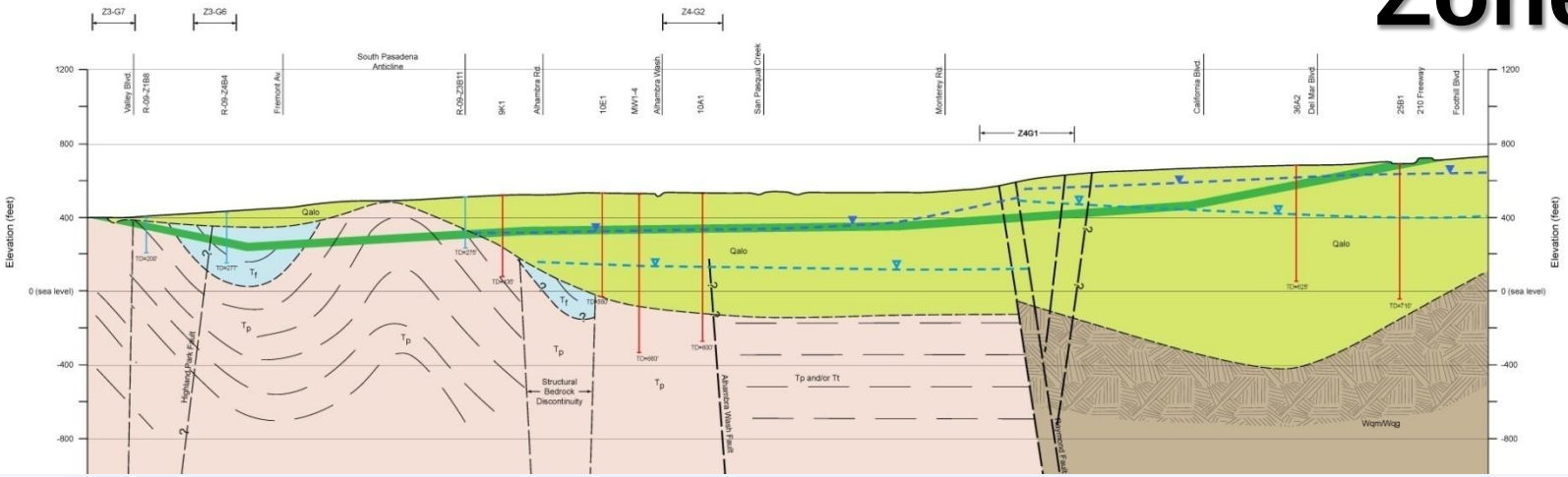
Geotechnical Map

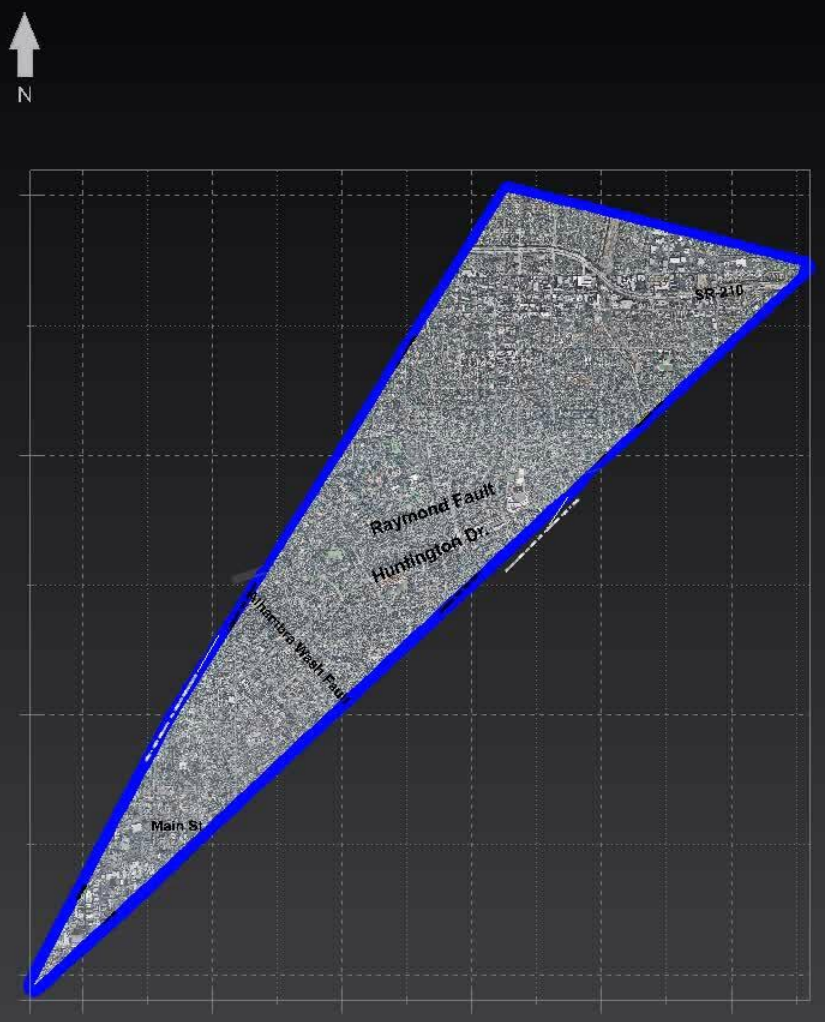
Representative Geologic Profile for Zone 4

Zone 4



Zone 4 (to I-210)

- Mostly alluvium with some Fernando and Puente Formation rock near south end
  - Alluvium may contain cobbles and boulders
  - Fernando Formation: mudstone
  - Puente Formation: sandstone, siltstone, and mudstone
- Raymond and Alhambra Wash Faults are considered active and act as a groundwater barrier
- Potential for high groundwater inflows in alluvium
- Potential for caving soils
- Groundwater levels not uniform across the zone
- Superfund site located in the central portion



Alluvial Soil (Qalo)

Fernando Formation (Tf)

Puente Formation (Tp)

Tunnel

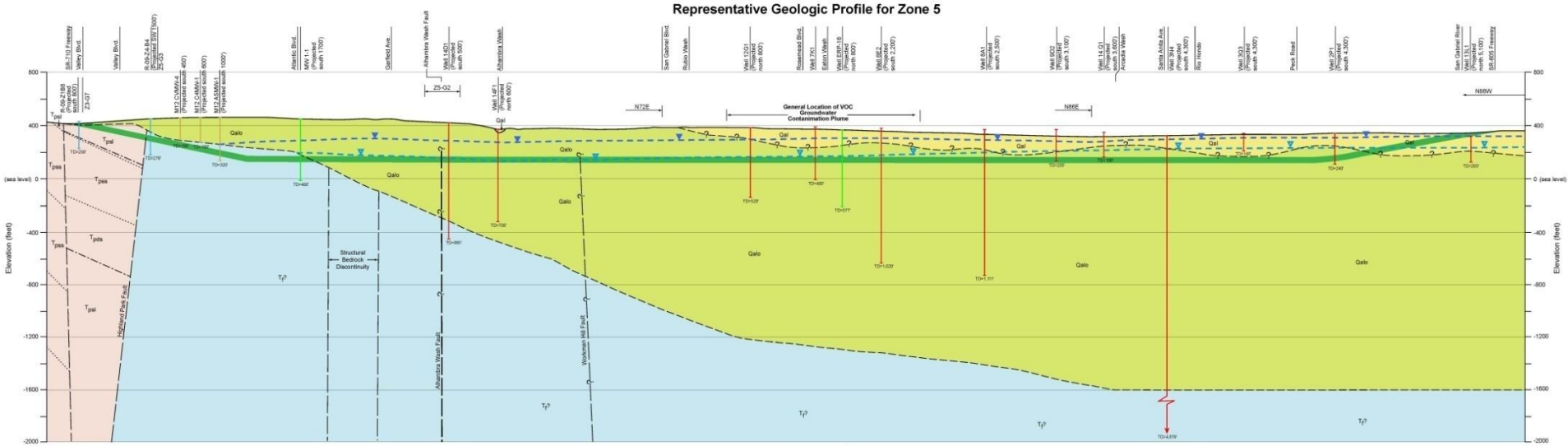
Wilson Quartz Diorite (Wqm)

CH2MHILL

Geotechnical Map

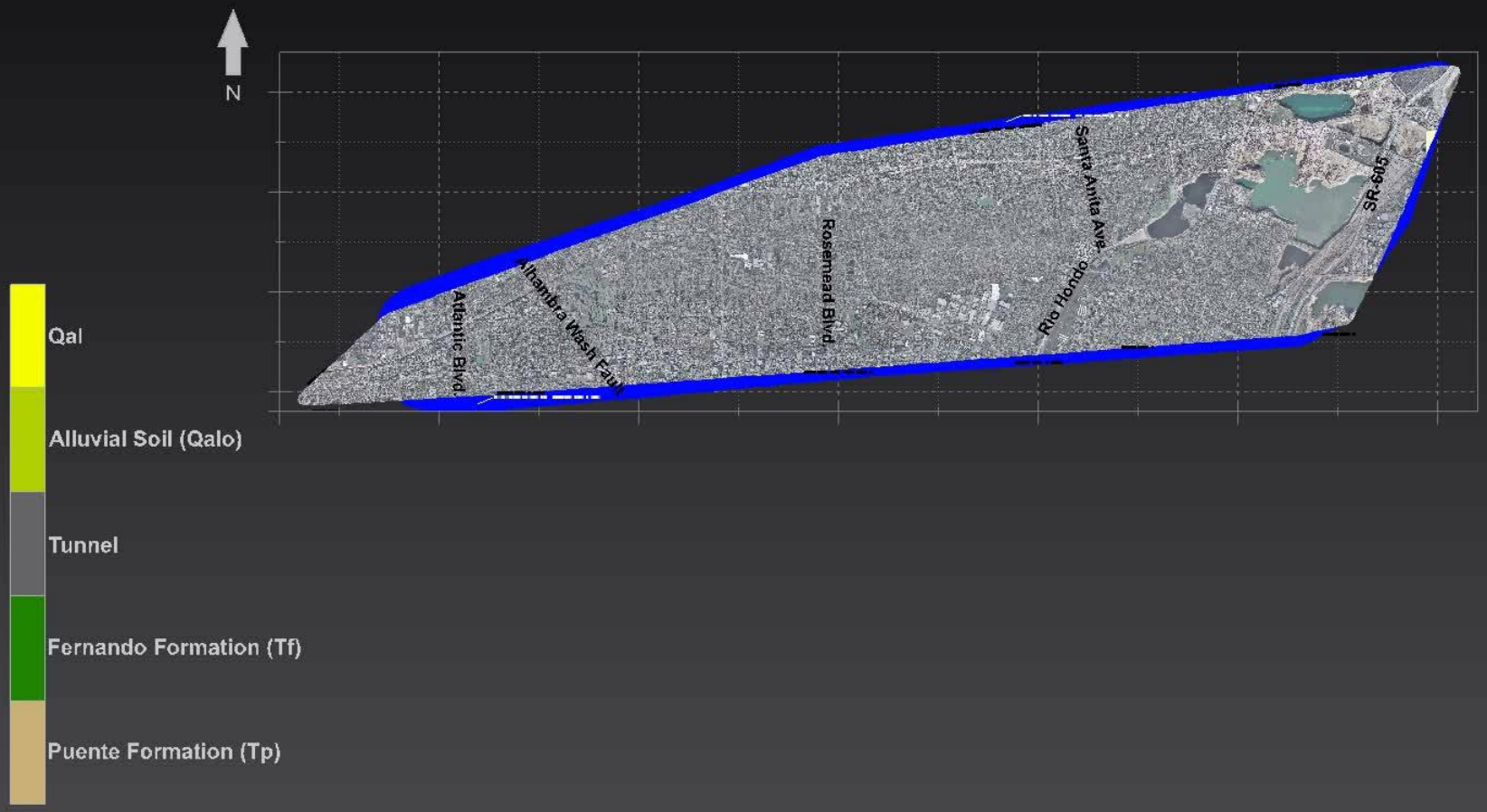
Zone 5

Representative Geologic Profile for Zone 5



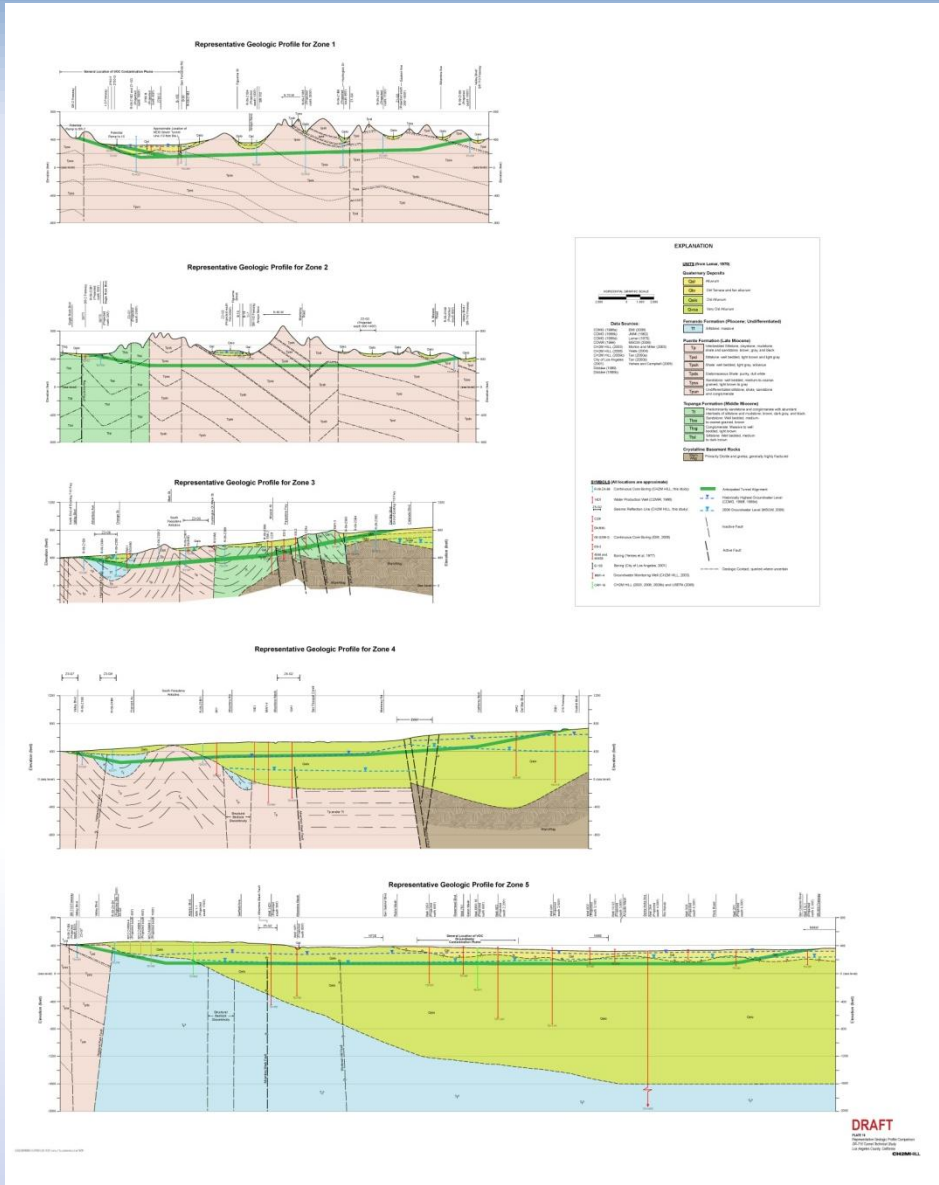
Zone 5 (to I-605)

- Mostly alluvium with some Fernando and Puente Formation rock near south end
  - Alluvium may contain cobbles and boulders
  - Fernando Formation: mudstone
  - Puente Formation: sandstone, siltstone, and mudstone
- Alhambra Wash Fault is considered active
- Potential for high groundwater inflows in alluvium
- Groundwater levels not uniform across the zone
- Superfund site located in the south central portion
- Perennial Rio Hondo and San Gabriel Rivers and recharge lakes at eastern portion


N
Atlantic Blvd.
Alhambra Wash Fault
Rosemead Blvd.
Rio Hondo
Santa Anita Ave.
SR-605
Qal
Alluvial Soil (Qalo)
Tunnel
Fernando Formation (Tf)
Puente Formation (Tp)

CH2MHILL

Geologic Zone Comparison



Summary of Findings

Zone	Predominant Geologic Formation(s)	Number of Geologic Formations	Percent of Zone in each Formation	Number of Reported / Mapped Faults	Number of Active Faults Crossing Zone	Potential for Gassy Conditions[a]	Percent of Zone Under Superfund Site
1	Puente Alluvium	2	80 to 90 10 to 20	5	0	H	5 to 10
2	Puente Topanga Fernando Alluvium	4	70 to 80 10 to 15 5 to 10 5 to 10	7	1 (NW Portal)	H	0
3	Topanga Alluvium Puente Fernando Diorite	5	30 to 40 10 to 20 20 to 30 5 to 10 10 to 20	7	3[b]	M	0
4	Alluvium Fernando Puente	3	70 to 80 10 to 15 10 to 15	5	2	L	5 to 15
5	Alluvium Fernando Puente	3	75 to 85 10 to 15 5 to 10	3	1	L	5 to 30

[a]H-High, M-Moderate, L-Low
[b]Includes potentially active faults

Key Geotechnical Factors for Tunneling

- Type of material (soil or rock)
- Uniformity of geology
- Rock/soil strength
- Stability of the ground
- Groundwater conditions
- Faults, especially active faults
- Potential for gas (methane, hydrogen sulfide)
- Contaminated soil, rock, or groundwater

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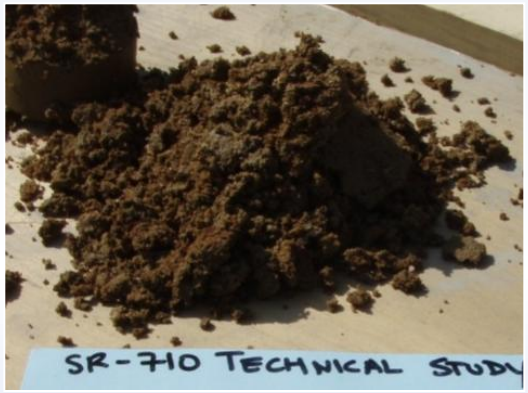
Ground Stability

- Loss of ground leads to surface settlement
- Groundwater magnifies issues
- Alluvium (soil deposits)
- Extensive in Zones 4 and 5, some in Zone 3, limited in Zones 1 and 2



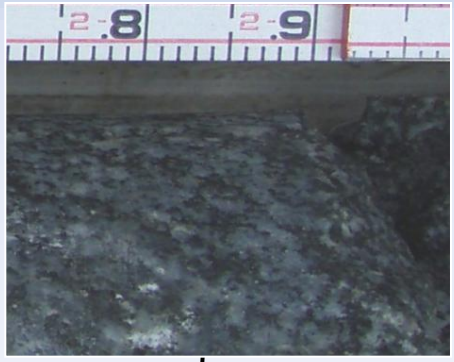
Special Pressurized Face Tunneling Machines

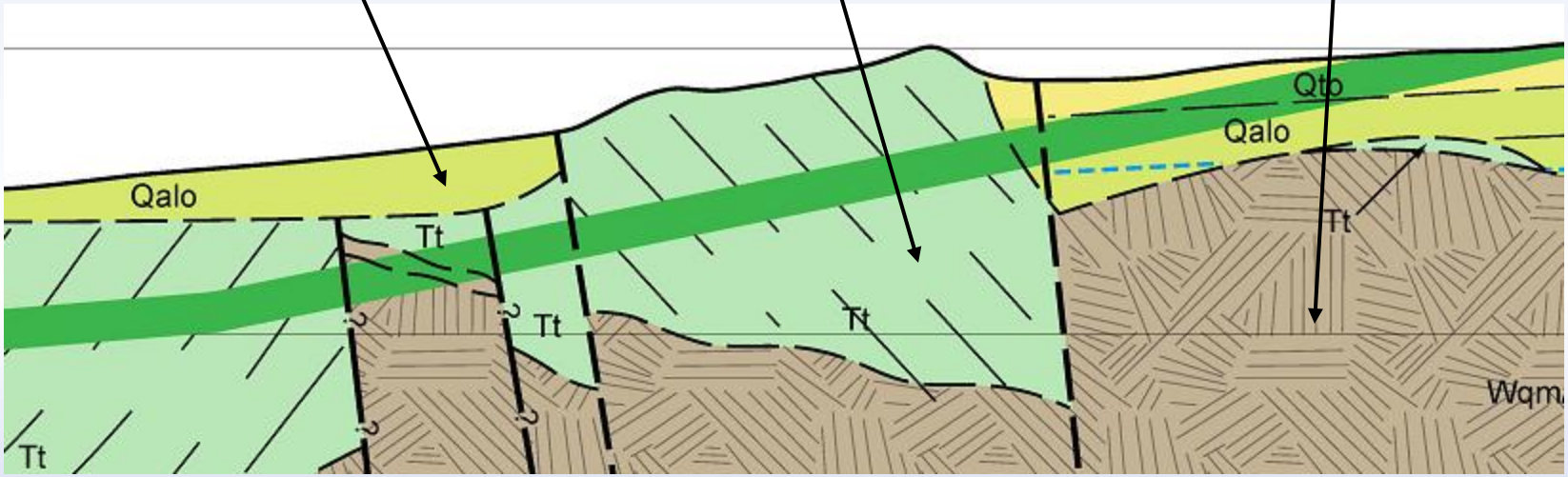
Uniformity of Geologic Units

Soil

Weak (Soft) Rock

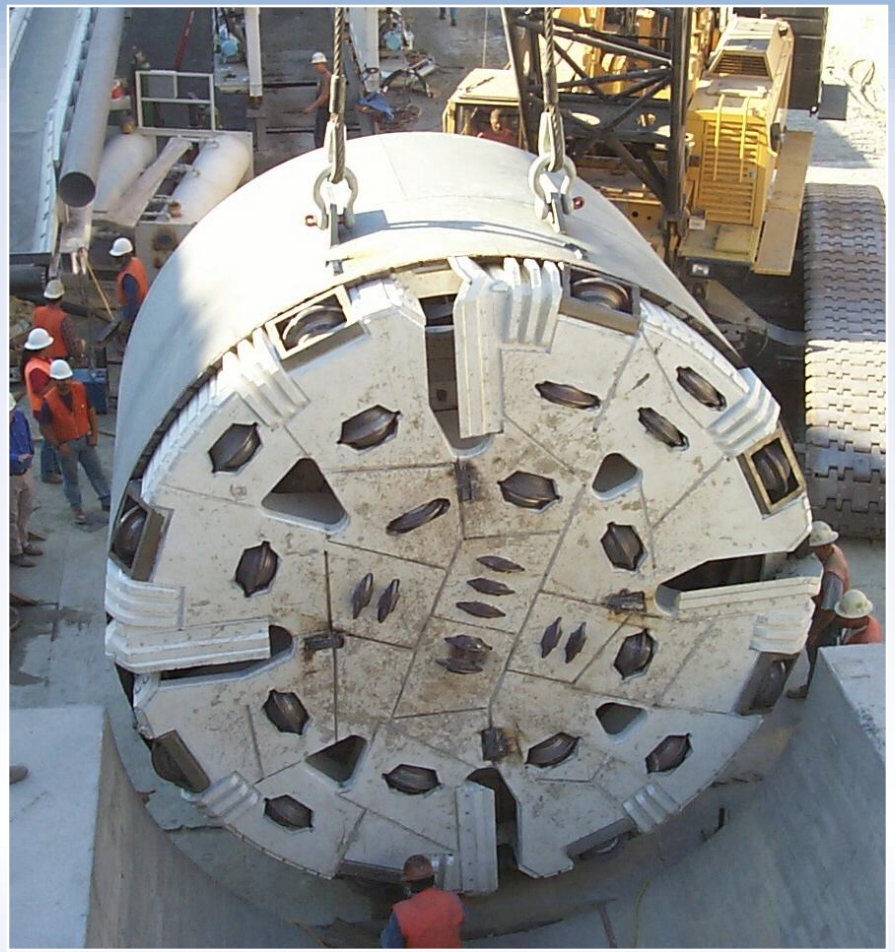
Hard Rock



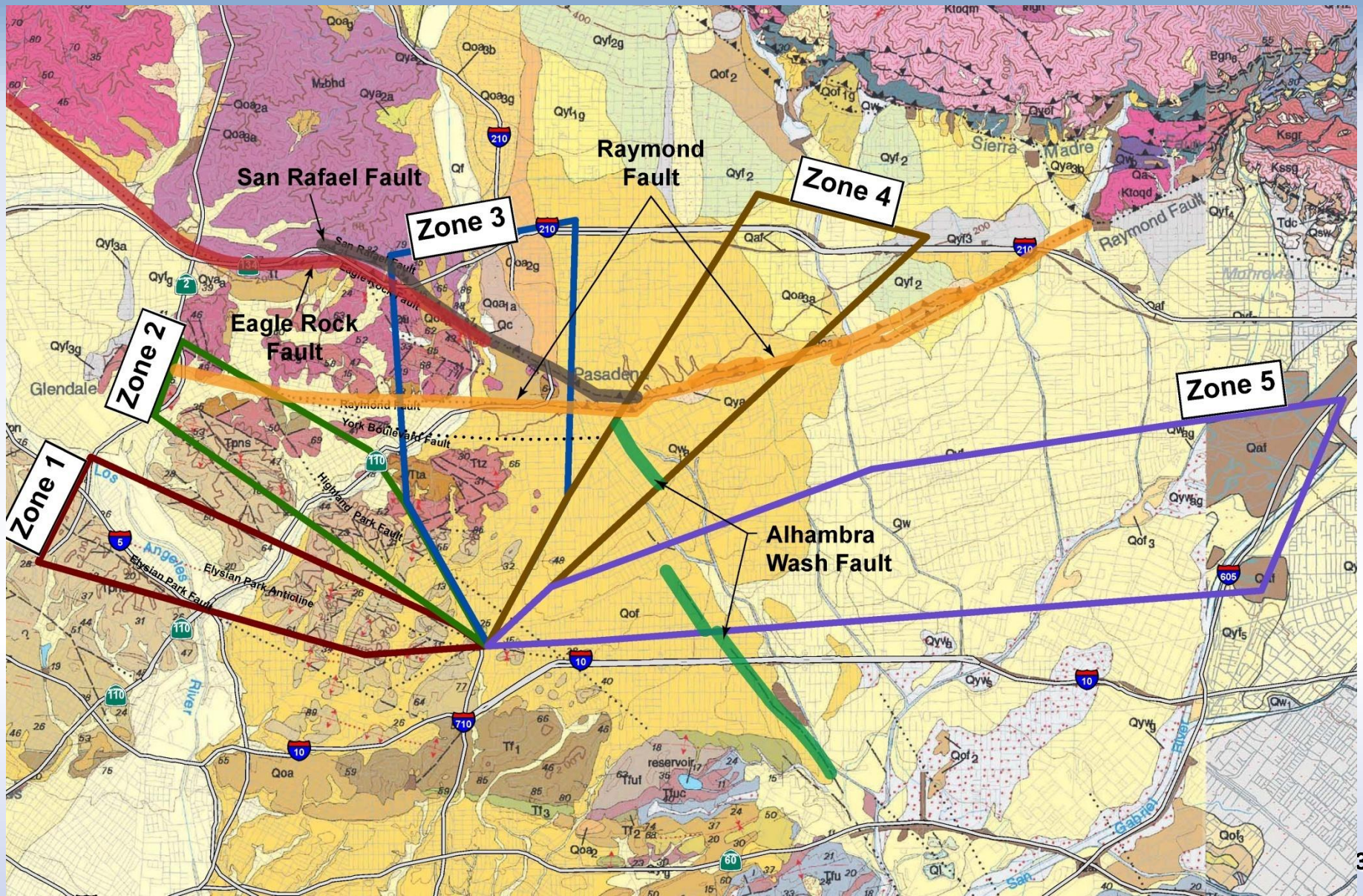


TBM with Rock/Soil Cutterhead

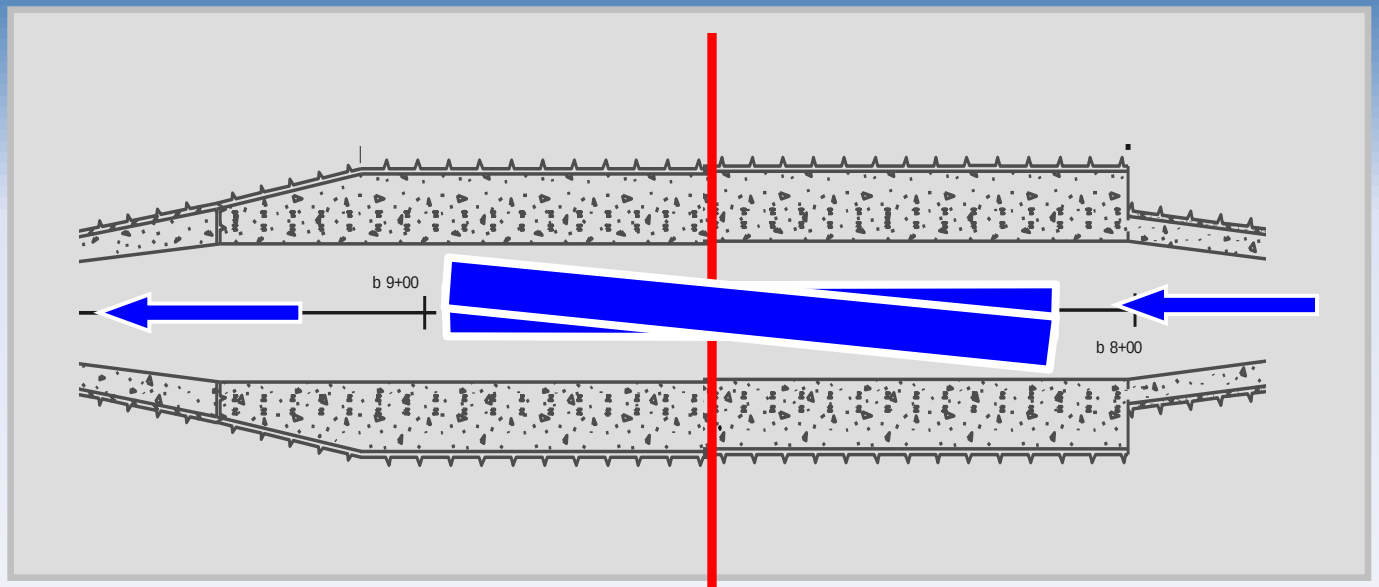
- Riverside Badlands Tunnel
- Single TBM for 8-mile tunnel
- Weak sedimentary rock; hard rock (gneiss); and alluvium



Active Faults in Zones 2, 3, 4, and 5

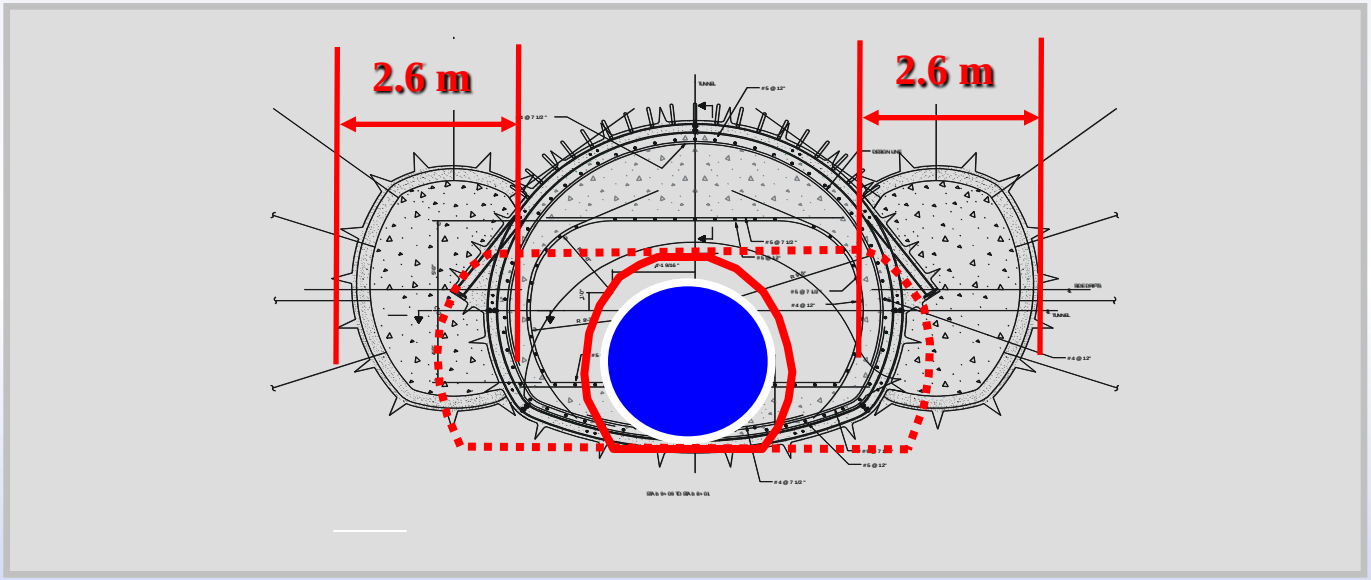


Oversized Vault Section

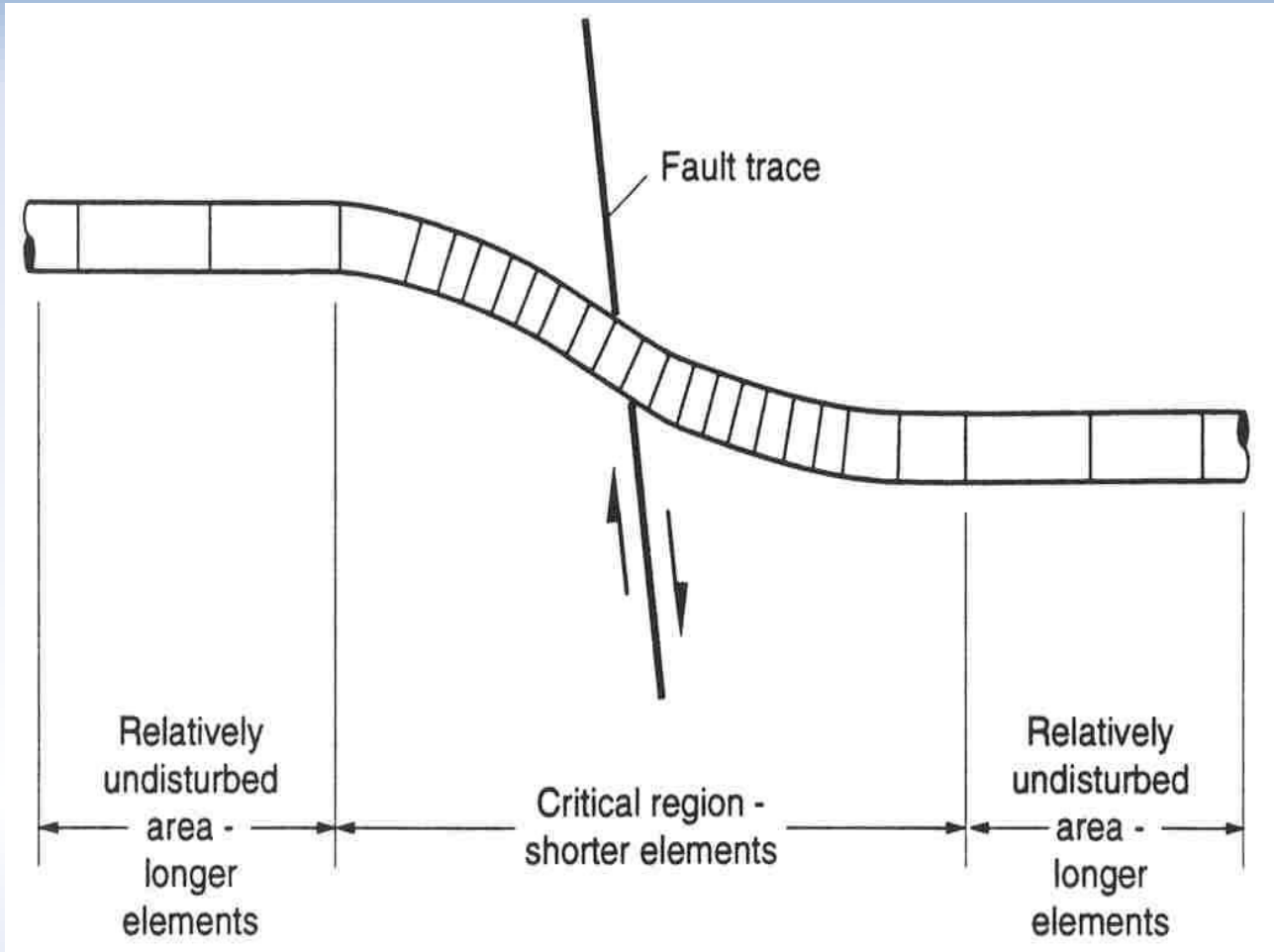


Plan

Configuration after Earthquake



Fault Crossing with Segmental Tunnel



Summary of Tunnel Case Histories

Tunnel Name	Geology	Fault Crossings	Naturally Occurring Gas	Contaminate Soils	Tunnel Size (>35 feet)	Highway Tunnel	Urban Setting	Tunnel Length (>4 miles)
NEIS	■		■				■	■
ECIS	■		■	■			■	■
Metro Red Line	■	■	■	■			■	
Metro Gold Line	■		■	■			■	
Caldecott Fourth Bore		■			■	■		
Devil's Slide		■	■		■	■		
Madrid Calle 30					■	■	■	
Shanghai Yangtze River					■	■		■
Paris A-86 SOCATOP	■				■	■		■

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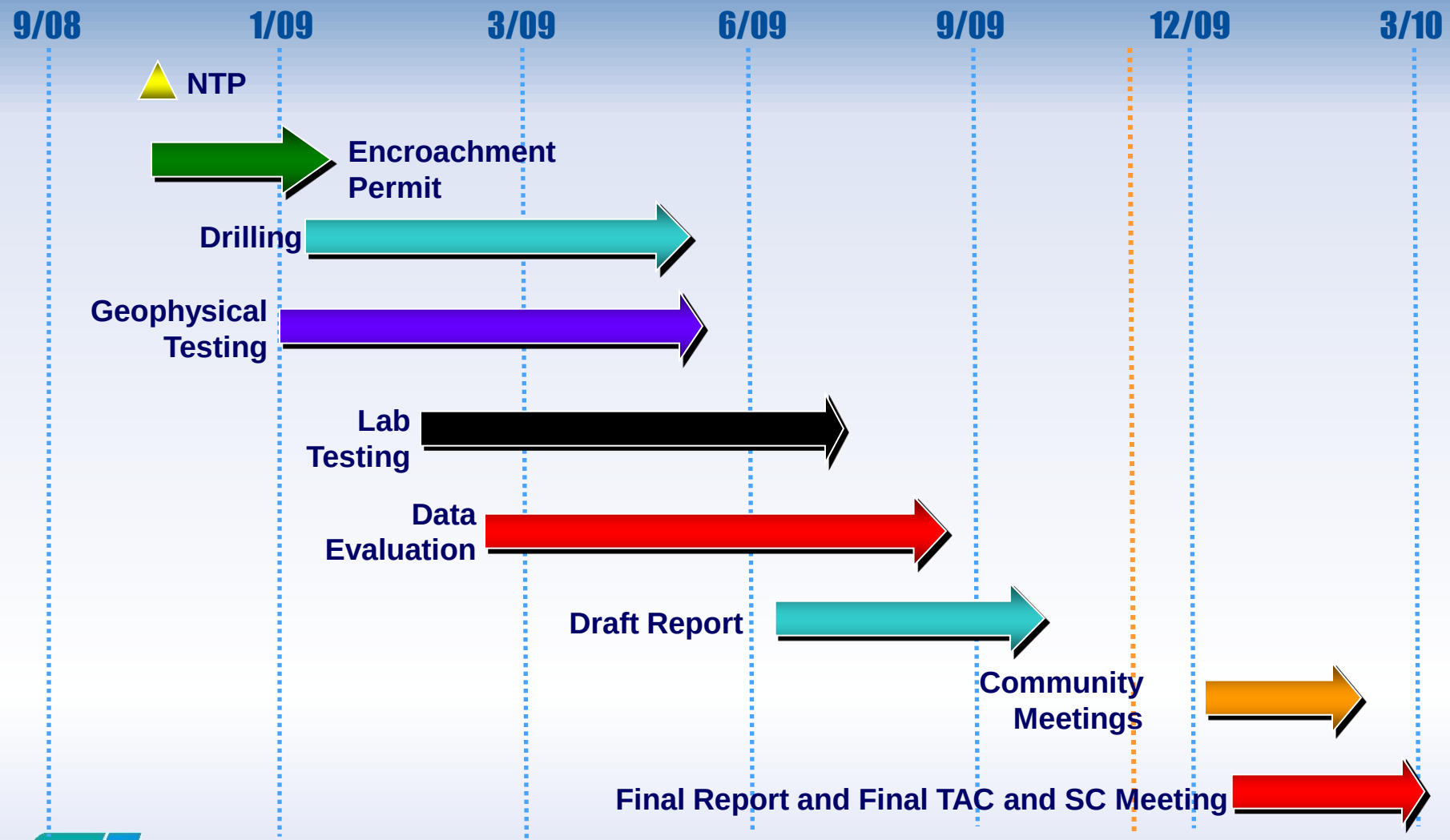
Geotechnical Feasibility of Tunneling

- Feasible in all 5 zones
- Each zone presents unique conditions
- Technology exists to address these conditions
- Has been done successfully in Los Angeles, California, and around the world

Tunnel Study - Schedule



Neighborhood & Community Outreach

- Steering and Technical Advisory Committees
- Elected Officials Briefings
- Presentations
- Community Meetings & Events
- Boring Notices, Fact Sheets, FAQs, Newsletter
- Website
- Canvassing
- Advertising & Articles in Local Newspapers
- Field Office and Outreach
- Information Line

Upcoming Meetings

Wednesday, January 20, 2010 **Wilson Middle School** **1221 Monterey Road** **Glendale, 91206** **6 p.m. to 8 p.m.**	**Tuesday, January 26, 2010** **San Marino Center** **1800 Huntington Drive** **San Marino, 91108** **6 p.m. to 8 p.m.**	**Tuesday, February 2, 2010** **Los Angeles Christian Presbyterian Church** **2241 N. Eastern Avenue** **Los Angeles, 90032** **6 p.m. to 8 p.m.**
Wednesday, February 10, 2010 **Jefferson Middle School** **1372 E. Las Tunas Drive** **San Gabriel, 91776** **6 p.m. to 8 p.m.**	**Wednesday, February 17, 2010** **Ramona Hall** **N. Figueroa Street** **Los Angeles, 90031** **6 p.m. to 8 p.m.**	**Wednesday , February 24, 2010** **El Monte Community Center** **3130 N. Tyler Avenue** **El Monte, 91731** **6 p.m. to 8 p.m.**

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Summary Report DVD Library Locations

Alhambra Civic Center and Library Alhambra, CA	Arroyo Seco Regional Library Los Angeles, CA	Crowell Library San Marino, CA
Cypress Park Library Los Angeles, CA	El Monte Library El Monte, CA	El Sereno Branch Library Los Angeles, CA
Glendale Public Library Glendale, CA	Irwindale Public Library Irwindale, CA	La Canada Flintridge Library La Canada Flintridge, CA
Lincoln Heights Library Los Angeles, CA	Live Oak Public Library Arcadia, CA	Monterey Park Bruggemeyer Library Monterey Park, CA
Norwood Library El Monte, CA	Pasadena Public Library Pasadena, CA	Rosemead Library Rosemead, CA
San Gabriel Public Library San Gabriel, CA	South Pasadena Public Library South Pasadena, CA	Temple City Public Library Temple City, CA

Next Steps

- **Final Summary Report- March 2010**
  - **Draft Report**
  - **Public Comments due February 9, 2010**
  - **Study Next Steps**

- **Presentation to TAC/SC- March 2010**

Send Comments to:

SR-710 Technical Tunnel Study Information Office

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Los Angeles, CA 90032
Toll Free: (877) 710-INFO
Tel. (323) 222-1710
Fax: (323) 222-9710

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Questions and Answers