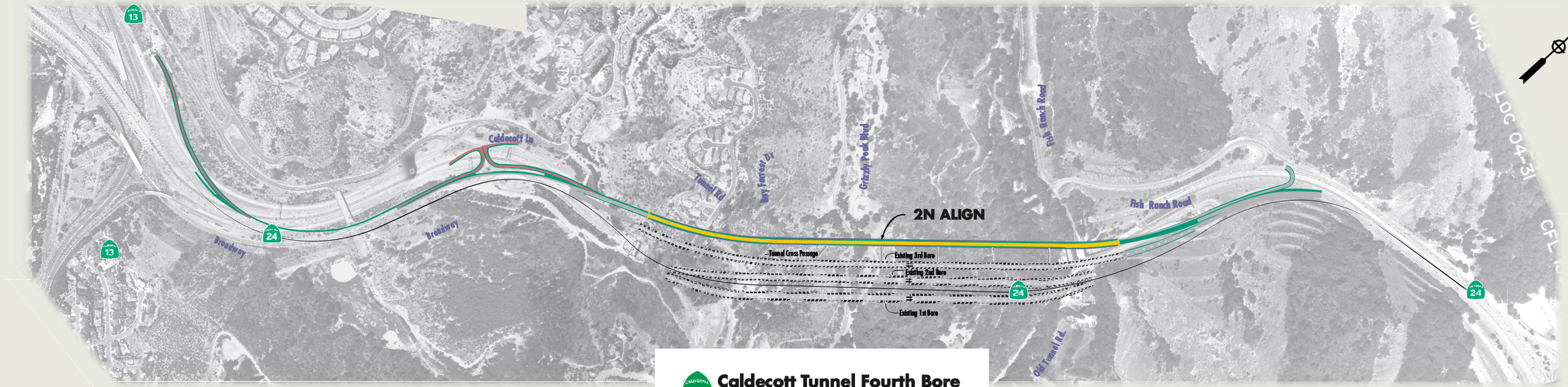
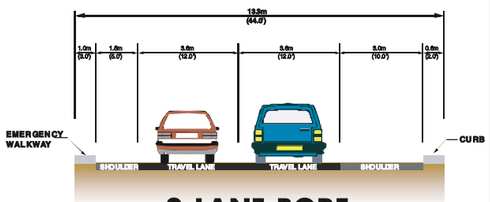
2-Lane North Alternative



Caldecott Tunnel Fourth Bore

Proposed Tunnel Cross Section

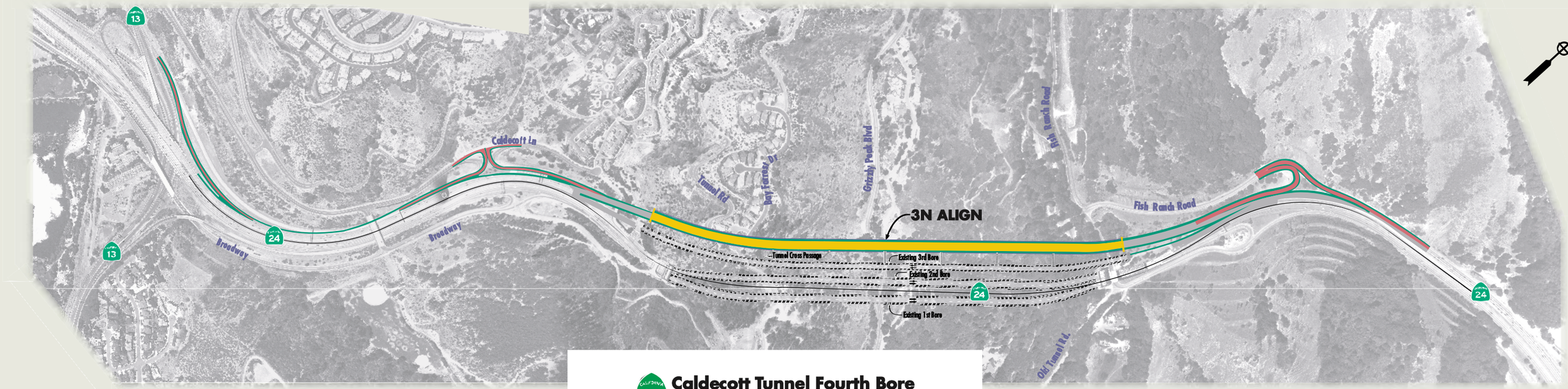


2-LANE BORE

LEGEND

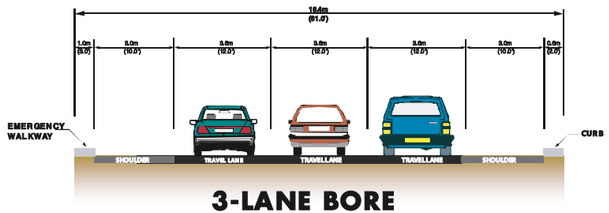
- Emergency Walkway
- Ramp
- Tunnel
- Shoulder
- Highway

3-Lane North Alternative



Caldecott Tunnel Fourth Bore

Proposed Tunnel Cross Section



3-LANE BORE

LEGEND

- Emergency Walkway
- Ramp
- Tunnel
- Shoulder
- Highway

TUNNEL DESIGN

CALDECOTT Improvement Project

Horizontal bore holes being drilled in March 2005 near the proposed East Portal.

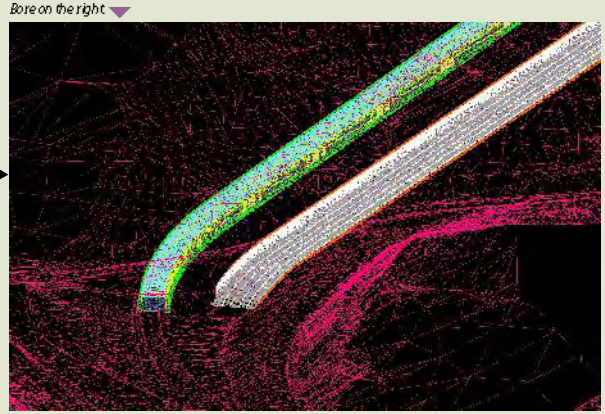
Rock core samples are retrieved from boreholes, reviewed, photographed, and logged. Lab testing yields rock strength and other data needed to design the tunnel support and linings

Historic construction photos and documents of the first 3 Caldecott tunnel bores yields valuable information about the ground conditions that can be expected in the new tunnel

Step 1

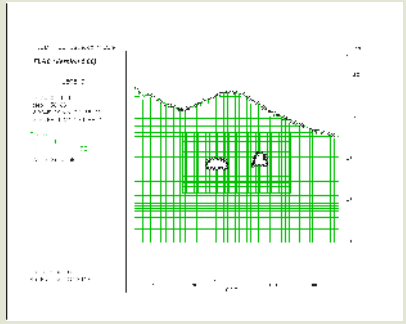
Historical Review and Geotechnical Investigation: Rock and soil samples are taken from proposed alignment – Surface geologic formations, faults, and groundwater conditions are reviewed and analyzed.

3D CAD model above shows view at Orinda end of tunnel with existing third bore on left and proposed 4th Bore on the right

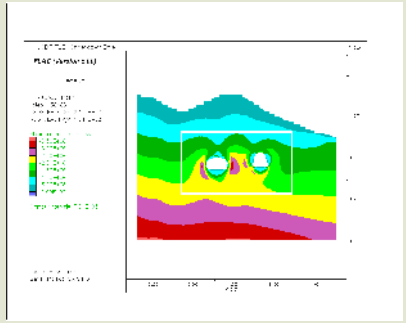


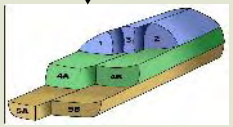
Step 2

Tunnel Alignment and Interaction: Proposed alignment is refined while potential impact on existing 3rd bore must be considered.



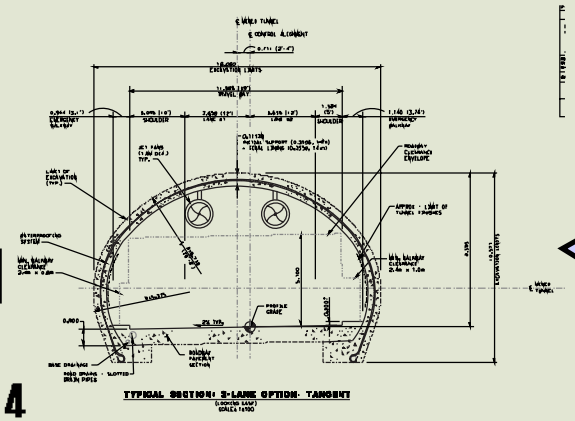
Finite element computer modeling is used to determine allowable clearance between the new tunnel and the existing tunnel based on ground conditions determined from geologic and historic investigation.





Step 3

Initial Tunnel Lining and Excavation Design: Full tunnel will be mined in stages (drifts) from top to bottom so smaller areas can be more easily supported with sprayed-on concrete (shotcrete).



TYPICAL SECTION: 2-LANE OPTION: TANGENT

Step 4

Final Tunnel Lining and Finishes:
Waterproofing, final concrete lining, lighting, architectural finishes and safety systems are designed to meet long-term design life of new tunnel.

Final Step

Engineers and geologists map and interpret actual ground conditions encountered during tunnel construction to ensure appropriate ground support types are placed to meet design requirements.

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TUNNEL CONSTRUCTION SEQUENCE

CALDECOTT Improvement Project

Step 1

Staging Area Preparation: Construction Equipment, trailers, and materials are gathered at each portal and softer earth and rock materials are removed to allow beginning of mined tunneling.

A mechanical "Roadheader" will be used to cut through most of the rock

Step 2

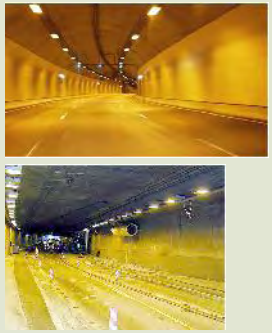
Tunnel Excavation: Tunnel is excavated in stages from both the Oakland and Orinda Portals.

Sprayed-on concrete (shotcrete) is applied over steel supports to the top of the tunnel to provide temporary support during construction.

Emergency cross-passages will be installed to allow safe exit to the 3rd bore in case of emergency.

Step 3

Tunnel Concrete Lining: Final Concrete Lining is cast-in-place with steel reinforcement to form the final structural surface of the tunnel.



Step 4

Tunnel Utilities: Lighting, ventilation and other tunnel utilities are installed in tunnel and cross-passages. Final roadway surface is placed.

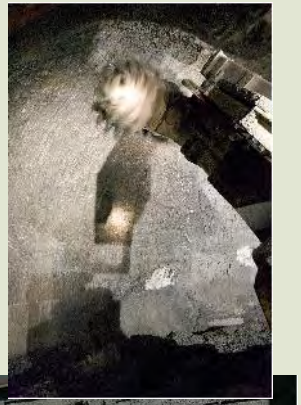
Final Step

Tunnel Opens! Final system, quality, and safety checks are performed prior to opening tunnel to traffic.

Caltrans CCTA

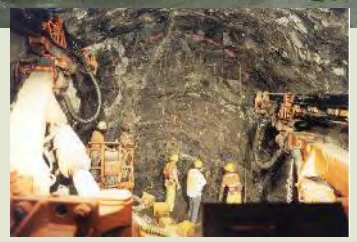
TUNNEL CONSTRUCTION EQUIPMENT

CALDECOTT Improvement Project



ROADHEADER
This equipment will be the primary excavating equipment used in the tunnel to excavate softer rock. It uses a rotating cutter head that grinds the rock away in a controlled manner and conveys the muck to dump trucks behind it for hauling.

DRILL JUMBO
Large drill jumbos may be used to drill in holes in precise patterns at the face of the excavation. These holes are used for setting small charges to loosen and excavate very hard rock encountered in the tunnel.



DUMP/HAUL TRUCKS
10-20 Cubic Yard rubber tire dump trucks are used for transporting muck out of tunnel.

ROLLING STEEL FORMS
Pre-fabricated steel forms made to the exact final dimensions of the tunnel allow efficient placement of the final concrete lining along the excavated tunnel.

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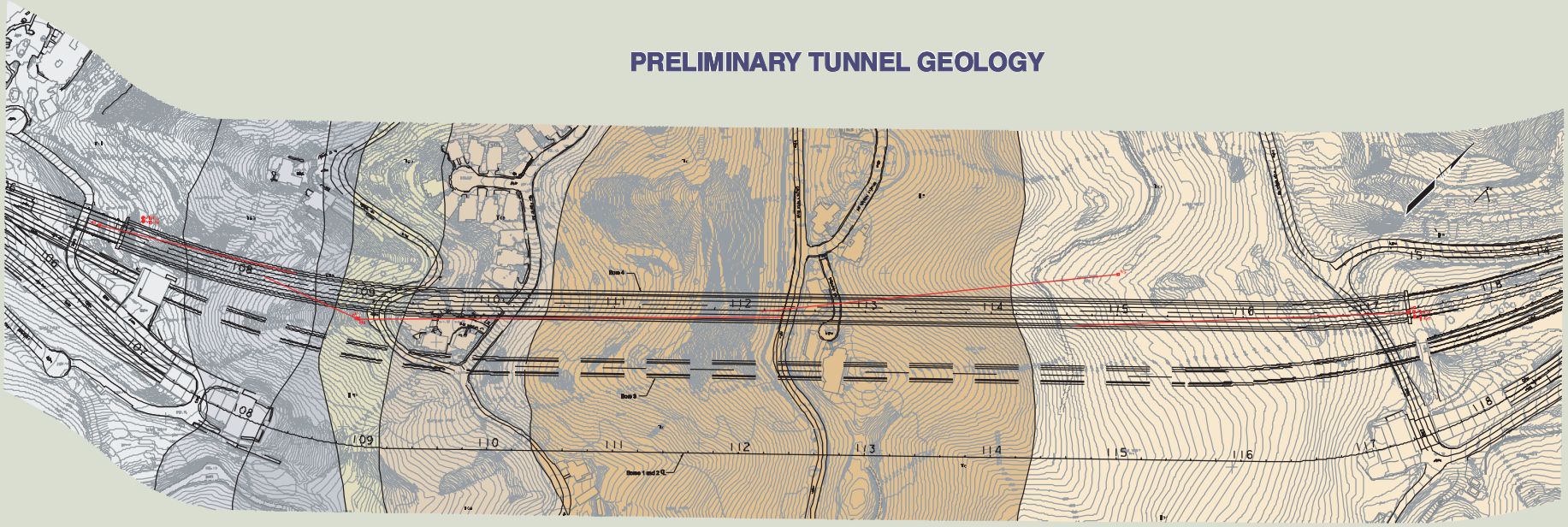
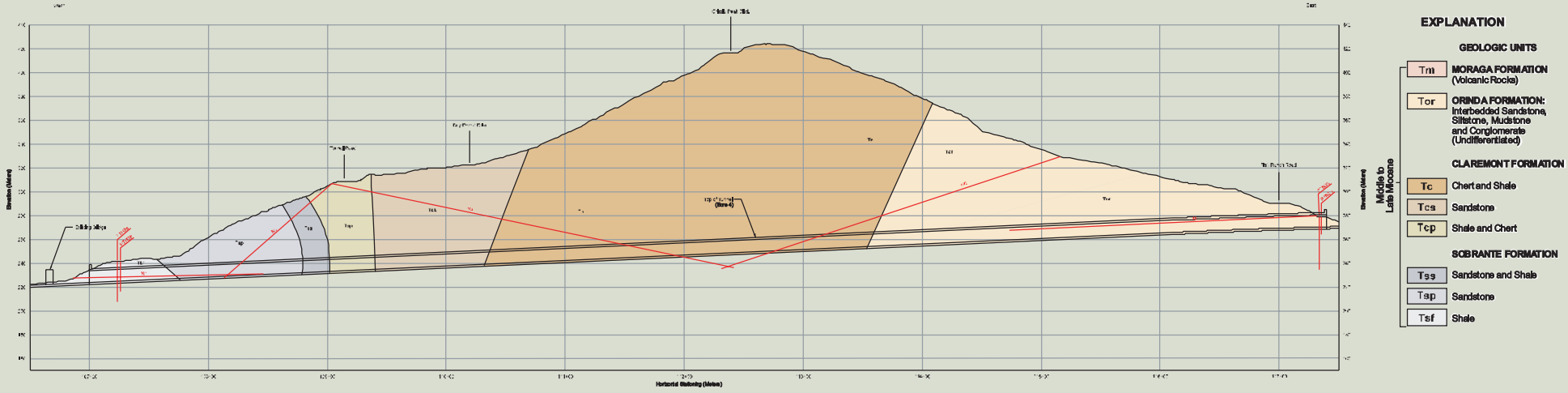
GEOLOGIC/GEOTECHNICAL STUDIES

PRELIMINARY TUNNEL GEOLOGY



PLAN



PROFILE