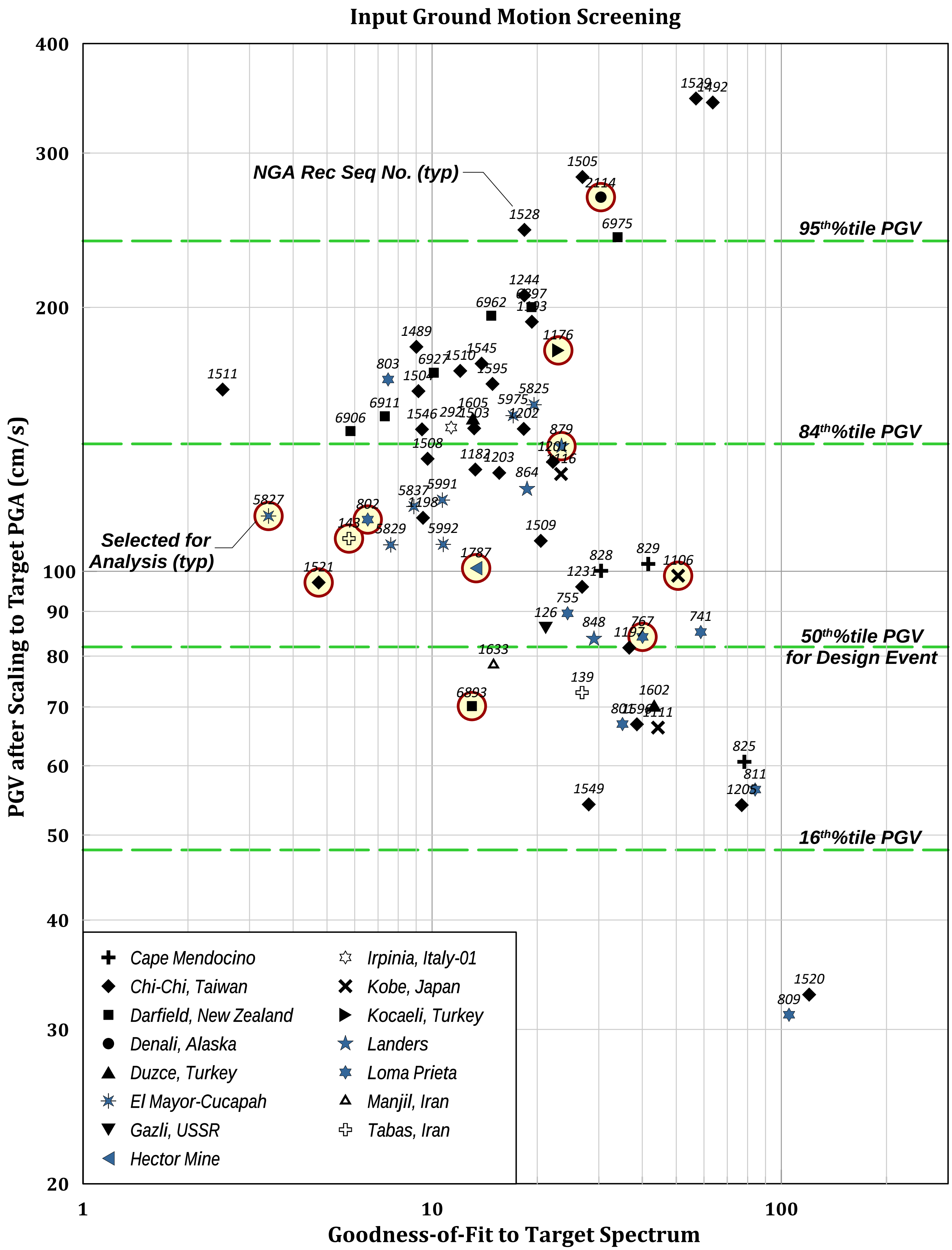
GeoPentech



LONGEST USABLE PERIOD AND SCALE FACTOR SCREENING FOR DESIGN EVENT

Project No.: 18079A	Project: MSJC - SEISMIC RETROFIT FOR EXIST. BLDGS.	Date: JAN 2019	Figure 6

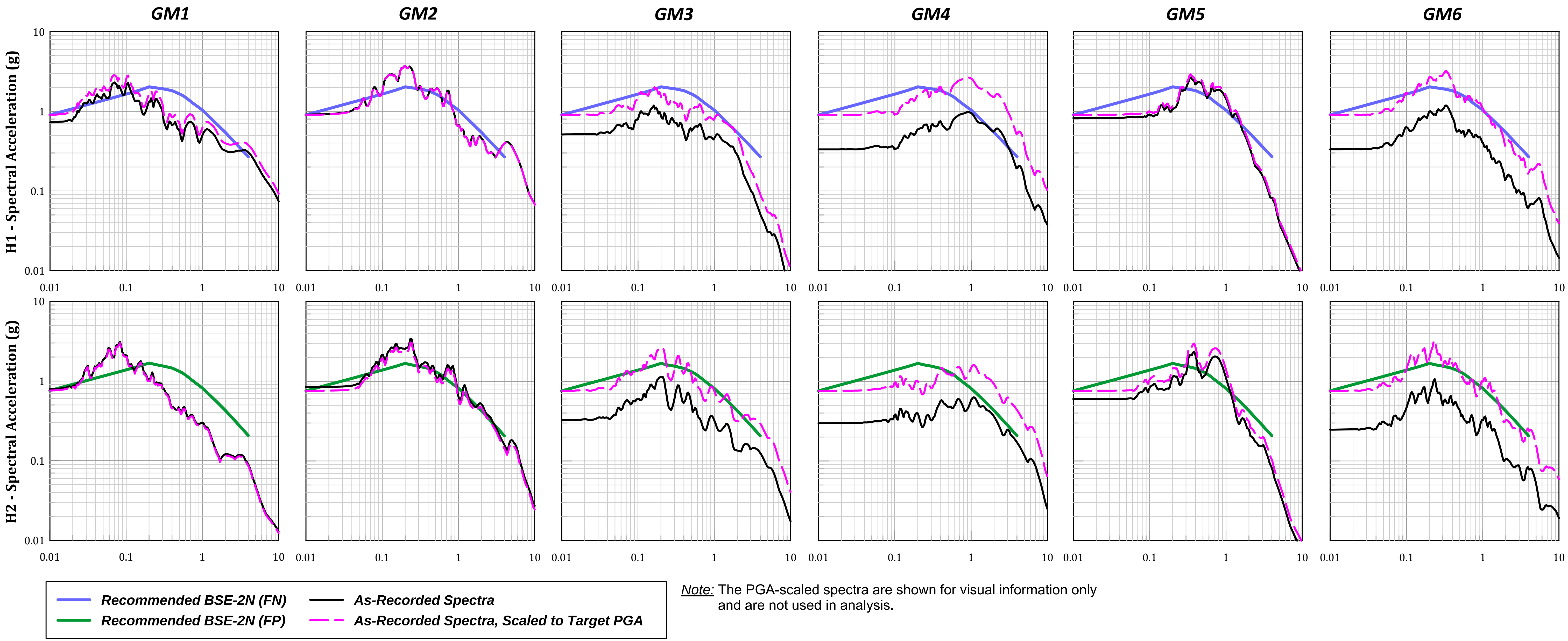
GeoPentech



PGV AND GOODNESS-OF-FIT SCREENING FOR DESIGN EVENT

Project No.: 18079A	Project: MSJC - SEISMIC RETROFIT FOR EXIST. BLDGS.	Date: JAN 2019	Figure 7

GeoPentech



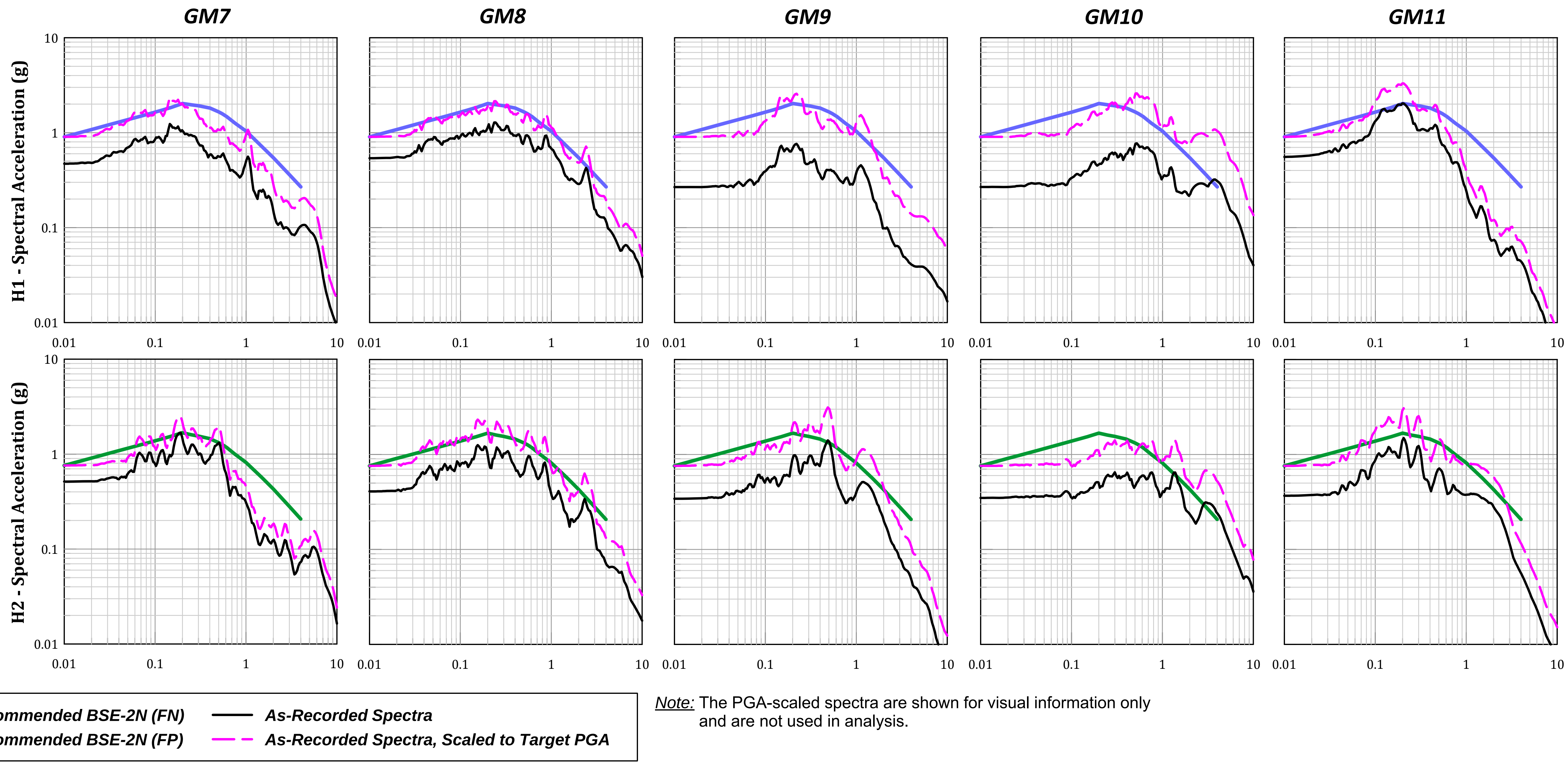
Note: The PGA-scaled spectra are shown for visual information only and are not used in analysis.

Event Seed Time History Records

Analysis Record No.	Earthquake Name	Station Name	PEER NGA Record No.	H1 (deg)	H2 (deg)	Date	Earthquake Magnitude	Rupture Mechanism	Closest Distance (km)	NEHRP Site Class/V_{S30} (m/s)	PGA (g)	D_{a5-95} (sec)	T_L (sec)	T_P (sec)	BSE-2N Target Spectrum	BSE-1E Target Spectrum
GM1	Landers	Lucerne	879	260 (FN)	345 (FP)	6/28/1992	7.28	SS	2.2	C – 685	0.72	13.5	10.00	4.4 - 5.1	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM2	Tabas, Iran	Tabas	143	240 (FN)	330 (FP)	9/16/1978	7.35	RV	2.1	B – 767	0.81	16.3	16.00	4.7, 5.3, 6.2	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM3	Loma Prieta	Saratoga - Aloha Ave	802	000	090	10/18/1989	6.93	RV/OBL	8.5	C – 371	0.38	8.8	8.00	4.5, 6.2	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM4	Denali, Alaska	TAPS Pump Station #10	2114	047	317	11/3/2002	7.9	SS	2.7	D – 329	0.32	23.9	40.00	2.3, 3.2	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM5	Kobe, Japan	KJMA	1106	000	090	1/16/1995	6.9	SS	1.0	D – 312	0.71	8.9	16.00	0.8 - 1.1	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM6	Chi-Chi, Taiwan	TCU089	1521	090 (FN)	000 (FP)	9/20/1999	7.62	RV/OBL	8.9	C – 553	0.29	24.5	11.43	n/a	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM7	Darfield, New Zealand	DFHS	6893	163	253	9/3/2010	7	SS	11.9	D – 344	0.45	21.1	6.15	n/a	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM8	El Mayor-Cucapah	Michoacan de Ocampo	5827	000	090	4/4/2010	7.2	SS	15.9	D – 242	0.43	33.6	16.00	n/a	H1 = FN, H2 = FP	H1 & H2 = FP
GM9	Hector Mine	Hector	1787	000	090	10/16/1999	7.13	SS	11.7	C – 685	0.31	10.6	26.67	n/a	H1 = FN, H2 = FP	H1 & H2 = FP
GM10	Kocaeli, Turkey	Yarimca	1176	060	330	8/17/1999	7.51	SS	4.8	D – 297	0.31	15.5	11.43	4.4, 4.9, 7.7	H1 = FN, H2 = FP	H1 & H2 = FP
GM11	Loma Prieta	Gilroy Array #3	767	000	090	10/18/1989	6.93	RV/OBL	12.8	D – 350	0.46	8.5	8.00	2.0, 2.6	H1 = FN, H2 = FP	H1 & H2 = FP

BSE-2N SEED RESPONSE SPECTRA		
Project: MSJC - SEISMIC RETROFIT		Figure 8a
Project No.: 18079A	Date: JAN 2019	

GeoPentech



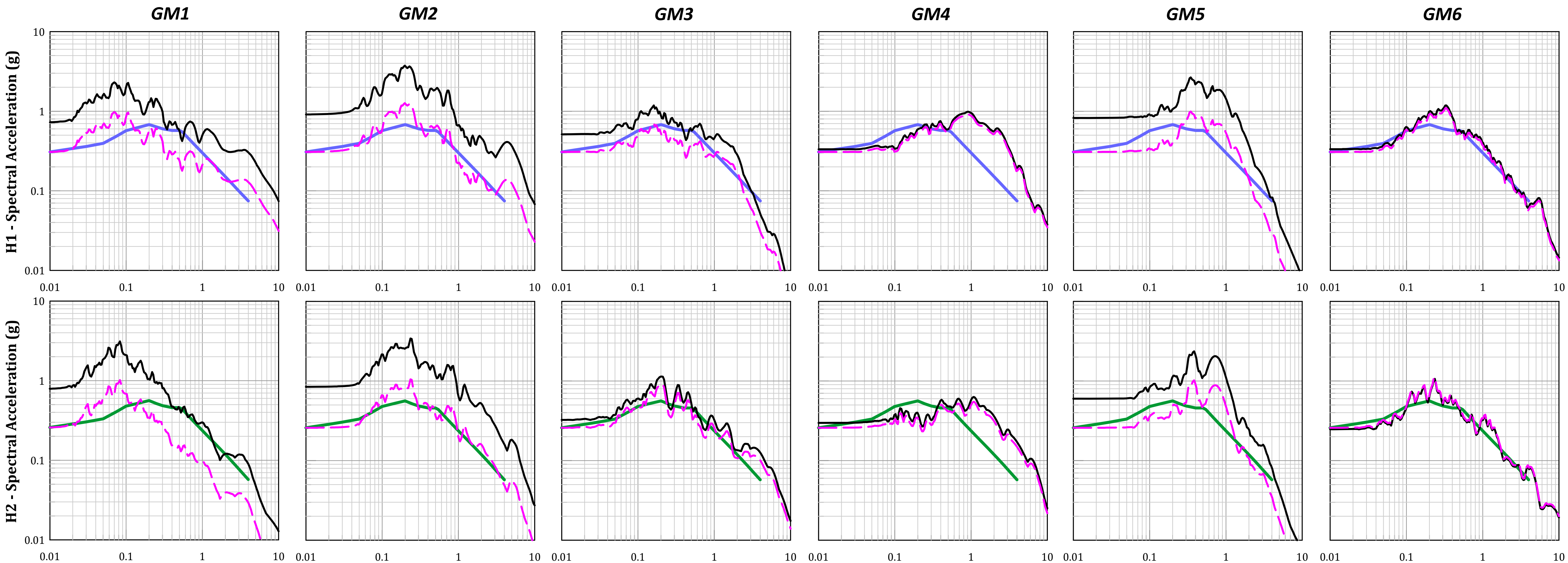
Note: The PGA-scaled spectra are shown for visual information only and are not used in analysis.

Event Seed Time History Records

Analysis Record No.	*Earthquake Name*	*Station Name*	*PEER NGA Record No.*	*H1* (deg)	*H2* (deg)	*Date*	*Earthquake Magnitude*	*Rupture Mechanism*	*Closest Distance* (km)	*NEHRP Site Class/V_{S30}* (m/s)	*PGA* (g)	*D_{a5-95}* (sec)	*T_L* (sec)	*T_P* (sec)	*BSE-2N Target Spectrum*	*BSE-1E Target Spectrum*
GM1	Landers	Lucerne	879	260 (FN)	345 (FP)	6/28/1992	7.28	SS	2.2	C – 685	0.72	13.5	10.00	4.4 - 5.1	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM2	Tabas, Iran	Tabas	143	240 (FN)	330 (FP)	9/16/1978	7.35	RV	2.1	B – 767	0.81	16.3	16.00	4.7, 5.3, 6.2	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM3	Loma Prieta	Saratoga - Aloha Ave	802	000	090	10/18/1989	6.93	RV/OBL	8.5	C – 371	0.38	8.8	8.00	4.5, 6.2	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM4	Denali, Alaska	TAPS Pump Station #10	2114	047	317	11/3/2002	7.9	SS	2.7	D – 329	0.32	23.9	40.00	2.3, 3.2	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM5	Kobe, Japan	KJMA	1106	000	090	1/16/1995	6.9	SS	1.0	D – 312	0.71	8.9	16.00	0.8 - 1.1	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM6	Chi-Chi, Taiwan	TCU089	1521	090 (FN)	000 (FP)	9/20/1999	7.62	RV/OBL	8.9	C – 553	0.29	24.5	11.43	n/a	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM7	Darfield, New Zealand	DFHS	6893	163	253	9/3/2010	7	SS	11.9	D – 344	0.45	21.1	6.15	n/a	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM8	El Mayor-Cucapah	Michoacan de Ocampo	5827	000	090	4/4/2010	7.2	SS	15.9	D – 242	0.43	33.6	16.00	n/a	H1 = FN, H2 = FP	H1 & H2 = FP
GM9	Hector Mine	Hector	1787	000	090	10/16/1999	7.13	SS	11.7	C – 685	0.31	10.6	26.67	n/a	H1 = FN, H2 = FP	H1 & H2 = FP
GM10	Kocaeli, Turkey	Yarimca	1176	060	330	8/17/1999	7.51	SS	4.8	D – 297	0.31	15.5	11.43	4.4, 4.9, 7.7	H1 = FN, H2 = FP	H1 & H2 = FP
GM11	Loma Prieta	Gilroy Array #3	767	000	090	10/18/1989	6.93	RV/OBL	12.8	D – 350	0.46	8.5	8.00	2.0, 2.6	H1 = FN, H2 = FP	H1 & H2 = FP

BSE-2N SEED RESPONSE SPECTRA		
Project: MSJC - SEISMIC RETROFIT		Figure 8b
Project No.: 18079A	Date: JAN 2019	

GeoPentech



Recommended BSE-1E (FN)
Recommended BSE-1E (FP)
As-Recorded Spectra
As-Recorded Spectra, Scaled to Target PGA

Note: The PGA-scaled spectra are shown for visual information only and are not used in analysis.

Event Seed Time History Records

Analysis Record No.	Earthquake Name	Station Name	PEER NGA Record No.	H1 (deg)	H2 (deg)	Date	Earthquake Magnitude	Rupture Mechanism	Closest Distance (km)	NEHRP Site Class/V_{S30} (m/s)	PGA (g)	D_{a5-95} (sec)	T_L (sec)	T_P (sec)	BSE-2N Target Spectrum	BSE-1E Target Spectrum
GM1	Landers	Lucerne	879	260 (FN)	345 (FP)	6/28/1992	7.28	SS	2.2	C – 685	0.72	13.5	10.00	4.4 - 5.1	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM2	Tabas, Iran	Tabas	143	240 (FN)	330 (FP)	9/16/1978	7.35	RV	2.1	B – 767	0.81	16.3	16.00	4.7, 5.3, 6.2	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM3	Loma Prieta	Saratoga - Aloha Ave	802	000	090	10/18/1989	6.93	RV/OBL	8.5	C – 371	0.38	8.8	8.00	4.5, 6.2	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM4	Denali, Alaska	TAPS Pump Station #10	2114	047	317	11/3/2002	7.9	SS	2.7	D – 329	0.32	23.9	40.00	2.3, 3.2	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM5	Kobe, Japan	KJMA	1106	000	090	1/16/1995	6.9	SS	1.0	D – 312	0.71	8.9	16.00	0.8 - 1.1	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM6	Chi-Chi, Taiwan	TCU089	1521	090 (FN)	000 (FP)	9/20/1999	7.62	RV/OBL	8.9	C – 553	0.29	24.5	11.43	n/a	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM7	Darfield, New Zealand	DFHS	6893	163	253	9/3/2010	7	SS	11.9	D – 344	0.45	21.1	6.15	n/a	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM8	El Mayor-Cucapah	Michoacan de Ocampo	5827	000	090	4/4/2010	7.2	SS	15.9	D – 242	0.43	33.6	16.00	n/a	H1 = FN, H2 = FP	H1 & H2 = FP
GM9	Hector Mine	Hector	1787	000	090	10/16/1999	7.13	SS	11.7	C – 685	0.31	10.6	26.67	n/a	H1 = FN, H2 = FP	H1 & H2 = FP
GM10	Kocaeli, Turkey	Yarimca	1176	060	330	8/17/1999	7.51	SS	4.8	D – 297	0.31	15.5	11.43	4.4, 4.9, 7.7	H1 = FN, H2 = FP	H1 & H2 = FP
GM11	Loma Prieta	Gilroy Array #3	767	000	090	10/18/1989	6.93	RV/OBL	12.8	D – 350	0.46	8.5	8.00	2.0, 2.6	H1 = FN, H2 = FP	H1 & H2 = FP

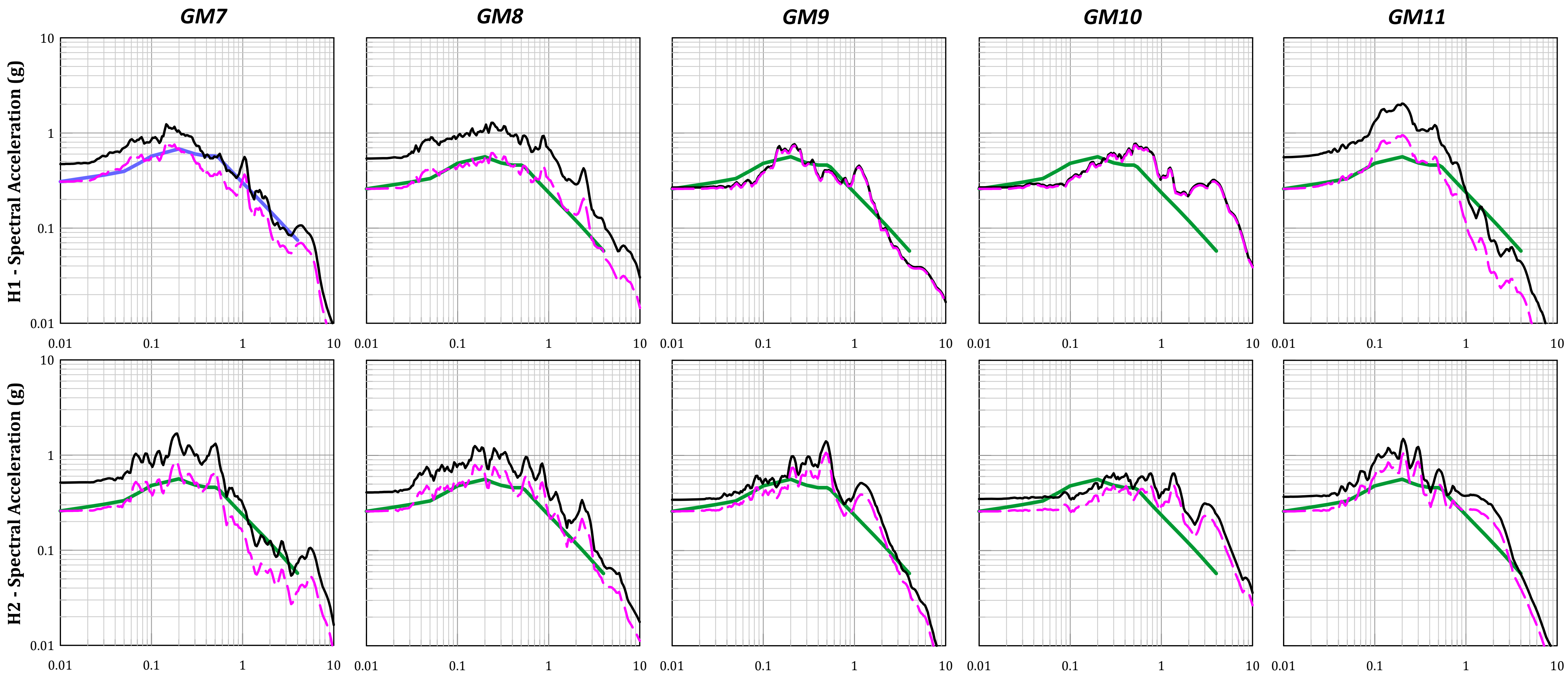
BSE-1E SEED RESPONSE SPECTRA

Project: MSJC - SEISMIC RETROFIT

Project No.: 18079A | Date: JAN 2019

Figure 9a

GeoPentech



Recommended BSE-1E (FN) *As-Recorded Spectra*

Recommended BSE-1E (FP) *As-Recorded Spectra, Scaled to Target PGA*

Note: The PGA-scaled spectra are shown for visual information only and are not used in analysis.

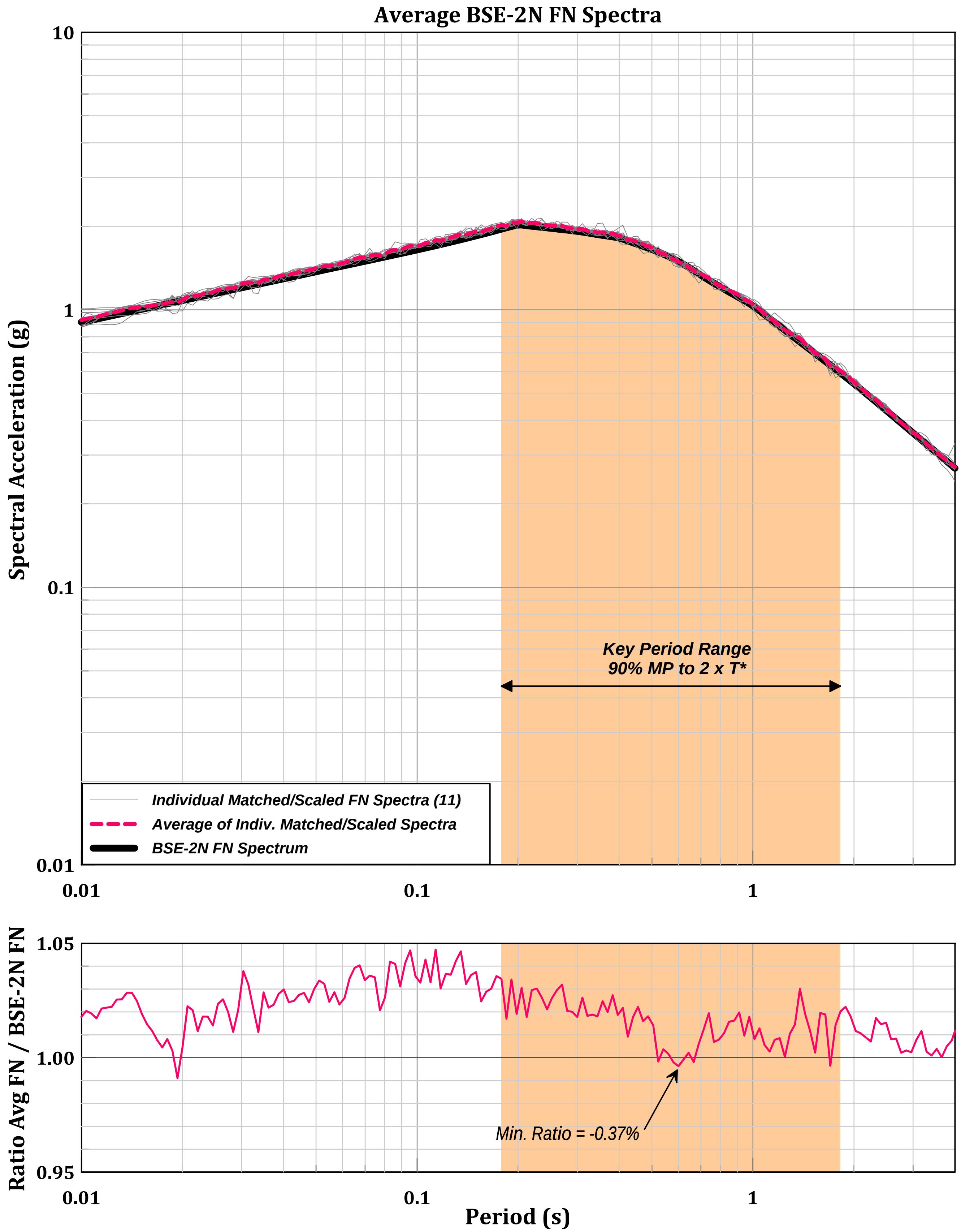
Event Seed Time History Records

Analysis Record No.	Earthquake Name	Station Name	PEER NGA Record No.	H1 (deg)	H2 (deg)	Date	Earthquake Magnitude	Rupture Mechanism	Closest Distance (km)	NEHRP Site Class/V_{S30} (m/s)	PGA (g)	D_{a5-95} (sec)	T_L (sec)	T_P (sec)	BSE-2N Target Spectrum	BSE-1E Target Spectrum
GM1	Landers	Lucerne	879	260 (FN)	345 (FP)	6/28/1992	7.28	SS	2.2	C – 685	0.72	13.5	10.00	4.4 - 5.1	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM2	Tabas, Iran	Tabas	143	240 (FN)	330 (FP)	9/16/1978	7.35	RV	2.1	B – 767	0.81	16.3	16.00	4.7, 5.3, 6.2	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM3	Loma Prieta	Saratoga - Aloha Ave	802	000	090	10/18/1989	6.93	RV/OBL	8.5	C – 371	0.38	8.8	8.00	4.5, 6.2	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM4	Denali, Alaska	TAPS Pump Station #10	2114	047	317	11/3/2002	7.9	SS	2.7	D – 329	0.32	23.9	40.00	2.3, 3.2	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM5	Kobe, Japan	KJMA	1106	000	090	1/16/1995	6.9	SS	1.0	D – 312	0.71	8.9	16.00	0.8 - 1.1	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM6	Chi-Chi, Taiwan	TCU089	1521	090 (FN)	000 (FP)	9/20/1999	7.62	RV/OBL	8.9	C – 553	0.29	24.5	11.43	n/a	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM7	Darfield, New Zealand	DFHS	6893	163	253	9/3/2010	7	SS	11.9	D – 344	0.45	21.1	6.15	n/a	H1 = FN, H2 = FP	H1 = FN, H2 = FP
GM8	El Mayor-Cucapah	Michoacan de Ocampo	5827	000	090	4/4/2010	7.2	SS	15.9	D – 242	0.43	33.6	16.00	n/a	H1 = FN, H2 = FP	H1 & H2 = FP
GM9	Hector Mine	Hector	1787	000	090	10/16/1999	7.13	SS	11.7	C – 685	0.31	10.6	26.67	n/a	H1 = FN, H2 = FP	H1 & H2 = FP
GM10	Kocaeli, Turkey	Yarimca	1176	060	330	8/17/1999	7.51	SS	4.8	D – 297	0.31	15.5	11.43	4.4, 4.9, 7.7	H1 = FN, H2 = FP	H1 & H2 = FP
GM11	Loma Prieta	Gilroy Array #3	767	000	090	10/18/1989	6.93	RV/OBL	12.8	D – 350	0.46	8.5	8.00	2.0, 2.6	H1 = FN, H2 = FP	H1 & H2 = FP

BSE-1E SEED RESPONSE SPECTRA

Project: MSJC - SEISMIC RETROFIT		Figure 9b
Project No.: 18079A	Date: JAN 2019	

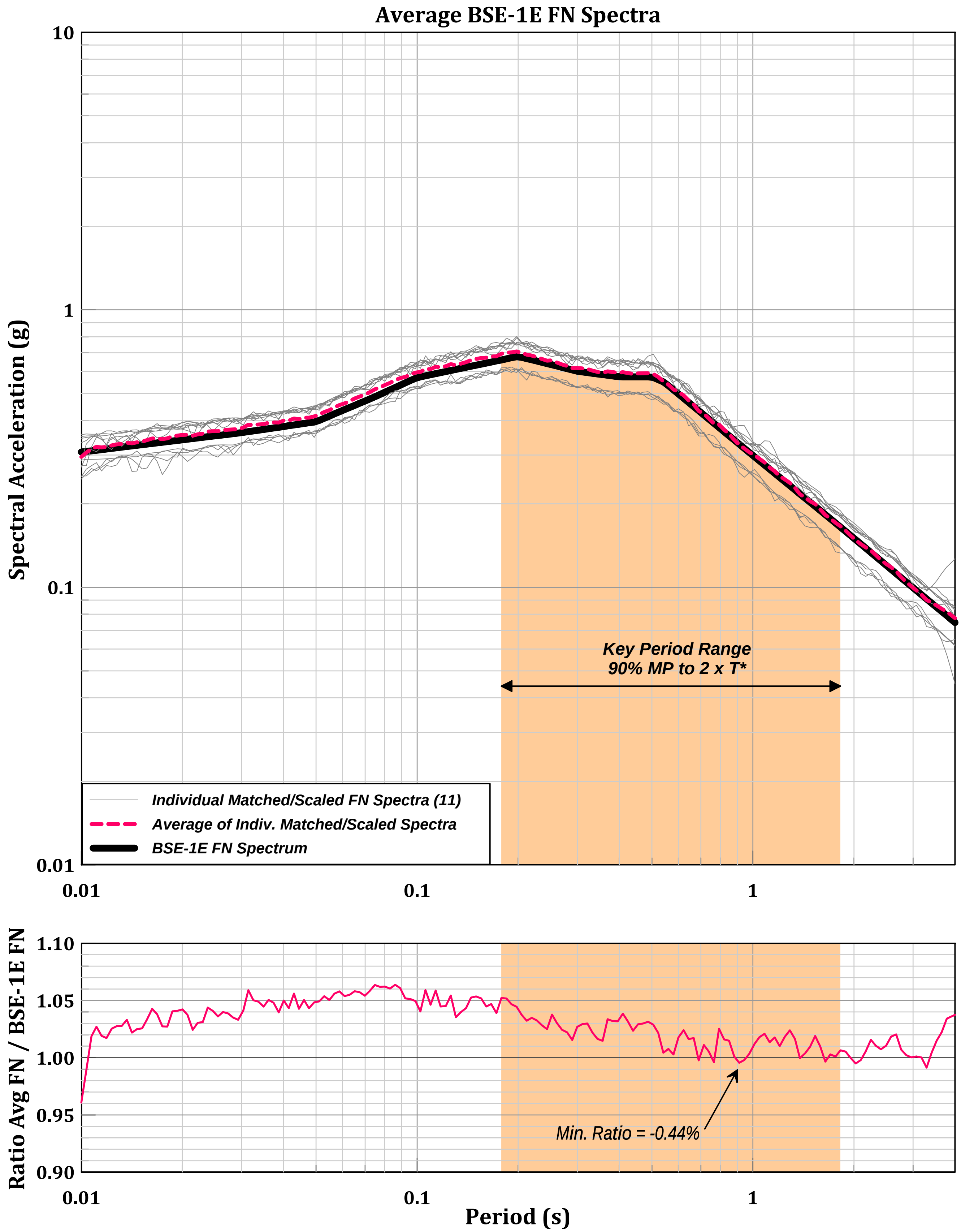
GeoPentech



Note: All spectra are for Damping (β) = 5.0% unless otherwise indicated.

ASCE 41-13 CODE CHECK FOR MATCHED SPECTRA			
Project No.: 18079A	Project: MSJC - SEISMIC RETROFIT FOR EXIST. BLDGS.	Date: JAN 2019	Figure 10

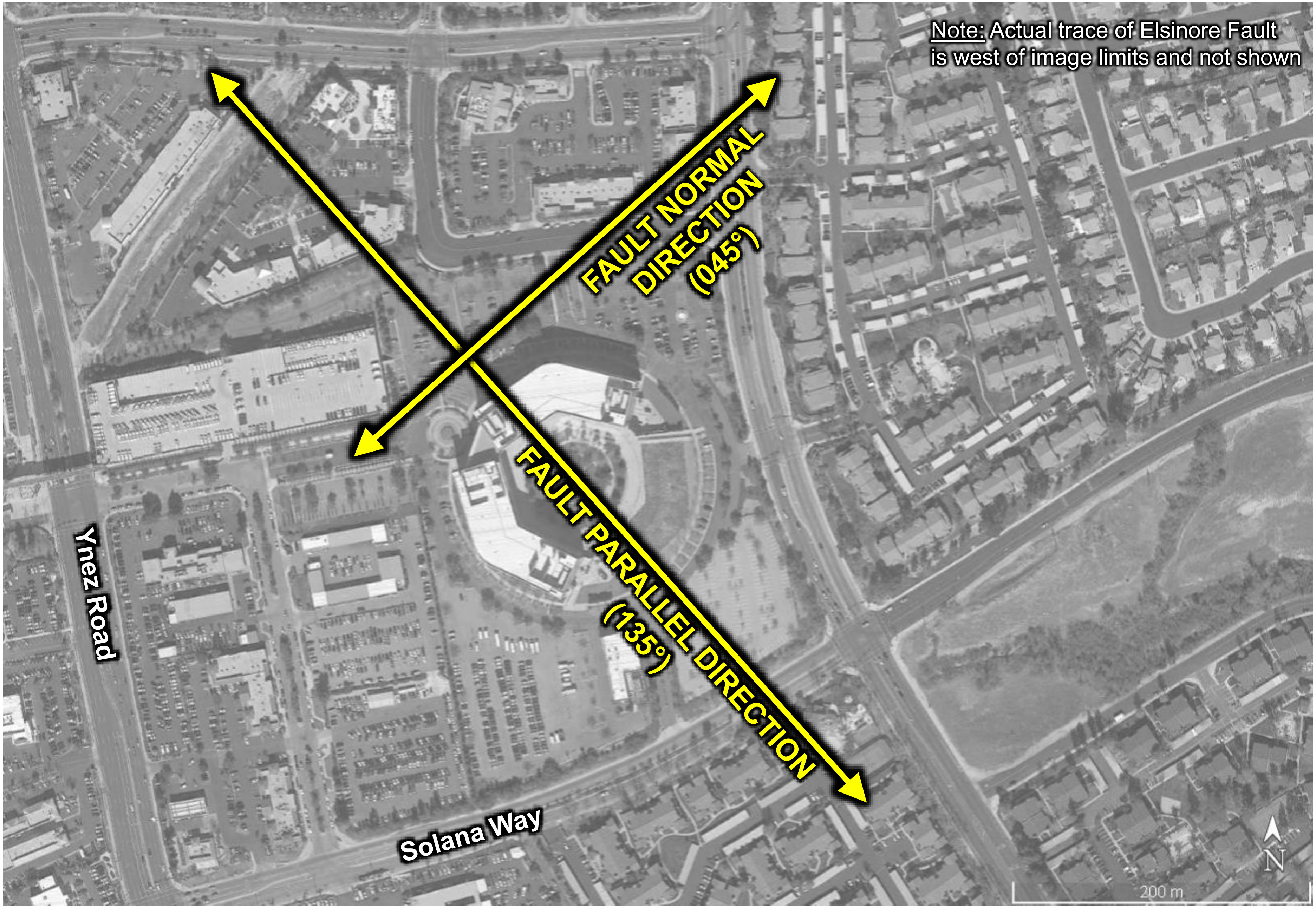
GeoPentech



Note: All spectra are for Damping (β) = 5.0% unless otherwise indicated.

ASCE 41-13 CODE CHECK FOR MATCHED SPECTRA			
Project No.: 18079A	Project: MSJC - SEISMIC RETROFIT FOR EXIST. BLDGS.	Date: JAN 2019	Figure 11

GeoPentech



RECOMMENDED APPLICATION OF HORIZONTAL GROUND MOTION COMPONENT ORIENTATIONS

Date: JAN 2019	Project No.: 18079A	Project: MSJC - SEISMIC RETROFIT FOR EXISTING BUILDINGS F & G	Figure 12

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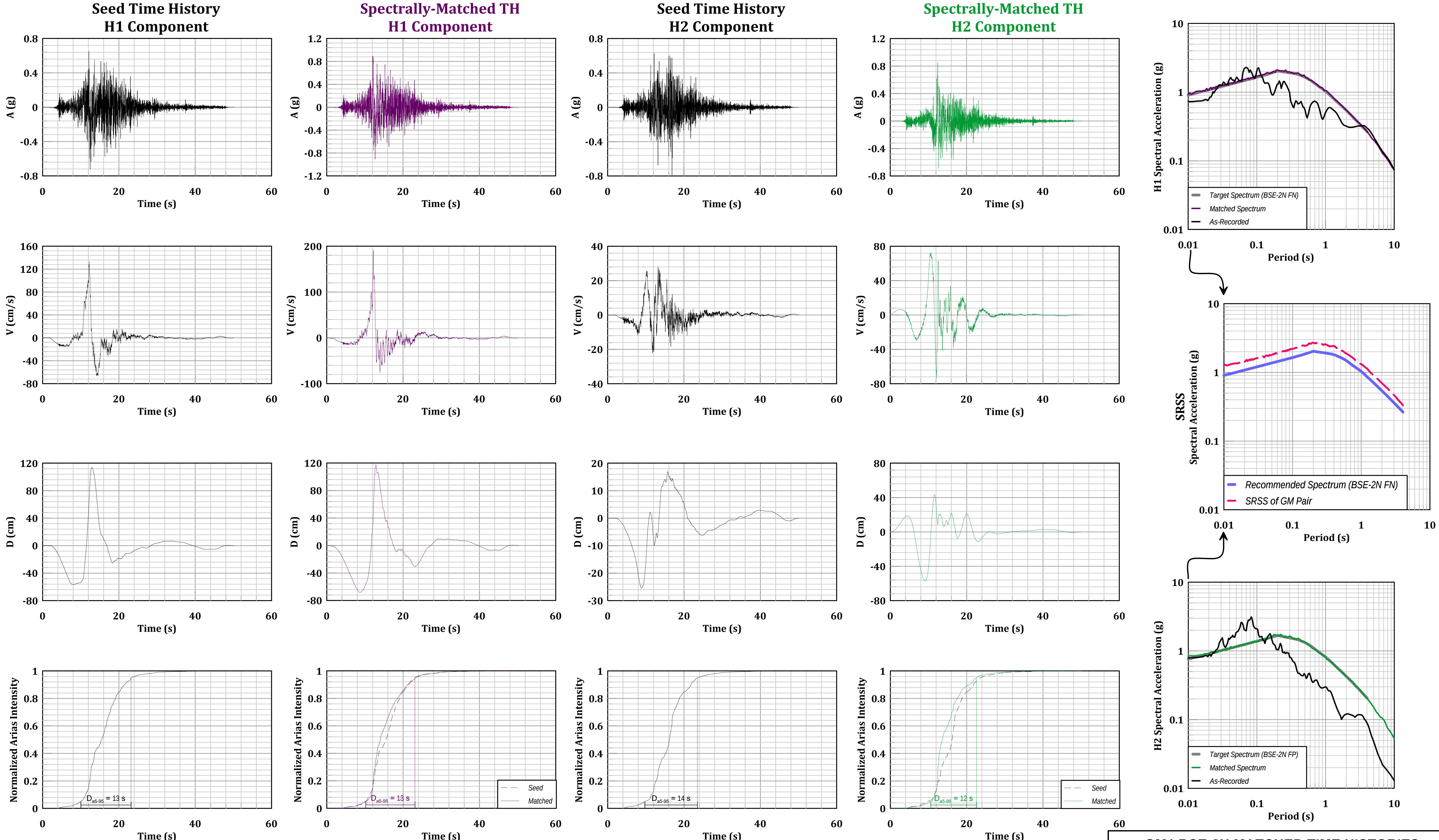
APPENDIX A

Seed & Spectrally-Matched Earthquake Time Histories
BSE-2N Level



GM1: Landers, Lucerne

Note: FN = Fault Normal (max. rotated) component; FP = Fault Parallel component.

GM1 BSE-2N MATCHED TIME HISTORIES		
Project: MSJC - SEISMIC RETROFIT		Figure A-1
Project No.: 18079A	Date: JAN 2019	

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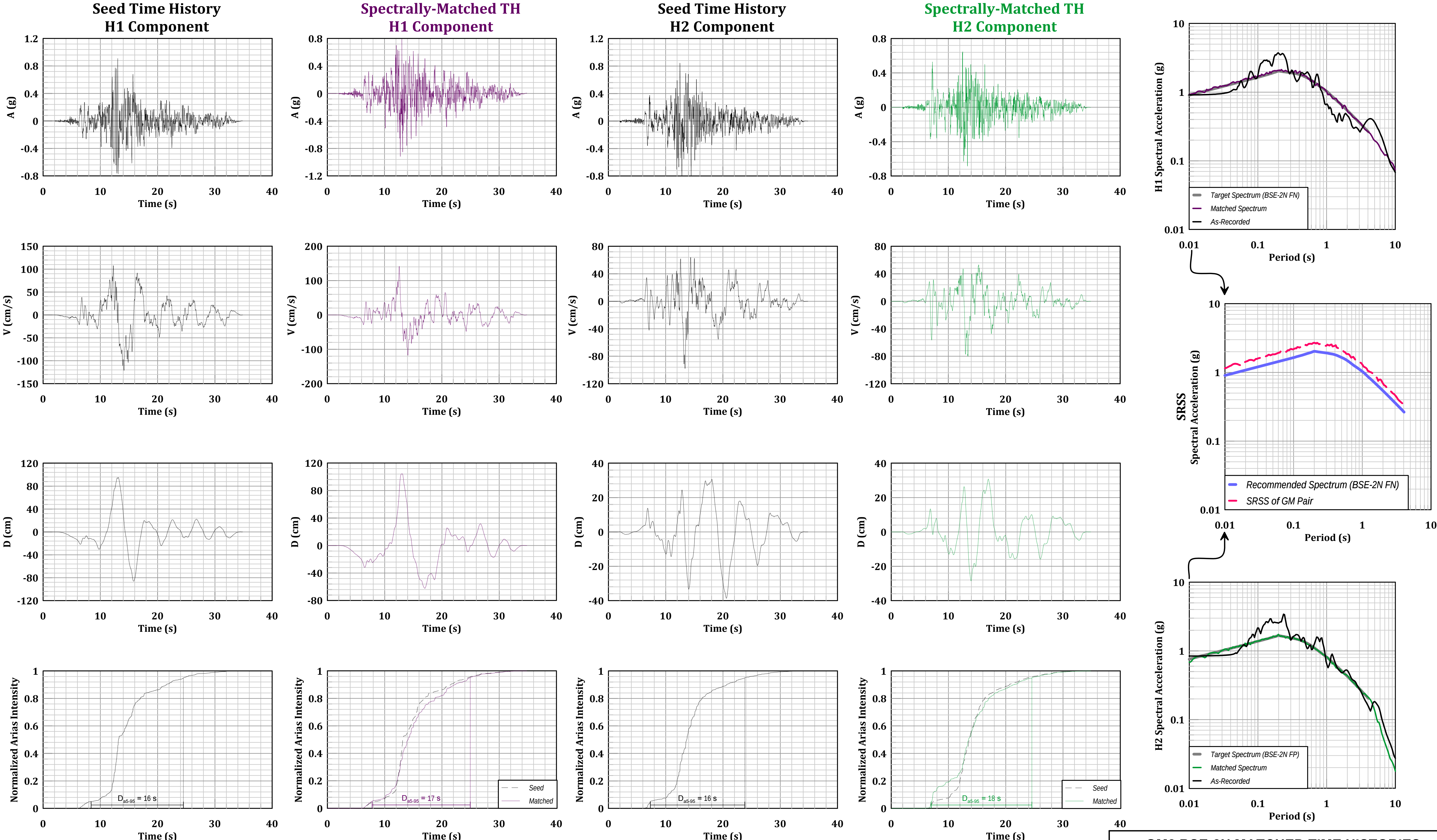
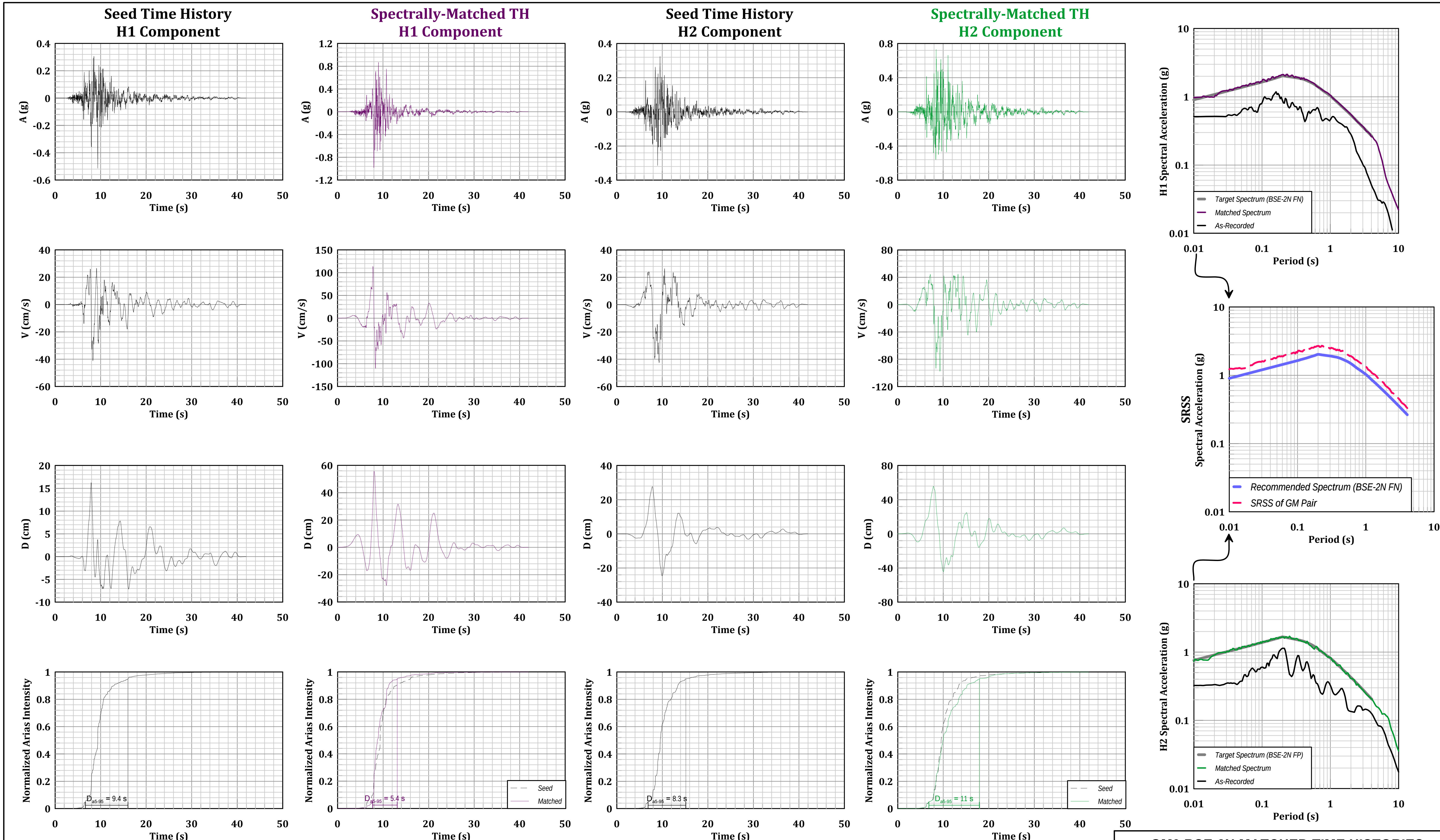


GM2: Tabas, Iran, Tabas

Note: FN = Fault Normal (max. rotated) component; FP = Fault Parallel component.

GM2 BSE-2N MATCHED TIME HISTORIES		
Project: MSJC - SEISMIC RETROFIT		Figure A-2
Project No.: 18079A	Date: JAN 2019	

GeoPentech

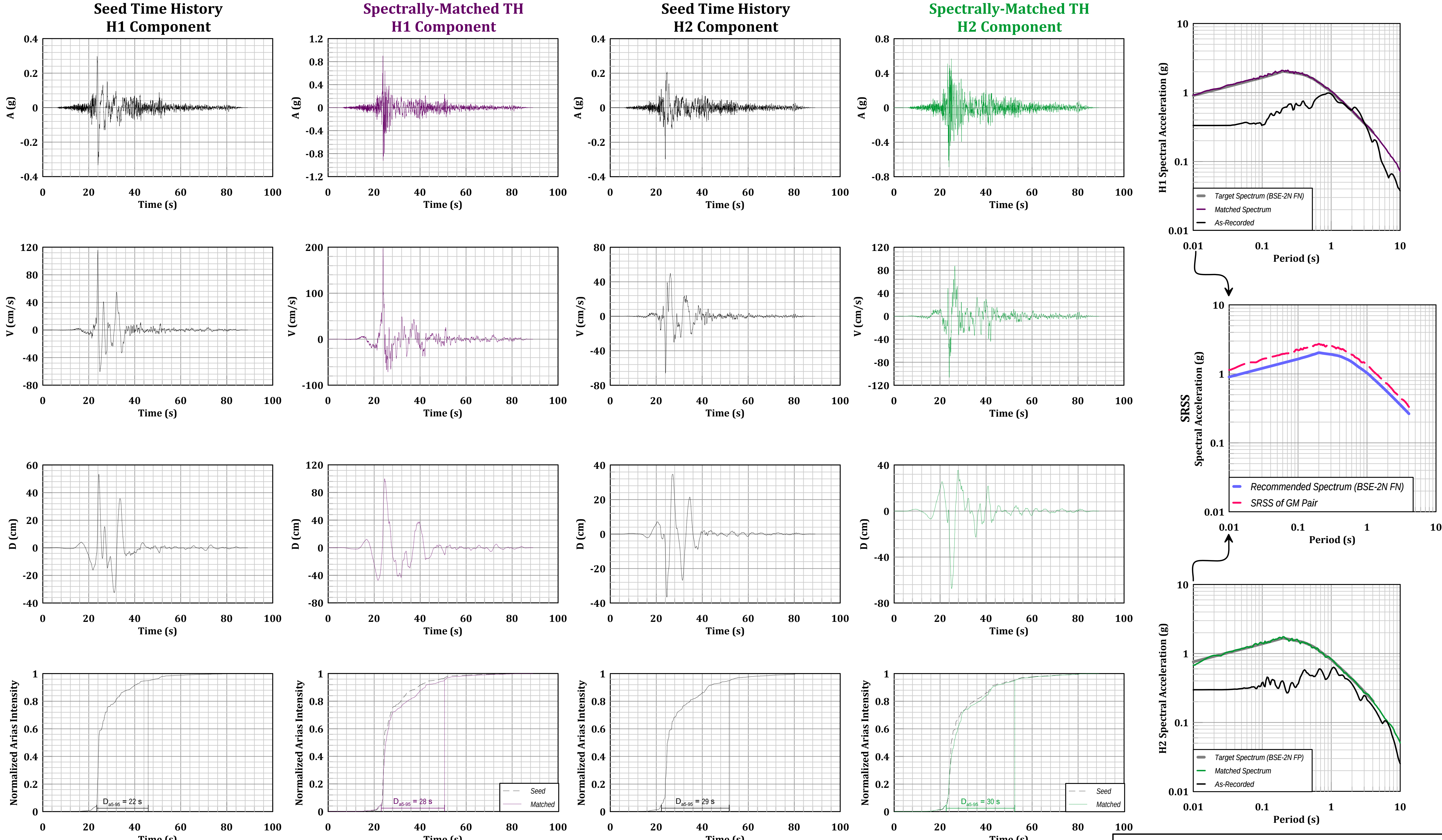


GM3: Loma Prieta, Saratoga - Aloha Ave

Note: FN = Fault Normal (max. rotated) component; FP = Fault Parallel component.

GM3 BSE-2N MATCHED TIME HISTORIES		
Project: MSJC - SEISMIC RETROFIT		Figure A-3
Project No.: 18079A	Date: JAN 2019	

GeoPentech



GM4: Denali, Alaska, TAPS Pump Station #10

Note: FN = Fault Normal (max. rotated) component; FP = Fault Parallel component.

GM4 BSE-2N MATCHED TIME HISTORIES		
Project: MSJC - SEISMIC RETROFIT		Figure A-4
Project No.: 18079A	Date: JAN 2019	

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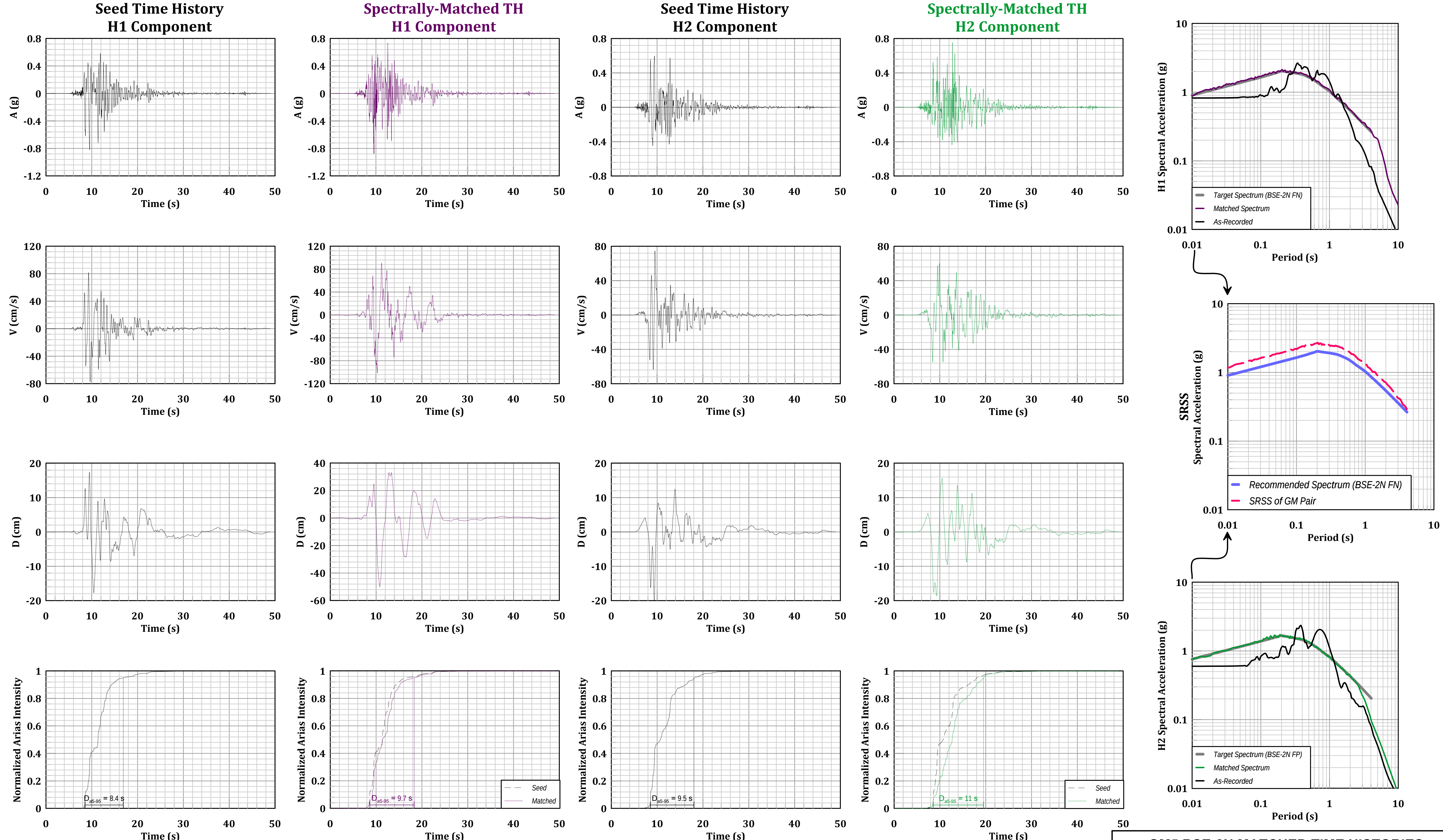
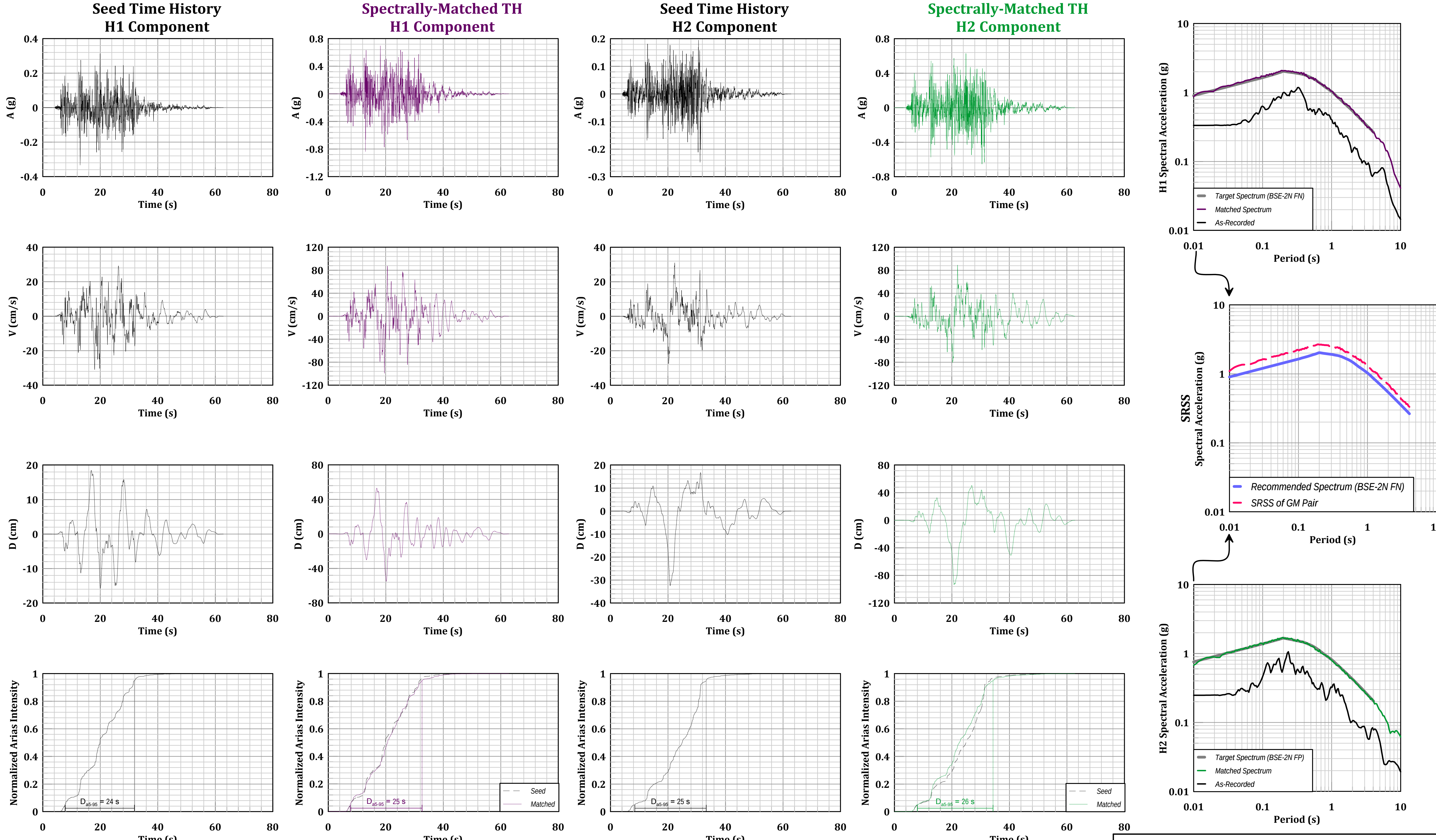


GM5: Kobe, Japan, KJMA

Note: FN = Fault Normal (max. rotated) component; FP = Fault Parallel component.

GM5 BSE-2N MATCHED TIME HISTORIES		
Project: MSJC - SEISMIC RETROFIT		Figure A-5
Project No.: 18079A	Date: JAN 2019	

GeoPentech

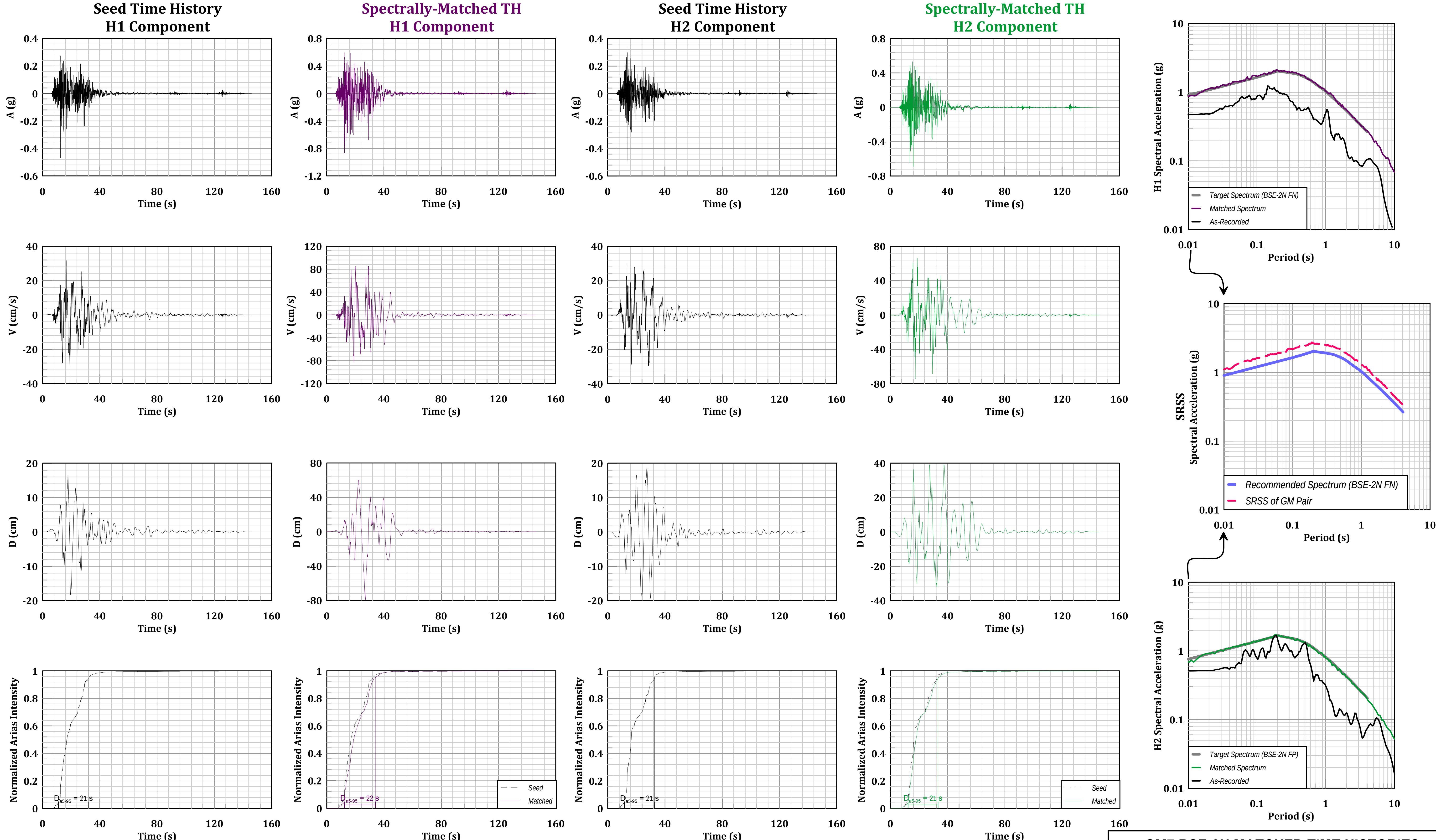


GM6: Chi-Chi, Taiwan, TCU089

Note: FN = Fault Normal (max. rotated) component; FP = Fault Parallel component.

GM6 BSE-2N MATCHED TIME HISTORIES		
Project: MSJC - SEISMIC RETROFIT		Figure A-6
Project No.: 18079A	Date: JAN 2019	

GeoPentech

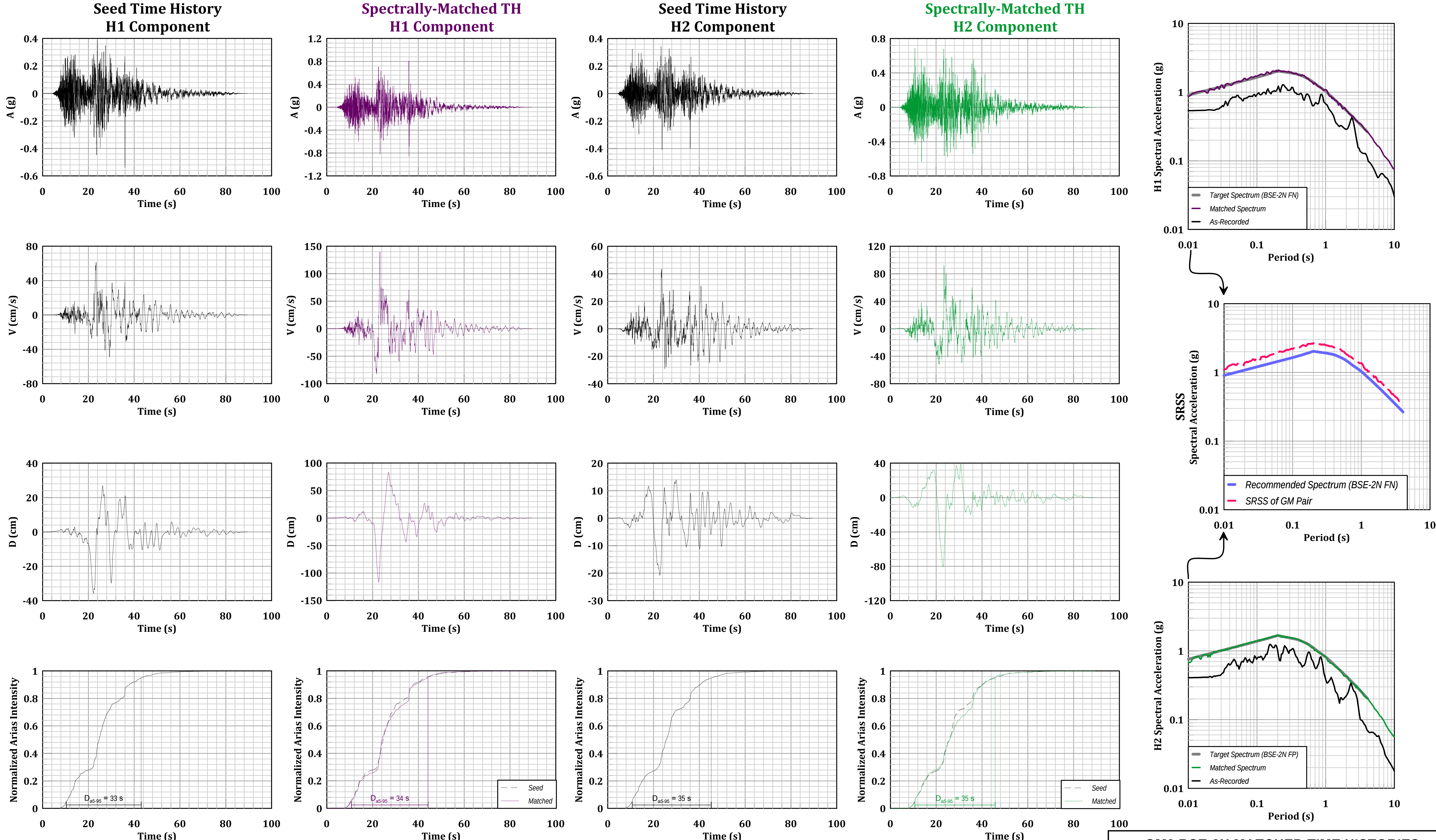


GM7: Darfield, New Zealand, DFHS

Note: FN = Fault Normal (max. rotated) component; FP = Fault Parallel component.

GM7 BSE-2N MATCHED TIME HISTORIES		
Project: MSJC - SEISMIC RETROFIT		Figure A-7
Project No.: 18079A	Date: JAN 2019	

GeoPentech

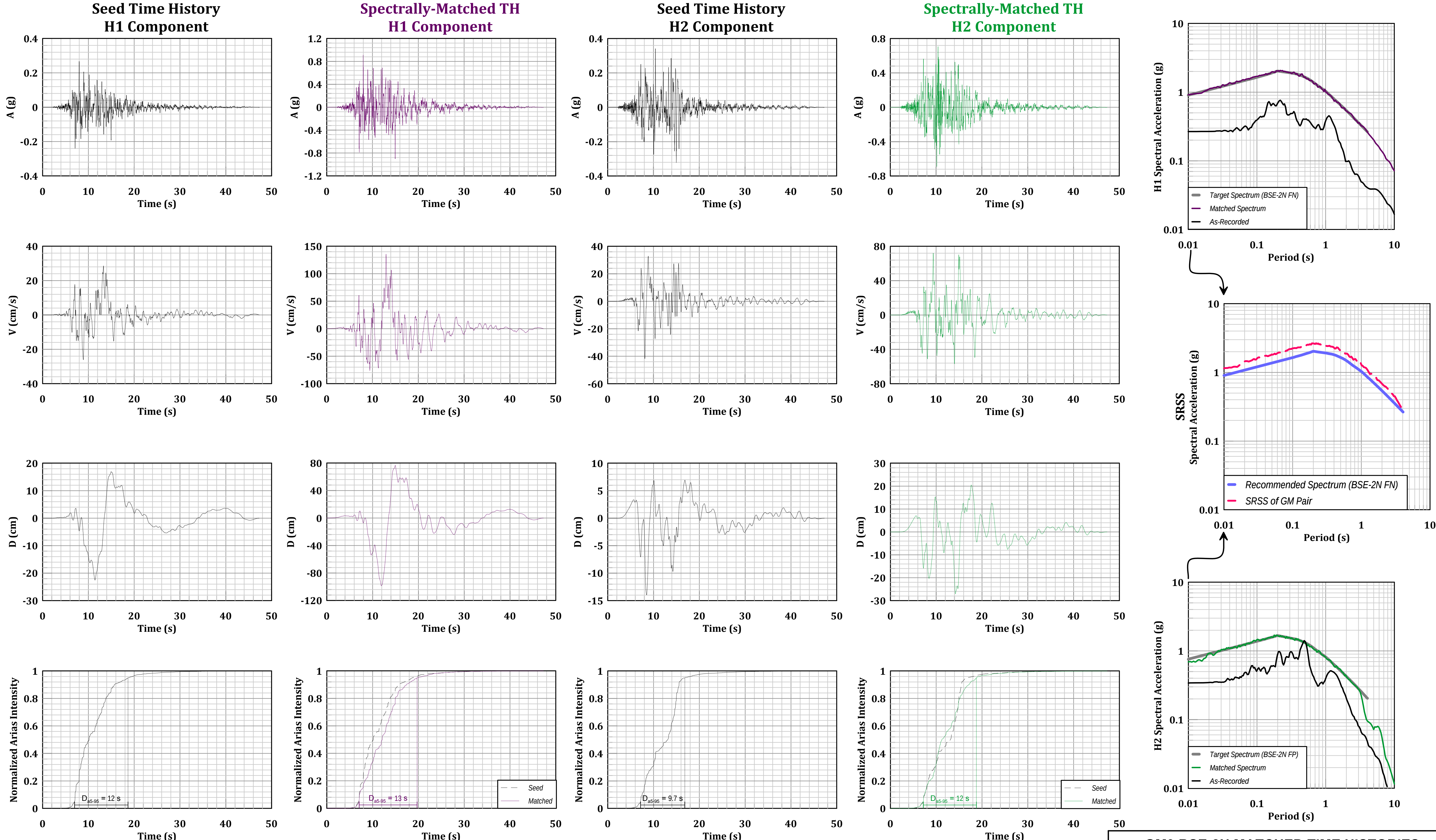


GM8: El Mayor-Cucapah, Michoacan de Ocampo

Note: FN = Fault Normal (max. rotated) component; FP = Fault Parallel component.

GM8 BSE-2N MATCHED TIME HISTORIES		
Project: MSJC - SEISMIC RETROFIT		Figure A-8
Project No.: 18079A	Date: JAN 2019	

GeoPentech

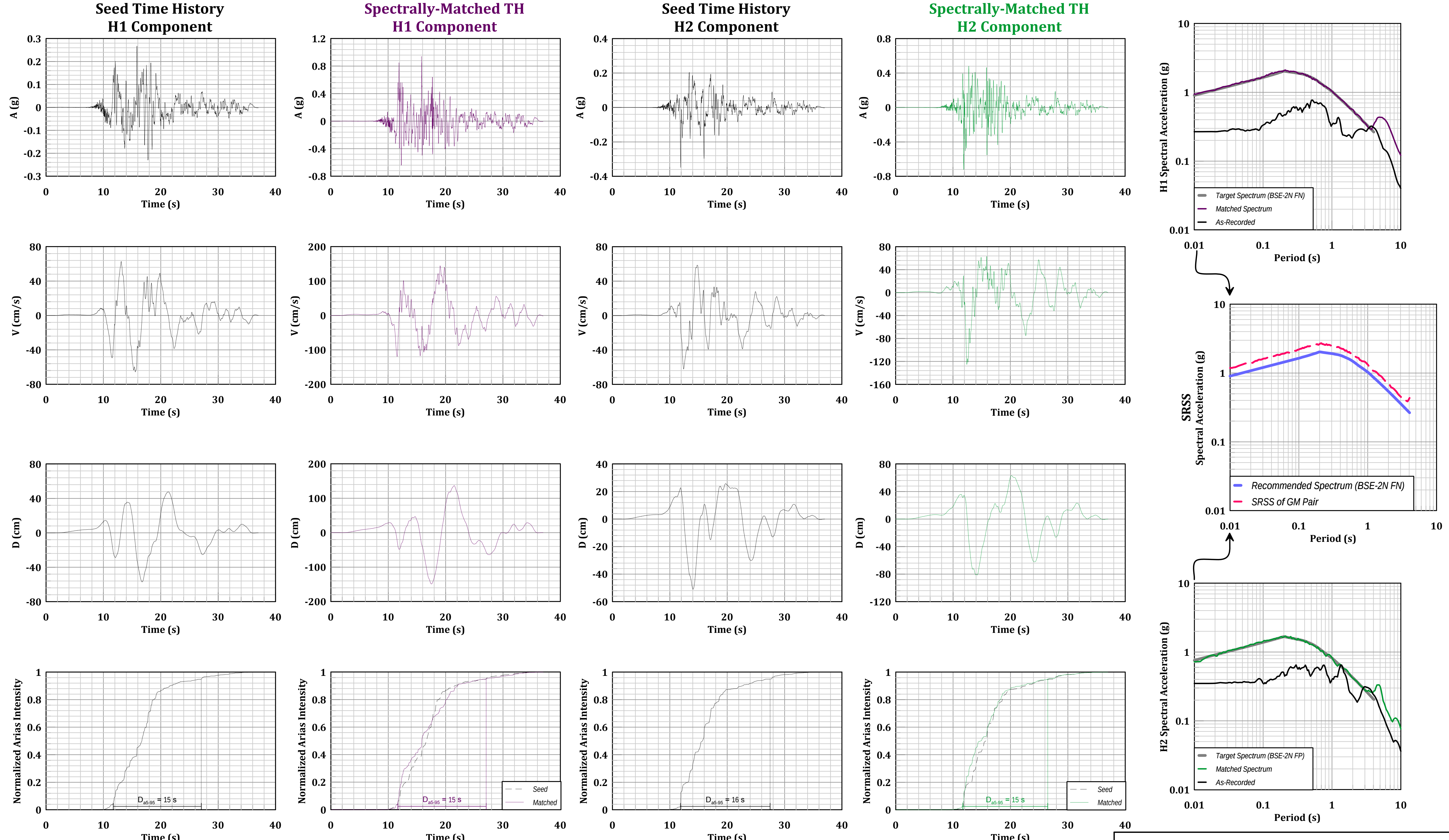


GM9: Hector Mine, Hector

Note: FN = Fault Normal (max. rotated) component; FP = Fault Parallel component.

GM9 BSE-2N MATCHED TIME HISTORIES		
Project: MSJC - SEISMIC RETROFIT		Figure A-9
Project No.: 18079A	Date: JAN 2019	

GeoPentech

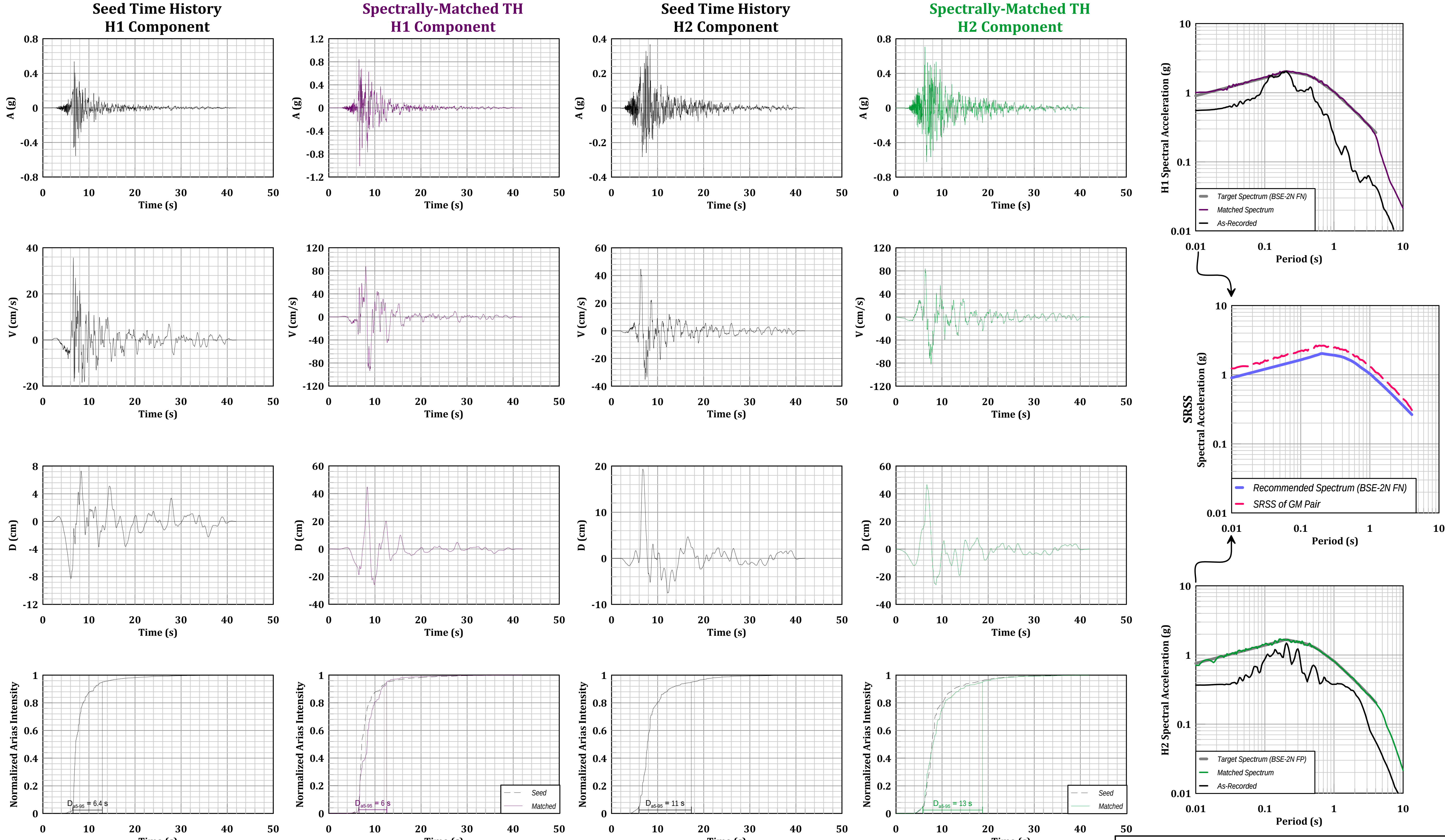


GM10: Kocaeli, Turkey, Yarimca

Note: FN = Fault Normal (max. rotated) component; FP = Fault Parallel component.

GM10 BSE-2N MATCHED TIME HISTORIES		
Project: MSJC - SEISMIC RETROFIT		Figure A-10
Project No.: 18079A	Date: JAN 2019	

GeoPentech



GM11: Loma Prieta, Gilroy Array #3

Note: FN = Fault Normal (max. rotated) component; FP = Fault Parallel component.

GM11 BSE-2N MATCHED TIME HISTORIES		
Project: MSJC - SEISMIC RETROFIT		Figure A-11
Project No.: 18079A	Date: JAN 2019	

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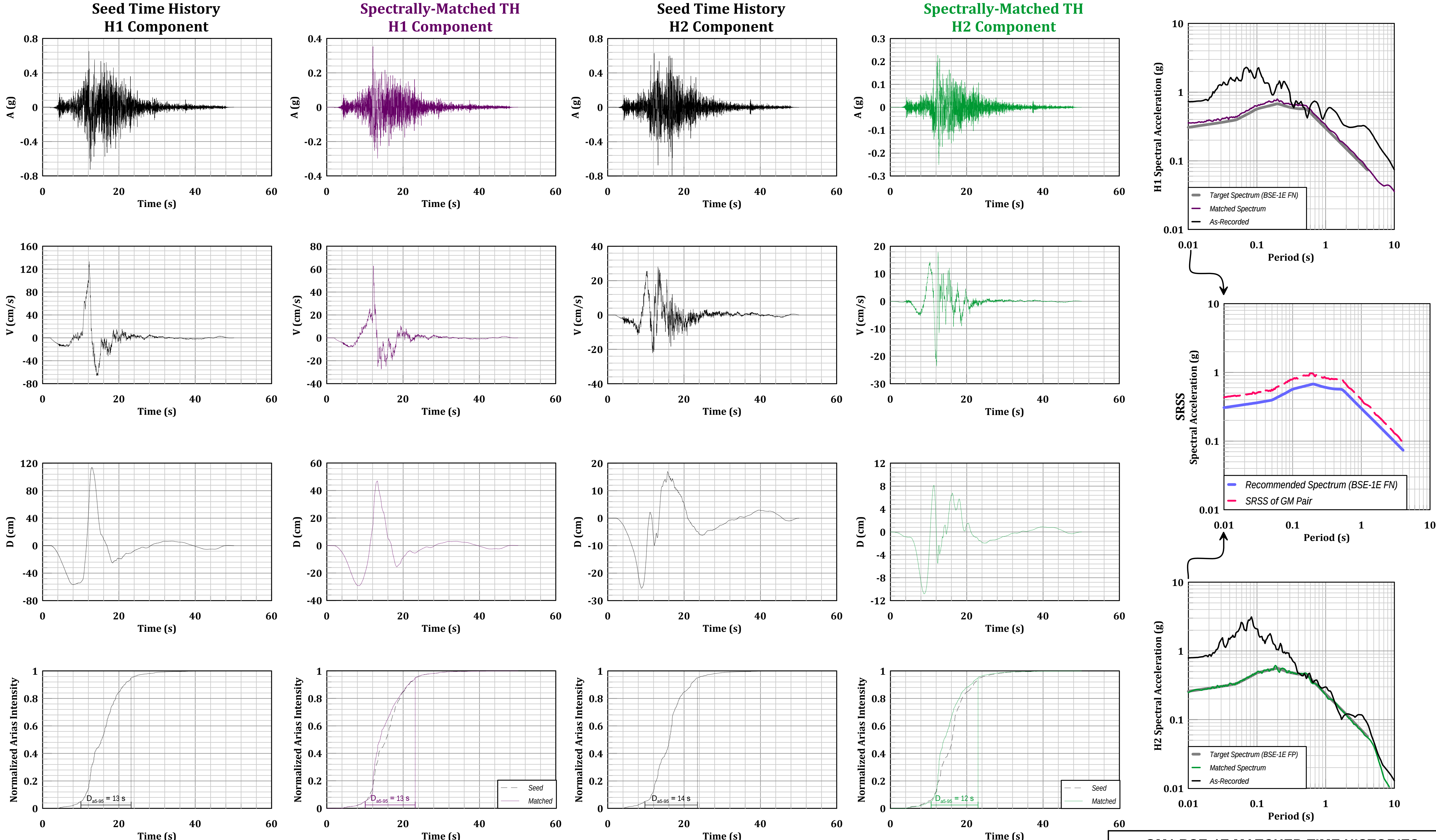
APPENDIX B

Seed & Spectrally-Matched Earthquake Time Histories
BSE-1E Level

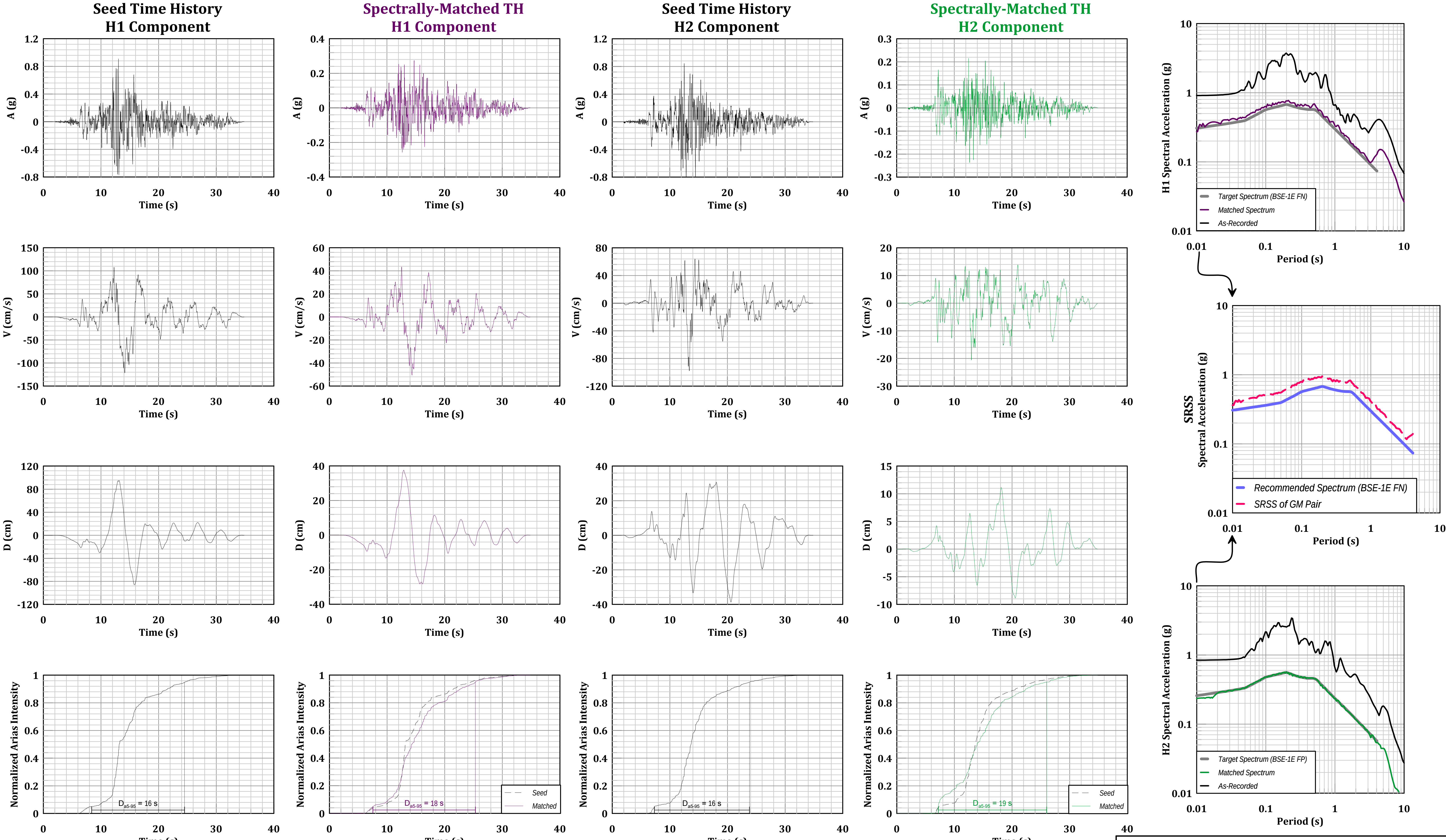


GM1: Landers, Lucerne

Note: FN = Fault Normal (max. rotated) component; FP = Fault Parallel component.

GM1 BSE-1E MATCHED TIME HISTORIES		
Project: MSJC - SEISMIC RETROFIT		Figure B-1
Project No.: 18079A	Date: JAN 2019	

GeoPentech

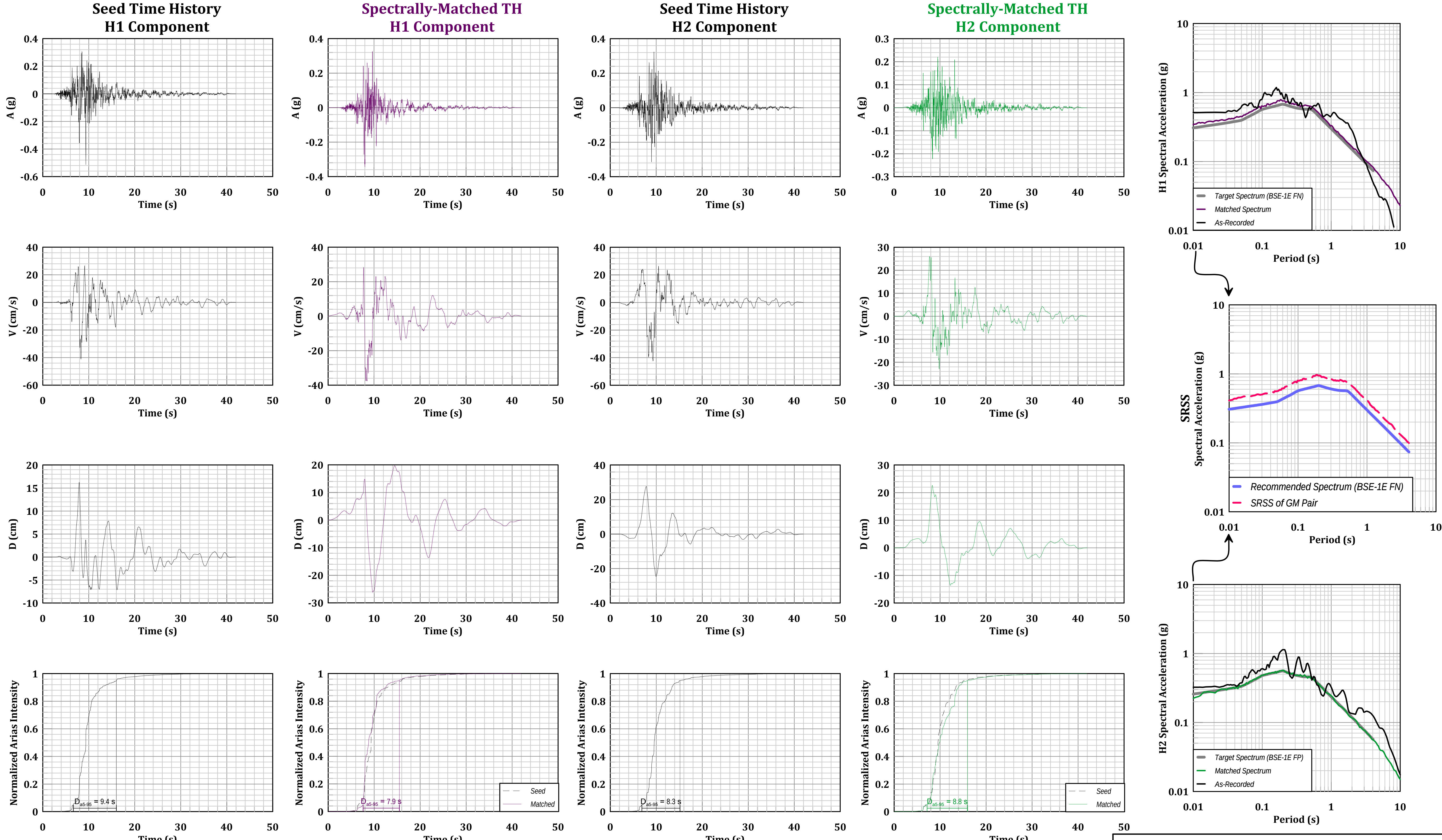


GM2 BSE-1E MATCHED TIME HISTORIES		
Project: MSJC - SEISMIC RETROFIT		Figure B-2
Project No.: 18079A	Date: JAN 2019	

GM2: Tabas, Iran, Tabas

Note: FN = Fault Normal (max. rotated) component; FP = Fault Parallel component.

GeoPentech

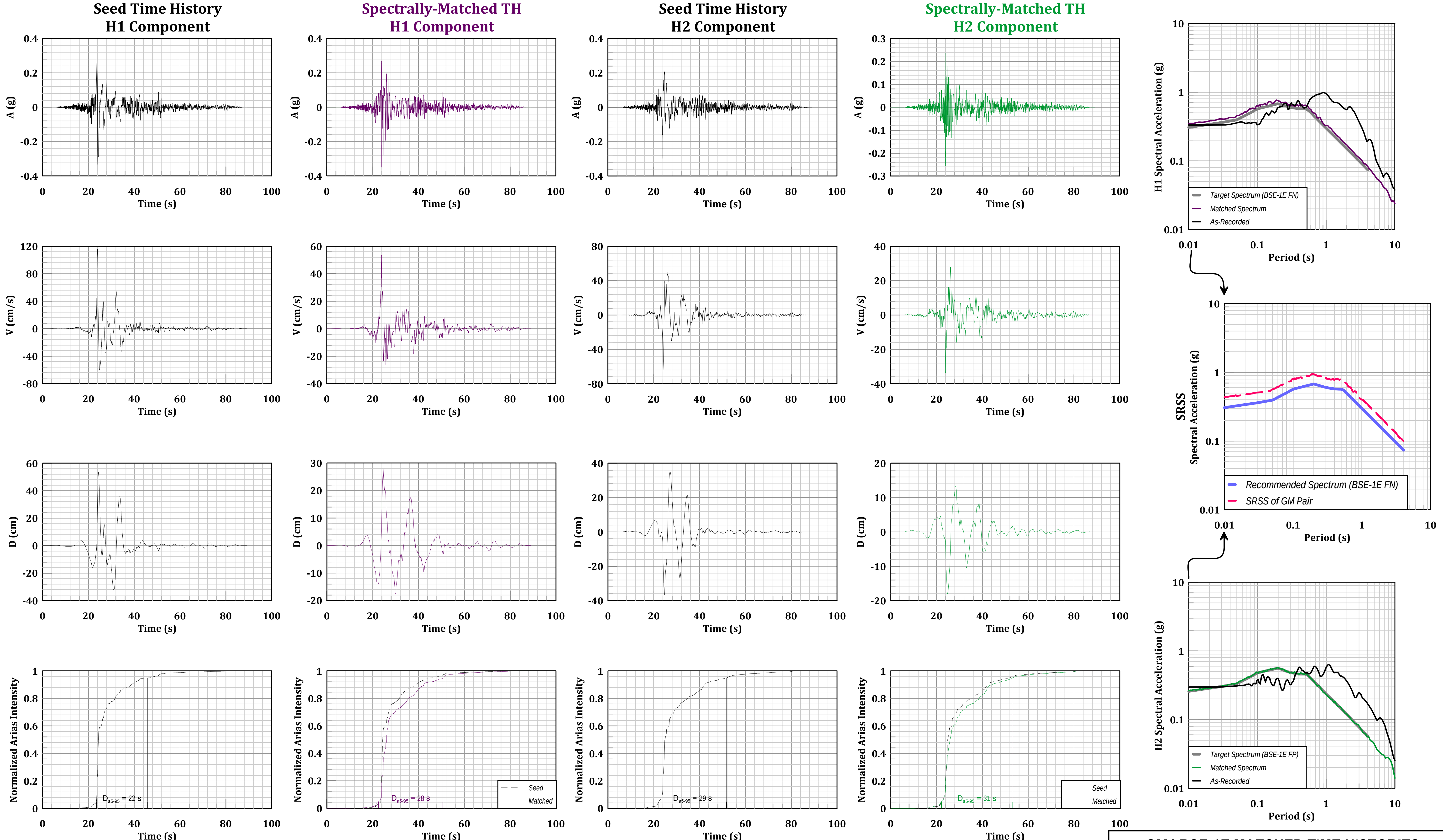


GM3: Loma Prieta, Saratoga - Aloha Ave

Note: FN = Fault Normal (max. rotated) component; FP = Fault Parallel component.

GM3 BSE-1E MATCHED TIME HISTORIES		
Project: MSJC - SEISMIC RETROFIT		Figure B-3
Project No.: 18079A	Date: JAN 2019	

GeoPentech

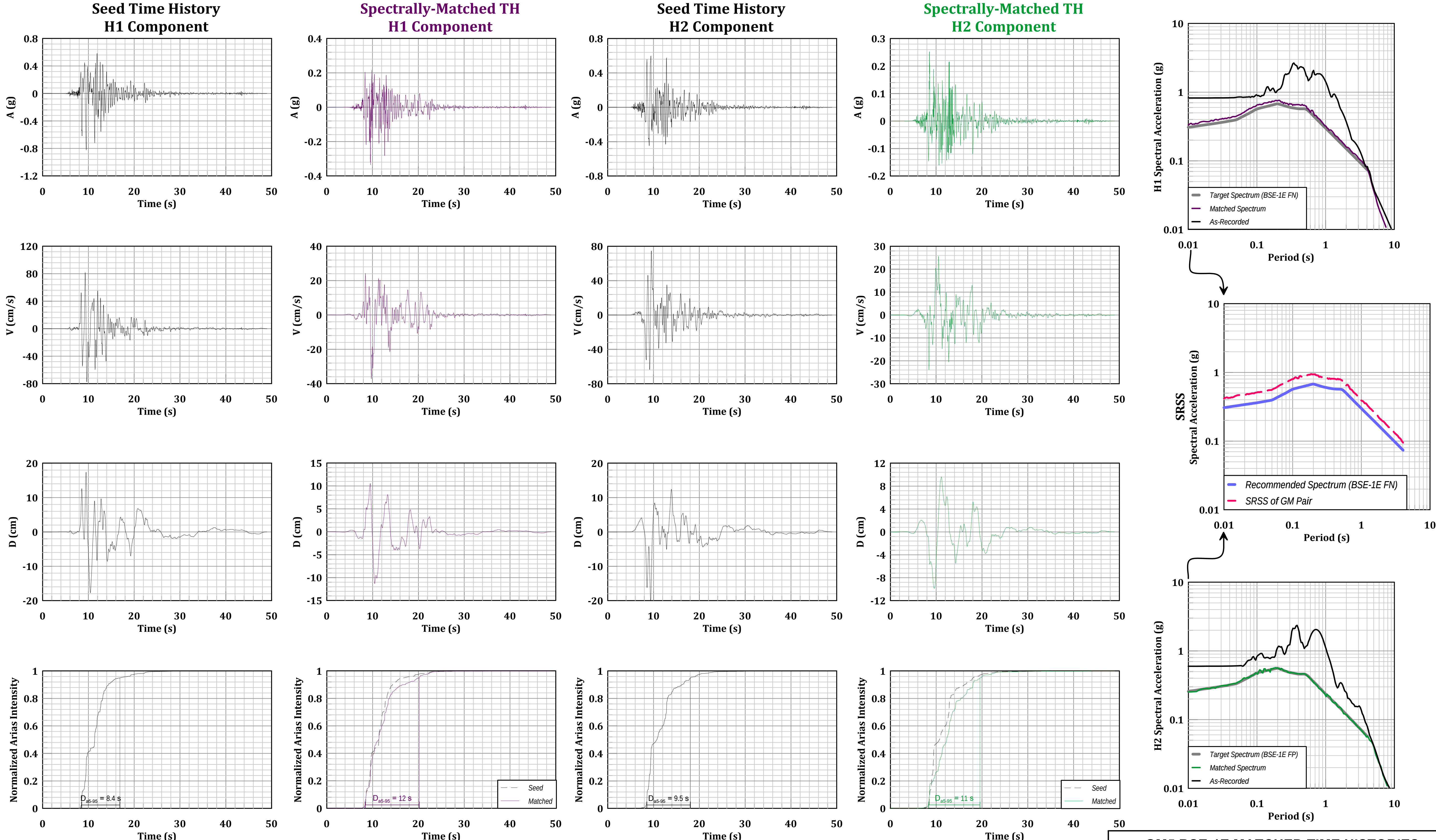


GM4: Denali, Alaska, TAPS Pump Station #10

Note: FN = Fault Normal (max. rotated) component; FP = Fault Parallel component.

GM4 BSE-1E MATCHED TIME HISTORIES		
Project: MSJC - SEISMIC RETROFIT		Figure B-4
Project No.: 18079A	Date: JAN 2019	

GeoPentech

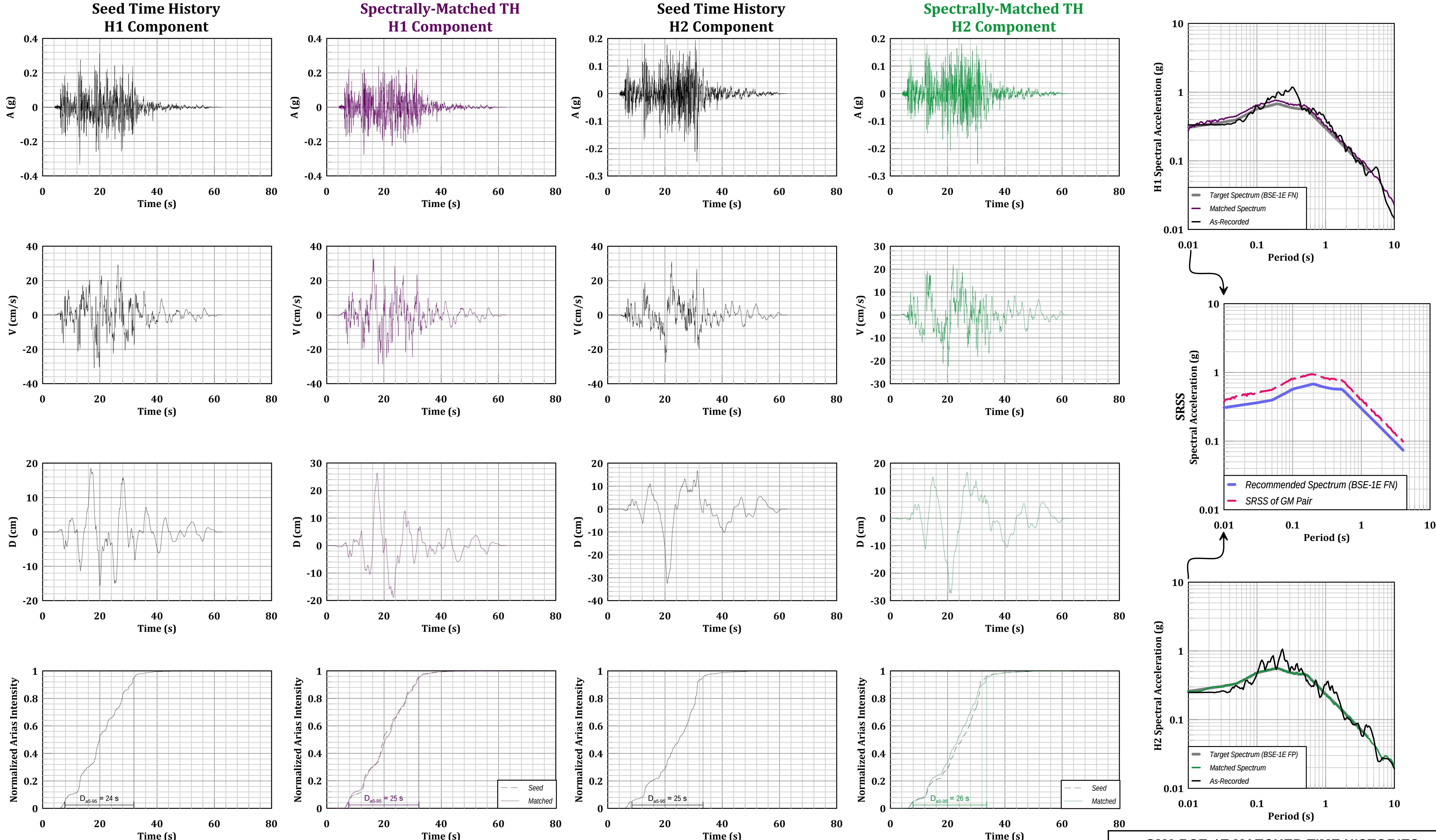


GM5: Kobe, Japan, KJMA

Note: FN = Fault Normal (max. rotated) component; FP = Fault Parallel component.

GM5 BSE-1E MATCHED TIME HISTORIES		
Project: MSJC - SEISMIC RETROFIT		Figure B-5
Project No.: 18079A	Date: JAN 2019	

GeoPentech

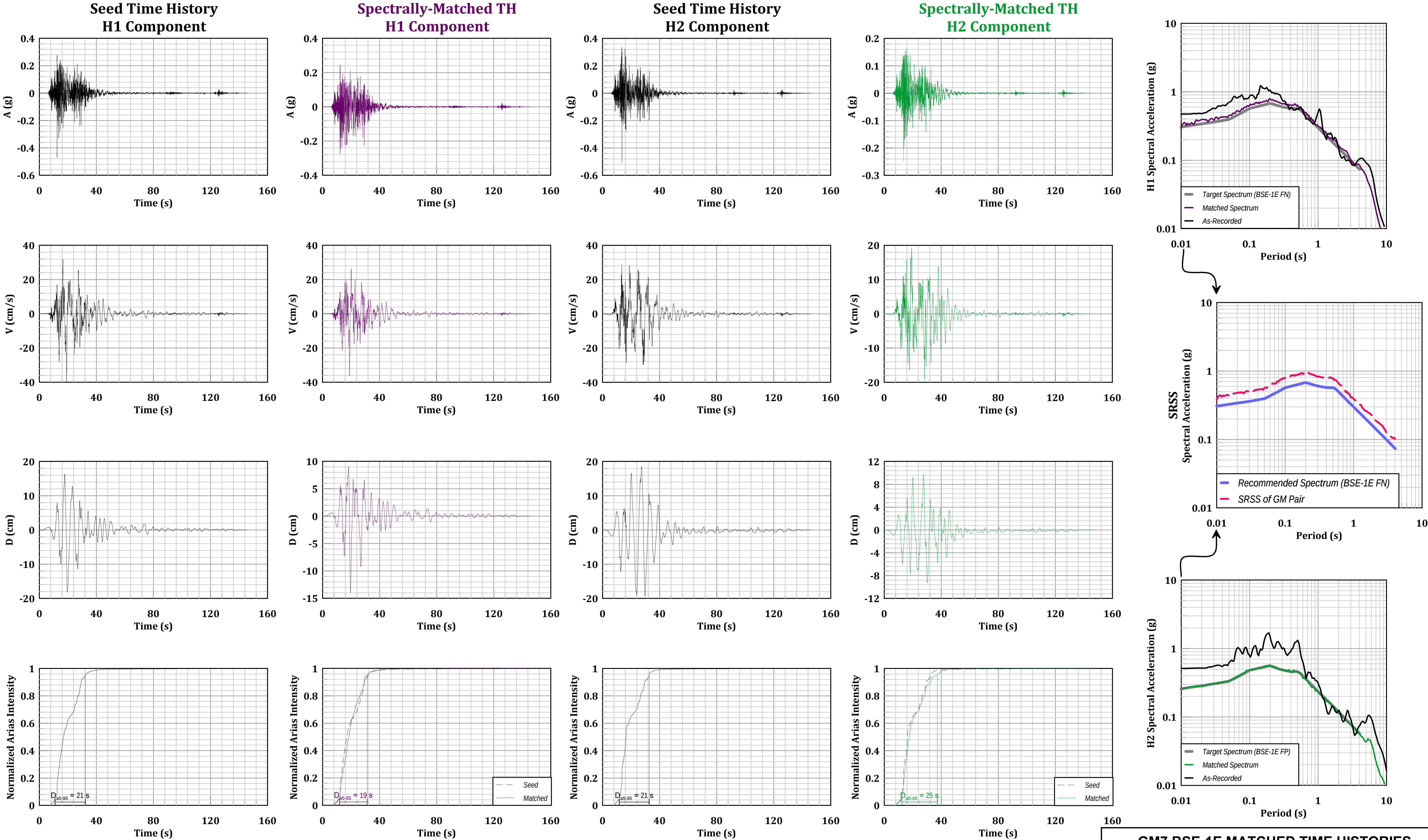


GM6: Chi-Chi, Taiwan, TCU089

Note: FN = Fault Normal (max. rotated) component; FP = Fault Parallel component.

GM6 BSE-1E MATCHED TIME HISTORIES		
Project: MSJC - SEISMIC RETROFIT		Figure B-6
Project No.: 18079A	Date: JAN 2019	

GeoPentech

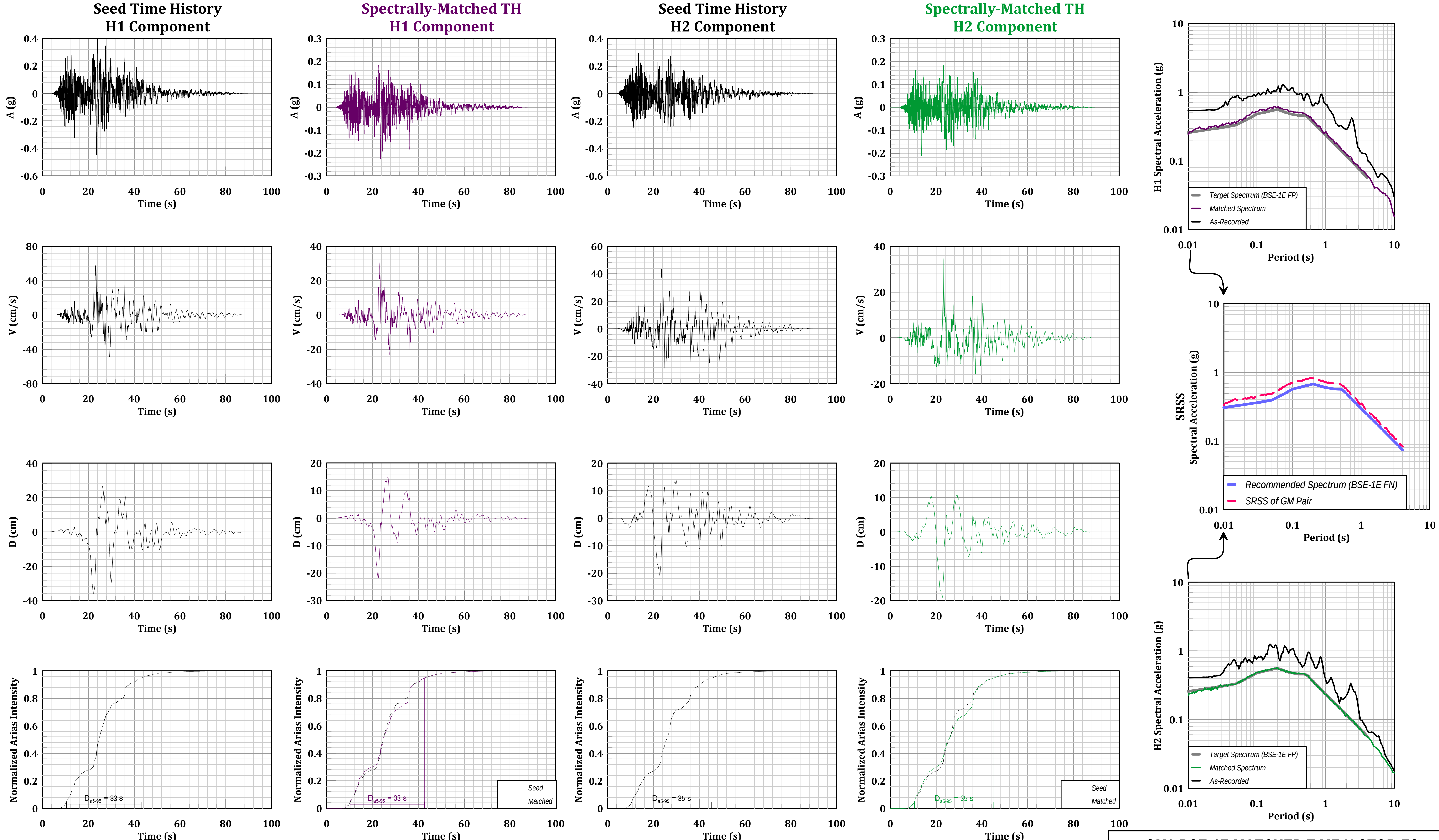


GM7: Darfield, New Zealand, DFHS

Note: FN = Fault Normal (max. rotated) component; FP = Fault Parallel component.

GM7 BSE-1E MATCHED TIME HISTORIES		
Project: MSJC - SEISMIC RETROFIT		Figure B-7
Project No.: 18079A	Date: JAN 2019	

GeoPentech

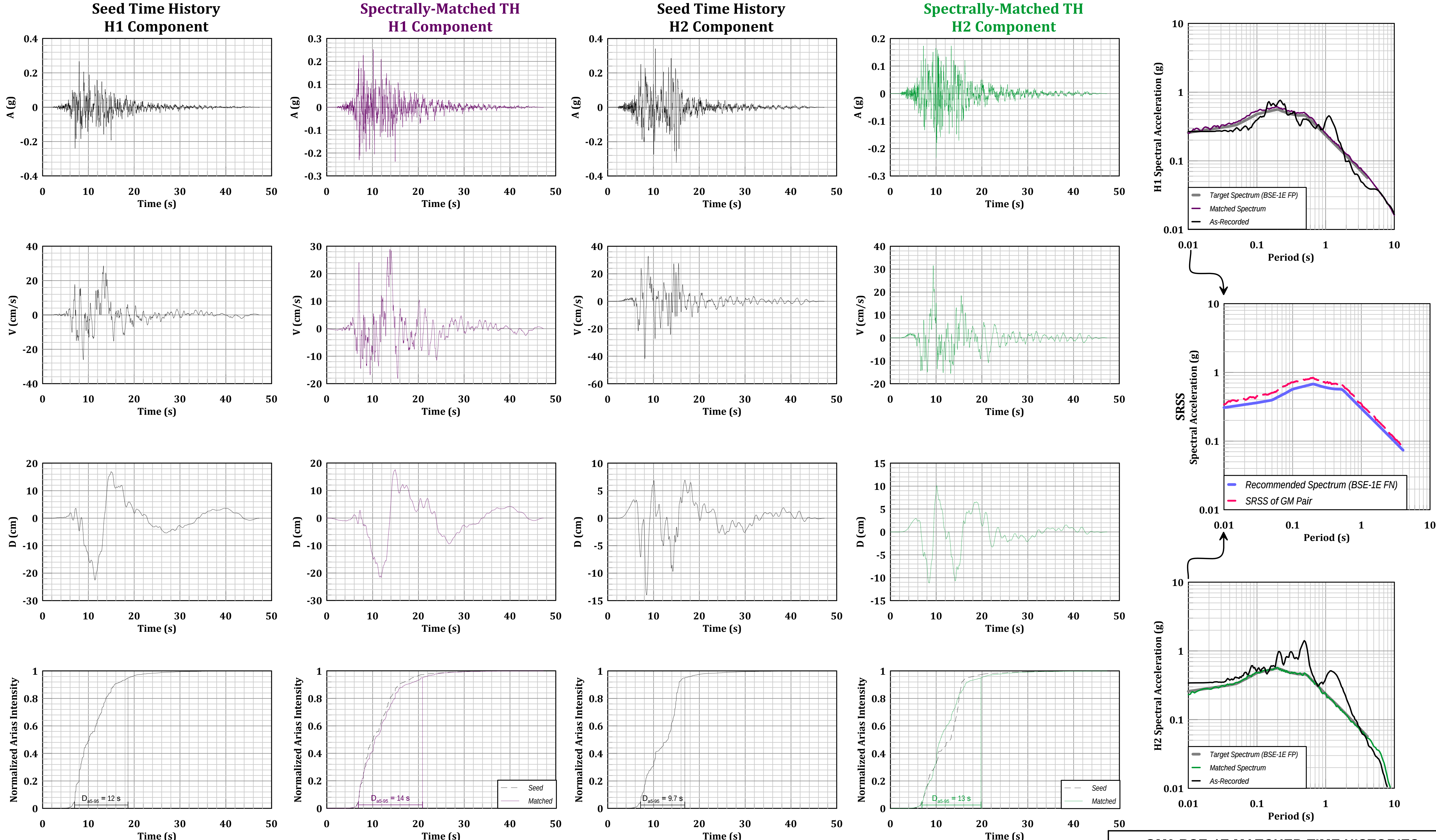


GM8: El Mayor-Cucapah, Michoacan de Ocampo

Note: FN = Fault Normal (max. rotated) component; FP = Fault Parallel component.

GM8 BSE-1E MATCHED TIME HISTORIES		
Project: MSJC - SEISMIC RETROFIT		Figure B-8
Project No.: 18079A	Date: JAN 2019	

GeoPentech

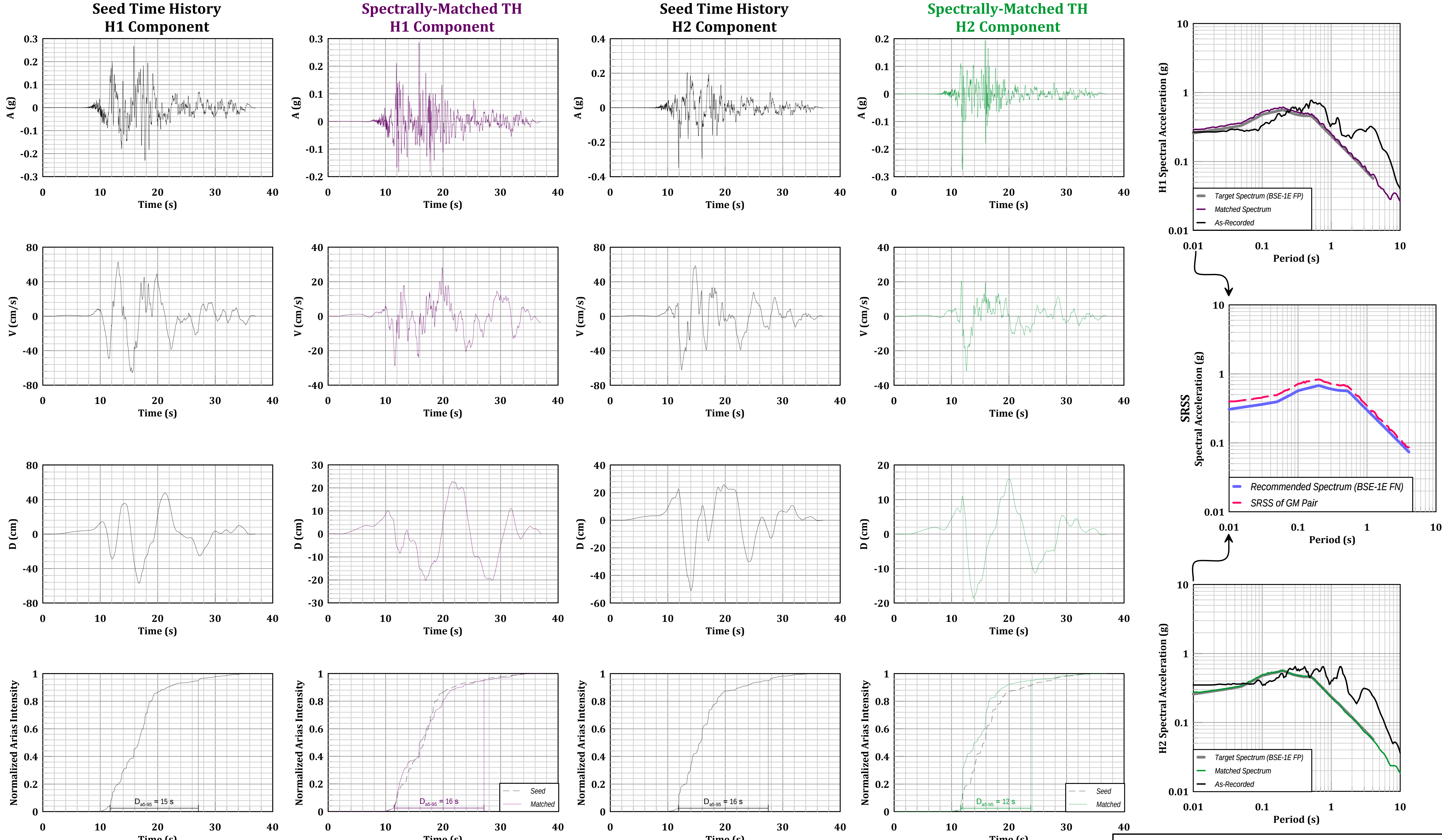


GM9: Hector Mine, Hector

Note: FN = Fault Normal (max. rotated) component; FP = Fault Parallel component.

GM9 BSE-1E MATCHED TIME HISTORIES		
Project: MSJC - SEISMIC RETROFIT		Figure B-9
Project No.: 18079A	Date: JAN 2019	

GeoPentech

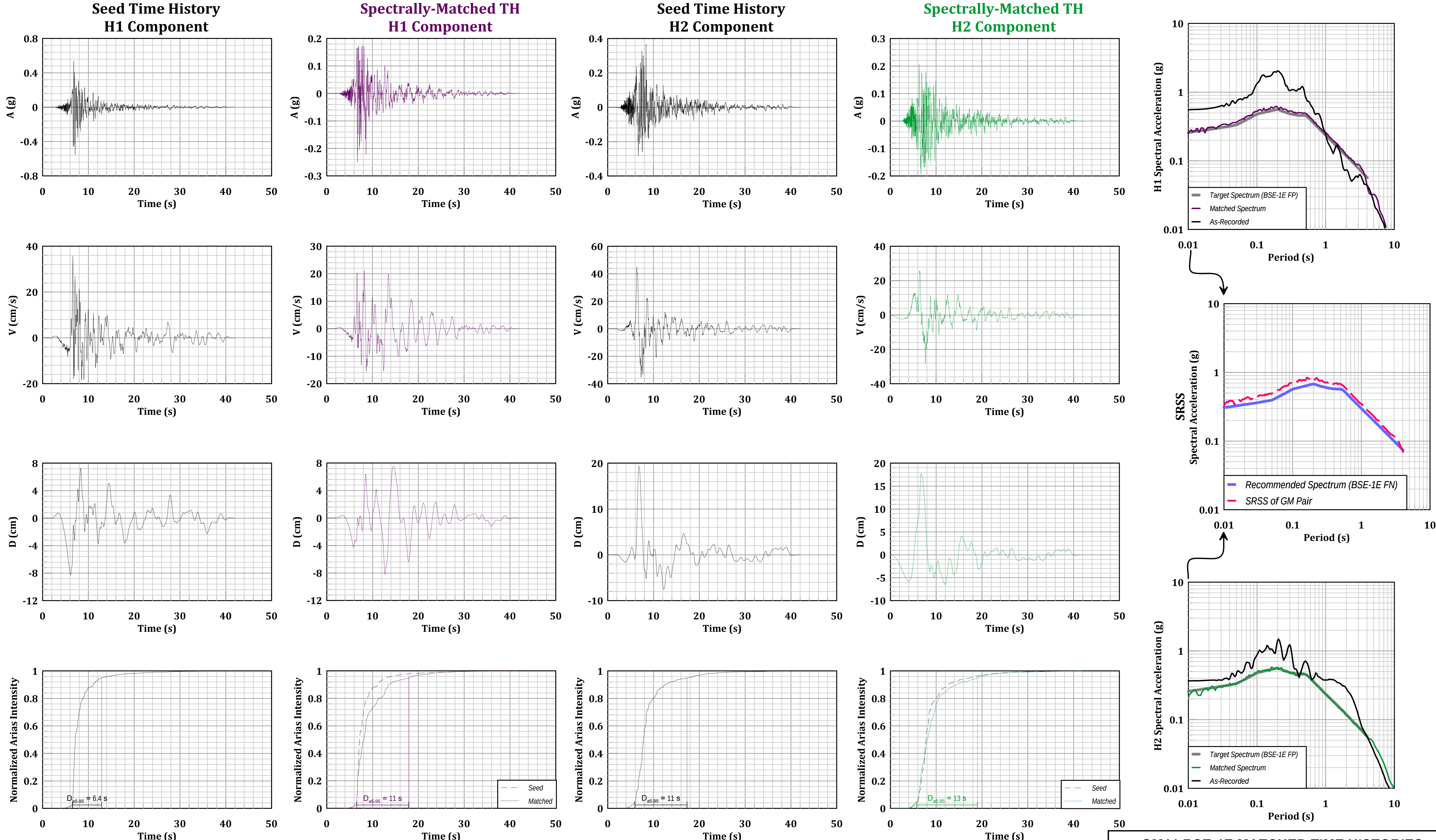


GM10: Kocaeli, Turkey, Yarimca

Note: FN = Fault Normal (max. rotated) component; FP = Fault Parallel component.

GM10 BSE-1E MATCHED TIME HISTORIES		
Project: MSJC - SEISMIC RETROFIT		Figure B-10
Project No.: 18079A	Date: JAN 2019	

GeoPentech



GM11: Loma Prieta, Gilroy Array #3

Note: FN = Fault Normal (max. rotated) component; FP = Fault Parallel component.

GM11 BSE-1E MATCHED TIME HISTORIES		
Project: MSJC - SEISMIC RETROFIT		Figure B-11
Project No.: 18079A	Date: JAN 2019	

GeoPentech

APPENDIX E

EARTHWORK AND GRADING SPECIFICATIONS

APPENDIX E

LEIGHTON CONSULTING, INC.
EARTHWORK AND GRADING GUIDE SPECIFICATIONS

TABLE OF CONTENTS

Section — Appendix E Page

E-1.0 GENERAL 1

E-1.1 Intent 1
E-1.2 Role of Leighton Consulting, Inc. 1
E-1.3 The Earthwork Contractor 1

E-2.0 PREPARATION OF AREAS TO BE FILLED 2

E-2.1 Clearing and Grubbing 2
E-2.2 Processing 3
E-2.3 Overexcavation 3
E-2.4 Benching 3
E-2.5 Evaluation/Acceptance of Fill Areas 3

E-3.0 FILL MATERIAL 4

E-3.1 Fill Quality 4
E-3.2 Oversize 4
E-3.3 Import 4

E-4.0 FILL PLACEMENT AND COMPACTION 4

E-4.1 Fill Layers 4
E-4.2 Fill Moisture Conditioning 5
E-4.3 Compaction of Fill 5
E-4.4 Compaction of Fill Slopes 5
E-4.5 Compaction Testing 5
E-4.6 Compaction Test Locations 5

E-5.0 EXCAVATION 6

E-6.0 TRENCH BACKFILLS 6

E-6.1 Safety 6
E-6.2 Bedding and Backfill 6
E-6.3 Lift Thickness 7

E-1.0 GENERAL

E-1.1 Intent

These Earthwork and Grading Guide Specifications are for grading and earthwork shown on the current, approved grading plan(s) and/or indicated in the Leighton Consulting, Inc. geotechnical report(s). These Guide Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the project-specific recommendations in the geotechnical report shall supersede these Guide Specifications. Leighton Consulting, Inc. shall provide geotechnical observation and testing during earthwork and grading. Based on these observations and tests, Leighton Consulting, Inc. may provide new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

E-1.2 Role of Leighton Consulting, Inc.

Prior to commencement of earthwork and grading, Leighton Consulting, Inc. shall meet with the earthwork contractor to review the earthwork contractor's work plan, to schedule sufficient personnel to perform the appropriate level of observation, mapping and compaction testing. During earthwork and grading, Leighton Consulting, Inc. shall observe, map, and document subsurface exposures to verify geotechnical design assumptions. If observed conditions are found to be significantly different than the interpreted assumptions during the design phase, Leighton Consulting, Inc. shall inform the owner, recommend appropriate changes in design to accommodate these observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include (1) natural ground after clearing to receiving fill but before fill is placed, (2) bottoms of all "remedial removal" areas, (3) all key bottoms, and (4) benches made on sloping ground to receive fill.

Leighton Consulting, Inc. shall observe moisture-conditioning and processing of the subgrade and fill materials, and perform relative compaction testing of fill to determine the attained relative compaction. Leighton Consulting, Inc. shall provide *Daily Field Reports* to the owner and the Contractor on a routine and frequent basis.

E-1.3 The Earthwork Contractor

The earthwork contractor (Contractor) shall be qualified, experienced and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Guide

Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing grading and backfilling in accordance with the current, approved plans and specifications.

The Contractor shall inform the owner and Leighton Consulting, Inc. of changes in work schedules at least one working day in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that Leighton Consulting, Inc. is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish earthwork and grading in accordance with the applicable grading codes and agency ordinances, these Guide Specifications, and recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of Leighton Consulting, Inc., unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, adverse weather, etc., are resulting in a quality of work less than required in these specifications, Leighton Consulting, Inc. shall reject the work and may recommend to the owner that earthwork and grading be stopped until unsatisfactory condition(s) are rectified.

E-2.0 PREPARATION OF AREAS TO BE FILLED

E-2.1 Clearing and Grubbing

Vegetation, such as brush, grass, roots and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies and Leighton Consulting, Inc.. Care should be taken not to encroach upon or otherwise damage native and/or historic trees designated by the Owner or appropriate agencies to remain. Pavements, flatwork or other construction should not extend under the “drip line” of designated trees to remain.

Leighton Consulting, Inc. shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 3 percent of organic materials (by dry weight: ASTM D 2974). Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area. As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

E-2.2 Processing

Existing ground that has been declared satisfactory for support of fill, by Leighton Consulting, Inc., shall be scarified to a minimum depth of 6 inches (15 cm). Existing ground that is not satisfactory shall be over-excavated as specified in the following Section E-2.3. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

E-2.3 Overexcavation

In addition to removals and over-excavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be over-excavated to competent ground as evaluated by Leighton Consulting, Inc. during grading. All undocumented fill soils under proposed structure footprints should be excavated

E-2.4 Benching

Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), (>20 percent grade) the ground shall be stepped or benched. The lowest bench or key shall be a minimum of 15 feet (4.5 m) wide and at least 2 feet (0.6 m) deep, into competent material as evaluated by Leighton Consulting, Inc.. Other benches shall be excavated a minimum height of 4 feet (1.2 m) into competent material or as otherwise recommended by Leighton Consulting, Inc.. Fill placed on ground sloping flatter than 5:1 (horizontal to vertical units), (<20 percent grade) shall also be benched or otherwise over-excavated to provide a flat subgrade for the fill.

E-2.5 Evaluation/Acceptance of Fill Areas

All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by Leighton Consulting, Inc. as suitable to receive fill. The Contractor shall obtain a written acceptance (*Daily Field Report*) from Leighton Consulting, Inc. prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys and benches.

E-3.0 FILL MATERIAL

E-3.1 Fill Quality

Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by Leighton Consulting, Inc. prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to Leighton Consulting, Inc. or mixed with other soils to achieve satisfactory fill material.

E-3.2 Oversize

Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 6 inches (15 cm), shall not be buried or placed in fill unless location, materials and placement methods are specifically accepted by Leighton Consulting, Inc.. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 feet (3 m) measured vertically from finish grade, or within 2 feet (0.61 m) of future utilities or underground construction.

E-3.3 Import

If importing of fill material is required for grading, proposed import material shall meet the requirements of Section E-3.1, and be free of hazardous materials (“contaminants”) and rock larger than 3-inches (8 cm) in largest dimension. All import soils shall have an Expansion Index (EI) of 20 or less and a sulfate content no greater than (≤) 500 parts-per-million (ppm). A representative sample of a potential import source shall be given to Leighton Consulting, Inc. at least four full working days before importing begins, so that suitability of this import material can be determined and appropriate tests performed.

E-4.0 FILL PLACEMENT AND COMPACTION

E-4.1 Fill Layers

Approved fill material shall be placed in areas prepared to receive fill, as described in Section E-2.0, above, in near-horizontal layers not exceeding 8 inches (20 cm) in loose thickness. Leighton Consulting, Inc. may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers, and only if the building officials with the appropriate jurisdiction approve. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

E-4.2 Fill Moisture Conditioning

Fill soils shall be watered, dried back, blended and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM) Test Method D 1557.

E-4.3 Compaction of Fill

After each layer has been moisture-conditioned, mixed, and evenly spread, each layer shall be uniformly compacted to not-less-than (≥) 90 percent of the maximum dry density as determined by ASTM Test Method D 1557. In some cases, structural fill may be specified (see project-specific geotechnical report) to be uniformly compacted to at-least (≥) 95 percent of the ASTM D 1557 modified Proctor laboratory maximum dry density. For fills thicker than (>) 15 feet (4.5 m), the portion of fill deeper than 15 feet below proposed finish grade shall be compacted to 95 percent of the ASTM D 1557 laboratory maximum density. Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

E-4.4 Compaction of Fill Slopes

In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by back rolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet (1 to 1.2 m) in fill elevation, or by other methods producing satisfactory results acceptable to Leighton Consulting, Inc.. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of the ASTM D 1557 laboratory maximum density.

E-4.5 Compaction Testing

Field-tests for moisture content and relative compaction of the fill soils shall be performed by Leighton Consulting, Inc.. Location and frequency of tests shall be at our field representative(s) discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

E-4.6 Compaction Test Locations

Leighton Consulting, Inc. shall document the approximate elevation and horizontal coordinates of each density test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that Leighton

Consulting, Inc. can determine the test locations with sufficient accuracy. Adequate grade stakes shall be provided.

E-5.0 EXCAVATION

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by Leighton Consulting, Inc. during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by Leighton Consulting, Inc. based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, then observed and reviewed by Leighton Consulting, Inc. prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by Leighton Consulting, Inc..

E-6.0 TRENCH BACKFILLS

E-6.1 Safety

The Contractor shall follow all OSHA and Cal/OSHA requirements for safety of trench excavations. Work should be performed in accordance with Article 6 of the *California Construction Safety Orders*, 2009 Edition or more current (see also: http://www.dir.ca.gov/title8/sb4a6.html).

E-6.2 Bedding and Backfill

All utility trench bedding and backfill shall be performed in accordance with applicable provisions of the 2015 Edition of the *Standard Specifications for Public Works Construction* (Green Book). Bedding material shall have a Sand Equivalent greater than 30 (SE>30). Bedding shall be placed to 1-foot (0.3 m) over the top of the conduit, and densified by jetting in areas of granular soils, if allowed by the permitting agency. Otherwise, the pipe-bedding zone should be backfilled with Controlled Low Strength Material (CLSM) consisting of at least one sack of Portland cement per cubic-yard of sand, and conforming to Section 201-6 of the 2015 Edition of the *Standard Specifications for Public Works Construction* (Green Book). Backfill over the bedding zone shall be placed and densified mechanically to a minimum of 90 percent of relative compaction (ASTM D 1557) from 1 foot (0.3 m) above the top of the conduit to the surface. Backfill above the pipe zone shall **not** be jetted. Jetting of the bedding around the conduits shall be observed by Leighton Consulting, Inc. and backfill above the pipe zone (bedding) shall be observed and tested by Leighton Consulting, Inc..

E-6.3 Lift Thickness

Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to Leighton Consulting, Inc. that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method, and only if the building officials with the appropriate jurisdiction approve.

APPENDIX F

GBA – IMPORTANT INFORMATION ABOUT THIS GEOTECHNICAL REPORT

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL
BUSINESS
ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

April 30, 2019

Project No. 12202.001

Mt. San Jacinto Community College
1499 N. State Street
San Jacinto, California 92583

Attention: Ms. Carol Ward

Subject: Geotechnical/Geologic Hazard Report - Addendum #1
Seismic Retrofit for Existing Buildings F, G, and Central Plant
Proposed MSJCC Temecula Campus (Formerly Abbott Vascular)
41888 Motor Car Parkway, Temecula, California

In accordance with your request and email transmittal dated April 30, 2019, this addendum report is to provide revised soils parameters for the estimation of the allowable lateral pressures associated with the existing building foundation/footings embedded at least 3 feet below ground surface. As such, a maximum allowable frictional resistance of 0.5 and allowable passive pressure based on an equivalent fluid pressure of 400 pounds-per-cubic-foot (pcf) may be used. The design of all other existing footings or new footings should comply with our submitted March 2019 report.

If you have any questions regarding this report, please do not hesitate to contact the undersigned. We appreciate this opportunity to be of service on this project.

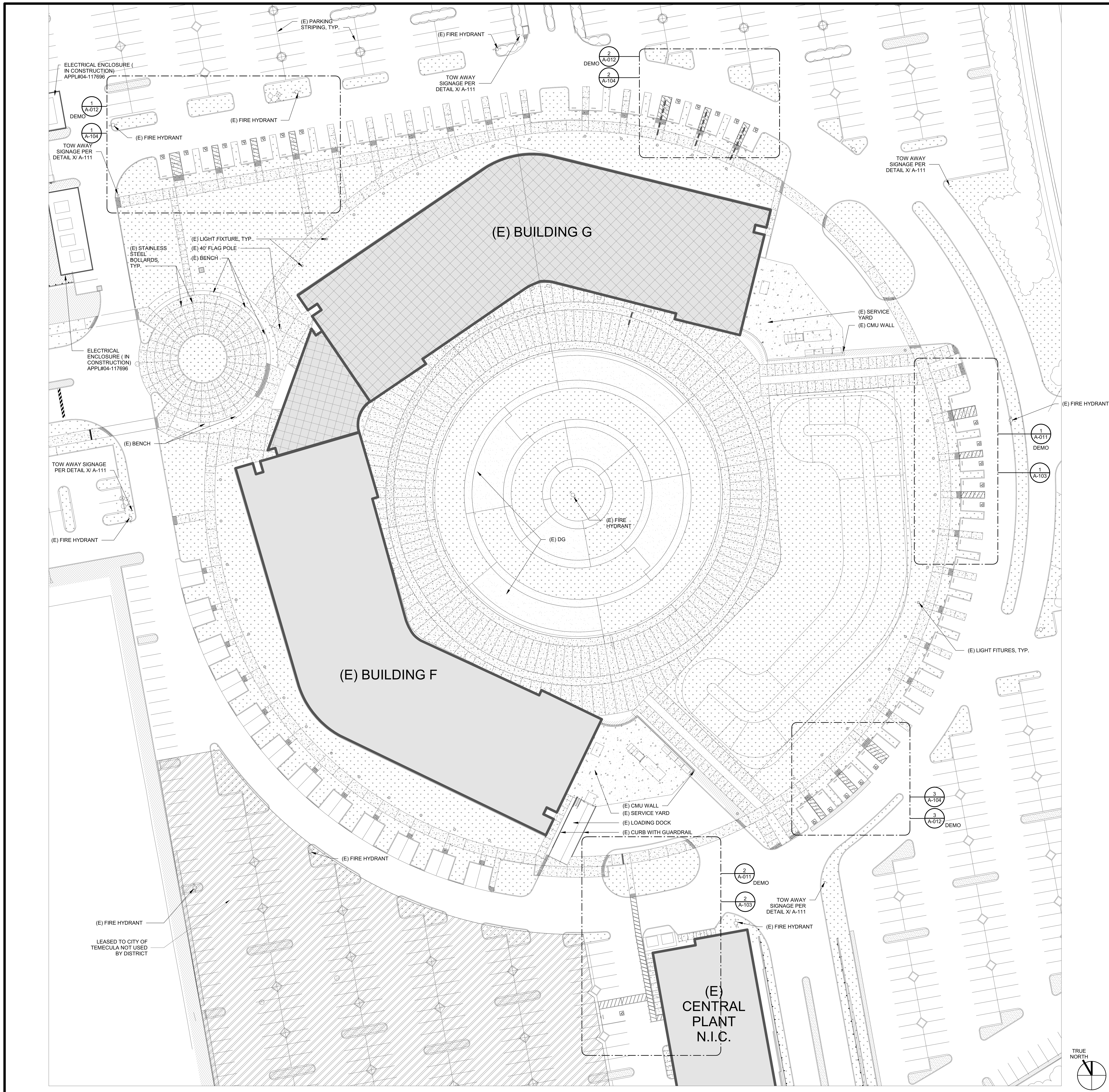
Respectfully submitted,

LEIGHTON CONSULTING, INC.

PROFESSIONAL ENGINEER
SIMON I SAIID
2641
GEOTECHNICAL
STATE OF CALIFORNIA

Simon I. Saiid, GE 2641
Principal Engineer

Distribution: (1) Addressee (via email)
(1) Structural Engineer/kpff (Maikol Del Carpio, via email)



FILE LOCATION: A360://MSJC Temecula Valley Campus/A17_MSJC_TEMECULA VALLEY COLLEGE_Building G.rvt

DATE PLOTTED: 4/22/2019 3:02:01 PM

ENLARGED SITE PLAN | 1" = 30'-0" | 1

KEYNOTES

SITE PLAN LEGEND

	PROPERTY LINE
	PROJECT BUILDING
	(E) CONCRETE PAVING
	(E) ASPHALT PAVING
	(E) BUILDING - NOT IN PROJECT SCOPE
	(E) LANDSCAPING
▲	ACCESSIBLE ENTRANCE
	CONCRETE PAVING

GENERAL NOTES

19·6 ARCHITECTS

802 EAST COTA STREET, SUITE A
SANTA BARBARA, CA 93103
TEL (805) 963-1955

CONSULTANTS

CIVIL ENGINEER
KPFF
700 South Flower Street, Suite 2100
Los Angeles, CA 90017
TEL (213) 418-0201

STRUCTURAL ENGINEER
KPFF
700 South Flower Street, Suite 2100
Los Angeles, CA 90017
TEL (213) 310-8536

MECHANICAL ENGINEER
P2S INC
5000 East Spring Street, Suite 800
Long Beach, CA 90815
TEL (562) 497-2999

ELECTRICAL ENGINEER
P2S INC
5000 East Spring Street, Suite 800
Long Beach, CA 90815
TEL (562) 497-2999

FIRE PROTECTION ENGINEER
P2S INC
5000 East Spring Street, Suite 800
Long Beach, CA 90815
TEL (562) 497-2999

LABORATORY DESIGNCONSULTANT
RFD
3965 Fifth Avenue, Suite 400
San Diego, CA 92103
TEL (619) 756-2681

ARCHITECT STAMP	CONSULTANT STAMP
LICENSED ARCHITECT MONISHA ADNANI, AIA C-32128 REN. 1-31-19 STATE OF CALIFORNIA NOT FOR CONSTRUCTION	

AGENCY APPROVAL

REVISIONS

NO.	DATE	DESCRIPTION

KEY PLAN

PROJECT OWNER & TITLE

MT. SAN JACINTO COMMUNITY COLLEGE DISTRICT

TEMECULA VALLEY CAMPUS

41888 Motor Car Pkwy,
Temecula, CA 92591

SHEET TITLE

ENLARGED SITE PLAN

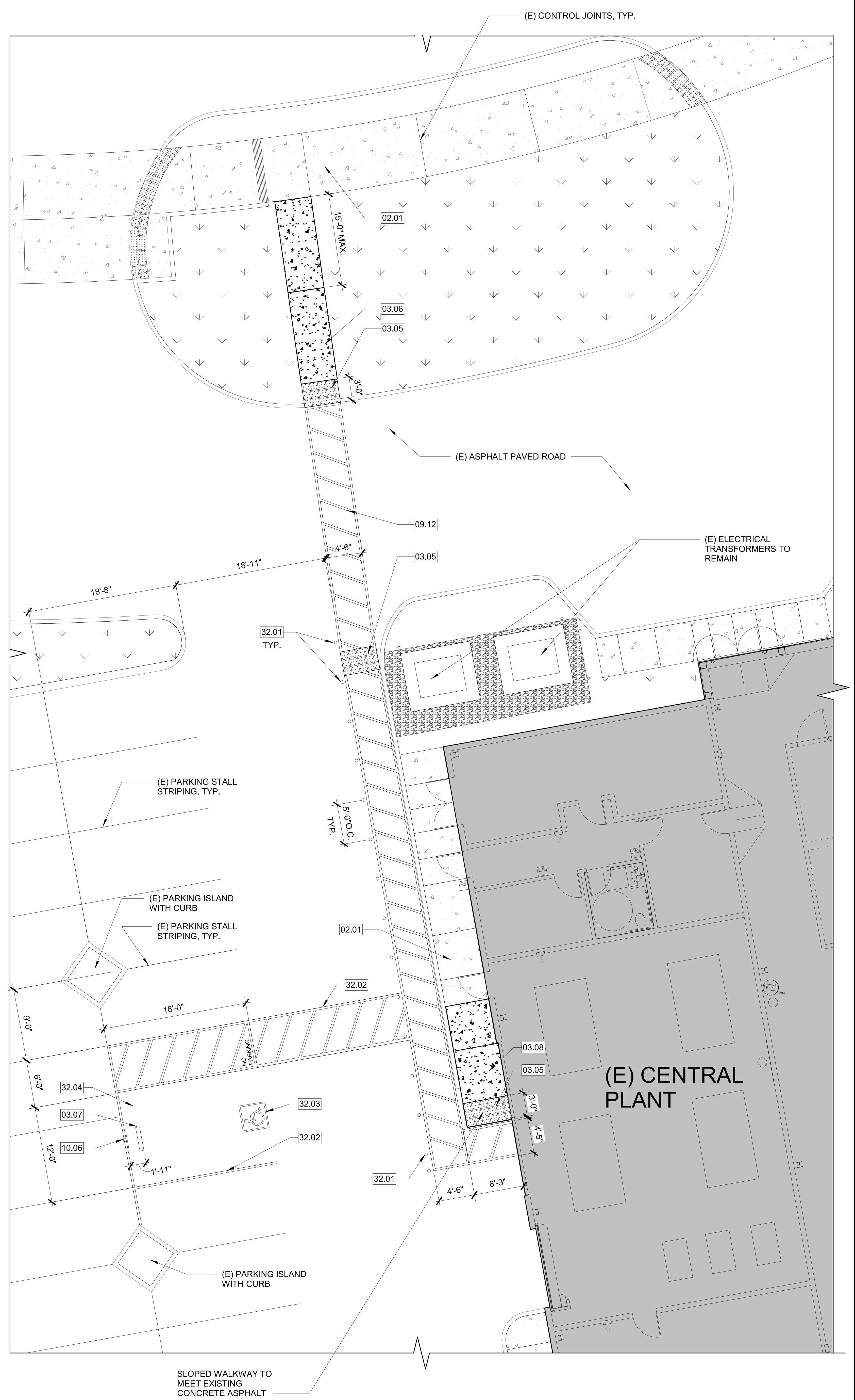
DRAWN BY: Author JOB NUMBER: 018103.01

SHEET NO.

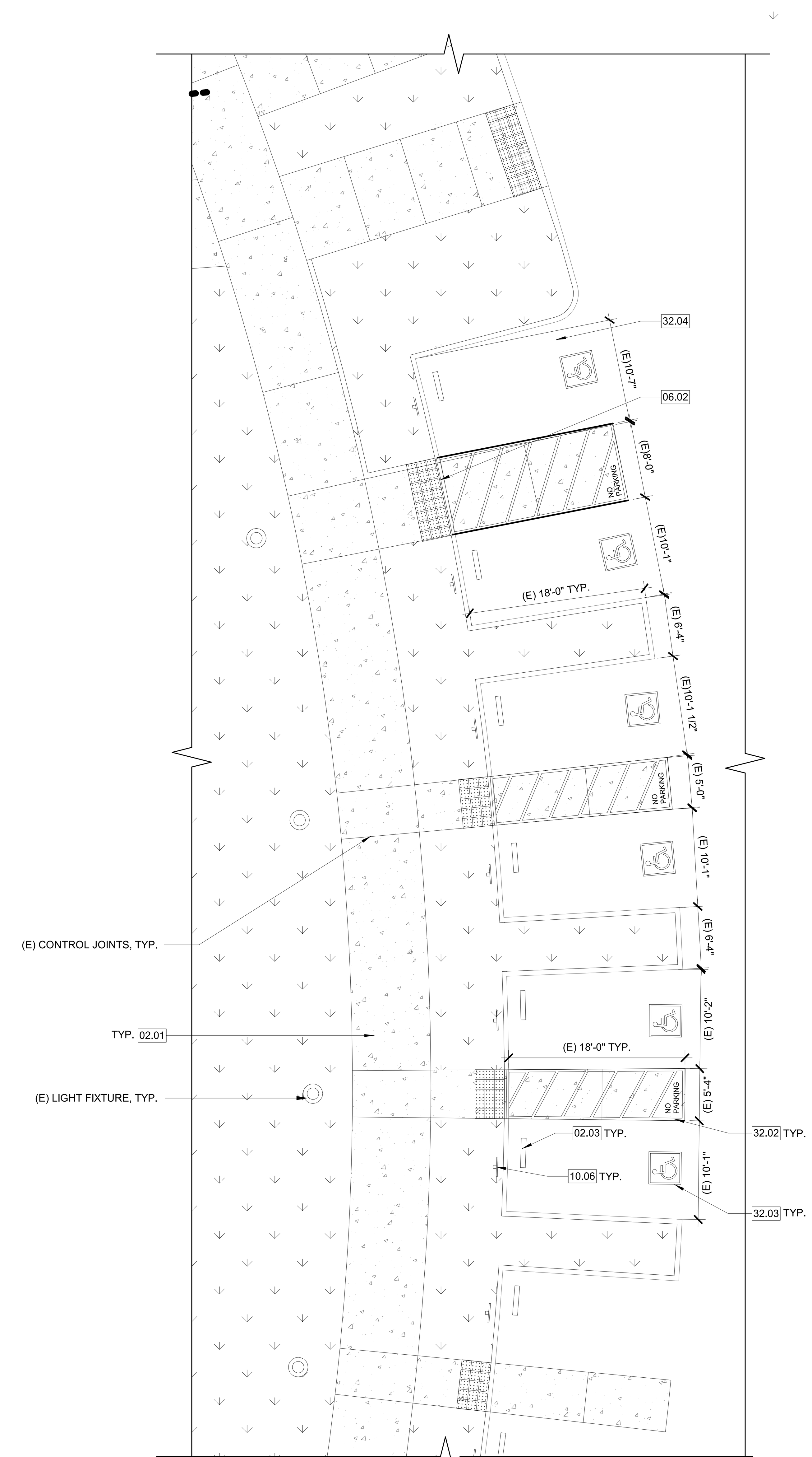
A-102

DATE: APRIL 22, 2019

50% CONSTRUCTION DOCUMENTS



ENLARGED SITE PLAN- ACCESSIBLE ACCESS TO CENTRAL PLANT 1/8" = 1'-0" 2



ENLARGED SITE PLAN- EAST ACCESSIBLE PARKING STALLS 1/8" = 1'-0" 1

KEYNOTES

02.01	(E) CONCRETE PAVING TO REMAIN, PROTECT IN PLACE
02.03	(E) CONCRETE CURB STOP TO REMAIN
03.05	CAST-IN-PLACE TRUNCATED DOME DETECTABLE WARNING, SEE DETAIL 3/A-111
03.06	INSTALL CONCRETE WALKWAY PER DETAIL 9/A-111
03.07	INSTALL CONCRETE CURB STOP AT VAN ACCESSIBLE PARKING STALL, PER DETAILS 2&5/A-111
03.08	SLOPED WALKWAY WITH CURB
06.02	REPLACE (E) TRUNCATED DOMES, SEE DETAIL X/XX
09.12	PAINTED GYPSUM BOARD, SEE FINISH SCHEDULE
10.06	ACCESSIBLE PARKING SIGN PER DETAIL 1B/A-111
32.01	INSTALL METAL BOLLARDS IN (E) ASPHALT PAVEMENT
32.02	PAINTED PAVEMENT MARKINGS REFER TO ENLARGED PLANS AND DETAIL 2/A-111
32.03	PAINTED PAVEMENT ISA SYMBOL FOR PARKING STALL, SEE DETAIL 8/A-111
32.04	ACCESSIBLE PARKING STALLS, REFER TO DETAIL 2/A-111

SITE PLAN LEGEND

- PROPERTY LINE
- PROJECT BUILDING
- (E) CONCRETE PAVING
- (E) ASPHALT PAVING
- (E) BUILDING - NOT IN PROJECT SCOPE
- (E) LANDSCAPING
- ACCESSIBLE ENTRANCE
- CONCRETE PAVING

GENERAL NOTES

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AGENCY APPROVAL

REVISIONS

NO.	DATE	DESCRIPTION

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KEY PLAN

PROJECT OWNER & TITLE

MT. SAN JACINTO COMMUNITY COLLEGE DISTRICT

TEMECULA VALLEY CAMPUS

41888 Motor Car Pkwy,
Temecula, CA 92591

SHEET TITLE

ENLARGED SITE PLAN

DRAWN BY: Author JOB NUMBER: 018103.01

SHEET NO.

A-103

DATE: APRIL 22, 2019

50% CONSTRUCTION DOCUMENTS

FILE LOCATION: A360://MSJC Temecula Valley Campus/A17_MSJC_TEMECULA VALLEY COLLEGE_Building G.rvt

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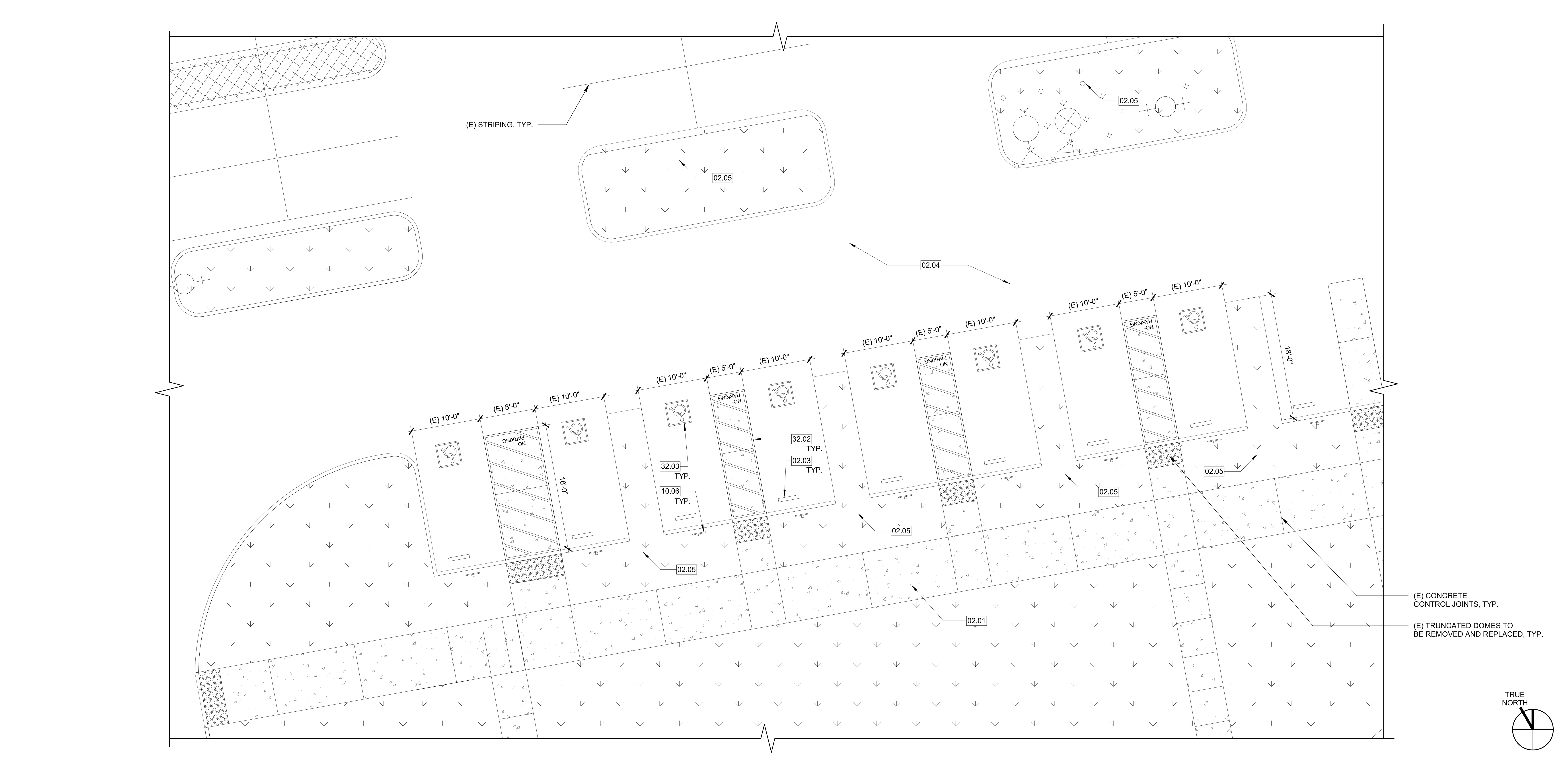
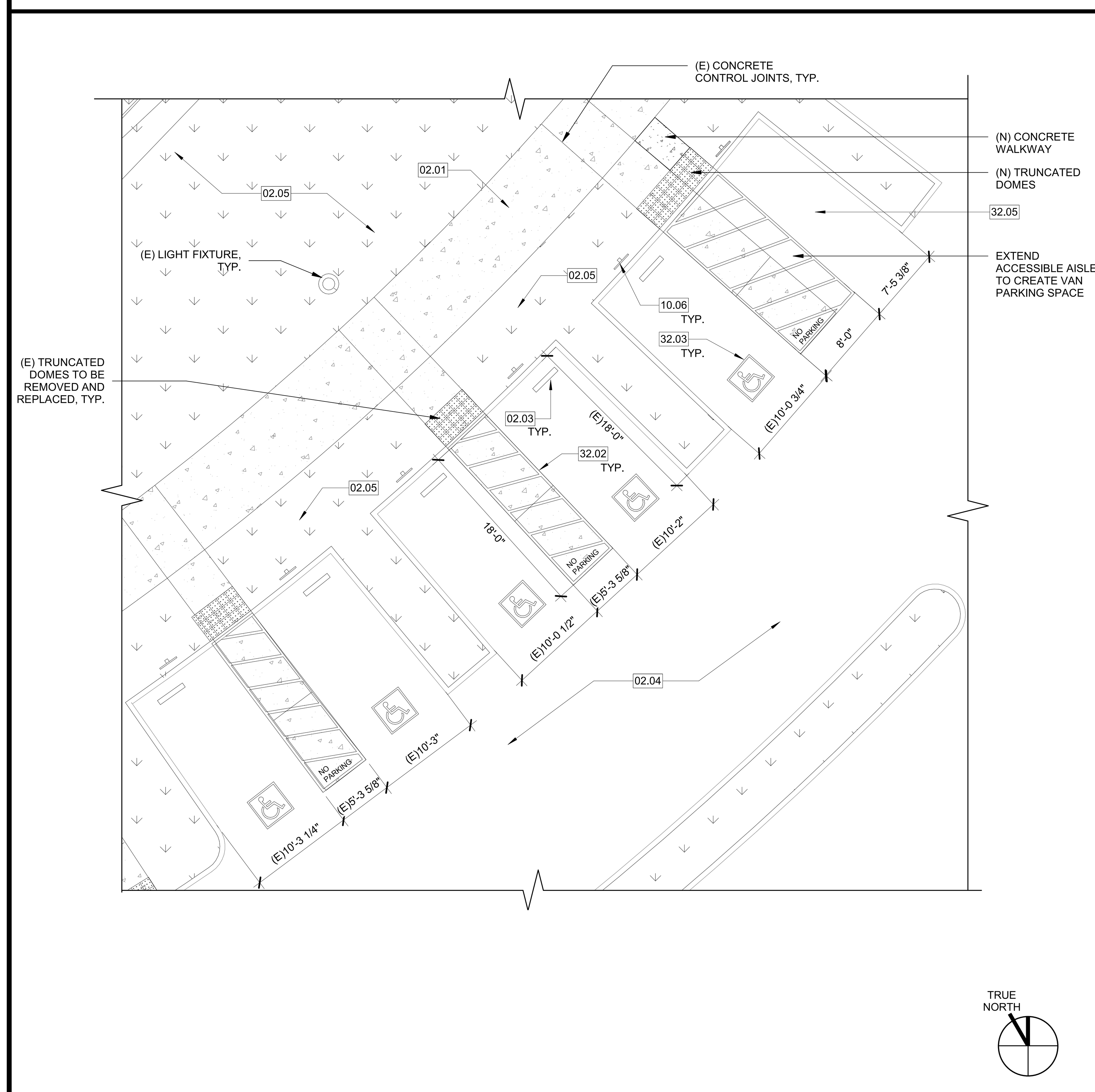
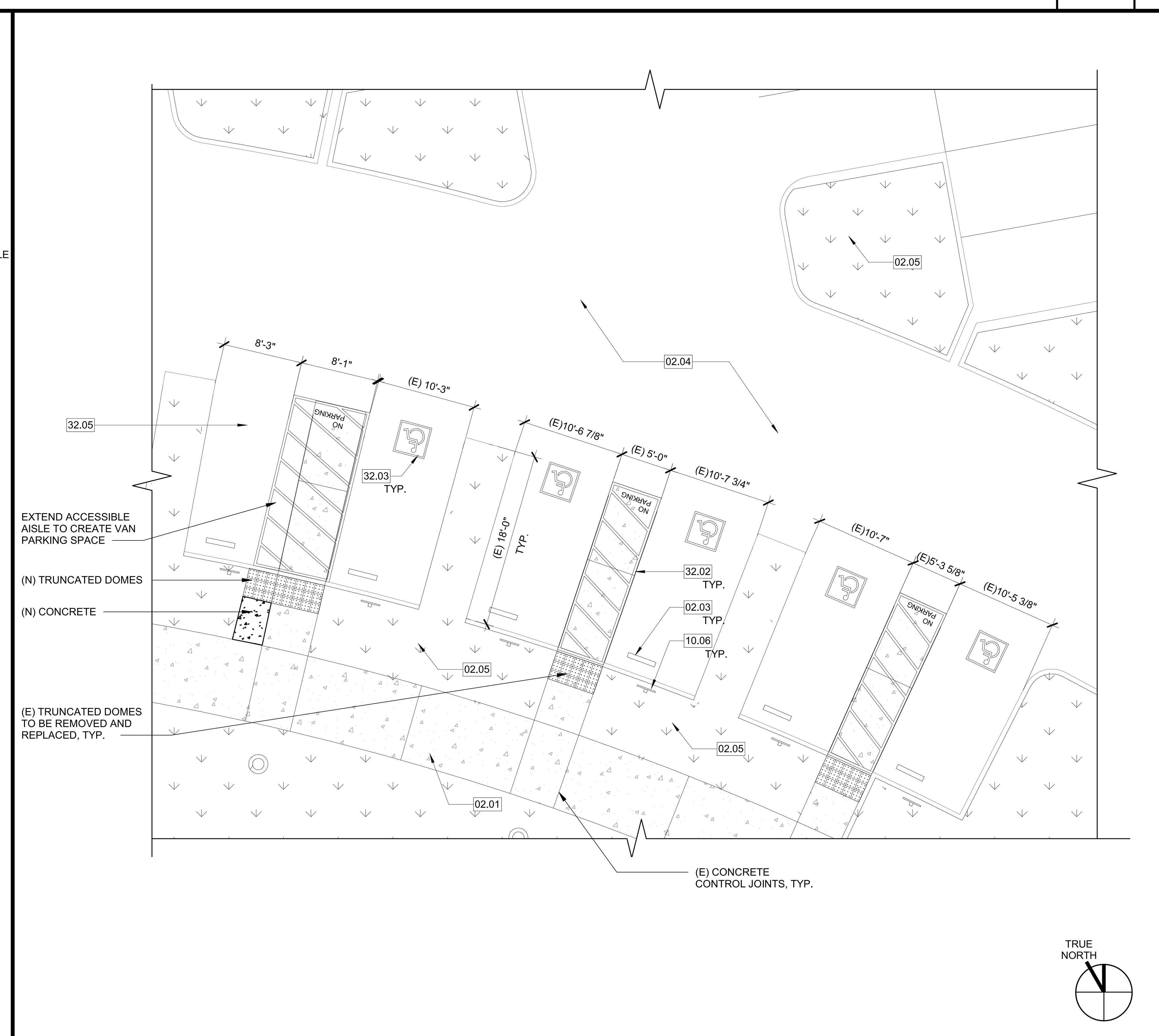


ENLARGED SITE PLAN - 3 1/8" = 1'-0" 1



ENLARGED SITE PLAN - 5 1/8" = 1'-0" 3



ENLARGED SITE PLAN - 4 1/8" = 1'-0" 2

KEYNOTES

02.01	(E) CONCRETE PAVING TO REMAIN, PROTECT IN PLACE
02.03	(E) CONCRETE CURB STOP TO REMAIN
02.04	(E) ASPHALT PAVED ROAD
02.05	(E) LANDSCAPING TO REMAIN, PROTECT IN PLACE
10.06	ACCESSIBLE PARKING SIGN PER DETAIL 1B/A-111
32.02	PAINTED PAVEMENT MARKINGS REFER TO ENLARGED PLANS AND DETAIL 2/A-111
32.03	PAINTED PAVEMENT ISA SYMBOL FOR PARKING STALL, SEE DETAIL 8/A-111
32.05	MOTORBIKE PARKING

SITE PLAN LEGEND

- PROPERTY LINE
- PROJECT BUILDING
- (E) CONCRETE PAVING
- (E) ASPHALT PAVING
- (E) BUILDING - NOT IN PROJECT SCOPE
- (E) LANDSCAPING
- ACCESSIBLE ENTRANCE
- CONCRETE PAVING

GENERAL NOTES

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KEY PLAN

PROJECT OWNER & TITLE

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TEMECULA VALLEY CAMPUS

41888 Motor Car Pkwy,
Temecula, CA 92591

SHEET TITLE

ENLARGED SITE PLAN

DRAWN BY: Author JOB NUMBER: 018103.01

SHEET NO.

A-104

DATE: APRIL 22, 2019

50% CONSTRUCTION DOCUMENTS

FILE LOCATION: A360://MSJC Temecula Valley Campus/A17_MSJC_TEMECULA VALLEY COLLEGE_Building G.rvt

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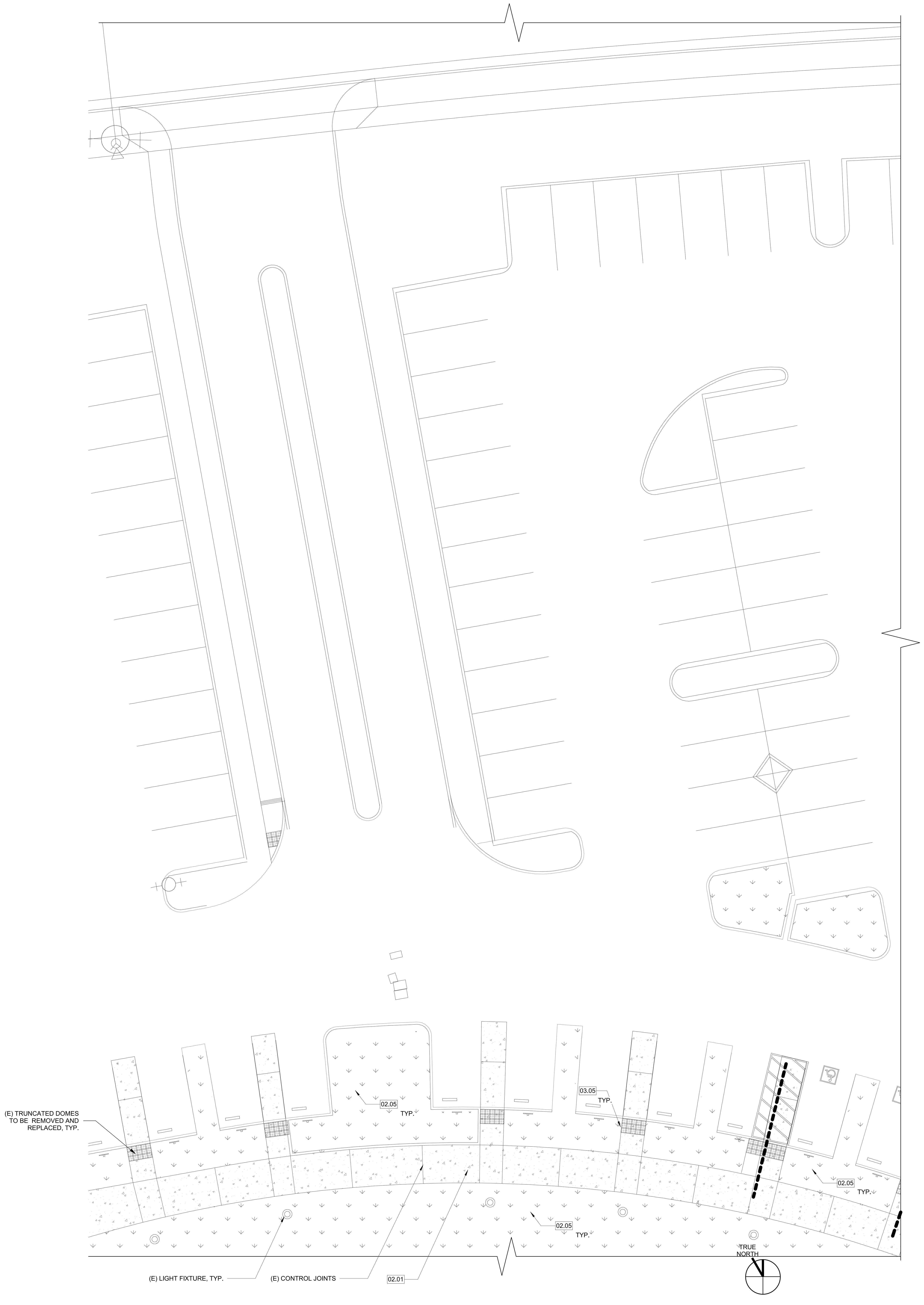

ENLARGED SITE PLAN - 6 | 1" = 10'-0" | 1

KEYNOTES

02.01 (E) CONCRETE PAVING TO REMAIN, PROTECT IN PLACE
02.05 (E) LANDSCAPING TO REMAIN, PROTECT IN PLACE
03.05 CAST-IN-PLACE TRUNCATED DOME DETECTABLE WARNING, SEE DETAIL 3/A-111

SITE PLAN LEGEND

- PROPERTY LINE
- PROJECT BUILDING
- (E) CONCRETE PAVING
- (E) ASPHALT PAVING
- (E) BUILDING - NOT IN PROJECT SCOPE
- (E) LANDSCAPING
- ▲ ACCESSIBLE ENTRANCE
- CONCRETE PAVING

GENERAL NOTES

19·6 ARCHITECTS

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MT. SAN JACINTO COMMUNITY COLLEGE DISTRICT

TEMECULA VALLEY CAMPUS

41888 Motor Car Pkwy,
Temecula, CA 92591

SHEET TITLE

ENLARGED SITE PLAN

DRAWN BY: Author JOB NUMBER: 018103.01

SHEET NO.

A-105

DATE: APRIL 22, 2019

FILE LOCATION: A360://MSJC Temecula Valley Campus/A17_MSJC_TEMECULA VALLEY COLLEGE_Building G.rvt
DATE PLOTTED: 4/22/2019 3:02:18 PM
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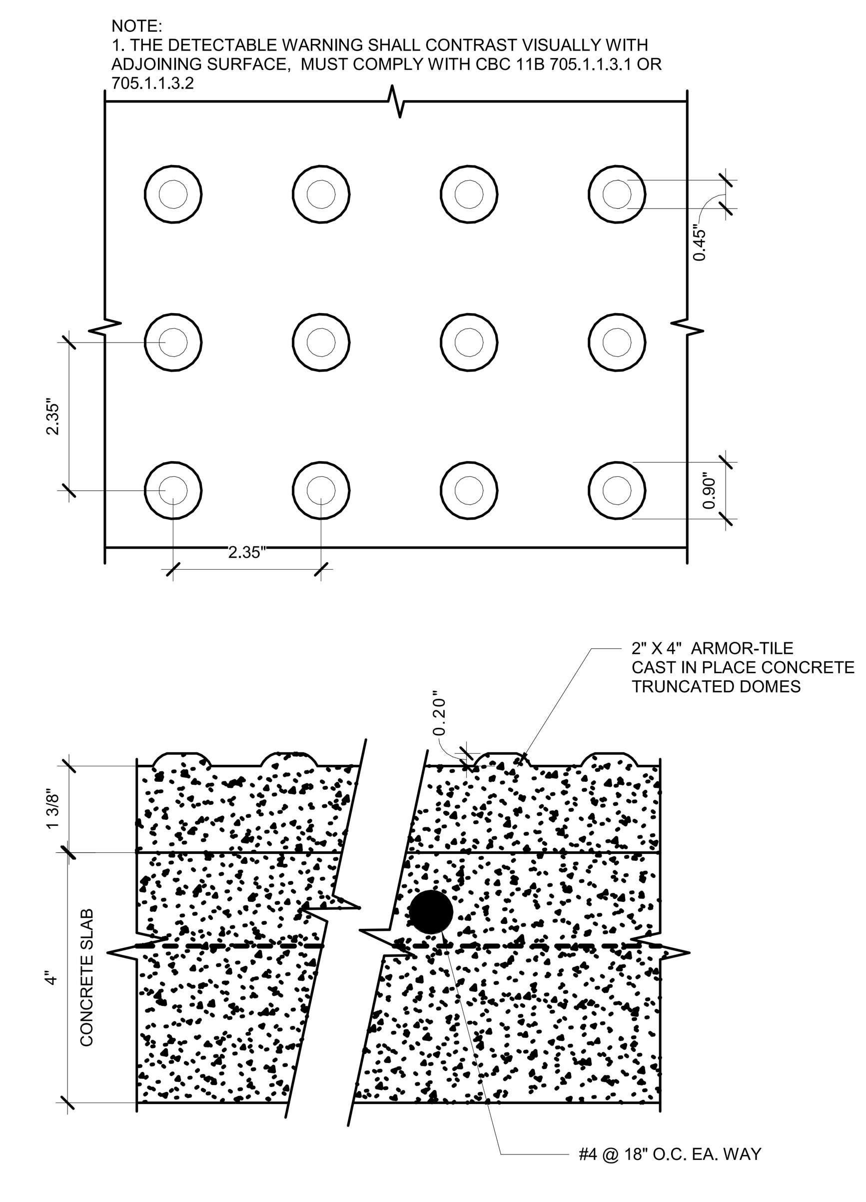
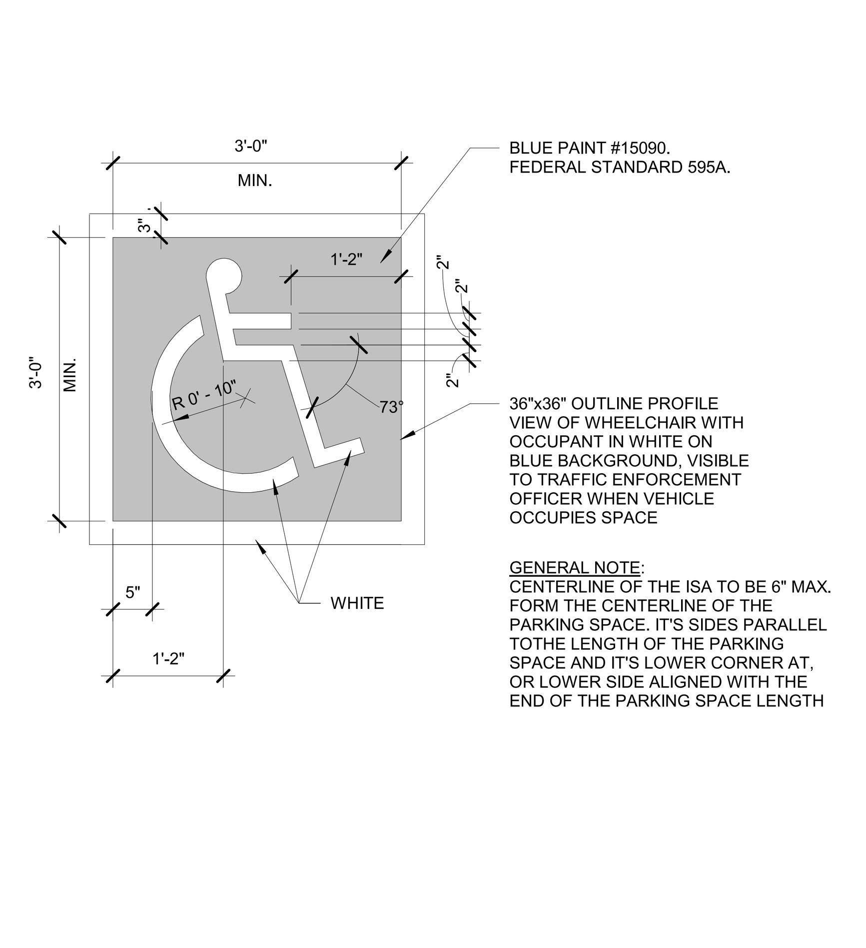
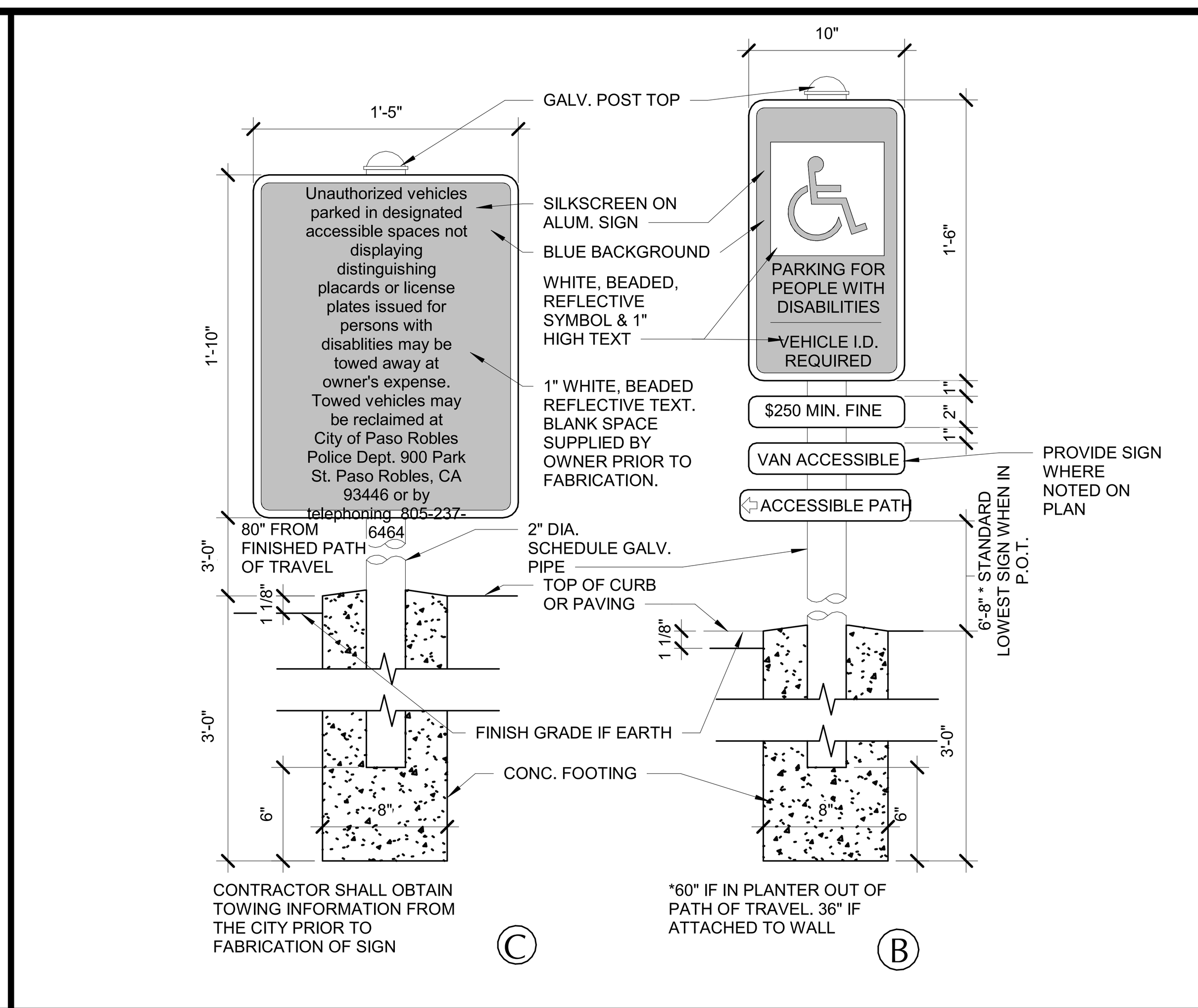


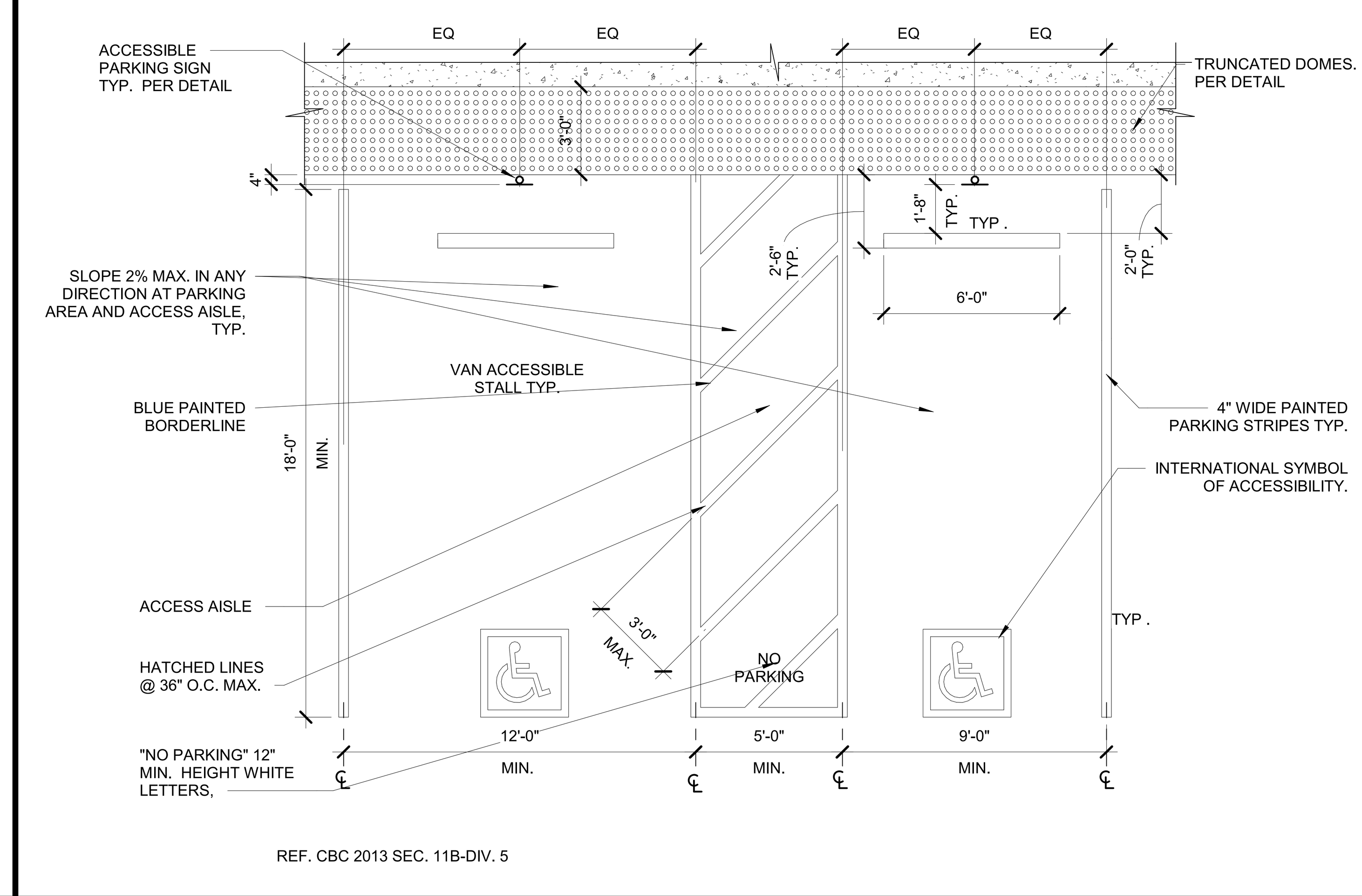
TRUNCATED DOMES | 6" = 1'-0" | 3



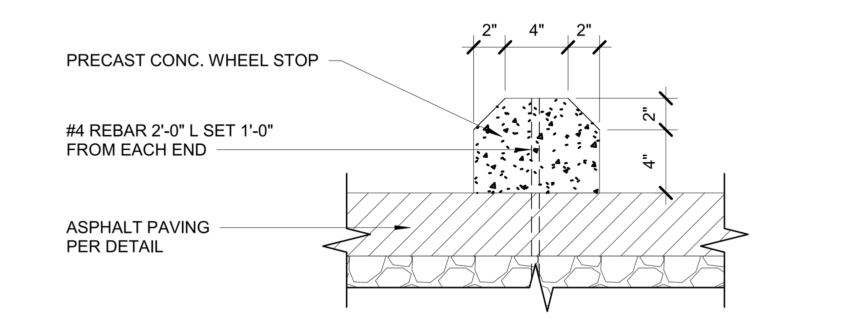
ISA SYMBOL FOR PARKING STALL | 3/4" = 1'-0" | 8



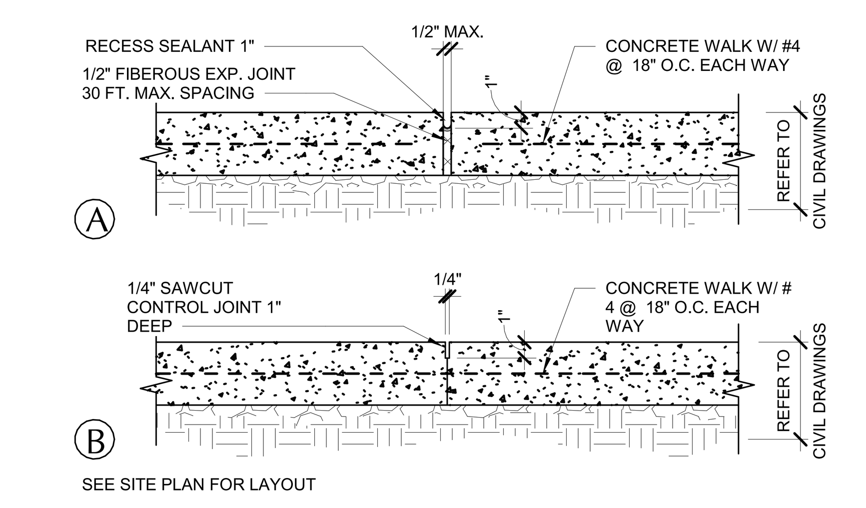
PARKING LOT SIGNAGE | 1 1/2" = 1'-0" | 1



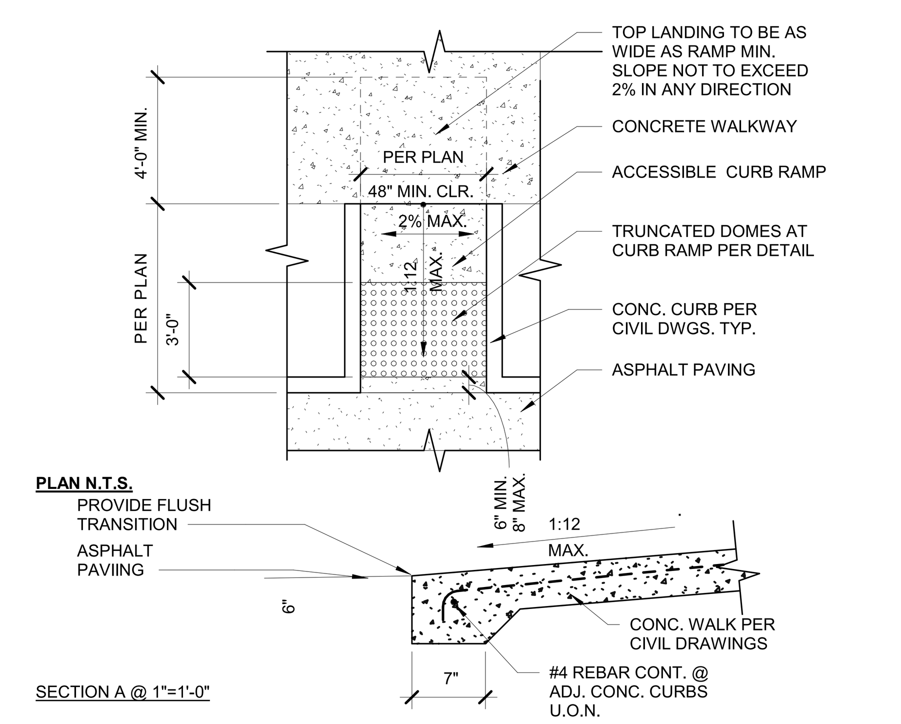
ACCESSIBLE PARKING | 1/4" = 1'-0" | 2



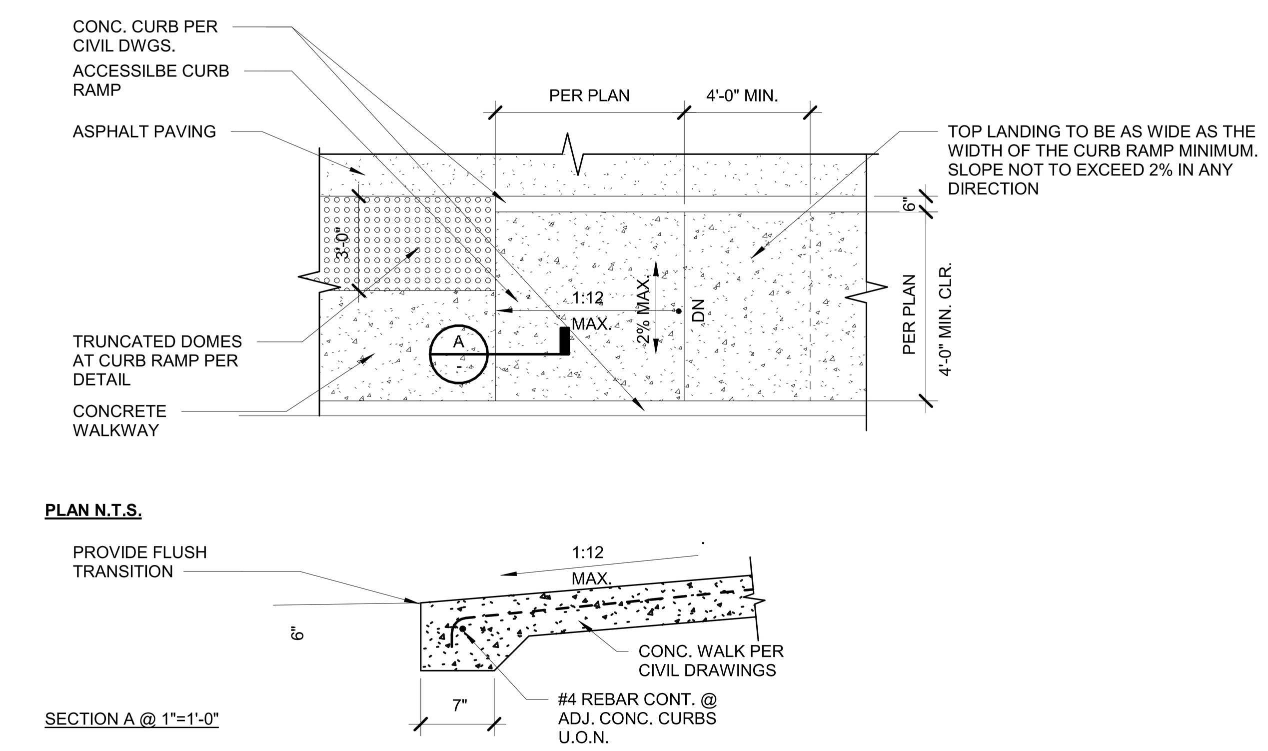
PRE-CAST CONC. WHEEL STOP | 1 1/2" = 1'-0" | 5



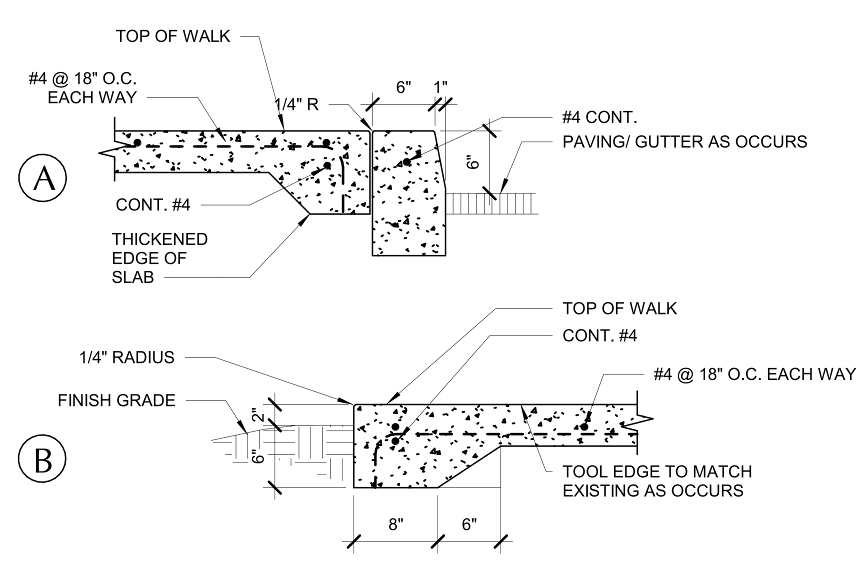
CONCRETE JOINT | 1 1/2" = 1'-0" | 4



ACCESSIBLE CURB RAMP DETAIL 1 | 1/4" = 1'-0" | 7



ACCESSIBLE CURB RAMP DETAIL 2 | 1/4" = 1'-0" | 6



CONCRETE WALK EDGE DETAILS | 1" = 1'-0" | 9

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KEY PLAN

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MT. SAN JACINTO COMMUNITY COLLEGE DISTRICT

TEMECULA VALLEY CAMPUS

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SHEET TITLE

SITE DETAILS

DRAWN BY: Author JOB NUMBER: 018103.01

SHEET NO.

A-111

DATE: APRIL 22, 2019

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