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TABLE OF CONTENTS

LISTS OF TABLES AND FIGURES

Tables

Figures

ABBREVIATIONS AND ACRONYMS

AB	Assembly Bill
CCCSIP	Central Coastal California Seismic Imaging Project
DCPP	Diablo Canyon Power Plant
GMPE	ground-motion-prediction equation
Hz	hertz
km	kilometer
LN	natural logarithm
LTSP	Long Term Seismic Program
m/s	meters per second
NGA	Next Generation Attenuation
NRC	U.S. Nuclear Regulatory Commission
PEER	Pacific Earthquake Engineering Research Center
PG&E	Pacific Gas and Electric Company
SSHAC	Senior Seismic Hazard Analysis Committee
SWUS	Southwestern United States
V_S	shear-wave velocity
V_{S30}	shear-wave velocity for the upper 30 meters
Z_1	soil depth to Vs = 1.0 km/s
$Z_{2.5}$	soil depth to Vs = 2.5 km/s

1.0 INTRODUCTION

As part of the Central Coastal California Seismic Imaging Project (CCCSIP), Pacific Gas and Electric Company (PG&E) evaluated the sensitivity of the deterministic ground motions at the Diablo Canyon Power Plant (DCPP) to the new information collected. These deterministic hazard sensitivities considered the results of two recent studies: new information developed as part of the Assembly Bill (AB) 1632 studies and new ground-motion-prediction equations (GMPEs) developed as part of the Pacific Earthquake Engineering Research (PEER) Center's Next Generation Attenuation (NGA) West2 project. The effect of the new information on the probabilistic seismic hazard for the DCPP is being evaluated separately for the U.S. Nuclear Regulatory Commission's (NRC) required Senior Seismic Hazard Analysis Committee (SSHAC) seismic source characterization and ground-motion-characterization studies that are due in March 2015. This study was conducted under PG&E DCPP QA program, as required by 10CFR appendix B.

The source parameters used for the deterministic evaluation in the 2011 Shoreline Fault Zone Report (PG&E, 2011) and the updated source parameters from the AB 1632 studies are compared in Table 1-1. In the 2011 Shoreline Fault Zone Report, the full logic tree was used to estimate the magnitude for the deterministic scenarios. These logic trees are currently being reassessed as part of the SSHAC source characterization study. For this hazard sensitivity study, a simplified approach is used to compute the magnitude of the deterministic scenarios: the magnitude is computed using the magnitude-area scaling relation of Leonard (2010), with the maximum length, minimum dip, and a seismogenic crustal thickness of 12 kilometers (km).

Table 1-1. Comparison of Source Characterizations for the Deterministic Ground-Motion Evaluation

	2011 Shoreline Report			Updated Parameters		
Fault	Maximum Length (km)	Minimum Dip (degrees)	Mag. (90th fractile)	Maximum Length (km)	Minimum Dip (degrees)	Mag.*
Shoreline	23	90	6.5	45	90	6.7
Hosgri	110	80	7.1	171	75	7.3
Los Osos	36	45	6.8	36	55	6.7
San Luis Bay	16	50	6.3	16	50	6.4

* The updated magnitudes are based on the Leonard (2010) magnitude-area scaling relation, using the maximum length and the minimum dip with a seismogenic crustal thickness of 12 km.

The Leonard (2010) magnitude-area relations for strike-slip and dip-slip faults are given in Equations 1-1 and 1-2:

$$M = 3.99 + \log_{10}(\text{area}) \text{ for strike-slip} \qquad (1\text{-}1)$$

$$M = 4.00 + \log_{10}(\text{area}) \text{ for dip-slip} \qquad (1\text{-}2)$$

where *area* is the rupture area in square kilometers.

The AB 1632 studies of the southern end of the Shoreline fault found that the fault extended an additional 22 km to the south, thereby increasing the fault length from 23 km used in the 2011 Shoreline Fault Zone Report to 45 km. With this increased length, the magnitude, based on Leonard (2010), increased from 6.5 to 6.7 as shown in Table 1-1.

For the Hosgri fault, the step-over between the Hosgri and San Simeon faults is small enough that the two faults are assumed to rupture together. The northern end of the San Simeon fault was not addressed in the AB 1632 studies. The length of the combined Hosgri and San Simeon faults, 171 km, was defined using the Hosgri fault length from the U.S. Geological Survey (Petersen et al., 2008, Table I-3) which treated the San Simeon and Hosgri faults as a single fault called the Hosgri fault. This increased length leads to a magnitude of 7.3.

The AB 1632 studies for the Los Osos fault, found that the minimum dip consistent with the newly collected data is 55 degrees, as compared to a minimum dip of 45 degrees used in the 2011 Shoreline Fault Zone Report. The steeper dip leads to a smaller fault area, and the magnitude is reduced from 6.8 to 6.7.

The AB 1632 studies did not provide new information for the San Luis Bay fault length or dip. Using the length and dip from the 2011 Shoreline Fault Zone Report leads to a magnitude of 6.4. The increase from the 2011 magnitude of 6.3 results from using the bounding length and dip rather than the full logic tree to define the rupture area.

Additional linking of the ruptures to fault segments outside the study region (such as linking the Hosgri–San Simeon rupture to a San Gregorio rupture) was not evaluated in the AB 1632 studies. Because this is best addressed with the probabilistic approach, the potential for linking of ruptures outside the AB 1632 study area is being characterized in the SSHAC seismic source characterization study.

2.0 DETERMINISTIC GROUND MOTIONS

2.1 Hazard Sensitivity for Updated Scenarios

For the scenarios listed in Table 1-1, the parameters required as inputs to GMPEs are listed in Tables 2-1 and 2-2. A reference site condition with shear-wave velocity in the upper 30 meters (V_{S30}) at 760 meters per second (m/s) and default values for depths to V_S=1.0 km/s and V_S =2.5 km/s (called Z_1 and $Z_{2.5}$) is used to compute the median ground motion and standard deviation for the four NGA-West2 GMPEs (Abrahamson et al., 2014; Boore et al., 2014; Campbell and Bozorgnia, 2014; Chiou and Youngs, 2014). The four models are given equal weight of 0.25. In addition to the source parameters, the distanes from the source to the DCPP site is also required. There are three distance metrics used in the GMPEs: the closest distance from the rupture plane to the site (R_{RUP}), the shortest horizontal distance from the vertical projection of the rupture plane to the site (R_{JB}), and the shortest horizontal distance from the vertical projection of the top of the rupture to the site measured perpendicular to strike (R_X). These distance metric are listed in Table 2-2 for each scenario.

Table 2-1. Source Input Parameters Required for the GMPEs

Fault	Mag	Dip	Downdip Width (km)	Sense of Slip[1]	Hypocentral Depth (km)	Depth to Top of Rupture (km)
Hosgri (linked to San Simeon)	7.3	75	12.4	SS	8	0
Los Osos	6.7	55	14.6	RV	8	0
San Luis Bay	6.4	50	15.7	RV	8	0
Shoreline	6.7	90	12	SS	8	0

[1] RV = reverse-slip; SS = strike-slip

Table 2-2. Distance and Site Input Parameters Required for the GMPEs

Fault	R_{RUP} (km)	R_{JB} (km)	R_X (km)	Hanging Wall or Footwall	V_{S30} (m/s)	Z_1 (km)	$Z_{2.5}$ (km)
Hosgri (linked to San Simeon)	4.7	1.7	4.9	HW	760	Default	Default
Los Osos	8.1	1.5	9.9	HW	760	Default	Default
San Luis Bay	1.9	0.0	2.5	HW	760	Default	Default
Shoreline	0.6	0.6	0.6	N/A	760	Default	Default

To account for the site-specific site response at the DCPP, the amplification factors given in Table 3-3 of CCCSIP Report Chapter 11 (PG&E, 2014) are applied to the reference site condition ground motion from the GMPEs. As described in GEO.DCPP.TR.14.06, the deterministic 84th percentile ground motion is computed by combining the epistemic uncertainty in the site term ($\sigma_{SiteAmp}(f)$) with the single-station sigma ($\sigma_{SS}(f)$). The 84th percentile ground motion is computed using Equation 2-1:

$$\ln\left(PSA_{84th}(f)\right) = \ln\left(NGA_{Med}(f)\right) + \ln\left(SiteAmp(f)\right) + \sqrt{\sigma_{SS}^2(f) + \sigma_{SiteAmp}^2(f)} \quad (2\text{-}1)$$

where $\left(NGA_{Med}(f)\right)$ is the weighted average of the medians from the five NGA-West2 models, $\ln\left(SiteAmp(f)\right)$ is the natural log of the DCPP site-specific site amplification (for either the power block or the turbine building, $\sigma_{SS}(f)$ is the single-station sigma, and $\sigma_{SiteAmp}(f)$ is the epistemic uncertainty in the DCPP site-specific site amplification in natural log units. The single-station sigma is computed by removing the within-event site variability, $\phi_{S2S}(f)$, from the ergodic standard deviation, $\sigma_{ERG}(f)$ given by the GMPEs:

$$\sigma_{SS}^2(f) = \sqrt{\sigma_{ERG}^2(f) - \phi_{S2S}^2(f)} \quad (2\text{-}2)$$

The values of $\phi_{S2S}(f)$ from the 2011 Shoreline Fault Zone Report (Table 6-7 in the 2011 report) are listed in Table 2-3. The values of $\ln\left(SiteAmp(f)\right)$ for the power-block and turbine-building foundation levels and the values of $\sigma_{SiteAmp}(f)$ are given in GEO.DCPP.TR.14.06 and are repeated here in Table 2-3.

Table 2-3. Total Site-Specific Amplification from the NGA-West2 GMPEs for a Reference Site with V_{S30}=760 m/s to the Power-Block and Turbine-Building Foundation Levels

Frequency (Hz)	$\phi^2_{S2S}(f)$	Amplification, $\ln(SiteAmp(f))$ (LN units)		Epistemic Uncertainty in Site Amplification, $\sigma_{SiteAmp}(f)$
		Power Block Foundation	Turbine Building Foundation	
100	0.080	-0.506	-0.416	0.200
50	0.079	-0.520	-0.433	0.199
34	0.081	-0.546	-0.465	0.201
20	0.084	-0.706	-0.625	0.205
13.5	0.087	-0.718	-0.631	0.209
10	0.089	-0.751	-0.650	0.211
6.7	0.090	-0.785	-0.660	0.212
5	0.092	-0.704	-0.562	0.214
4	0.092	-0.551	-0.415	0.214
3.3	0.093	-0.420	-0.293	0.216
2.5	0.094	-0.015	0.075	0.217
2	0.096	0.020	0.094	0.219
1.3	0.099	0.065	0.120	0.222
1	0.103	-0.049	-0.006	0.227
0.67	0.106	-0.010	0.016	0.230
0.5	0.109	0.004	0.024	0.233

Sources: Shoreline Fault Zone Report (Table 6-7 of PG&E, 2011) and GEO.DCPP.TR.14.06 (Table 3-3).

The median and standard deviations of the ground motions are computed for the reference site condition using the NGA-West2 GMPEs. The software used for this calculation is the PEER NGA-W2 spreadsheet (file name: NGAW2-GMPE_Spreadsheets_V5.5_060514_protected.xlsm). This spreadsheet was checked in GEO.DCPP.14.03, Rev0.

The resulting ground motions values are are listed in Tables 2-4 through 2-7 for the Hosgri, Los Osos, San Luis Bay, and Shoreline scenarios. The deterministic 84th percentile ground motions are computed using Equation 2-1. The deterministic response spectra for the power-block foundation level are listed in Table 2-8 and the deterministic response spectra for the turbine-building foundation level are listed in Table 2-9. The deterministic spectra for the power block and turbine building are compared to the 1977 Hosgri and 1991 LTSP spectra on Figures 2-1 and 2-2, respectively. The 1977 Hosgri spectrum is defined for frequencies greater than 1 hertz (Hz). The extension of the 1977 Hosgri spectrum to lower frequencies is shown by the dashed black lines on Figures 2-1 and 2-2. For all the scenarios and for both sites, the deterministic ground motions are bounded by the 1977 Hosgri spectrum.

Table 2-4. Deterministic Response Spectra (5% Damping) for the Hosgri Fault for the Reference Site Condition (V_{S30} = 760 m/s)

Frequency (Hz)	Average Median from 4 NGA Models $NGA_{Med}(f)$ (g)	Average $\sigma_{ERG}(f)$ from 4 NGA Models (LN units)	$\sigma_{SS}(f)$ (LN units)
100	0.475	0.588	0.516
50	0.489	0.590	0.519
34	0.542	0.601	0.529
20	0.688	0.618	0.546
13.5	0.863	0.637	0.564
10	0.972	0.643	0.570
6.7	1.095	0.638	0.563
5	1.069	0.630	0.553
4	0.980	0.625	0.546
3.3	0.889	0.630	0.551
2.5	0.749	0.638	0.560
2	0.636	0.652	0.573
1.3	0.451	0.679	0.602
1	0.337	0.691	0.612
0.67	0.210	0.698	0.617
0.5	0.148	0.699	0.616

Table 2-5. Deterministic Response Spectra (5% Damping) for the Los Osos Fault for the Reference Site Condition (V_{S30} = 760 m/s)

Frequency (Hz)	Average Median from 4 NGA Models $NGA_{Med}(f)$ (g)	Average $\sigma_{ERG}(f)$ from 4 NGA Models (LN units)	$\sigma_{SS}(f)$ (LN units)
100	0.434	0.591	0.518
50	0.446	0.593	0.522
34	0.494	0.603	0.532
20	0.633	0.621	0.549
13.5	0.807	0.640	0.568
10	0.922	0.646	0.573
6.7	1.029	0.641	0.566
5	1.000	0.633	0.555
4	0.902	0.627	0.549
3.3	0.811	0.633	0.554
2.5	0.664	0.641	0.563
2	0.545	0.654	0.576
1.3	0.365	0.682	0.605
1	0.256	0.694	0.615
0.67	0.146	0.700	0.620
0.5	0.096	0.701	0.618

Table 2-6. Deterministic Response Spectra (5% Damping) for the San Luis Bay Fault for the Reference Site Condition (V_{S30} = 760 m/s)

Frequency (Hz)	Average Median from 4 NGA Models $NGA_{Med}(f)$ (g)	Average $\sigma_{ERG}(f)$ from 4 NGA Models (LN units)	$\sigma_{SS}(f)$ (LN units)
100	0.540	0.596	0.525
50	0.558	0.598	0.528
34	0.620	0.608	0.537
20	0.790	0.624	0.553
13.5	0.999	0.642	0.571
10	1.137	0.649	0.576
6.7	1.267	0.645	0.571
5	1.221	0.638	0.561
4	1.109	0.633	0.555
3.3	1.000	0.638	0.560
2.5	0.810	0.646	0.569
2	0.661	0.659	0.582
1.3	0.443	0.686	0.610
1	0.307	0.698	0.620
0.67	0.170	0.704	0.624
0.5	0.109	0.704	0.622

Table 2-7. Deterministic Response Spectra (5% Damping) for the Shoreline Fault for the Reference Site Condition (V_{S30} = 760 m/s)

Frequency (Hz)	Average Median from 4 NGA Models $NGA_{Med}(f)$ (g)	Average $\sigma_{ERG}(f)$ from 4 NGA Models (LN units)	$\sigma_{SS}(f)$ (LN units)
100	0.495	0.591	0.518
50	0.511	0.593	0.522
34	0.569	0.603	0.532
20	0.725	0.620	0.549
13.5	0.910	0.639	0.566
10	1.022	0.645	0.572
6.7	1.148	0.641	0.566
5	1.108	0.633	0.555
4	1.015	0.627	0.549
3.3	0.913	0.633	0.554
2.5	0.753	0.641	0.562
2	0.629	0.654	0.576
1.3	0.440	0.682	0.605
1	0.323	0.694	0.615
0.67	0.191	0.700	0.620
0.5	0.130	0.701	0.618

Table 2-8. Deterministic 84th Percentile Site-Specific Ground Motions for the Power-Block Foundation Level

	5% Damped Spectral Acceleration (g)			
Frequency (Hz)	**Hosgri (M 7.3, Dip=75)**	**Los Osos (M=6.7, Dip=55)**	**San Luis Bay (M=6.4, Dip=50)**	**Shoreline (M=6.7, Dip=90)**
100	0.498	0.456	0.571	0.520
50	0.507	0.464	0.583	0.531
34	0.553	0.505	0.637	0.582
20	0.609	0.561	0.703	0.643
13.5	0.768	0.721	0.895	0.811
10	0.842	0.801	0.991	0.887
6.7	0.912	0.859	1.063	0.958
5	0.957	0.897	1.101	0.993
4	1.015	0.937	1.159	1.055
3.3	1.056	0.966	1.197	1.087
2.5	1.345	1.196	1.467	1.355
2	1.198	1.030	1.256	1.188
1.3	0.914	0.742	0.905	0.894
1	0.616	0.470	0.566	0.592
0.67	0.402	0.280	0.327	0.366
0.5	0.287	0.187	0.213	0.253

Table 2-9. Deterministic 84th Percentile Site-Specific Ground Motions for the Turbine-Building Foundation Level

	5% Damped Spectral Acceleration (g)			
Frequency (Hz)	Hosgri (M 7.3, Dip=75)	Los Osos (M=6.7, Dip=55)	San Luis Bay (M=6.4, Dip=50)	Shoreline (M=6.7, Dip=90)
100	0.545	0.499	0.625	0.569
50	0.553	0.506	0.636	0.579
34	0.600	0.548	0.691	0.631
20	0.660	0.609	0.763	0.697
13.5	0.838	0.786	0.976	0.885
10	0.932	0.886	1.096	0.982
6.7	1.033	0.973	1.204	1.086
5	1.103	1.033	1.269	1.145
4	1.163	1.074	1.327	1.208
3.3	1.199	1.097	1.360	1.234
2.5	1.472	1.309	1.605	1.483
2	1.290	1.109	1.352	1.280
1.3	0.966	0.784	0.956	0.945
1	0.643	0.490	0.591	0.618
0.67	0.412	0.287	0.336	0.376
0.5	0.293	0.190	0.217	0.258

2.2 Shoreline Rupture Sensitivity

In the evaluation of the Shoreline fault rupture developed in the Shoreline Fault Zone Report (PG&E, 2011), the Shoreline fault was assumed to intersect with the Hosgri fault, but a linked rupture involving the full Shoreline fault and the full Hosgri fault was not included because the geometry of the two faults was unfavorable to allow such a rupture. Dynamic rupture modeling (see Appendix J in the 2011 Shoreline Fault Zone Report) showed that if the rupture on the Hosgri stepped onto the Shoreline fault, the rupture would continue for only a few kilometers at most. Similarly, ruptures on the Shoreline fault stepping onto the Hosgri would continue for only a few kilometers. To impact the deterministic hazard, the rupture on the Shoreline fault must rupture the section of the fault within 5 km of the DCPP (e.g. the rupture would have to include the central segment of the Shoreline fault), otherwise the ground motion will be less than for the Hosgri rupture, which is at a distance of 4.9 km and has the same magnitude.

The new information collected on the geometry of the Shoreline and Hosgri faults shows that within a resolution of a few hundred meters, the two faults intersect. This new information indicates that the fault may rupture together, but it does not change the unfavorable geometries for a linked rupture discussed above.

As a sensitivity, the deterministic hazard is computed assuming that the full Shoreline fault rupture is linked to a rupture on the Hosgri fault, extending north to the end of the San Simeon fault. The rupture length for this scenario is computed using the part of the Hosgri/San Simeon fault that is north of the intersection of the Shoreline fault and the Hosgri fault (100 km) and the full length of the Shoreline fault (45 km) for a total length of 145 km. Using a fault width of 12 km, this linked rupture has a magnitude of 7.23 based on the Leonard (2010) magnitude-area scaling relation for strike-slip faults. For this sensitivity, the magnitude is rounded up to M7.3. For this scenario, the closest distance is 0.6 km (this is the shortest distance to the Shoreline fault).

The median and standard deviations of the ground motions computed for the reference site condition using the NGA-West2 GMPEs are listed in Table 2-10. The deterministic 84th percentile ground motions are listed in Table 2-11, and the spectra are compared to the 1977 Hosgri and 1991 LTSP spectra on Figure 2-3. The ground motion from this linked rupture case remains bounded by the 1977 Hosgri spectrum.

Table 2-10. Deterministic Response Spectra (5% Damping) for the Scenario with the Shoreline Fault Rupture Linked to the Hosgri Fault and for the Reference Site Condition (V_{S30}=760 m/s)

Frequency (Hz)	Average Median from 4 NGA Models $NGA_{Med}(f)$ (g)	Average $\sigma_{ERG}(f)$ from 4 NGA Models (LN units)	$\sigma_{SS}(f)$ (LN units)
100	0.521	0.588	0.516
50	0.536	0.590	0.519
34	0.595	0.600	0.529
20	0.754	0.618	0.546
13.5	0.941	0.636	0.564
10	1.057	0.643	0.569
6.7	1.193	0.638	0.563
5	1.161	0.630	0.552
4	1.074	0.625	0.546
3.3	0.977	0.630	0.551
2.5	0.827	0.638	0.560
2	0.706	0.652	0.573
1.3	0.509	0.679	0.602
1	0.386	0.691	0.612
0.67	0.243	0.698	0.617
0.5	0.172	0.699	0.616

Table 2-11. Deterministic 84th Percentile Site-Specific Ground Motions for the Scenario with the Shoreline Fault Rupture Linked to the Hosgri Fault

	5% Damped Spectral Acceleration (g)	
Frequency (Hz)	**Power Block**	**Turbine Building**
100	0.546	0.598
50	0.556	0.606
34	0.607	0.658
20	0.667	0.723
13.5	0.838	0.914
10	0.915	1.012
6.7	0.993	1.125
5	1.038	1.196
4	1.113	1.275
3.3	1.160	1.317
2.5	1.485	1.625
2	1.330	1.432
1.3	1.032	1.090
1	0.706	0.737
0.67	0.465	0.477
0.5	0.334	0.340

3.0 CONCLUSIONS AND LIMITATIONS

For all the cases considered in this sensitivity study, the 84th percentile ground motions for the power-block and turbine-building foundation levels are bounded by the 1977 Hosgri spectrum.

For this evaluation, the reference rock ground motion is computed using the five NGA-West2 GMPEs with equal weight. The Southwestern United States (SWUS) ground-motion project is the SSHAC evaluation that will develop a complete set of ground-motion models and weights for application to the DCPP. The SWUS models will be completed as part of the March 2015 report. In addition, analytical modeling of the three-dimensional site amplification is being conducted and evaluated as part of the March 2015 hazard study, and this may affect the DCPP site-specific factors. Therefore, the ground motions shown in this section are for an initial hazard sensitivity evaluation only.

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VERIFICATION SUMMARY REPORT

Item	Parameter	Yes	No*	N/A*
1	Purpose is clearly stated and the report satisfies the Purpose.	✓		
2	Data to be interpreted and/or analyzed are included or referenced.	✓		
3	Methodology is appropriate and properly applied.	✓		
4	Assumptions are reasonable, adequately described, and based upon sound geotechnical principles and practices.	✓		
5	Software is identified and properly applied. Validation is referenced or included, and is acceptable. Input files are correct.	✓		
6	Interpretation and/or Analysis is complete, accurate, and leads logically to Results and Conclusions.	✓		
7	Results and Conclusions are accurate, acceptable, and reasonable compared to the Data, interpretation and/or analysis, and Assumptions.	✓		
8	The Limitation on the use of the Results has been addressed and is accurate and complete.	✓		
9	The Impact Evaluation has been included and is accurate and complete.	✓		
10	References are valid for intended use.	✓		
11	Appendices are complete, accurate, and support text.			N/A*

*No appendices or supporting documents are included.

Comments:

- Table 1-1 "2011 Shoreline Report" parameters are the maximum fault length, the minimum dip, and the 90th fractile magnitude. The minimum dip and 90th fractile parameters in this table are correctly transmitted from Table 6-8 of the 2011 Shoreline Fault report. The maximum length for each fault source is taken from the 2011 Shoreline Fault logic trees in Chapter 5 (Shoreline: Figure 5-2, Hosgri: Figure 5-9, Los Osos: Figure 5-10, San Luis Bay: Figure 5-11). The "Updated Parameters" in Table 1-1 also include the maximum fault length, the minimum dip, and the magnitude. Updated magnitudes are verified using Leonard 2010 (see "Chapter13check.xls"). Updated dip for the Hosgri and Los Osos faults are taken from the "Study Results" section of the CCCSIP Report Executive Summary (Hosgri Dip: Study Result #2, Los Osos Dip: Study Result #5). The updated maximum length for the Shoreline fault is taken from the Study Result #10 of the CCSIP Report Executive Summary, and the updated maximum length for the Hosgri fault consistent with the USGS value. The approach for computing the Hosgri length is verified and appropriate. All values in Table 1-1 are verified to be accurate.
- Table 2-1 magnitudes and dips are correctly transmitted from Table 1-1. The downdip widths are independently computed (see "Chapter13check.xls") and verified to be

correct. The sense of slip for each of the faults is verified to be appropriate based on Table 6-8 of the 2011 Shoreline Fault report. Hypocentral depth is an assumed parameter, and it is verified to be reasonable. Also, the depth to top of rupture is an assumed parameter, and it is reasonable based on the magnitudes of the ruptures assigned to each fault. All values in Table 2-1 are verified to be accurate.

- Because the Hosgri and Los Osos dips have been updated, the R_{RUP} and R_{JB} parameters in Table 2-2 are new values. These parameters were independently computed by hand and verified to be correct. All other distance metrics (R_{RUP}, R_{JB}, and R_X) in Table 2-2 are correctly transmitted from Table 6-8 of the 2011 Shoreline Fault report. DCPP is located on the HW side of each of these fault sources (with the exception of Shoreline because dip=90) and this parameter is verified to be correct. Vs30 is a default parameter based on the reference rock condition. It is a reasonable assumption and verified to be appropriate. Default values are used for Z1 and Z2.5 and this is a reasonable approach for the purposes of this calculation. All values in Table 2-2 are verified to be accurate.
- Table 2-3 was verified against Tables 6.5-1 and 10.1-1 in GEO.DCPP.14.03 rev0.
- Median SA values (the geometric mean over the 4 NGA-W2 models) for the deterministic fault sources in Tables 2-4, 2-5, 2-6, 2-7, and 2-10 were computed using the PEER spreadsheet (NGAW2_GMPE_Spreadsheets_v5.5_060514_Protected.xlsm). The spreadsheet was also used to compute the Median SA plus one standard deviation and from these two numbers, the average standard deviation model over the 4 NGA GMPEs was computed. Finally, σ_{SS} was computed using equation 2-2. Tables 2-4, 2-5, 2-6, 2-7, 2-10 are verified to be correct (see "Chapter13check.xls" for independent ITR computation).
- Using equation 2-1, the deterministic 84th percentile ground motions were independently computed using the median spectral acceleration (Tables 2-4, 2-5, 2-6, 2-7, and 2-10), the site amplification factors for the power block foundation and the turbine building foundation (Table 2-3) and the standard deviation. The values in Table 2-8, 2-9, and 2-11 are verified to be correct (see "Chapter13check.xls" for independent ITR computation).

All supporting documents for this ITR report are located on the Geosciences S:/ Drive.

Verifier (ITR): [signature] (name/signature) 08/08/14 (date)