



EMBRACE THE FUTURE CHAMPION CHANGE

Gerald Desmond Bridge Replacement Project

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Leighton Group

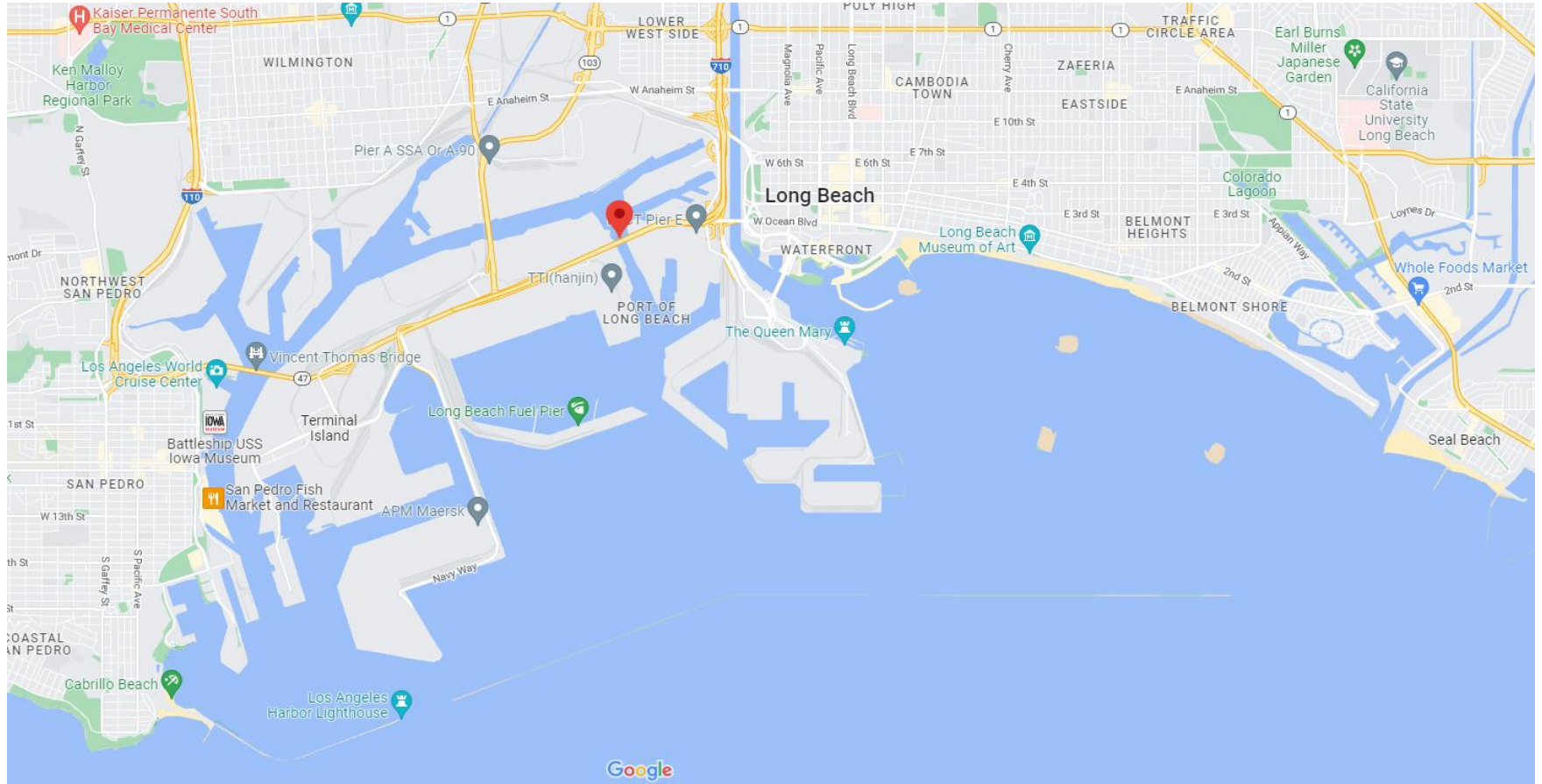


Presentation Outline

- Where?
- Why?
- Who?
- What?
- How?



Site Location



Existing Bridge

- Built in 1968
- Inadequate traffic capacity
- Low vertical clearance (155 feet)
- Seismically vulnerable
- Long-term maintenance issues



Project Team

- Client: Port of Long Beach
- Owner: California Department of Transportation (Caltrans)
- Design/Build Contractor: SFI (Shimmick, FCC Construction, Impregilo)
- Design Team Lead: Arup
- Geotechnical Consultants:
 - Arup
 - Leighton
 - Group Delta

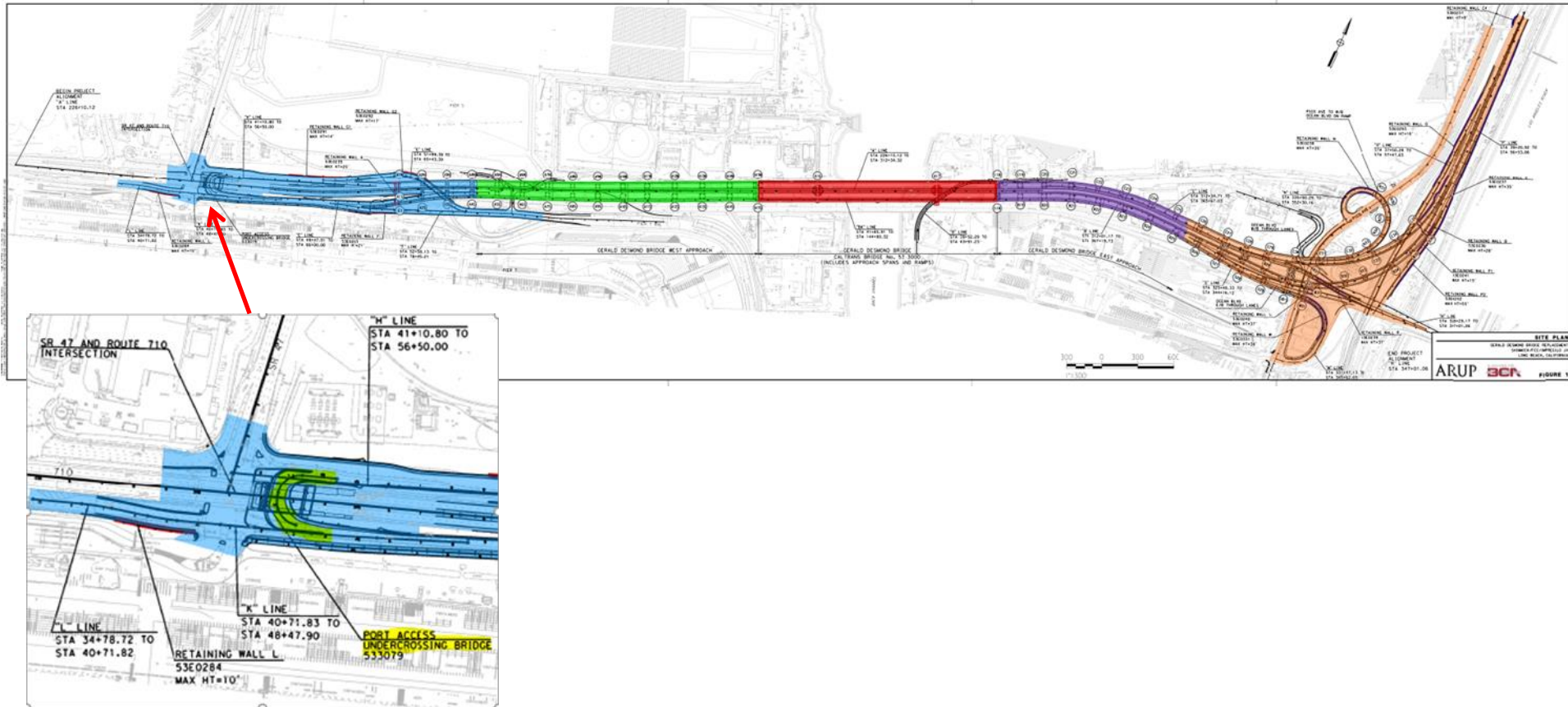


Project Elements

- Cable-Stayed Bridge:
 - 2,000 feet long (longest in West Coast)
 - 515-foot high tower (second tallest in the nation)
- Two miles of approaches:
 - Embankments
 - Bridge decks on bents
 - 10 new retaining walls (15 to 55 feet high)
 - 7 new local bridges
- \$1.56 billion budget



Project Elements (Cont'd)

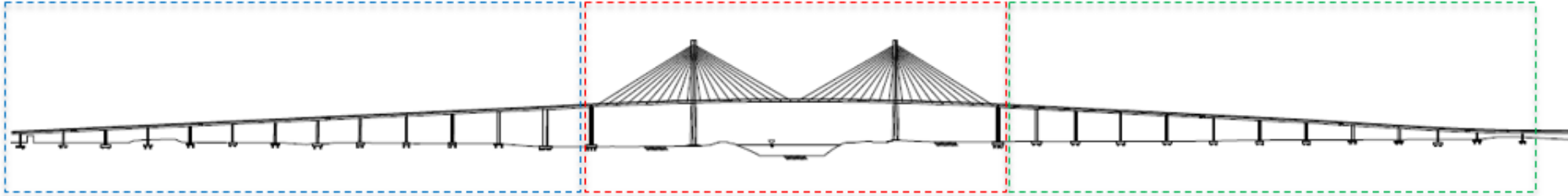


Project Elements (Cont'd)

West Approach

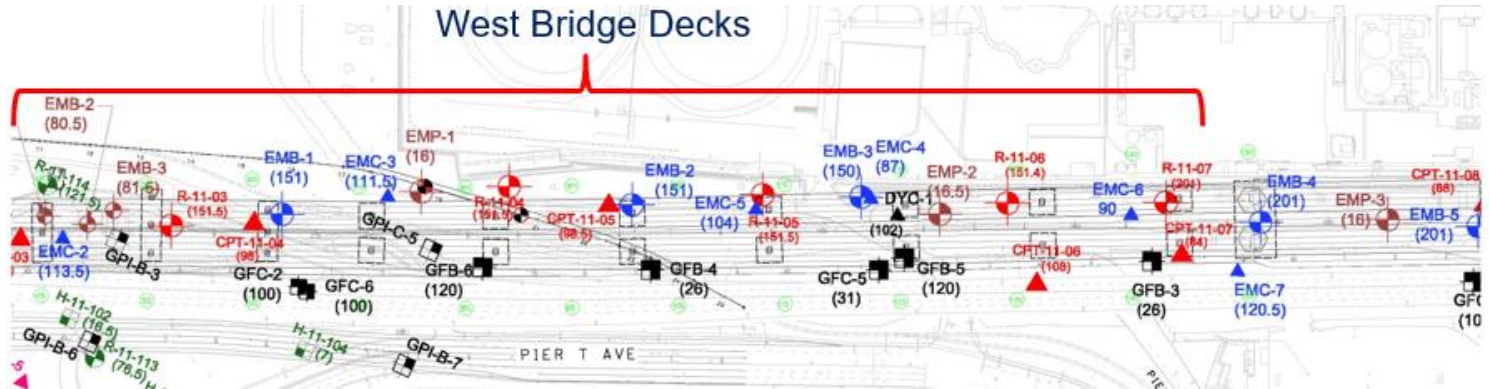
Main Span Bridge

East Approach

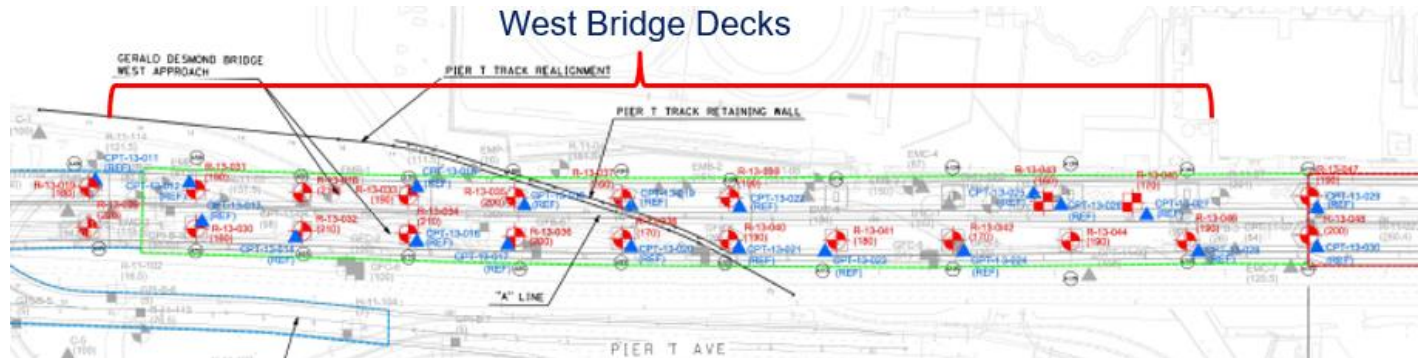


Field Explorations

- Existing:

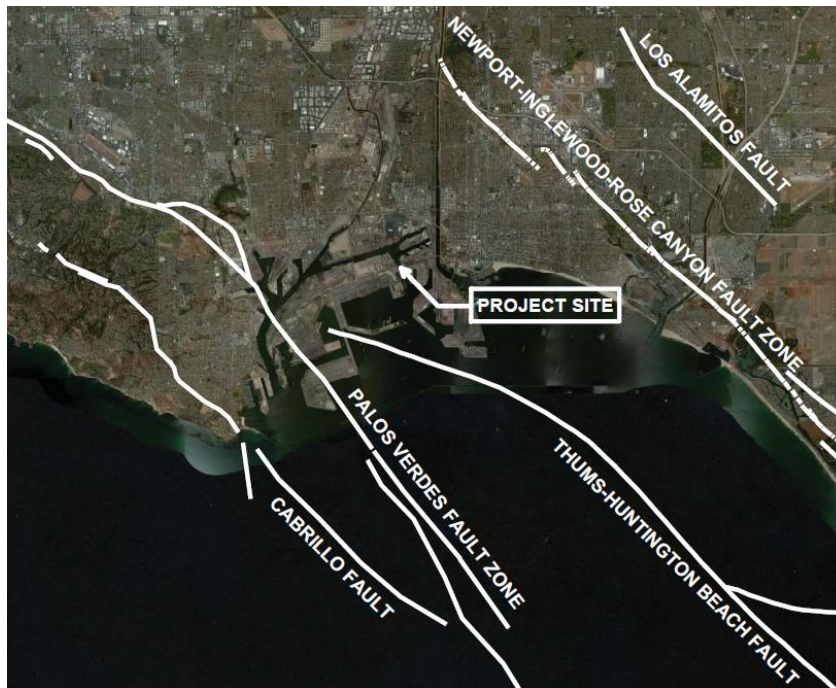


- Supplemental:



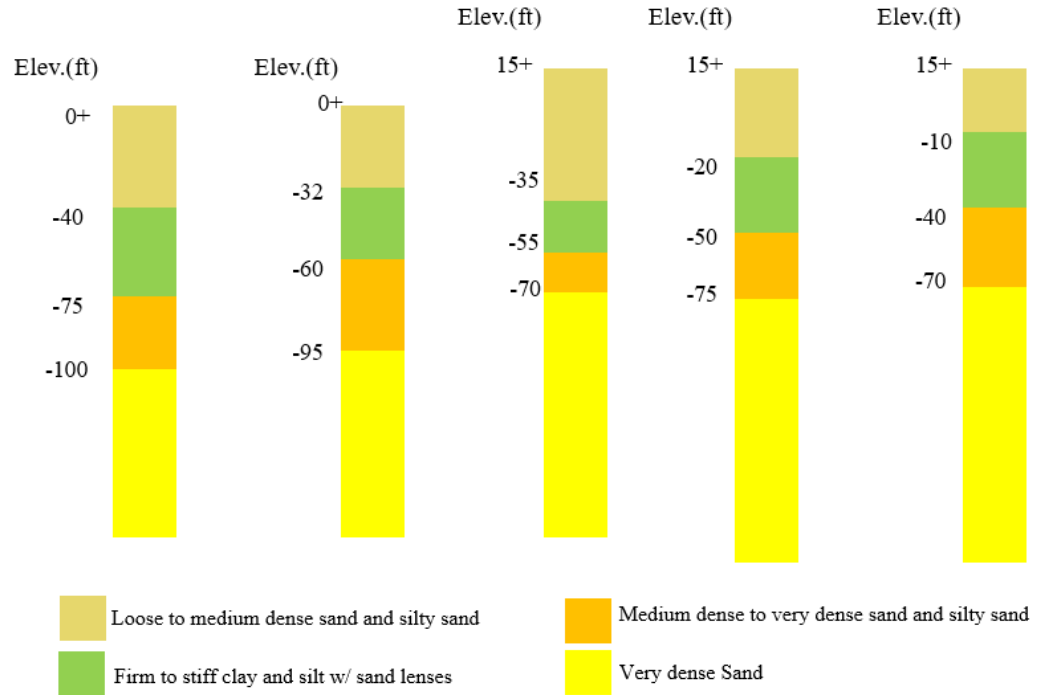
Geotechnical Challenges

- Ground Shaking

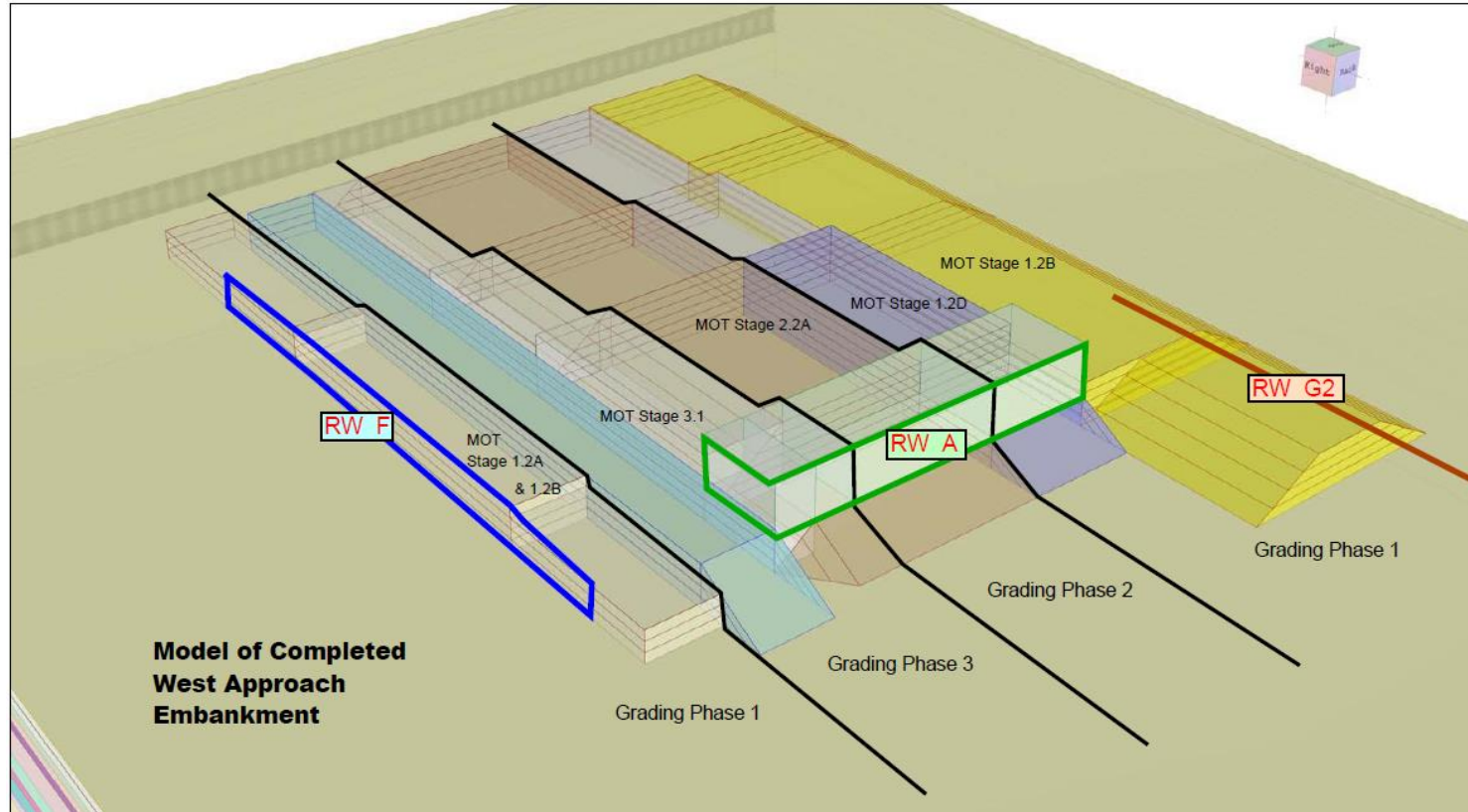


Geotechnical Challenges (Cont'd)

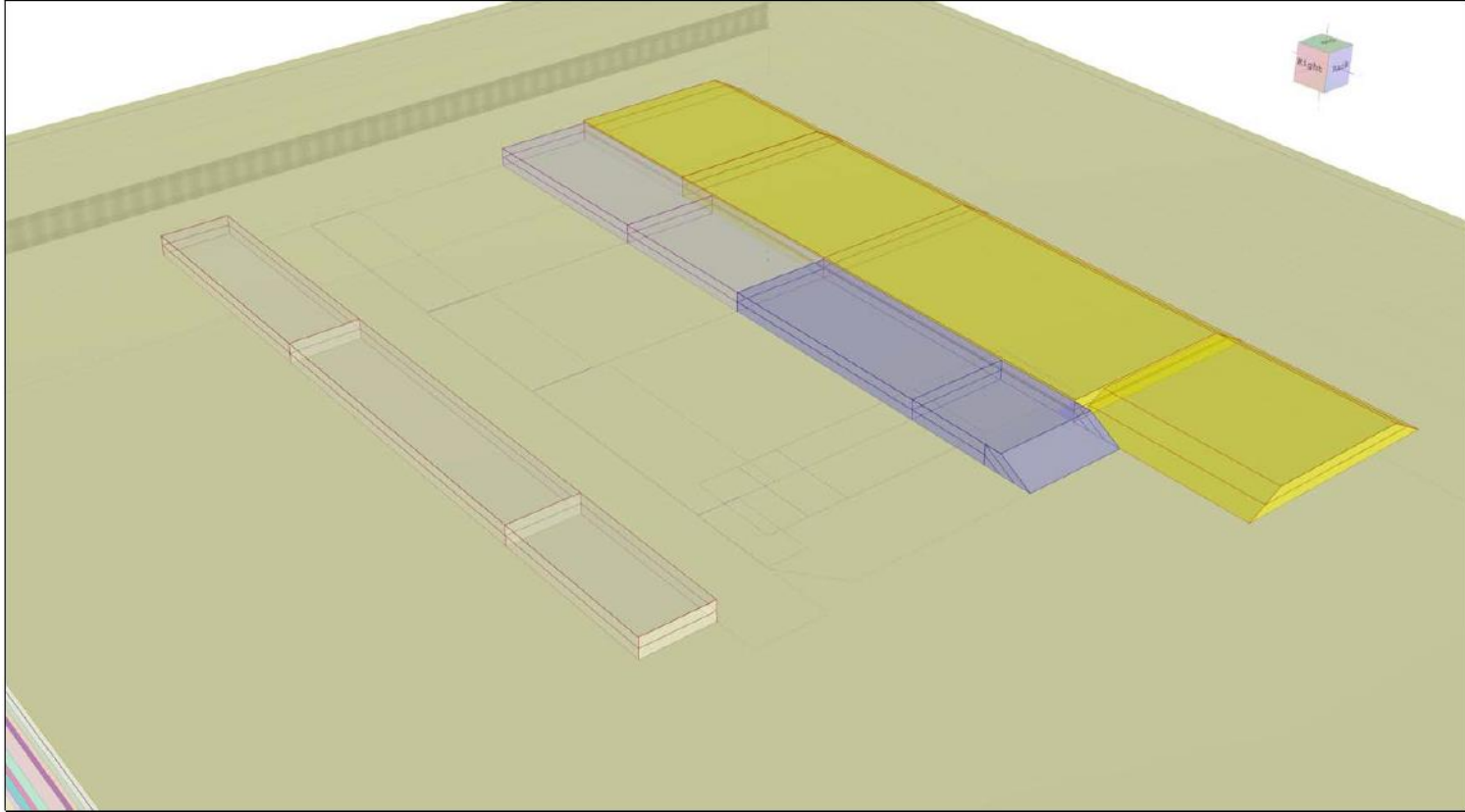
- Compressible Soils
- Liquefaction
- Contaminated Groundwater and Soils



Settlement Analysis



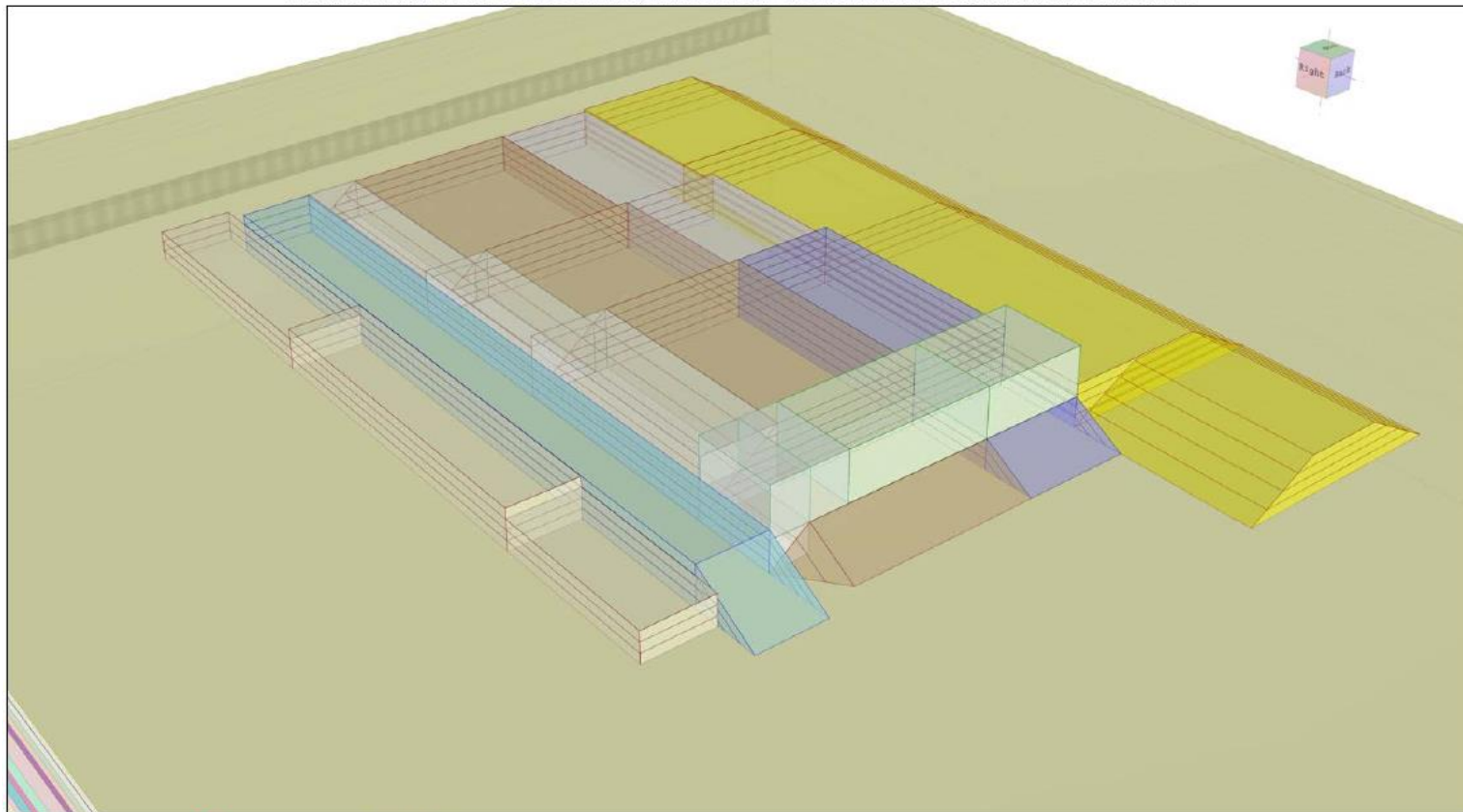
Settlement Analysis



West Approach - 1.2 A (F Line) - 1.2B (G Line) - 1.2D (A Line at Bent A1N) - 2.2A (Bent A1S & E1) - 3.1

Construction Staging of West Approach Embankment - Soil Fill and Wall A MSE

P:\Leighton Consulting\603000\603288.006 GDB Roadways\Analyses\SETTLE_3D\West\Wall A\West App_3-Stage_MX6_MSE_ocr012_QL_rev2.s3z



Leighton

Project Name:					Gerald Desmond Bridge Replacement Project, Port of Long Beach, California		
Analyzed By:	JEH	Units:	feet	Settlement:	None	Project No.:	603288-005
Date:	April 21, 2014	Stage:	Stage 15 = 1180 d		File Name: West App_3-Stage_MX6_MSE_ocr012_QL_rev2.s3z		

**End of Phase 3
(End of Construction)**

Stages

- Stage 1 = 15 d
- Stage 2 = 30 d
- Stage 3 = 45 d
- Stage 4 = 60 d
- Stage 5 = 120 d
- Stage 6 = 939 d
- Stage 7 = 947 d
- Stage 8 = 955 d
- Stage 9 = 962 d
- Stage 10 = 970 d
- Stage 11 = 1000 d
- Stage 12 = 1119 d
- Stage 13 = 1135 d
- Stage 14 = 1150 d
- Stage 15 = 1180 d
- Stage 16 = 1270 d
- Stage 17 = 1360 d
- Stage 18 = 1460 d
- Stage 19 = 1825 d
- Stage 20 = 3650 d

Total Settlement (in)

- 0.00
- 0.79
- 1.58
- 2.37
- 3.16
- 3.95
- 4.74
- 5.53
- 6.32
- 7.11
- 7.90

max (stage): 7.76 in
max (all): 7.88 in

Retaining Wall A

58+00

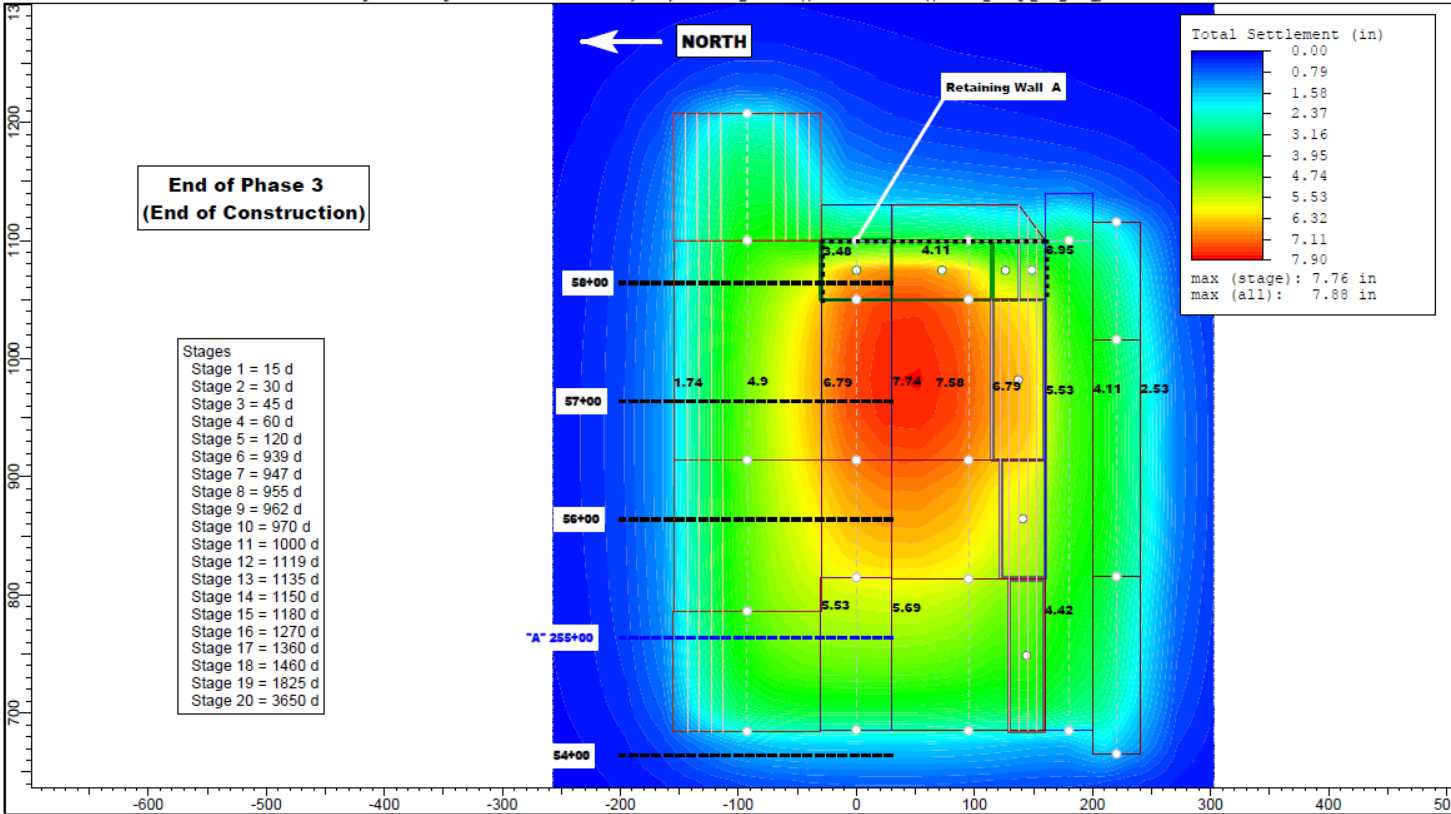
57+00

56+00

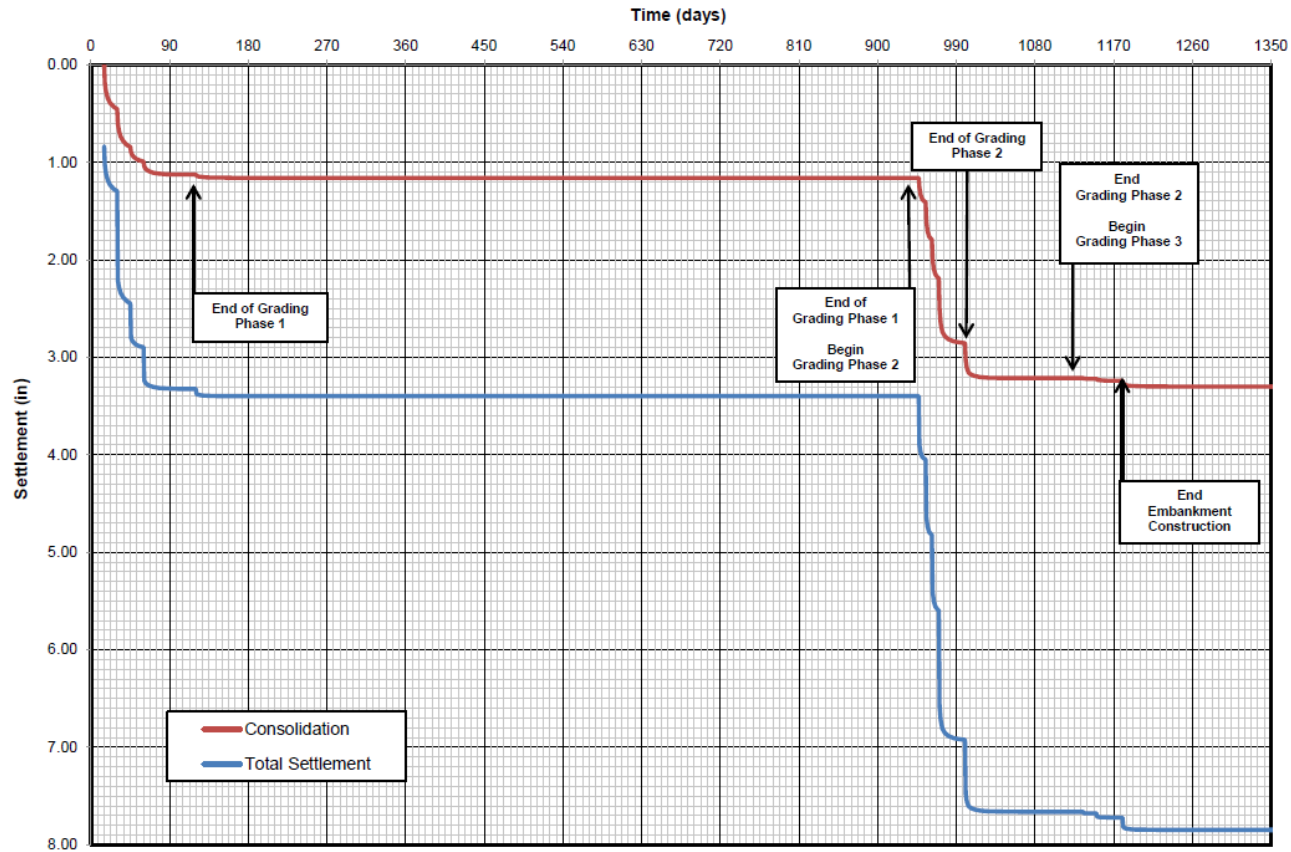
"A" 255+00

54+00

NORTH



Settlement Analysis



Geotechnical Solutions

- Waiting period
- Lightweight Fill
- Seismic Design
 - Safety Evaluation (1,000-year return period)
 - Functional Evaluation (100-year return period)
- Downdrag on Piles
- Pile Tip Postgrouting:
 - 6' diameter cast-in-place piles
 - 350 piles



Innovations

- Pile Tip Postgrouting:
 - First in California for bridge support
 - *C. William Bermingham Innovation Award* from DFI

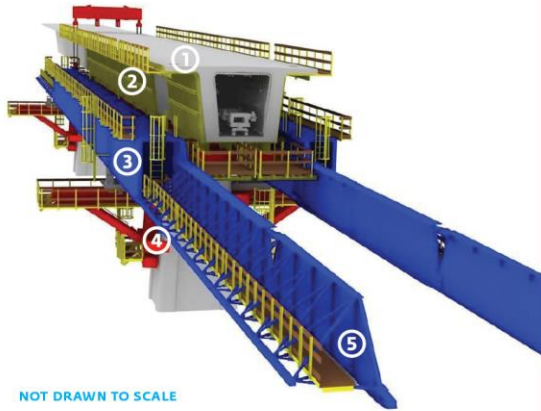


Innovations (Cont'd)

- Movable Scaffolding System

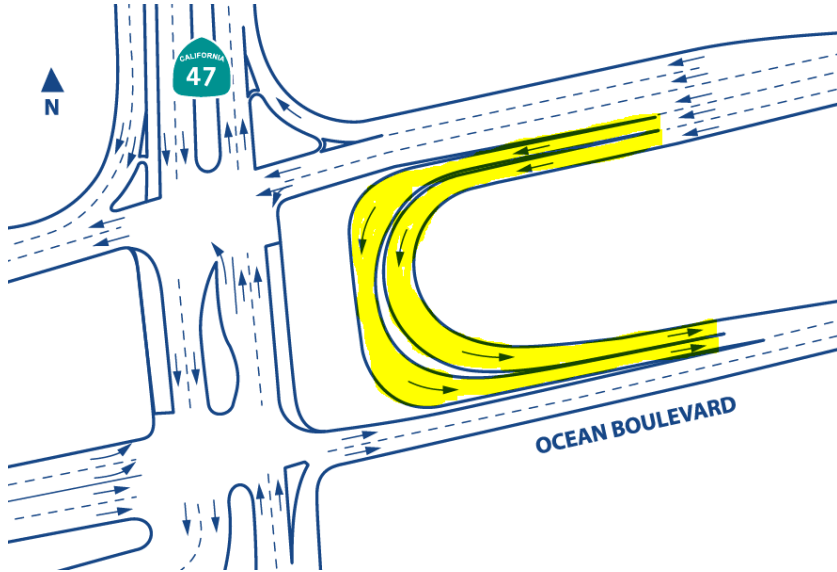
COMPONENTS OF THE MSS

- ① Concrete Casted Deck
- ② External Formwork
- ③ Main Girder
- ④ Support Bracket
- ⑤ Nose



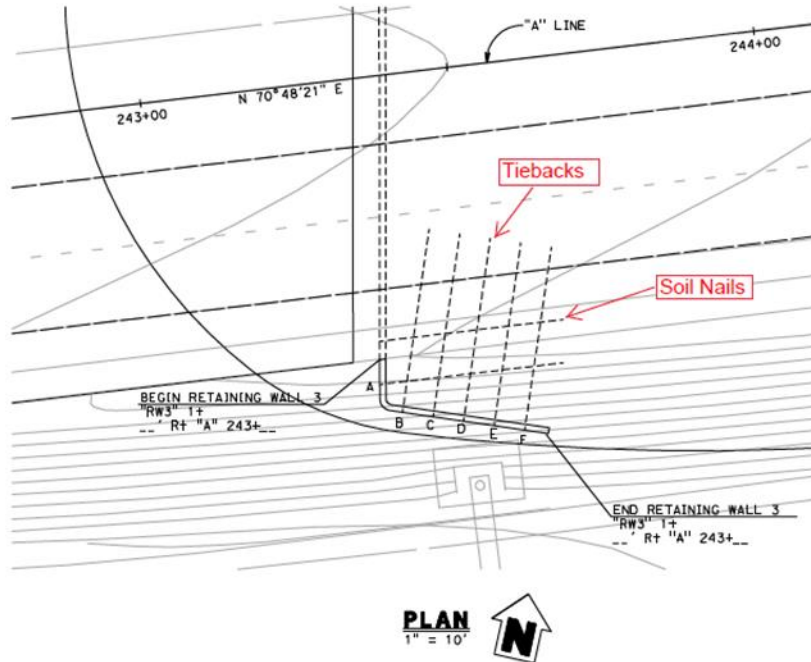
Innovations (Cont'd)

- Port Access Undercrossing



Innovations (Cont'd)

- Port Access Undercrossing



Lessons Learned from GBA

- Case History 78 (“a good contract contemplate risk allocation”)
- Case History 77 (“must” can be better than “should”)
- Case History 79 (“comprehensive documentation is absolutely essential”)
- "if it isn't in writing, it didn't happen"

Lessons Learned from GBA

Successful Change Orders:

- CPT based liquefaction-induced settlement
- Base Resistance Factor: 0.5 versus 0.7
- Over \$200k of Additional Budget





Thank you!

