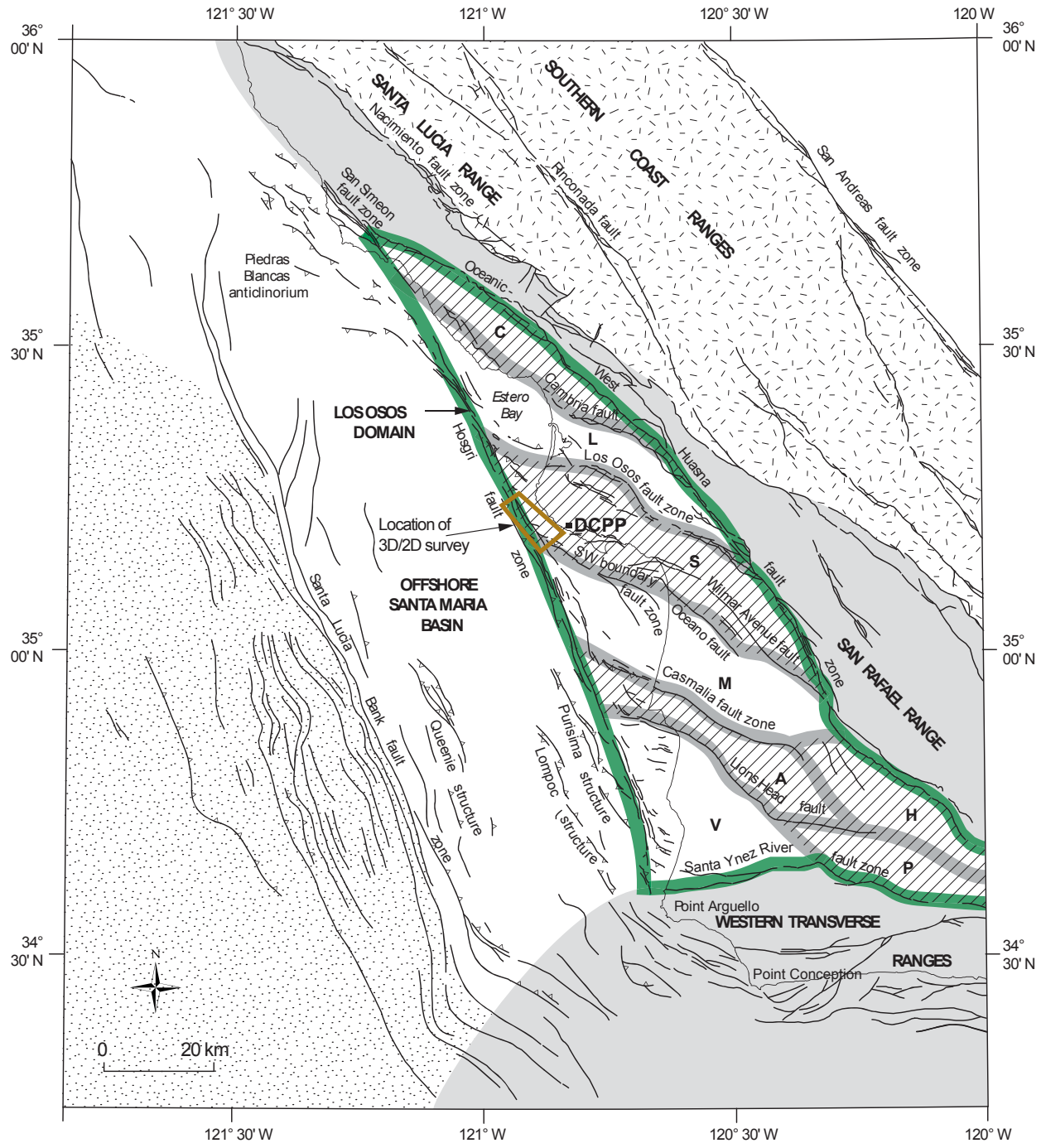


EXPLANATION

- SalinianTerrane
- Stanley Mountain Terrane
- San Simeon Terrane
- Patton Terrane

Sur-Obispo Composite (McCulloch, 1987)

Structural blocks within the Los Osos domain

A = Casmalia
C = Cambria
H = Solomon Hills
L = Los Osos
M = Santa Maria Valley
P = Purisima
S = San Luis/Pismo
V = Vandenberg/Lompoc

Source: PG&E (1988)

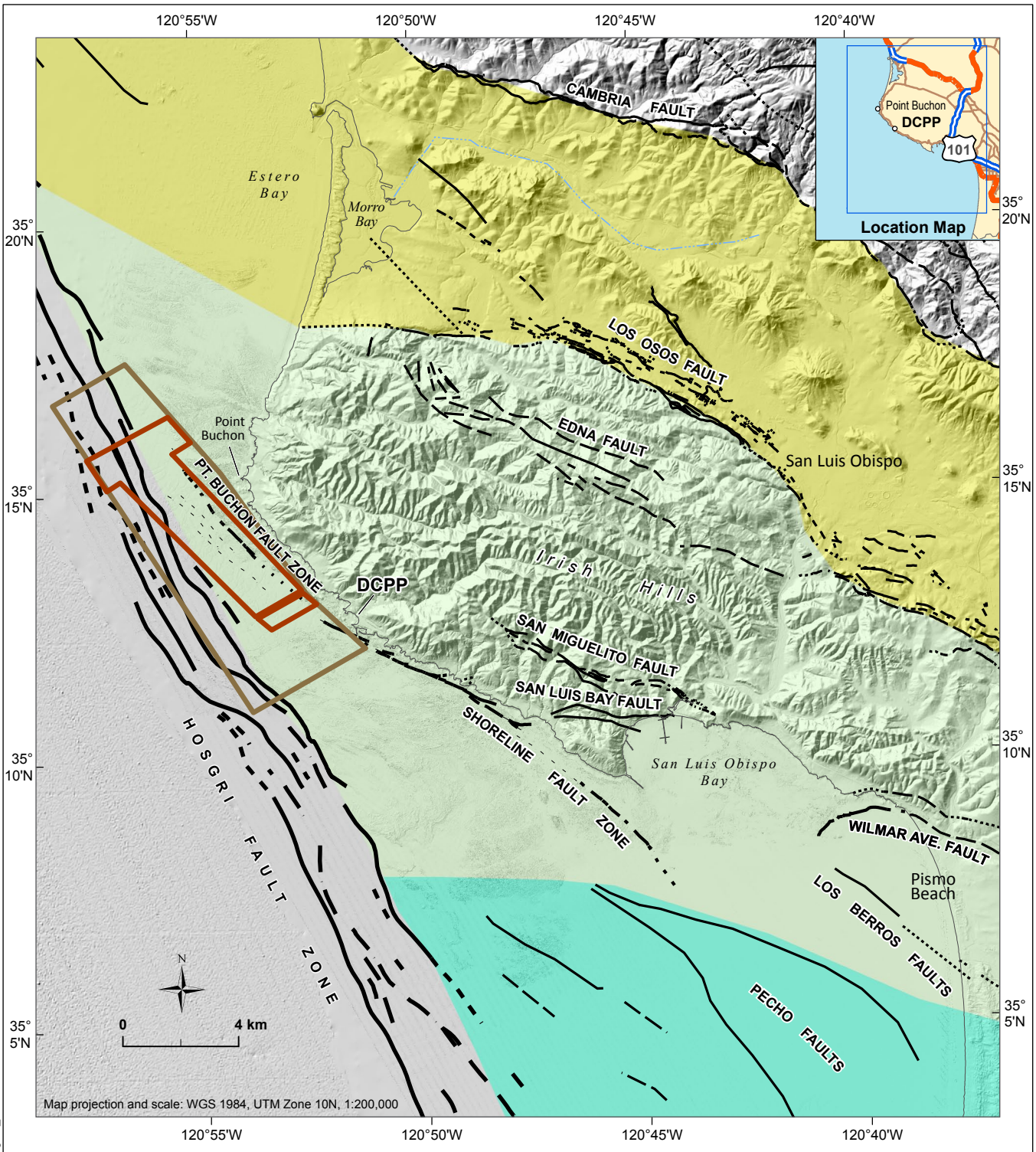
Notes:
- Brown box outlines the 3D/2D seismic-reflection study area.
- Green line outlines the Los Osos domain.
- Hachures indicate uplifted structural blocks within the Los Osos domain.

Regional Tectonic Setting with Faults and Structural Domains (Modified from PG&E, 1988)

DCPP 3D/2D Seismic-Reflection Investigation

Pacific Gas and Electric Company | Figure **1-1**

File path: S:\13800\13838\13838.002\Figures\20120210_SIT\AI\Figure_0101.ai; Date: 07/17/2014; User: Serkan Bozkurt, LCI



EXPLANATION

- Hosgri Fault Zone, slip rate >1 mm/yr
- Fault with estimated slip rate <1 mm/yr
- Los Osos structural block
- San Luis/Pismo structural block
- Santa Maria Valley structural block
- 2D Survey area extent
- 3D Survey area extent

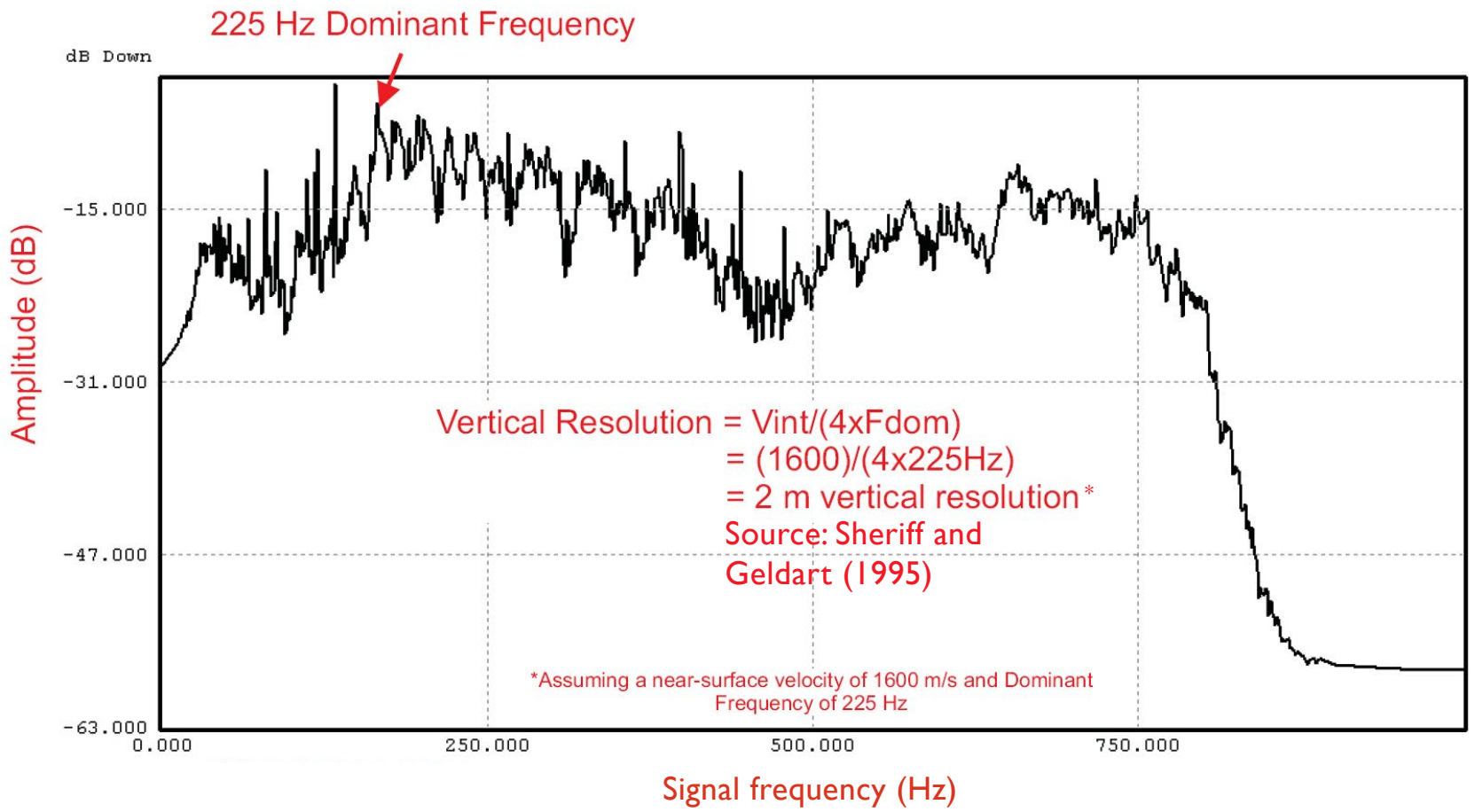
Notes:
- Locations of faults shown on map are from PG&E (2011b).
- Base map is 2010 PG&E Project DEM.

Structural Blocks and Faults in the DCPP Area (Modified from PG&E, 1988)

DCPP 3D/2D Seismic-Reflection Investigation

Pacific Gas and Electric Company | Figure **1-2**

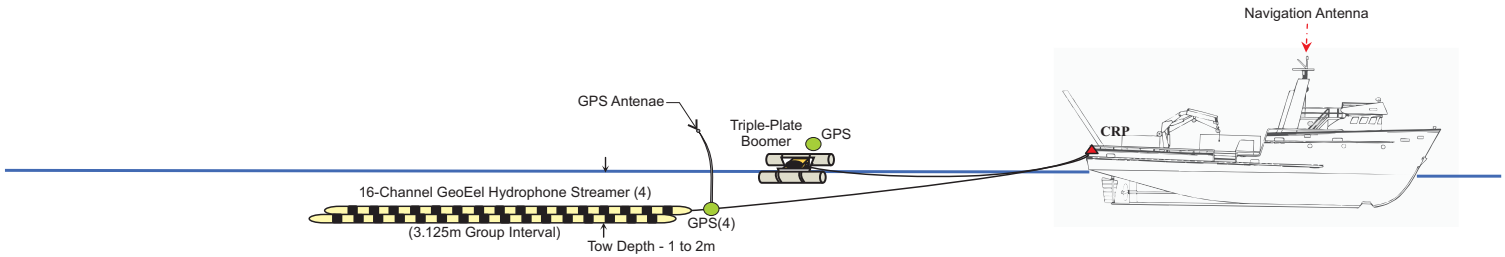
File path: S:\13800\13838\13838.002\Figures\20120210_SITA\Figure_0102.ai; Date: 08/04/2014; User: Serkan Bozkurt, LCI

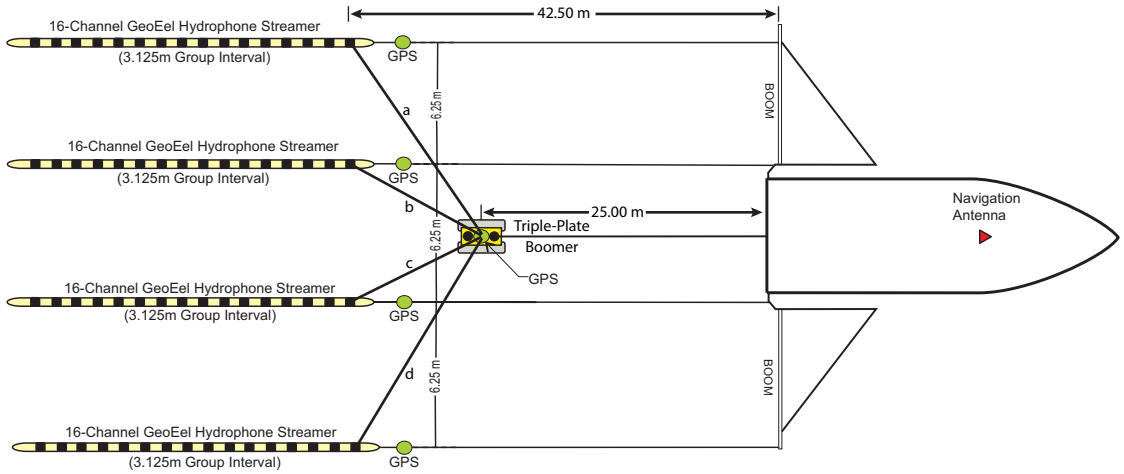


Frequency Spectrum from 3D/2D Seismic-Reflection Data Set Showing Dominant (Fundamental) Frequency of 200–225 Hz and Calculation Using 1,600–1,650 m/s to Determine Vertical Resolution (2.00–2.06 and 1.78–1.83 m)

DCPP 3D/2D Seismic-Reflection Investigation

Pacific Gas and Electric Company | Figure **1-3**





Distances from boomer to head of streamers:

a: 12.01 m

b: 8.15 m

c: 8.15 m

d: 12.01 m

Abbreviations:

CRP = common reference point

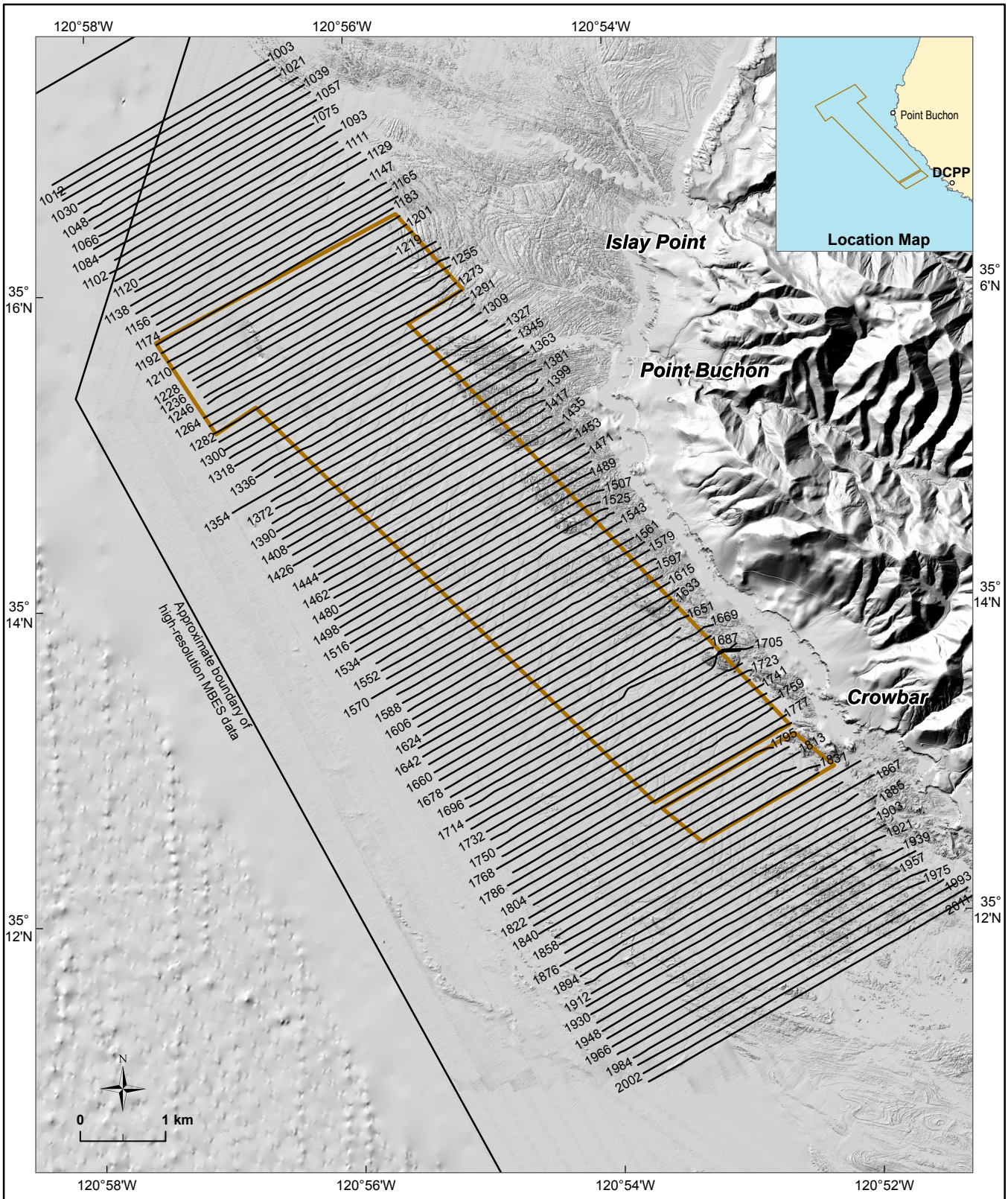
GPS = global positioning system

Streamer Layout (Layback Diagram) for Seismic Source and Receivers Used in the Collection of 3D/2D Data from the M/V *Michael Uhl*

DCPP 3D/2D Seismic-Reflection Investigation

Pacific Gas and Electric Company

Figure **2-1**



EXPLANATION

2D survey trackline, approximately 100 m spacing

Data boundary for 3D seismic-reflection surveys

Map projection: WGS 1984, UTM Zone 10N
MBES data source: CSUMB Seafloor Mappling Lab

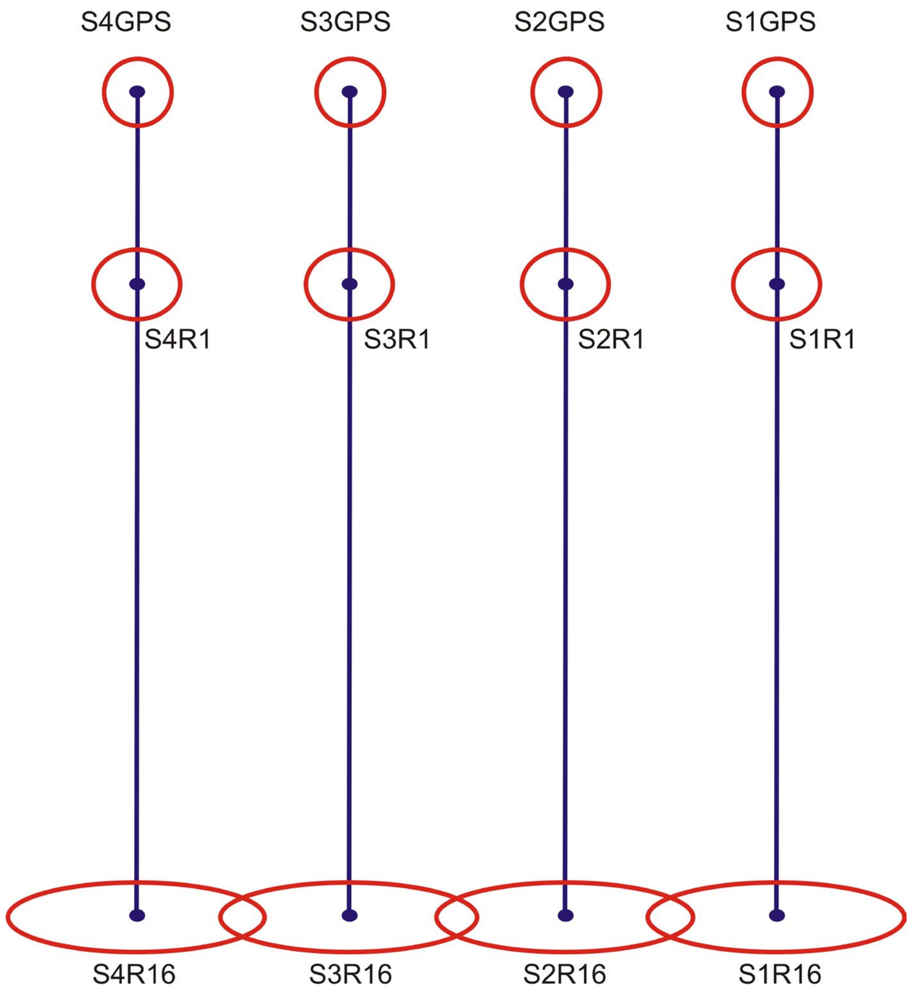
Trackline Map of 2D Seismic-Reflection Lines and Boundary of 3D Survey Area

DCPP 3D/2D Seismic-Reflection Investigation

Pacific Gas and Electric Company

Figure **2-2**

File path: S:\13800\13838\113838.002\Figures\20120210_SITA\Figure_0202.ai; Date: 07/17/2014; User: Serkan Bozkurt, LCI



Notes:

Ellipses represent working error of positioning; head end of streamers have a 1 m positioning accuracy, whereas a 3 m positioning accuracy occurs at the tail ends, resulting in an overall horizontal resolution of ~2–3 m.

Codes at dots indicate the following: S1–4 = streamer number; S1GPS-S4GPS = position of GPS unit at head of each streamer; S1–4R1–16 = receiver number in streamer.

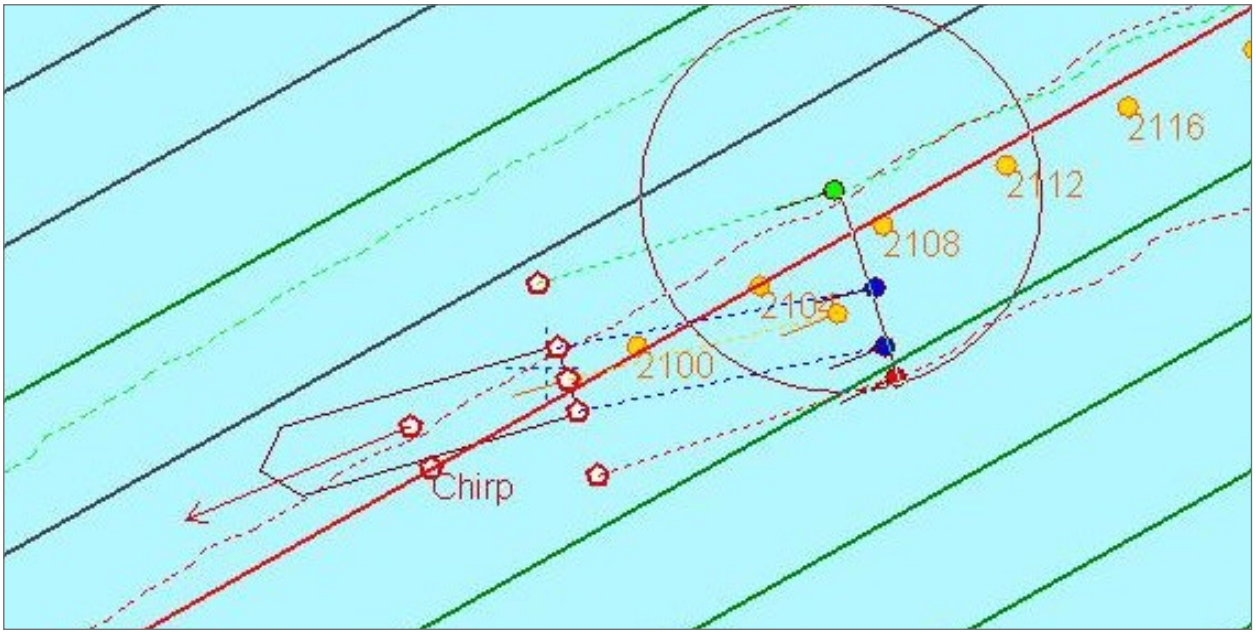
Schematic Diagram of Streamer Array Showing Navigation Positioning Accuracy During 3D/2D Seismic-Reflection Survey

DCPP 3D/2D Seismic-Reflection Investigation

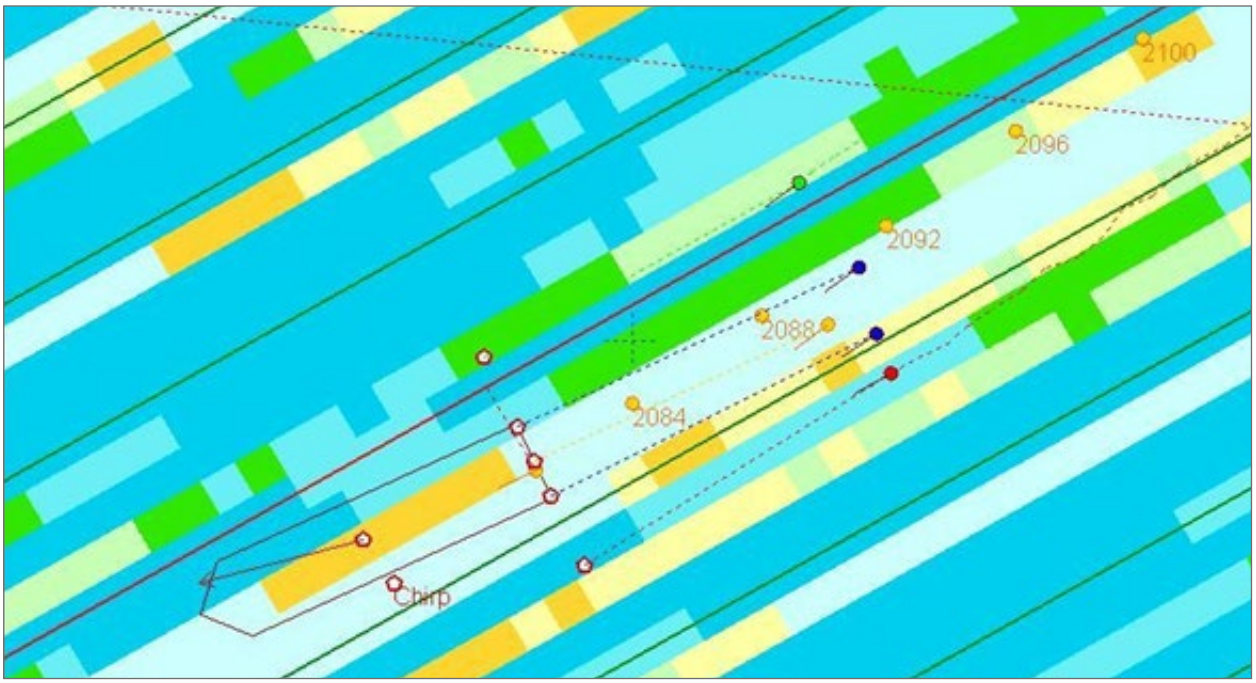
Pacific Gas and Electric Company | Figure **2-3**

File path: S:\13800\13838\13838.002\Figures\20120210_SIT\Ai\Figure_0203.ai; Date: 07/17/2014; User: Serkan Bozkurt, LCI

(a) Geometry of Array in Relation to Line Orientation (Data Coverage)



(b) Example of Coverage Obtained and Geometry of Array During Gap Filling Operations (Bin Infilling)



Notes:

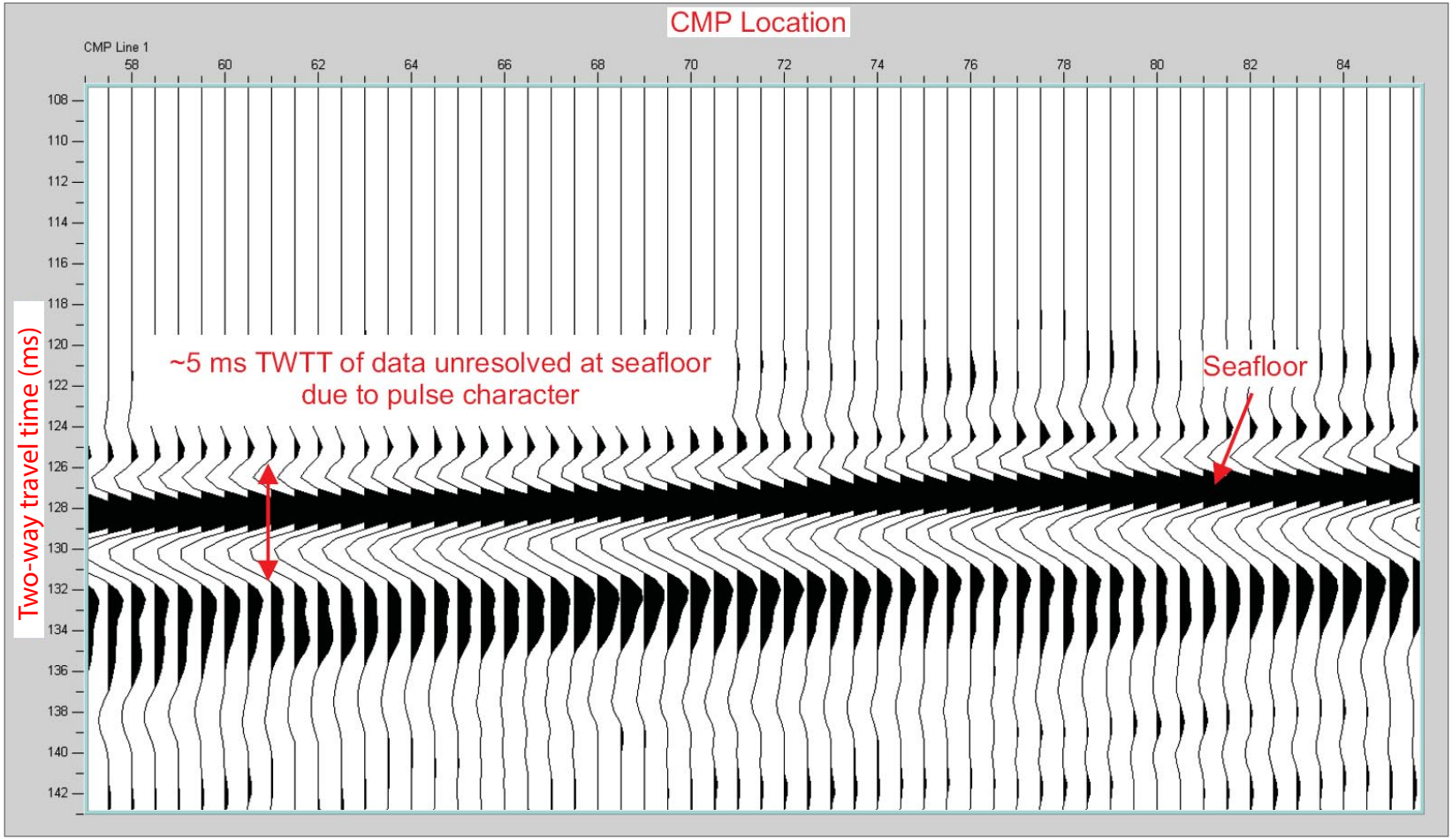
In part (a), red circles represent locations of GPS sensors on vessel, at the source and at head ends of streamers. Green (starboard or right), blue (inner) and red (port or left) color-filled circles represent ends of streamerss Numbers along the red line (active navigation line) represent shot points. Green lines are pre-programmed navigation lines.

In part (b), blue color represents 4-fold coverage or more; green, 3 fold; yellow, 2 fold; and gray, 0 coverage.

Schematic Diagram Illustrating Skewed Geometry of Streamer Array During Times of Adverse Weather Conditions Resulting in Irregular Coverage

DCPP 3D/2D Seismic-Reflection Investigation

Pacific Gas and Electric Company | Figure **2-4**



Note:

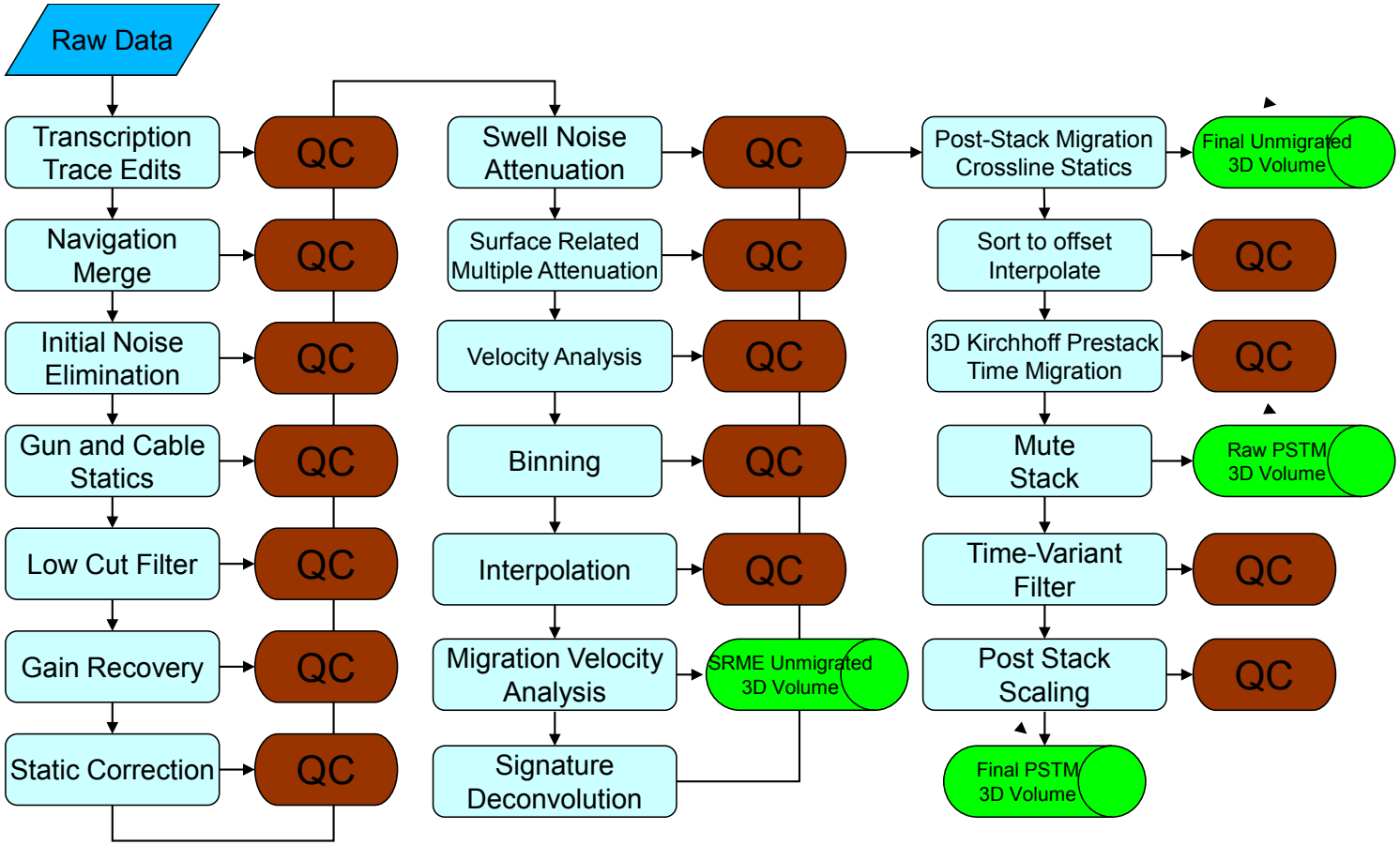
CMP = common midpoint or shot point

Example of "Bubble Pulse" Recorded During 3D/2D Seismic-Reflection Survey Showing ~5 ms (~4 m) Thick Shallow Subsurface Section Not Resolvable due to Masking of Legitimate Reflectors by Pulse Width

DCPP 3D/2D Seismic-Reflection Investigation

Pacific Gas and Electric Company | Figure **2-5**

Processing Flow



Note:
All quality control (QC) assessments were made prior to advancing to the next step of processing.

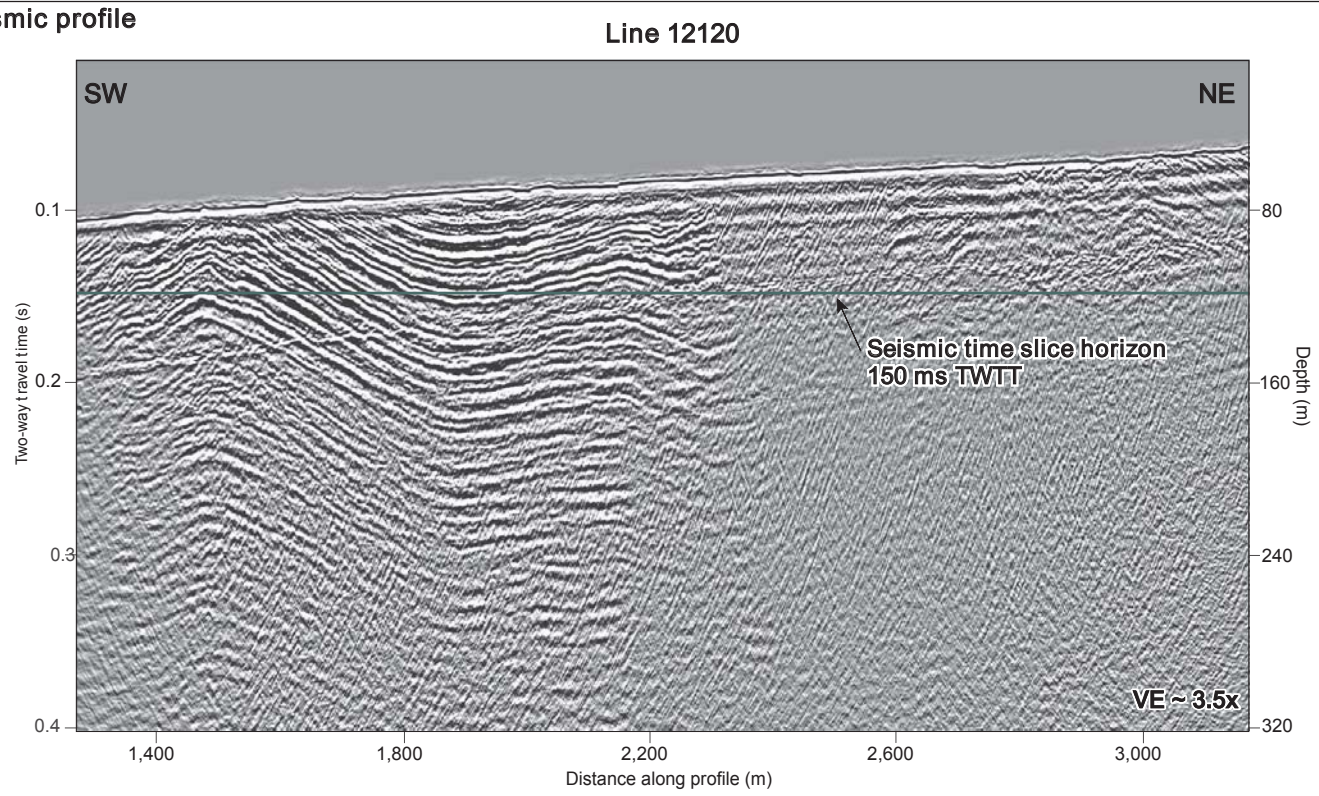
Flow Chart Showing Procedures and Steps Undertaken in the Processing of the 3D Data

DCPP 3D/2D Seismic-Reflection Investigation

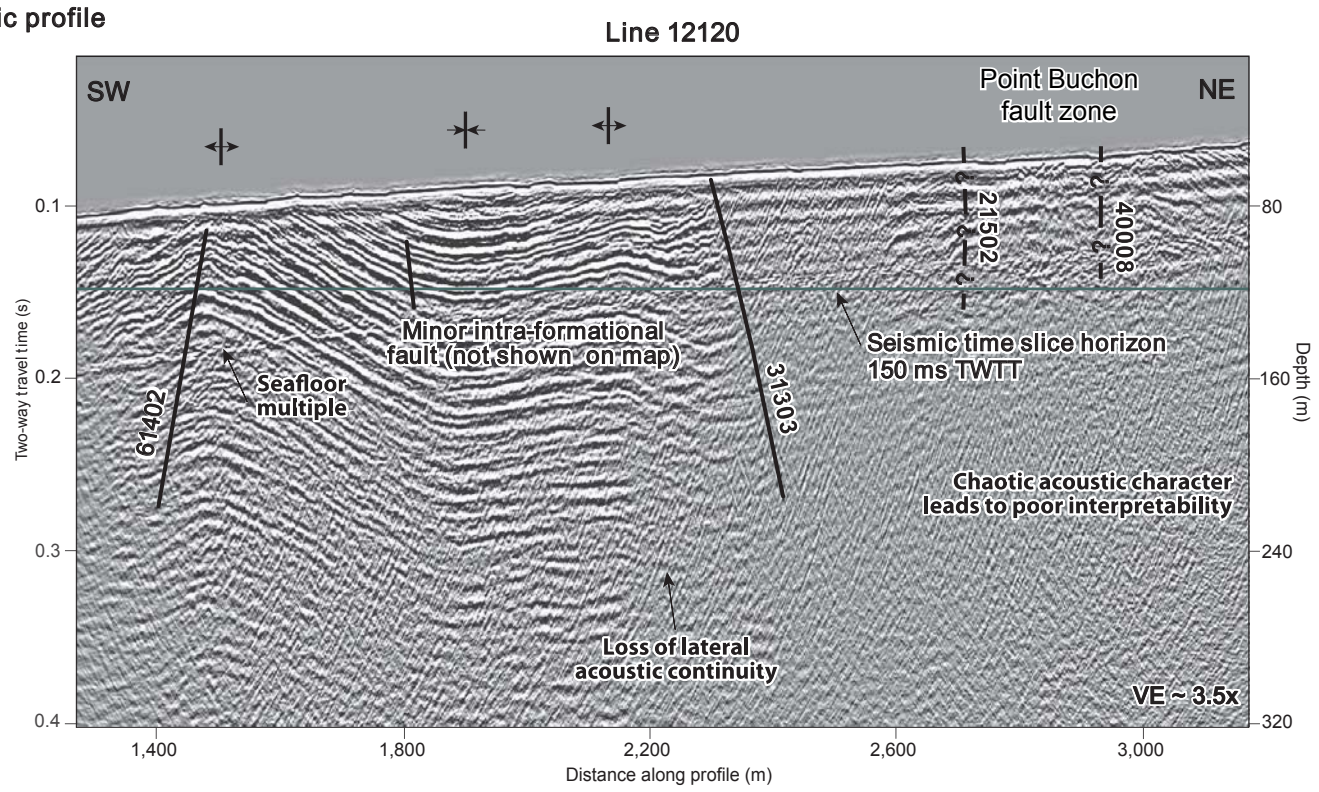
Pacific Gas and Electric Company

Figure **2-6**

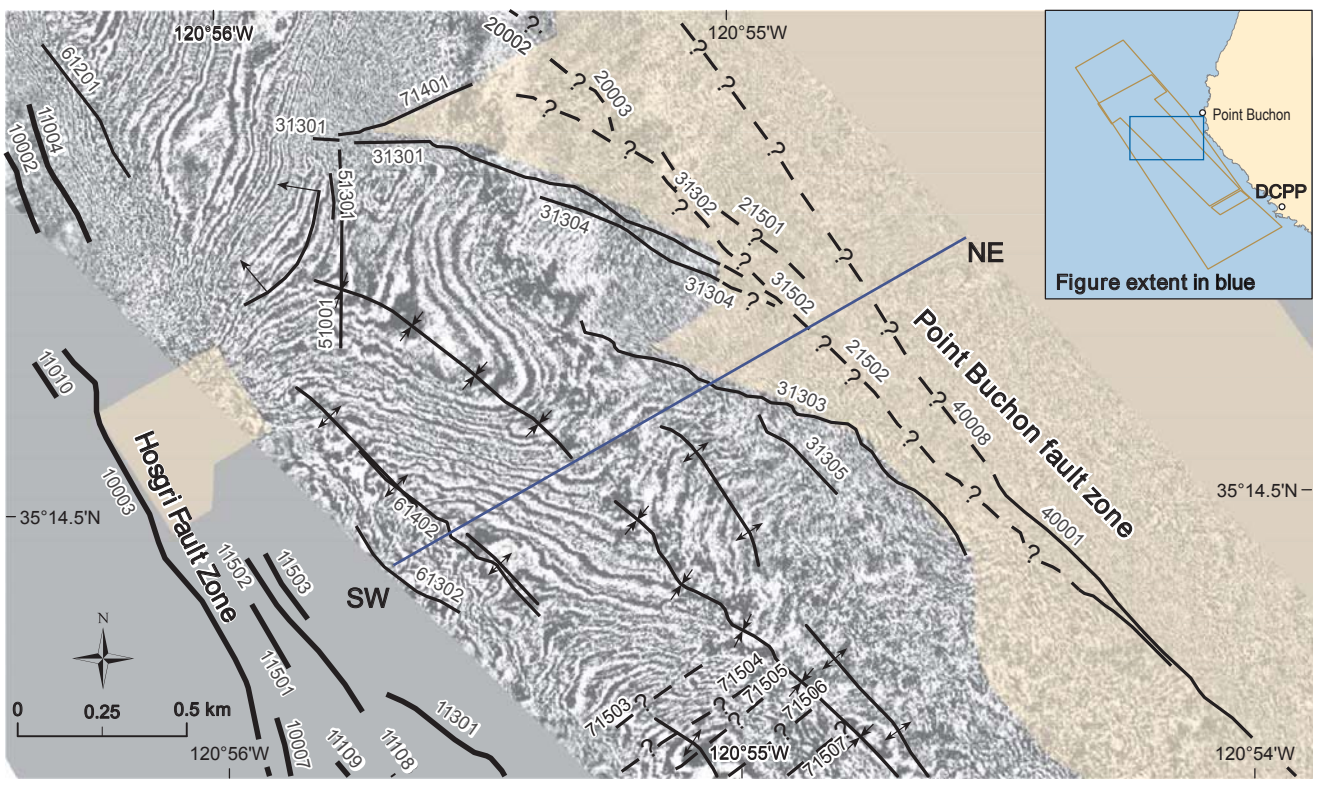
(a) Uninterpreted seismic profile



(b) Interpreted seismic profile



(c) Location map



EXPLANATION

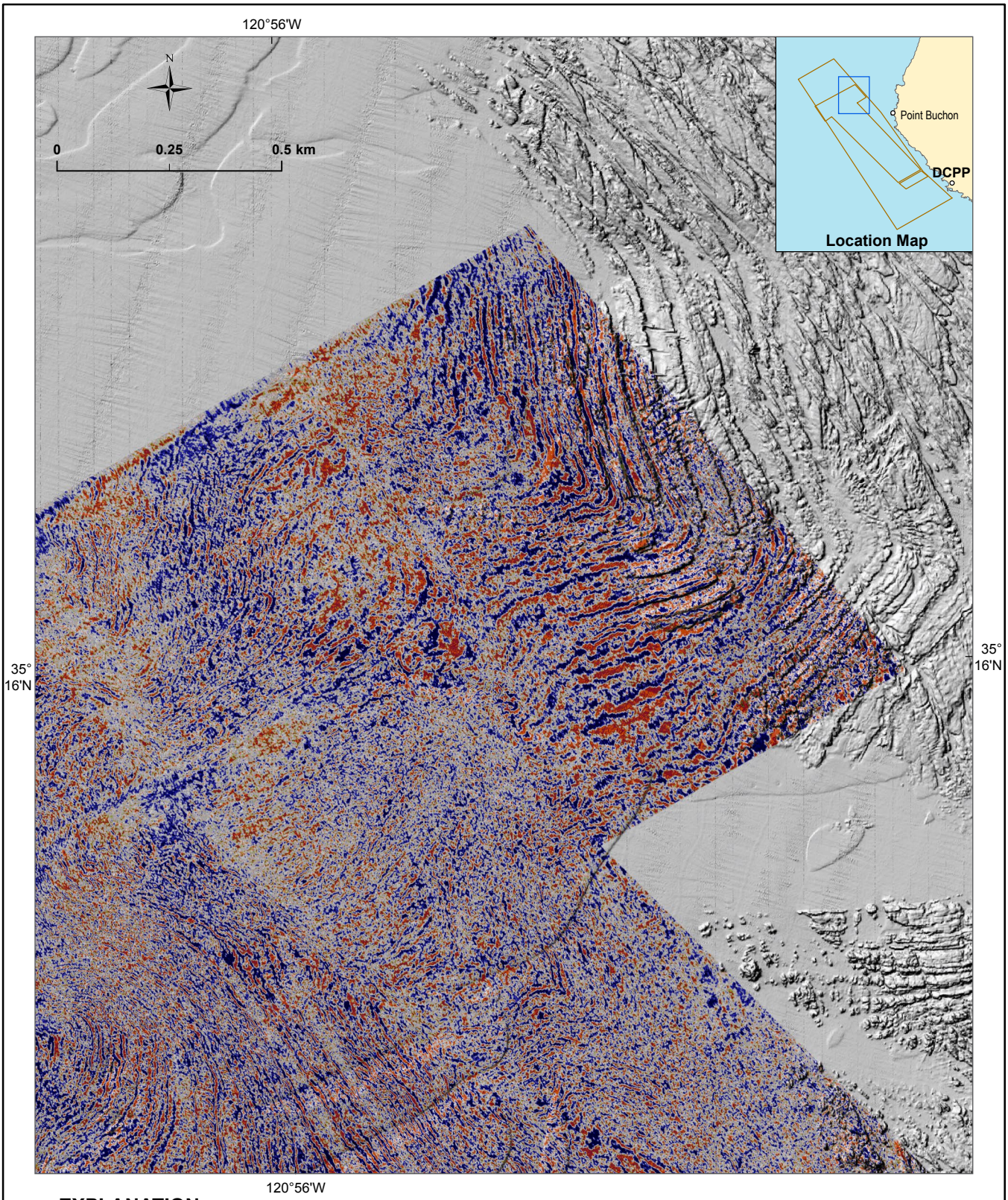
- Time slice horizon
- Location of seismic profile shown on Plate 3b
- Area of poor interpretability
- Faults, solid where well located, dashed where inferred or approximately located, queried where uncertain, dotted where buried by more than 20 milliseconds of undeformed strata
- Amplitude: High / Low
- Syncline
- Anticline
- Monocline

Note: Depth values on seismic profile assume a velocity of 1,600 m/s.

Examples of Data Quality (Interpretability) Shown in (a,b) 3D Seismic-Reflection Profile Line 12120 and on (c) Amplitude Time Slice at 150 ms (TWTT)

DCPP 3D/2D Seismic-Reflection Investigation

Pacific Gas and Electric Company | Figure **3-1**



EXPLANATION

Time Slice Explanation

Amplitude: High / Low

Note: Good correlation of reflectors in the time slice with ridges imaged in bathymetry suggests that 3D survey is correctly aligned with MBES survey.

MBES Bathymetry Overlain on 3D Amplitude Time Slice at 138 ms (TWTT) Showing a Good Correlation Between the Two Data Sets

DCPP 3D/2D Seismic-Reflection Investigation

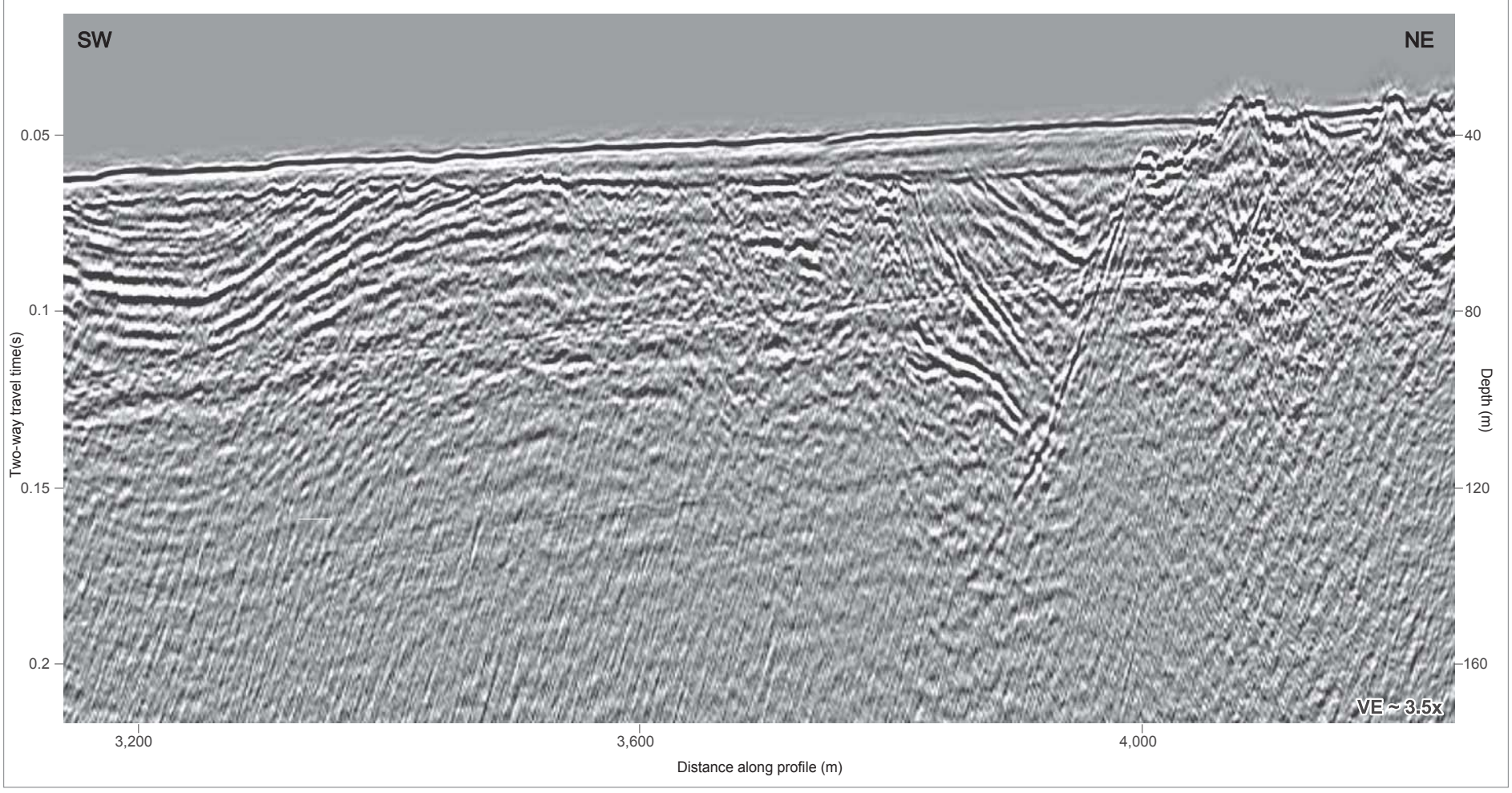
Pacific Gas and Electric Company

Figure **4-1**

File path: S:\13800\13838\13838.002\Figures\20120210_SITA\Figure_0401.ai; Date: 07/17/2014; User: Serkan Bozkurt, LCI

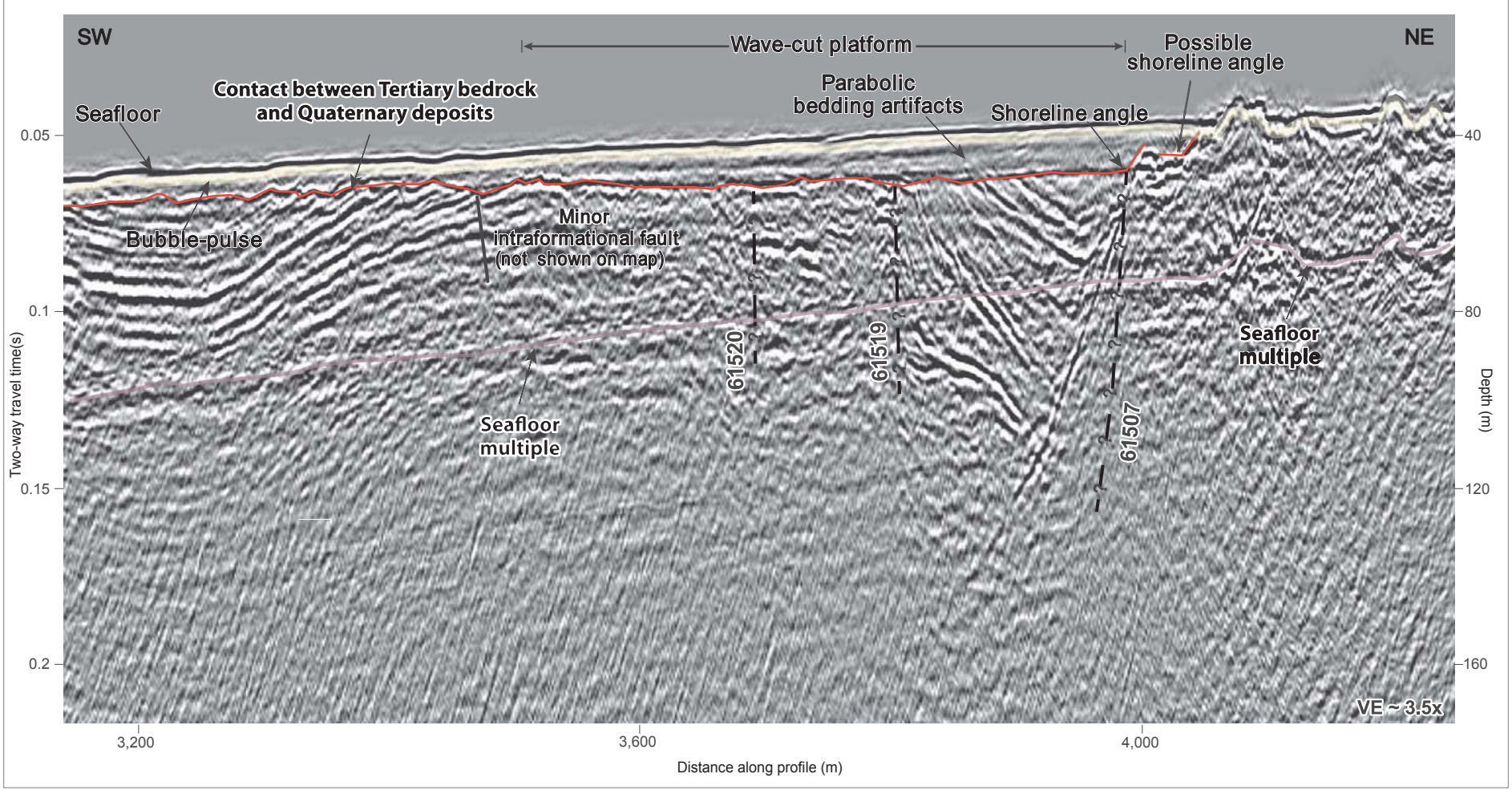
(a) Uninterpreted seismic profile

Line 13340



(b) Interpreted seismic profile

Line 13340

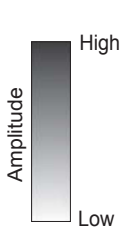


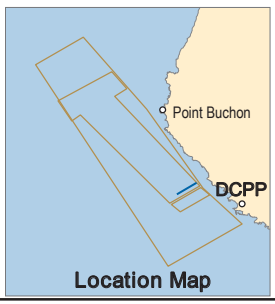
EXPLANATION

- Faults, solid where well located, dashed where inferred or approximately located, queried where uncertain, dotted where buried by more than 20 milliseconds of undeformed strata
- Erosional surface (top of Tertiary rock)
- Location of seismic profile shown on Plate 3b

Notes:

1. Depth values on seismic profile assume a velocity of 1,600 m/s.
2. Minor intraformational fault displayed on profile is not mapped and shown on fault maps or included within the fault database.





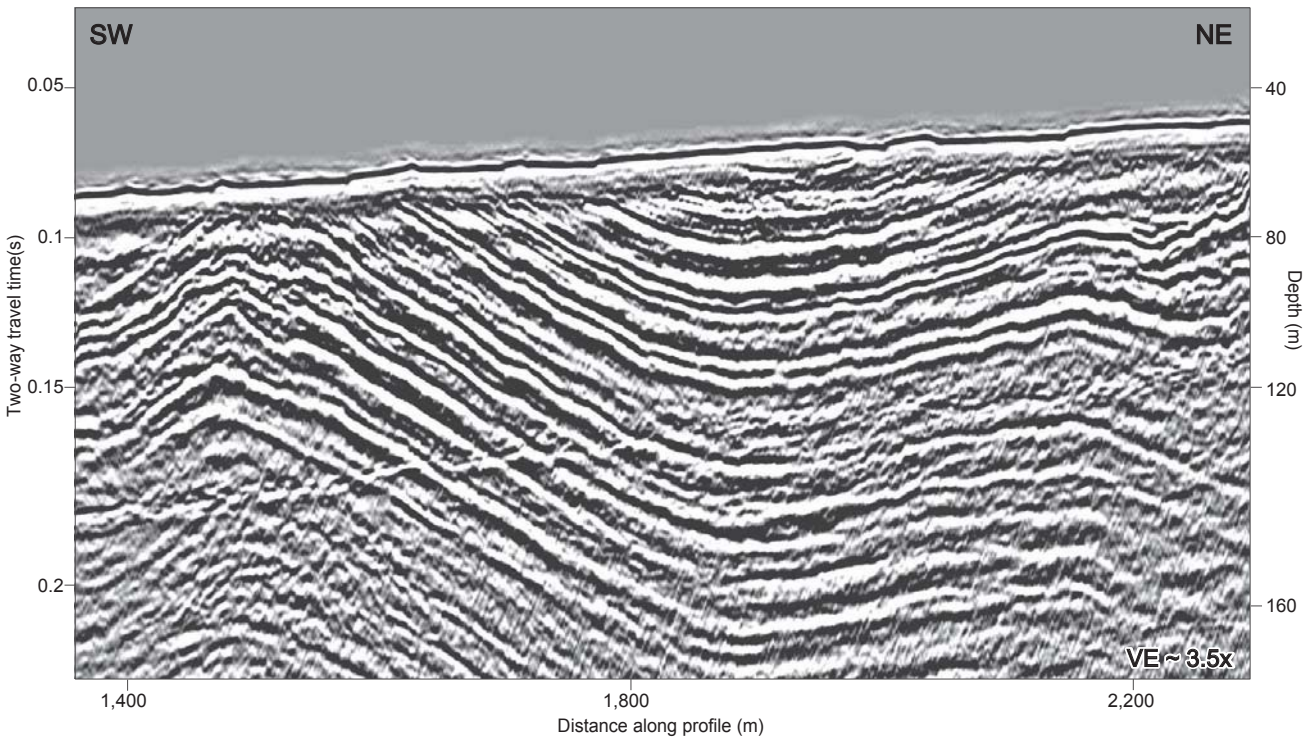
Example of a Wave-Cut Platform and Shoreline Angles Illustrated in 3D Seismic-Reflection Profile 13340 and Showing Bedding Artifacts

DCPP 3D/2D Seismic-Reflection Investigation

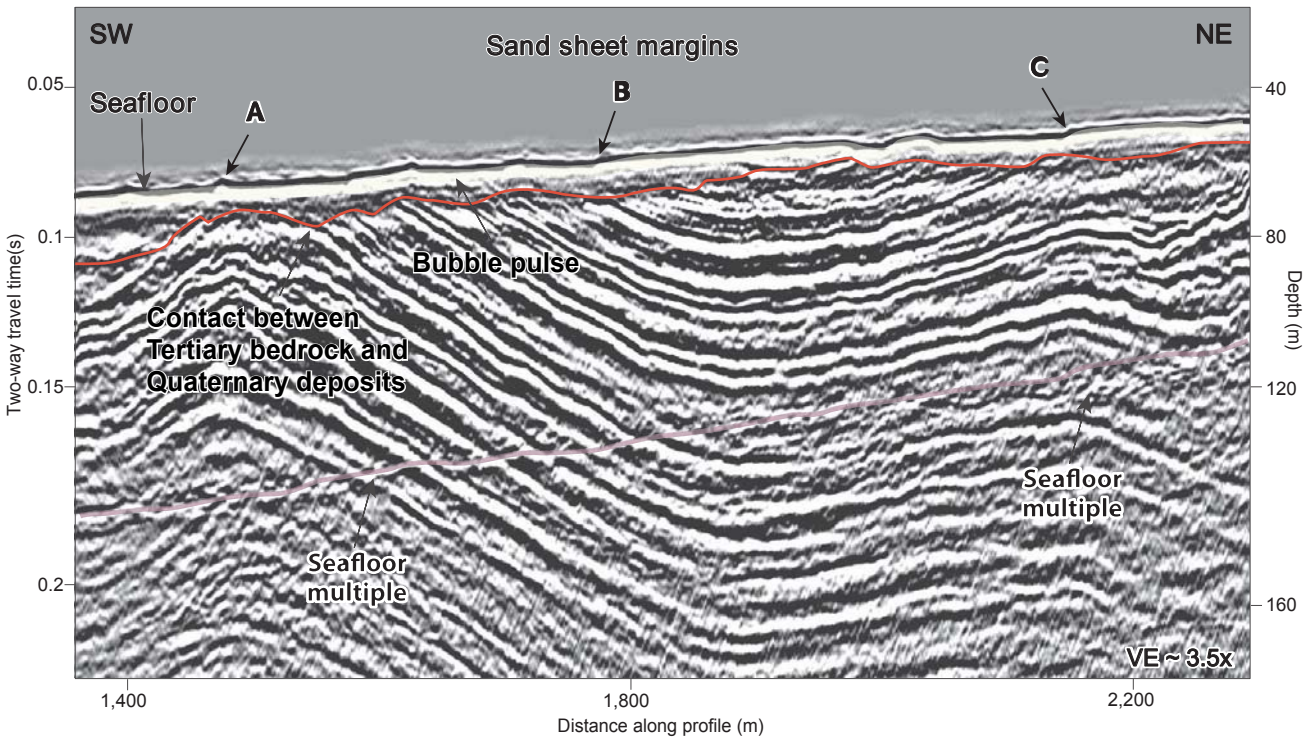
Pacific Gas and Electric Company | Figure **6-1**

File path: S:\13800\13838\13838.002\Figures\20120210_SITA\Figure_0601.ai; Date: 07/29/2014; User: Serkan Bozkurt, LCI

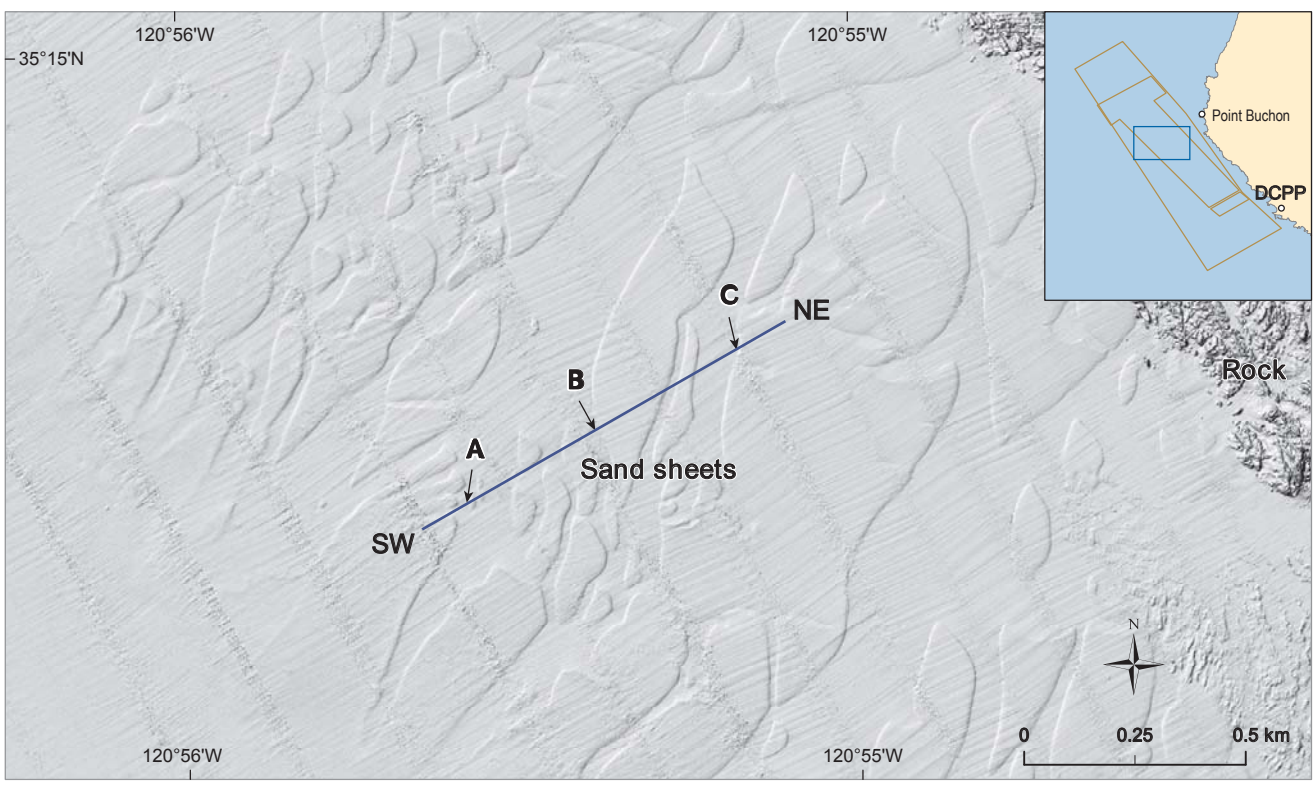
(a) Uninterpreted seismic profile



(b) Interpreted seismic profile



(c) Location map



EXPLANATION

- Location of seismic profile shown on Plate 3b
- Erosional surface (top of Tertiary rock)
- Location of mobile sand sheet margins

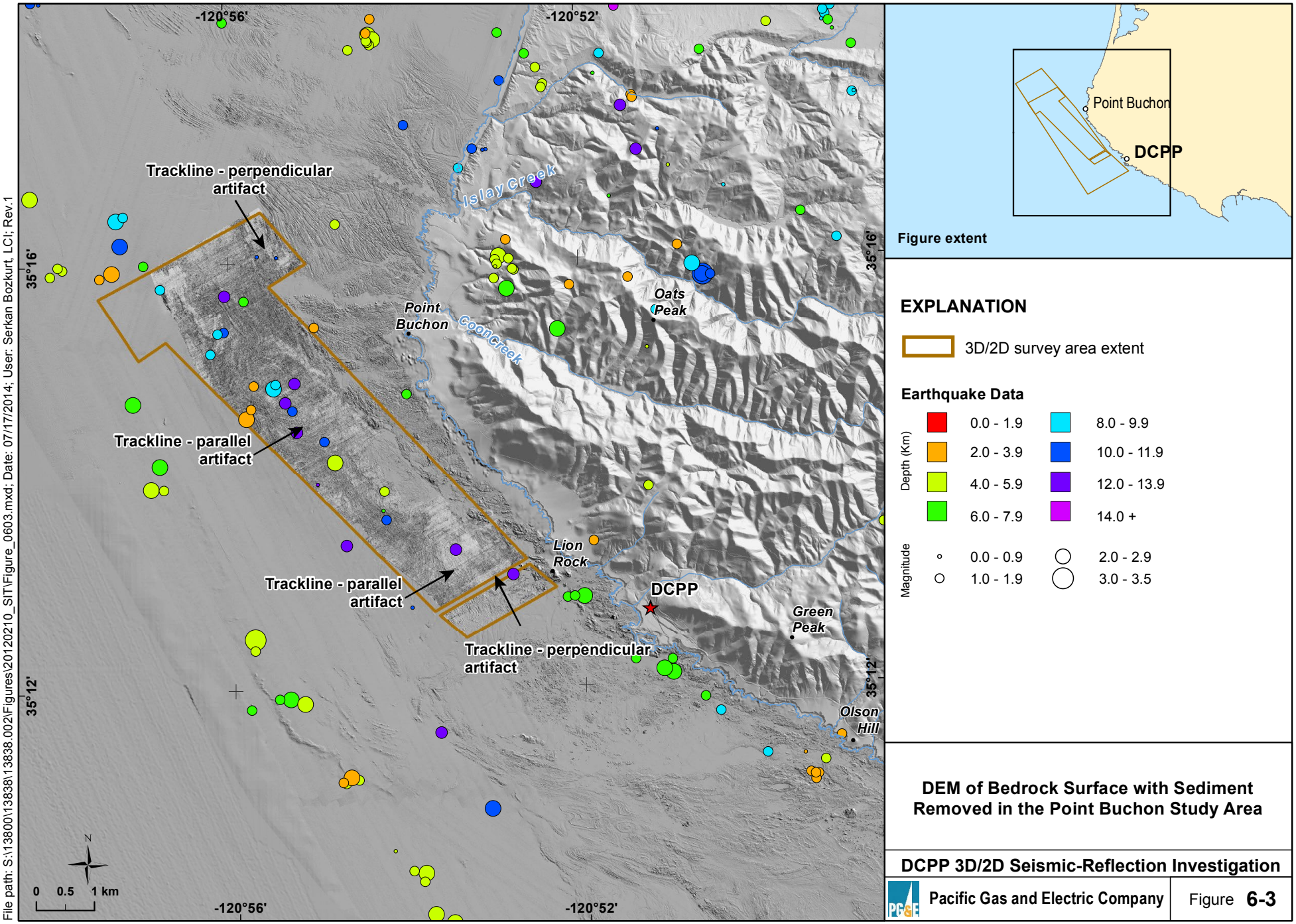
Note: Depth values on seismic profile assume a velocity of 1,600 m/s.

Amplitude: High / Low

Illustrations of Mobile Sand Sheets Shown in (a, b) 3D Seismic-Reflection Profile 12120 and on (c) MBES Shaded Relief Bathymetry Map

DCPP 3D/2D Seismic-Reflection Investigation

Pacific Gas and Electric Company | Figure **6-2**



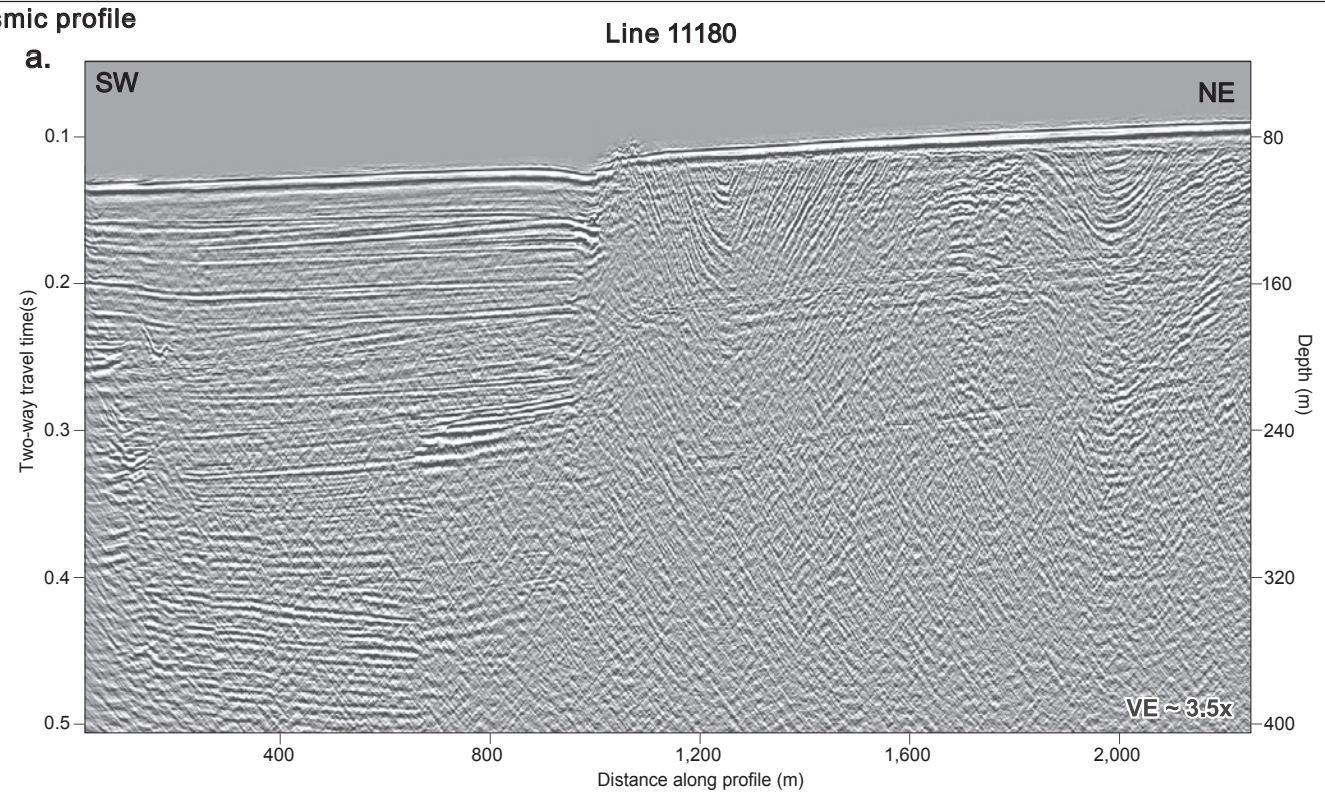
File path: S:\13800\13838\13838.002\Figures\20120210_SIT\Figure_0603.mxd; Date: 07/17/2014; User: Serkan Bozkurt, LCI; Rev.1

DEM of Bedrock Surface with Sediment Removed in the Point Buchon Study Area

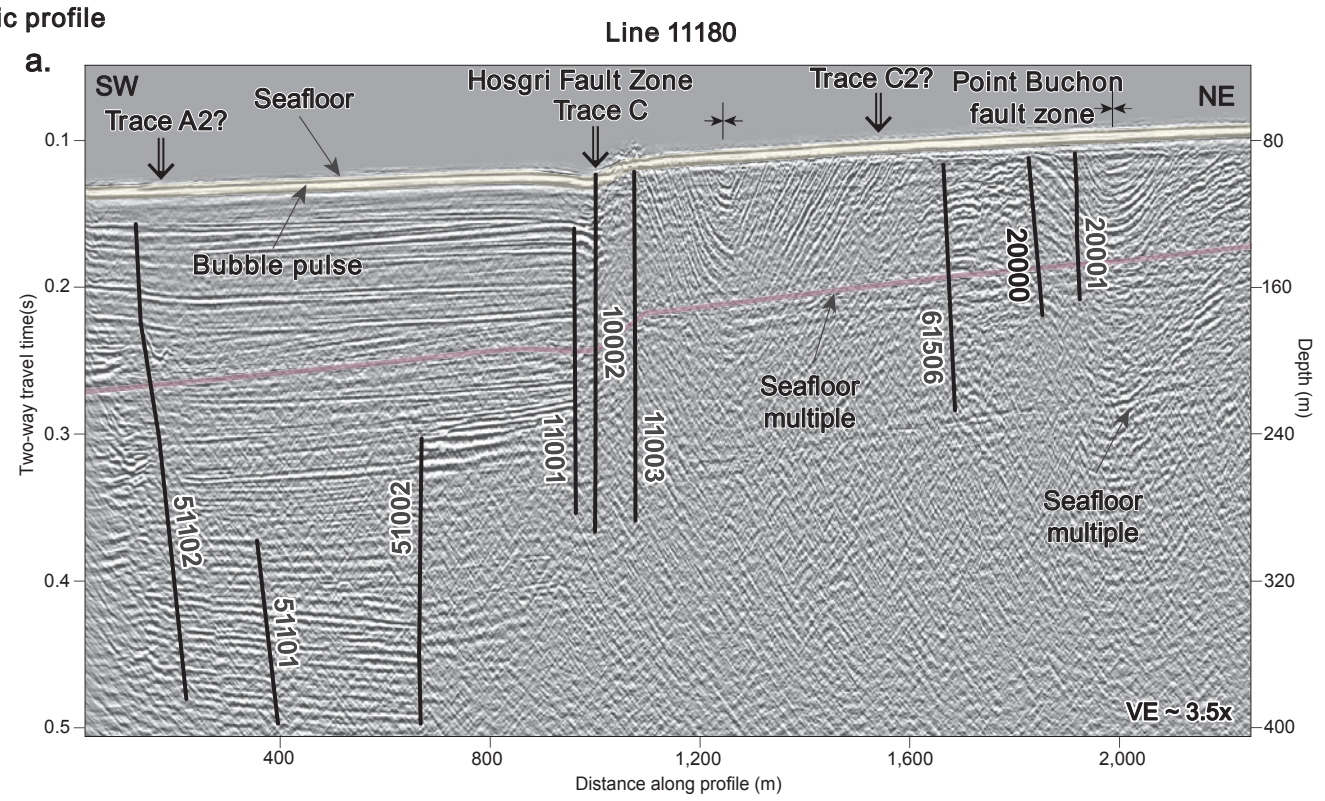
DCPP 3D/2D Seismic-Reflection Investigation

Pacific Gas and Electric Company | Figure **6-3**

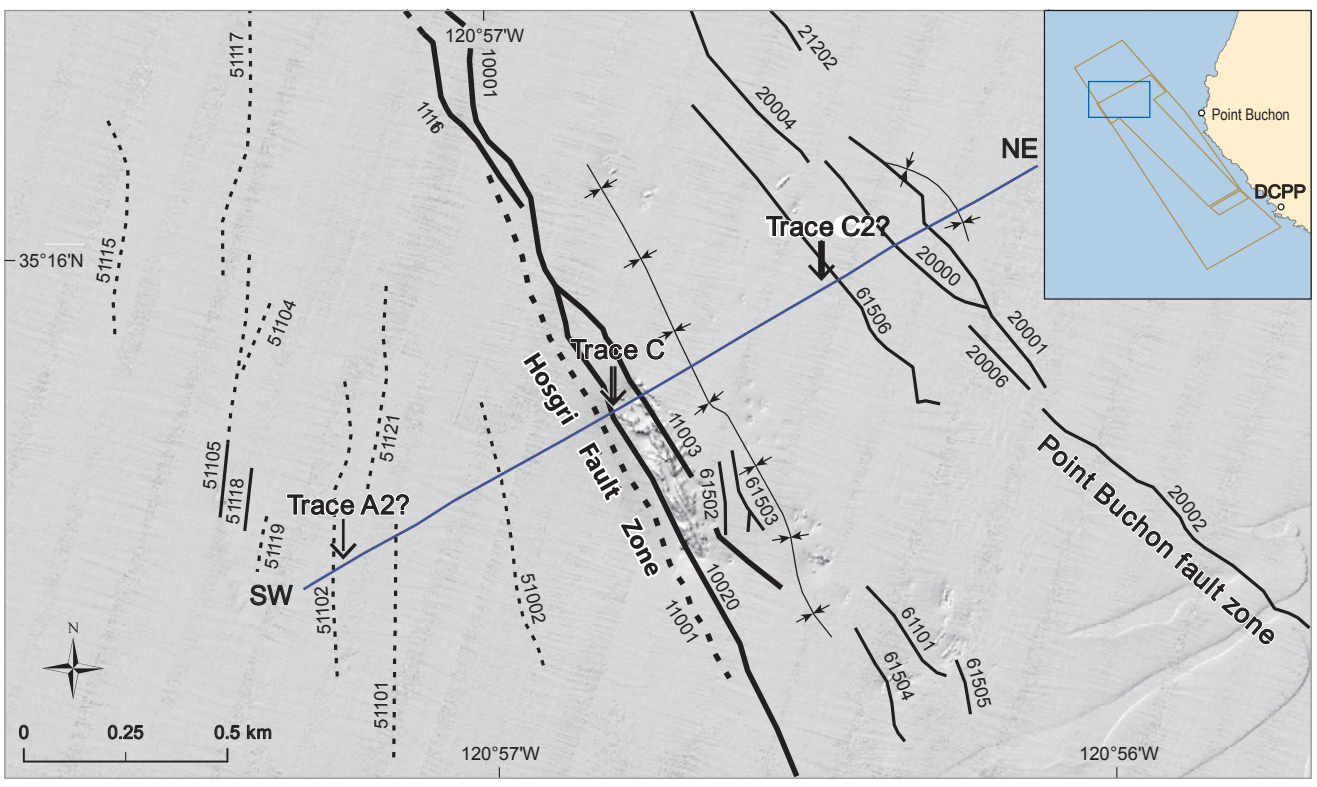
(a) Uninterpreted seismic profile



(b) Interpreted seismic profile



(c) Location map



Explanation

- Location of seismic profile shown on Plate 3b
- Faults, solid where well located, dashed where inferred or approximately located, dotted where buried by more than 20 milliseconds of undeformed strata
- Approximate positions of Hosgri fault traces from PG&E (2011b)
- Syncline
- Anticline
- Amplitude: High / Low

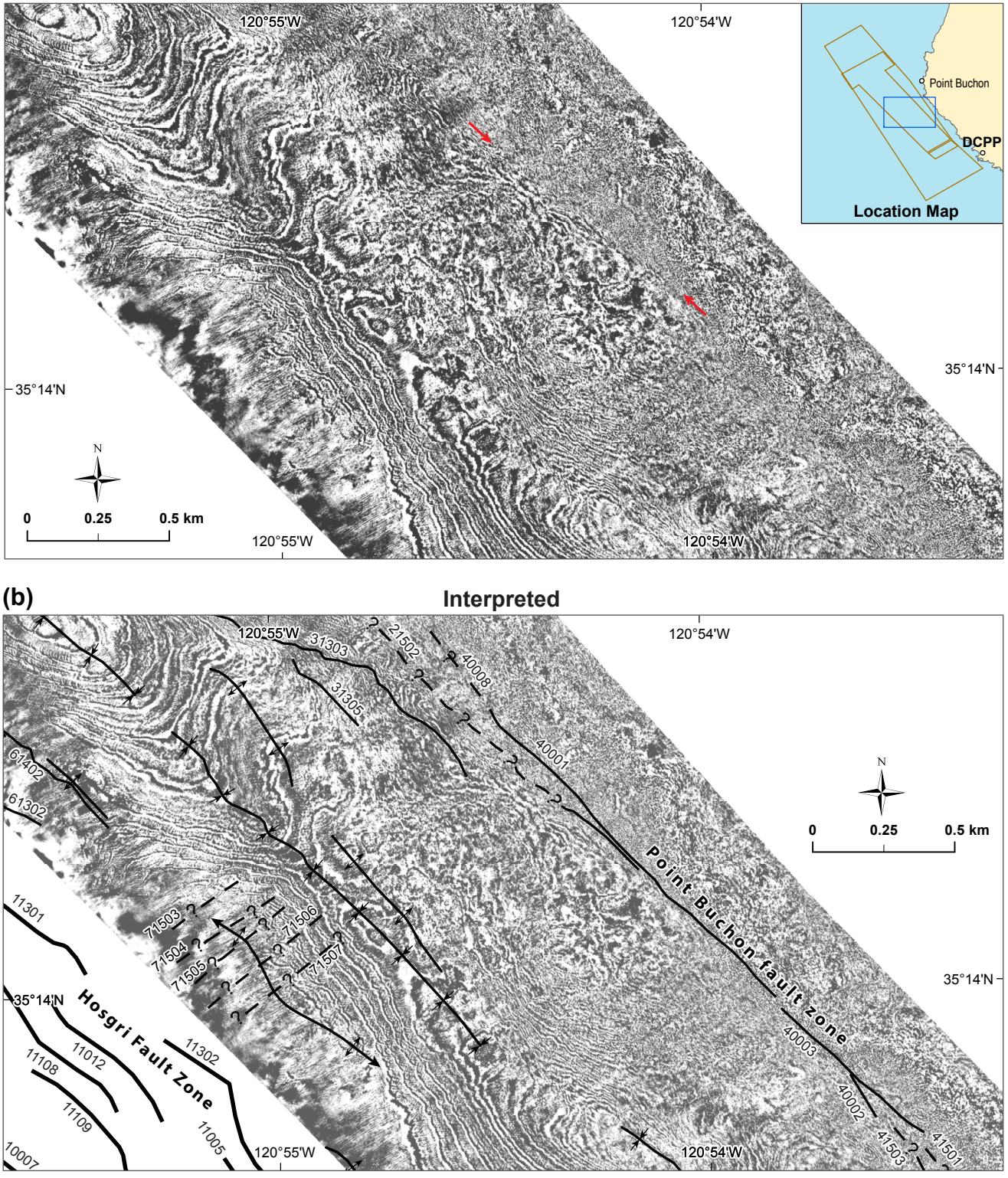
Note: Depth values on seismic profile assume a velocity of 1,600 m/s.

Vertical and Horizontal Geometry of Hosgri Fault Zone Strands in (a, b) 3D Seismic-Reflection Profile 11180 and on (c) MBES Bathymetry Map Within Northern Part of Survey Area

DCPP 3D/2D Seismic-Reflection Investigation

Pacific Gas and Electric Company | Figure **6-4**

File path: S:\13800\13838\13838.002\Figures\20120210_SITAllFigure_0604.ai; Date: 07/17/2014; User: Serkan Bozkurt, LCI



EXPLANATION

—·—?··· Faults, solid where well located, dashed where inferred or approximately located, queried where uncertain, dotted where buried by more than 20 milliseconds of undeformed strata

Amplitude: High / Low

Syncline Anticline Point Buchon fault lineament

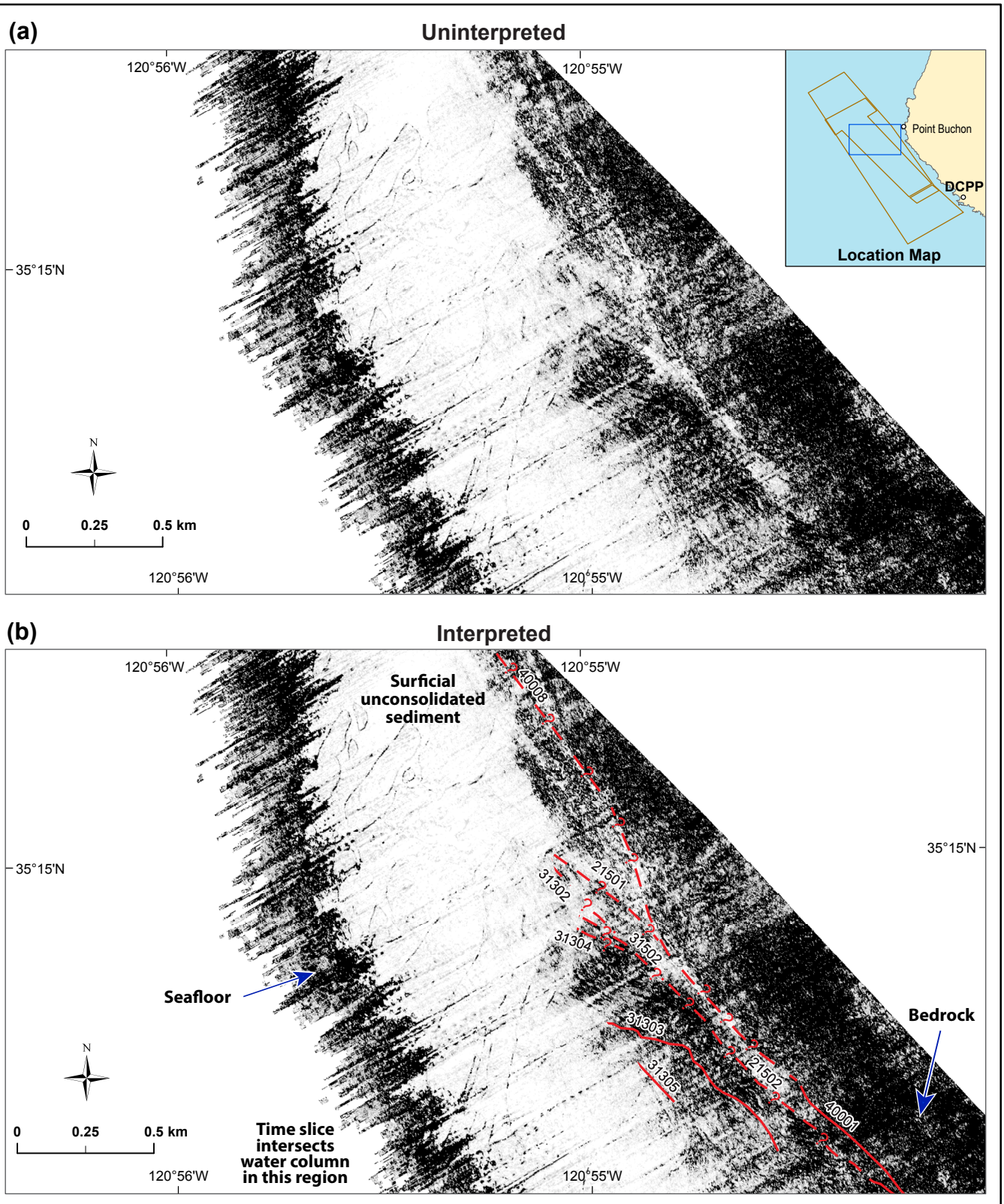
Amplitude Time-Slice Maps at 95 ms (TWTT) in Southern Part of 3D Study Area Showing (a) Uninterpreted and (b) Interpreted Strands of the Point Buchon Fault Zone

DCPP 3D/2D Seismic-Reflection Investigation

Pacific Gas and Electric Company

Figure **6-5**

File path: S:\13800\13838\13838.002\Figures\20120210_SITA\Figure_0605.ai; Date: 07/29/2014; User: Serkan Bozkurt, LCI



EXPLANATION

Faults, solid where well located, dashed where inferred or approximately located, queried where uncertain, dotted where buried by more than 20 milliseconds of undeformed strata

Fault Strands Associated with Fault Intersection of Point Buchon Fault Zone Shown in (a) Uninterpreted and (b) Interpreted Similarity Time Slices at 74 ms (TWTT)

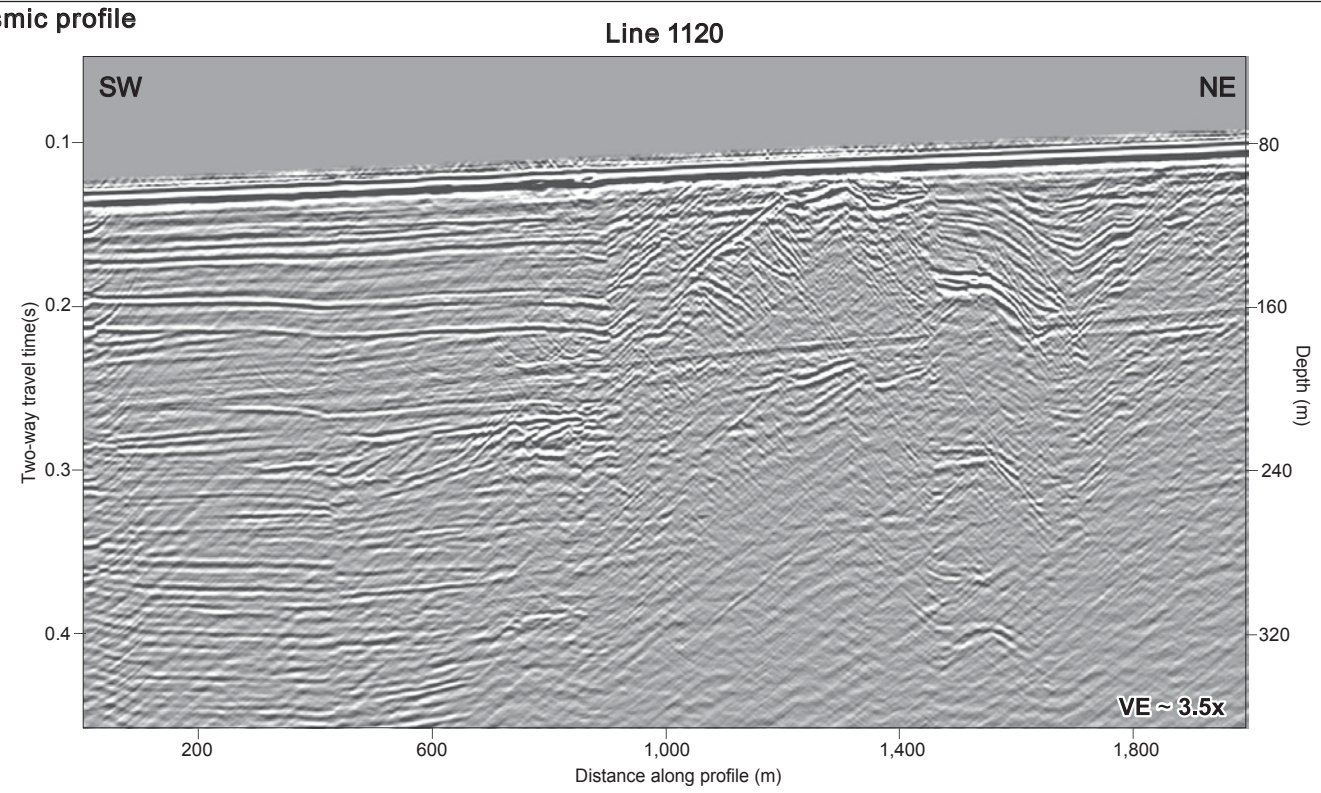
DCPP 3D/2D Seismic-Reflection Investigation

Pacific Gas and Electric Company

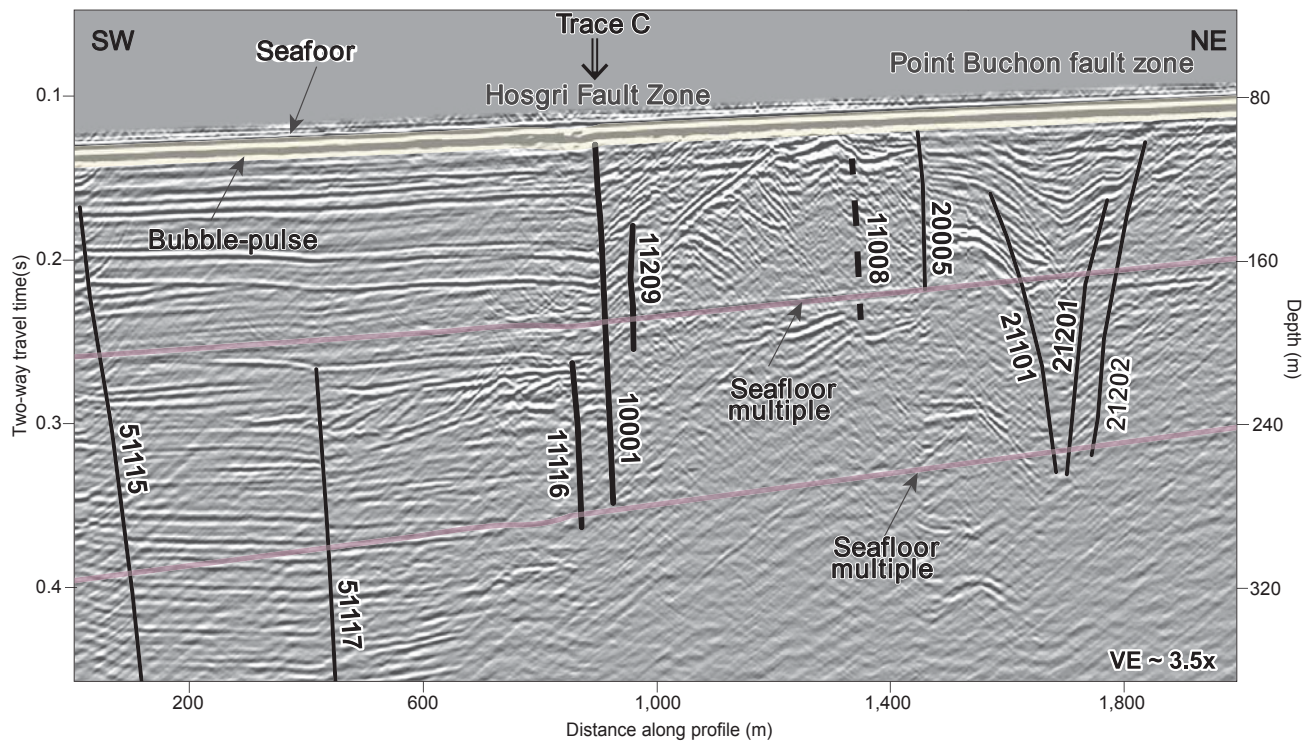
Figure **6-6**

File path: S:\13800\138381138381138.002\Figures\20120210_SIT\Ai\Figure_0606.ai; Date: 07/17/2014; User: Serkan Bozkurt, LCI

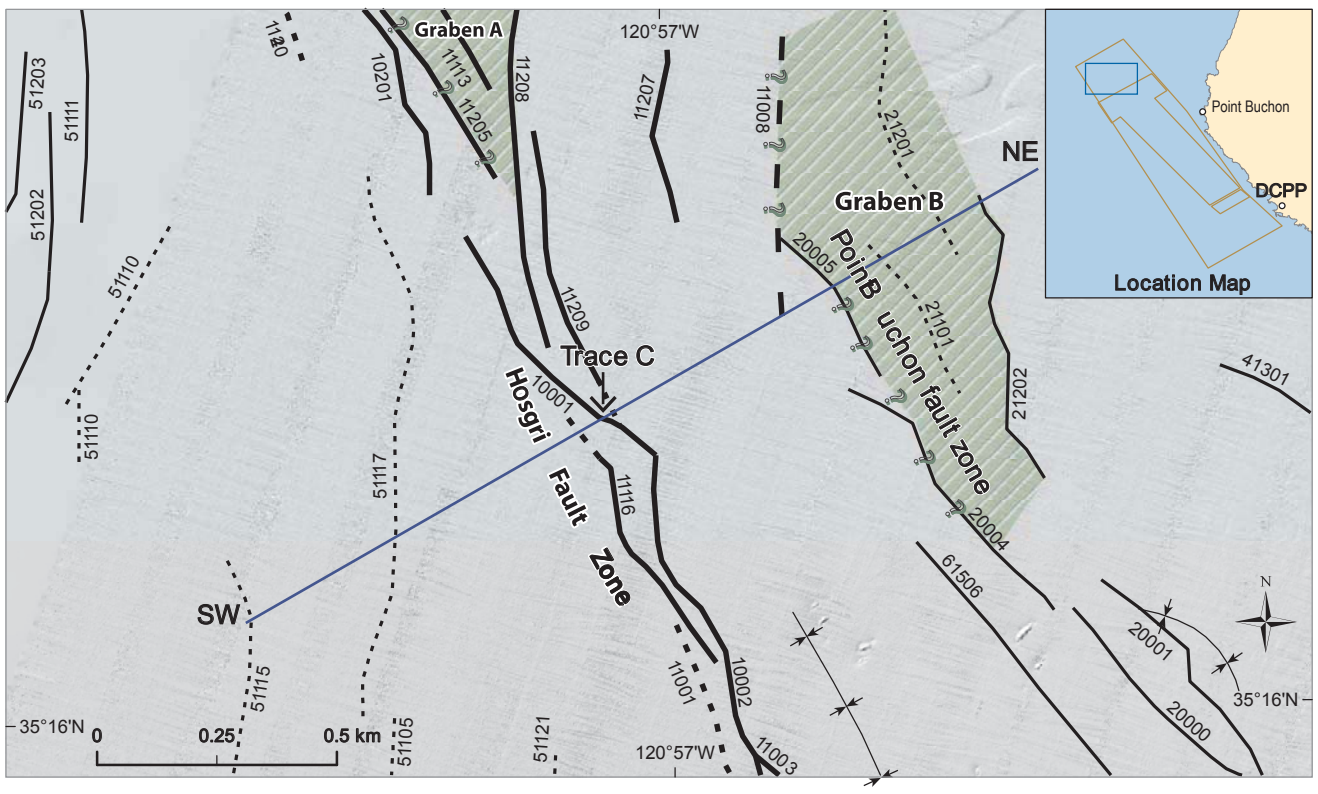
(a) Uninterpreted seismic profile



(b) Interpreted seismic profile



(c) Location map



Explanation

- Location of seismic profile shown on Plate 3b
- Faults, solid where well located, dashed where inferred or approximately located, dotted where buried by more than 20 milliseconds of undeformed strata
- Graben, queried where full extent is uncertain

Amplitude: High / Low

N

Note: Depth values on seismic profile assume a velocity of 1,600 m/s.

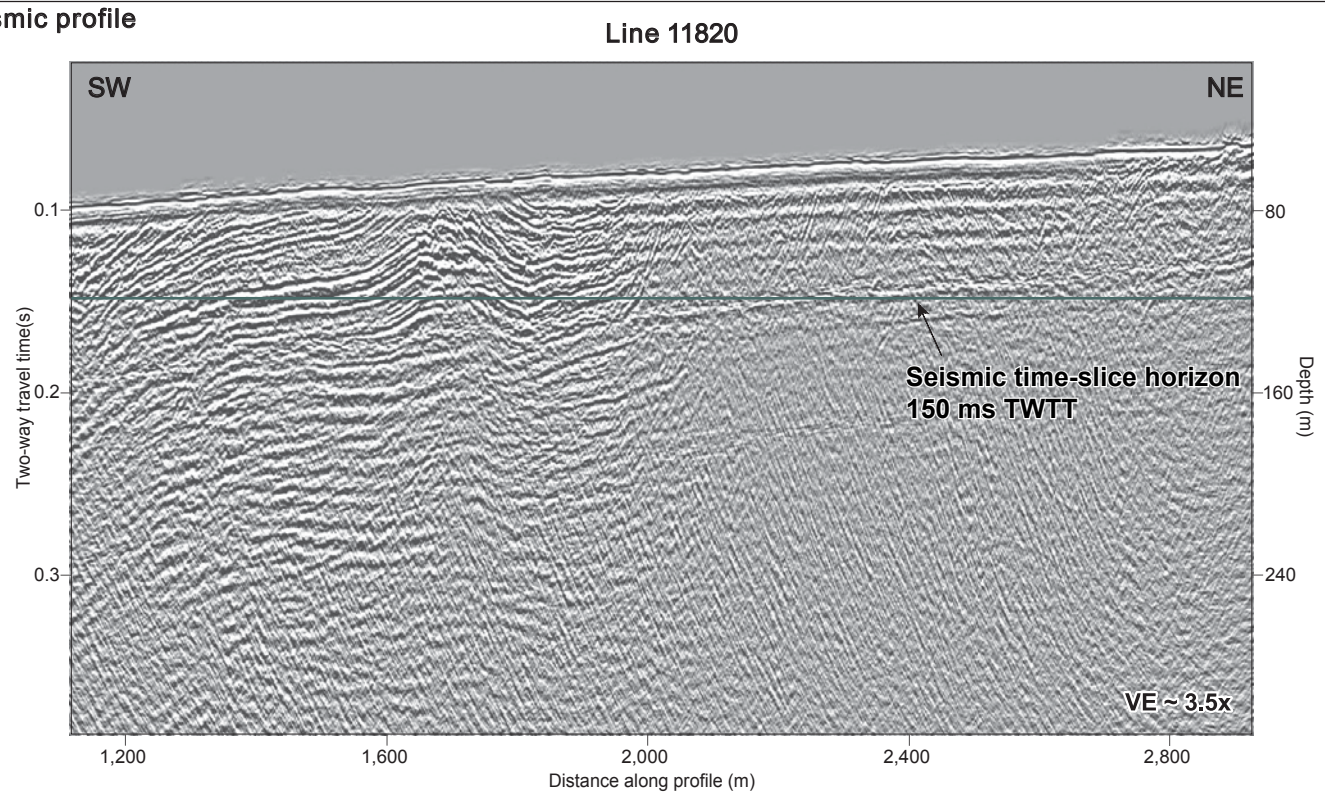
Graben at Northern End of Point Buchon Fault Zone Shown on (a, b) 2D Seismic-Reflection Profile 1120 and (c) MBES Bathymetry

DCPP 3D/2D Seismic-Reflection Investigation

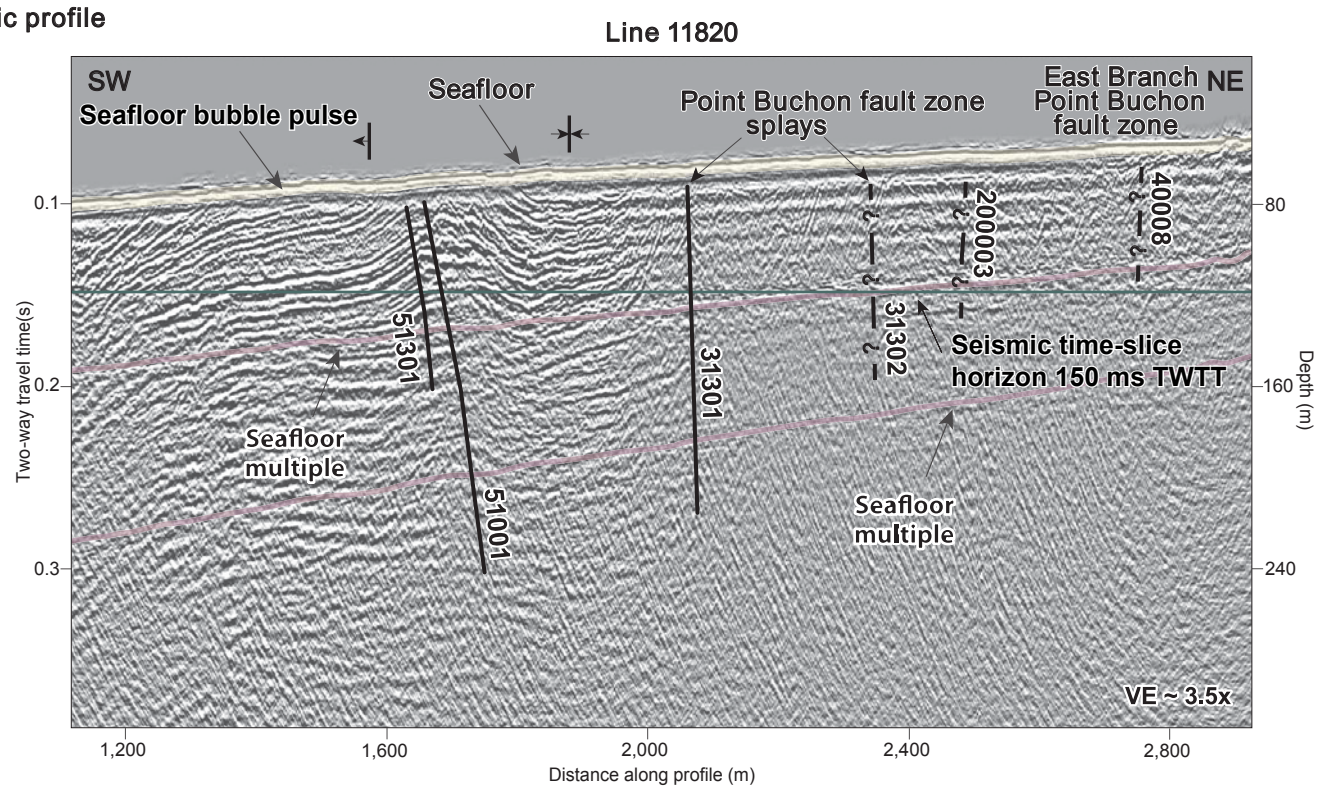
Pacific Gas and Electric Company | Figure **6-7**

File path: S:\13800\13838\13838.002\Figures\20120210_SITA\iFigure_0607.ai; Date: 07/17/2014; User: Serkan Bozkurt, LCI

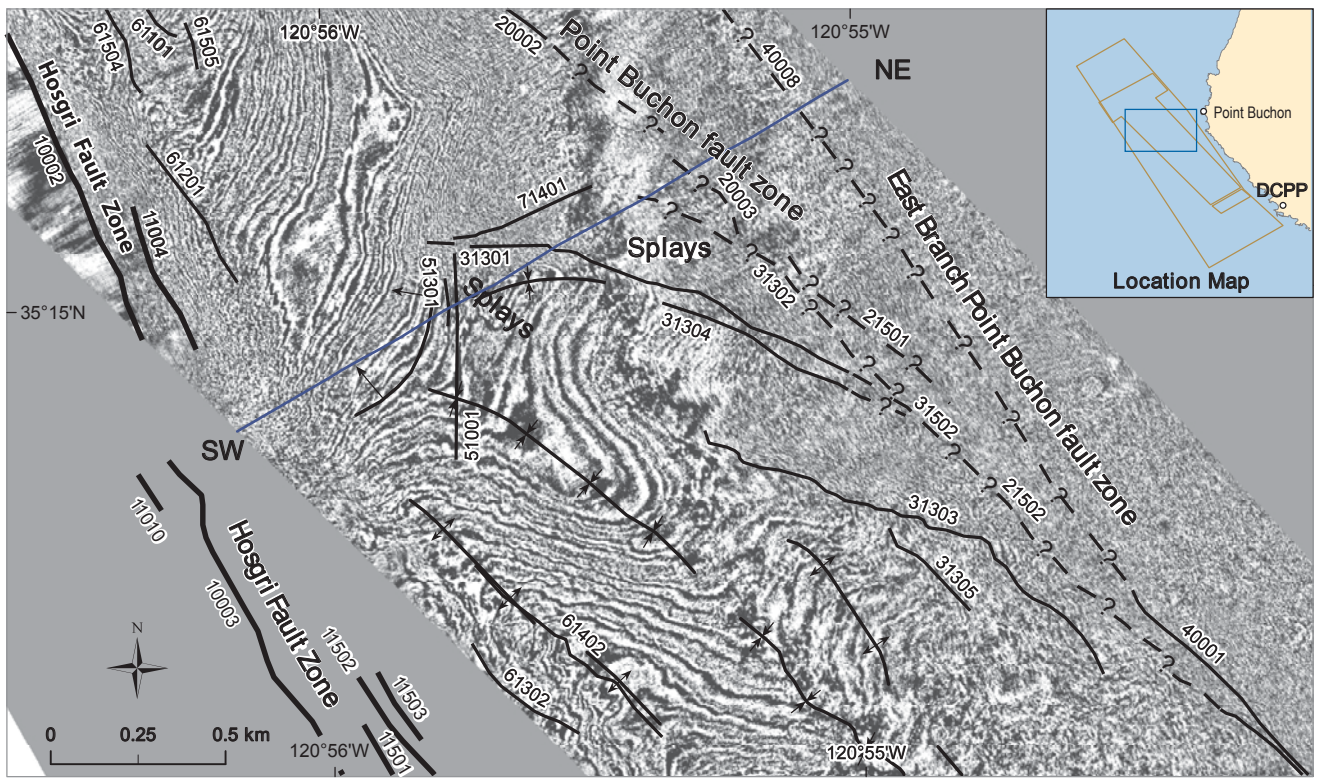
(a) Uninterpreted seismic profile



(b) Interpreted seismic profile



(c) Location map



Explanation

- Location of seismic profile shown on Plate 3b
- Time slice horizon
- Faults, solid where well located, dashed where inferred or approximately located, queried where uncertain, dotted where buried by more than 20 milliseconds of undeformed strata
- Amplitude: High / Low
- Syncline
- Anticline
- Monocline

N

Note: Depth values on seismic profile assume a velocity of 1,600 m/s.

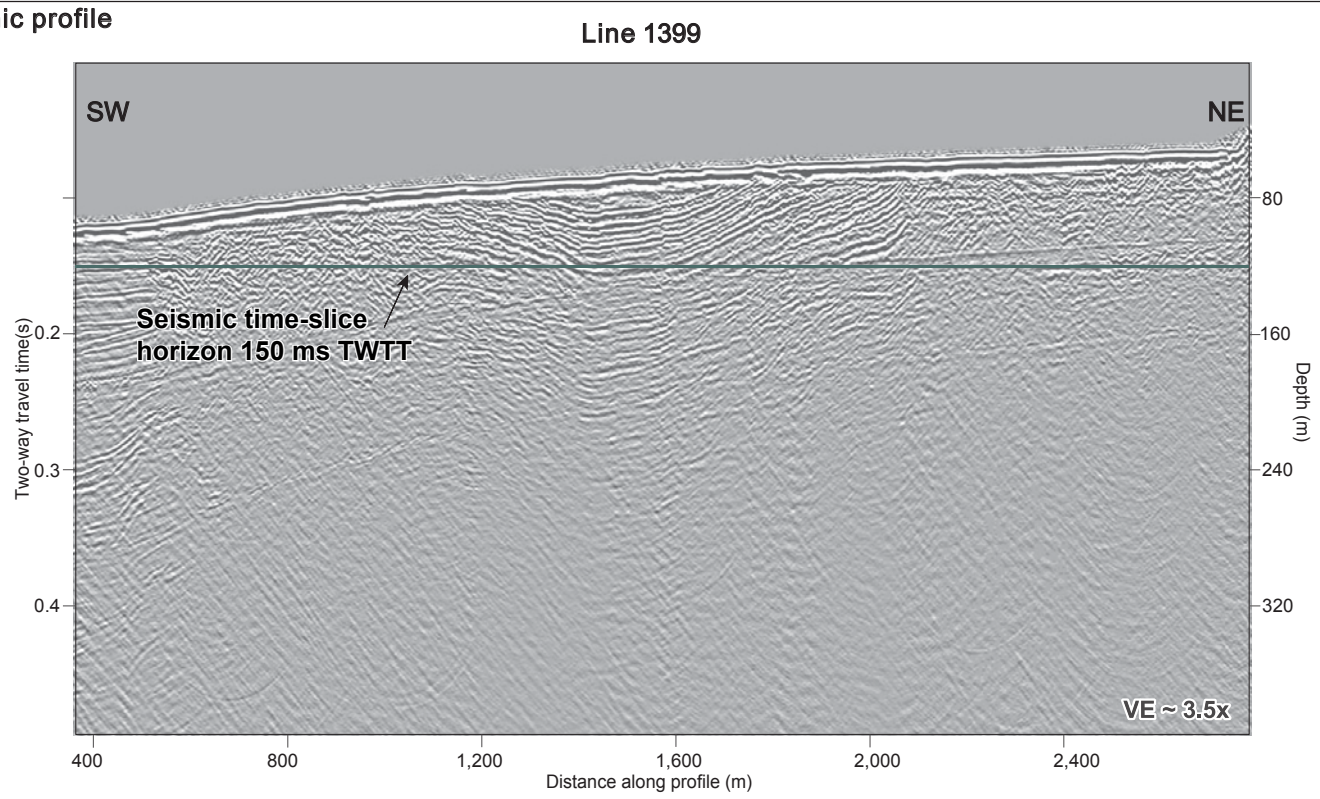
Structure Associated with Northern Part of Point Buchon Fault Zone Shown in (a, b) 3D Seismic-Reflection Profile 11820 and (c) Amplitude Time Slice at 150 ms (TWTT)

DCPP 3D/2D Seismic-Reflection Investigation

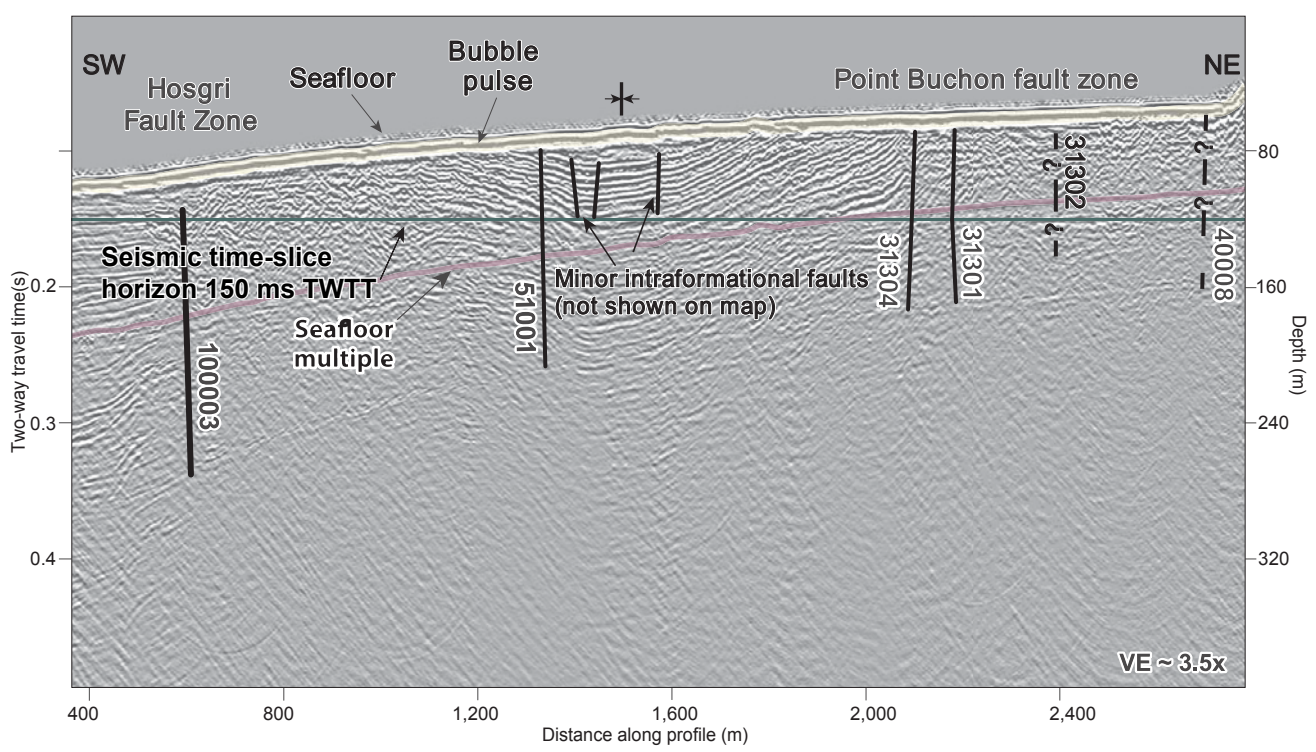
Pacific Gas and Electric Company | Figure **6-8**

File path: S:\13800\13838\13838.002\Figures\20120210_SITA\Figure_0608.ai; Date: 07/17/2014; User: Serkan Bozkurt, LCI

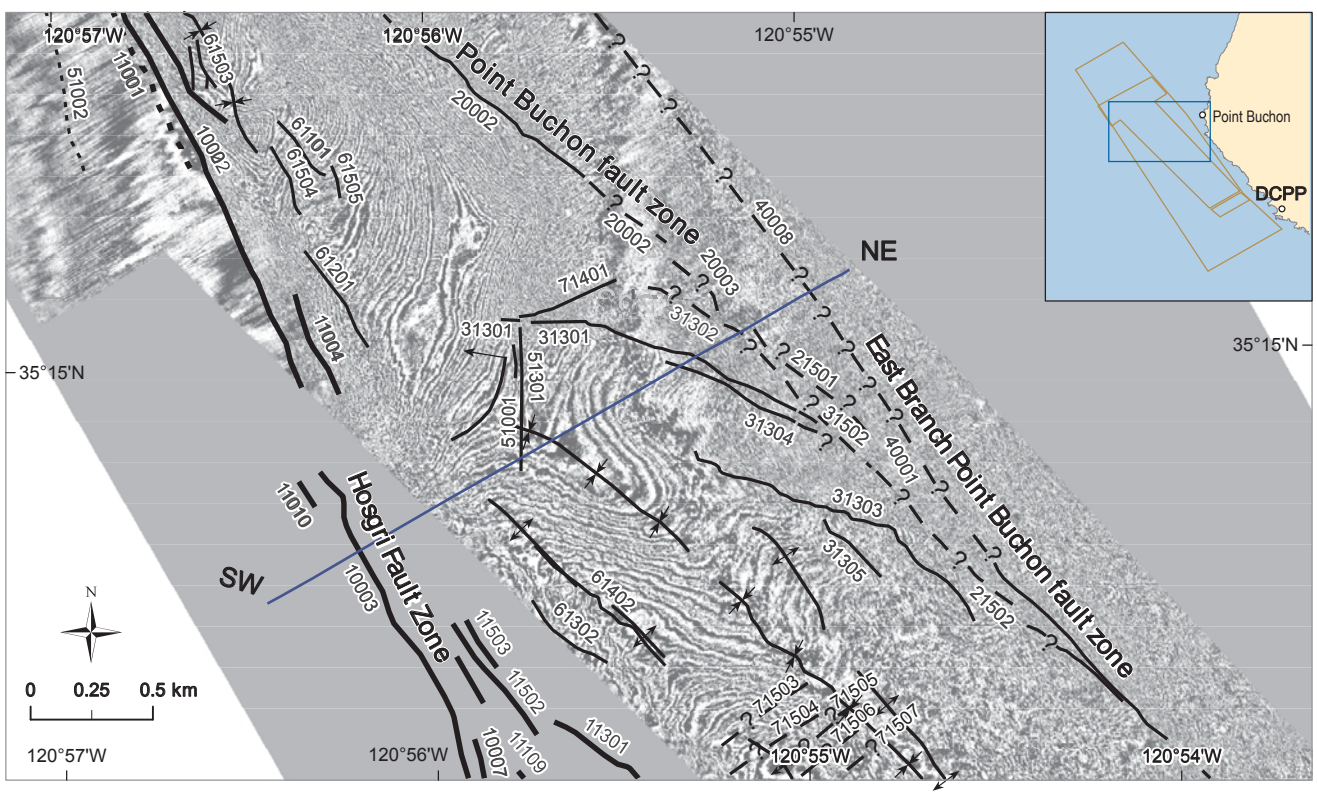
(a) Uninterpreted seismic profile



(b) Interpreted seismic profile



(c) Location map



EXPLANATION

- Location of seismic profile shown on Plate 3b
- Time slice horizon
- Faults, solid where well located, dashed where inferred or approximately located, queried where uncertain, dotted where buried by more than 20 milliseconds of undeformed strata
- Amplitude: High / Low
- Syncline
- Anticline
- Monocline

Note: Depth values on seismic profile assume a velocity of 1,600 m/s.

Principal Structural Elements in Northern Part of Study Area Showing Faults and Folds in (a, b) 2D Seismic-Reflection Profile 1399 and on (c) Amplitude Time-Slice Map at 150 ms (TWTT)

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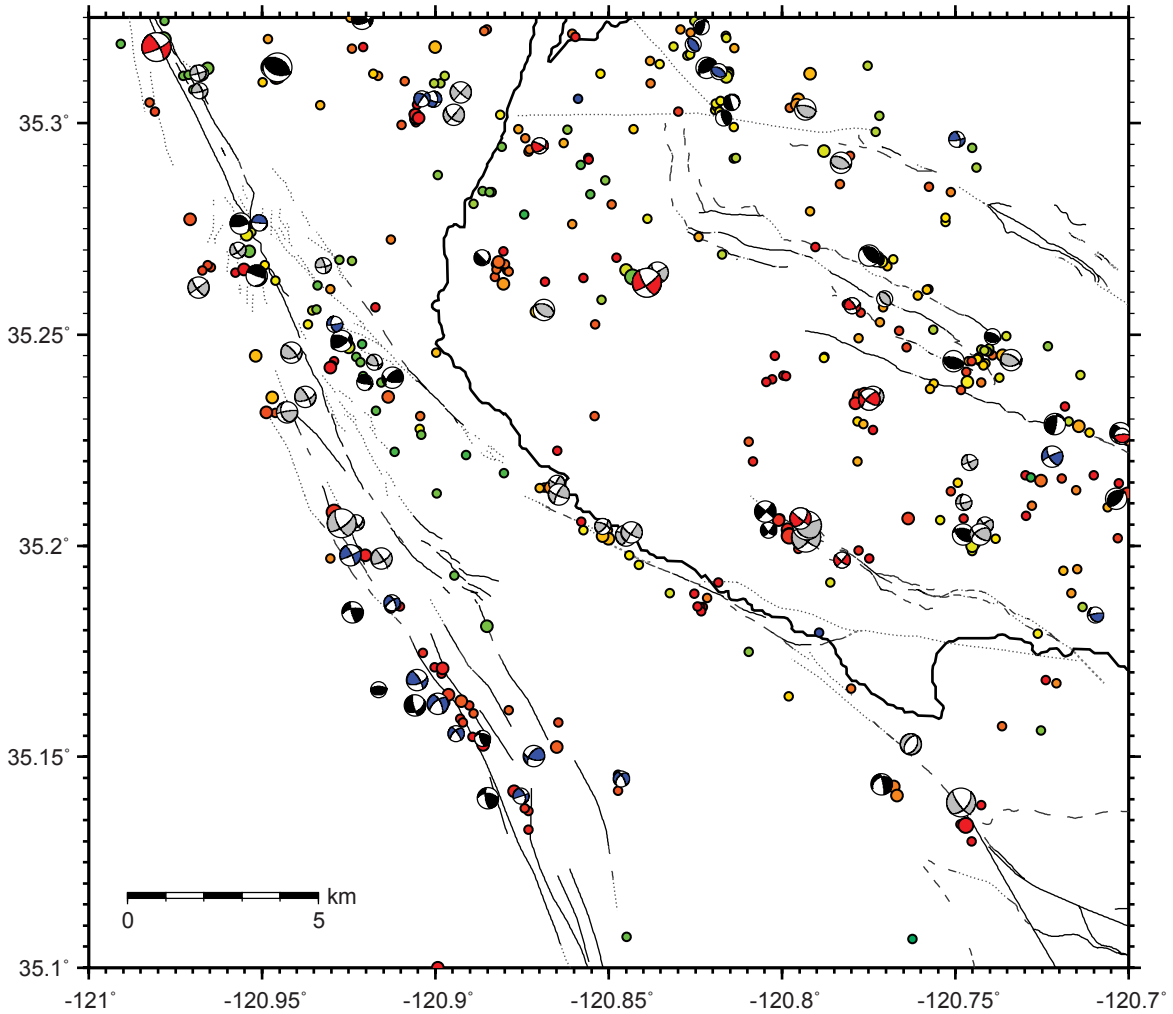
File path: S:\13800\13838\13838.002\Figures\20120210_SITA\Figure_0609.ai; Date: 07/17/2014; User: Serkan Bozkurt, LCI



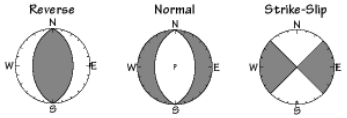
EXPLANATION

Earthquakes

magnitude
- < 2.0
- 2.0 - 2.99
- 3.0 - 3.99

depth
0 2 4 6 8 10 12 14 16 18
km

Focal Mechanisms
- <2.0
- 2.0 - 2.9
- 3.0 - 3.9
- Hash Quality A,B,C Hardebeck, 2010 (HASH; Hardebeck and Shearer, 2002)
- Hash Quality D Hardebeck, 2010 (HASH; Hardebeck and Shearer, 2002)
- FPFIT NCEDC, 2010 (FPFIT; Reasenberg and Oppenheimer, 1985)
- FPFIT NCEDC, 2010 to 2014 (FPFIT; Reasenberg and Oppenheimer, 1985)



Seismicity and Focal Mechanisms in the Study Area

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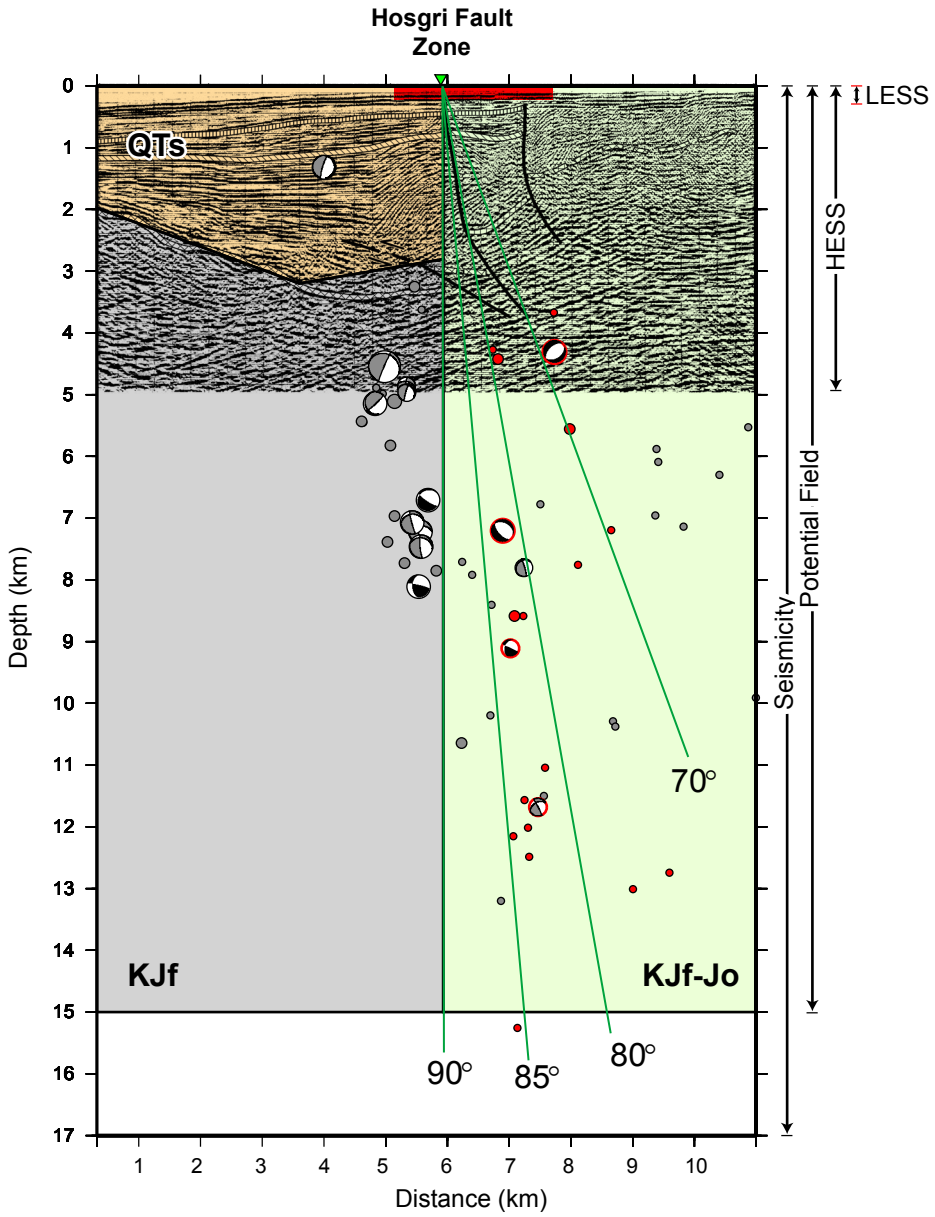
Figure **6-10**

File path: S:\13800\13838\13838.002\Figures\20120210_SITA\Figure_0610.ai; Date: 07/18/2014; User: Serkan Bozkurt, LCI



EXPLANATION

- QTs: Quaternary-Tertiary sedimentary rocks
- KJf: Cretaceous-Jurassic Franciscan Complex
- KJf-Jo: Cretaceous-Jurassic Franciscan Complex-Jurassic ophiolites

Notes: Earthquake relocations from Hardebeck (2010). Possible Hosgri fault zone dip angles are shown. Focal mechanisms are from 1-D (FPFIT) and 3-D (HASH) locations. Focal Mechanism symbols are associated with adjacent earthquake locations.

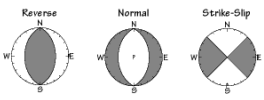
Focal Mechanisms

- <2.0
- 2.0 - 2.9
- 3.0 - 3.9

Magnitudes

- < 2.0
- 2.0 - 2.99
- 3.0 - 3.99

- Hash Quality A,B,C — Hardebeck, 2010 (HASH; Hardebeck and Shearer, 2002)
- Hash Quality D — Hardebeck, 2010 (HASH; Hardebeck and Shearer, 2002)
- FPFIT — NCEDC, 2010 (Reasenberg and Oppenheimer, 1985)



Seismicity in Relation to Depth of 3D/2D Seismc Reflection and Potential Field Imaging

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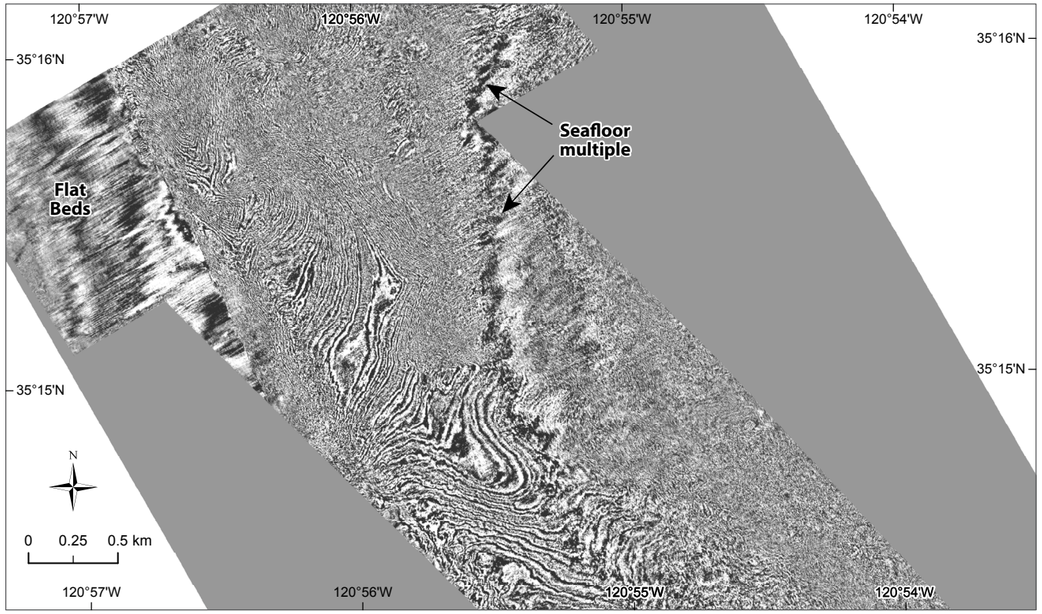
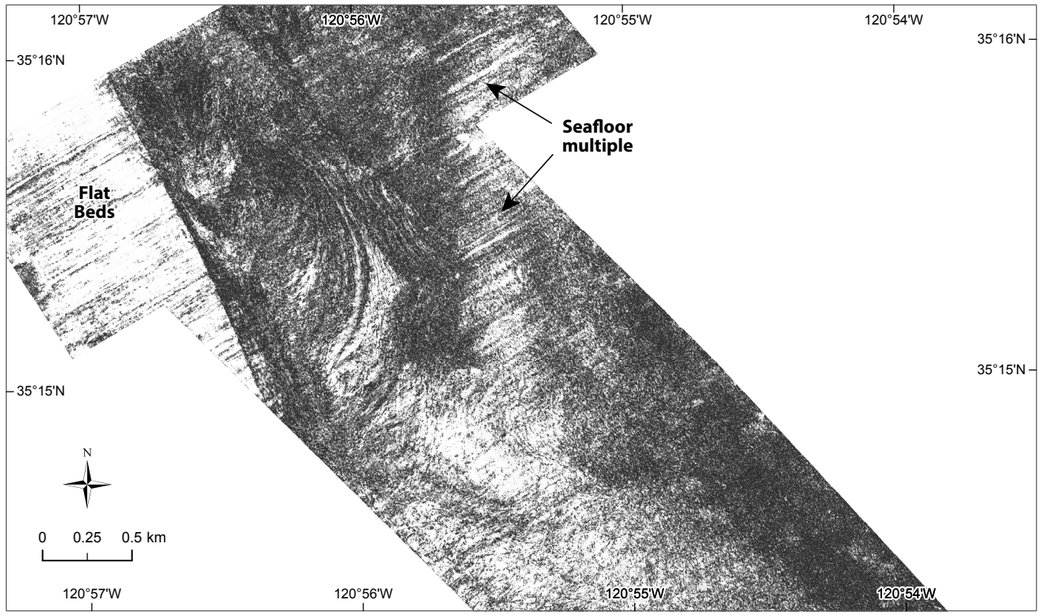
Figure **7-1**

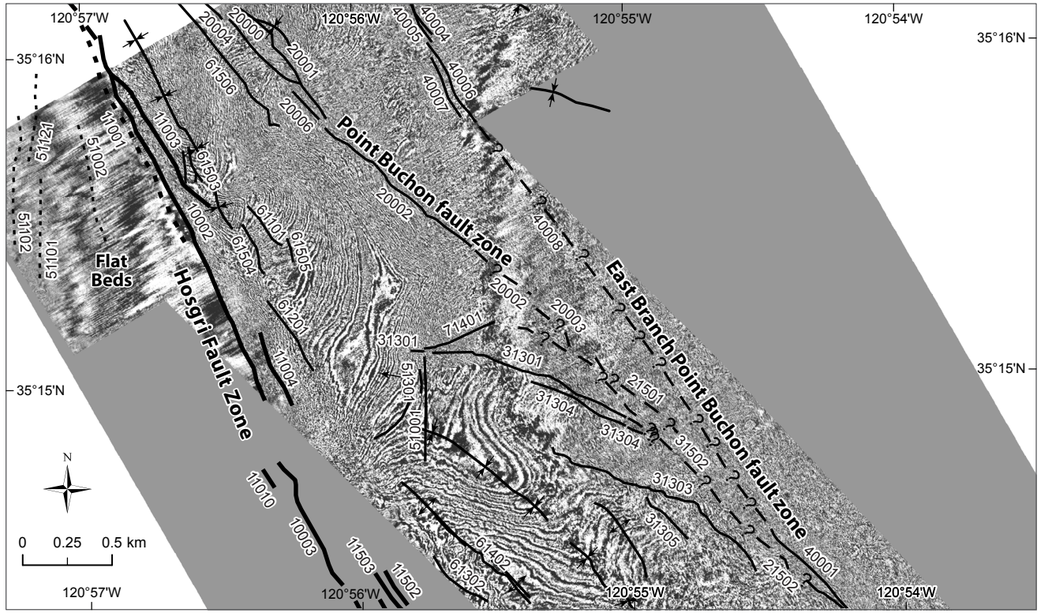
(a) Uninterpreted Amplitude



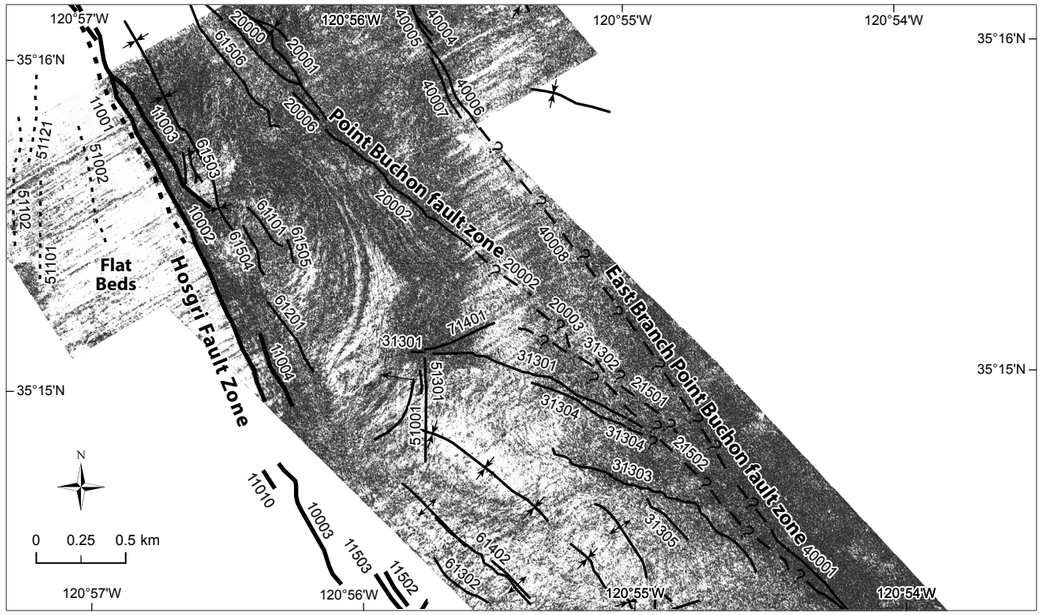
(b) Uninterpreted Similarity



(c) Interpreted Amplitude



(d) Interpreted Similarity



Map projections: UTM Zone 10N, WGS 84

EXPLANATION

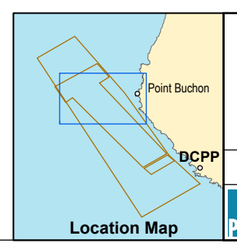
Faults, soild where well located, dashed where inferred or approximately located, queried where uncertain, dotted where buried by more than 20 milliseconds of undeformed strata

Syncline

Anticline

Monocline

Amplitude: High / Low



Comparison of Amplitude and Similarity Time Slices at 150 ms Showing Uninterpreted Data (a and b) and Interpreted Maps (c and d)

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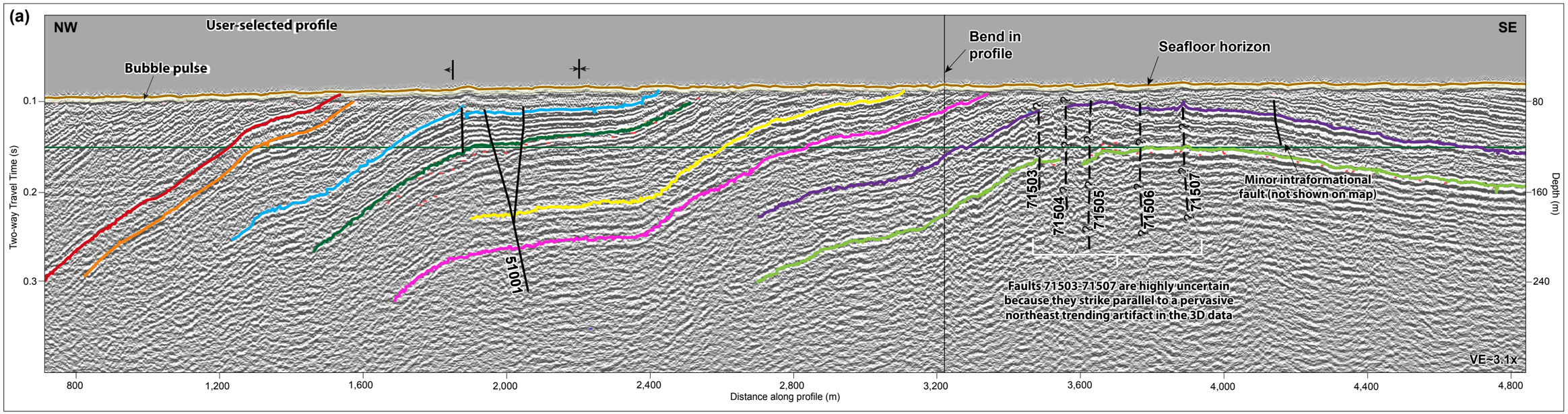
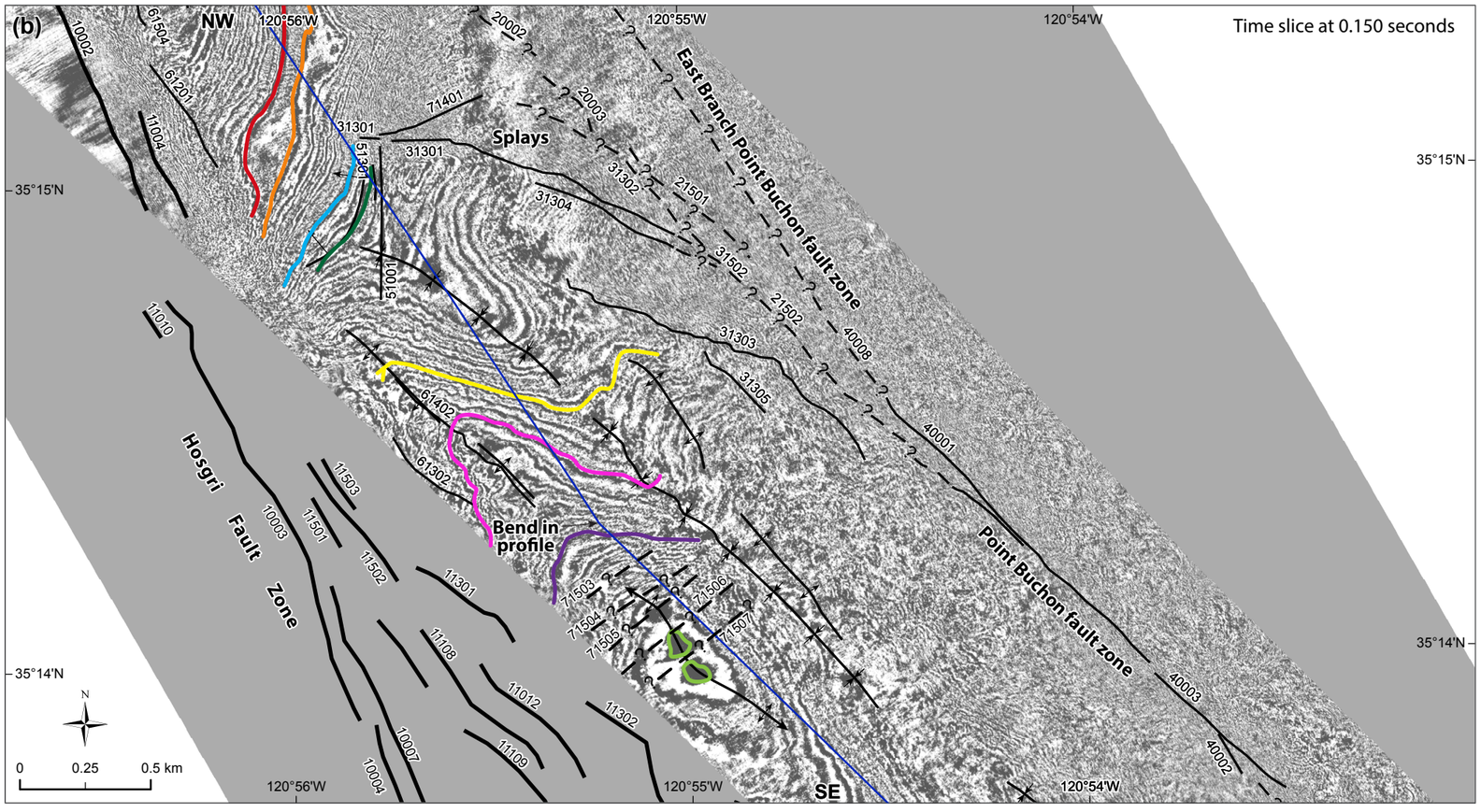
Foldout **A**

File path: S:\138001\13838\13838.002\Figures\20120210_SITA\Foldout_A.ai; Date: 07/17/2014; User: Serkan Bozkurt, LCI





EXPLANATION

- Location of seismic profile shown on Plate 3b
- Time slice horizon
- Faults, solid where well located, dashed where inferred or approximately located, queried where uncertain, dotted where buried by more than 20 milliseconds of undeformed strata

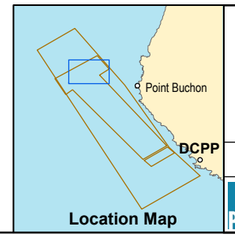
Horizon Name

- H05A
- H05B
- H15
- H20
- H25
- H30
- H35
- H40

- Monocline
- Anticline
- Syncline

Amplitude: High / Low

Note: Depth values on seismic profile assume a velocity of 1,600 m/s.



Marker Horizons Identified in (a) User-Selected 3D Strike Line and (b) Mapped on Amplitude Time Slice at 150 ms (TWTT)

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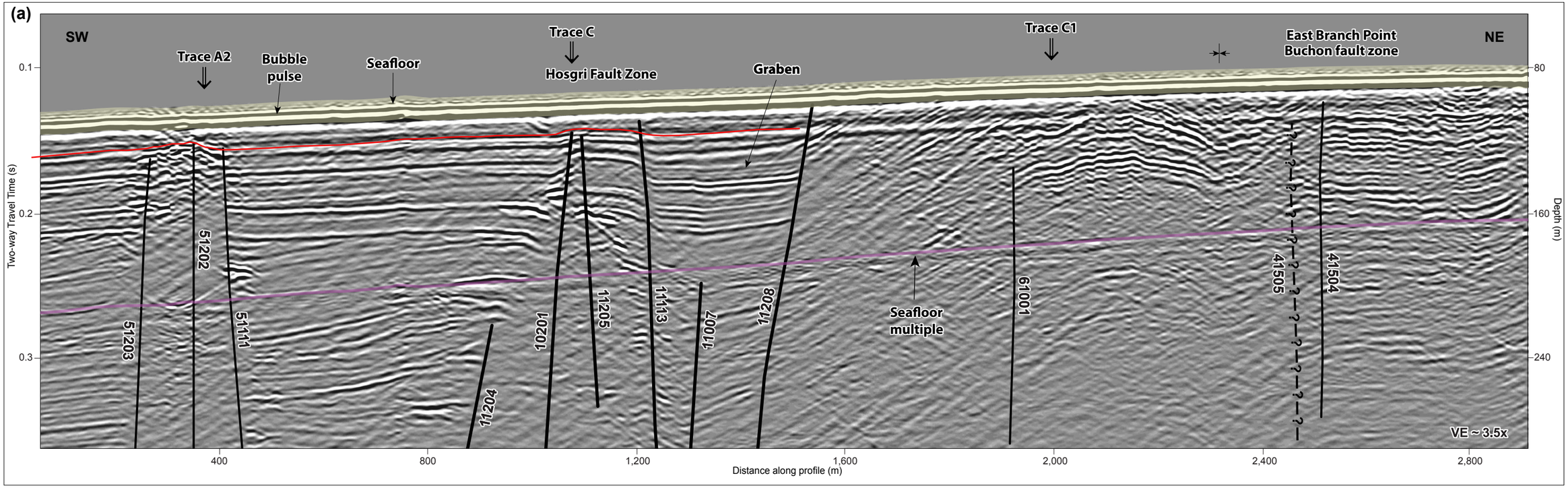
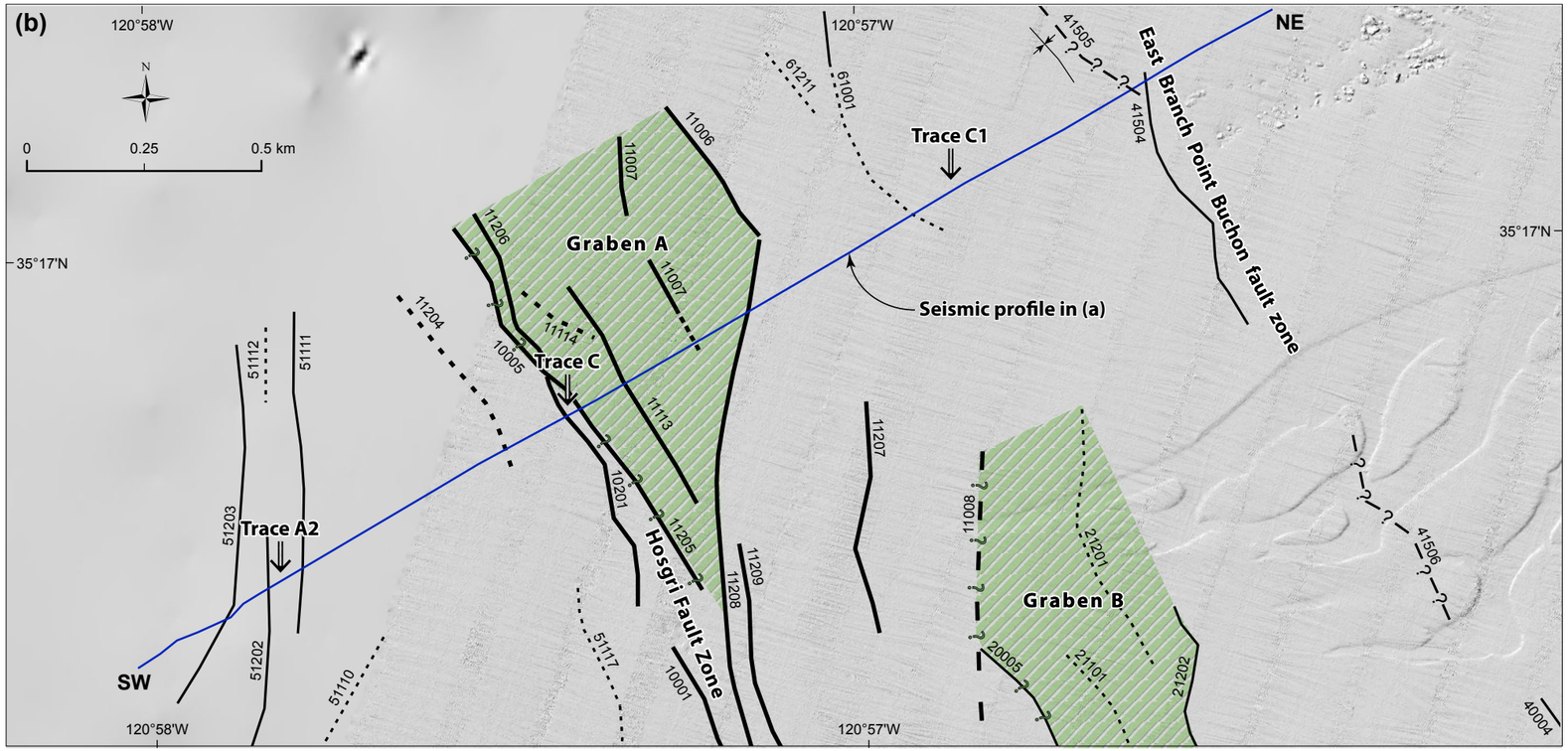
Foldout **B**

File path: S:\138000\138381\13838.002\Figures\20120210_SITA\Foldout_B.ai; Date: 07/17/2014; User: Serkan Bozkurt, LCI

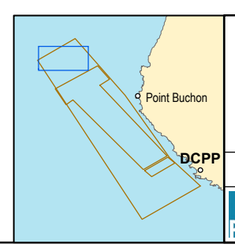




EXPLANATION

- Location of seismic profile as shown on Plate 3b
- Shallow unconformity described in text
- Faults, solid where well located, dashed where inferred or approximately located, queried where uncertain, dotted where buried by more than 20 milliseconds of undeformed strata
- Approximate location of Hosgri fault traces from PG&E (2011b)
- Graben, queried where full extent is uncertain
- Syncline
- Anticline
- Monocline
- Amplitude: High / Low

Note: Depth values on seismic profile assume a velocity of 1,600 m/s.



Graben Associated with Hosgri Fault Zone: (a) 2D Seismic-Reflection Profile 1039 Showing Fault Boundaries and Sediment Fill and (b) Map View Showing Faults, Graben, and MBES Bathymetry

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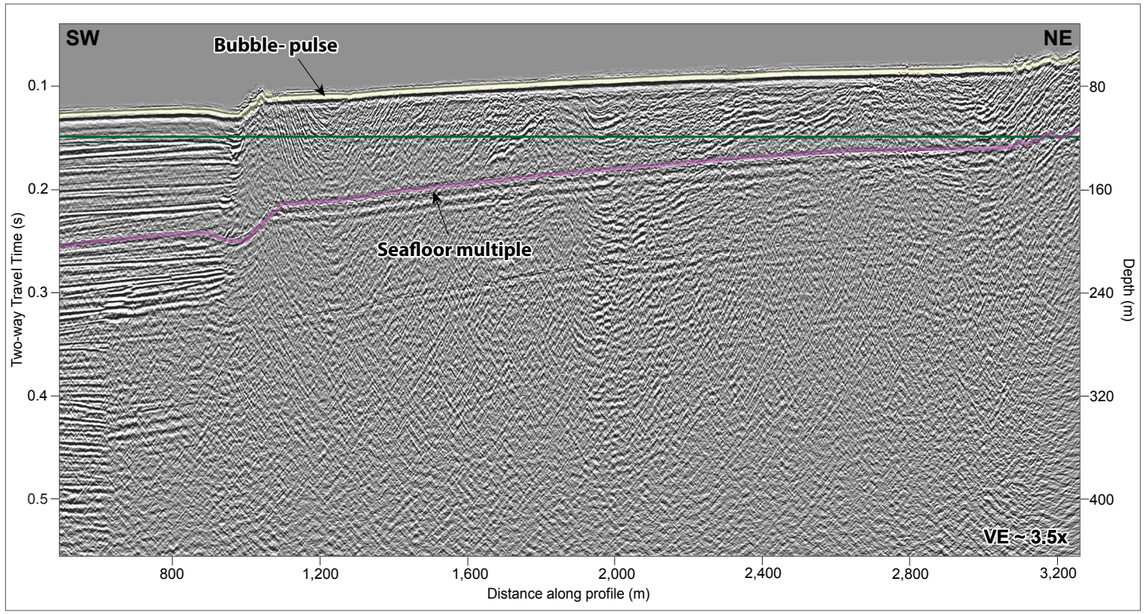
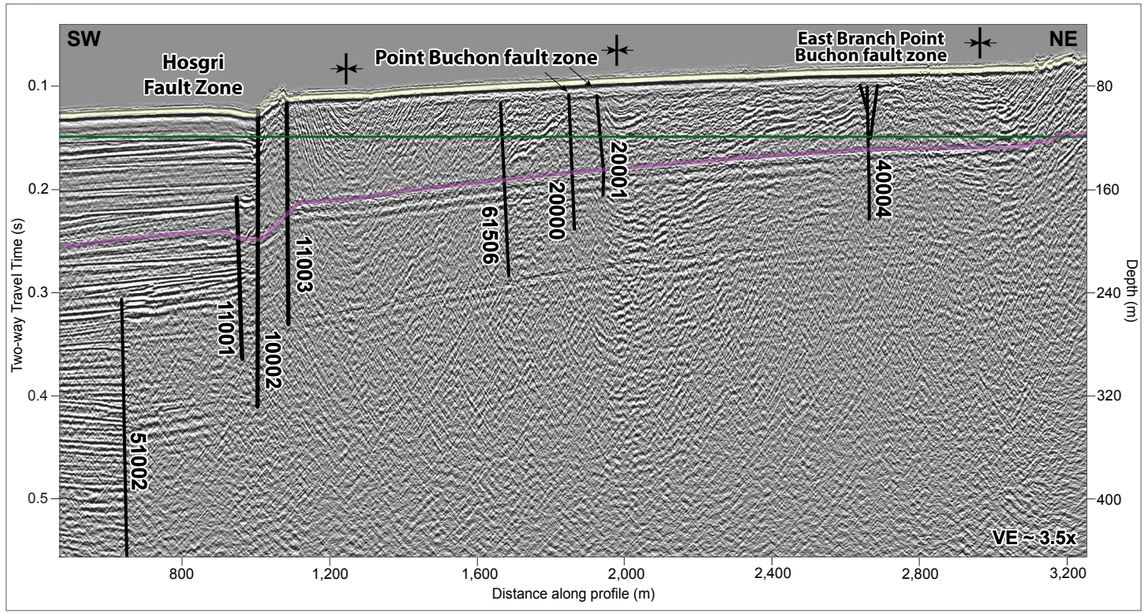
Foldout **C**

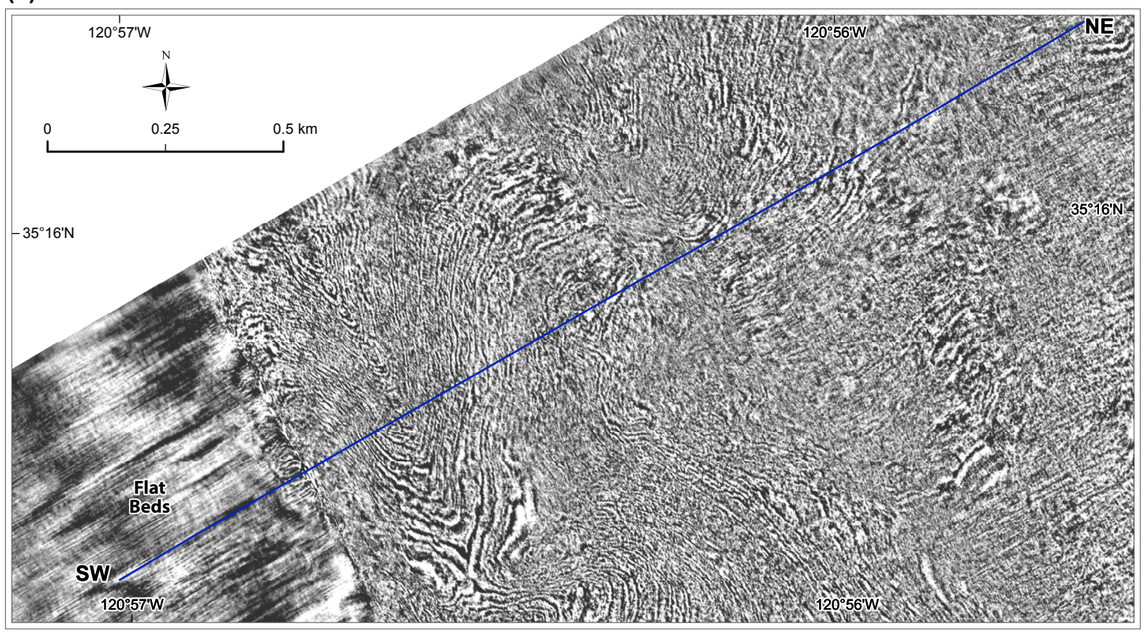
(a) Uninterpreted



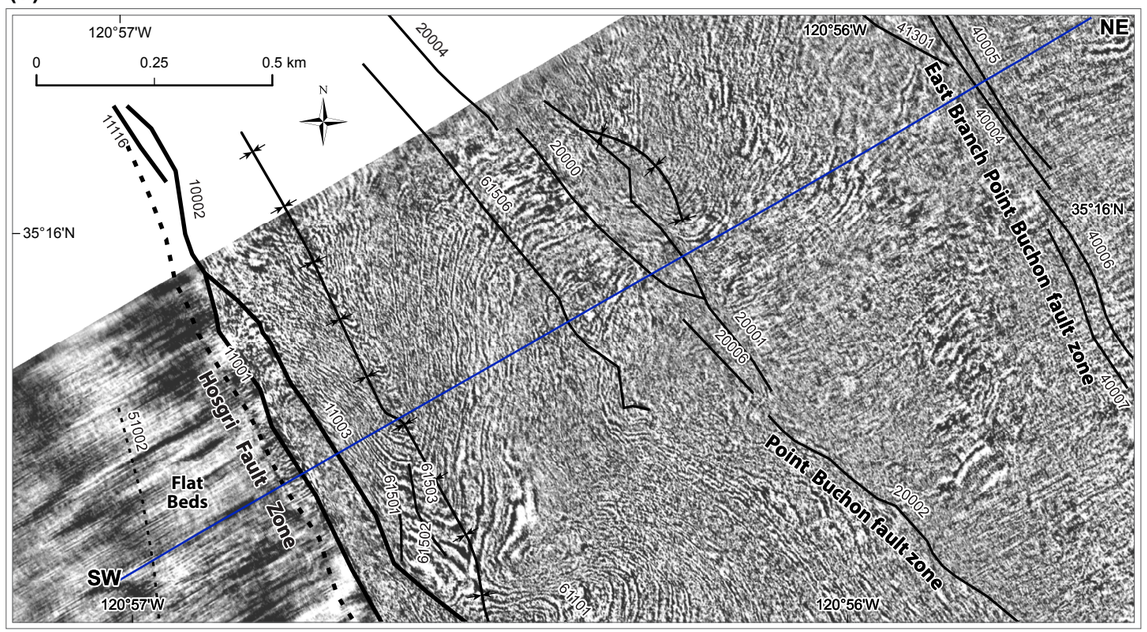
(b) Interpreted



(c)



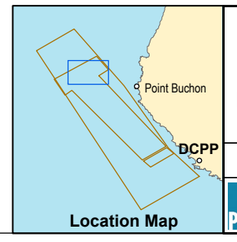
(d)



EXPLANATION

- Location of seismic profile shown on Plate 3b
- Faults, solid where well located, dashed where inferred or approximately located, queried where uncertain, dotted where buried by more than 20 milliseconds of undeformed strata
- Time slice horizon
- Anticline
- Syncline
- Amplitude: High / Low

Notes:
- Depth values on seismic profile assume a velocity of 1600 m/sec.
- Map projections: UTM Zone 10N, WGS 84



Relationship of the Hosgri and Point Buchon Fault Zones in Northern Part of Survey Area: (a) Uninterpreted and (b) Interpreted 3D Profile 11200; (c) Uninterpreted and (d) Interpreted Amplitude Time Slice at 150 ms (TWTT)

DCPP 3D/2D Seismic-Reflection Investigation

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