Appendix C: Final SSC Model Hazard Input Document (HID)

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C.1 Introduction

This Hazard Input Document (HID) describes the Final Seismic Source Characterization (SSC) model for the Diablo Canyon Power Plant (DCPP). This SSC model is intended for use in a site-specific Probabilistic Seismic Hazard Analysis (PSHA) for the DCPP. This HID is authored by the SSC Technical Integrator (TI) Team that conducted the Diablo Canyon SSC study following the SSHAC Level 3 process (Budnitz et al., 1997; U.S. NRC, 2012).

C.1.1 Purpose of the HID

The purpose of this HID is to provide the hazard analyst(s) with a complete description of how to implement the SSC model and a listing of all the model components. The HID is a succinct summary of what is in the SSC model and provides the SSC logic tree parameters (nodes), alternative values (branches), and their weights (relative likelihood of each branch value being correct). It also provides instructions for implementing aleatory variability in the SSC model. The HID does not describe or justify the technical basis for the model approach, parameters, values, or weights. Documentation of the technical basis for the Final Diablo Canyon SSC model is provided in the Diablo Canyon SSC Study Report.

C.1.2 Description of Seismic Sources

The SSC model has two types of seismic sources: fault sources and areal sources. Fault sources are described in the following sections:

- Primary and Connected fault sources (*Section C.2*)
- San Andreas fault source (*Section C.3*)
- UCERF3 Regional fault sources (*Section C.4*)
- Non-UCERF3 Regional fault sources (*Section C.5*)

Areal sources are described in the following section:

- Local, Vicinity, and Regional areal source zones (*Section C.6*)

C.2 Primary and Connected Fault Sources

Primary fault sources are earthquake sources of most importance to hazard for the DCPP based on sensitivity analyses. Primary fault sources are located within 12 kilometers (km) of the DCPP at closest source to site distances. Connected fault sources are those faults that directly connect to and rupture with the Primary fault sources in the SSC model. In the HID, we capitalize Primary and Connected fault sources to distinguish when we are using these terms to refer to the fault sources from other usage.

Primary and Connected fault sources are listed in Table C.2-1 below. Also listed is the “group” each fault source belongs to. There are two groups: The Hosgri fault source group (Hosgri group) and the San Luis–Pismo Block (SLPB) fault source group (SLPB group).

Table C.2-1. Primary and Connected Fault Sources and Groups

Primary Fault Source Name	Group
Hosgri	Hosgri
Los Osos	SLPB
San Luis Bay	SLPB
Shoreline	SLPB
Connected Fault Source Name	**Group**
Foxen Canyon	SLPB
Little Pine	SLPB
Nipomo	SLPB
Oceano	SLPB
Piedras Blancas	Hosgri
San Andreas	Hosgri
San Gregorio	Hosgri
San Miguelito (offshore only)	SLPB
San Simeon	Hosgri
Western Hosgri	Hosgri
Wilmar Avenue–Los Berros	SLPB

The SLPB fault source group consists of fault sources east of the Hosgri fault zone.

The SSC model for Primary and Connected fault sources consists of sets of *rupture sources* that are treated as individual fault sources in a PSHA. Each rupture source should be thought of as a "layer" on the network of Primary and Connected fault sources, such that, in total, the rupture sources produce earthquake magnitude-frequency distributions for the entire network of Primary and Connected faults.

C.2.1 Fault Geometry Models

The Fault Geometry Model (FGM) defines the location, dip, and width of fault sections that make up the Primary and Linked fault sources listed in Table C.2-1. Epistemic uncertainty in fault geometry is accounted for in the SSC model through the FGM. There are three alternative FGMs for the Hosgri group of fault sources and three FGMs for the SLPB group of fault sources. The FGMs are not correlated between the Hosgri and SLPB groups, so there are 9 possible FGM combinations for the Primary and Connected fault sources. The names and model weights given to the FGMs are listed in Table C.2-2 and shown graphically on Figure C-1.

Table C.2-2. FGM Names and Weights

FGM	Weight	Sum
Hosgri 90 (H90)	0.2	
Hosgri 85 (H85)	0.6	
Hosgri 75 (H75)	0.2	
Hosgri FGM Total:		*1.0*
Outward-Vergent (OV)	0.4	
Southwest-Vergent (SW)	0.4	
Northeast-Vergent (NE)	0.2	
SLPB FGM Total:		*1.0*

C.2.1.1 Fault Sections and Their Location

Each Primary and Connected fault listed in Table C.2-1 is divided into sections that are named with two-letter codes. These fault sections are listed in Table C.2-3. Figures C-2 to C-6 are maps showing the Primary and Linked fault sections. Figures C-2 to C-4 show differences among the three SLPB FGMs near the DCPP.

Table C.2-3. Primary and Connected Fault Section Codes and Descriptions

Code	Fault	Section Description
BE	San Luis Bay	Mallagh Landing to San Luis Hill
BR	San Luis Bay	San Luis Hill to Shoreline fault junction
BW	San Luis Bay	Shoreline fault junction to Hosgri fault junction
FN	Foxen Canyon	Nipomo lineament-Oceano to West Huasna junction
FS	Foxen Canyon	West Huasna junction to Little Pine junction
GN	San Gregorio	Point Año Nuevo to San Andreas junction
GS	San Gregorio	Point Sur to Point Año Nuevo
HA	Hosgri	Casmalia fault to bend offshore of San Luis Bay fault
HB	Hosgri	Shoreline fault to Western Hosgri fault junction
HC	Hosgri	San Luis Bay (SW) fault to Shoreline fault junction
HD	Hosgri	Western Hosgri to Los Osos fault junction
HE	Hosgri	East path between Casmalia and Shoreline fault junctions
HN	Hosgri	Los Osos fault to offshore of Cambria
HS	Hosgri	Point Arguello to Casmalia fault junction
HW	Hosgri	West path between Casmalia and Shoreline fault junctions
LB	Los Osos	San Luis Obispo Creek basin - truncated
LC	Los Osos	Morro Bay to Hosgri fault junction
LE	Los Osos	West Huasna fault junction to San Luis Obispo Creek
LM	Los Osos	Southern margin of Morro Bay
LO	Los Osos	San Luis Obispo Creek Basin
LP	Little Pine	West Huasna junction to Big Pine-Little Pine junction
LS	Los Osos	San Luis Obispo Creek Basin

Code	Fault	Section Description
LV	Los Osos	San Luis Obispo Creek to Los Osos valley
MF	San Miguelito offshore	San Luis Obispo Bay to Mallagh Landing
NL	Nipomo	West Huasna fault junction to Arroyo Grande
OF	Oceano	Coastline to Shoreline fault junction
ON	Oceano	West Huasna fault junction to coastline
PB	Piedras Blancas	Western Hosgri to north end Piedras Blancas anticlinorium
PO	Pismo	Wilmar Avenue to Mallagh Landing
SA	San Andreas North	San Gregorio junction to Mendocino Triple Junction
SE	Shoreline	Casmalia fault to Oceano fault junction
SF	Shoreline	Oceano to Wilmar Avenue fault
SH	Shoreline	San Luis Bay fault junction to Hosgri junction
SI	San Simeon	Offshore of Cambria to Oceanic fault junction
SN	San Simeon	Oceanic fault junction to Point Sur
SS	Shoreline	San Luis Bay fault junction to Wilmar Avenue fault junction
WA	Wilmar Avenue	Arroyo Grande to coastline
WB	Wilmar Avenue	Coastline to Shoreline fault
WC	Wilmar Avenue	Coastline to San Miguelito offshore fault
WR	Western Hosgri	Hosgri junction to Piedras Blancas anticlinorium

The coordinates defining the top of these fault sections are provided in *Attachment C-1*. The file includes the following: two-letter fault section code, unique point ID, longitude and latitude (in decimal degrees, WGS84), and depth (in km). The coordinates and depths for the top of the fault sections are the same for all FGMs.

C.2.1.2 Fault Section Dips

The dips of the fault sections—including bends in the fault along its width—are different between fault models. Instead of prescribing dip values in degrees, the input files for rupture sources provide arrays of build points along the top of the fault (long, lat, depth), build points at changes in fault dip (long, lat, depth), and build points at the bottom of the fault (long, lat, depth). The input files are provided in *Attachments C-2* through *C-5*.

C.2.1.3 Maximum Depth of Faulting

The depths to the top and bottom of faulting for the fault sections are defined in the input files (*Attachments C-2* through *C-5*) as described in *Section C.2.2*. The maximum depth of faulting is 12 km for all fault sources in the SLPB group and for the Piedras Blancas fault source (fault section PB in Table C.2-3) in the Hosgri group. Other fault sections in the Hosgri group have a maximum depth of 12 km for magnitudes less than or equal to **M** 7.3, and a maximum depth of 15 km for magnitudes greater than **M** 7.3.

C.2.1.4 Sense of Slip

For purposes of GMPE selection, the sense of slip is provided in the input files (*Attachments C-2* through *C-5*). The sense of slip for all Hosgri group fault sources listed in Table C.2-1 is strike slip, with the exception of Piedras Blancas, which is reverse. For the SLPB group fault sources, the Shoreline fault source is strike slip, the San Luis Bay fault source is reverse, and the Los Osos and other fault sources (e.g., Wilmar Avenue, Oceano, Foxen Canyon) are either reverse (in the SW and NE FGMs) or oblique (in the OV FGM).

C.2.2 Fault Source Slip Rates

The SSC logic tree for Primary and Connected fault sources does not use the fault slip rates as direct input to the logic tree (Figure C-1). Instead, fractions of the fault slip rates are allocated among various rupture sources that occupy the faults as described in the Rupture Model (*Section C.2.3*) and Slip Rate Allocation Model (*Section C.2.4*).

C.2.3 Rupture Model

Each FGM has a corresponding rupture model that describes the combinations of fault sections that may rupture together. The rupture models consist of sets of *rupture sources*. A rupture source is a series of fault sections that are considered capable of hosting a single, maximum earthquake and smaller, floating earthquakes. All rupture sources are considered to occur within each rupture model. In other words, the rupture sources represent aleatory variability, not epistemic uncertainty. Epistemic uncertainty comes from the selection of the FGM and its corresponding rupture model.

There are four rupture models—one for the Hosgri FGMs and three for the SLPB FGMs. The rupture models and the number of rupture sources in each rupture model are listed in Table C.2-4. The three Hosgri FGMs share the same rupture model. Each SLPB FGM has a distinct rupture model.

Table C.2-4. Number of Rupture Sources in Each Rupture Model

Rupture Model	No. Rupture Sources
Hosgri (all three FGMs)	8
Outward-Vergent (OV)	10
Southwest-Vergent (SW)	10
Northeast-Vergent (NE)	11

The rupture models describe the number of rupture sources, the fault sections involved in each rupture source, the sense of slip for each fault section in the rupture source, and the type of rupture source. The four types of rupture sources used in the Diablo Canyon SSC model are named and described briefly in Table C.2-5.

Table C.2-5. Rupture Source Types

Rupture Source Type	Explanation
Characteristic	Rupture source is confined to a single, named fault of limited length that has a uniform sense of slip
Linked	Rupture source that includes fault sections of multiple named faults of the same sense of slip
Complex	Rupture source contains multiple named faults and more than one sense of slip on adjacent fault sections.
Splay	Rupture source includes overlapping faults that rupture simultaneously.

Linked and Splay ruptures involving the Shoreline and Hosgri fault sources are tracked as part of the Hosgri rupture model. Linked and Complex ruptures involving the Shoreline and other SLPB fault sources are tracked as part of the SLPB rupture models. Complex ruptures involving the Hosgri fault sources are tracked as part of the SLPB rupture models.

The Complex and Splay rupture source types require special consideration by the ground motion characterization (GMC) model regarding how to implement ground motion contributions from multiple portions of the fault rupture (GeoPentech, 2015). For Complex rupture types, where different portions of the rupture have different senses of slip, the input files distinguish between the *primary* part of the rupture source (the part of the rupture source with the larger fault area) and the *secondary* part of the rupture source (the part with the smaller fault area). The input files specify the sense of slip for the primary and secondary parts. For Splay rupture types, where there are overlapping portions of the rupture resulting in two source-site distances to consider, the input files identify which fault sections are part of the *main* rupture (the part with the larger fault area) and which fault sections are part of the *splay* rupture (the part with the smaller fault area).

The rupture sources are presented in Tables C.2-6 through C.2-9 for the Hosgri, OV, SW, and NE Rupture Models, respectively.

C.2.3.1 Hosgri Rupture Model

The Hosgri rupture model is presented in Table C.2-6. The table shows the 8 rupture sources in the Hosgri rupture model. The same rupture sources (and their corresponding locations and lengths) are used for each of the three Hosgri FGMs, but the fault dips for the Hosgri fault near the DCPP will vary between the FGMs. These differences are contained in the build points that are presented in the input files in *Attachment C-2*.

Table C.2-6. Hosgri Rupture Model

Rupture Source Number	Type	Description	Fault Sections[1] (closest section to the DCPP in bold)	Sense of Slip
H-01	Linked	Hosgri (Central trace) to MTJ[2]	HS+**HA**+HC+HB+HD+HN+SI+SN+GS+GN+SA	Strike slip
H-02	Linked	Hosgri (West trace) to MTJ	HS+**HW**+HB+HD+HN+SI+SN+GS+GN+SA	Strike slip
H-03	Linked	Hosgri (East trace) to MTJ	HS+**HE**+HB+HD+HN+SI+SN+GS+GN+SA	Strike slip
H-04	Complex	Hosgri (Central trace) with Piedras Blancas	HS+**HA**+HC+HB+WR (primary fault); PB (secondary fault)	Primary = strike slip Secondary = reverse
H-05	Splay	Shoreline with Hosgri (Central trace) to Bolinas	HS+**HA**+HC+HB+HD+HN+SI+SN+GS+GN (main fault); SE+SS+**SH** (splay fault)	Strike slip
H-06[3]	Linked	Hosgri north of the Shoreline fault intersection	**HB**+HD+HN+SI+SN+GS+GN+SA	Strike slip
H-07[3]	Linked	Hosgri north of the Los Osos fault intersection	**HN**+SI+SN+GS+GN+SA	Strike slip
H-08[3]	Characteristic	Piedras Blancas	**PB**	Reverse

[1] Two-letter codes are explained in Table C.2-3.
[2] MTJ = Mendocino Triple Junction
[3] Same downdip geometry is used for all three Hosgri FGMs.

C.2.3.2 Outward-Vergent Rupture Model

The Outward-Vergent (OV) rupture model is presented in Table C.2-7. The table shows the 10 rupture sources in the OV rupture model. The build points defining the locations, dips, and depths of these rupture sources are presented in the input files in *Attachment C-3*.

Table C.2-7. Outward-Vergent (OV) Rupture Model

Rupture Source Number	Type	Description	Fault Sections[1] (closest section to the DCPP in **bold**)	Sense of Slip
OV-01	Characteristic	Shoreline	SE+SF+SS+**SH**	Strike slip
OV-02	Linked	Shoreline and Hosgri	SE+SF+SS+**SH**+HB+HD+HN+SI +SN+GS+GN+SA	Strike slip
OV-03	Complex	Shoreline with San Luis Bay	**SH** (primary fault); BE+BR (secondary fault)	Primary = reverse Secondary = strike slip
OV-04	Complex	Shoreline and Hosgri with San Luis Bay and SWBZ[2]	**SH**+HB+HD+HN+SI+SN+GS+GN (primary fault); LP+FS+FN+NL+WA+WC+MF+BE+BR (secondary fault)	Primary = strike slip Secondary= reverse
OV-05	Characteristic	San Luis Bay	BE+**BR**	Reverse
OV-06	Splay	San Luis Bay with Los Osos	LO+LV+**LM** (main fault); BE+**BR** (splay fault)	Reverse
OV-07	Characteristic	Los Osos	LE+LO+LV+**LM**+LC	Reverse oblique
OV-08	Complex	Los Osos with Hosgri	HN+SI+SN+GS+GN (primary fault); LO+LV+**LM**+LC (secondary fault)	Primary = strike slip Secondary = reverse oblique
OV-09	Linked	Oceano and SWBZ[2]	LP+FS+FN+ON+**OF**	Reverse oblique
OV-10	Characteristic	Wilmar Ave.	NL+WA+**WC**	Reverse oblique

[1] Two-letter codes are explained in Table C.2-3.
[2] SWBZ = Southwestern Boundary zone of faults. The SWBZ includes the Little Pine and Foxen Canyon faults and the Nipomo lineament, as well as the San Luis Bay, Wilmar Avenue, and Oceano faults, which are specified by name in this table.

C.2.3.3 Southwest-Vergent Rupture Model

The Southwest-Vergent (SW) rupture model is presented in Table C.2-8. The table shows the 10 rupture sources in the SW rupture model. The build points defining the locations, dips, and depths of these rupture sources are presented in the input files in *Attachment C-4*.

Table C.2-8. Southwest-Vergent (SW) Rupture Model

Rupture Source Number	**Type**	**Description**	**Fault Sections**[1] (closest section to the DCPP in **bold**)	**Sense of Slip**
SW-01	Characteristic	Shoreline	SE+SF+SS+**SH**	Strike slip
SW-02	Linked	Shoreline and Hosgri	SE+SF+SS+**SH**+HB+HD+HN +SI+SN+GS+GN+SA	Strike slip
SW-03	Complex	Shoreline with Oceano and SWBZ[2]	LP+FS+FN+ON+OF (primary fault); SF+SS+**SH** (secondary fault)	Primary = reverse Secondary = strike slip
SW-04	Complex	San Luis Bay with Hosgri	HC+HB+HD+HN+SI+SN+GS +GN (primary fault); BE+**BW** (secondary fault)	Primary = strike slip Secondary = reverse
SW-05	Characteristic	San Luis Bay	BE+**BW**	Reverse
SW-06	Splay	San Luis Bay with Los Osos	BE+**BW** (main fault); LV+**LM** (splay fault)	Reverse
SW-07	Linked	San Luis Bay, Wilmar Ave., and SWBZ[2]	LP+FS+FN+NL+WA+PO+BE+**BW**	Reverse
SW-08	Complex	Los Osos offshore with Hosgri	HN+SI+SN+GS+GN (primary fault); **LC** (secondary fault)	Primary = strike slip Secondary = reverse oblique
SW-09	Linked	Oceano and SWBZ[2]	LP+FS+FN+ON+**OF**	Reverse
SW-10	Splay	Wilmar Ave. with Los Osos East	NL+WA+**WB** (main fault); LE+**LB** (splay fault)	Reverse

[1] Two-letter codes are explained in Table C.2-3.
[2] SWBZ = Southwestern Boundary zone of faults. The SWBZ includes the Little Pine and Foxen Canyon faults and the Nipomo lineament, as well as the San Luis Bay, Wilmar Avenue, and Oceano faults, which are specified by name in this table.

C.2.3.4 Northeast-Vergent Rupture Model

The Northeast-Vergent (NE) rupture model is presented in Table C.2-9. The table shows the 11 rupture sources in the NE rupture model. The build points defining the locations, dips, and depths of these rupture sources are presented in the input files in *Attachment C-5*.

Table C.2-9. Northeast-Vergent (NE) Rupture Model

Rupture Source Number	Type	Description	**Fault Sections[1]** (closest section to the DCPP in **bold**)	Sense of Slip
NE-01	Characteristic	Shoreline	SE+SF+SS+**SH**	Strike slip
NE-02	Linked	Shoreline and Hosgri	SE+SF+SS+**SH**+HB+HD+HN+SI +SN+GS+GN+SA	Strike slip
NE-03	Complex	Shoreline with San Luis Bay	**SH** (primary fault); BE+BR (secondary fault)	Primary = strike slip Secondary = reverse
NE-04	Complex	Shoreline and Hosgri with Oceano and SWBZ[2]	SF+SS+**SH**+HB+HD+HN+SI +SN+GS+GN (primary fault); LP+FS+FN+ON+OF (secondary fault)	Primary = strike slip Secondary = reverse
NE-05	Characteristic	Los Osos, Irish Hills	LV+**LM**	Reverse
NE-06	Splay	Los Osos with San Luis Bay	LV+**LM** (main fault); BE+**BR** (splay fault)	Reverse
NE-07	Splay	Los Osos with Wilmar Avenue and SWBZ	LP+FS+FN+NL+WA+**WB** (main fault); LV+**LM**+LC (splay fault)	Reverse
NE-08	Complex	Los Osos with Hosgri	HN+SI+SN+GS+GN (primary fault); LV+**LM**+LC (secondary fault)	Primary = strike slip Secondary = reverse
NE-09	Linked	Oceano and SWBZ	LP+FS+FN+ON+**OF**	Reverse

Rupture Source Number	Type	Description	Fault Sections[1] (closest section to the DCPP in **bold**)	Sense of Slip
NE-10	Splay	Wilmar Avenue with Los Osos East	**WA**+WB (main fault); LE+**LB** (splay fault)	Reverse
NE-11	Characteristic	Los Osos, Irish Hills and Offshore	LV+**LM**+LC	Reverse

[1] Two-letter codes are explained on Table C.2-3.
[2] SWBZ = Southwestern Boundary zone of faults. The SWBZ includes the Little Pine and Foxen Canyon faults and the Nipomo lineament, as well as the San Luis Bay, Wilmar Avenue, and Oceano faults, which are specified by name in this table.

C.2.4 Rupture Source Slip Rates

The slip rate for each rupture source is a source of epistemic uncertainty, and is represented with three alternative branch values and weights (Figure C-1). The branch values and weights are provided in the input files for each rupture source (*Attachments C-2 through C-5*). The values and weights are duplicated in Tables C.2-10 to C.2-13 below. The slip rates for each rupture source are assigned in the Slip Rate Allocation Model that is described in the main report.

For Characteristic and Linked rupture source types, the slip rates apply to the entire rupture source. For Complex and Splay rupture source types, the slip rates in the tables below, and in the input files, are valid for the *primary* or *main* parts (for Complex and Splay rupture sources, respectively).

Complex and Splay rupture sources have magnitude PDFs that are constructed as pairs of delta functions, with a magnitude given for the primary or main part and a magnitude given for the secondary or splay part. Complex and Splay rupture sources may have 1, 2, or 3 pairs of magnitudes. In cases where there are two or three pairs of magnitudes, the rupture source is subdivided into two or three separate sub rupture sources so that each sub rupture source (and corresponding input file) has one magnitude pair and one slip rate for the primary or main part. Sub rupture sources separated out in this way are shown in the tables below with underscores. For example, Splay rupture source H-05 has three sub rupture sources, H-05_01, H-05_02, and H-05_03, which are listed in Table C.2-10.

Table C.2-10. Hosgri Rupture Source Slip Rates

Rupture Source* No.	Description	Slip Rate, mm/yr	Weight	Rupture Source No.	Description	Slip Rate, mm/yr	Weight
H-01	Hosgri (Central trace) to MTJ	1.93	0.185	H-05_01†	Shoreline and full Hosgri (Central trace)	0.078	0.185
		0.81	0.630			0.005	0.630
		0.34	0.185			0.0004	0.185
H-02	Hosgri (West trace) to MTJ	1.23	0.185	H-05_02†	Shoreline and full Hosgri (Central trace)	0.173	0.185
		0.40	0.630			0.017	0.630
		0.13	0.185			0.002	0.185
H-03	Hosgri (East trace) to MTJ	0.35	0.185	H-05_03†	Shoreline and full Hosgri (Central trace)	0.083	0.185
		0.05	0.630			0.006	0.630
		0.01	0.185			0.0004	0.185
H-04_1†	Hosgri (Central trace) to Piedras Blancas	0.237	0.185	H-06	Hosgri north of the Shoreline fault intersection	0.131	0.185
		0.029	0.630			0.011	0.630
		0.003	0.185			0.001	0.185
H-04_2†	Hosgri (Central trace) to Piedras Blancas	0.167	0.185	H-07	Hosgri north of the Los Osos fault intersection	0.266	0.185
		0.017	0.630			0.033	0.630
		0.002	0.185			0.004	0.185
				H-08	Piedras Blancas	0.25	0.185
						0.13	0.63
						0.07	0.185

*Rupture sources in the Hosgri Rupture Model described further in Table C.2-6
†Complex or Splay rupture type. Slip rate values are for the primary or main part only.

Table C.2-11. Outward-Vergent Rupture Source Slip Rates

Rupture Source* No.	Description	Slip Rate, mm/yr	Weight	Rupture Source No.	Description	Slip Rate, mm/yr	Weight
OV-01	Shoreline fault	0.051	0.185	OV-06[†]	Los Osos (and San Luis Bay)	0.125	0.185
		0.012	0.630			0.054	0.630
		0.003	0.185			0.023	0.185
OV-02	Shoreline and Hosgri	0.046	0.185	OV-07	Los Osos fault	0.212	0.185
		0.010	0.630			0.114	0.630
		0.002	0.185			0.061	0.185
OV-03	Shoreline and San Luis Bay	0.039	0.185	OV-08_1[†]	Los Osos and Hosgri	0.209	0.185
		0.007	0.630			0.023	0.630
		0.001	0.185			0.003	0.185
OV-04_1[†]	Hosgri to Shoreline to San Luis Bay and SWBZ	0.010	0.185	OV-08_2[†]	Los Osos and Hosgri	0.322	0.185
		0.001	0.630			0.046	0.630
		0.0001	0.185			0.006	0.185
OV-04_2[†]	Hosgri to Shoreline to San Luis Bay and SWBZ	0.019	0.185	OV-08_3[†]	Los Osos and Hosgri	0.129	0.185
		0.003	0.630			0.011	0.630
		0.0003	0.185			0.001	0.185
OV-04_3[†]	Hosgri to Shoreline to San Luis Bay and SWBZ	0.011	0.185	OV-09	Oceano and SWBZ	0.241	0.185
		0.001	0.630			0.144	0.630
		0.0001	0.185			0.086	0.185
OV-05	San Luis Bay fault	0.165	0.185	OV-10	Wilmar Ave. and Nipomo	0.331	0.185
		0.098	0.630			0.230	0.630
		0.058	0.185			0.160	0.185

*Rupture sources in the OV Rupture Model described further in Table C.2-7
[†]Complex or Splay rupture type. Slip rate values are for the primary or main part only.

Table C.2-12. Southwest-Vergent Rupture Source Slip Rates

Rupture Source* No.	Description	Slip Rate, mm/yr	Weight		Rupture Source No.	Description	Slip Rate, mm/yr	Weight
SW-01	Shoreline fault	0.065	0.185		SW-06†	San Luis Bay and Los Osos	0.164	0.185
		0.017	0.630				0.087	0.630
		0.005	0.185				0.046	0.185
SW-02	Shoreline and Hosgri	0.058	0.185		SW-07	San Luis Bay and SWBZ	0.102	0.185
		0.014	0.630				0.044	0.630
		0.004	0.185				0.019	0.185
SW-03_1†	Shoreline to Oceano and SWBZ	0.053	0.185		SW-08_1†	Los Osos offshore and Hosgri	0.589	0.185
		0.016	0.630				0.119	0.630
		0.005	0.185				0.024	0.185
SW-03_2†	Shoreline to Oceano and SWBZ	0.017	0.185		SW-08_2†	Los Osos offshore and Hosgri	0.858	0.185
		0.002	0.630				0.223	0.630
		0.0003	0.185				0.058	0.185
SW-04_1†	San Luis Bay and Hosgri	0.071	0.185		SW-08_3†	Los Osos offshore and Hosgri	0.388	0.185
		0.005	0.630				0.060	0.630
		0.0003	0.185				0.009	0.185
SW-04_2†	San Luis Bay and Hosgri	0.135	0.185		SW-09	Oceano and SWBZ	0.208	0.185
		0.012	0.630				0.119	0.630
		0.001	0.185				0.068	0.185
SW-04_3†	San Luis Bay and Hosgri	0.066	0.185		SW-10†	Wilmar Ave. and Los Osos east	0.214	0.185
		0.004	0.630				0.154	0.630
		0.0003	0.185				0.111	0.185
SW-05	San Luis Bay fault	0.117	0.185					
		0.054	0.630					
		0.025	0.185					

*Rupture sources in the SW Rupture Model described further in Table C.2-8
†Complex or Splay rupture type. Slip rate values are for the primary or main part only.

Table C.2-13. Northeast-Vergent Rupture Source Slip Rates

Rupture Source* No.	Description	Slip Rate, mm/yr	Weight	Rupture Source No.	Description	Slip Rate, mm/yr	Weight
NE-01	Shoreline fault	0.056	0.185	NE-07_1†	Los Osos to Wilmar Ave. and SWBZ	0.085	0.185
		0.013	0.630			0.049	0.630
		0.003	0.185			0.029	0.185
NE-02	Shoreline and Hosgri	0.046	0.185	NE-07_2†	Los Osos to Wilmar Ave. and SWBZ	0.053	0.185
		0.010	0.630			0.026	0.630
		0.002	0.185			0.012	0.185
NE-03	Shoreline and San Luis Bay	0.039	0.185	NE-08_1†	Los Osos and Hosgri	0.163	0.185
		0.007	0.630			0.016	0.630
		0.001	0.185			0.002	0.185
NE-04_1†	Shoreline to Oceano and SWBZ	0.008	0.185	NE-08_2†	Los Osos and Hosgri	0.254	0.185
		0.001	0.630			0.031	0.630
		0.0001	0.185			0.004	0.185
NE-04_2†	Shoreline to Oceano and SWBZ	0.016	0.185	NE-08_3†	Los Osos and Hosgri	0.100	0.185
		0.002	0.630			0.007	0.630
		0.0002	0.185			0.001	0.185
NE-04_3†	Shoreline to Oceano and SWBZ	0.009	0.185	NE-09	Oceano and SWBZ	0.235	0.185
		0.001	0.630			0.140	0.630
		0.0001	0.185			0.083	0.185
NE-05	Los Osos fault – Irish Hills	0.179	0.185	NE-10†	Wilmar Ave. and Los Osos east	0.168	0.185
		0.106	0.630			0.116	0.630
		0.062	0.185			0.081	0.185
NE-06†	Los Osos and San Luis Bay	0.179	0.185	NE-11	Los Osos – Irish Hills and offshore	0.166	0.185
		0.106	0.630			0.096	0.630
		0.062	0.185			0.055	0.185

*Rupture sources in the NE Rupture Model described further in Table C.2-9
†Complex or Splay rupture type. Slip rate values are for the primary or main part only.

C.2.5 Rupture Source Magnitude PDFs

The Magnitude Distribution Model in the Diablo Canyon SSC model describes the magnitude probability density function (PDF) for each rupture source. This section will present the four functional forms of the magnitude PDF used in the SSC model, which functional forms to use with each rupture source, and the values and weights to use to parameterize the functional forms.

Magnitudes of characteristic and maximum ruptures are calculated from the magnitude-area scaling relation of Hanks and Bakun (2014) (HB14). Characteristic earthquake magnitudes for the Hosgri group of rupture sources are determined based on a maximum rupture depth of 12 km, whereas maximum earthquake magnitudes for the Hosgri group of rupture sources are determined based on a maximum rupture depth of 15 km. Build points to create rupture geometries down to 12 or 15 km depth are provided as tabs in the input files for the Hosgri rupture sources where needed (*Attachment C-2*).

Four earthquake magnitude PDF functional forms are used in the SSC. The four functional forms used in the SSC model are listed in Table C.2-14 and described in *Sections C.2.5.1* through *C.2.5.4*. Schematic diagrams of the functional forms are shown on Figure C-7.

Table C.2-14. Functional Forms of the Magnitude PDF Used in the SSC Model

Functional Form	Explanation
Truncated Exponential	From Gutenberg and Richter (1944). Magnitude PDF is a doubly-truncated exponential distribution with a constant *b*-value.
Simplified Maximum Magnitude	From Wesnousky et al. (1983). Magnitude PDF is a delta function with the peak at a characteristic magnitude. $M_{min}=M_{char}=M_{max}$.
Characteristic Earthquake	From Youngs and Coppersmith (1985). Magnitude PDF has two components – a characteristic portion and a low-magnitude exponential portion. Characteristic portion is a uniform (boxcar) distribution centered on M_{char}.
WAACY	From Wooddell and Abrahamson (2013) and Abrahamson (2014); see *Appendix G* of this report. Magnitude PDF has three components: a normally-distributed characteristic portion centered on M_{char}, a low-magnitude exponential portion, and a high-magnitude exponential "tail."

C.2.5.1 Truncated Exponential Model

The truncated exponential model is characterized by a doubly truncated exponential distribution (Cornell and Van Marcke, 1969). This functional form of the magnitude PDF is adopted with the parameterization shown in Table C.2-15. Parameters are defined on Figure C-7.

Table C.2-15. Parameterization of the Truncated Exponential Model

Parameter	Value	Weight
Minimum magnitude, M_{min}	5.0	1.0
b-value	1.0	1.0
Maximum magnitude, M_{max}	M_{max}	Tables C.2-20 through C.2-26

C.2.5.2 Simplified Maximum Magnitude Model

The simplified maximum magnitude model, as implemented in the Diablo Canyon SSC model, puts 100% of the moment on a single magnitude (i.e., a delta function); smaller magnitudes on the fault are assumed to be dependent events (mostly aftershocks) (Wesnousky et al., 1983). Parameters to implement the simplified maximum magnitude model are shown in Table C.2-16. Recognizing that it is common practice in PSHA to implement the maximum magnitude model with aleatory variability (a mean magnitude and non-zero standard deviation), parameters shown in Table C.2-16 include the standard deviation and a truncation on the standard deviation (which for this model are not applicable). The maximum magnitude model is used for Complex and Splay cases, where separate magnitudes are defined for the primary (or main) part and the secondary (or splay) part.

Table C.2-16. Parameterization of the Simplified Maximum Magnitude Model

Parameter	Value	Weight
Mean Magnitude of the Primary or Main Part	$M_{primary}$ or M_{main}	Tables C.2-21 through C.2-27
Standard deviation of $M_{primary}$ or M_{main}	N/A	1.0
Mean Magnitude of the Secondary or Splay Part	$M_{secondary}$ or M_{splay}	Tables C.2-21 through C.2-27
Standard deviation of $M_{secondary}$ or M_{splay}	N/A	1.0
Number of SD for truncation	N/A	N/A

N/A = Not Applicable

C.2.5.3 Characteristic Earthquake Model

The Youngs and Coppersmith (1985) characteristic earthquake model functional form is adopted with the parameterization shown in Table C.2-17. Parameters are defined on Figure C-7.

Table C.2-17. Parameterization of the Characteristic Earthquake Model

Parameter	Value	Weight
Minimum magnitude, M_{min}	5.0	1.0
b-value, low-magnitude exponential portion	1.0	1.0
Percent of total moment rate allocated to the low-magnitude tail	6%	1.0
Boxcar width (magnitude units)	0.5	1.0
Center of boxcar	M_{char}	Tables C.2-20 through C.2-26
Maximum magnitude, M_{max}	M_{char}+0.25	1.0

C.2.5.4 WAACY Model

The WAACY model (named for authors Wooddell, Abrahamson, Acevedo-Cabrera, and Youngs) is described in more detail in *Appendix G* of this report.

The WAACY magnitude PDF has three components: a characteristic portion, a low-magnitude exponential portion, and a high-magnitude exponential distribution, or "tail." These components and the parameters introduced below are shown graphically on Figure C-7. The low-magnitude portion fits an exponential distribution from M_{min} = 5.0 to M_1 with a slope consistent with a value *b*. M_1 is assumed to be M_{char}-Δ_{M1}. The characteristic portion is a Gaussian distribution with a mean of M_{char}, standard deviation σ_{char}, and ranges from M_1 to M_2, where M_2 equals $M_{char} + \sigma_{char}N_{sig}$. N_{sig} is the number of standard deviations above the mean for the transition from the characteristic to the high-magnitude-tail portion of the PDF. The high-magnitude tail fits an exponential distribution from M_2 to M_{max} with a *b*-value of b_{tail}. The rate at M_2 is fixed at a single value to blend the characteristic part and the high-magnitude tail.

The parameterization of the WAACY magnitude PDF is shown in Table C.2-18. The table shows which parameters are fixed with single values and which parameters have alternative branch values. The weights on the branch values depend on the M_{char} and M_{max} values and the certain parameters. Logic trees showing the implementation of the WAACY parameters are shown on Figure C-8.

Table C.2-18. Parameterization of the WAACY Model

Parameter	Value	Weight
Minimum magnitude, M_{min}	5.0	1.0
b-value, low-magnitude portion, *b*	1.0	1.0
Percent of total moment rate allocated to the low-magnitude portion, F1	12%	Logic Tree on Figure C-8
	6%	
	3%	
Offset between low-magnitude tail and M_{char}, Δ_{M1}	0.25	1.0
Mean magnitude, characteristic part	M_{char}	Tables C.2-20 through C.2-26
Standard deviation, characteristic part, σ_{char}	0.20	1.0
Number of standard deviations above M_{char} to start the high-magnitude tail, N_{sig}	1.5	1.0
b-value, high-magnitude tail, b_{tail}	1.0	Logic Tree on Figure C-8
	2.0	
	3.0	
Maximum magnitude, M_{max}	M_{max}	Tables C.2-20 through C.2-26

Each rupture source in the SSC model is associated with one of three rupture source categories that defines the magnitude PDF(s) to be used in the hazard calculations. Table C.2-19 shows the categories, the relevant magnitude PDFs, and the branch weights.

Table C.2-19. Rupture Source Categories and Magnitude PDFs

Rupture Source Magnitude PDF Category	Magnitude PDF	Weight
Category A	Characteristic	1.0
Category B	WAACY	0.8
	Exponential	0.2
Category C	Maximum Moment	1.0

Tables C.2-20 to C.2-27 list the rupture sources, the rupture source category, and alternative branch values and weights for key magnitudes to populate the magnitude

PDFs. Two tables are provided for each rupture model. The first gives values and weights of M_{max} and/or M_{char} to populate the Category A and B rupture sources. The second table gives magnitude values for the pairs of Primary and Secondary or Main and Splay ruptures to populate Category C rupture sources. For rupture sources where alternative magnitude pairs are defined, the relative frequency of the pairs is shown as aleatory variability. Note that the aleatory frequency term in the tables below were used to develop the slip rates of the sub rupture sources provided in *Section C.2.4*. The rupture source input files (*Attachments C-2* through *C-5*) contain the same magnitude PDF information as provided in the following tables.

Table C.2-20. Hosgri Rupture Model Magnitude PDF Categories and Key Magnitude Parameters – Linked and Characteristic Rupture Sources

Rupture Source No.*	Type	Category (Table C.2-19)	M_{char}	Weight, M_{char}	M_{max}	Weight, M_{max}
H-01	Linked	B	7.3	0.2	8.5	0.1
			7.1	0.5	8.1	0.5
			6.8	0.3	7.8	0.4
H-02	Linked	B	7.3	0.2	8.5	0.1
			7.1	0.5	8.1	0.5
			6.8	0.3	7.8	0.4
H-03	Linked	B	7.3	0.2	8.5	0.1
			7.1	0.5	8.1	0.5
			6.8	0.3	7.8	0.4
H-06	Linked	B	7.3	0.3	8.4	0.1
			6.8	0.5	8.0	0.9
			6.6	0.2	-	-
H-07	Linked	B	7.2	0.5	8.4	0.1
			6.6	0.5	8.0	0.9
H-08	Characteristic	A	6.9	0.5	N/A	-
			6.6	0.5	-	-

*Parameters apply to all three Hosgri rupture models (H75, H85, and H90)
N/A = Not Applicable

Table C.2-21. Hosgri Rupture Model Magnitude PDF Categories and Key Magnitude Parameters – Complex and Splay (Category C) Rupture Sources

Rupture Source No.*	Type	Primary or Main M	Secondary or Splay M	Frequency
H-04	Complex	7.2	6.9	50%
		7.0	6.6	50%
H-05	Splay	8.0	6.8	10%
		7.7	6.5	40%
		7.1	6.3	50%

*Parameters apply to all three Hosgri rupture models (H75, H85, and H90)

Table C.2-22. OV Rupture Model Magnitude PDF Categories and Key Magnitude Parameters – Linked and Characteristic Rupture Sources

Rupture Source No.	Type	Category (Table C.2-19)	M_{char}	Weight, M_{char}	M_{max}	Weight, M_{max}
OV-01	Characteristic	A	6.8	0.2	N/A	-
			6.5	0.5	-	-
			6.3	0.3	-	-
OV-02	Linked	B	7.0	0.2	8.4	0.1
			6.8	0.5	8.1	0.5
			6.5	0.3	7.7	0.4
OV-05	Characteristic	A	6.1	0.5	N/A	-
			6.0	0.5	-	-
OV-07	Characteristic	A	7.0	0.2	N/A	-
			6.8	0.5	-	-
			6.4	0.3	-	-
OV-09	Linked	A	7.2	0.2	N/A	-
			6.8	0.3	-	-
			6.7	0.5	-	-
OV-10	Characteristic	A	6.5	0.5	N/A	-
			6.2	0.5	-	-

N/A = Not Applicable

Table C.2-23. OV Rupture Model Magnitude PDF Categories and Key Magnitude Parameters – Complex and Splay (Category C) Rupture Sources

Rupture Source No.	Type	Primary or Main M	Secondary or Splay M	Frequency
OV-03	Complex	6.3	6.1	100%
OV-04	Complex	8.0	7.2	10%
		7.5	6.9	40%
		7.0	6.5	50%
OV-06	Splay	6.4	6.1	100%
OV-08	Complex	7.9	6.8	10%
		7.4	6.8	40%
		6.6	6.6	50%

Table C.2-24. SW Rupture Model Magnitude PDF Categories and Key Magnitude Parameters – Linked and Characteristic Rupture Sources

Rupture Source No.	Type	Category (Table C.2-19)	M_{char}	Weight, M_{char}	M_{max}	Weight, M_{max}
SW-01	Characteristic	A	6.8	0.2	N/A	-
			6.5	0.5	-	-
			6.3	0.3	-	-
SW-02	Linked	B	7.0	0.2	8.4	0.1
			6.8	0.5	8.1	0.5
			6.5	0.3	7.7	0.4
SW-05	Characteristic	A	6.4	0.6	N/A	-
			6.2	0.4	-	-
SW-07	Linked	B	7.0	0.2	7.4	1.0
			6.7	0.5	-	-
			6.4	0.3	-	-
SW-09	Linked	A	7.3	0.2	N/A	-
			7.0	0.3	-	-
			6.8	0.5	-	-

N/A = Not Applicable

Table C.2-25. SW Rupture Model Magnitude PDF Categories and Key Magnitude Parameters - Complex and Splay (Category C) Rupture Sources

Rupture Source No.	Type	Primary or Main M	Secondary or Splay M	Frequency
SW-03	Complex	7.3	6.5	50%
		6.5	6.3	50%
SW-04	Complex	8.0	6.4	10%
		7.5	6.4	40%
		6.9	6.4	50%
SW-06	Splay	6.4	6.4	100%
SW-08	Complex	7.9	6.5	10%
		7.4	6.5	40%
		6.6	6.5	50%
SW-10	Splay	6.6	6.3	100%

Table C.2-26. NE Rupture Model Magnitude PDF Categories and Key Magnitude Parameters – Linked and Characteristic Rupture Sources

Rupture Source No.	Type	Category (Table C.2-19)	M_{char}	Weight, M_{char}	M_{max}	Weight, M_{max}
NE-01	Characteristic	A	6.8	0.2	N/A	-
			6.5	0.5	-	-
			6.3	0.3	-	-
NE-02	Linked	B	7.0	0.2	8.4	0.1
			6.8	0.5	8.1	0.5
			6.5	0.3	7.7	0.4
NE-05	Characteristic	A	6.4	0.6	N/A	-
			6.1	0.4	-	-
NE-09	Linked	A	7.3	0.2	N/A	-
			7.0	0.3	-	-
			6.8	0.5	-	-
NE-11	Characteristic	A	6.8	0.2	N/A	-
			6.4	0.6	-	-
			6.1	0.2	-	-

N/A = Not Applicable

Table C.2-27. NE Rupture Model Magnitude PDF Categories and Key Magnitude Parameters –Complex and Splay (Category C) Rupture Sources

Rupture Source No.	Type	Primary or Main M	Secondary or Splay M	Frequency
NE-03	Complex	6.3	6.1	100%
NE-04	Complex	8.0	7.3	10%
		7.5	7.0	40%
		7.0	6.8	50%
NE-06	Splay	6.4	6.1	100%
NE-07	Splay	7.2	6.8	50%
		6.8	6.4	50%
NE-08	Complex	7.9	6.8	10%
		7.4	6.8	40%
		6.6	6.7	50%
NE-10	Splay	6.5	6.3	100%

C.2.6 Time Dependency Model

The Time Dependency Model in the SSC applies to the recurrence behavior of moderate to large earthquakes. Earthquake recurrence in PSHA is commonly modeled as a time-independent Poisson process. In this SSC model, to account for the probability that moderate to large earthquakes on faults do not follow a Poisson process, equivalent Poisson rates (EPRs) are applied to the rupture sources that characterize the Primary and Connected fault sources. EPRs are also applied to the San Andreas fault source (*Section C.3*). The EPRs are multipliers of the Poisson rate. The EPR values and weights are global parameters with a different branch values and weights for the Hosgri fault source group and the SLPB fault source group (Figure C-1). The logic tree values and weights to use are provided in Table C.2-28 below. In the SSC model, the EPRs for the Hosgri fault source group are applied to the rupture sources in the Hosgri Rupture Model (Table C.2-6), the EPRs for the SLPB fault source group are applied to the rupture sources in the OV, SW, and NE Rupture Models (Tables C.2-7 to C.2-9).

Table C.2-28. Equivalent Poisson Rates (EPRs) and Weights

Fault Source	EPR	Weight
Hosgri (H90, H85, H75)	1.9	0.25
	1.3	0.5
	0.3	0.25
Weighted Mean, Hosgri:	1.2	
SLPBs (OV, SW, and NE)	1.6	0.25
	1.1	0.5
	0.3	0.25
Weighted Mean, SLPBs:	1.0	
San Andreas fault zone (SAF)	1.5	0.25
	1.4	0.50
	1.1	0.25
Weighted Mean, SAF:	1.35	

C.3 San Andreas Fault Source

The SSC model of the San Andreas fault (SAF) source is adopted from the state-wide UCERF3 model (Field et al., 2013). Specifically, the "event set" results from the UCERF3 reference branch, FM 3.1, are used for the SAF source and the UCERF3 regional fault sources (*Section C.4*). UCERF3 ruptures were considered part of the SAF rupture set if the rupture involves any part of the SAF within 320 km of the DCPP. The rate of SAF source ruptures from the time-independent UCERF3 model is scaled using the EPRs in Table C.2-28.

The ruptures (with rates from the time-independent model) are provided as ASCII files for inclusion in the SSC Model in *Attachment C-6*. The closest point on the rupture to the DCPP, with its strike, dip, and rake, is selected to represent the entire rupture.

The input file consists of the UCERF3 FM3.1 rupture number, latitude and longitude of the point on the rupture closest to the DCPP, the rupture magnitude, and rate of occurrence. Strike, dip, and rake are provided for the subsection nearest the DCPP. The depth to top of rupture for all ruptures is 0 km. To simplify hazard calculations, all ruptures that included the subsection closest to the DCPP (the Cholame subsection No. 8) were summed in 0.1 magnitude width units, and are in the input file as 22 net rate-magnitude pairs.

C.4 UCERF3 Regional Fault Sources

The SSC model includes other fault sources within the 320 km (200 mi.) DCPP site region from the UCERF3 model as described in *Section C.3*. The UCERF3, FM3.1 event set is adopted, after removing SAF source ruptures and redundant Primary and Connected rupture sources, with no EPR scaling. A map of UCERF3 regional fault sources is on Figure C-9.

The ruptures are provided as ASCII files for inclusion in the SSC Model in *Attachment C-7*. The input file consists of the UCERF3 FM3.1 rupture number, latitude and longitude of the point on the rupture closest to the DCPP, the rupture magnitude, and rate of occurrence. Strike, dip, and rake are provided for the subsection nearest the DCPP. The depth to top of rupture for all ruptures is 0 km.

C.5 Non-UCERF3 Regional Fault Sources

The SSC model includes five other offshore fault sources within the DCPP site region that are not in the UCERF3 model. The five non-UCERF3 regional fault sources characterized for the DCPP SSC are shown on Figure C-10 and listed in Table C.5-1.

Table C.5-1. Non-UCERF3 Regional Fault Source Parameters

Fault Source Name (closest distance to the DCPP)	Length (km)	Dip	Dip Direction	Slip Rate (mm/yr)	Style of Faulting	M_{char}
Lompoc Structure (36 km)	25.0	40°	NE	0.1	Reverse slip	6.7
Purisima Structure (32 km)	20.6	40°	NE	0.1	Reverse slip	6.6
Queenie Structure (35 km)	28.3	40°	NE	0.1	Reverse slip	6.7
Santa Lucia Bank (46 km)	170	45°	NE	1	Strike slip–reverse oblique	7.6
West Basin–Southwest Channel (62 km)	83.0	45°	NE	1	Strike slip–reverse oblique	7.2

The SSC model input files for the non-UCERF3 regional fault sources are presented in *Attachment C-8*. The input files include geometric information in the form of build points for the top of the fault source, dip magnitude, dip direction, and depth to the bottom of the fault source. Build points are provided in longitude-latitude pairs in the WGS 1984 coordinate system. The order of build points follows the right-hand rule such that positive dip values dip down to the right of the build order direction. The depths to the top and bottom of all other offshore fault sources are 0 and 12 km, respectively.

The magnitude PDF for the non-UCERF3 regional fault sources is the Youngs and Coppersmith (1985) characteristic model, with parametrization as shown in Table C.2-17. Table C.5-1 lists the single values for M_{char} to use with a weight of 1.0.

C.6 Areal Source Zones

Earthquakes occurring off the recognized fault sources within the 320 km (200 mi.) DCPP site region are modeled to occur on areal source zones. The SSC model has three areal source zones: (1) the Local source zone, (2) the Vicinity source zone, and (3) the Regional source zone (Figure C-11). The areal source zones do not overlap. The Local source zone is modeled in the SSC with virtual faults, with input files in *Attachment C-9*. The Regional and Vicinity source zones are modeled in the SSC from gridded seismicity rates. Input files for the Regional and Vicinity source zones are in *Attachments C-10* and *C-11*, respectively.

C.6.1 Local Areal Source Zone

The Local areal source zone boundary and the virtual faults are shown on Figure C-12. The DCPP site is located within the Local source zone. The boundaries for the source zone are delineated based on a 0.02 x 0.02 degree grid. Coordinates defining the perimeter of the Local source zone, in decimal degrees, WGS84, are presented in *Attachment C-9*. There are 18 subparallel, virtual fault traces spaced 1 km apart (Figure C-12). The virtual faults are 50 km long and strike N50°W. Build points for the virtual faults are contained in the input files in *Attachment C-9*.

The style of faulting, geometry, and magnitude PDF parameters for the Local source zone are presented in a logic tree on Figure C-13 and in Tables C.6-1 and C.6-2. The magnitude PDF for earthquakes within the Local source zone is a doubly truncated exponential distribution with a minimum magnitude (M_{min}) of 5.0, maximum magnitude (M_{max}) from Table C.6-1, and Gutenberg-Richter *a*- and *b*-values and weights as shown in Table C.6-2. The magnitude PDF parameters represent the entire Local source zone, and thus the rate is divided between the virtual faults.

Table C.6-1. Style of Faulting, Geometry, and M_{max} Parameters for Virtual Faults, Local Areal Source Zone

Parameter	Value	Weight	Value	Weight
Style of Faulting (Frequency)	Strike Slip (70%)		Reverse (30%)	
Fault Length and Spacing	50 km long, 1 km spacing		50 km long, 1 km spacing	
Fault Strike	N50°W	1.0	N50°W	1.0
Fault Dip	90°	0.4	70°	0.25
	75°	0.4	55°	0.5
	65°	0.2	35°	0.25
Dip Direction (Frequency)	NE (50%), SW (50%)		NE (50%), SW (50%)	
Maximum magnitude, M_{max}	7.0	0.25	7.1	0.3
	6.8	0.5	6.9	0.5
	6.6	0.25	6.7	0.2

Table C.6-2. Gutenberg-Richter *a*- and *b*-Value Pairs for Virtual Faults, Local Areal Source Zone

a-Value	*b*-Value	Weight
2.54	1.0	0.15
2.24	0.9	0.20
1.94	0.8	0.15
2.29	1.0	0.15
2.04	0.9	0.20
1.79	0.8	0.15

C.6.2 Gridded Areal Source Zones

The Regional and Vicinity areal source zones are characterized by a gridded seismicity model from the 2008 National Seismic Hazard Mapping Program (NSHMP; Petersen et al., 2008). The Regional source zone is defined over a 0.1 x 0.1 degree grid from the 2008 NSHMP model (Figures C-11 and C-14). The grid point values represent the southwest corner of the grid cell. The Vicinity source zone is defined over the same 0.1 x 0.1 degree grid and a finer 0.02 x 0.02 degree grid (Figures C-11 and C-15). Input files containing the grid coordinates and "baseline" rates are provided in *Attachments C-10* and *C-11* for the Regional and Vicinity source zones, respectively.

Parameters for the Regional and Vicinity areal source zones are in Table C.6-3. The magnitude PDF for the two gridded source zones is a doubly truncated exponential distribution with a uniform *b*-value of 0.8, a weighted M_{max} value, and a grid cell rate based on a uniform 50 km Gaussian smoothing kernel (Petersen et al., 2008). The rates from the 2008 NSHMP represent the baseline rates and are used with a weight of 1.0 for the Regional source zone. The rate for the Vicinity source zone is modeled as a 3-point distribution with a middle value equal to the baseline rate (with a 0.6 weight) and high and low values equal to twice and one half the baseline rate, respectively (each with a 0.2 weight).

Table C.6-3. Regional and Vicinity Areal Source Zone Parameters

Parameter	Regional	Vicinity
Grid cell size	0.1° x 0.1°	0.1° x 0.1° and 0.02° x 0.02°
b-value	0.8	0.8
M_{max} value [weight]	7.9 [0.1] 7.6 [0.8] 7.3 [0.1]	7.5 [0.1] 7.0 [0.5] 6.5 [0.4]
Depth distribution	Uniform: 0 to 12 km	Uniform: 0 to 12 km
Style of faulting	70% Strike slip, 30% Reverse	70% Strike slip, 30% Reverse
Activity rate baseline value	2008 NSHMP model (Petersen et al., 2008)	2008 NSHMP model (Petersen et al., 2008)
Activity rate uncertainty	Only baseline value used	2x baseline value [0.2] Baseline value [0.6] 0.5x baseline value [0.2]

C.7 References

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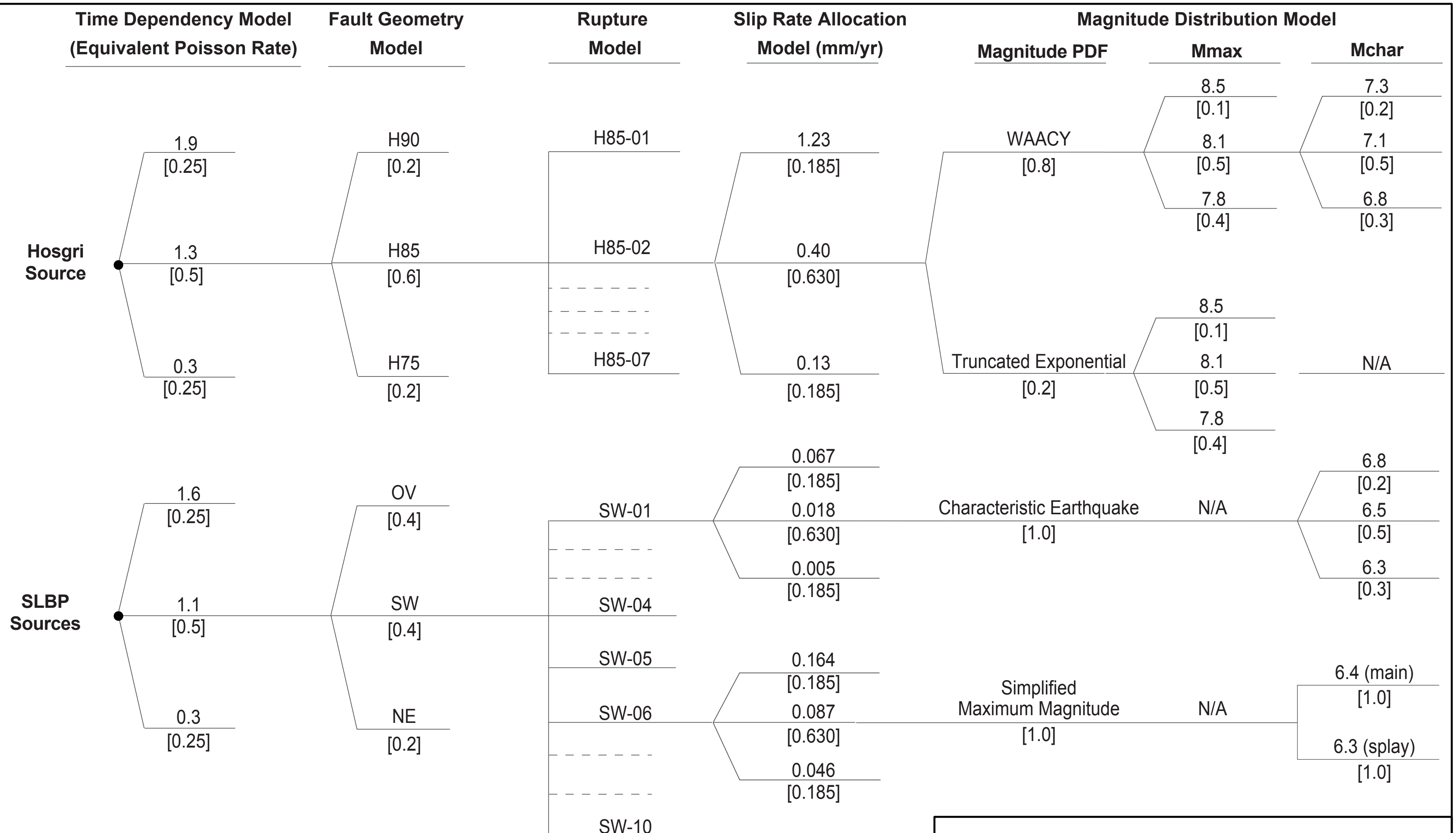

Notes: In the example tree, rupture source H85-02 is a longer *linked* rupture source, so the WAACY and truncated exponential magnitude PDF models are considered. Rupture source SW-01 is a *characteristic* rupture source, so only the Youngs and Coppersmith (1985) characteristic earthquake magnitude PDF is considered. Rupture source SW-06 is a *splay* rupture source, so only the simplified maximum magnitude PDF model is considered. See text.

Logic Tree Structure for the Primary and Connected Fault Sources

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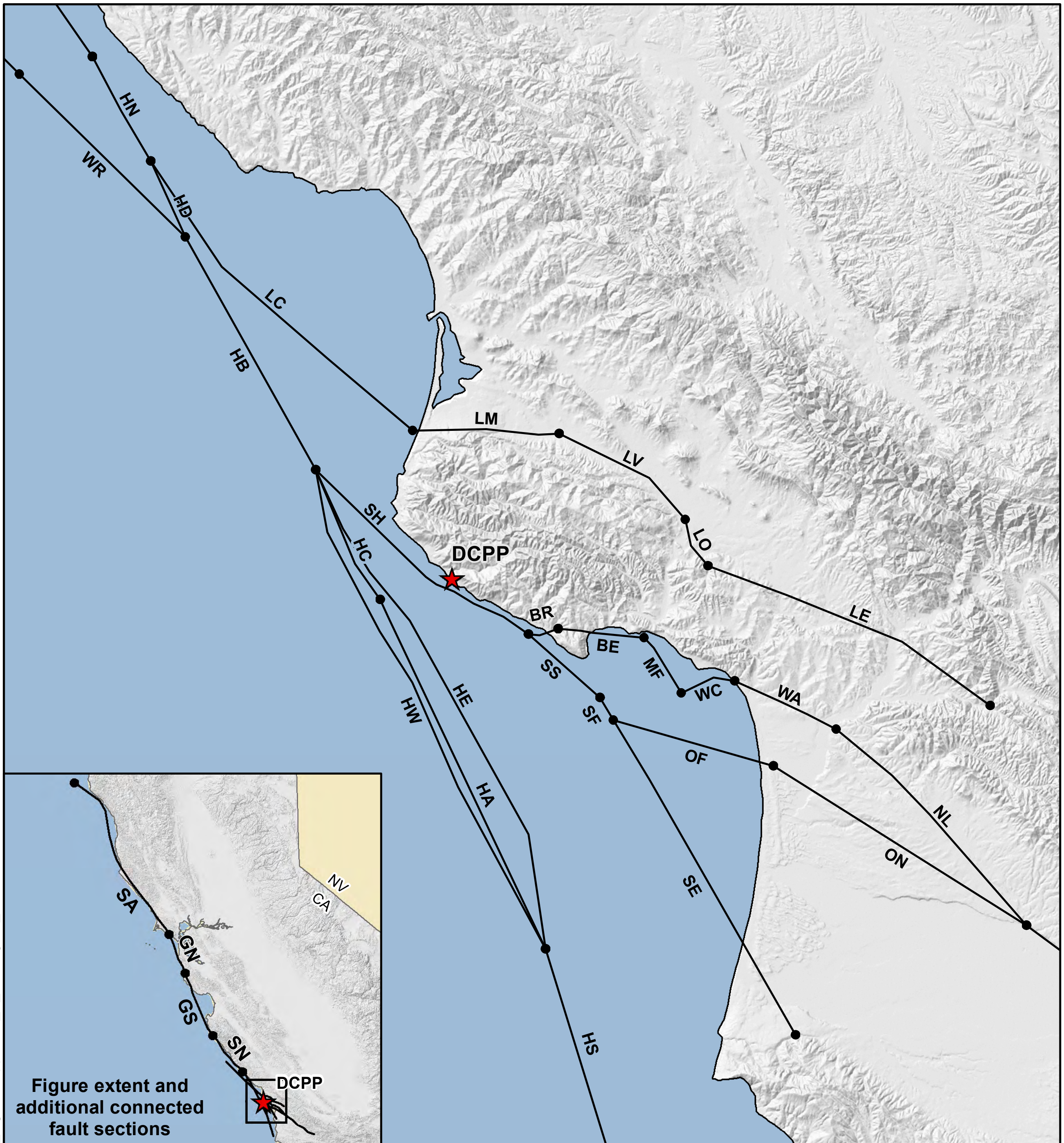
Figure C-1



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EXPLANATION

★ DCPP site

Fault section, surface trace, or updip surface projection

Note: Two letter fault section codes are defined in Table C.2-3.

N

0 6 12 mi.

0 10 20 km

Map projection and scale: WGS 84 / UTM Zone 10N, 1:400,000

Primary and Connected Fault Sections in the Hosgri and Outward-Vergent (OV) Fault Geometry Model, DCPP Vicinity

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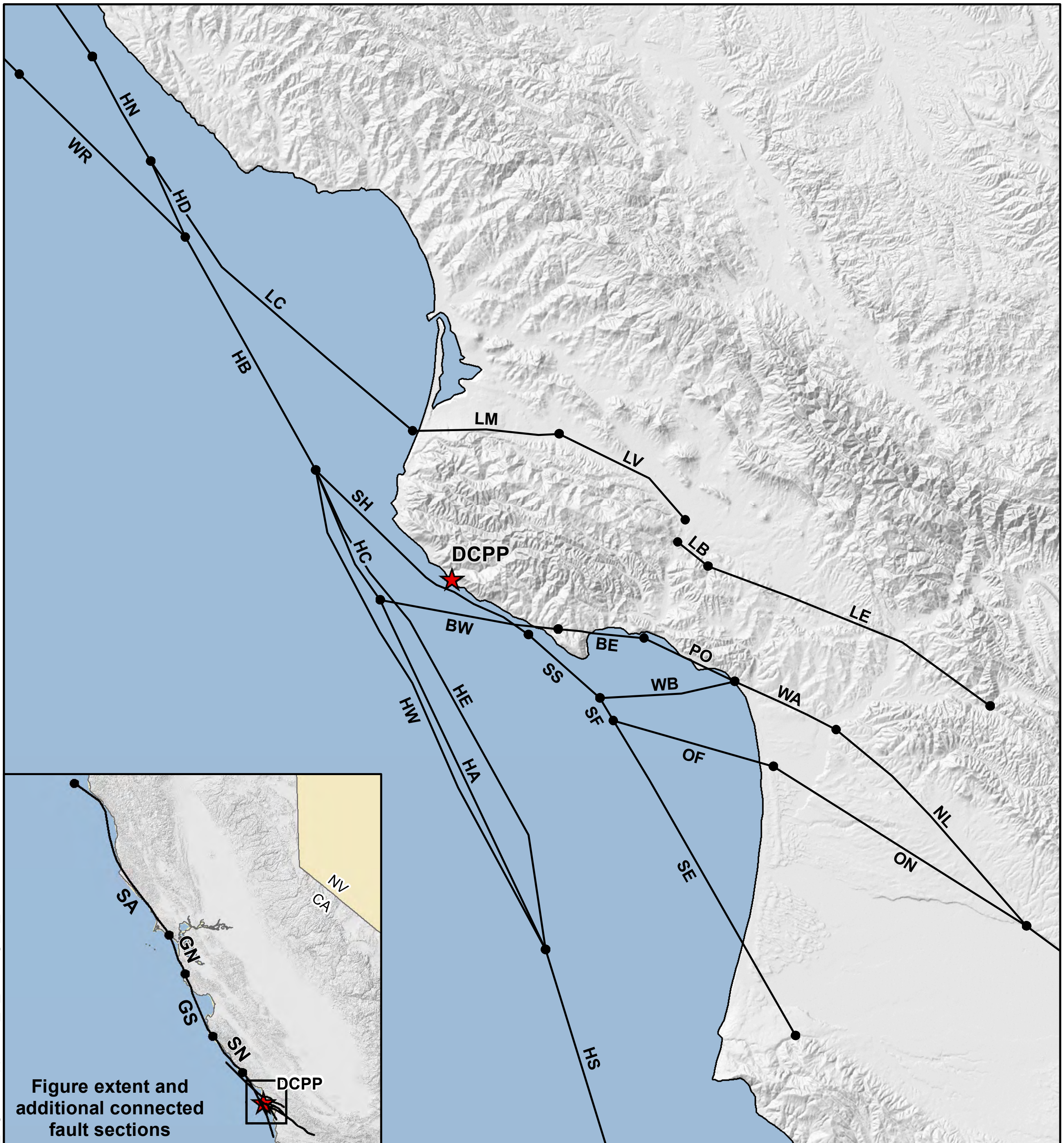
Figure **C-2**



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EXPLANATION

DCPP site

Fault section, surface trace, or updip surface projection

Note: Two letter fault section codes are defined in Table C.2-3.

N

0 6 12 mi.

0 10 20 km

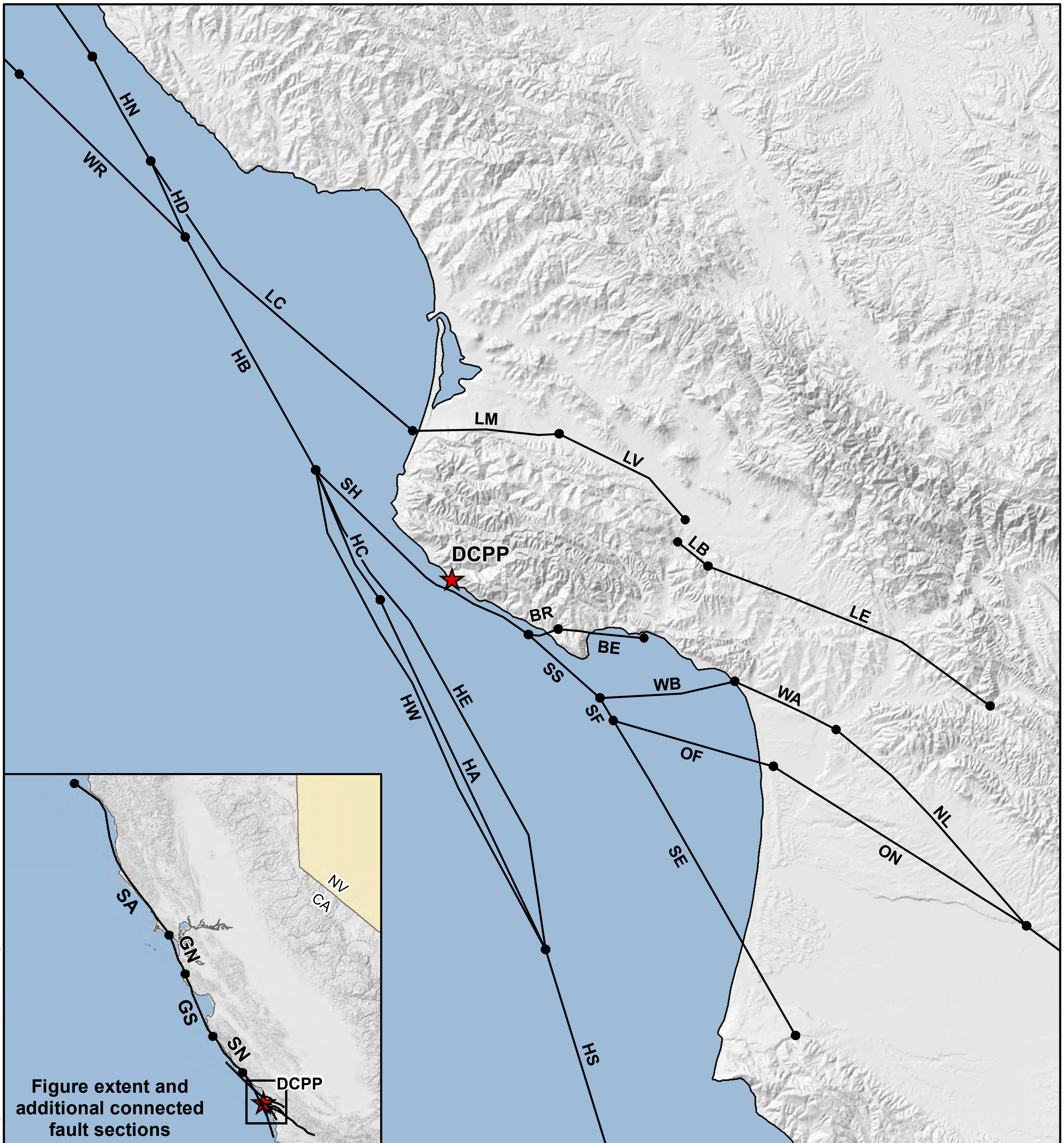
Map projection and scale: WGS 84 / UTM Zone 10N, 1:400,000

Primary and Connected Fault Sections in the Hosgri and Southwest-Vergent (SW) Fault Geometry Model, DCPP Vicinity

DCPP SSC REPORT

Pacific Gas and Electric Company

Figure **C-3**



EXPLANATION

★ DCPP site

●—● Fault section, surface trace, or updip surface projection

Note: Two letter fault section codes are defined in Table C.2-3.

N

0 6 12 mi.

0 10 20 km

Map projection and scale: WGS 84 / UTM Zone 10N, 1:400,000

Primary and Connected Fault Sections in the Hosgri and Northeast-Vergent (NE) Fault Geometry Model, DCPP Vicinity

DCPP SSC REPORT

Pacific Gas and Electric Company | Figure **C-4**

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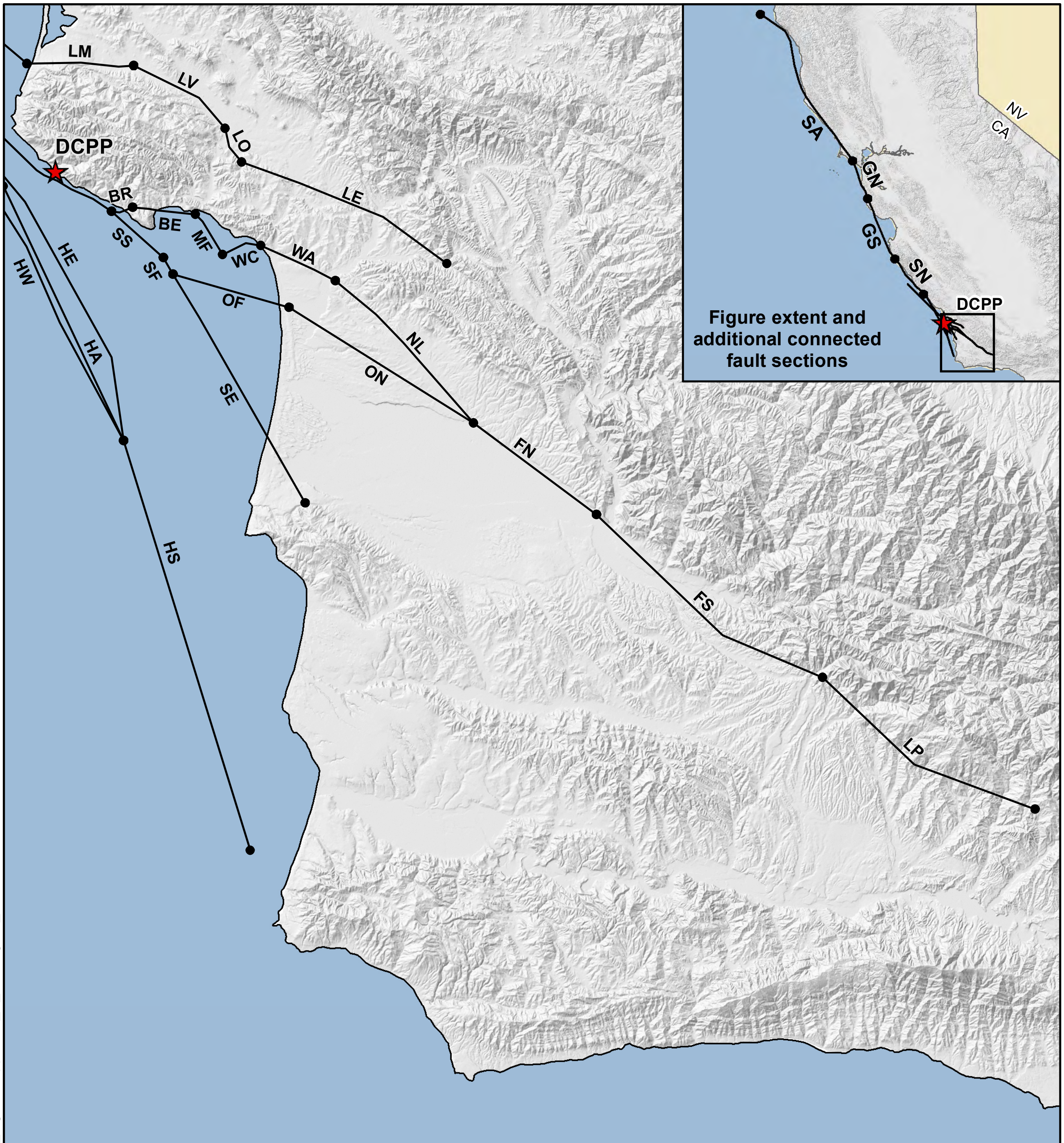

EXPLANATION

DCPP site

Fault section, surface trace, or updip surface projection

Notes:
- Outward-Vergent (OV) Fault Geometry Model shown.
- Two letter fault section codes are defined in Table C.2-3.

N

0 6 12 mi.

0 10 20 km

Map projection and scale: WGS 84 / UTM Zone 10N, 1:550,000

Primary and Connected Fault Sections in the Fault Geometry Models, Southern Region

DCPP SSC REPORT

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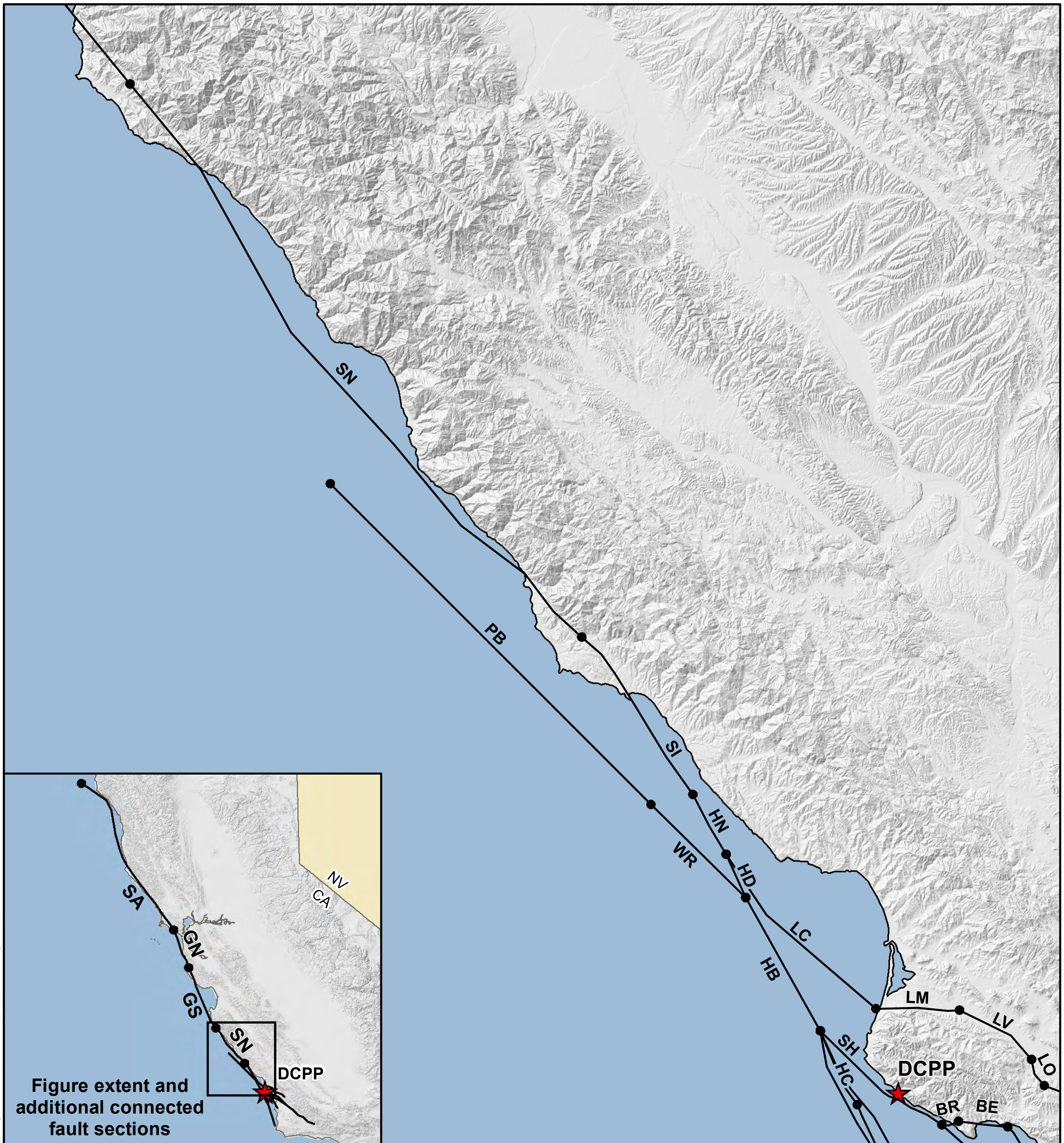
Figure **C-5**

File path: S:\1005\005\Final_Report_Figures\Appendices_Figures\Appendix_C_HID\Figure_C-05.mxd; Date: 03/04/2015; User: Alex, LCI; Rev.1



EXPLANATION

DCPP site

Fault section, surface trace, or updip surface projection

N

0 6 12 mi.

0 10 20 km

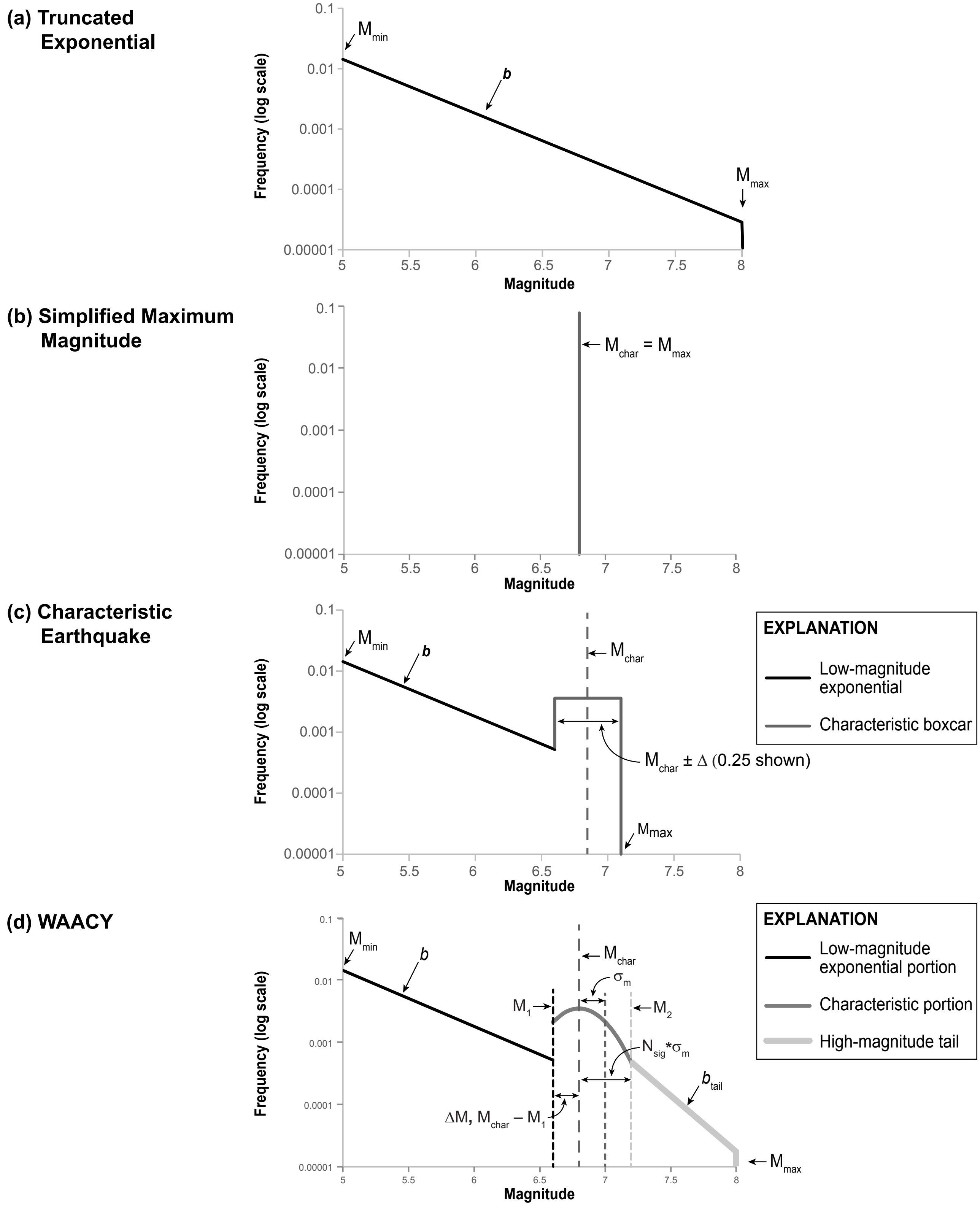
Map projection and scale: WGS 84 / UTM Zone 10N, 1:700,000

Notes:
- Outward-Vergent (OV) Fault Geometry Model shown.
- Two letter fault section codes are defined in Table C.2-3.

Primary and Connected Fault Sections in the Fault Geometry Models, Northern Region

DCPP SSC REPORT

Pacific Gas and Electric Company Figure **C-6**



Schematic Diagrams of Magnitude Probability Density Functions Used in the Diablo Canyon SSC Model

DCPP SSC REPORT

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Figure C-7

Magnitude Range	Group	Percent Moment Rate, Low- Magnitude Exponential Portion	*b*-Value, High- Magnitude Tail
M_{char} = 6.5 ± 0.2, M_{max} = 7.5 ± 0.2 or M_{char} = 7.0 ± 0.2, M_{max} = 7.5 ± 0.2 or M_{char} = 7.3, M_{max} = 8.0 ± 0.2	GROUP (A)	12% [0.2] 6% [0.35] 3% [0.45]	3 [0.35] 2 [0.35] 1 [0.30]
M_{char} = 7.0 ± 0.2, M_{max} = 8.0 ± 0.2 or M_{char} = 7.3, M_{max} = 8.3–8.5	GROUP (B)	12% [0.1] 6% [0.4] 3% [0.5]	3 [0.45] 2 [0.35] 1 [0.2]
M_{char} = 6.5 ± 0.2, M_{max} = 8.0 ± 0.2 or M_{char} = 6.5 ± 0.2, M_{max} = 8.3–8.5 or M_{char} = 7.0 ± 0.2, M_{max} = 8.3–8.5	GROUP (C)	12% [0.2] 6% [0.35] 3% [0.45]	3 [0.7] 2 [0.3] 1 [0.0]

Note: WAACY magnitude PDF parameters are shown on Figure C-7 and defined in *Section C.2.5.4*. The logic trees specify values and weights for the two non-fixed WAACY parameters to be used with specific M_{char}, M_{max} combinations based on their proximity to one of 8 combinations tested in the parametric study. These 8 combinations are arranged into 3 groups as discussed in *Appendix G*.

Logic Trees for the Non-Fixed Parameters in the WAACY Magnitude PDF Model

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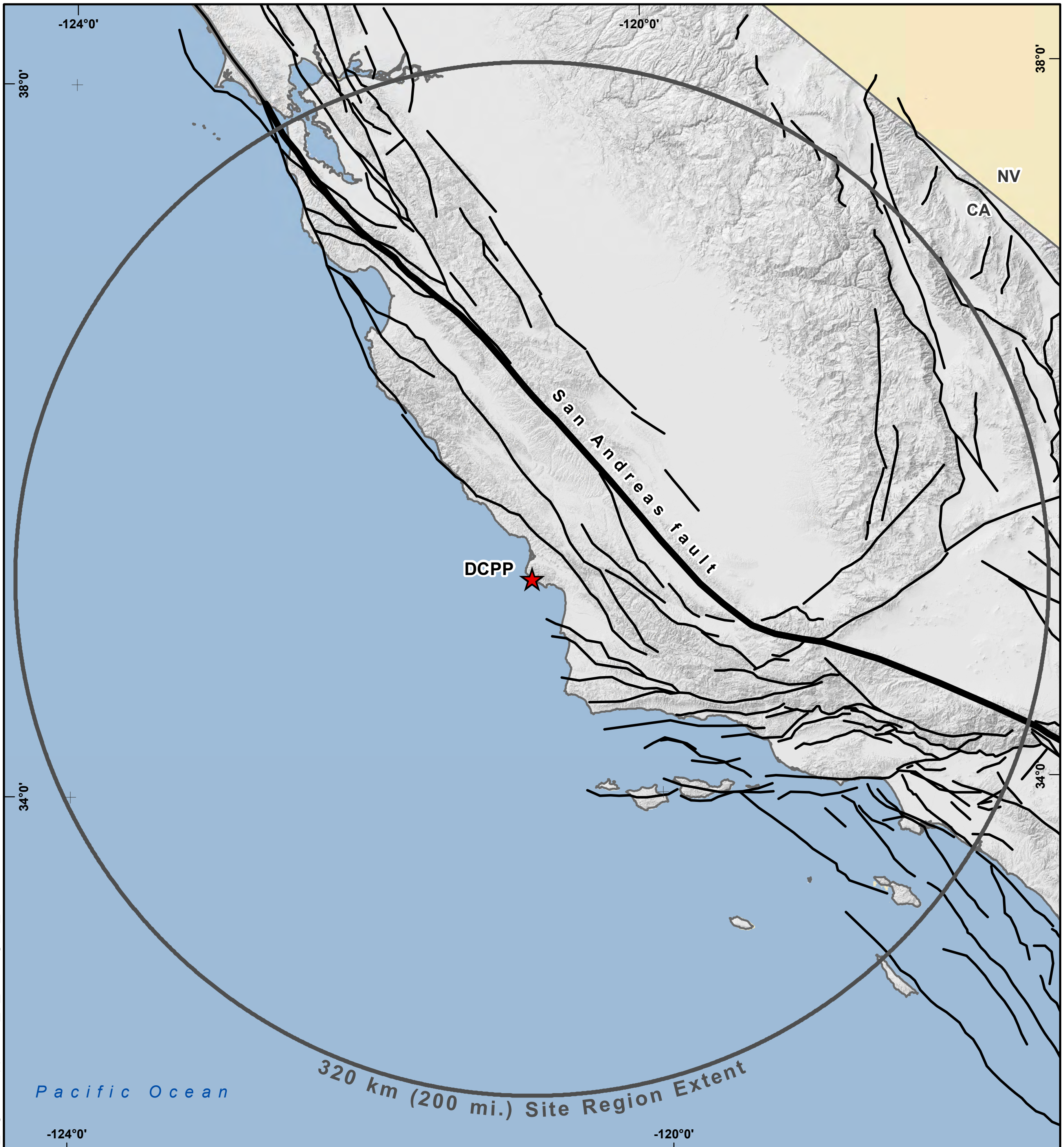
Figure **C-8**



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EXPLANATION

Faults from UCERF3 (Fault Model 3.1)

San Andreas Fault from UCERF3

Sections inside the site region

Sections outside the site region

N

0 50 100 mi.

0 100 200 km

Map projection and scale: WGS 1984 UTM Zone 10N, 1:3,700,000

UCERF3 Regional Fault Sources

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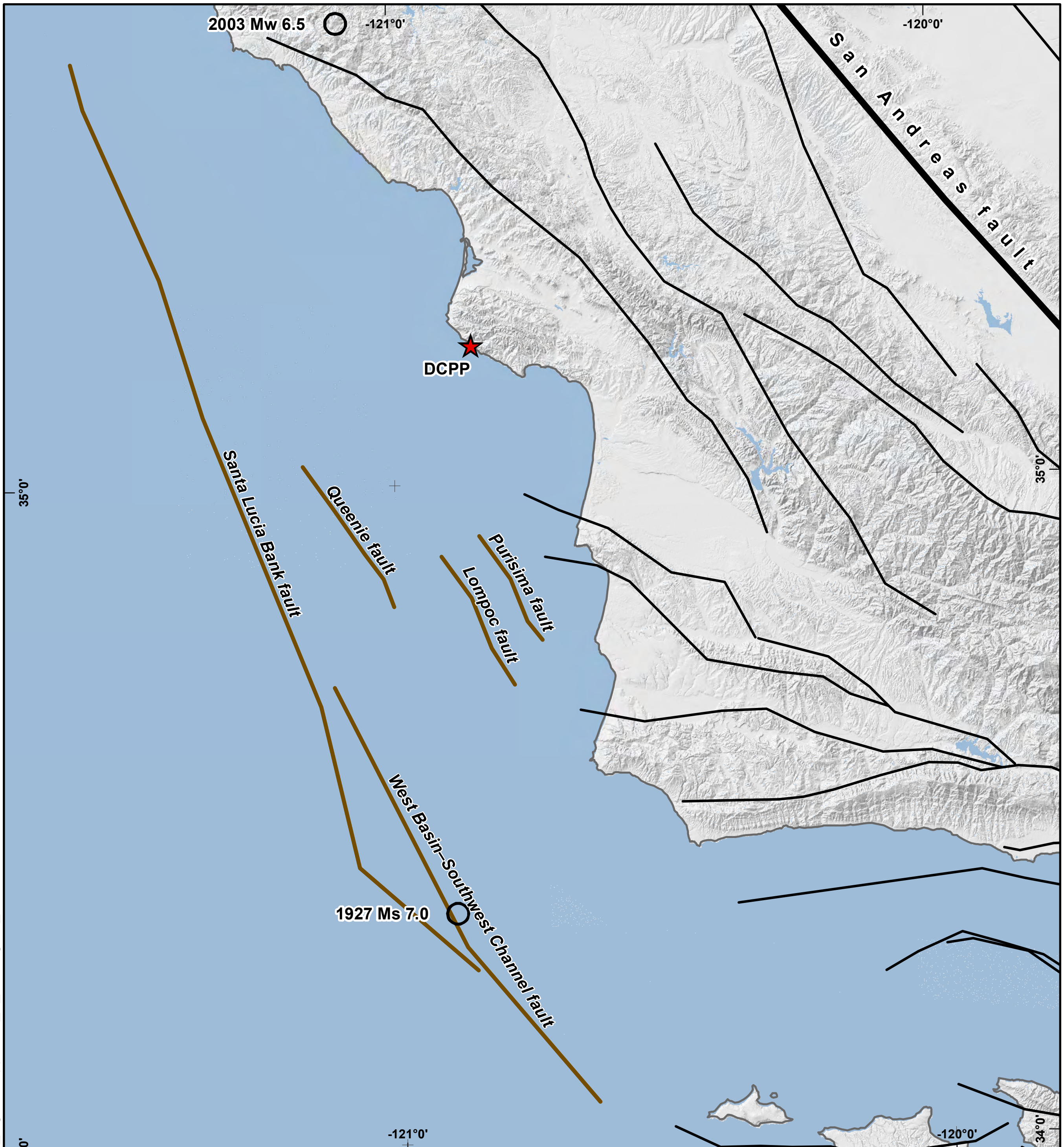
Figure **C-9**



EXPLANATION

- Epicenters of key earthquakes
- Non-UCERF3 faults
- Faults from UCERF3 (fault model 3.1)
- San Andreas fault from UCERF3

N

0 16 32 mi.

0 30 60 km

Map projection and scale: WGS 1984 UTM Zone 10N, 1:1,000,000

Non-UCERF3 Regional Fault Sources

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Pacific Gas and Electric Company | Figure **C-10**

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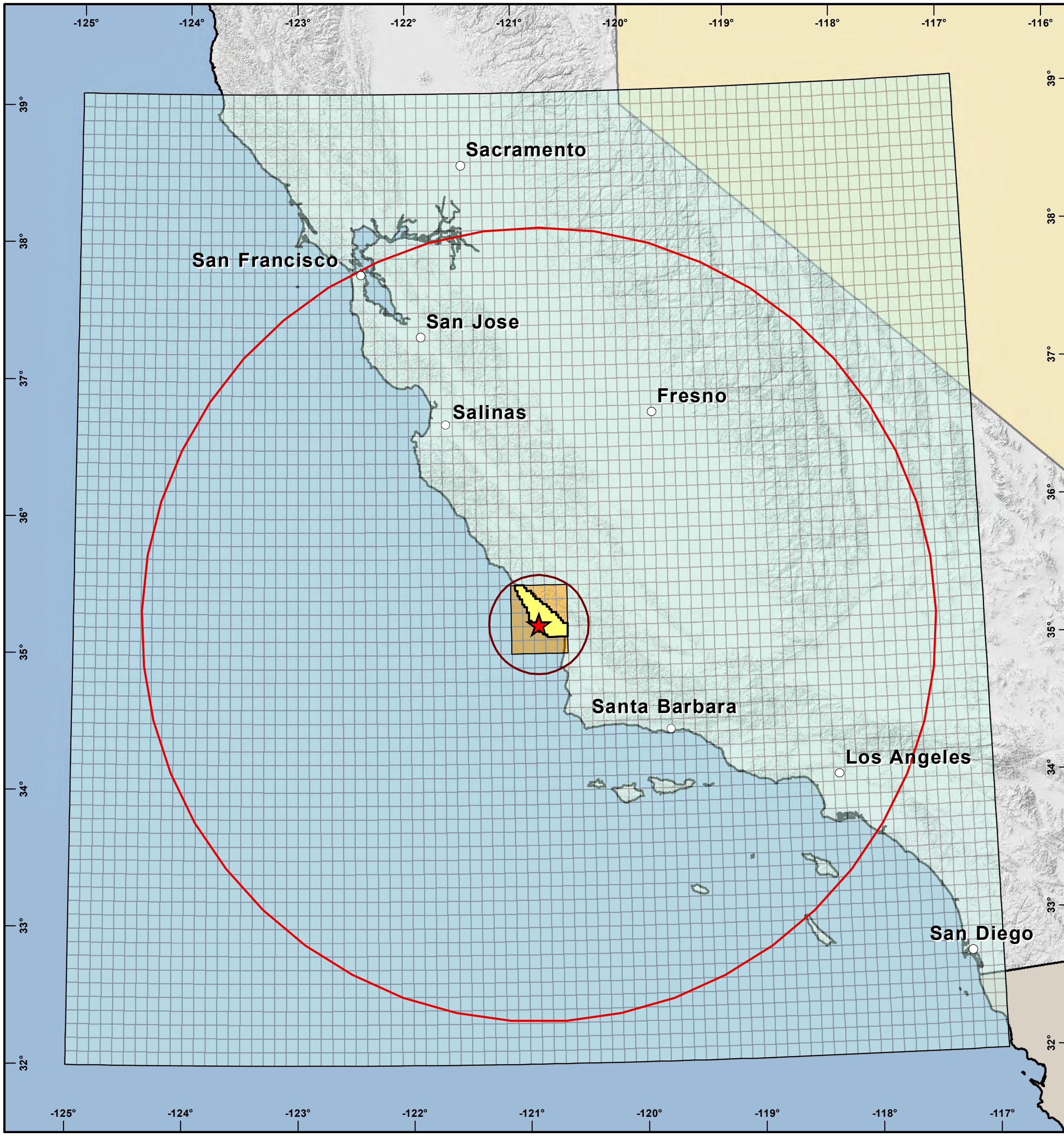

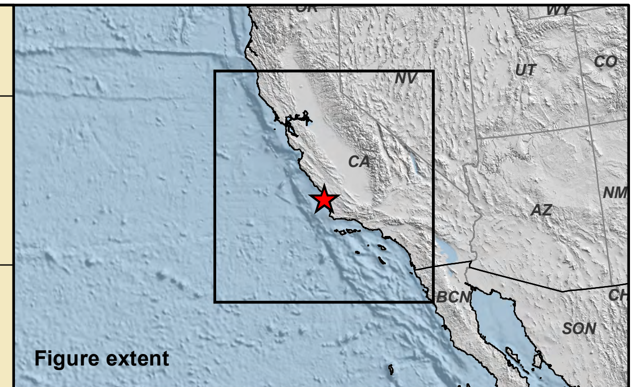

EXPLANATION

- DCPP
- 40 km (25 mi.) DCPP site vicinity boundary
- 320 km (200 mi.) DCPP site region boundary
- Local areal source zone
- Vicinity areal source zone
- Regional areal source zone

Note: 0.1° grid from the 2008 National Seismic Hazard Mapping Project (Petersen et al., 2008).

N

0 50 100 mi.

0 100 200 km

Map projection and scale: WGS 84 / UTM 10N, 1:5,000,000

Areal Source Zones Used in the Diablo Canyon SSC Model

DCPP SSC REPORT

Pacific Gas and Electric Company | Figure **C-11**

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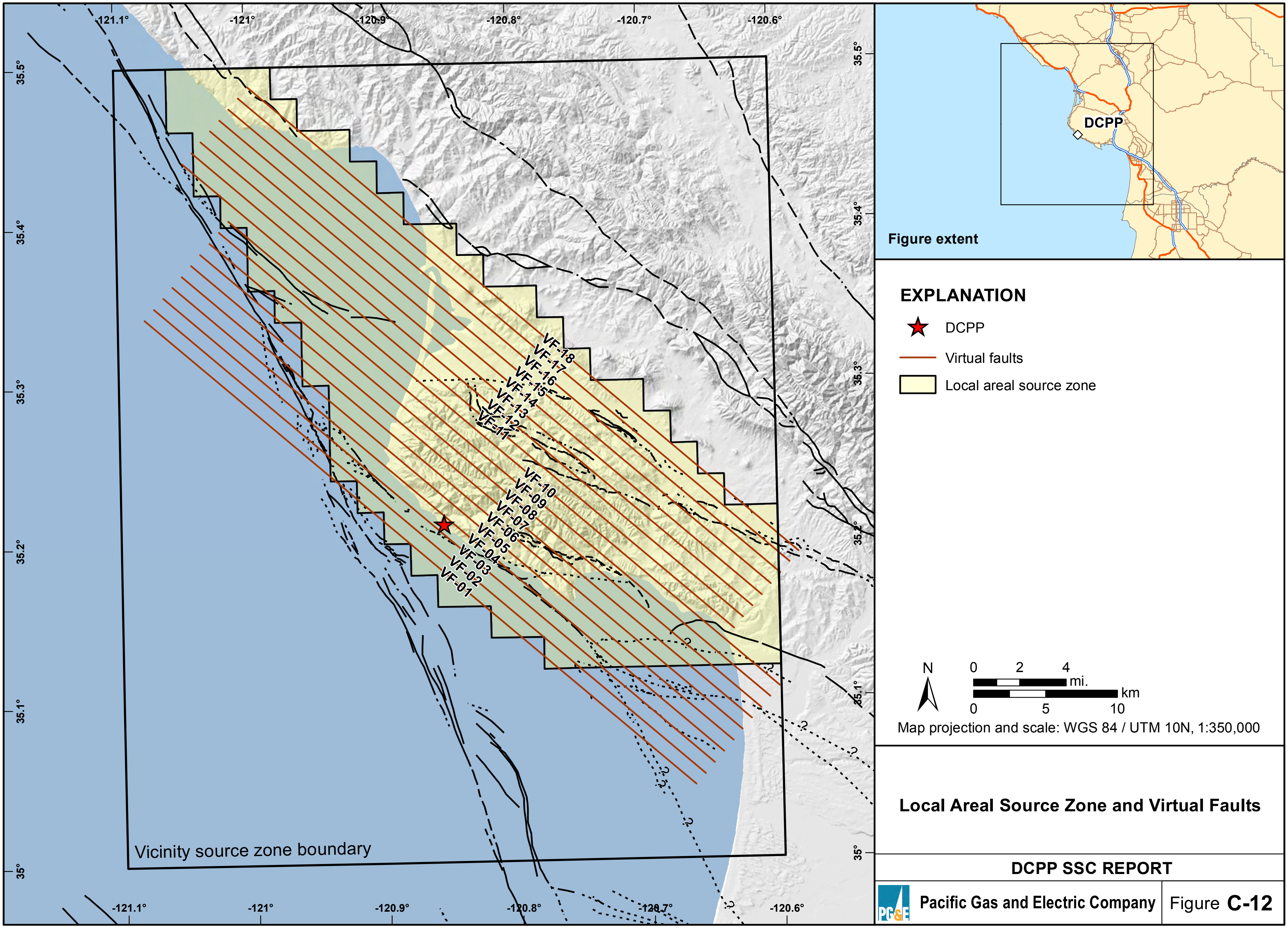
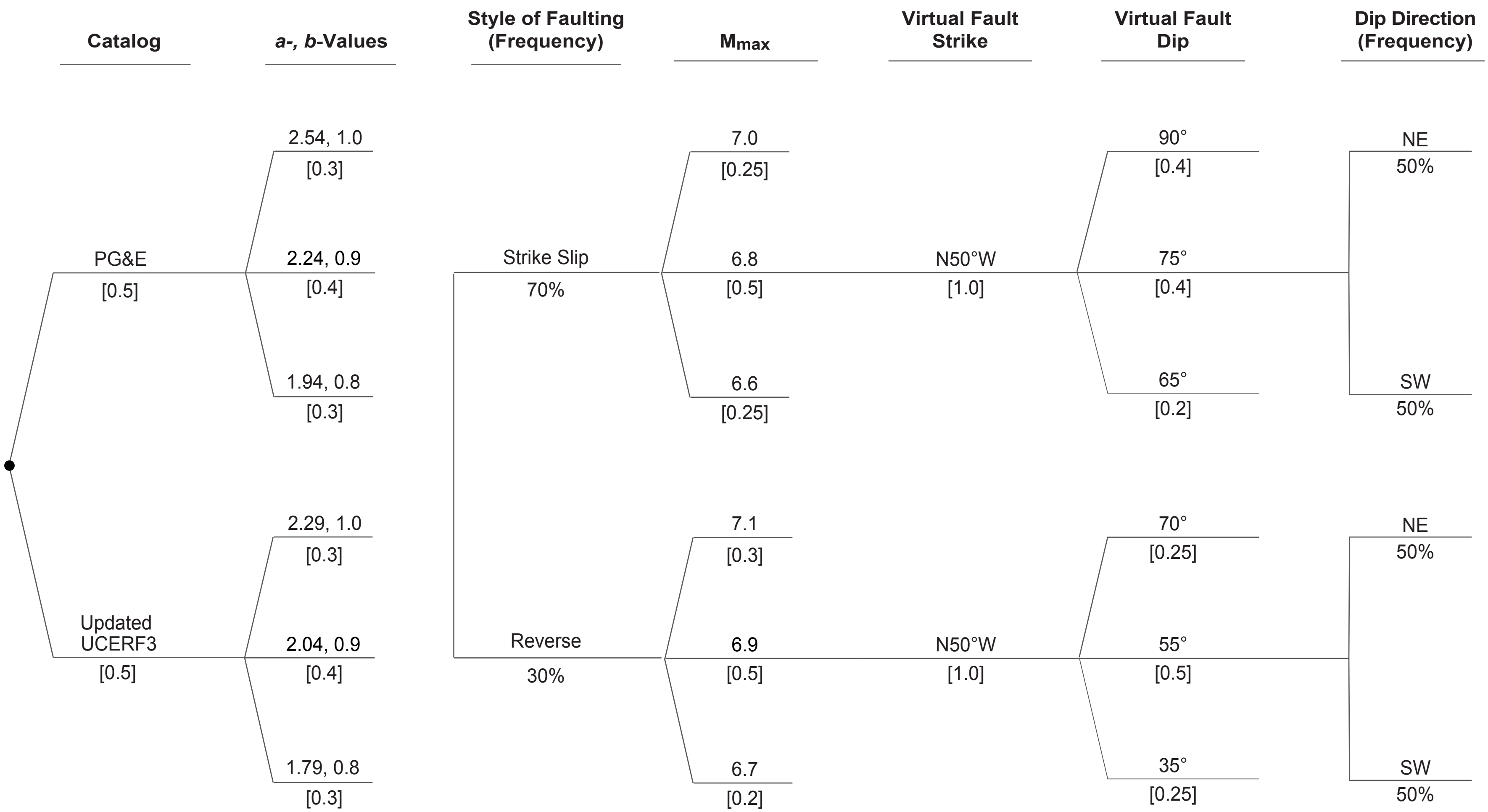


Local Areal Source Zone and Virtual Faults

DCPP SSC REPORT

Pacific Gas and Electric Company

Figure C-12



Note: Local areal source zone virtual faults are shown on Figure C-12.

Logic Tree for the Local Areal Source Zone

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Figure **C-13**

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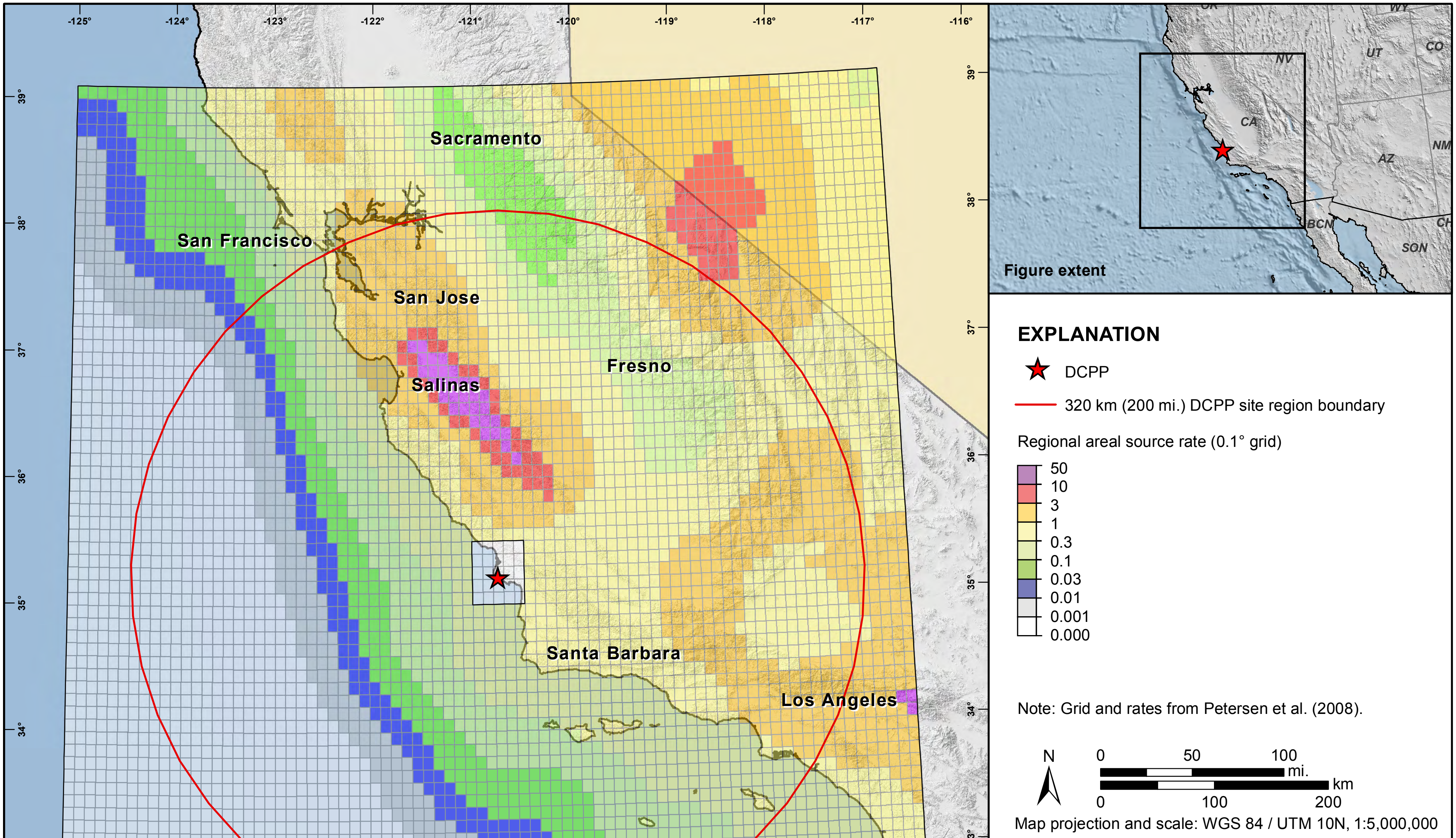

Regional Areal Source Zone Showing 0.1° Gridded Seismicity Rates from the 2008 NSHMP

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Pacific Gas and Electric Company | Figure **C-14**

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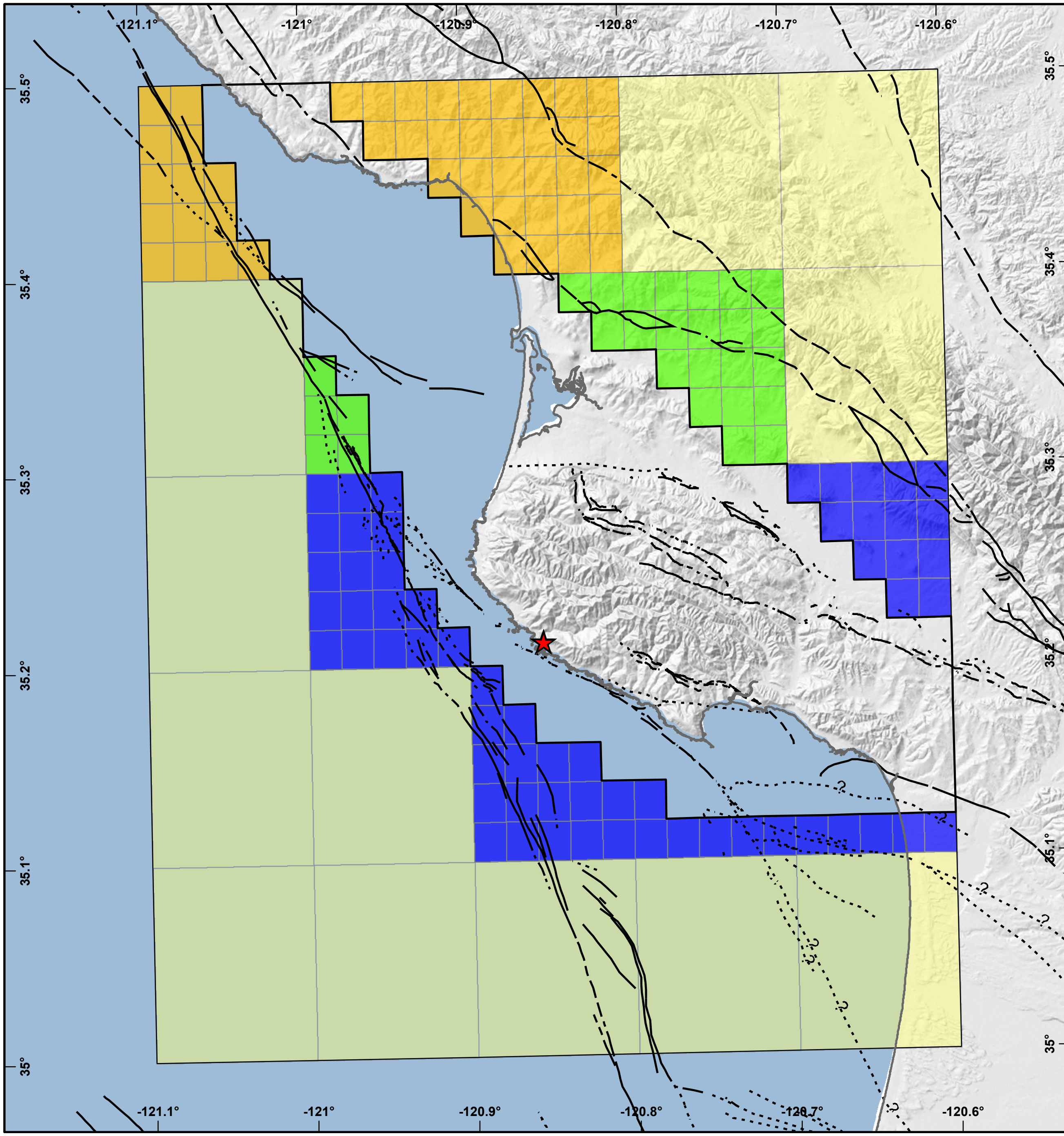

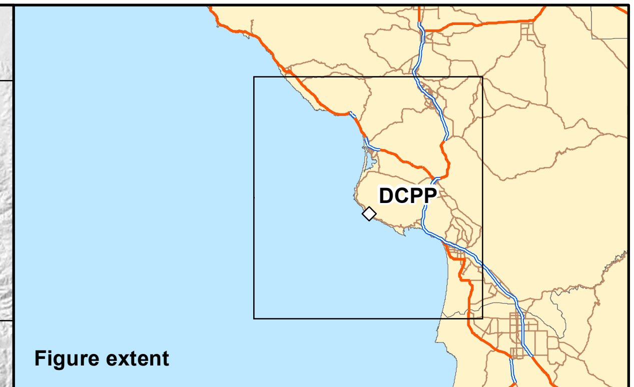

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EXPLANATION

★ DCPP

Vicinity Areal Source Rate

0.1° Grid	0.02° Grid
1.000	0.035
0.300	0.025
	0.020
	0.015

Notes:
- 0.1° grid division values and color from Figure C-14.
- 0.1° grid and rates, and scaled-down 0.02° grid and rates based on Petersen et al. (2008).

N

0 2 4 mi.

0 5 10 km

Map projection and scale: WGS 84 / UTM 10N, 1:350,000

Vicinity Areal Source Zone Showing 0.1° and Finer 0.02° Gridded Seismicity Rates Based on the 2008 NSHMP

DCPP SSC REPORT

Pacific Gas and Electric Company | Figure **C-15**