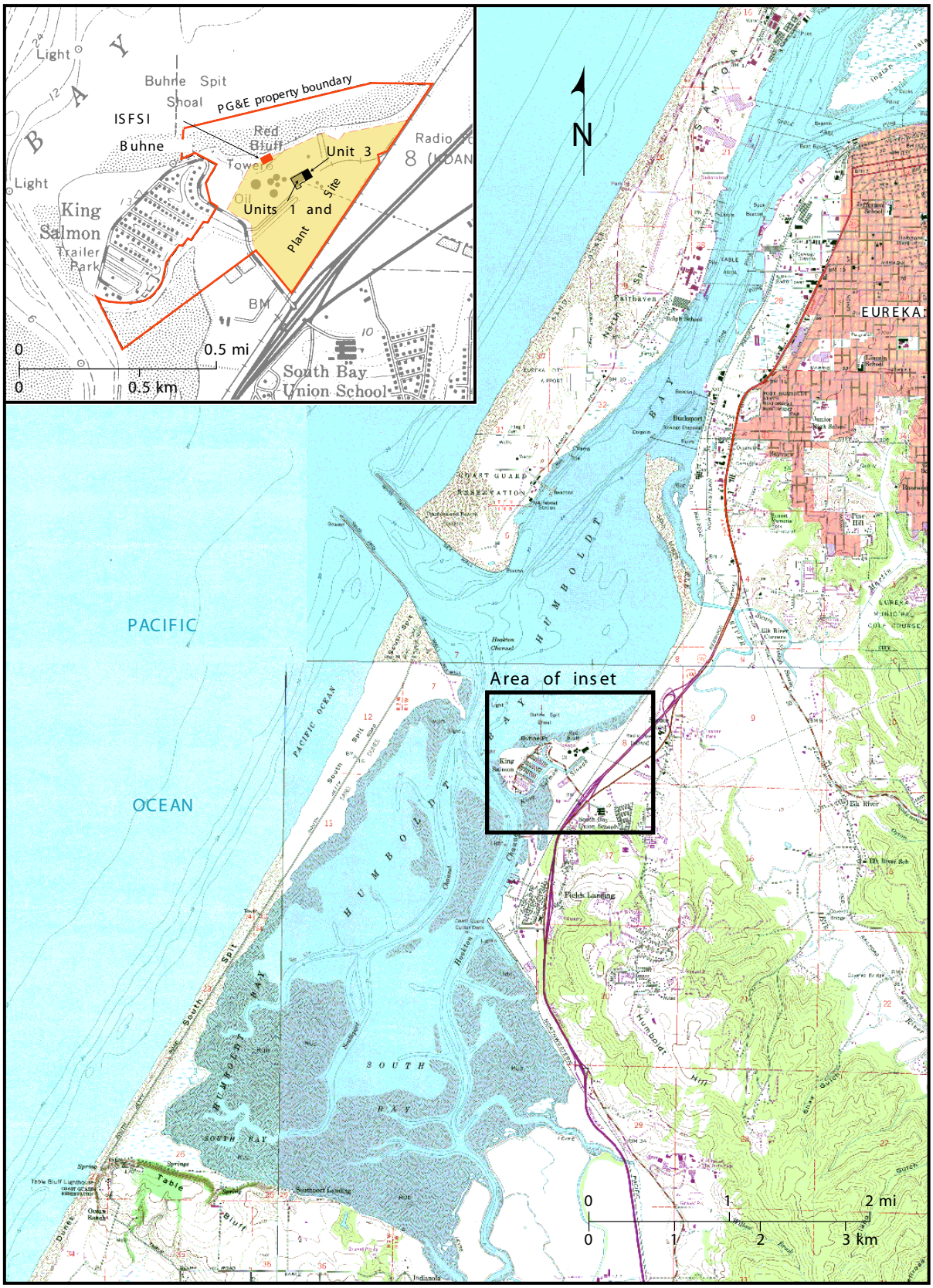

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HUMBOLDT BAY ISFSI
FIGURE 2.6-1 TOPOGRAPHIC MAP OF HUMBOLDT BAY SHOWING LOCATION OF THE HUMBOLDT BAY ISFSI SITE

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HUMBOLDT BAY ISFSI
FIGURE 2.6-2 SOUTH HUMBOLDT BAY VIEW IS SOUTHEAST

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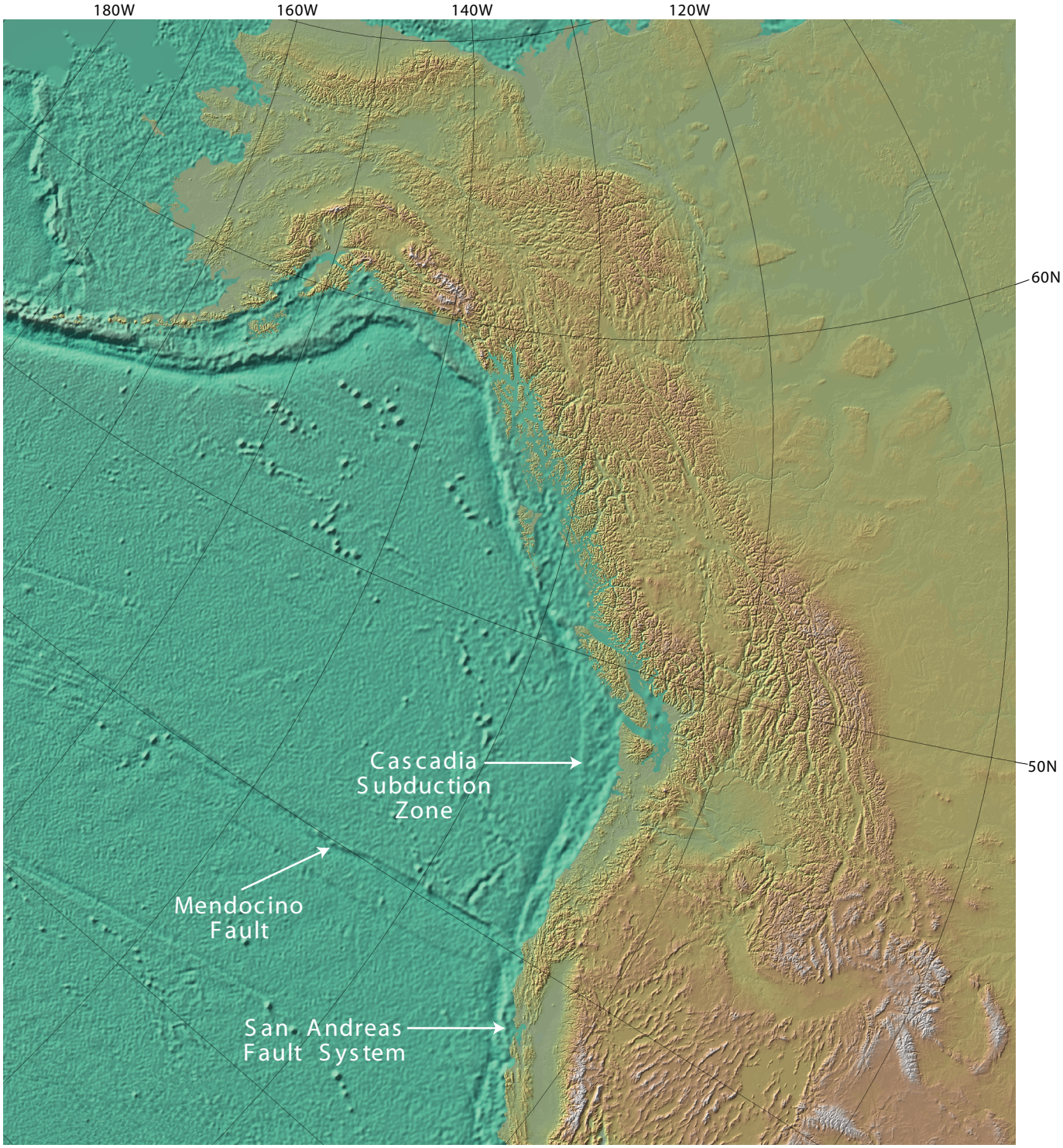

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FIGURE 2.6-3
Color shaded-relief map (oblique Mercator projection) of the Cascadia subduction zone along the northwest coast of the United States and Canada (from R.A. Haugerud, 1998, USGS Open-File Report 98-140).

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HUMBOLDT ISFSI
FIGURE 2.6-4

General plate tectonic setting of the western United States. Humboldt Bay and the proposed ISFSI site are on the western edge of the North American plate, at the north edge of the Mendocino triple junction region. Three plate-bounding fault zones, the San Andreas and Mendocino transform fault zones and the Cascadia subduction zone, intersect at the triple junction. Cross section A-A' is shown on Figure 2.6-10b.

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FIGURE 2.6-5 TECTONIC EVOLUTION OF THE WEST COAST UNITED STATES DURING PAST 50 MILLION YEARS (FROM NATIONAL GEOGRAPHIC SOCIETY, 1995)

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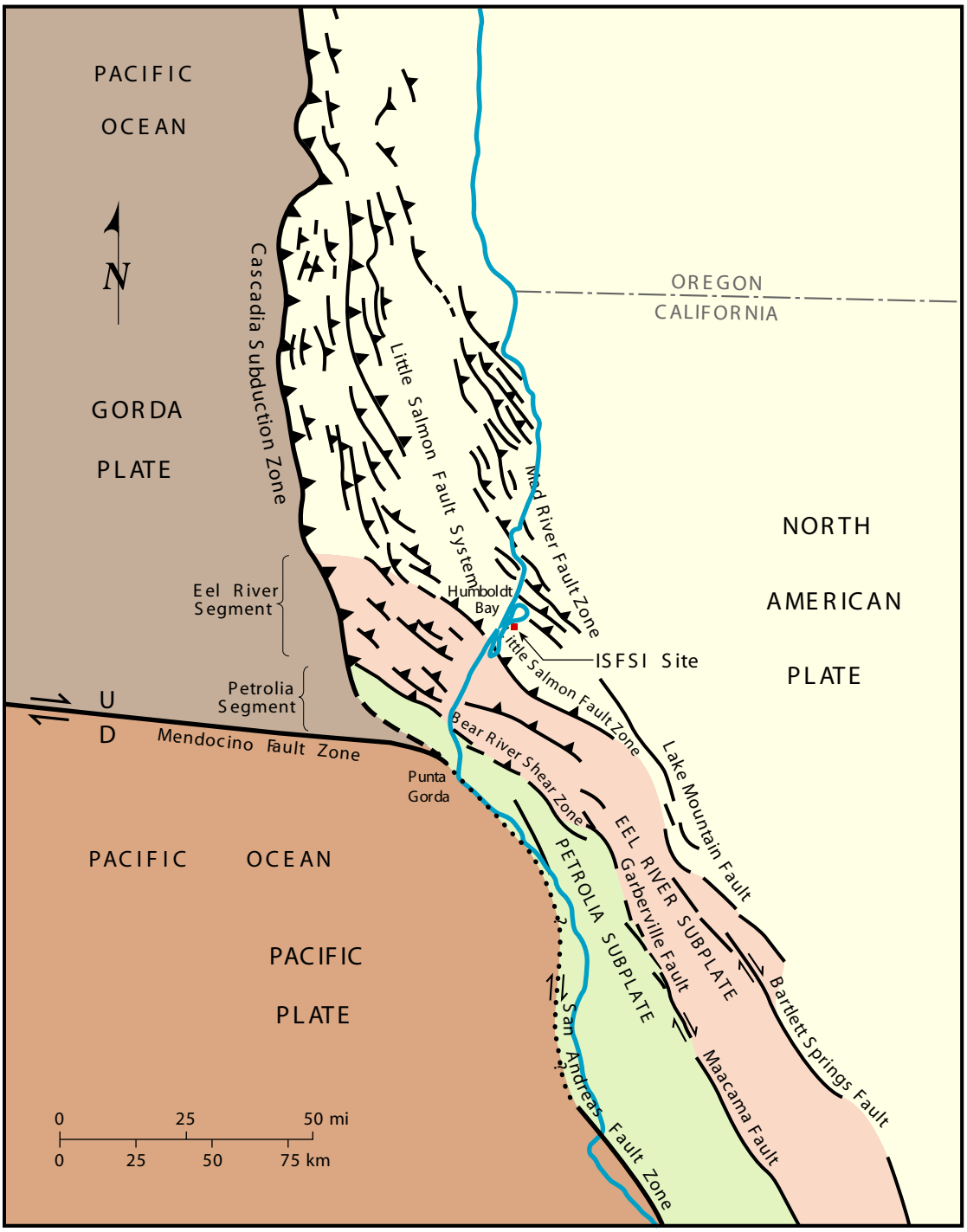

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FIGURE 2.6-6 MAP OF SUBPLATES IN THE NORTH AMERICAN PLATE AND MAJOR FAULTS IN NORTHWESTERN CALIFORNIA

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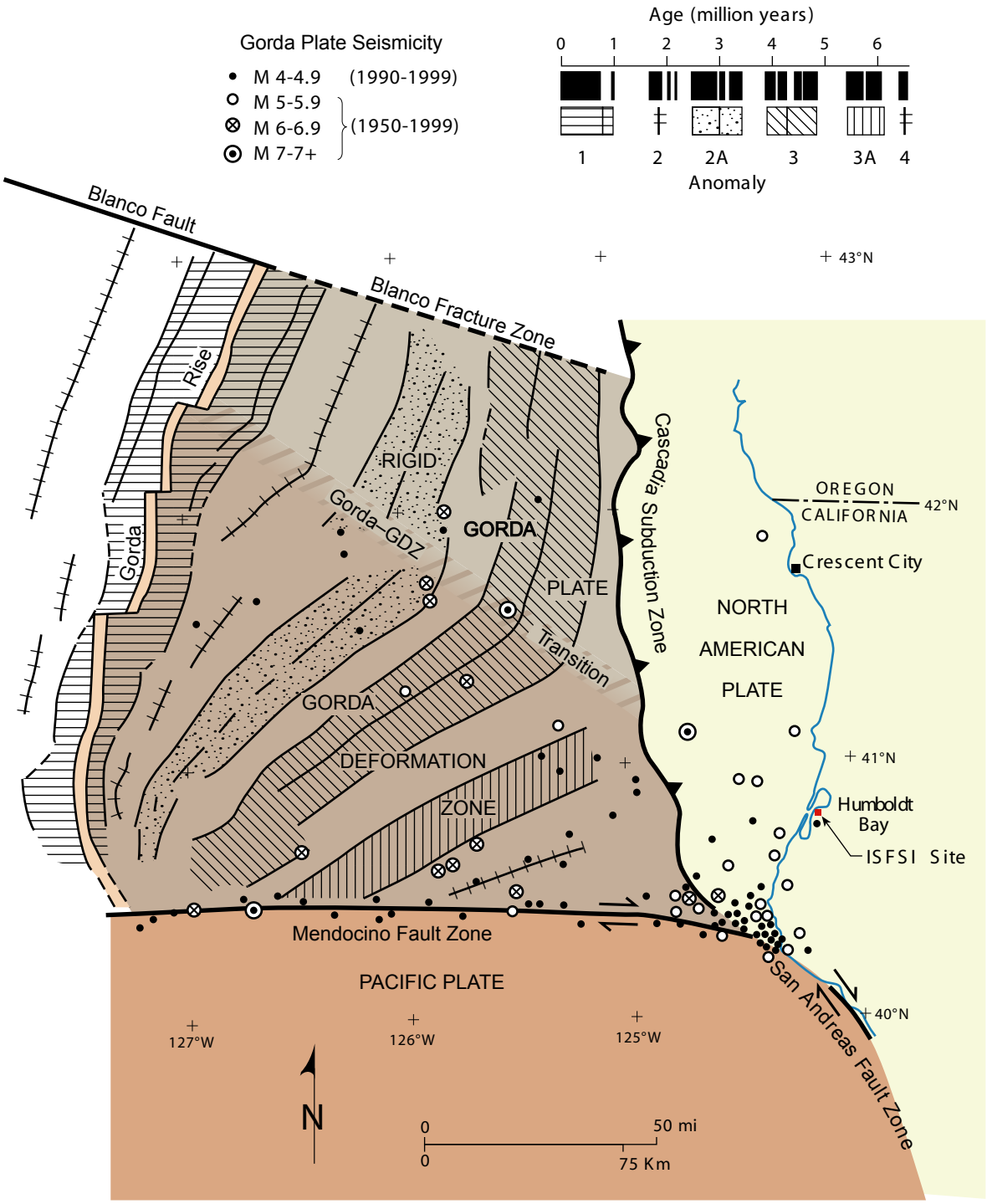

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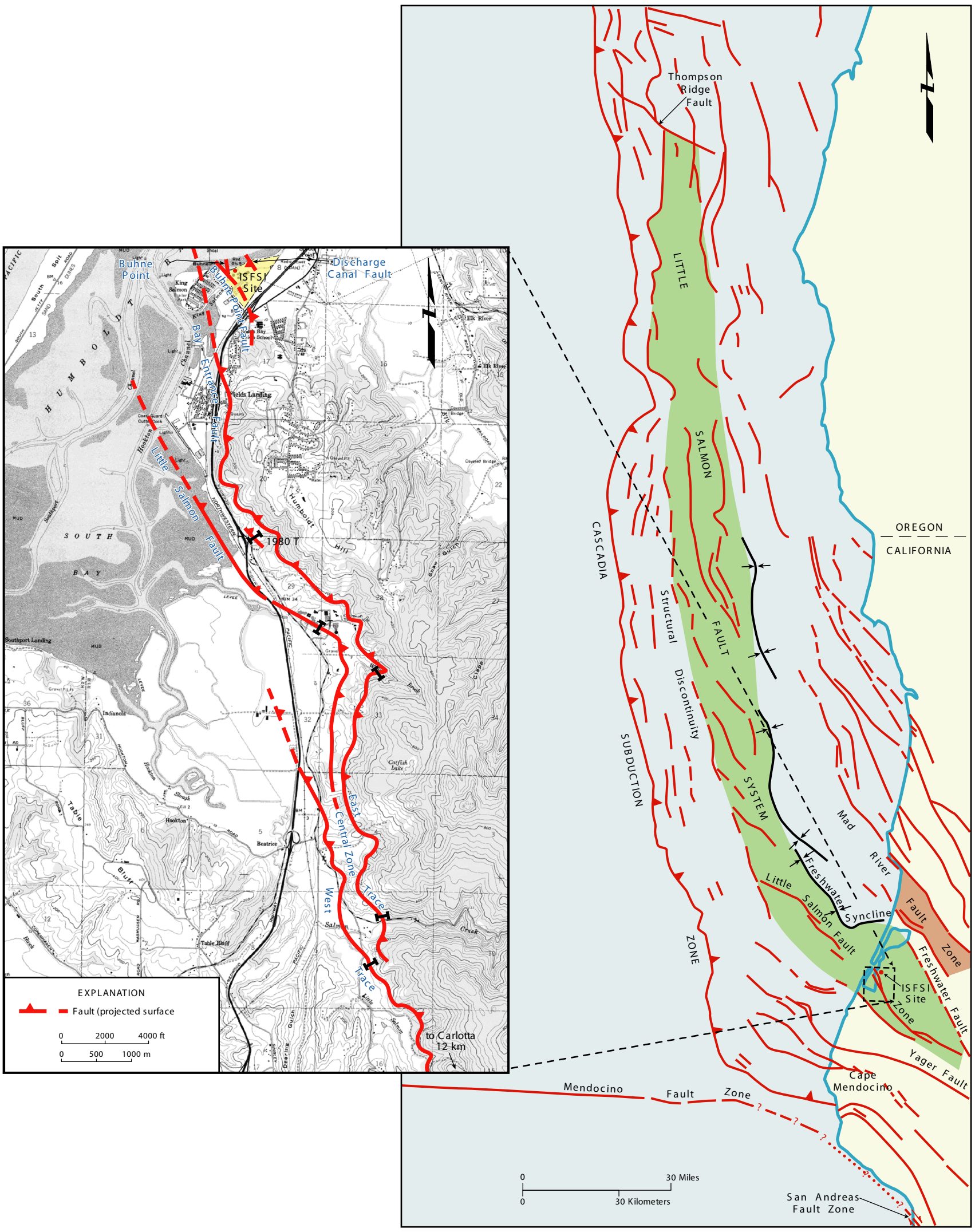
FIGURE 2.6-7

Tectonics of the Gorda plate (Modified from Wilson, 1989, Figure 3). The deforming and seismically active southern part of the plate and the internally rigid northern part are separated by a narrow transition that strikes northwest and intersects the subduction zone a short distance northwest of Humboldt Bay.



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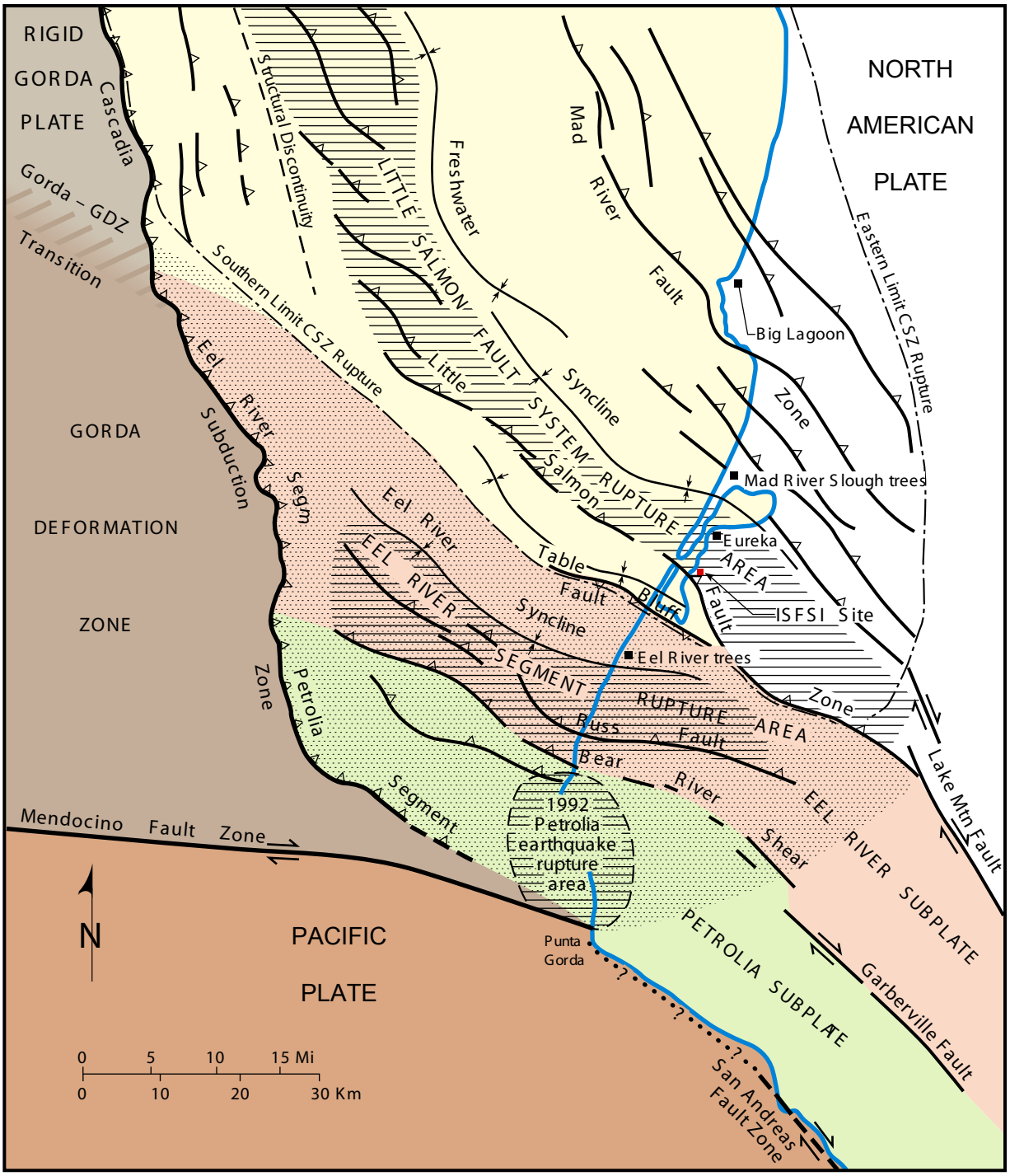
HUMBOLDT BAY ISFSI
FIGURE 2.6-8

Schematic maps showing the components of the Little Salmon fault system. The Little Salmon fault zone is part of a system of active folds and reverse faults, the Little Salmon fault system, which extends for 330 kilometers from its intersection with the Freshwater fault northwestward to its intersection with the Thompson Ridge fault off the coast of southern Oregon. The Little Salmon fault zone, which is the closest capable fault to the Humboldt Bay ISFSI site, is 95 kilometers long (including the offshore traces as mapped by Clarke (1992) and the Yager fault). The Little Salmon fault zone contains multiple subparallel surface traces. Near the Humboldt Bay ISFSI site, the Little Salmon fault zone includes two primary traces, the Little Salmon fault and the Bay Entrance fault, and three subsidiary faults in the hanging wall, the Buhne Point fault, the Buhne Point splay fault, and the Discharge Canal fault.



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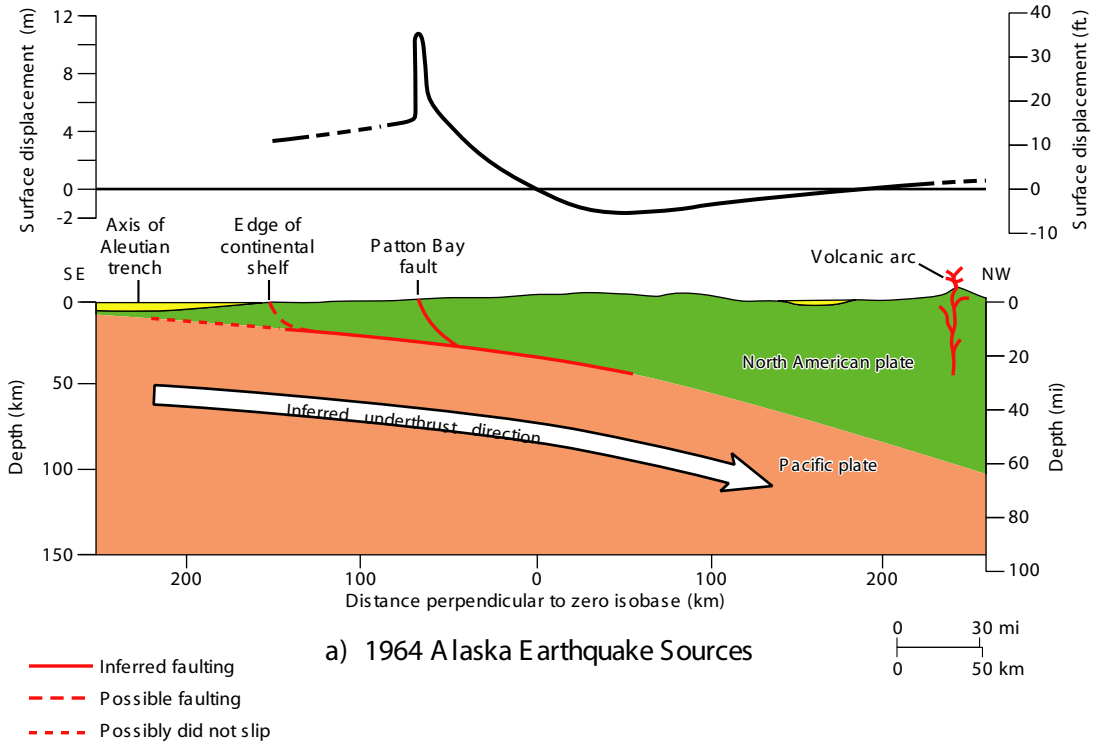
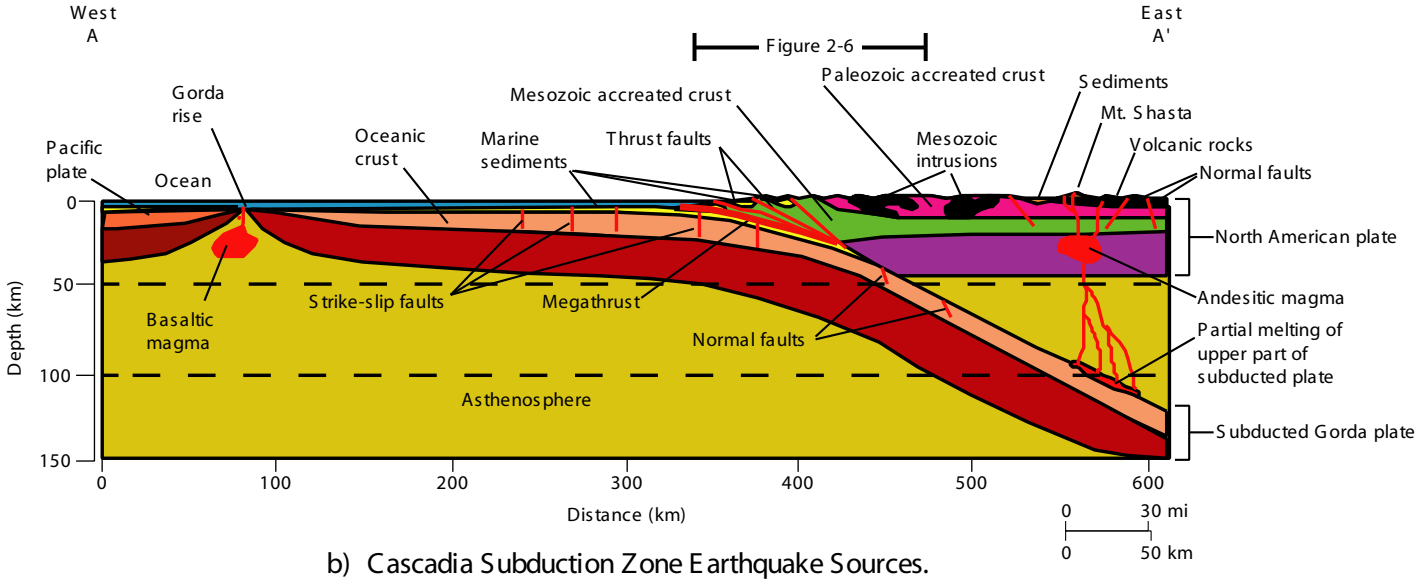
HUMBOLDT BAY ISFSI
FIGURE 2.6-9

Major active faults and known or inferred earthquake rupture areas (line pattern) in the Mendocino triple junction region (stippled area). Paleoseismic data indicate the Little Salmon fault system ruptured during a great Cascadia subduction zone (CSZ) event, which may have ruptured as far as the southern limit of the CSZ, 300 years ago, and that the Eel River segment ruptured independently less than 200 years ago.



a) 1964 Alaska Earthquake Sources



b) Cascadia Subduction Zone Earthquake Sources.
Location of cross section A-A' shown on Figure 2.6-4.

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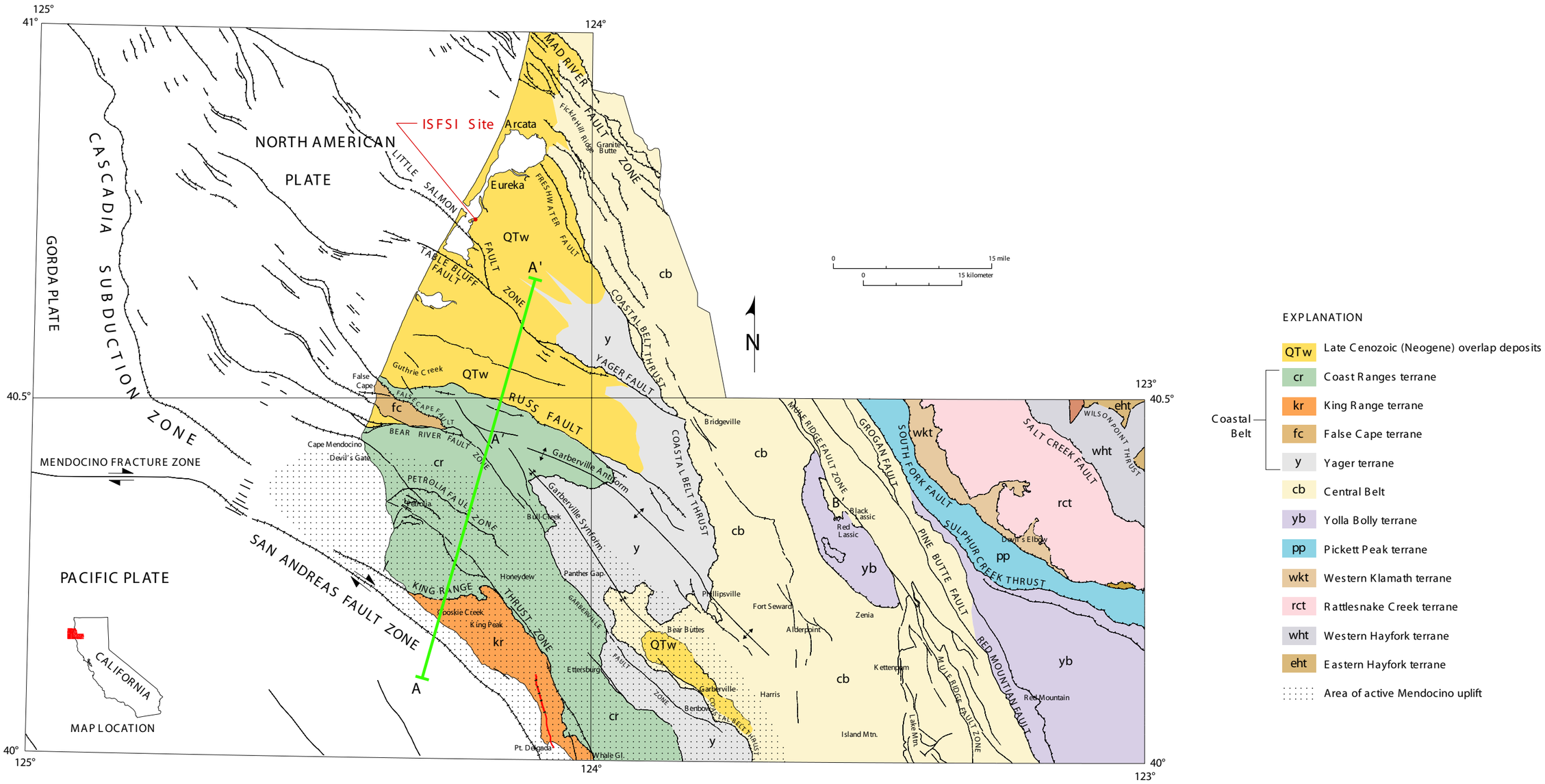
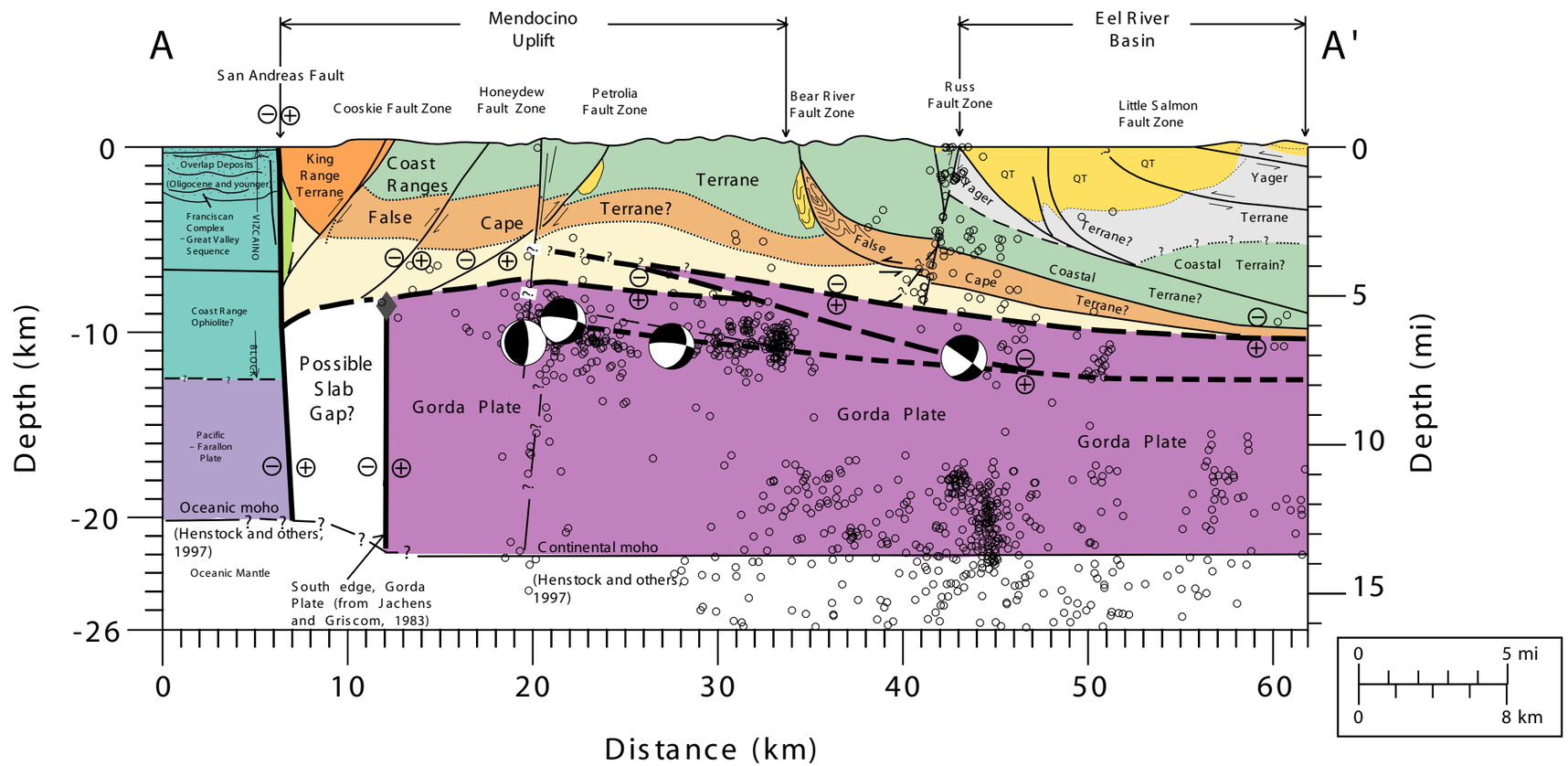
HUMBOLDT BAY ISFSI
FIGURE 2.6-10
Schematic cross section showing the suggested mechanisms for the 1964 Alaska earthquake (Plafker, 1972), and postulated Cascadia subduction zone earthquake sources.



FSAR UPDATE
HUMBOLDT BAY ISFSI
FIGURE 2.6-11

Generalized regional geologic map showing principal faults and folds, area of active Mendocino uplift (stippled pattern), and major plates (after McLaughlin and others, 2000). Cross section A-A' is shown on Figure 2.6-12. Details of faulting in the vicinity of Humboldt Bay area shown on Figures 2.6-13 and 2.6-18.



Notes:
Focal mechanisms are depicted as spheres viewed from the southeast; black sectors are tensional, white sectors compressional. Location data and focal mechanisms from M. Magee, Stanford University/USGS (1994).

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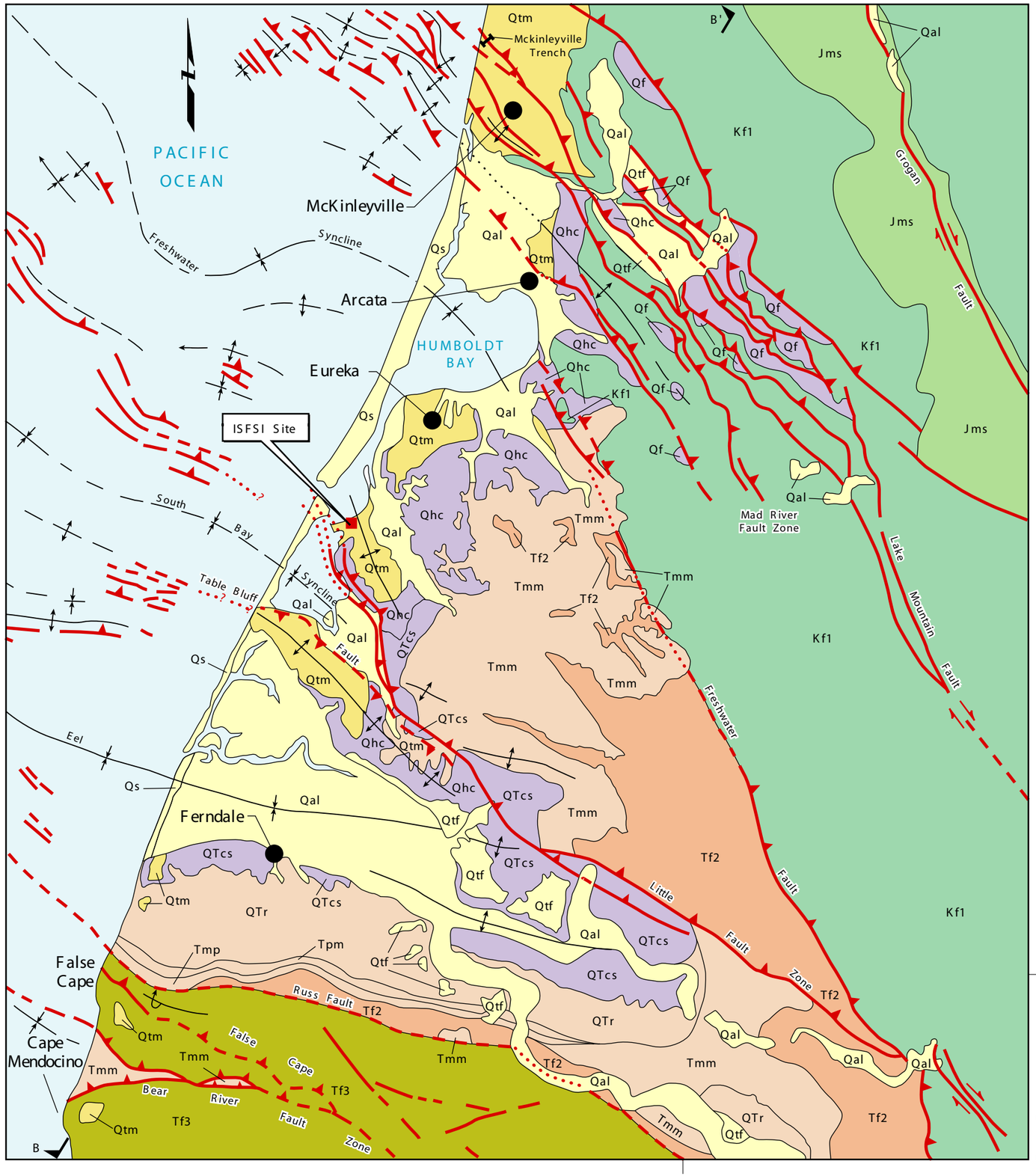
HUMBOLDT BAY ISFSI
FIGURE 2.6-12
Generalized regional structure section A-A' showing depth distribution of epicenters (open circles) and selected focal mechanisms (beach balls) of earthquakes from M. Magee (Stanford University and USGS), 1994 (after McLaughlin and others, 2000). The location of cross section A-A' is shown on Figure 2.6-11.



EXPLANATION

Faults: teeth on upper plate of thrust fault; arrows indicate sense of strike slip; dashed where location uncertain; dotted where buried or concealed

Anticline

Anticline, overturned

Syncline

Location of geologic cross section (Figure 3-4)

Location of McKinleyville trench (Woodward-Clyde Consultants, 1980)

COASTAL BELT AND OVERLYING SEDIMENTS

QUATERNARY

- Qs — upper Pleistocene and/or Holocene dune and beach sand
- Qal — upper Pleistocene and Holocene alluvium
- Qtf — upper Pleistocene fluvial terraces
- Qtm — middle and upper Pleistocene marine terraces
- Qhc — Pleistocene nonmarine and shallow water marine sediments (Hookton Formation and/or Carlotta Formation)

QUATERNARY AND TERTIARY

- QTcs — Plio-Pleistocene nonmarine sediments (Carlotta Formation and/or Scotia Bluffs Formation)
- QTr — upper Pliocene and lower Pleistocene marine sediments (Rio Dell Formation)

TERTIARY

- Tpm — lower and middle Pliocene marine sediments (Eel River Formation)
- Tmm — upper Tertiary marine sediments (lower Wildcat Group)
- Tmp — upper Miocene marine sediments (Pullen Formation)
- Tf2 — lower Tertiary Coastal Belt Franciscan Complex and Yager Formation

Wildcat Group

CRETACEOUS

PRE-CRETACEOUS

ADJACENT AREAS

- Qs — upper Pleistocene and/or Holocene dune and beach sand
- Qal — upper Pleistocene and Holocene alluvium
- Qtf — upper Pleistocene fluvial terraces
- Qtm — middle and upper Pleistocene marine terraces
- Qf — lower and middle Pleistocene marine and nonmarine (Falor Formation)
- Qc — Pleistocene nonmarine sediments (Carlotta Formation)
- Tmm — upper Tertiary marine sediments (lower Wildcat Group)
- Tf3 — lower to middle Tertiary Coastal Belt Franciscan Complex
- Kf1 — Cretaceous Central Belt Franciscan Complex
- Jms — Pre-Cretaceous (Jurassic ?) metasedimentary rocks (South Fork Mountain Schist)

FSAR UPDATE

HUMBOLDT BAY ISFSI

FIGURE 2.6-13
GEOLOGIC MAP OF THE HUMBOLDT BAY REGION

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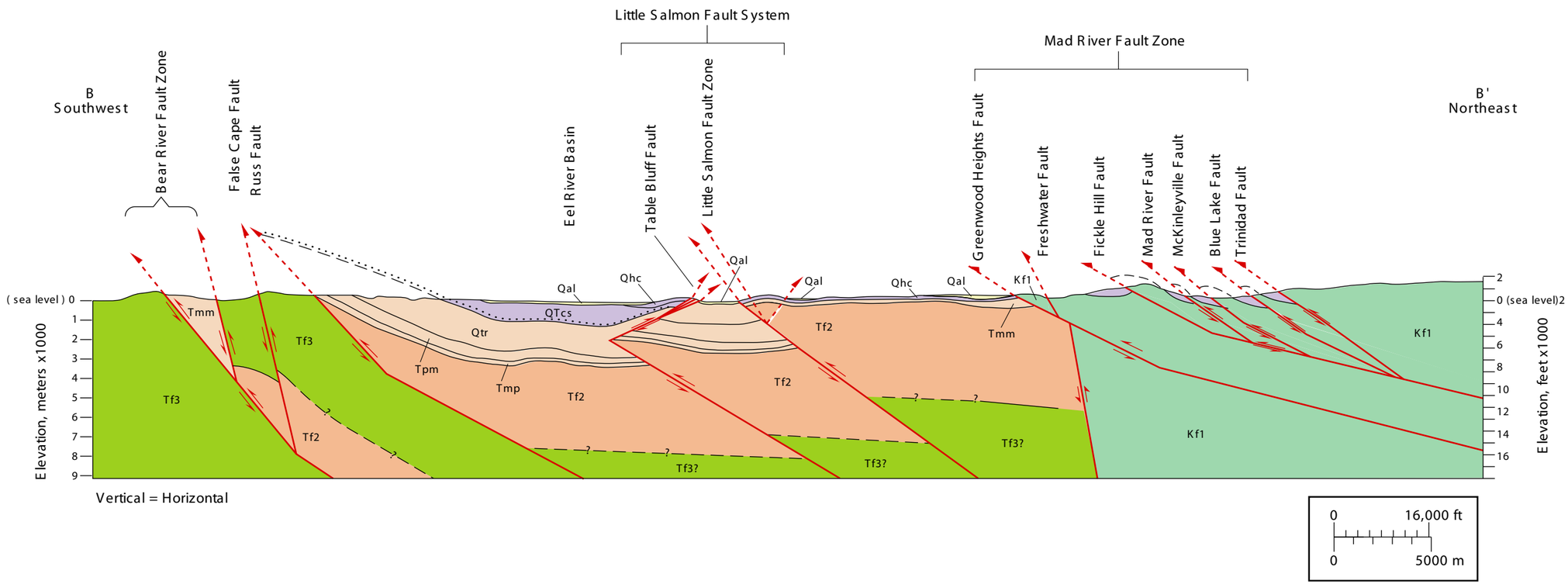
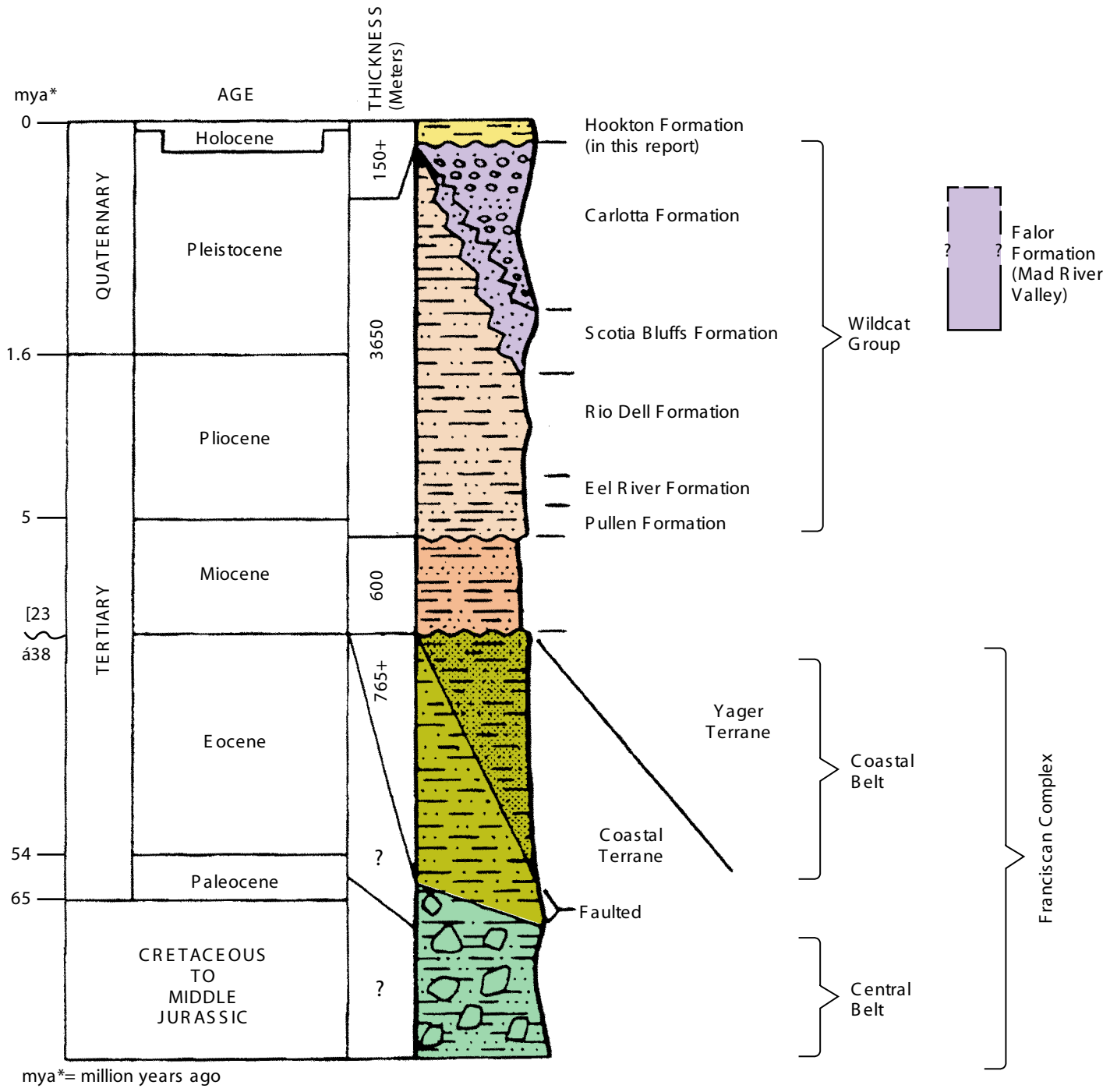


FSAR UPDATE
HUMBOLDT BAY ISFSI
FIGURE 2.6-14
Geologic cross section of the Humboldt Bay Region. See Figure 2.6-13 for description of stratagraphic units. The location of cross section B-B' is shown on Figure 2.6-13



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HUMBOLDT BAY ISFSI
FIGURE 2.6-15 COMPOSITE STRATIGRAPHIC COLUMN, ONSHORE EEL RIVER BASIN (AFTER CLARKE, 1992)

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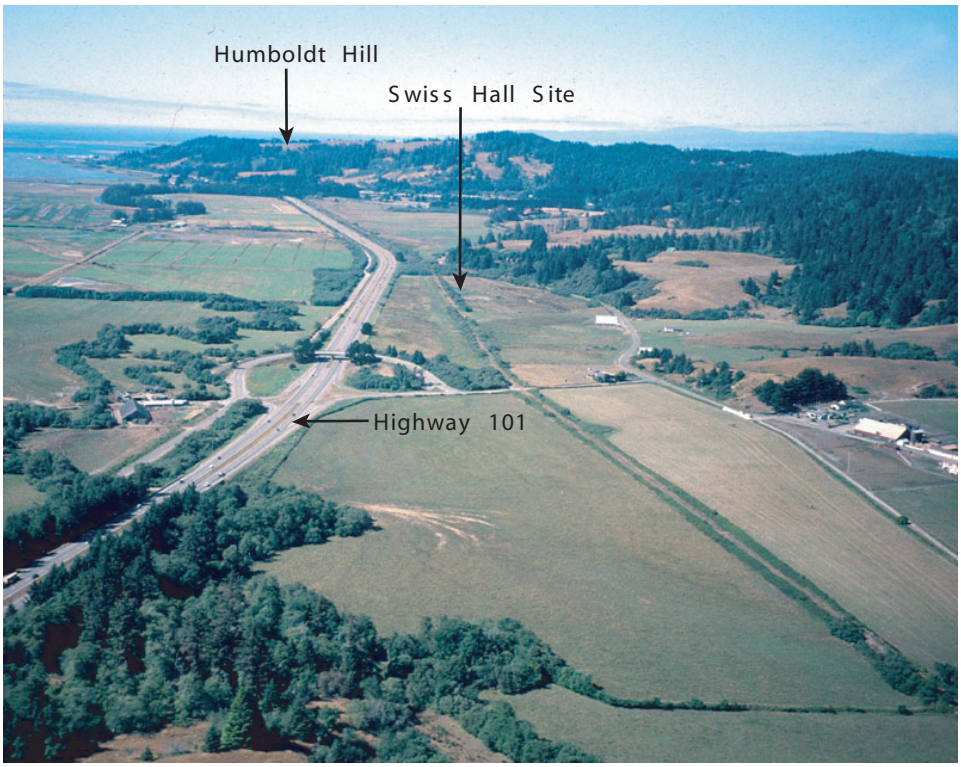
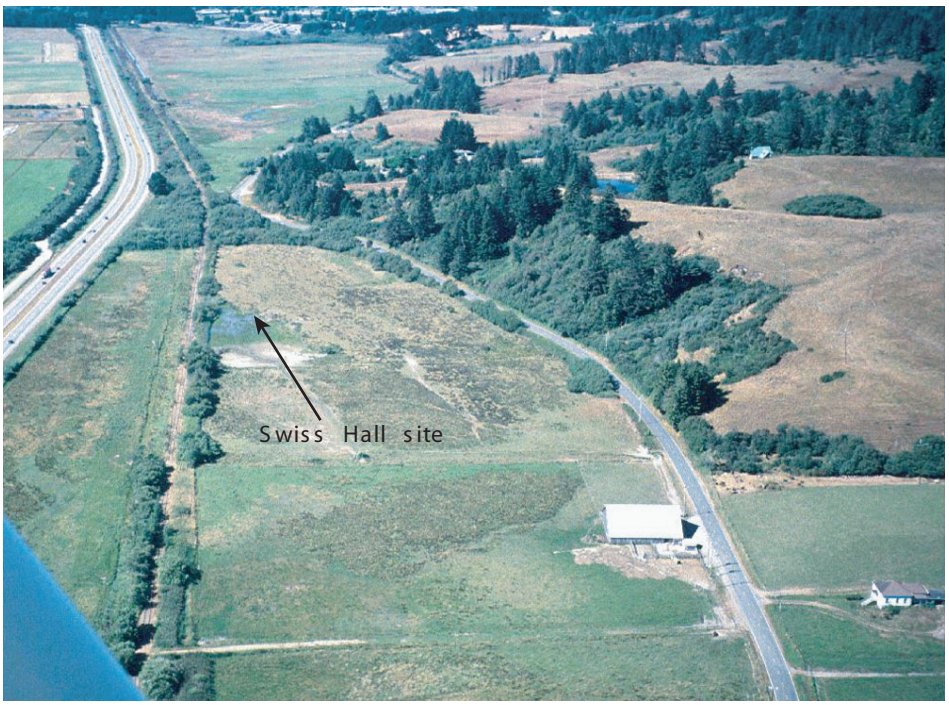


A) View north along Highway 101 with Humboldt Hill in the distance.



B) Closer view of the Swiss Hall paleoseismic study site.

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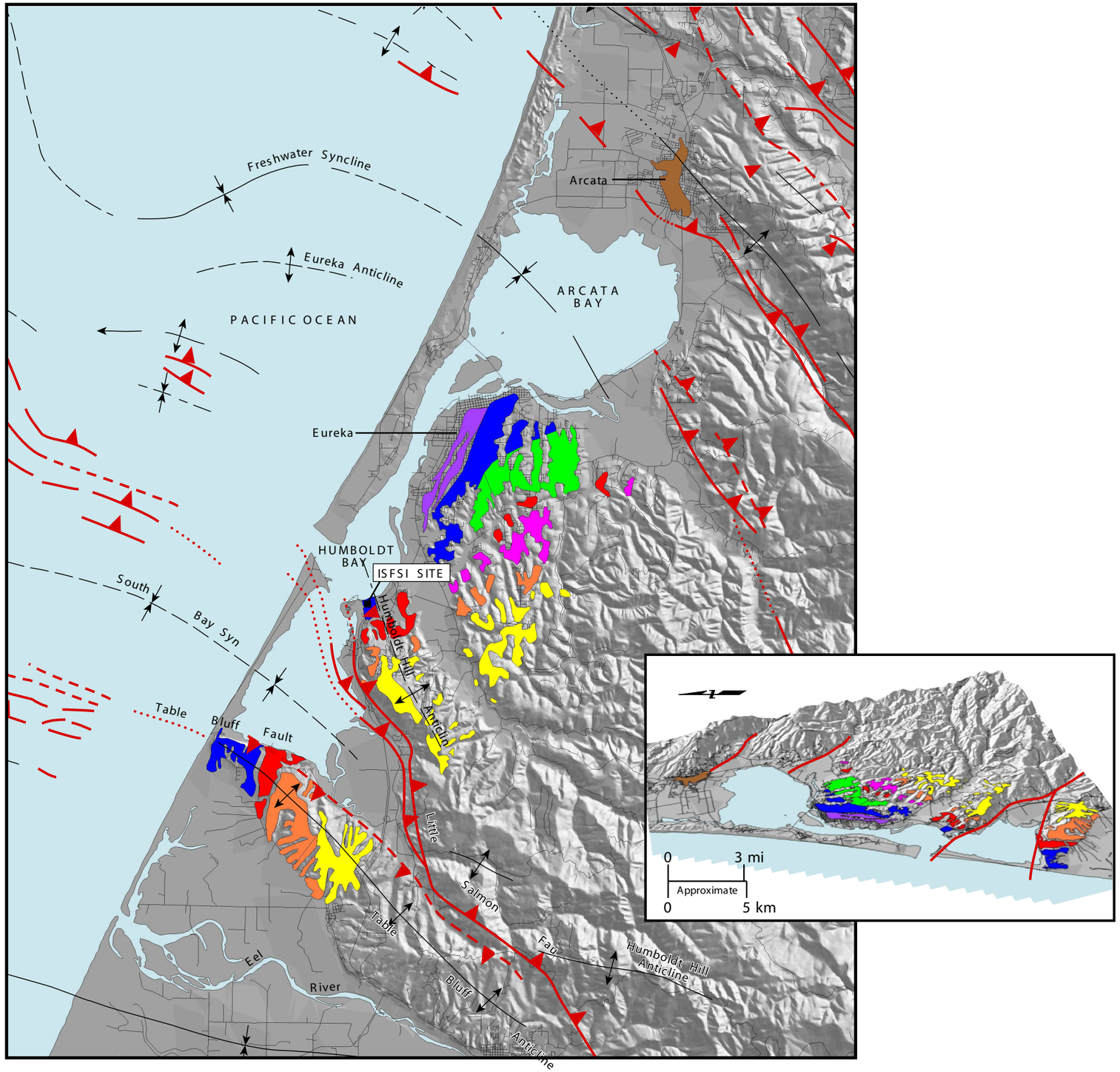
HUMBOLDT BAY ISFSI
FIGURE 2.6-16
Oblique aerial views looking north along the Humboldt Hill anticline and the Little Salmon fault zone. (Photographs taken July 25, 2000, by W.D. Page).



EXPLANATION

Faults: teeth on upper plate of thrust fault; arrows indicate sense of strike slip; dashed where location uncertain; dotted where buried or concealed

Anticline

Anticline, overturned

Syncline

Terrace Name	Isotope Stage	Approximate Age (x 1000 yrs.)
Patricks Point	4a	64
Savage Creek	5a	83
McKinleyville	5b	96
Westhaven	5c	103
Fox Farm	5d	120
Sky Horse	5e	130
A - Line	7a?	176
Older and much older Terraces		200+

0 3 mi
0 5 km

FSAR UPDATE

HUMBOLDT BAY ISFSI

FIGURE 2.6-17
MARINE TERRACE MAP OF THE HUMBOLDT BAY REGION

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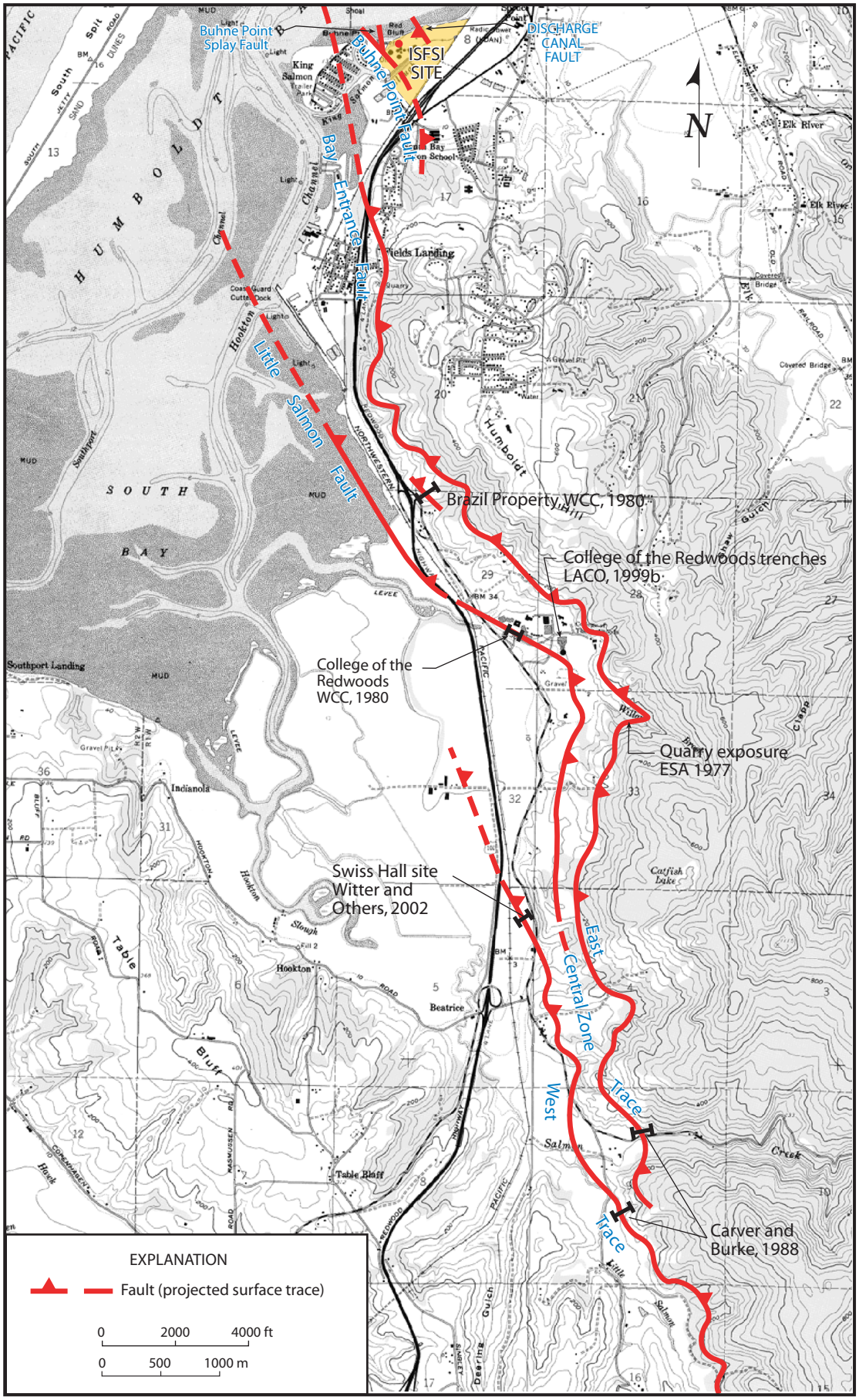
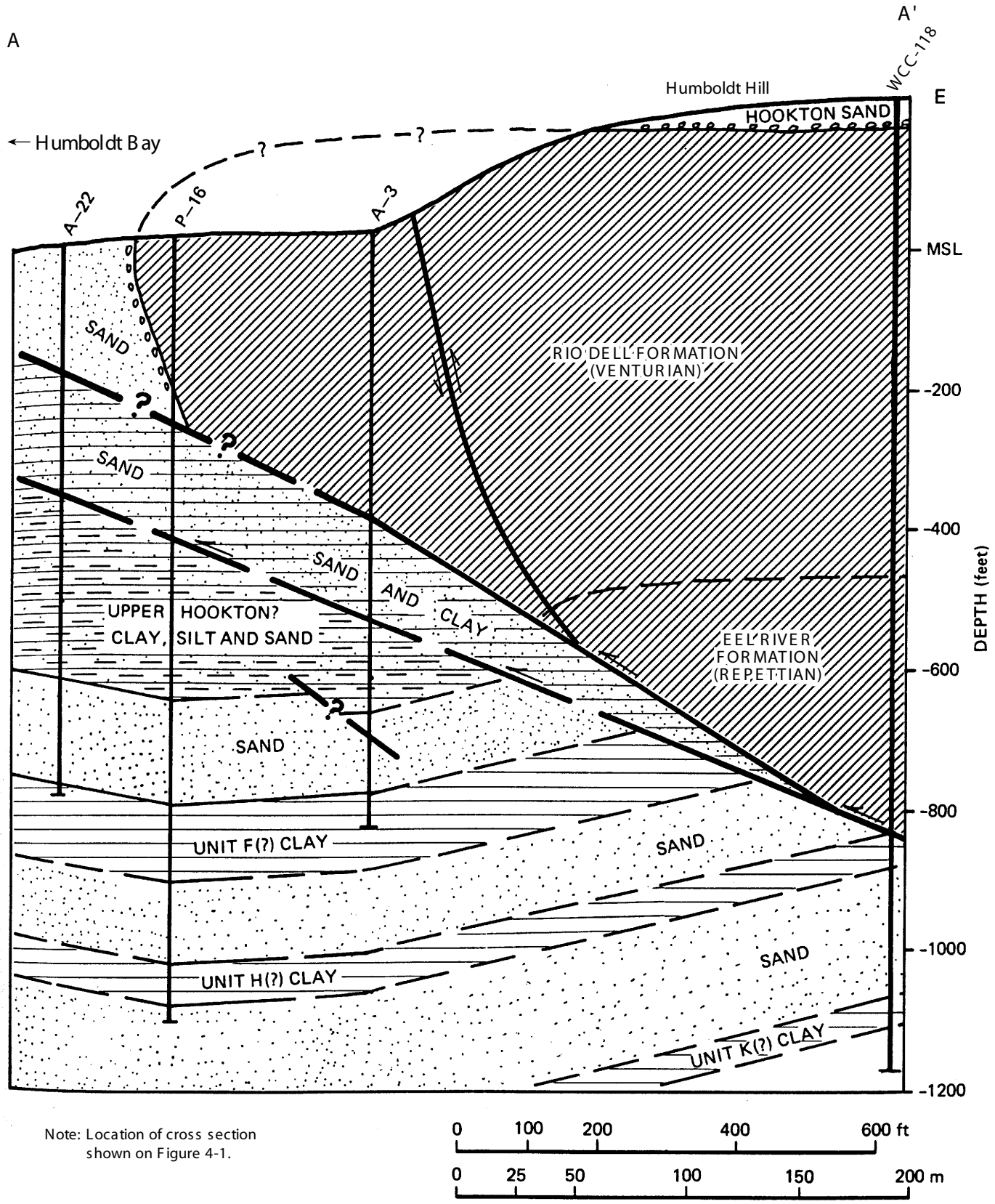


FSAR UPDATE

HUMBOLDT BAY ISFSI

FIGURE 2.6-18
SURFACE TRACES OF THE LITTLE SALMON FAULT ZONE SOUTH OF THE ISFSI SITE



Note: Location of cross section shown on Figure 4-1.

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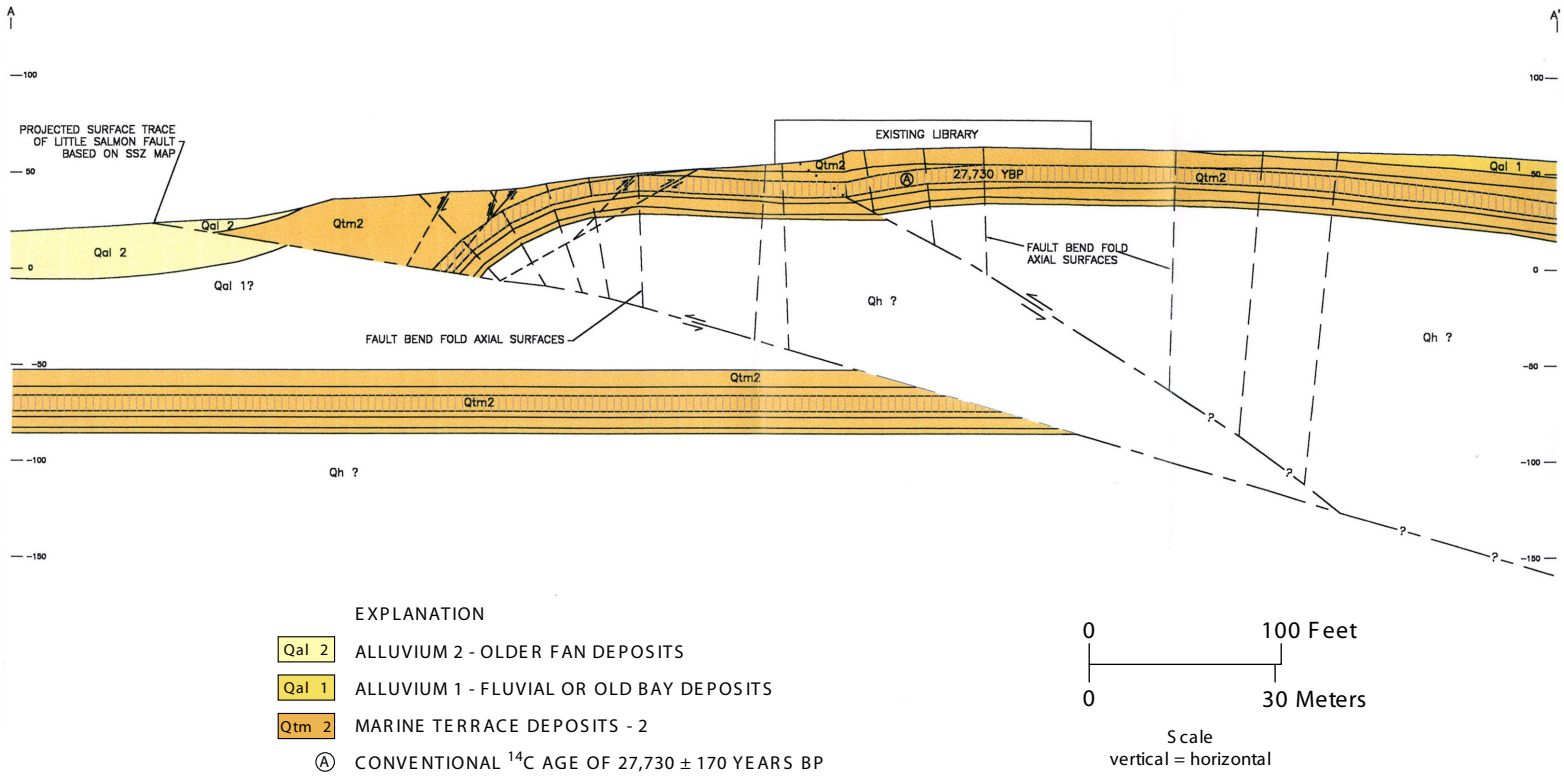
HUMBOLDT BAY ISFSI
FIGURE 2.6-19
Cross section A-A' across the Little Salmon fault zone at Humboldt Hill (after Woodward-Clyde Consultants, 1980, Figure C-15).



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HUMBOLDT BAY ISFSI
FIGURE 2.6-20

Geologic cross section A-A' across a trace of the Little Salmon fault zone at College of the Redwoods, 5 kilometers south of Humboldt Bay ISFSI site (after LACO Associates, 1999b, Figure 5). Location of cross section shown on Figure 2.6-18.