U.S. Department of Transportation
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Micropiles and the FHWA 30 Years of Implementation

International Workshop on Micropiles
Schrobenhausen, Germany
6 May 2006

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FHWA Micropile Projects

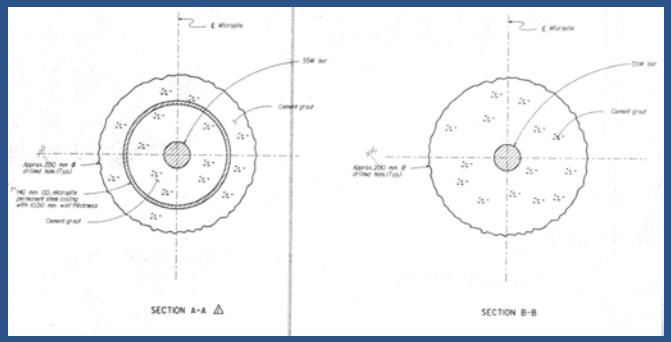
Mendocino Pass Slope Retention, 1978
Linn Cove Viaduct, Blue Ridge Pkwy, 1980
Marble Fork Bridge, Sequoia NP, 1992
Chilnualna Bridge, Yosemite NP, 1994
Foothills Parkway Bridge, 1998
Madrone Lake Dam Crossing, 2000
Going-to-the-Sun Guardwalls, 2002
Deer Canyon Bridge, 2003
Gibbon Falls Retaining Wall, 2004

FHWA Micropile Projects

Examples include bridge pier and abutment foundations, slope retention, and retaining wall foundations

Our terminology has evolved from *pali radice*, to *microshaft*, to *drilled shaft*, to *micropile*

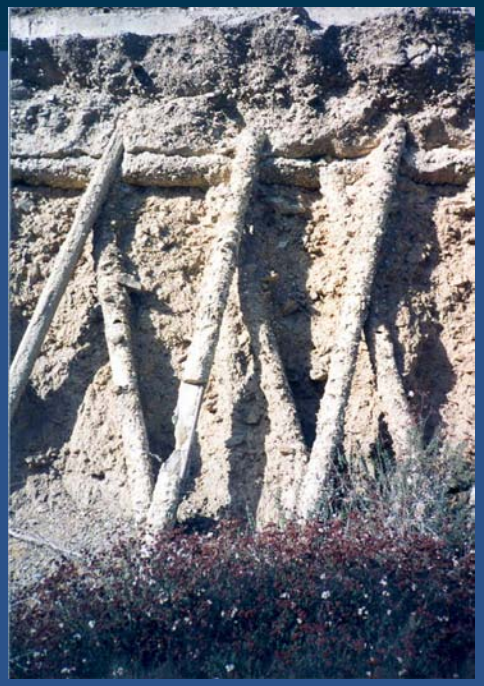
Let's take a closer look

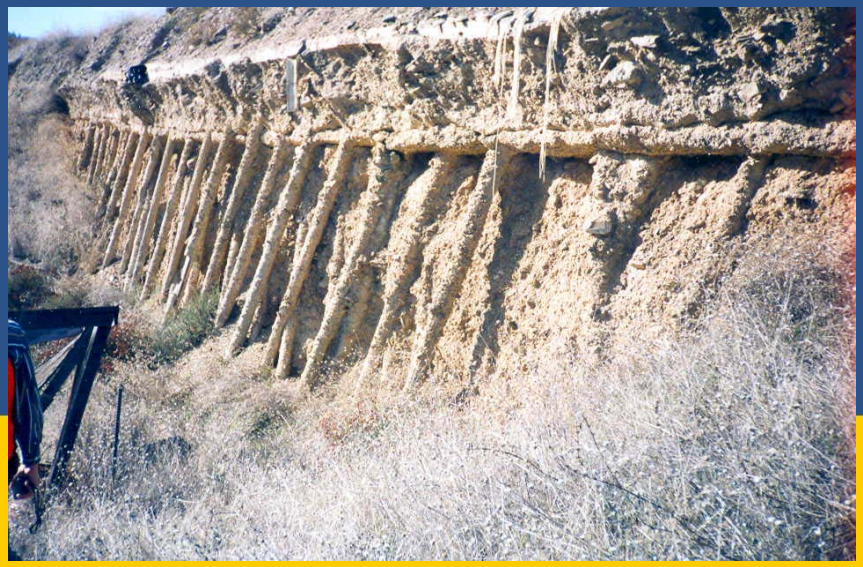


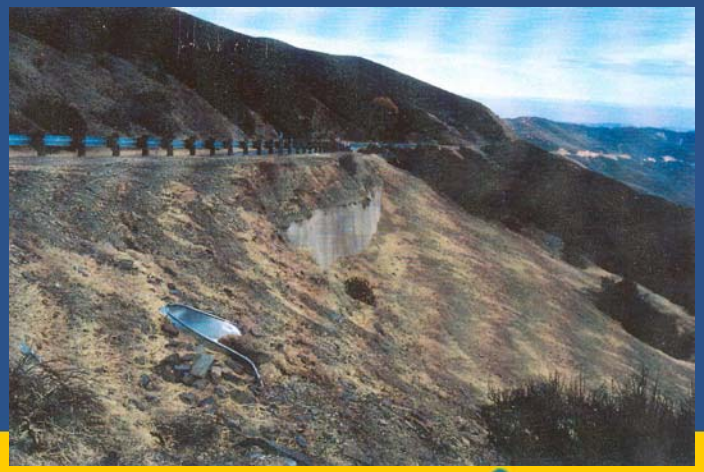
Pali Radice

Mendocino Pass, 1978

- 721 127 mm piles, 15 to 24 m long
- 8.25 piles per meter
- Wall designed for shear, piles in compression
- Slide in 1990s revealed wall, which still performed well







Linn Cove Viaduct

Deliver the Project 'Top-down'

Limited exploration

Linn Cove Viaduct

Two uses for 'Microshafts'

- Pier foundations
- Sliding resistance

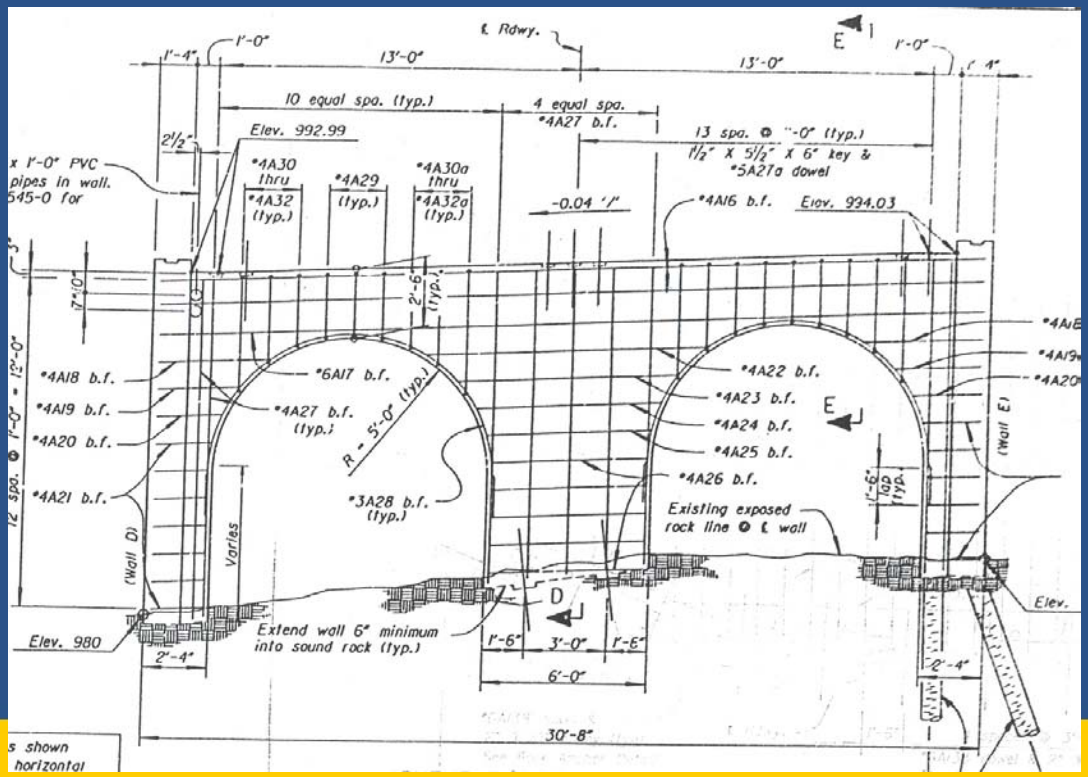
Linn Cove Viaduct

Load testing

- Design load of 130 tons compression, 50 tons tension
- Tested simultaneously to approx. 200% DL

Marble Fork Bridge, Sequoia NP

Foundation retrofit when poor bearing conditions encountered along two sides of the abutment

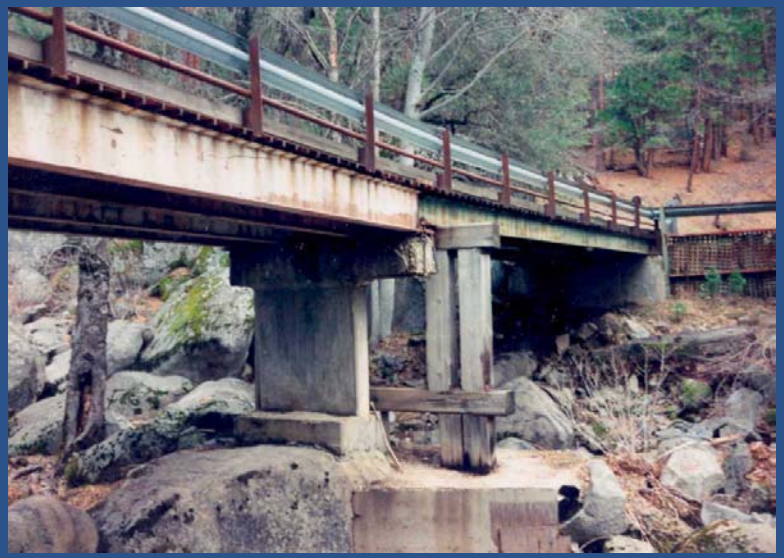


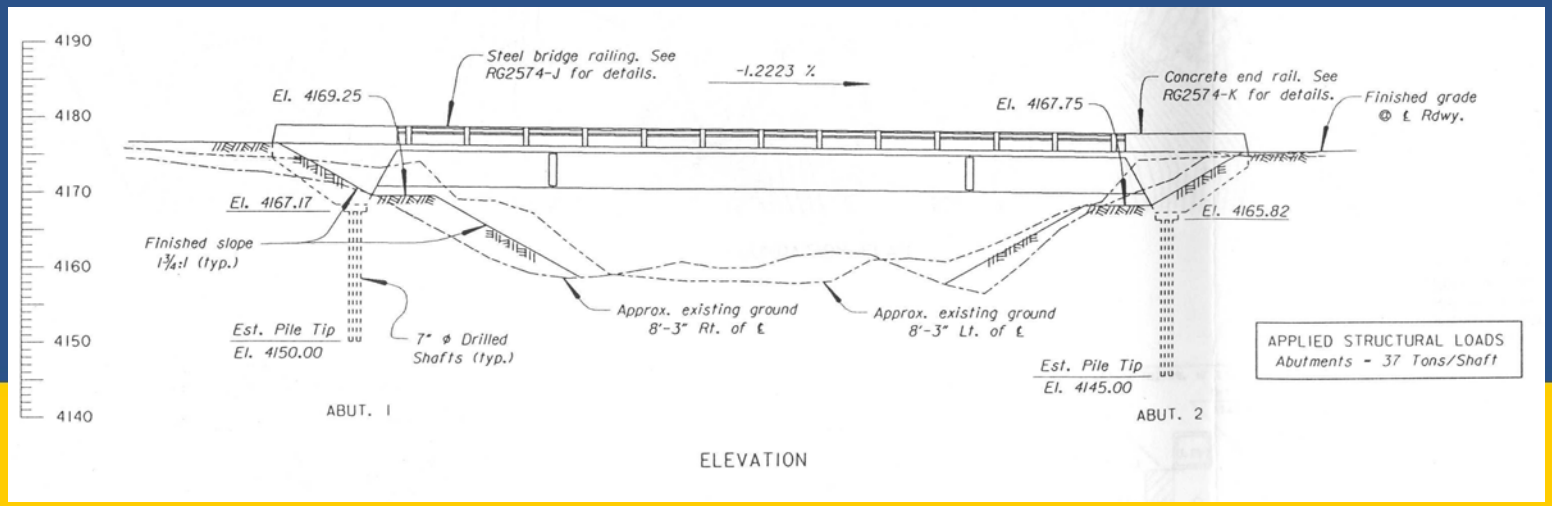
Chilnualna Bridge, Yosemite NP

15 years after Linn Cove

Follows Marble Fork Bridge, Sequoia NP

- Contractor design



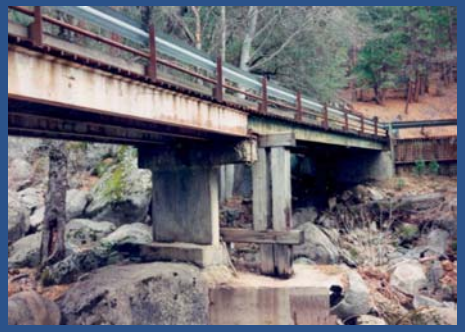


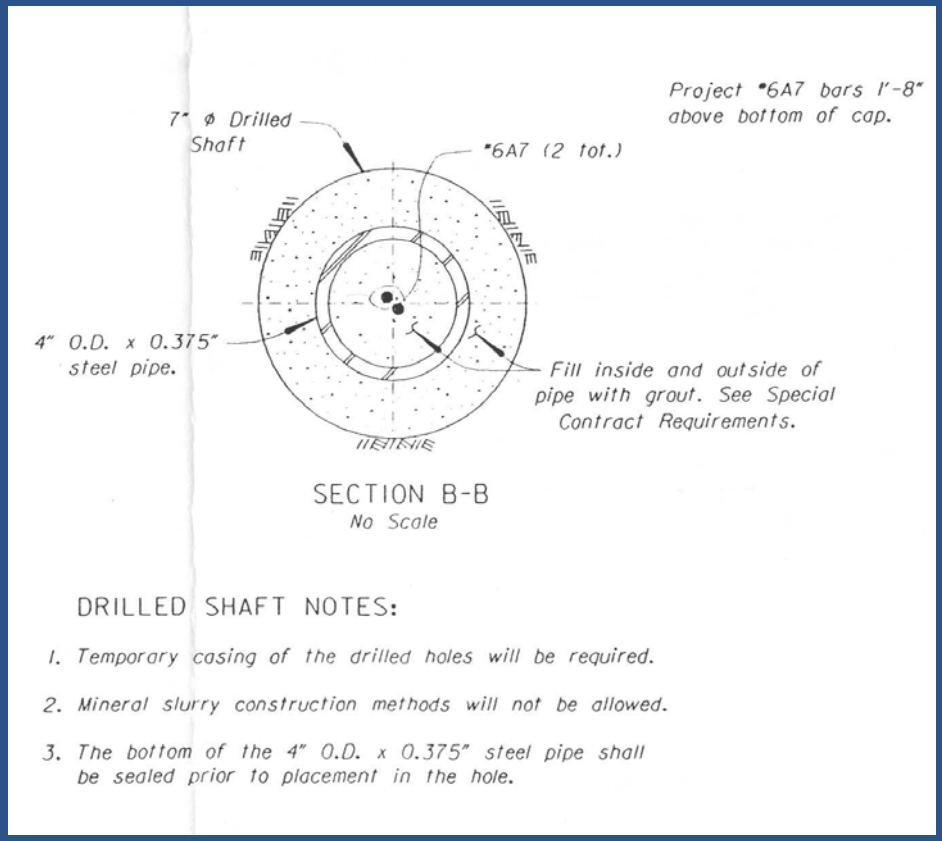
Chilnualna Bridge, Yosemite NP

Still calling them shafts

74 kips capacity

Led to 20-inch Louis Lake DH Hammer Spec.





Foothills Parkway, GSMNP

Late 1990s

Similar to Linn Cove

Madrone Lake Dam

New retaining wall on 75-year old, marginally stable dam

Madrone Lake Dam

Battered piles

No testing

Going to the Sun, Glacier NP

Avalanche Resistant Wall

- Install micro-piles
- Form work
- Masonry work

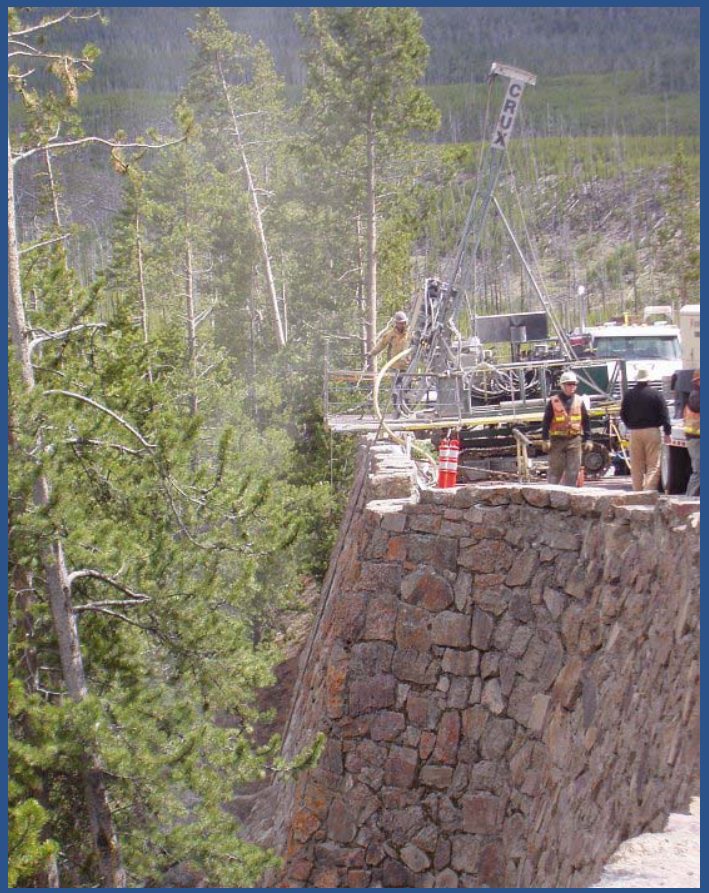
Deer Canyon Bridge, California

- Changed site conditions, bedrock lower than anticipated
- Boulders preclude drilled shafts
- Differential settlement preclude spread footing
- Change order design for micropiles

Gibbon Falls, Yellowstone NP

Historic wall stabilization

Extension of guardwall



FHWA Micropile Projects

FHWA – One of the pioneers of the technology

Most every project an innovation

Still not employed where they could be (?)

- Frenchman Lake, Challone Creek, Foothills Parkway (?)

Not yet routinely utilized and accepted technology

- Seismic design
- Quality assurance

It/ bring micropiles into the mainstream of FHWA practice

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QUESTIONS?

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