Investigations of the Pedro Miguel Fault during Borinquen Dam 1E Construction
Panama Canal Expansion

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Overview of fault investigations during construction:
- The Pedro Miguel fault had minor displacement of early Holocene alluvium at Dam 1W
- The absence of a reported “Main Trace” of the Pedro Miguel fault
Overview of Pacific Approach Channel (PAC)
PAC EXPANSION OVERVIEW
Gaillard Cut

Pedro Miguel Fault

Project Area

Pedro Miguel Fault

Project Area

Stewart and others, 1980
Active faults mapped at Dams 1E-1W

Multiple Holocene events
Surface rupture
Most recent event 1621 AD

Two or three late Holocene events
Potential 3 m rupture should be considered for design
The PAC - World’s Deepest Fault Trench
Initial PAC Excavation – Columnar Basalt
Paleoseismic Trenching 2010

[Image of a construction site with excavation work and labeled areas]

- Alloclastic sandstone
- Purple sulf
Pedro Miguel Fault at Dams 1E-1W and the PAC
Pedro Miguel Fault
South Abutment Dam 1E

Figure 6: Pedro Miguel Stewart Strands Geology
Pedro Miguel Fault
PAC Centerline
Pedro Miguel Fault
Dam 1W Foundation

Southeast Strand

Southeast Strand Fault

Stewart Trace Fault
Pedro Miguel “Southeast Strand” Fault
Trenching at Dam 1W

Legend
Unit A - Completely Weathered Volcanioclastic Rock (Pedro Miguel Fm)
Unit A1 - Highly Weathered Basalt (Pedro Miguel Fm)
Unit B - Basal Alluvial Gravels

Unit C - Fine-Grained Alluvium
Unit C2 - Clayey Gravels (at base of Unit C)
Unit F - Silty Clay (Completely Wx Bedrock/Possible Slump)

TL 8 (Age- years before present)
AMS-2 (Age- years before present)

Shelby Tube Sample
Bulk Sample
Fault Strike/Dip

Geologic Log of Trench Exposures
Southeast Strand Fault at Dam 1W
Pedro Miguel Fault at Dam 1W
Foundation Dental Treatment
Pedro Miguel Fault at Dam 1W

Stewart Trace Fault
N32E, 64W
Pedro Miguel Fault
Trenching at Dam 1W

SOUTH
Dam 1W backcut slope prior to trenching
NORTH

Dates are shown on Trench Log (below)

Subsidiary Faults
Fault Trench Exposures
Stewart Trace Fault

Geologic Log of Trench Exposures

Legend
Unit A - Moderately to highly weathered tuff (Pedro Miguel Formation)
Unit B - Basal Alluvial Gravels
Unit C - Fine-Grained Alluvium
Unit C2 - Clayey Gravels (at base of Unit C)
Unit D - Alluvial Gravels
Unit E - Fine-grained Alluvium

Stewart Trace Fault

TL-9 (9300 +/- 1400)
AMS-9 (4290)

TL-11 (8400 +/- 1400)
AMS-4 (4590)

TL-13 (8100 +/- 1700)
AMS-14 (1140)

TL-14 (8000 +/- 1000)
AMS-6 (680)

TL-15 (8000 +/- 1000)
AMS-12 (10070)

TL-16 (5000 +/- 2000)
AMS-11 (1140)

Stewart Trace Fault

Geologic Log of Trench Exposures

Fig 2 Logs of Trench Strand rev 12-30-13

Stewart Trace Fault At Dam 1W

CHECKED BY: DLS
DATE: 12-30-13
PM: PROJ. NO.: 26818044.00095

URS

NORTH/SOUTH
Key Geologic Findings at Borinquen Dams

The Pedro Miguel “Stewart Trace” fault does not displace Holocene alluvial gravels at Borinquen Dam 1W.

The “Southeast Strand” of the Pedro Miguel fault has produced minor displacement of early Holocene alluvium at Dam 1W.

Geologic observations do not provide evidence for multiple late Holocene events with meters of slip per event at Borinquen Dams.

The Pedro Miguel “Main Trace” does not exist at the Canal.
Thank you

FAULT INVESTIGATIONS DURING BORINQUEN DAM 1E CONSTRUCTION
PANAMA CANAL EXPANSION

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Section at 1+860 Fault (Deepened PAC Redesign)

Apparent bedding dip = 5 degrees

Line of Section N10W (view looking south)

Borinquen Road

Fill/Alluvium

Purple Tuff (marker bed)

La Boca Fm (undivided)

Agglomeratic Sandstone

1+860 Fault (projected to ground surface)

1+860 Fault (as mapped at foundation level)