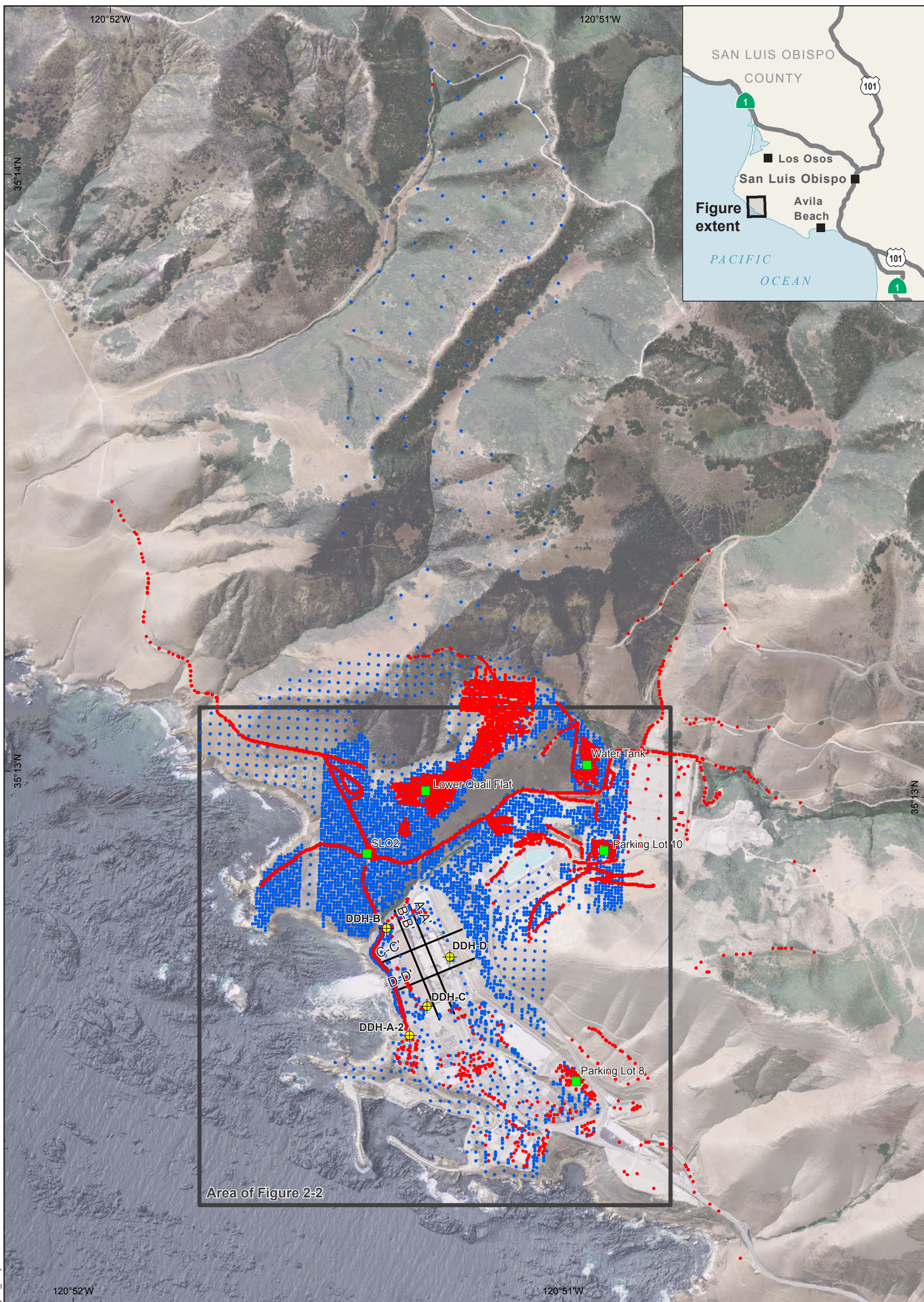


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Project Organizational Chart	
DCPP FOUNDATION VELOCITY REPORT	
Pacific Gas and Electric Company	Figure 1-1

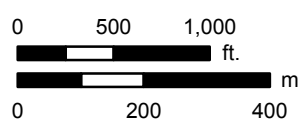


Area of Figure 2-2

Imagery from NAIP (2009).

EXPLANATION

- Downhole log location (1978)
- Alternative velocity location
- Source location
- Receiver location
- Profile



Map projection and scale: NAD 83 State Plane CA Zone V, 1:12,000

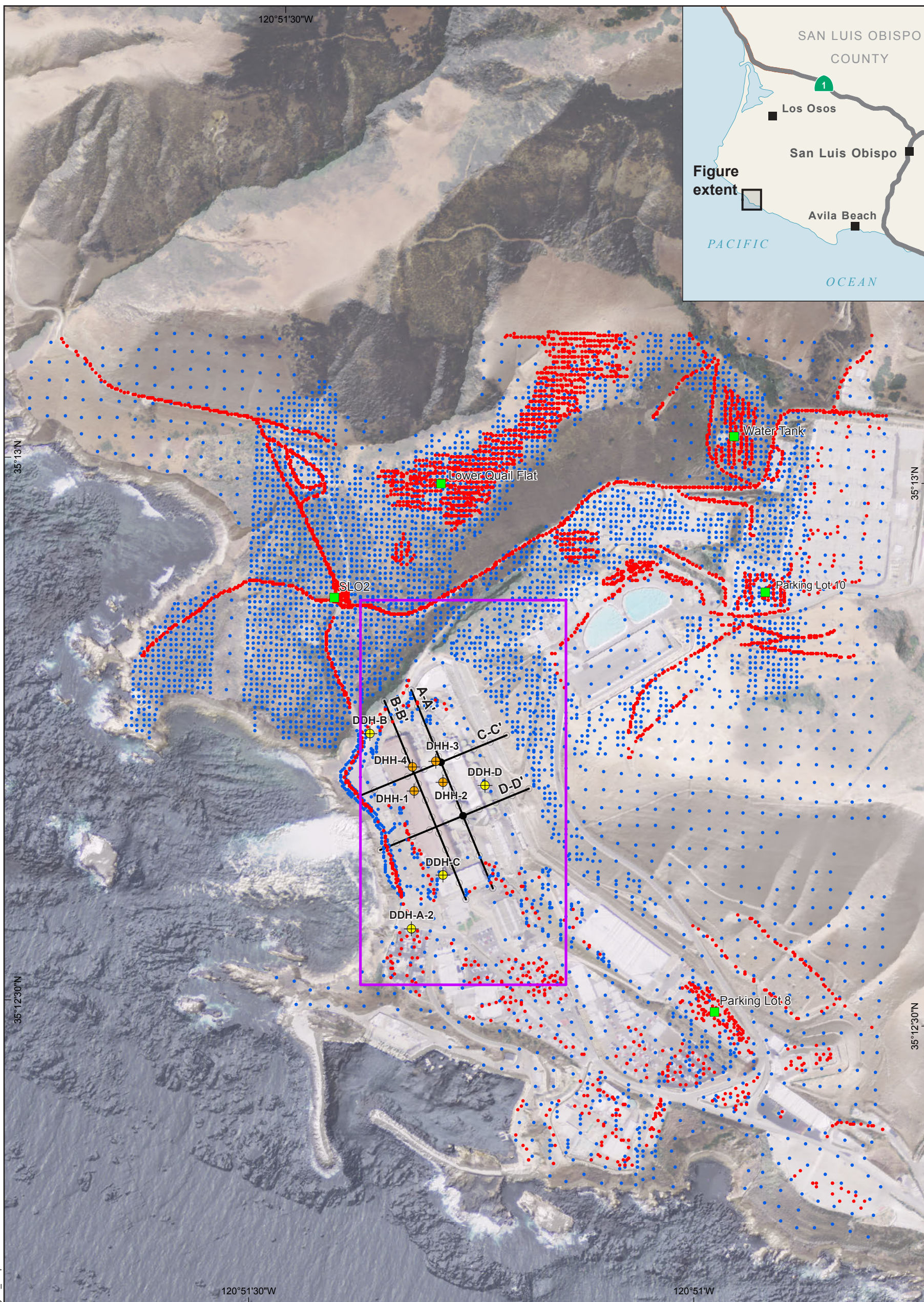
**3D Tomography
 Source and Receiver Locations**

DCPP FOUNDATION VELOCITY REPORT



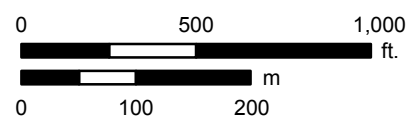
Figure 2-1

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Imagery from NAIP (2009).

EXPLANATION	
	Borehole location (Blume, 1968)
	Downhole log location (1978)
	Obispo velocity location
	Source location
	Receiver location
	Containment structure centerpoint
	100-ft spacing points along profile
	Profile
	Boundary of 3D velocity output



Map projection and scale: NAD 83 State Plane CA Zone V, 1:6,600

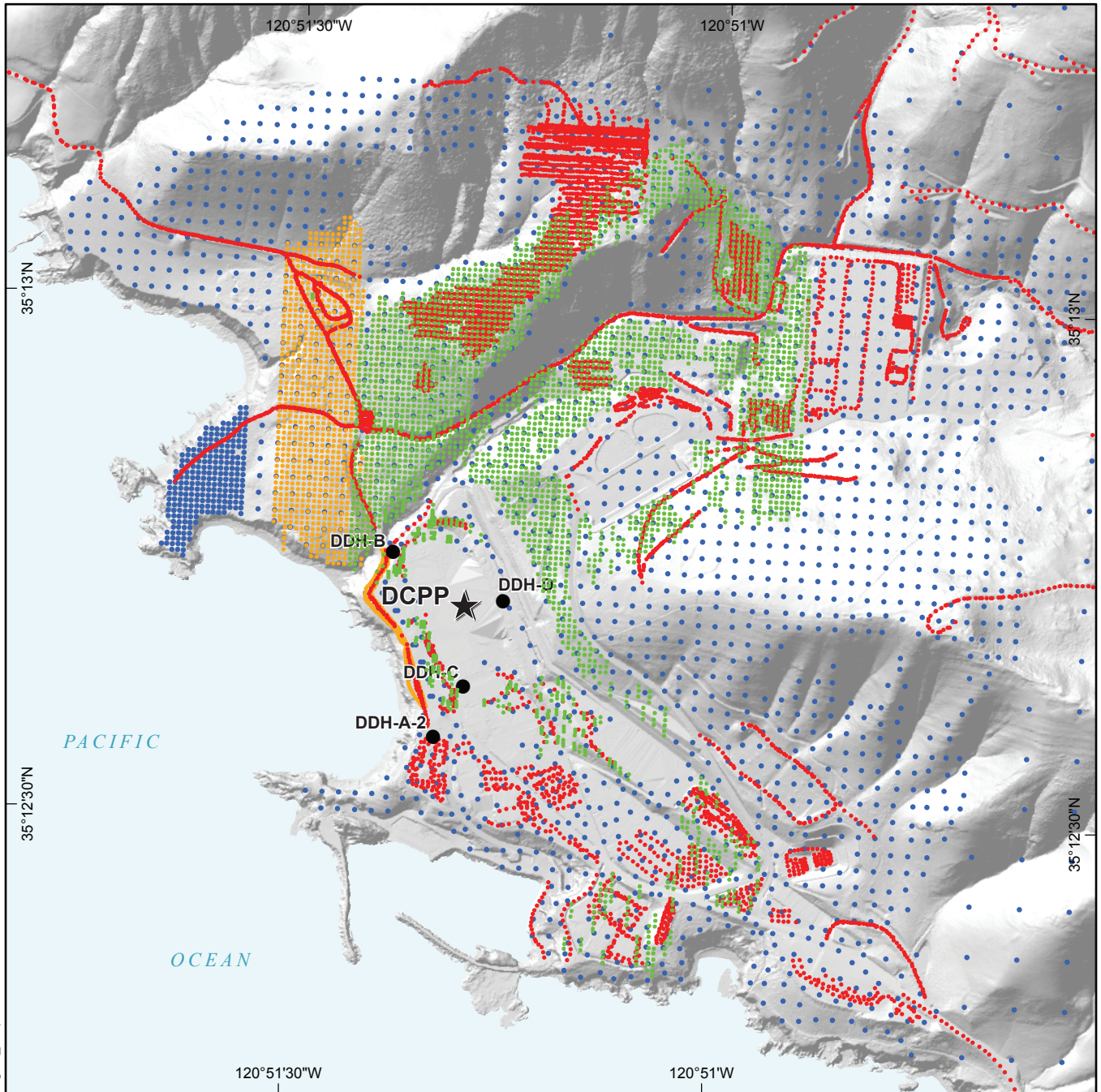
**2012 Phase 1 DCPV 3D Survey
 Source and Receiver Locations – Site Area**

DCPV FOUNDATION VELOCITY REPORT



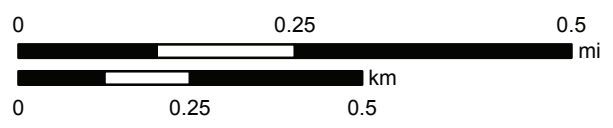
Figure 2-2





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- EXPLANATION**
- 2012 Phase 1 Data
- Zland receiver locations
 - Sigma receiver locations
 - Seistronix receiver locations
 - Vibroseis source locations
- DDH-C** ● Borehole location of the 1978 investigations



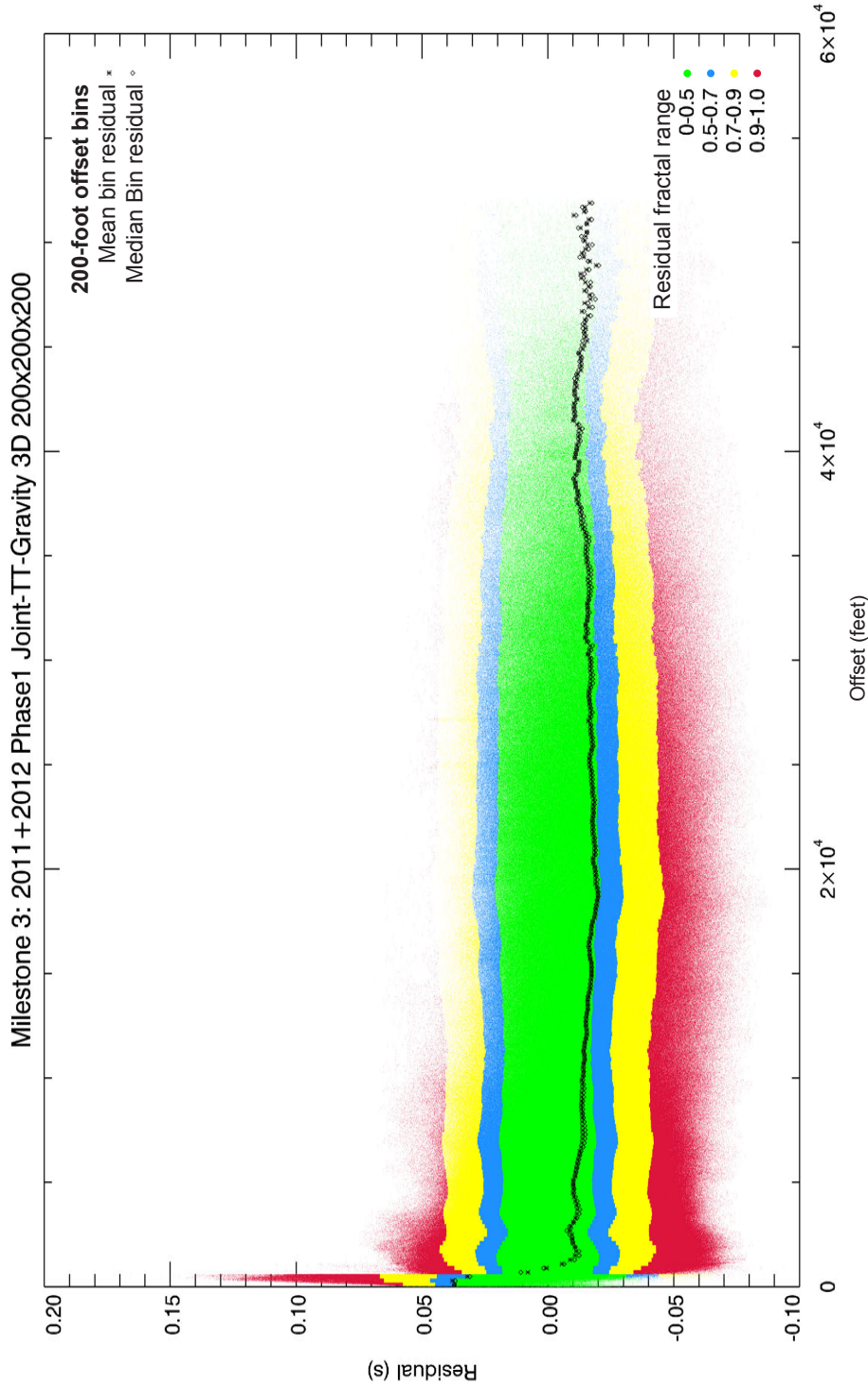
Map projection and scale: NAD 83 State Plane CA Zone V, 1:11,000

**2012 Phase 1 DCPD 3D Survey
 Source and Receiver Locations Detail**

DCPD FOUNDATION VELOCITY REPORT



Figure 3-1

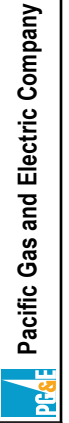


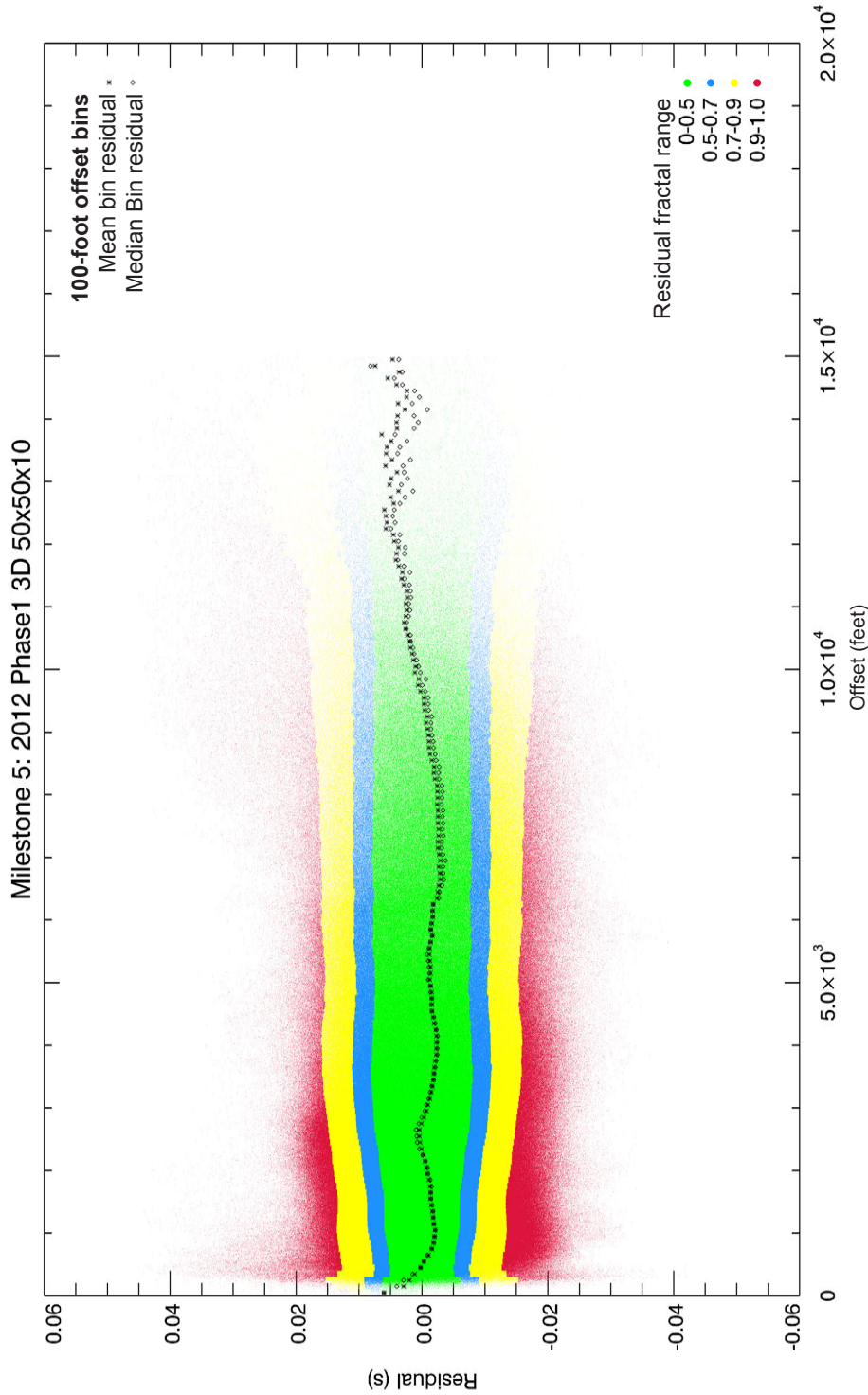
Note: 22700351 first break picks: mean residual = -8.08 ms, standard deviation = 25.26 ms

**2011 and 2012 Phase 1
 Joint Travel-Time-Gravity Inversion
 Residual Distribution**

DCPP FOUNDATION VELOCITY REPORT

Figure 3-2



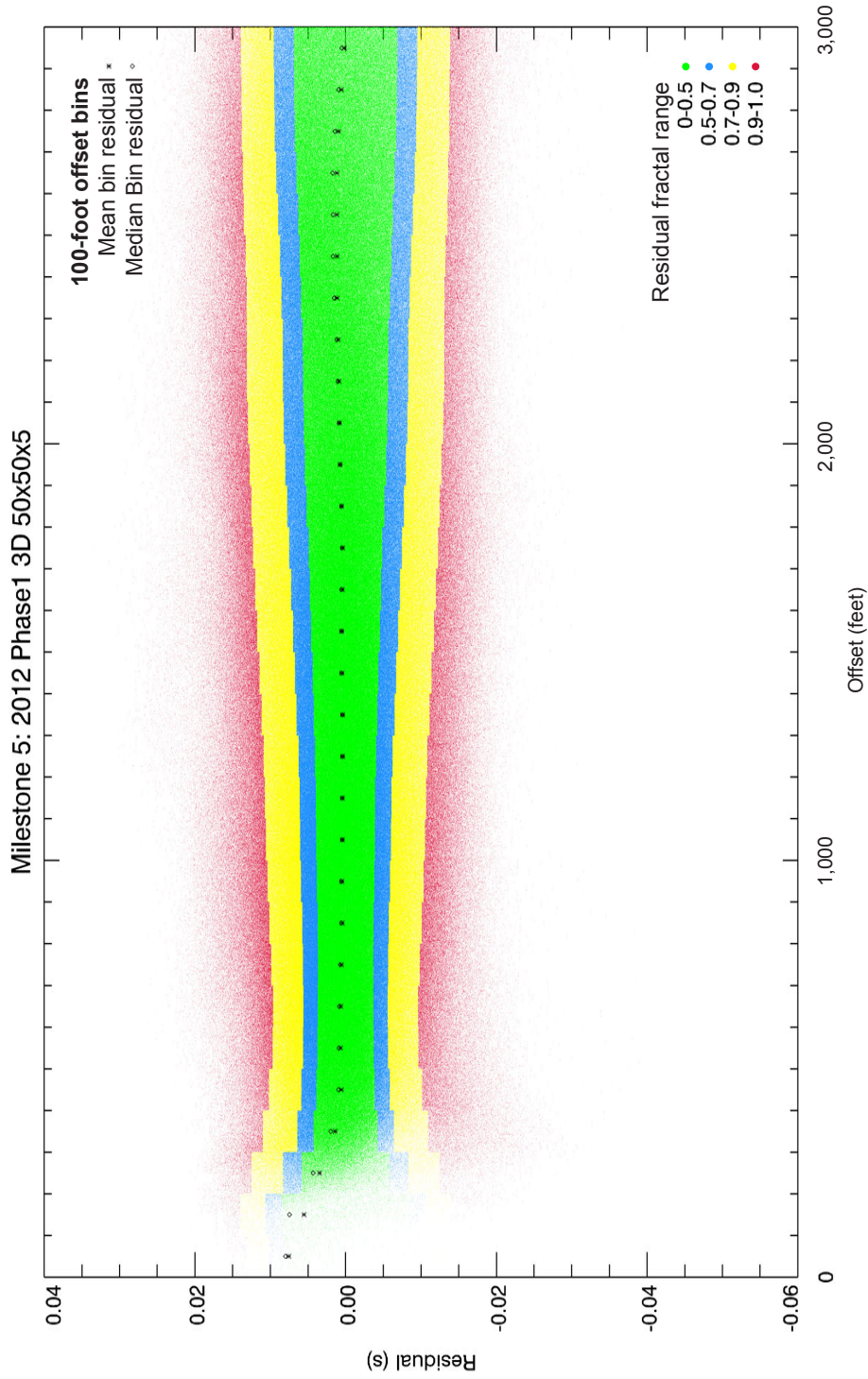


**2012 Phase 1 Offset <15,000-Foot
 Travel-Time-Inversion
 Residual Distribution**

DCPP FOUNDATION VELOCITY REPORT

Figure 3-3





Note: 6,380,553 first break picks: mean residual = -0.66 ms, standard deviation = 7.02 ms.

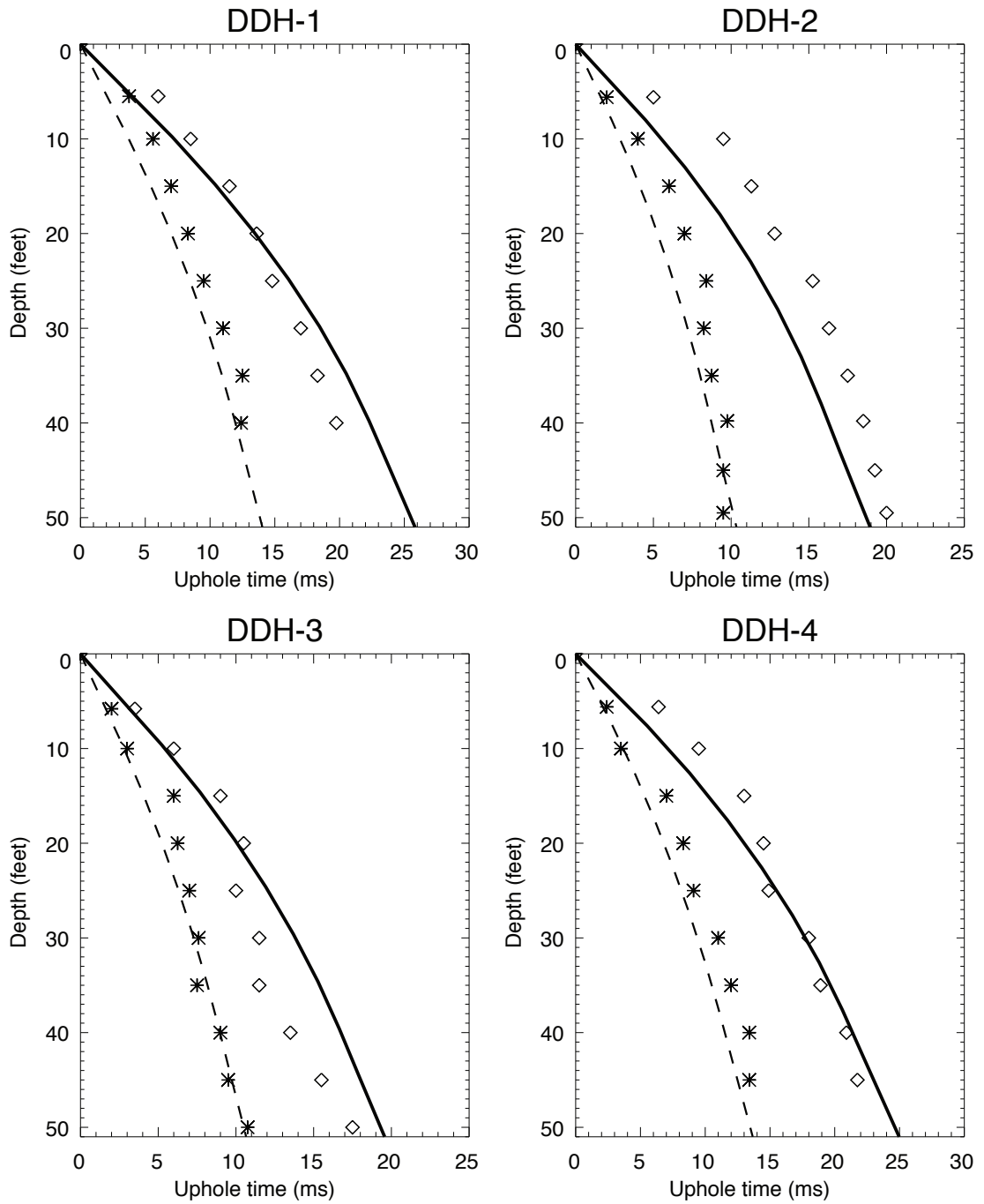
**2012 Phase 1 Offset <3,000-Foot
 Travel-Time-Inversion
 Residual Distribution**

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Figure 3-4



EXPLANATION

- Model S time
- ◇ Picked S time
- - - Model P time
- * Picked P time

Note: See Figure 2-2 for borehole locations.

**Blume and Associates (1969)
 Downhole Travel Times**

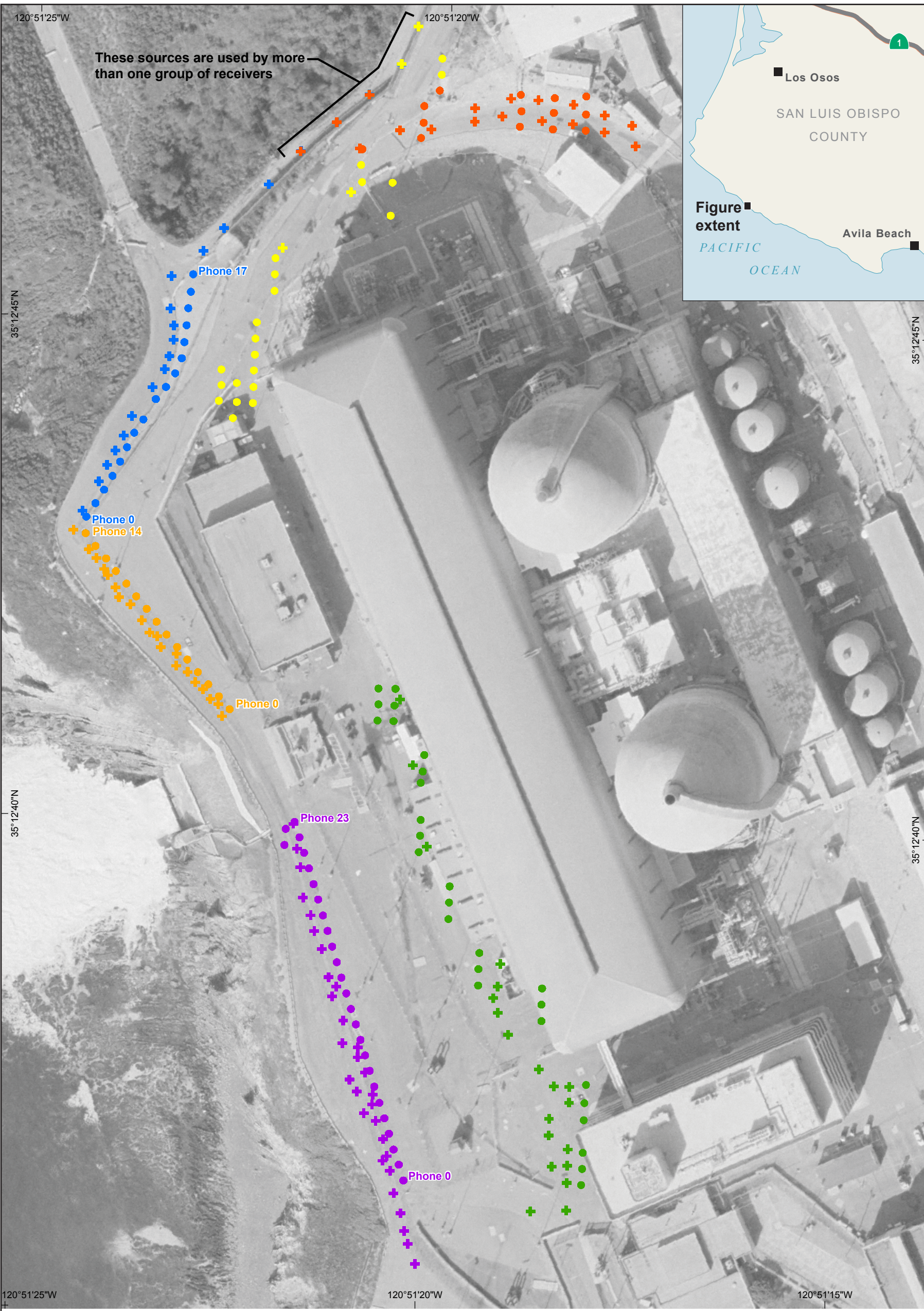
DCPP FOUNDATION VELOCITY REPORT



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Figure 4-1

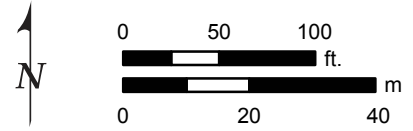
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Imagery from TetraTech (2010).

EXPLANATION

- | | | | |
|---|---------------------------------|---|----------|
| ■ | Sigma northeast PA | + | Source |
| ■ | Sigma northwest PA | ● | Receiver |
| ■ | Sigma southwest PA | | |
| ■ | Seistronix cable 3 central east | | |
| ■ | Seistronix cable 3 northeast | | |
| ■ | Seistronix cable 3 southeast | | |



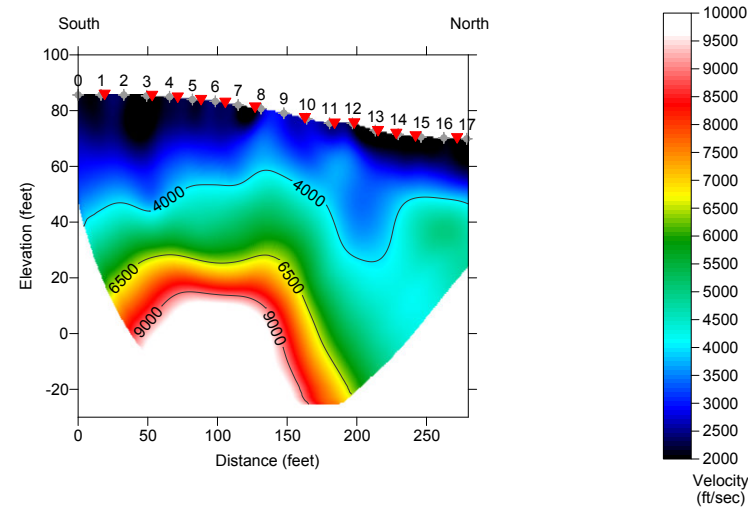
Map projection and scale: NAD 83 State Plane CA Zone V, 1:1,200

DCCP Source-Receiver Pairs	
DCCP FOUNDATION VELOCITY REPORT	
Pacific Gas and Electric Company	Figure 5-1

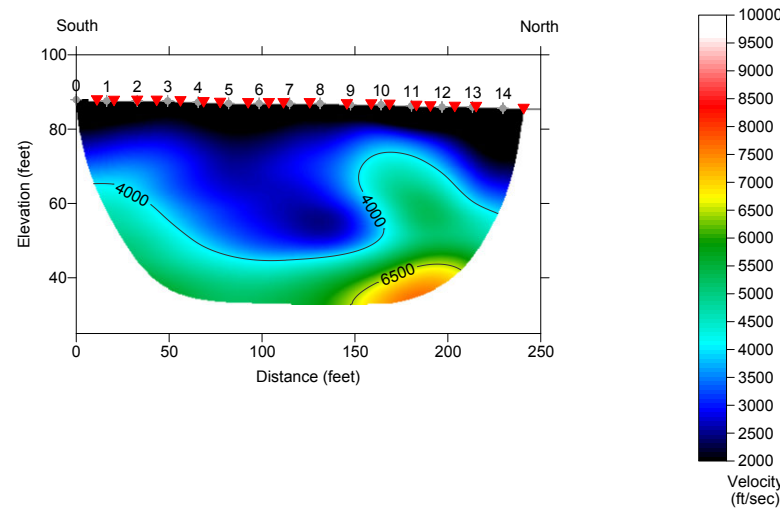




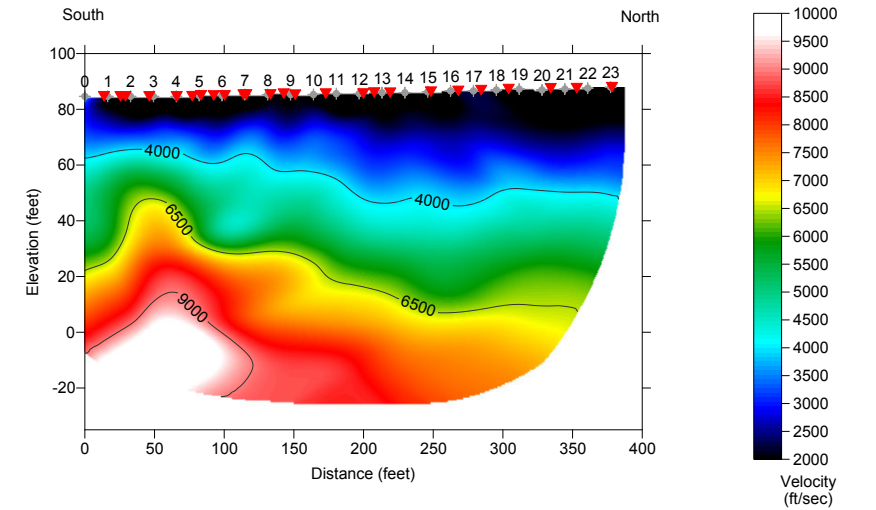
Cable 3 East, NE segment, 120 WET iterations, RMS error 3.7%,
 1D-gradient smooth initial model, Version 3.25



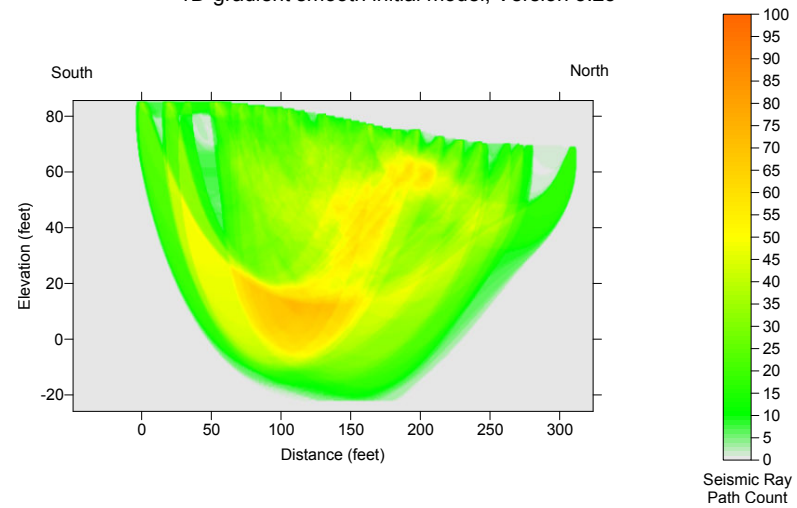
Cable 3 East, Center Segment, 120 WET iterations, RMS error 5.6%,
 1D-gradient smooth initial model, Version 3.25



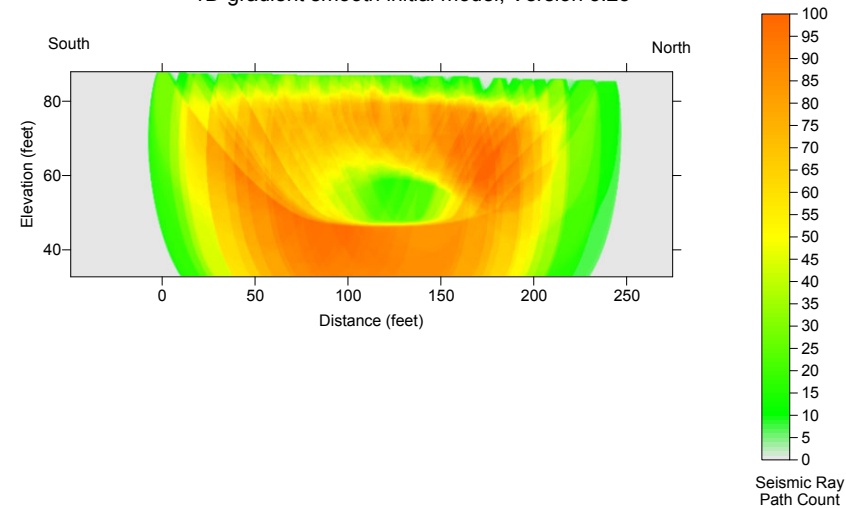
Cable 3 East, SE segment, 85 WET iterations, RMS error 3.0%,
 1D-gradient smooth initial model, Version 3.25



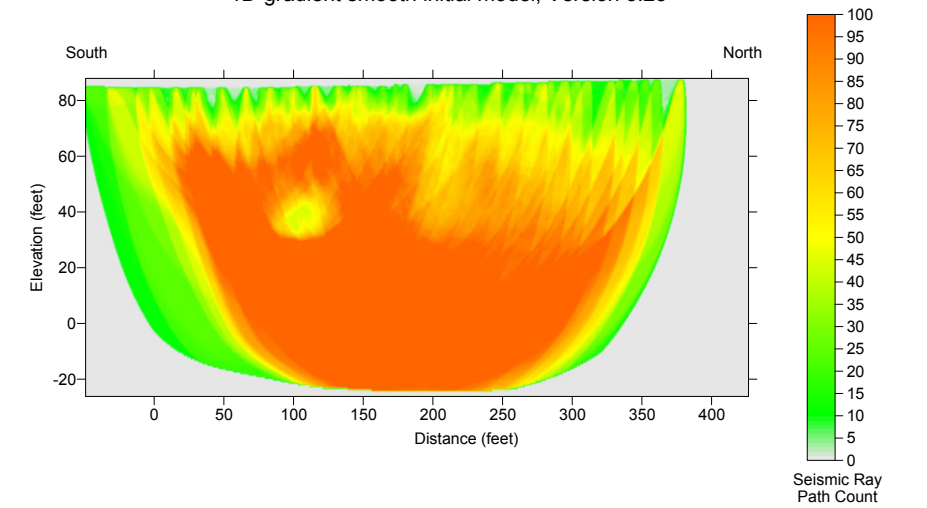
Cable 3 East, NE segment, 120 WET iterations, RMS error 3.7%,
 1D-gradient smooth initial model, Version 3.25



Cable 3 East, Center Segment, 120 WET iterations, RMS error 5.6%,
 1D-gradient smooth initial model, Version 3.25



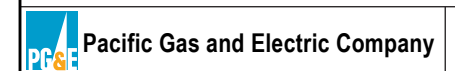
Cable 3 East, SE segment, 85 WET iterations, RMS error 3.0%,
 1D-gradient smooth initial model, Version 3.25



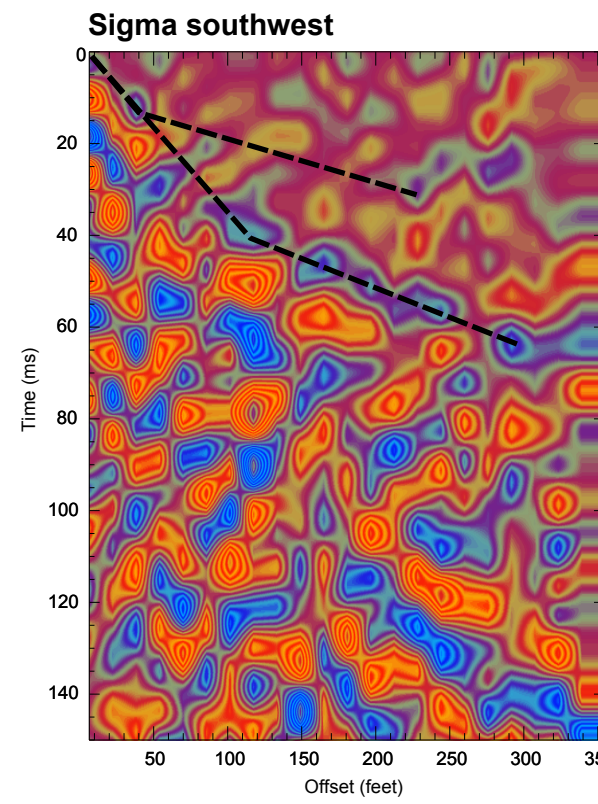
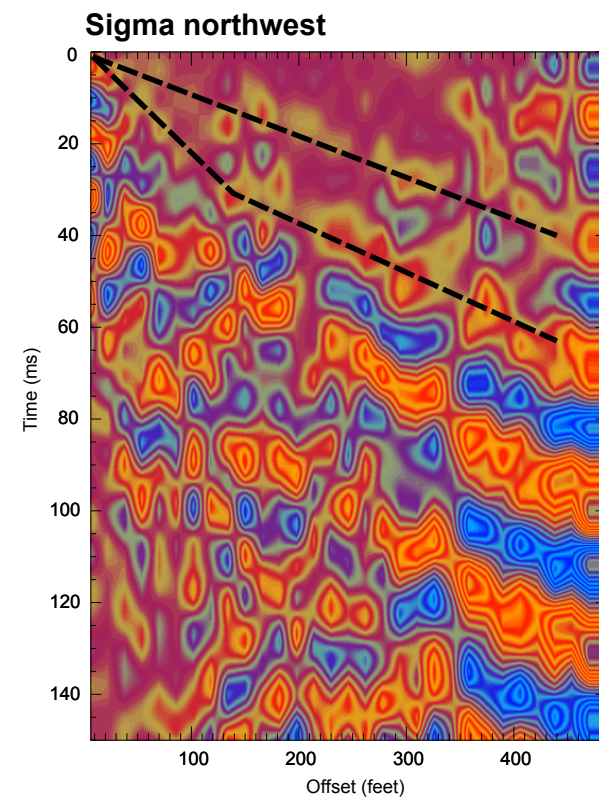
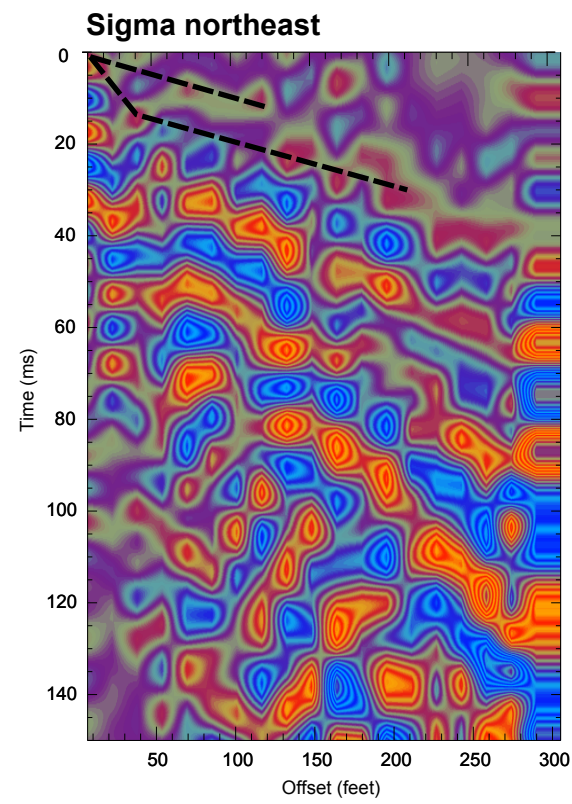
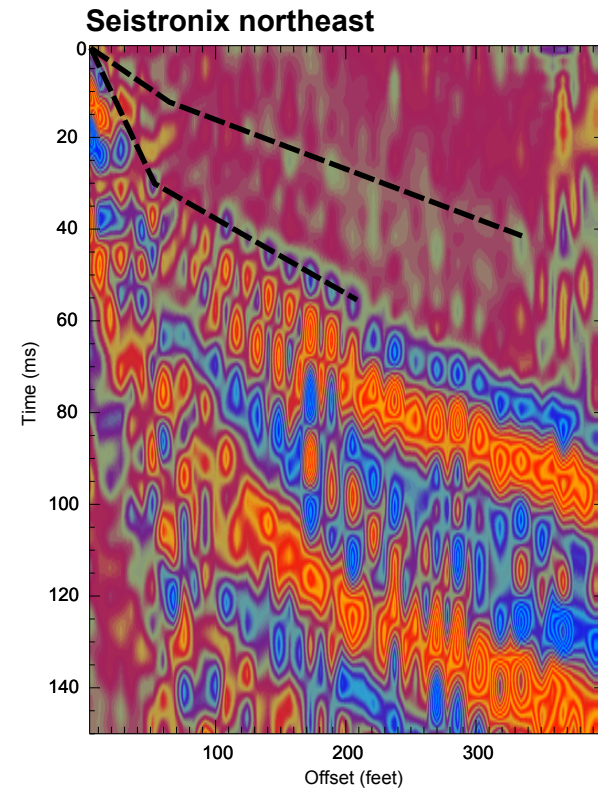
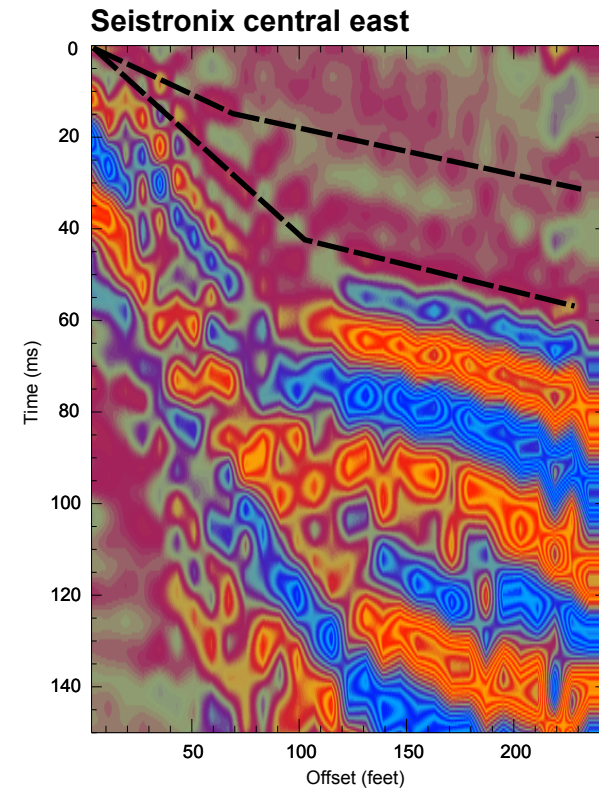
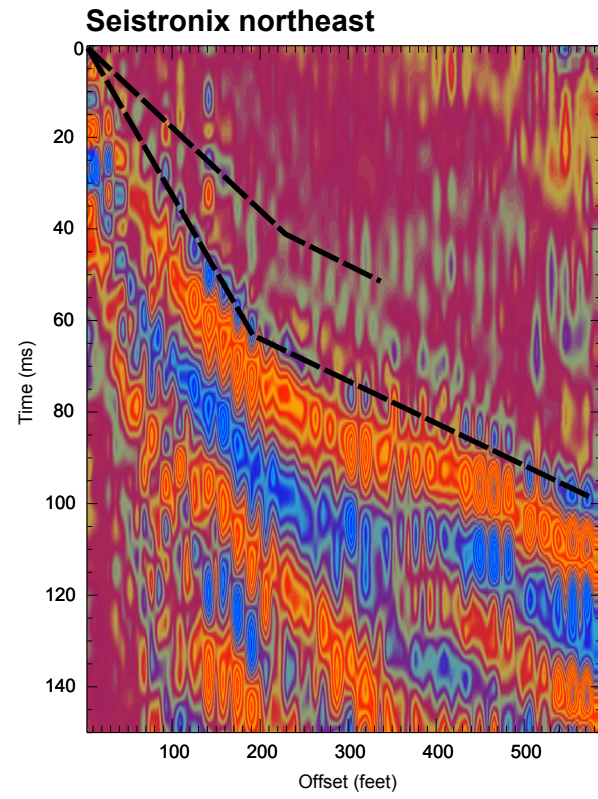
Notes:
 Scaled at 2 times vertical exaggeration.
 See Figure 5-1 for profile locations.

2D Rayfract Vp Models and Ray Coverage

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DCPP Receiver-Group Offset Stacks

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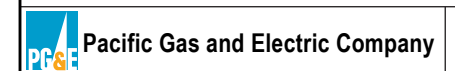
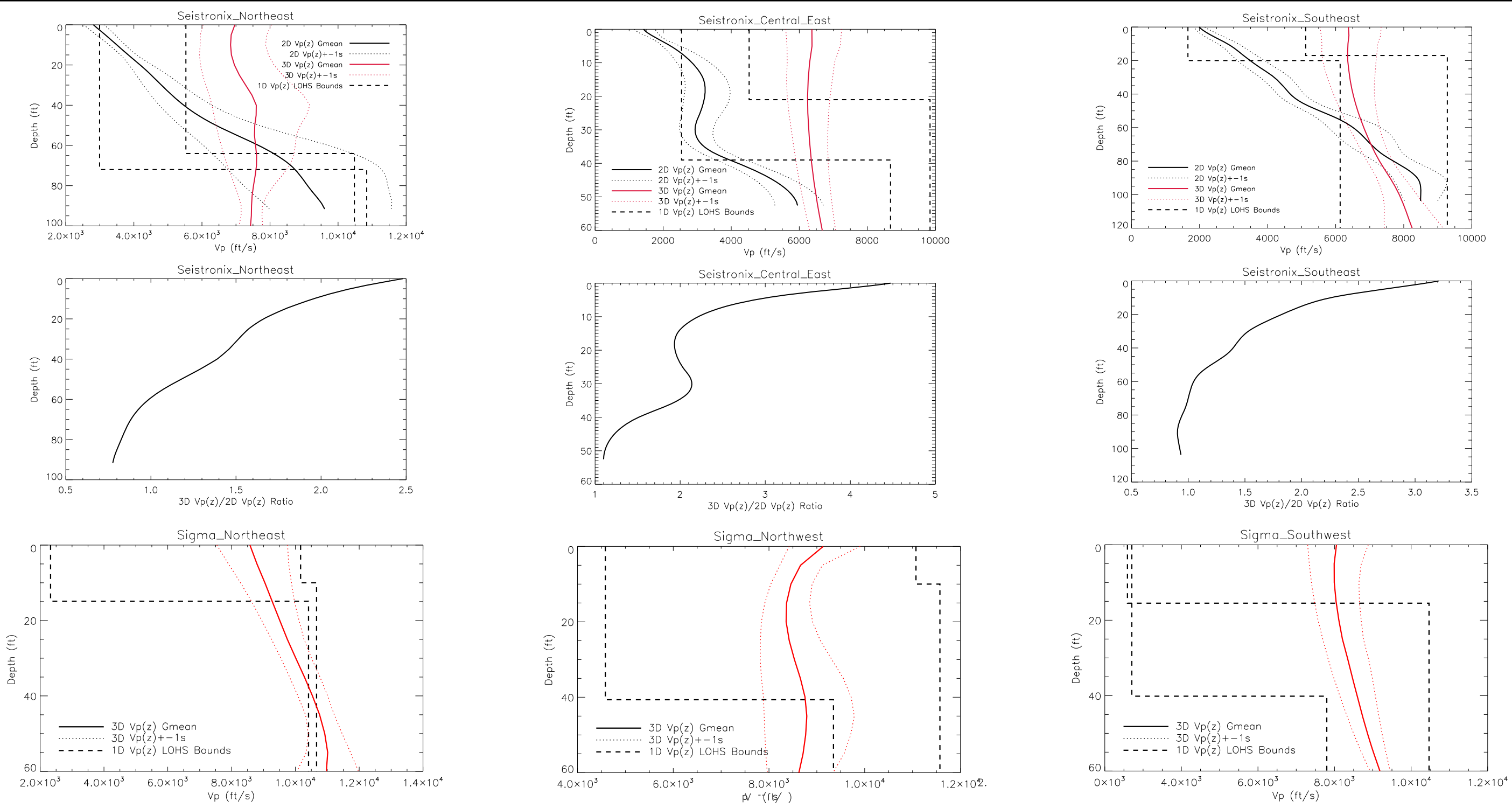


Figure 5-3

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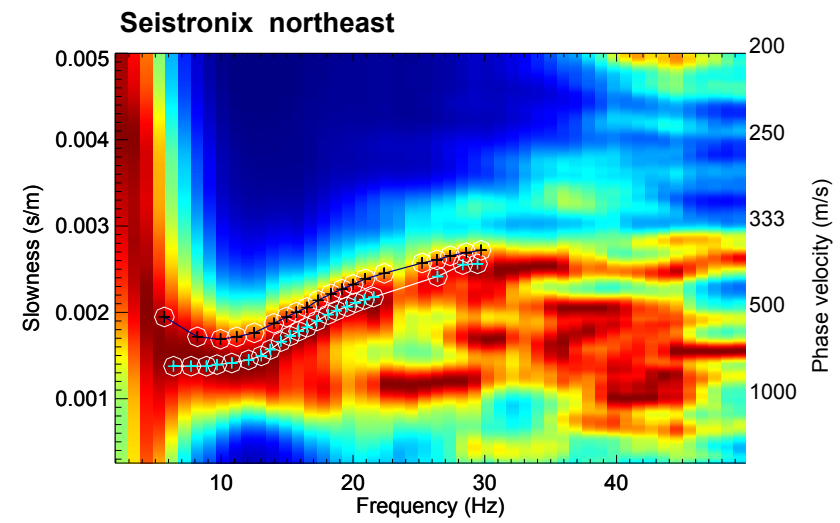
K:\Projects\79_225400_PGE_Onshore_2011_Ph1_Processing\05_Graphics\PR-16



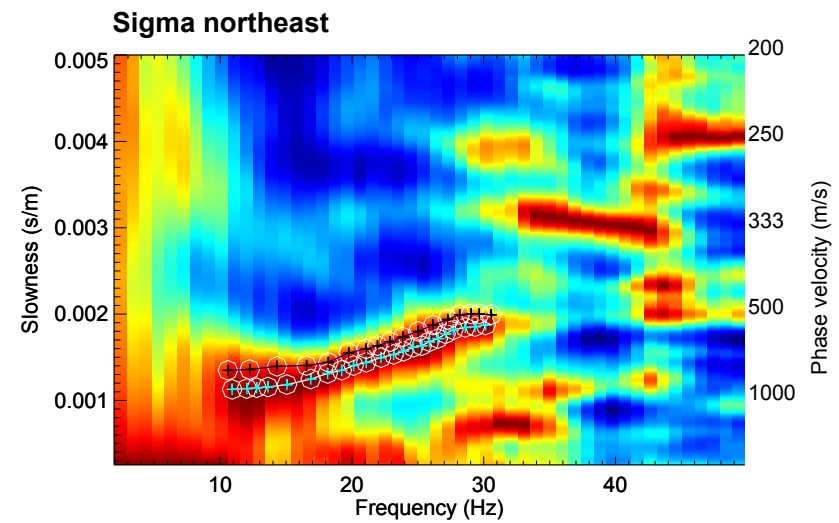
**1D Lateral Depth Averages of
 2D Vp and 3D Vp Compared with 1D Vp-Depth**

DCPP FOUNDATION VELOCITY REPORT

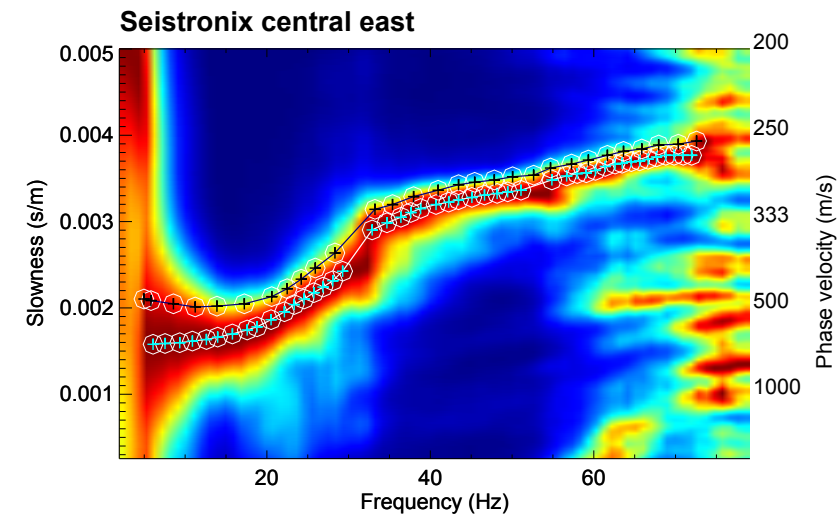
Pacific Gas and Electric Company
 Figure 5-4



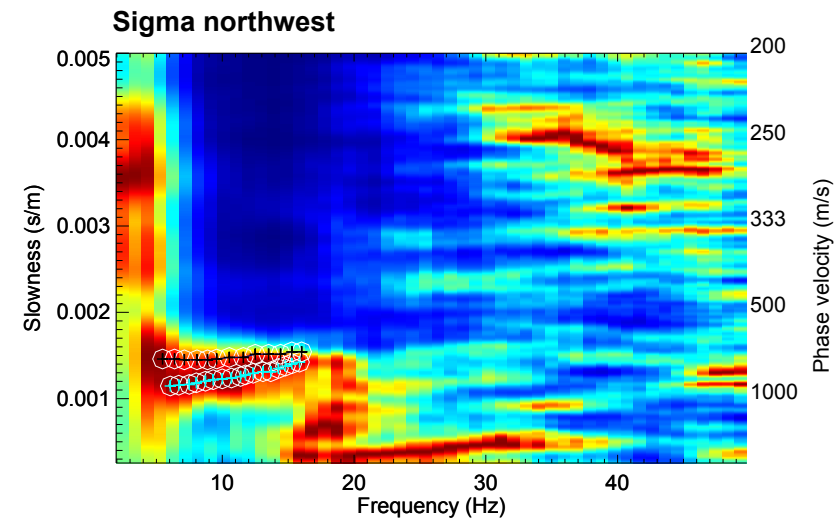
FCL IMASW Version 2.1.0: First to last stack of 23 of 23 records



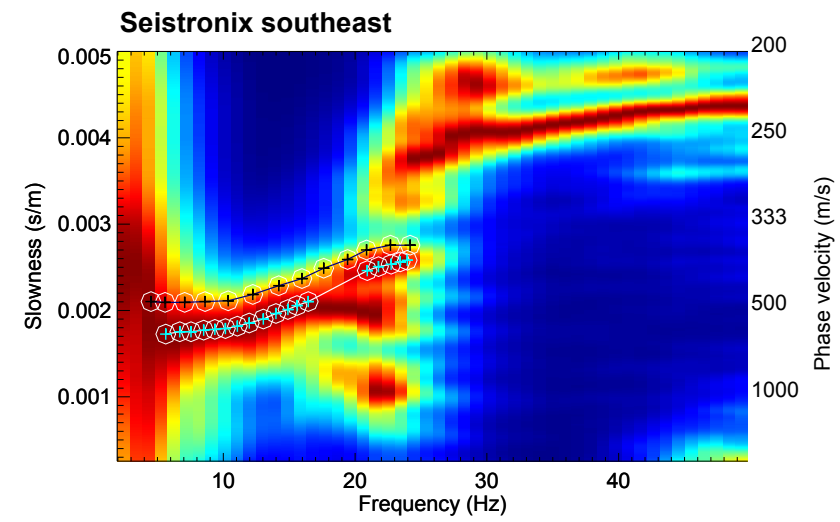
FCL IMASW Version 2.1.0: First to last stack of 18 of 18 records



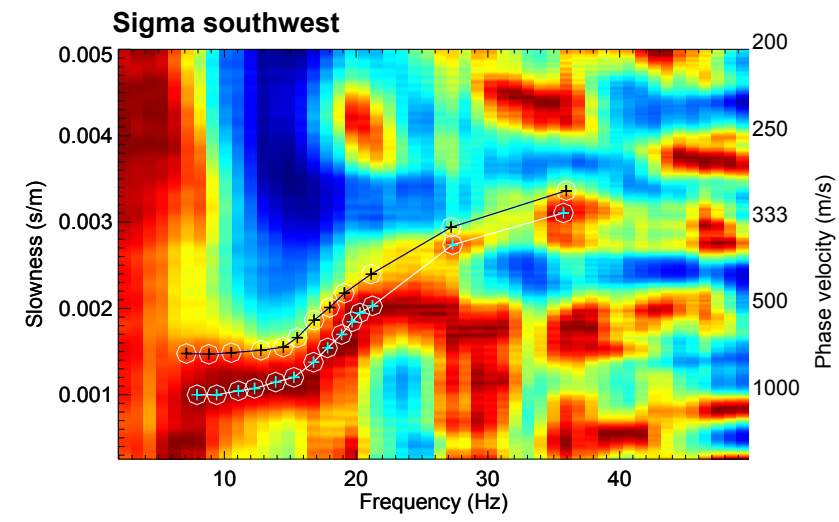
FCL IMASW Version 2.1.0: First to last stack of 20 of 20 records



FCL IMASW Version 2.1.0: First to last stack of 7 of 7 records



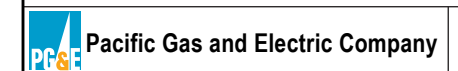
FCL IMASW Version 2.1.0: First to last stack of 30 of 30 records



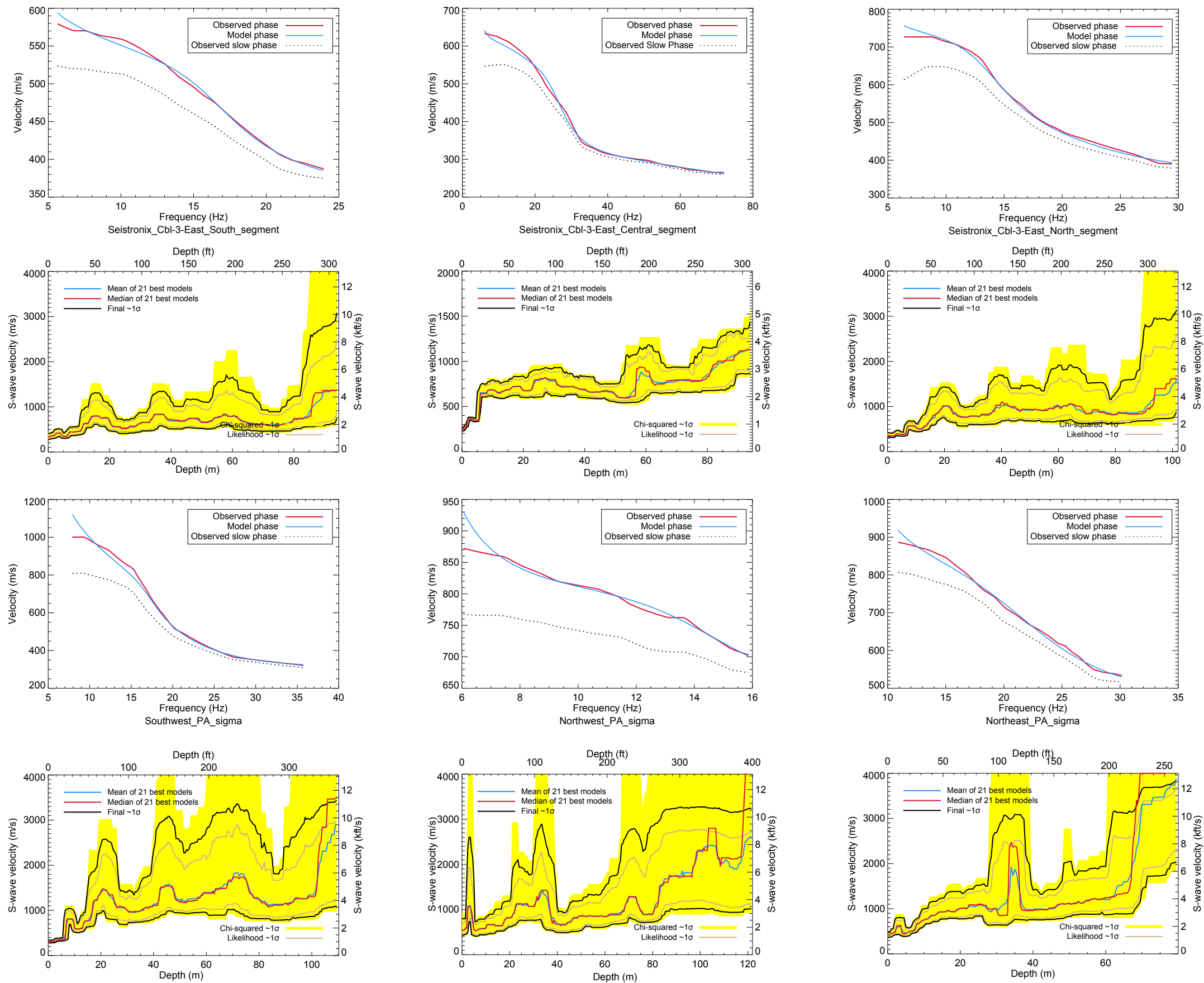
FCL IMASW Version 2.1.0: First to last stack of 7 of 7 records

DCPP Surface-Wave Dispersion

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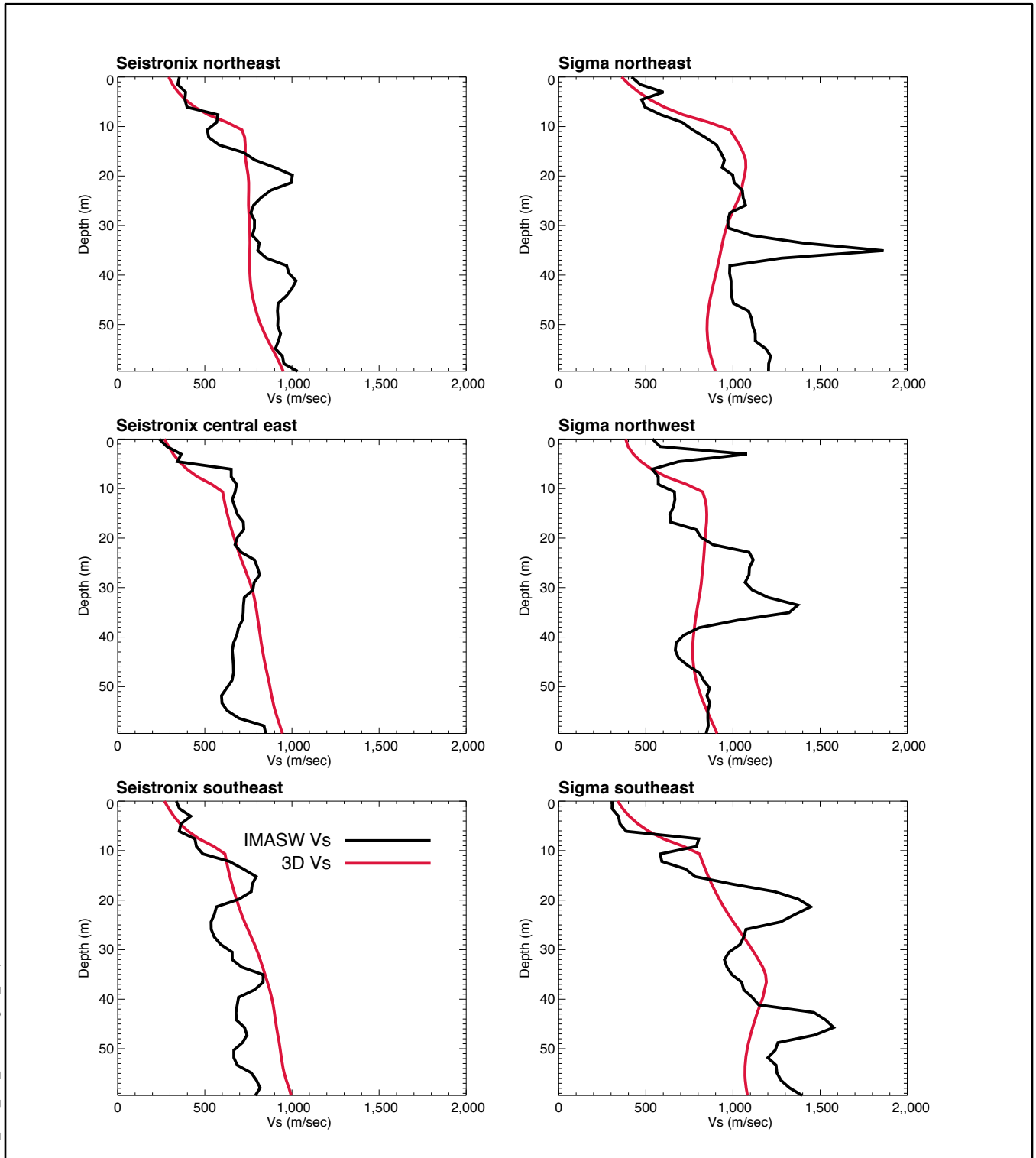
**1D Vs-Depth Models From
 Inversion of Surface Wave Dispersion**

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Figure 5-6

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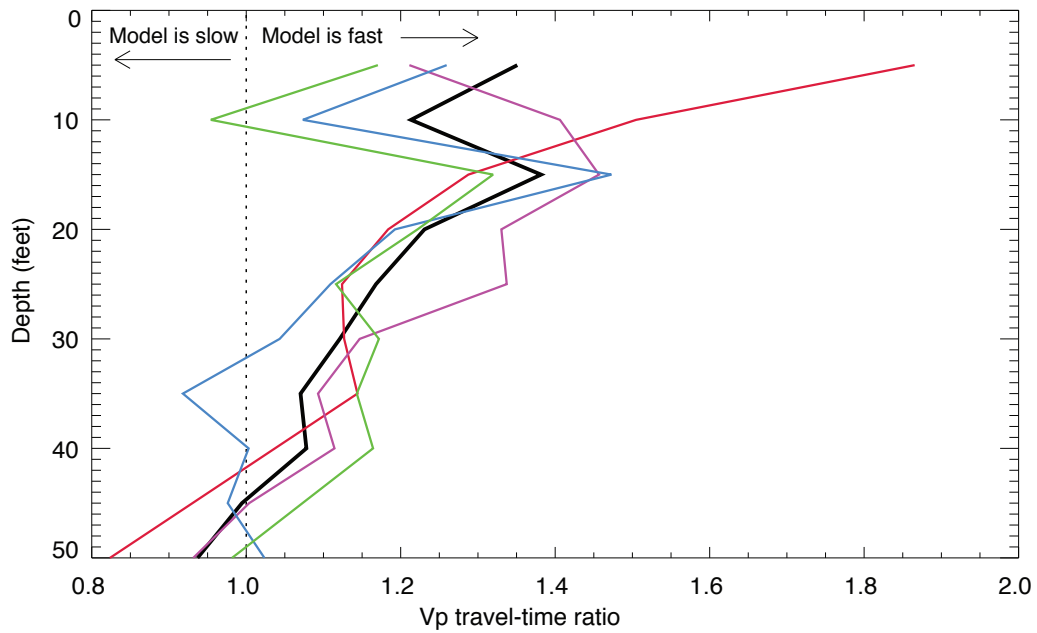
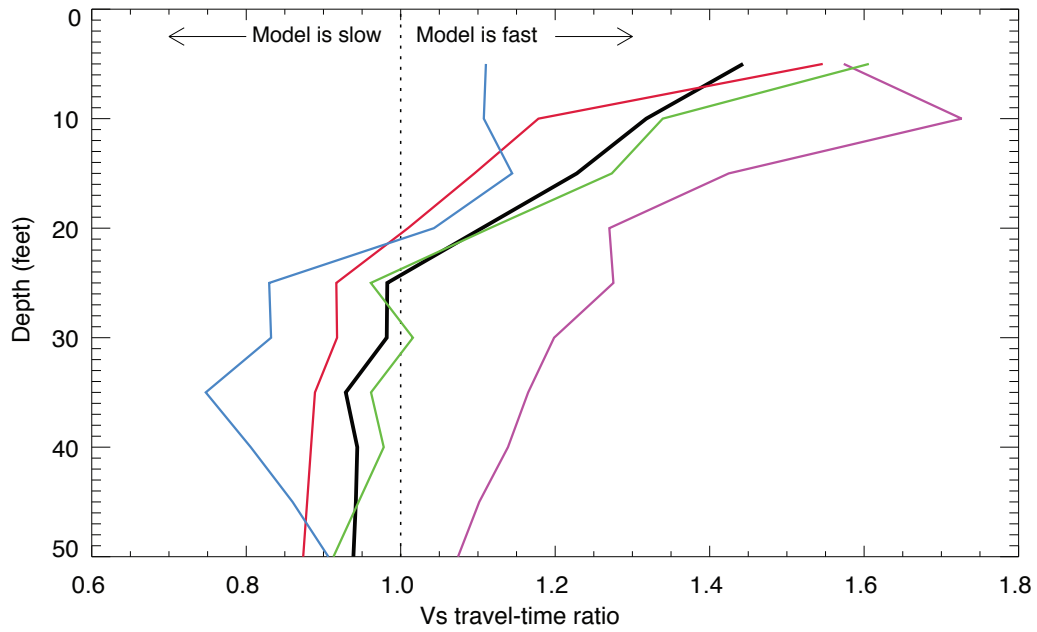


**Comparison of IMASW Vs Depth
 with GeoTomo 3D Vs Depth**

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 Figure 5-7

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EXPLANATION

- Log mean
- DDH-1
- DDH-2
- DDH-3
- DDH-4

DCPP Slower-Vp Model / Blume and Associates (1969) Model Velocity Ratios

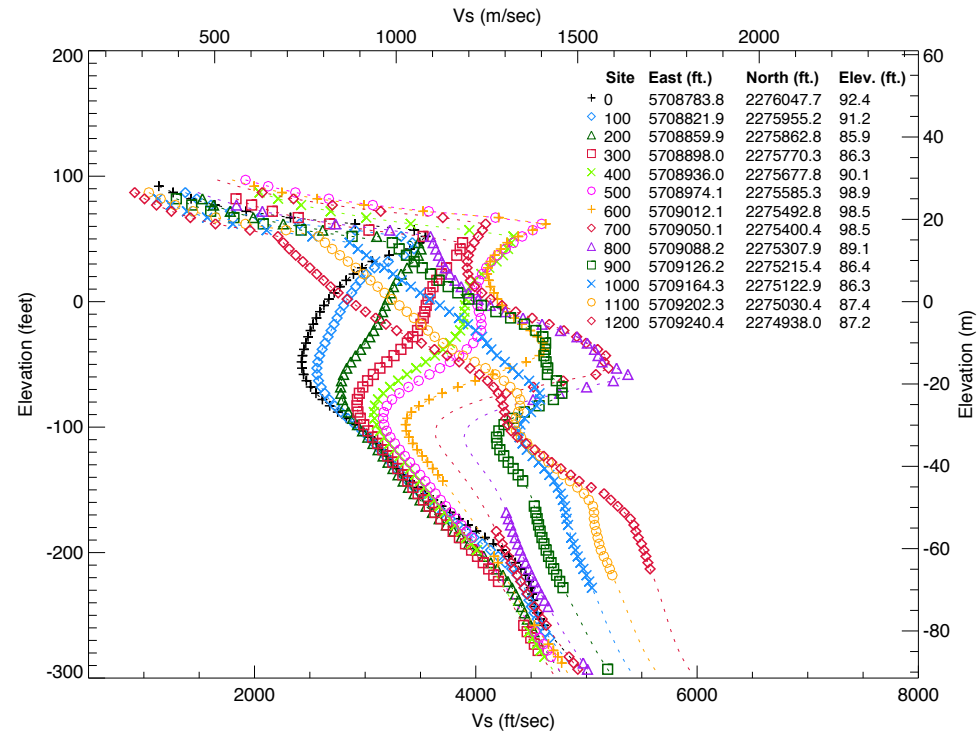
DCPP FOUNDATION VELOCITY REPORT



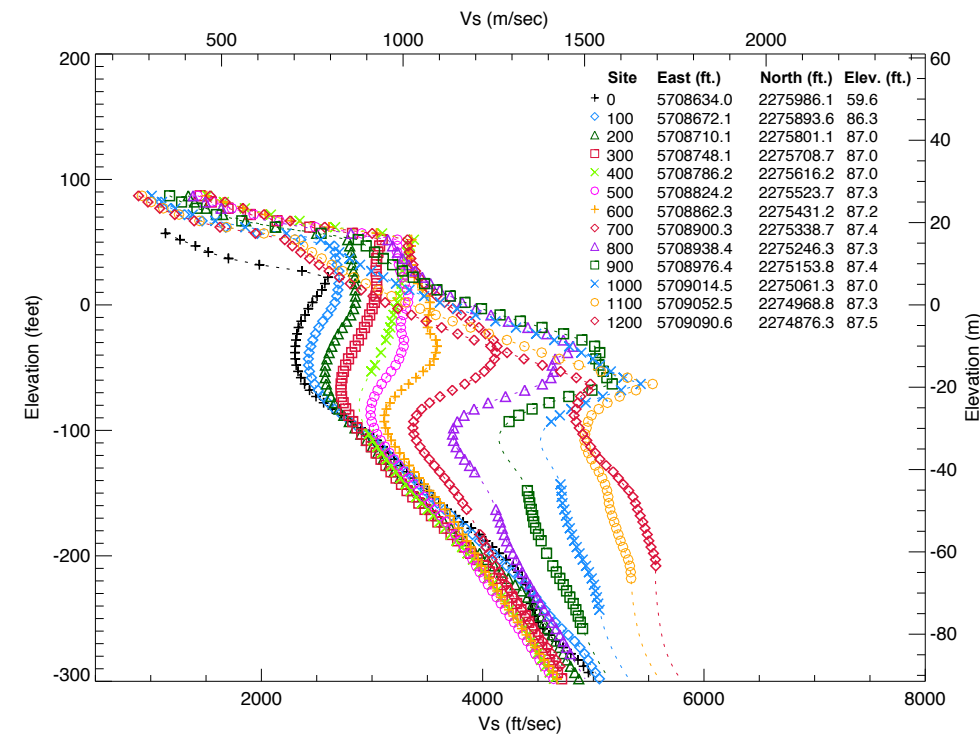
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Figure 5-8

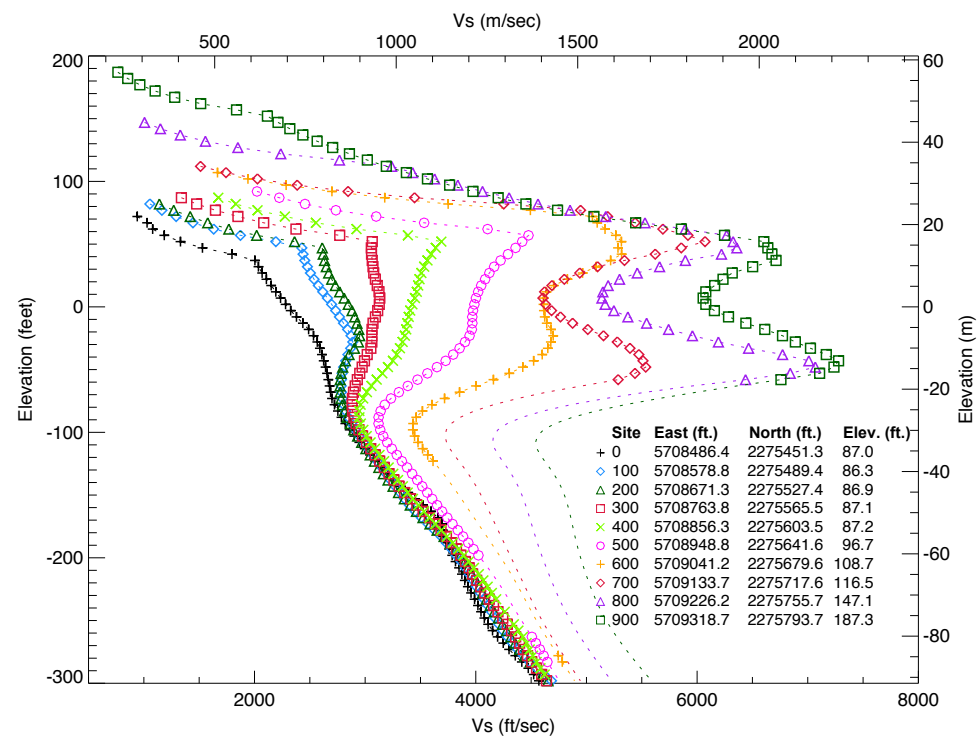
K:\Projects\79_225400_PGE_WE2_Onshore_2011_Ph1_Processing\05_Graphics\PR-16



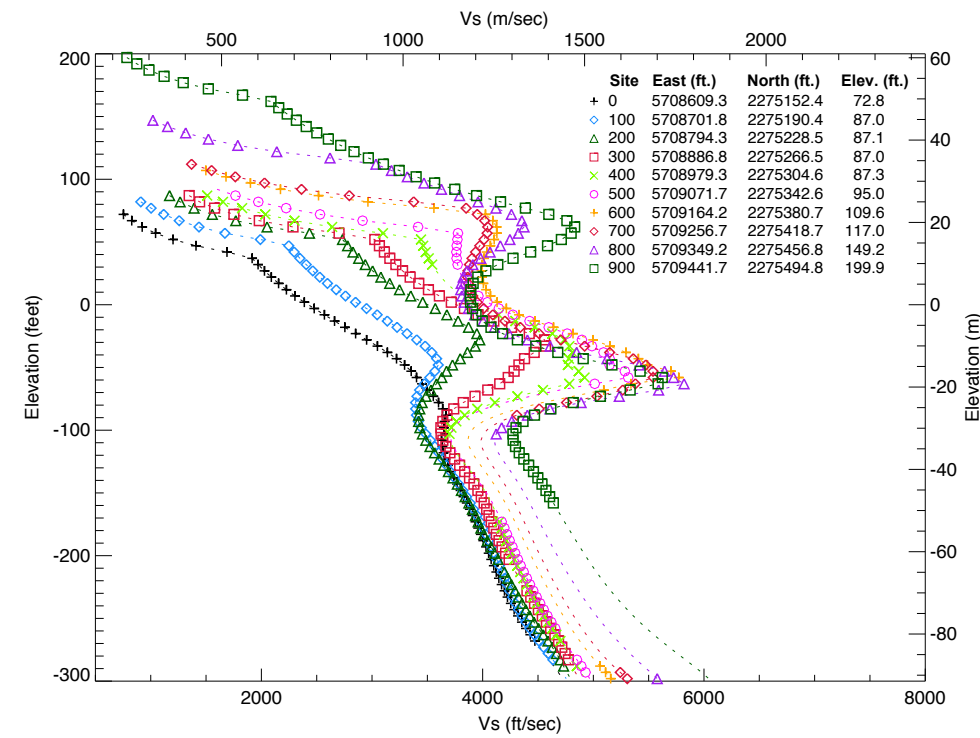
GeoTomo Vs Profile A-A' sites using Vp/Vs depth relation



GeoTomo Vs Profile B-B' sites using Vp/Vs depth relation



GeoTomo Vs Profile C-C' sites using Vp/Vs depth relation



GeoTomo Vs Profile D-D' sites using Vp/Vs depth relation

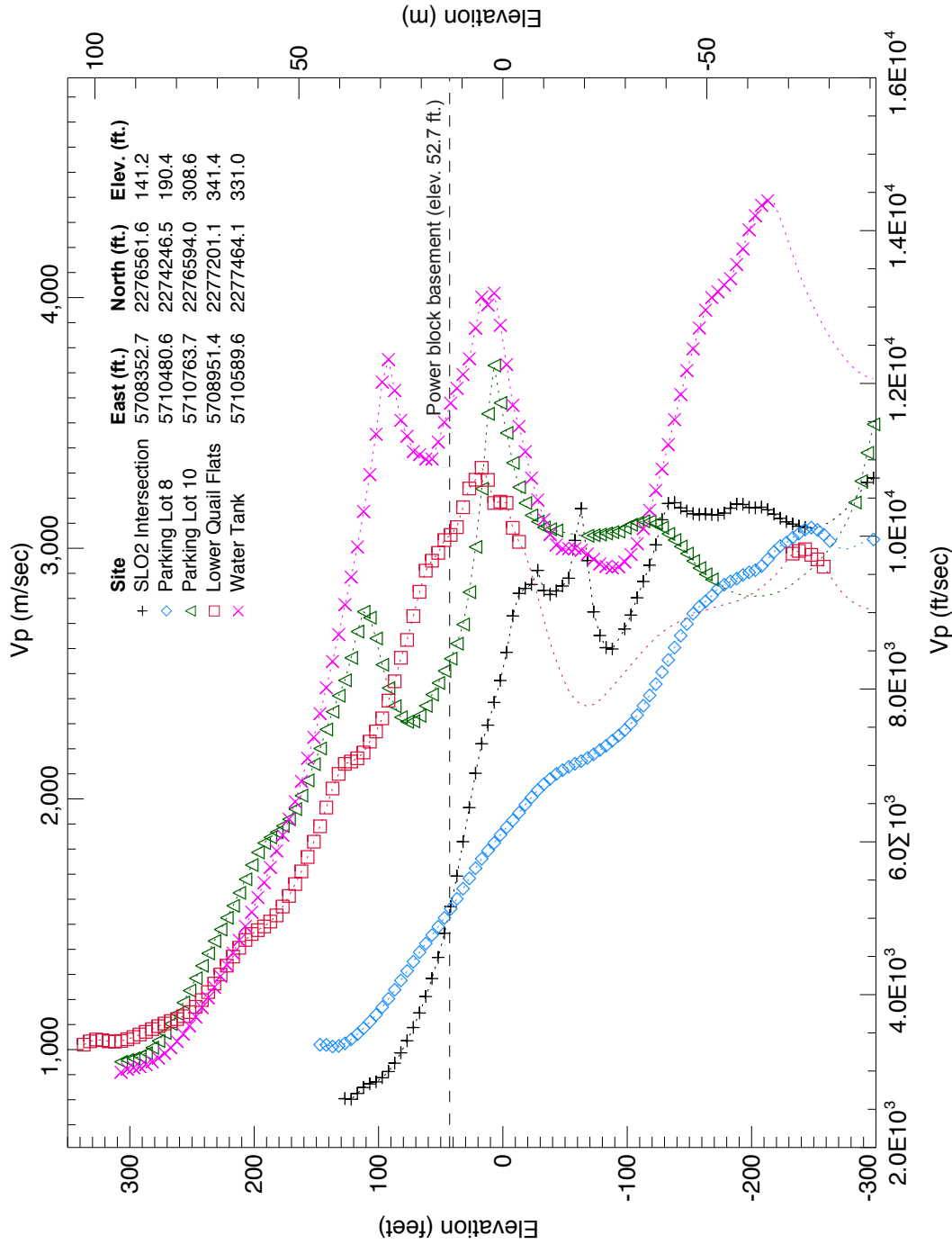
Note: See Figure 2-2 for profile locations.

**DCPP Vs Depth Profiles
 Along Transects A-D**

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Note: See Figure 2-2 for profile locations.

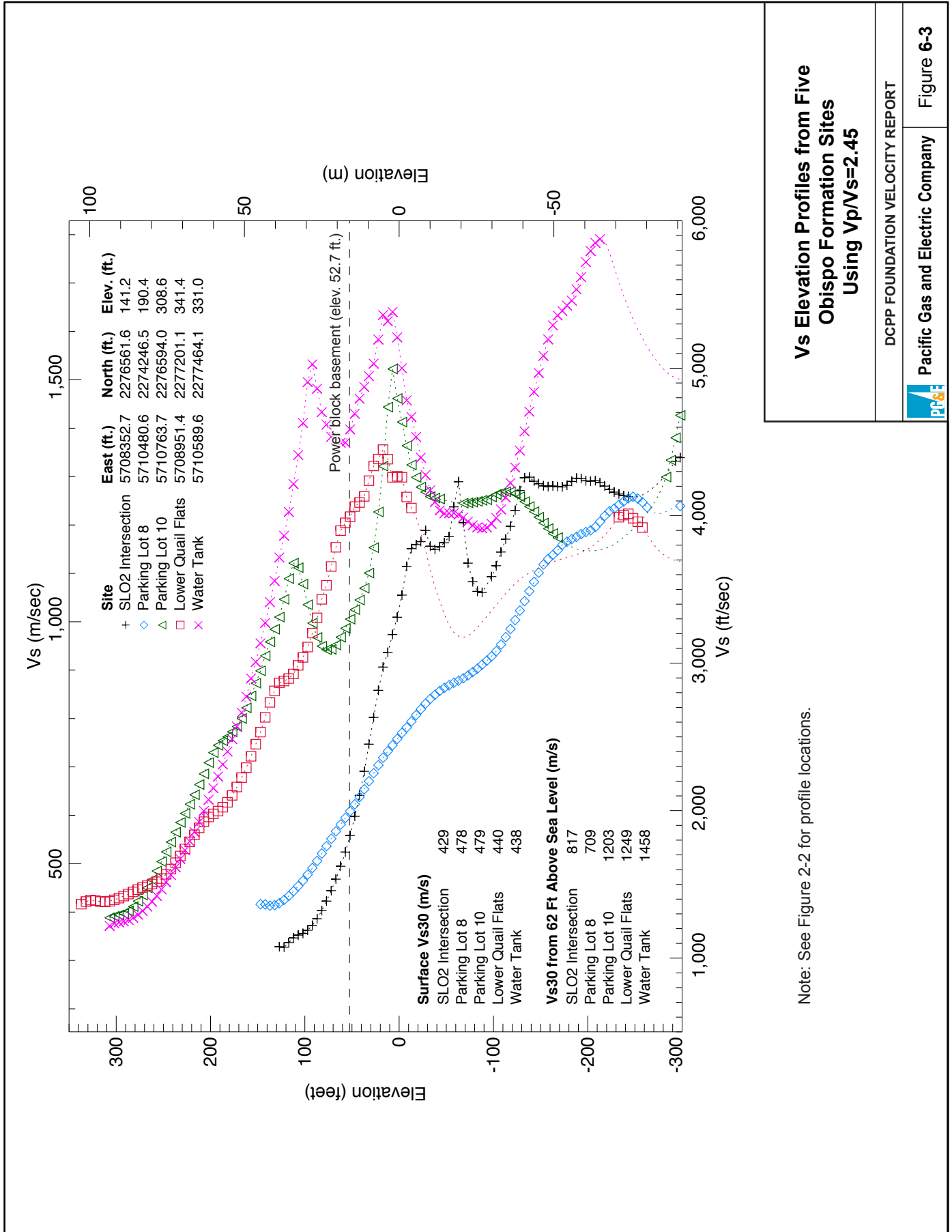
**GeoTomo Vp-Elevation Profiles from
 Five Obispo Formation Sites**

DCPP FOUNDATION VELOCITY REPORT

Figure 6-2

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Vs Elevation Profiles from Five Obispo Formation Sites Using $V_p/V_s=2.45$

DCPP FOUNDATION VELOCITY REPORT

Figure 6-3

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APPENDIX A

DCPP 3D Velocity Model Electronic Files

Three DCP 3D velocity models are provided in a text format to ensure that the files can be inspected with a standard text editor. The files contain all the geographic and velocity information as ASCII text. Coordinates are in North American Datum of 1983 (NAD 83) State Plane Zone 5 meters. Coordinates and velocities are provided in meters and meters/second.

The three files are as follows:

- slower_vp_rev3_draft_dcpp_3d_foundation_velocity_grid.txt
- faster_vp_rev3_draft_dcpp_3d_foundation_velocity_grid.txt
- GeoTomo_vp_rev3_draft_dcpp_3d_foundation_velocity_grid.txt

The file **faster_vp_rev3_draft_dcpp_3d_foundation_velocity_grid.txt** contains the faster estimates of shallow Vp velocity that are probably closer to current DCP conditions than the file **slower_vp_rev3_draft_dcpp_3d_foundation_velocity_grid.txt** that contains slower shallow Vp that correspond more to a pre-construction foundation condition. A minimum Vp corresponding to a saturated soil condition (Vp=1,600 m/s) is imposed below mean sea level when original 3D Vp is <1,600 m/s. The original GeoTomo Vp in the **GeoTomo_vp_rev3_draft_dcpp_3d_foundation_velocity_grid.txt** file has been modified to enforce the Vp=1,600 m/s saturation condition below sea level. Cell x and y coordinates correspond to cell centers, and cell elevations refer to the top of the cell. The original GeoTomo 3D velocity model started at an elevation of 2,107 feet above mean sea level to account for topography. Consequently, all elevations fall on 2- or 7-foot steps in the right-hand digit because the vertical cell size is 5 feet. All elevations are rounded to the closest cell top elevation.

The file format uses text lines above data to document the data following the text line. To illustrate the format, the first several lines of the following file are reproduced below with line numbers preceding each line of file context:

- faster_vp_rev3_draft_dcpp_3d_foundation_velocity_grid.txt

Example first 11 lines of file format:

- Line 1: Cell-centered draft DCP Vp and Vs velocity grid with units in meters and meters/second
- Line 2: Cell-centered NAD 83 State Plane Zone 5 lower-left origin in meters
- Line 3: 1739470.8 693153.31
- Line 4: Horizontal constant-velocity cell size in meters
- Line 5: 15.2400
- Line 6: Vertical constant-velocity cell size in meters

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- Line 7: 1.52400
- Line 8: Number of vertical velocity profiles
- Line 9: 2695
- Line 10: Number of elevation points in each velocity profile
- Line 11: 124

The entire sequential lists of text lines without the intervening data are produced below:

- Cell-centered draft DCPD Vp and Vs velocity grid with units in meters and meters/second
- Cell-centered NAD 83 State Plane Zone 5 lower-left origin in meters
- Horizontal constant-velocity cell size in meters
- Vertical constant-velocity cell size in meters
- Number of vertical velocity profiles
- Number of elevation points in each velocity profile
- Elevation values in meters (positive above sea level) of velocity cell tops (124 points)
- Distance east from lower-left cell center to each x,y cell center in meters (2,695 points)
- Distance north from lower-left cell center to each x,y cell center in meters (2,695 points)
- Vp value that indicates an elevation sample is above topography
- Vs value that indicates an elevation sample is above topography
- Vp elevations profiles in meters/second (2,695 lines with 124 velocity values per line)
- Vs elevations profiles in meters/second (2,695 lines with 124 velocity values per line)

The example Interactive Display Language (IDL) command set below illustrates an approach to read a DCPD 3D velocity file:

```

str=""
ifile='slower_vp_rev3_draft_dcpp_3d_foundation_velocity_grid.txt'
openr,unit1,ifile,/get_lun
readf,unit1,str
readf,unit1,str
xorigm=0d0
yorigm=0d0
readf,unit1,xorigm,yorigm
readf,unit1,str
hcellszem=0d0
readf,unit1,hcellszem
readf,unit1,str

```


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		Revision: 1
		Page A3 of A3

```

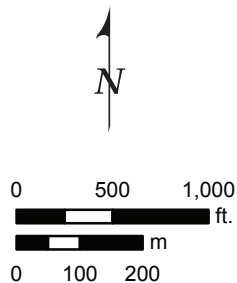
zcellsize=0d0
readf,unit 1,zcellsize
readf,unit 1,str
nn=0L
readf,unit 1,nn
readf,unit 1,str
nelevs=0L
readf,unit 1,nelevs
sizm=fltarr(nelevs)
readf,unit 1,str
readf,unit 1,sizm
readf,unit 1,str
dxm=fltarr(nn)
readf,unit 1,dxm
readf,unit 1,str
dym=fltarr(nn)
readf,unit 1,dym
vpnull=0.
readf,unit 1,str
readf,unit 1,vpnull
vsnull=0.
readf,unit 1,str
readf,unit 1,vsnull
vpn=fltarr(nelevs,nn)
readf,unit 1,str
readf,unit 1,vpn
readf,unit 1,str
vsn=fltarr(nelevs,nn)
readf,unit 1,vsn
close,unit 1
free_lun,unit 1

```

Figure A1 shows the geographic extent of the 3D foundation velocity model shown in 3D map view in Figure A2 and the depth profile location shown in Figure A3. Figures A2 and A3 illustrate how the 3D model will appear when read correctly. Figure A2 shows a FLAC3D rendering of the model topography. Figure A3 shows a 2D elevation Vs west-to-east cross section 381 m north of the south end of the model.



Imagery from NAIP (2009).



Map projection and scale: NAD 83 State Plane CA Zone V, 1:12,000

Velocity Model Location Map

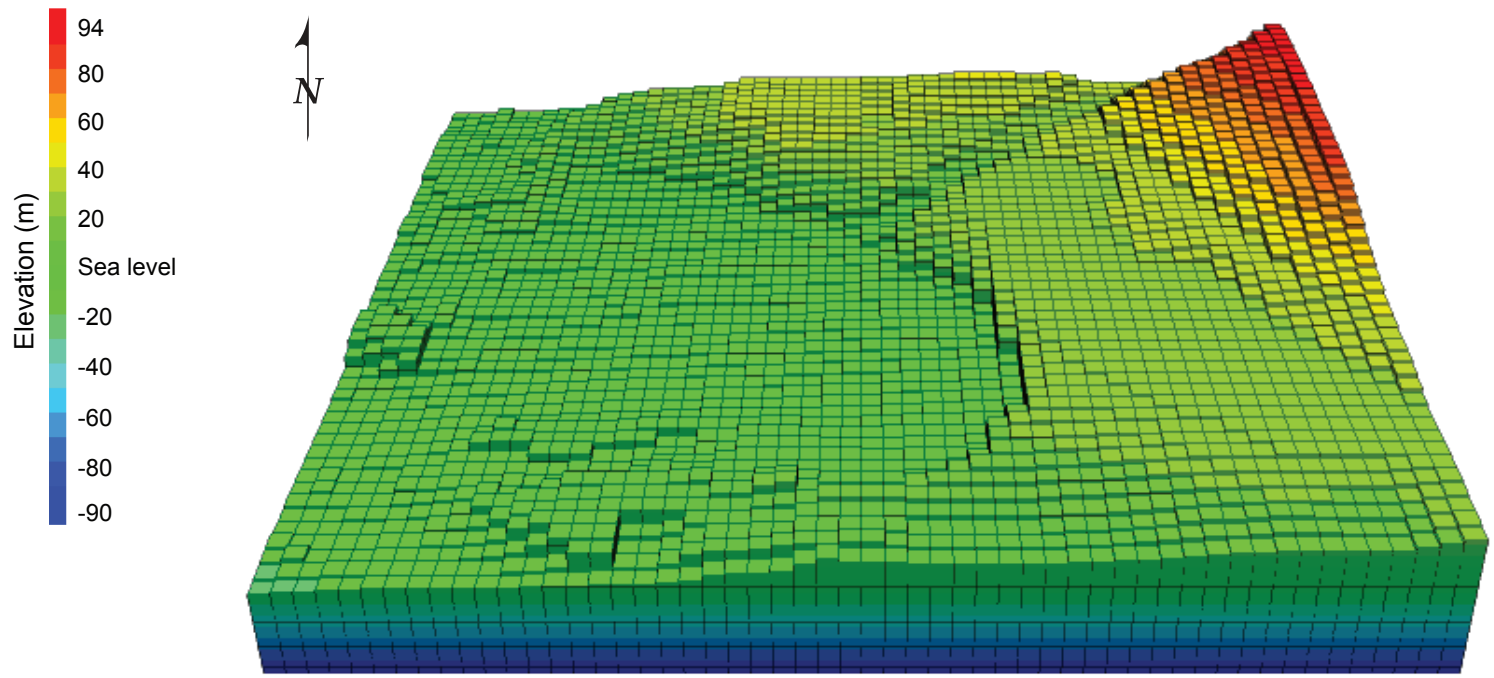
DCPD FOUNDATION VELOCITY REPORT



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Figure A1

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Note: See Figure A1 for model location.

DCPP FLAC^{3D} Model (Jigsaw Model)

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Figure A2

FLAC3D 5.01
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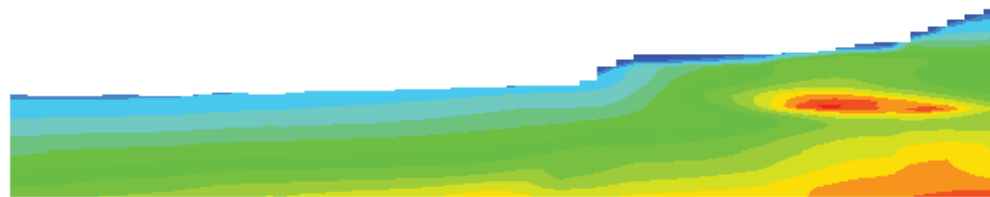
Contour of Gp Extra 5

- Plane: active on
- 1.7330E+03
 - 1.7000E+03
 - 1.6000E+03
 - 1.5000E+03
 - 1.4000E+03
 - 1.3000E+03
 - 1.2000E+03
 - 1.1000E+03
 - 1.0000E+03
 - 9.0000E+02
 - 8.0000E+02
 - 7.0000E+02
 - 6.0000E+02
 - 5.0000E+02
 - 4.0000E+02
 - 3.0730E+02

Vs (m/s)

West

East



Note: See Figure A1 for model location.

**Vs Profile @ Y of 381 m
 (South End of Plant Area)**

DCPP FOUNDATION VELOCITY REPORT



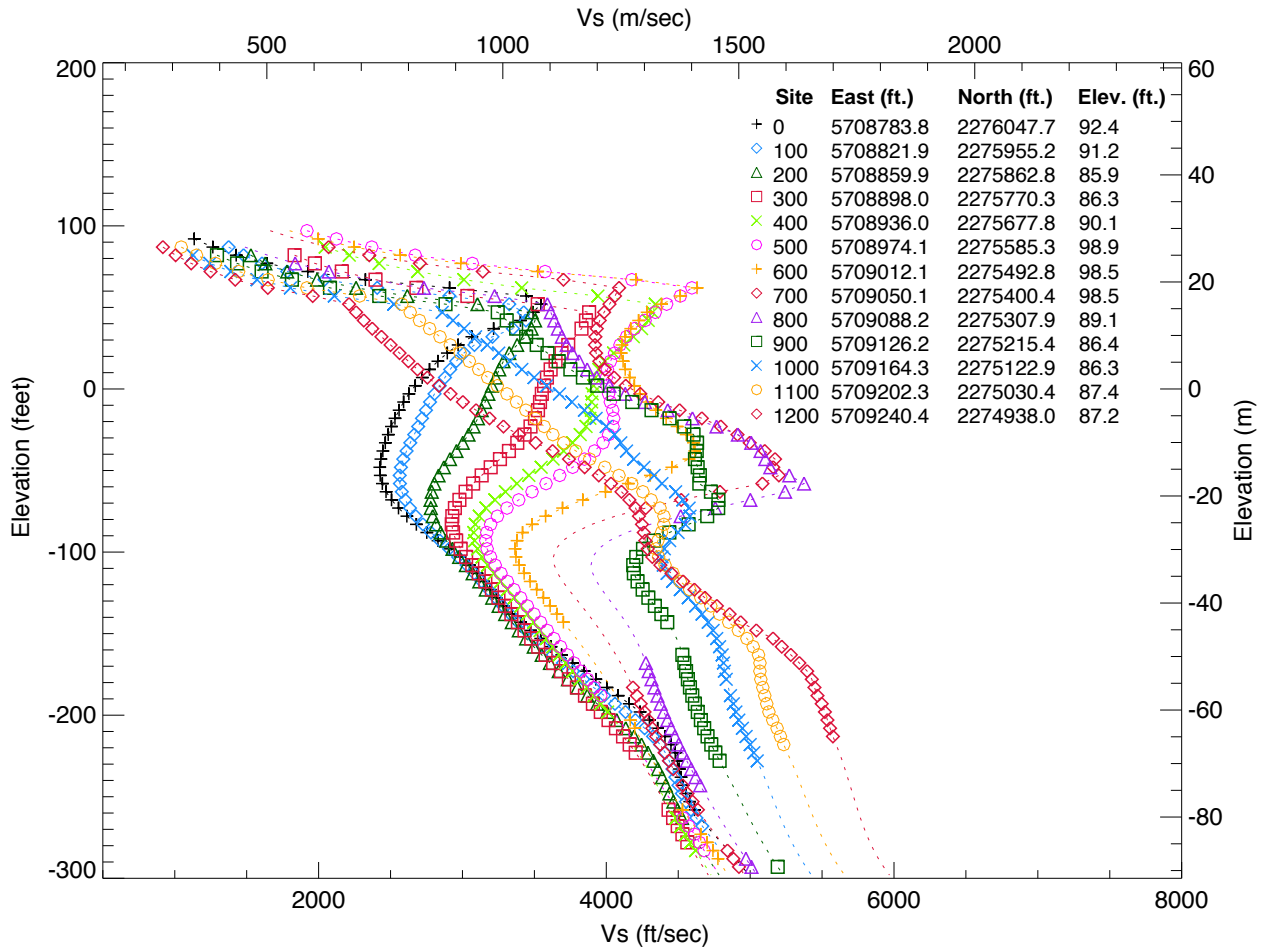
Pacific Gas and Electric Company

Figure A3



	FUGRO CONSULTANTS, INC. <i>Foundation Velocity Report</i>	PR No.: PGEQ-PR-16
		Revision: 1

APPENDIX B
DCPP VS-DEPTH PROFILES ALONG TRANSECTS A-D
(Total 4-Figures)



GeoTomo Vs Profile A-A' sites using Vp/Vs depth relation

Note: See Figure 2-2 for profile locations.

DCPP Vs Depth Profiles Along Transect A-A'

CENTRAL COASTAL CALIFORNIA SEISMIC IMAGING PROJECT

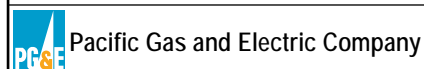
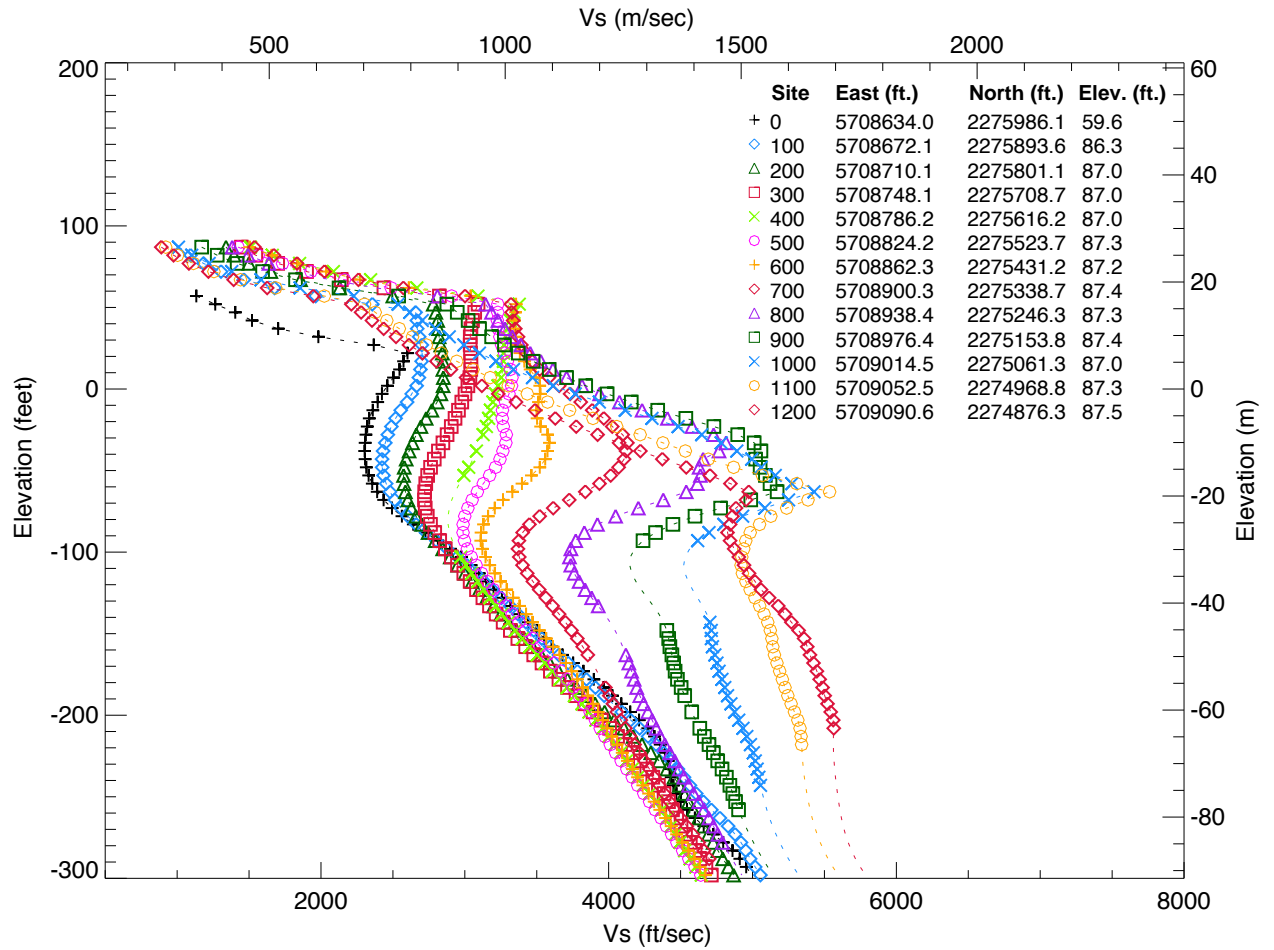


Figure B-1



GeoTomo Vs Profile B-B' sites using Vp/Vs depth relation

Note: See Figure 2-2 for profile locations.

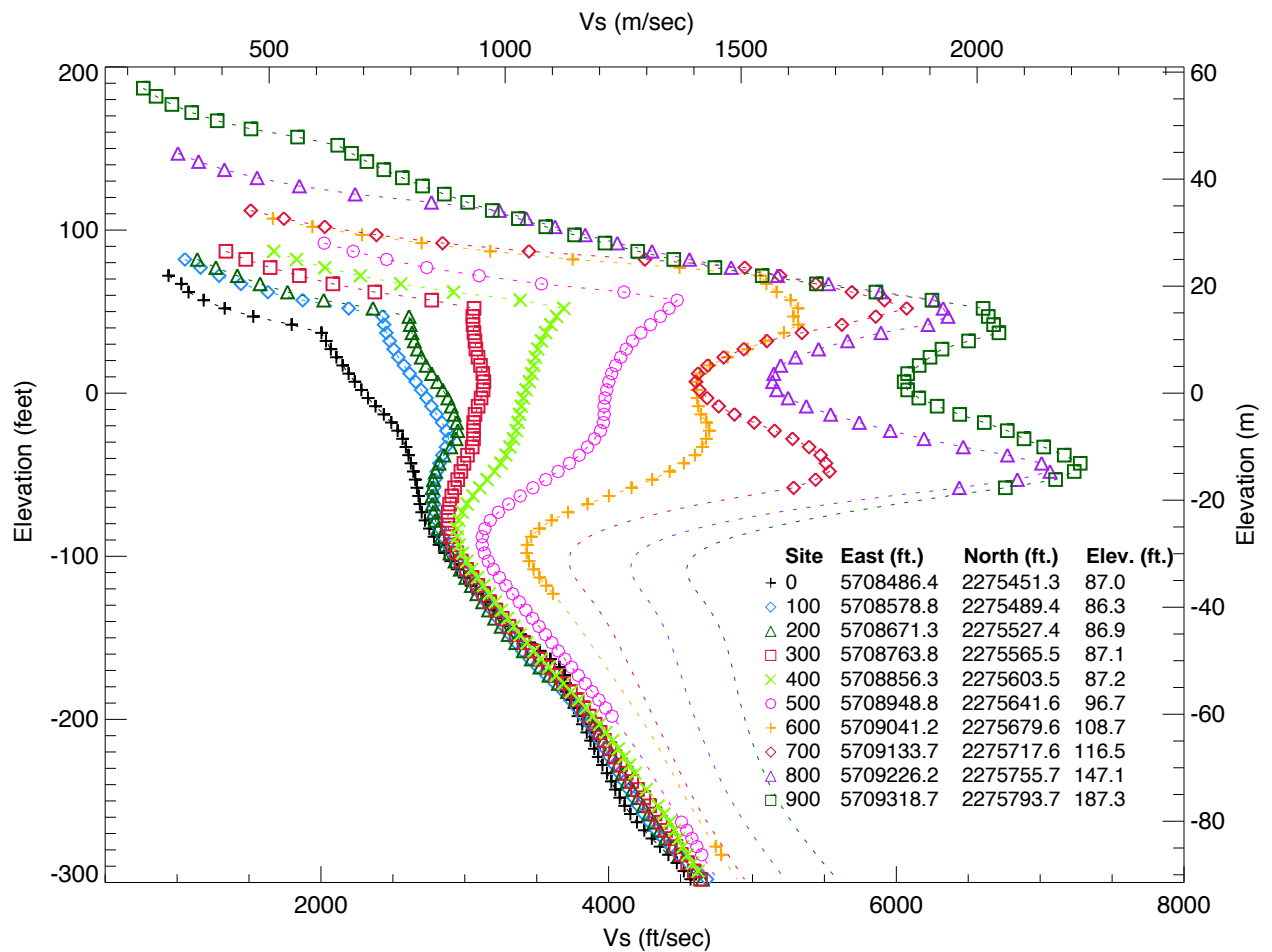
DCPP Vs Depth Profiles Along Transect B-B'

CENTRAL COASTAL CALIFORNIA SEISMIC IMAGING PROJECT



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Figure B-2



GeoTomo Vs Profile C-C' sites using Vp/Vs depth relation

Note: See Figure 2-2 for profile locations.

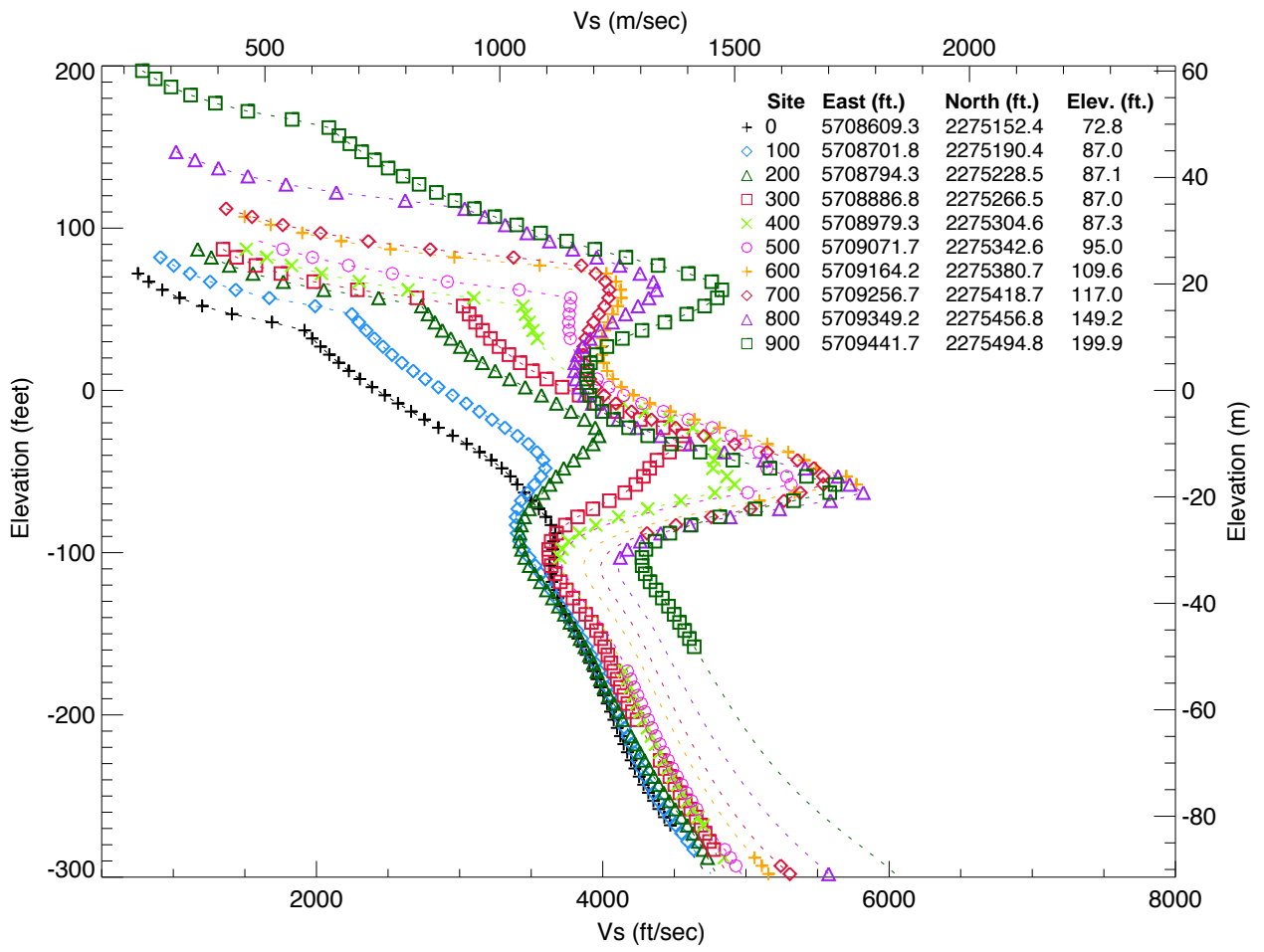
DCPP Vs Depth Profiles Along Transect C-C'

CENTRAL COASTAL CALIFORNIA SEISMIC IMAGING PROJECT



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Figure B-3



GeoTomo Vs Profile D-D' sites using Vp/Vs depth relation

Note: See Figure 2-2 for profile locations.

DCPP Vs Depth Profiles Along Transect D-D'

CENTRAL COASTAL CALIFORNIA SEISMIC IMAGING PROJECT

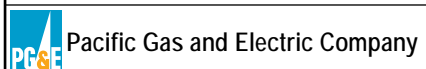


Figure B-4