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May 11, 2022
(Revised June 21, 2022)

Project No. 644-21002
22-05-063

JS Bray, LLC and JA Bray, LLC
3161 Michelson Drive Suite 425
Irvine, California 92612

Project: Proposed San Jacinto 100
Residential Development
Tentative Tract Map No. 38202
APN 436-280-011, 012, 013, 014 & 025
San Jacinto, California

Subject: Geotechnical Update

Ref: *Geotechnical Investigation* report prepared by Sladden Engineering dated March 26, 2021; Project No. 644-21002, Report No. 21-03-030
Plan Review – Restricted Use Zone memo prepared by Sladden Engineering dated July 30, 2021; Project No. 21002, Report No. 21-07-083

In accordance with your request, we have reviewed the above referenced Geotechnical Investigation report as it relates to the design and construction of the San Jacinto 100 residential development proposed for the project site located north of Cottonwood Avenue and east of Lyon Avenue in the City of San Jacinto, California. It is our understanding that the proposed structures will be of relatively lightweight wood-frame or light-gauge steel-frame construction and will be supported by conventional shallow spread footings and concrete slabs on grade.

The referenced report includes recommendations pertaining to the design and construction of residential structure foundations. Based upon our review of the referenced report and our understanding of the proposed construction, it is our opinion that the structural values and remedial grading recommendations included in this report remain applicable for the design and construction of the residential development except as amended herein.

The proposed residential structures may be supported upon conventional shallow spread footings. All footings should be founded upon properly compacted engineered fill soil and should have a minimum embedment depth of 12 inches measured from the lowest adjacent finished grade. Continuous and isolated footings should have minimum widths of 12 inches and 24 inches, respectively. Continuous footings and isolated pad footings should be designed utilizing allowable bearing pressures of 1800 psf and 2000 psf, respectively. Allowable increases of 200 psf for each additional 1 foot of width and 250 psf for each additional 6 inches of depth may be utilized, if desired. The maximum allowable bearing pressure should be 3000 psf. The recommended allowable bearing pressures may be increased by one-third for wind and seismic loading.

Static settlement resulting from the anticipated foundation loads should be tolerable provided that the recommendations included in this report are considered in foundation design and construction. The ultimate static settlement is expected to be less than 1.0 inch when using the recommended allowable foundation bearing pressures. As a practical matter, differential static settlement between footings can be assumed as one-half of the total static settlement.

Lateral forces may be resisted by friction along the base of the foundations and passive resistance along the sides of the footings. A friction coefficient of 0.40 times the normal dead load forces is recommended for use in design. Passive resistance may be estimated using an equivalent fluid weight of 250 pcf. If used in combination with the passive resistance, the frictional resistance should be reduced by one third.

The bearing soil is non-expansive and falls within the "very low" expansion category in accordance with 2019 California Building Code (CBC) classification criteria. Slab thickness and reinforcement should be determined by the structural engineer. We recommend a minimum floor slab thickness of 4.0 inches and minimum reinforcement of #3 bars at 24 inches on center in both directions. All slab reinforcement should be supported on concrete chairs to ensure that reinforcement is placed at slab mid-height.

Slabs with moisture sensitive surfaces should be underlain with a moisture vapor retarder consisting of a polyvinyl chloride membrane such as 10-mil Visqueen, or equivalent. All laps within the membrane should be sealed and at least 2 inches of clean sand should be placed over the membrane to promote uniform curing of the concrete. To reduce the potential for punctures, the membrane should be placed on a pad surface that has been graded smooth without any sharp protrusions. If a smooth surface cannot be achieved by grading, consideration should be given to placing a 1-inch thick leveling course of sand across the pad surface prior to placement of the membrane.

Minor retaining walls may be required to accomplish the proposed construction. Cantilever retaining walls may be designed using "active" pressures. Active pressures may be estimated using an equivalent fluid weight of 35 pcf for gently sloping (less than 3H:1V) native backfill soil acting in a triangular pressure distribution with free-draining backfill conditions "At Rest" pressures should be utilized for restrained walls. At rest pressures may be estimated using an equivalent fluid weight of 55 pcf for native backfill soil with level free-draining backfill conditions. These lateral pressures should also be applicable for use in swimming pool design.

The seismic design category for a structure may be determined in accordance with Section 1613 of the 2019 CBC or ASCE7-16. According to the 2019 CBC, Site Class D may be used to estimate design seismic loading for the proposed structures. The 2019 CBC Site Specific Seismic Hazard Analyses are attached. The project Structural Engineer should verify that all design parameters provided are applicable for the subject project.

In order to provide firm and uniform foundation bearing conditions and to help mitigate potential seismic settlements, we recommend over-excavation and re-compaction throughout the proposed building areas. All artificial fill soil and low density near surface native soil should be removed to a depth of at least 5 feet below existing grade or 5 feet below the bottom of the footings, whichever is deeper. Remedial grading should extend laterally, a minimum of five feet beyond the building perimeter where possible. The native soil exposed by over-excavation should be scarified, moisture conditioned to near optimum moisture content and compacted to at least 90 percent relative compaction prior to all placement. The previously removed soil may then be replaced as engineered fill as recommended below.

We appreciate the opportunity to provide service to you on this project. If you have any questions regarding this letter or the referenced report, please contact the undersigned.

Respectfully submitted,
SLADDEN ENGINEERING

REGISTERED PROFESSIONAL ENGINEER
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Copies: 2/ Addressee

Project: APN 436-280-011, 012, 013 & 014; San Jacinto, California
Project Number: 644-21002
Client: Richland Developers, Inc.
Site Lat/Long: 33.7900/-116.9877
Controlling Seismic Source: San Jacinto (Casa Loma)

REFERENCE	NOTATION	VALUE
Site Class	C, D, D default, or E	D measured
Site Class D - Table 11.4-1	F_a	1.0
Site Class D - 21.3(ii)	F_v	2.5
$0.2*(S_{D1}/S_{DS})$	T_0	0.138
S_{D1}/S_{DS}	T_S	0.690
Fundamental Period (12.8.2)	T	Period
Seismic Design Maps or Fig 22-14	T_L	8
Equation 11.4-4 - $2/3*S_{M1}$	S_{D1}	1.0053*
Equation 11.4-2 - F_V*S_1	S_{M1}	1.5079*

REFERENCE	NOTATION	VALUE
Fv (Table 11.4-2)[Used for General Spectrum]	F_v	1.7
Design Maps	S_s	2.184
Design Maps	S_1	0.887
Equation 11.4-1 - F_A*S_S	S_{MS}	2.184*
Equation 11.4-3 - $2/3*S_{MS}$	S_{DS}	1.456*
Design Maps	PGA	0.989
Table 11.8-1	F_{PGA}	1.1
Equation 11.8-1 - $F_{PGA}*PGA$	PGA_M	1.088*
Section 21.5.3	80% of PGA_M	0.870
Design Maps	C_{RS}	0.890
Design Maps	C_{R1}	0.877

RISK COEFFICIENT

Cr - At Perods <=0.2, Cr=C_{RS}	C_{RS}	0.890
Cr - At Periods >=1.0, Cr=C_{R1}	C_{R1}	0.877

Cr - At Periods between 0.2 and 1.0 use trendline formula to complete

Period	Cr
0.200	0.890
0.300	0.888
0.400	0.887
0.500	0.885
0.600	0.884
0.680	0.882
1.000	0.877

* **Code based design value.** See accompanying data for Site Specific Design values.

Mapped values from https://seismicmaps.org/

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PROBABILISTIC SPECTRA[1]
2% in 50 year Exceedence

Project No: 644-21002

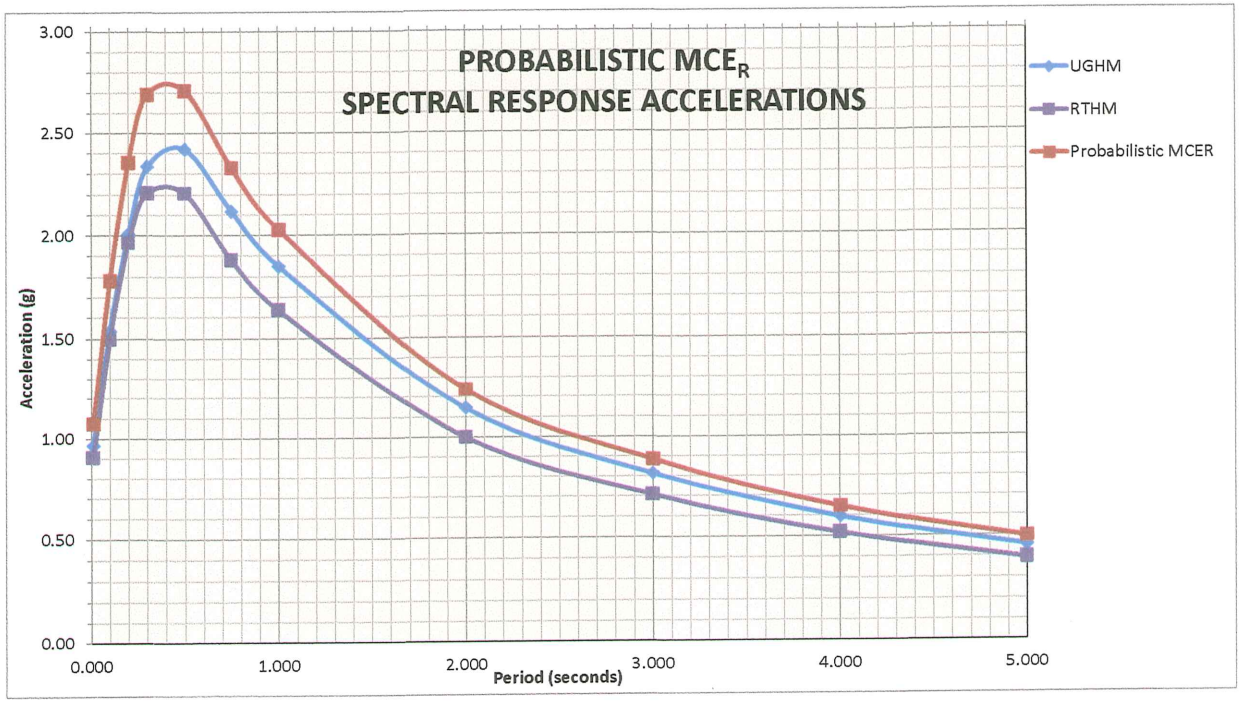
Period	UGHM	RTHM	Max Directional Scale Factor[2]	Probabilistic MCE
0.010	0.964	0.902	1.19	1.073
0.100	1.536	1.494	1.19	1.778
0.200	2.006	1.962	1.20	2.354
0.300	2.333	2.205	1.22	2.690
0.500	2.419	2.203	1.23	2.710
0.750	2.116	1.877	1.24	2.327
1.000	1.847	1.633	1.24	2.025
2.000	1.144	0.997	1.24	1.236
3.000	0.812	0.706	1.25	0.883
4.000	0.595	0.515	1.25	0.644
5.000	0.453	0.392	1.26	0.494

Probabilistic PGA: 0.964

Is Probabilistic $Sa_{(max)}<1.2F_a$? NO

[1] Data Sources:
https://earthquake.usgs.gov/hazards/interactive/
https://earthquake.usgs.gov/designmaps/rtgm/

[2] Shahi-Baker RotD100/RotD50 Factors (2014)



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DETERMINISTIC SPECTRUM

Largest Amplitudes of Ground Motions Considering All Sources Calculated using Weighted Mean of Attenuation Equations[1]

Controlling Source: San Jacinto (Casa Loma)

Is Probabilistic $Sa_{(max)}$<1.2Fa? NO

Project No: 644-21002

Period	Deterministic PSa Median + 1.σ for 5% Damping	Max Directional Scale Factor[2]	Deterministic MCE	Section 21.2.2 Scaling Factor Applied
0.010	1.033	1.19	1.229	1.229
0.020	1.037	1.19	1.234	1.234
0.030	1.049	1.19	1.248	1.248
0.050	1.087	1.19	1.293	1.293
0.075	1.273	1.19	1.515	1.515
0.100	1.488	1.19	1.771	1.771
0.150	1.788	1.20	2.146	2.146
0.200	2.005	1.20	2.406	2.406
0.250	2.210	1.21	2.674	2.674
0.300	2.324	1.22	2.836	2.836
0.400	2.429	1.23	2.988	2.988
0.500	2.402	1.23	2.955	2.955
0.750	2.045	1.24	2.535	2.535
1.000	1.768	1.24	2.193	2.193
1.500	1.292	1.24	1.602	1.602
2.000	0.985	1.24	1.222	1.222
3.000	0.679	1.25	0.849	0.849
4.000	0.461	1.25	0.576	0.576
5.000	0.336	1.26	0.423	0.423

Is Determinstic $Sa_{(max)}$<1.5*Fa? NO

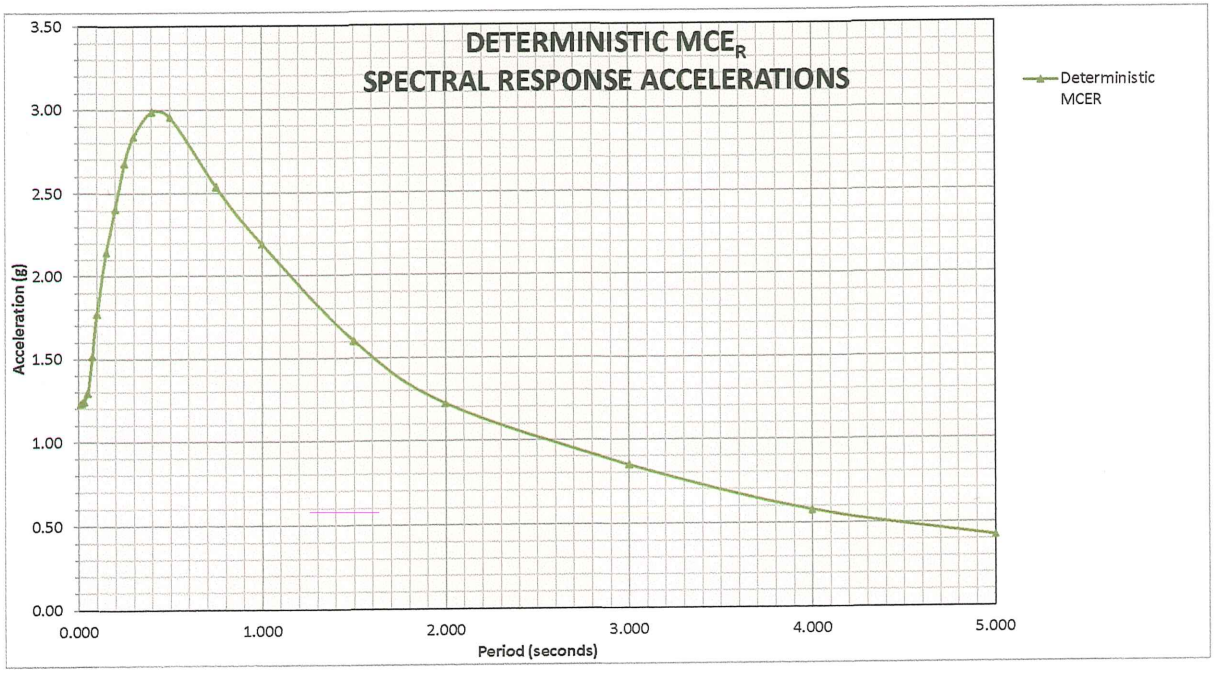
Section 21.2.2 Scaling Factor: N/A

Deterministic PGA: 1.033

Is Deterministic PGA >=F_{PGA}*0.5? YES

[1] NGAWest 2 GMPE worksheet and Uniform California Earthquake Rupture Forecast, Version 3 (UCERF3) - Time Dependent Model

[2] Shahi-Baker RotD100/RotD50 Factors (2014)



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SITE SPECIFIC SPECTRA

Period	Probabilistic MCE	Deterministic MCE	Site-Specific MCE	Design Response Spectrum (Sa)
0.010	1.073	1.229	1.073	0.716
0.100	1.778	1.771	1.771	1.181
0.200	2.354	2.406	2.354	1.570
0.300	2.690	2.836	2.690	1.793
0.500	2.710	2.955	2.710	1.806
0.750	2.327	2.535	2.327	1.552
1.000	2.025	2.193	2.025	1.350
2.000	1.236	1.222	1.222	0.814
3.000	0.883	0.849	0.849	0.566
4.000	0.644	0.576	0.576	0.384
5.000	0.494	0.423	0.423	0.282

ASCE 7-16: Section 21.4
Site Specific

	Calculated Value	Design Value
SDS:	1.626	1.626
SD1:	1.698	1.698
SMS:	2.439	2.439
SM1:	2.547	2.547
Site Specific PGAm:	0.964	0.964
Site Class:	D measured	

Seismic Design Category - Short*	E
Seismic Design Category - 1s*	E

* Risk Categories I, II, or III

Period	ASCE 7 SECTION 11.4.6 General Spectrum	80% General Response Spectrum
0.005	0.614	0.491
0.010	0.646	0.517
0.020	0.709	0.567
0.030	0.772	0.618
0.050	0.899	0.719
0.060	0.962	0.770
0.075	1.057	0.846
0.090	1.152	0.921
0.100	1.215	0.972
0.110	1.278	1.023
0.120	1.342	1.073
0.136	1.443	1.154
0.150	1.456	1.165
0.160	1.456	1.165
0.170	1.456	1.165
0.180	1.456	1.165
0.200	1.456	1.165
0.250	1.456	1.165
0.300	1.456	1.165
0.400	1.456	1.165
0.500	1.456	1.165
0.600	1.456	1.165
0.640	1.456	1.165
0.680	1.456	1.165
0.850	1.183	0.946
0.900	1.117	0.894
0.950	1.058	0.847
1.000	1.005	0.804
1.500	0.670	0.536
2.000	0.503	0.402
3.000	0.335	0.268
4.000	0.251	0.201
5.000	0.201	0.161

Project No: 644-21002

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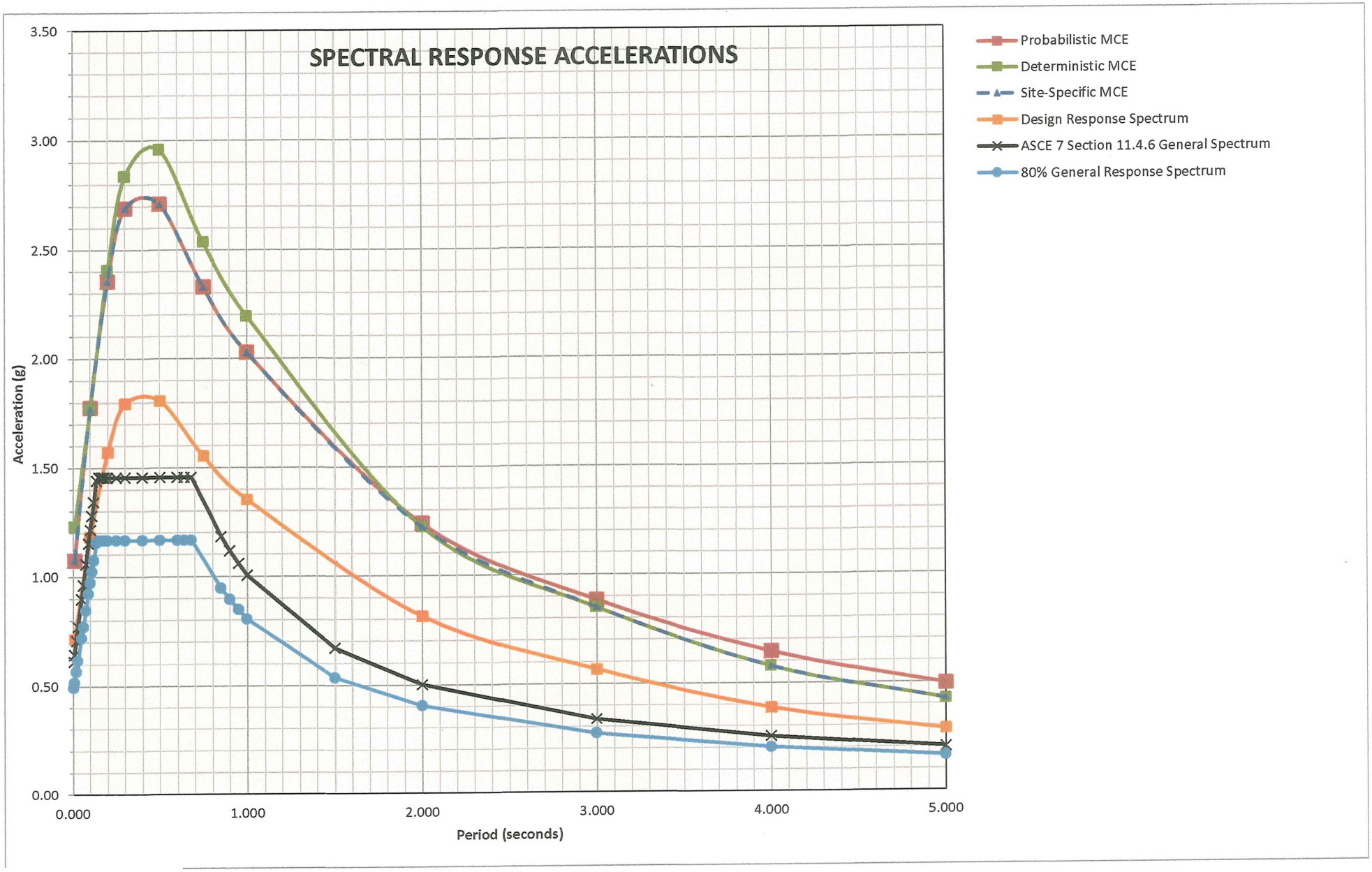

Project No: 644-21002

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