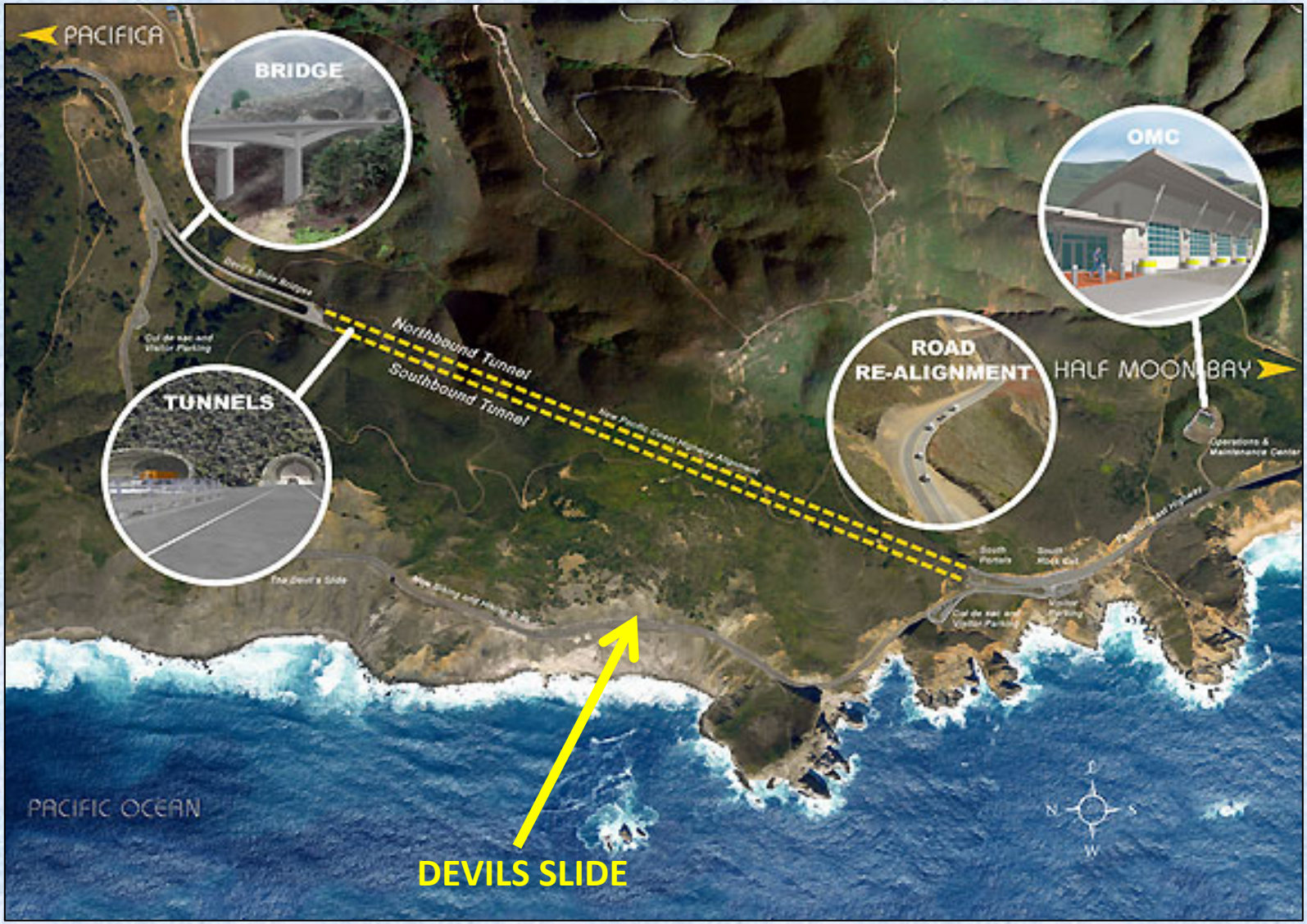
DEVIL'S SLIDE TUNNEL PROJECT UPDATE
CTC December 14, 2011



DEVIL'S SLIDE TUNNEL BID INFORMATION

Engineer's Estimate:
$240,011,867 and 1900 Working Days
(working days are calendar days)

Low Bidder: Kiewit Infrastructure West
$272,366,000 + 1500 Working Days

2nd Bidder: Shea Traylor Atkinson JT
$321,094,075 + 1900 Working Days

Contract Award: 12/13/06
Contract Approval: 1/3/07

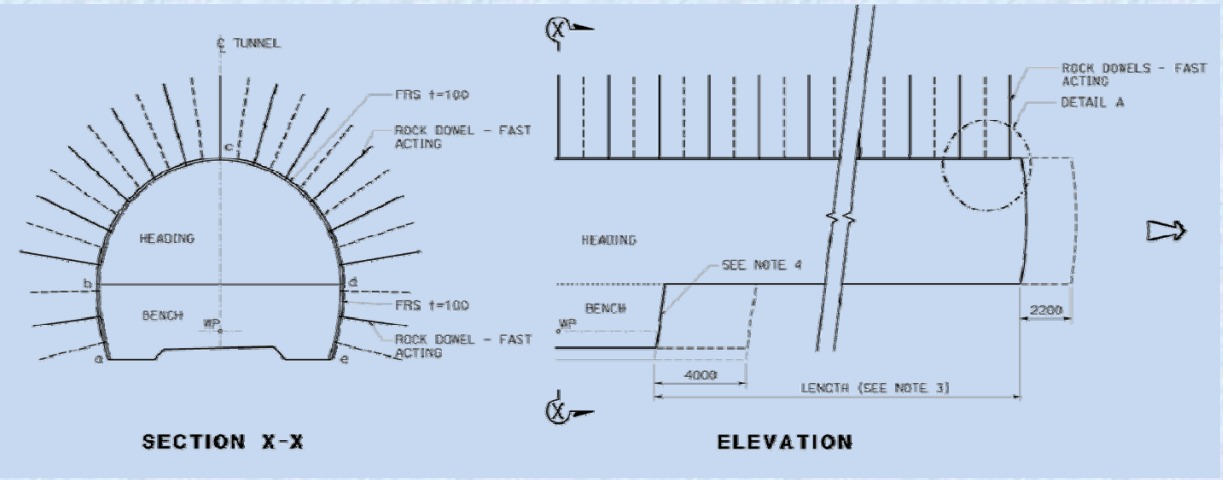
TUNNEL EXCAVATION METHOD

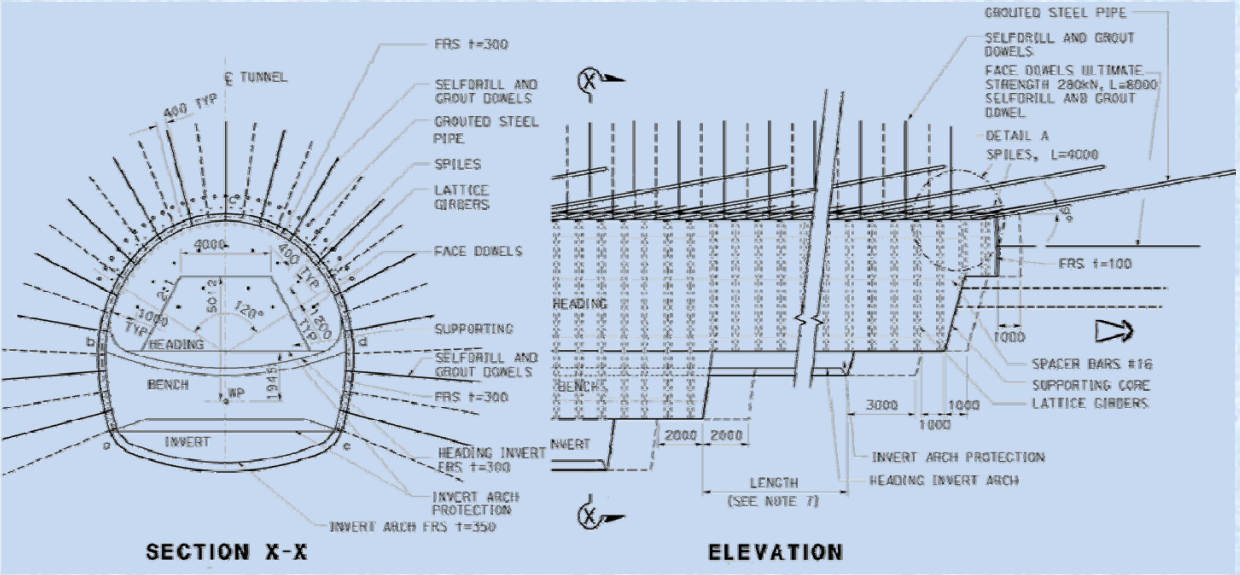
Twin bore Tunnels being constructed utilizing "New Austrian Tunneling Method" (NATM) Method

NATM or Sequential Excavation Method (SEM) utilizes a set of support measures for each category including the following:

- Reinforced Shotcrete
- Lattice Girder
- Rock Dowels, of different types
- Spiles, of different type
- Probing Ahead and Drainage Holes

TUNNEL PROJECT EXCAVATION
GROUND SUPPORT CATEGORY I & V





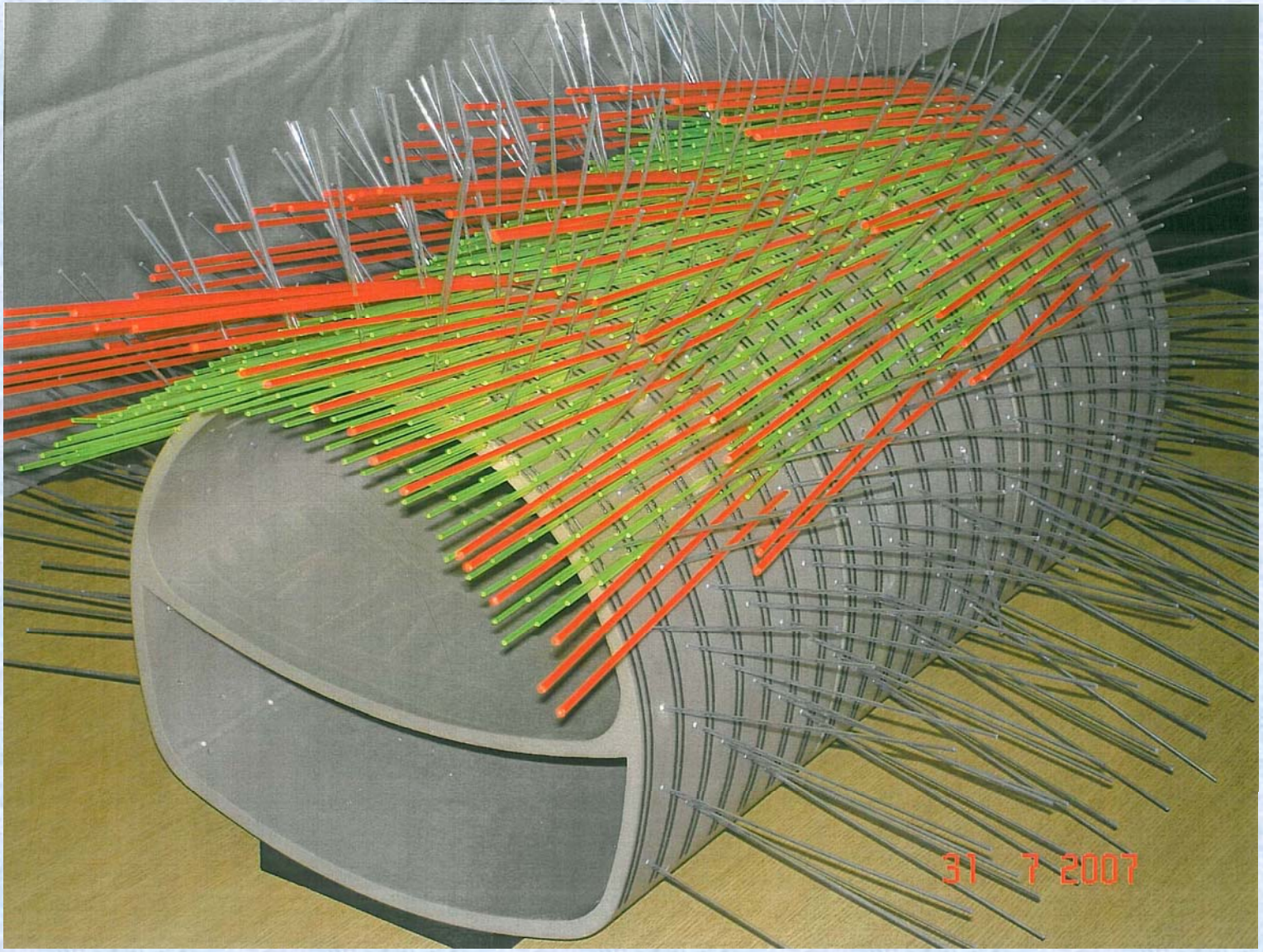
CATEGORY I

- Top Heading / Bench Excavation
- Advance Length: 2.2 m (7.2‘)
- Initial Lining: 0.1 m (0.3‘)
- Rock Dowels: 3.6 m (11.8‘) long, 1.0 m (3.3‘) O.C.

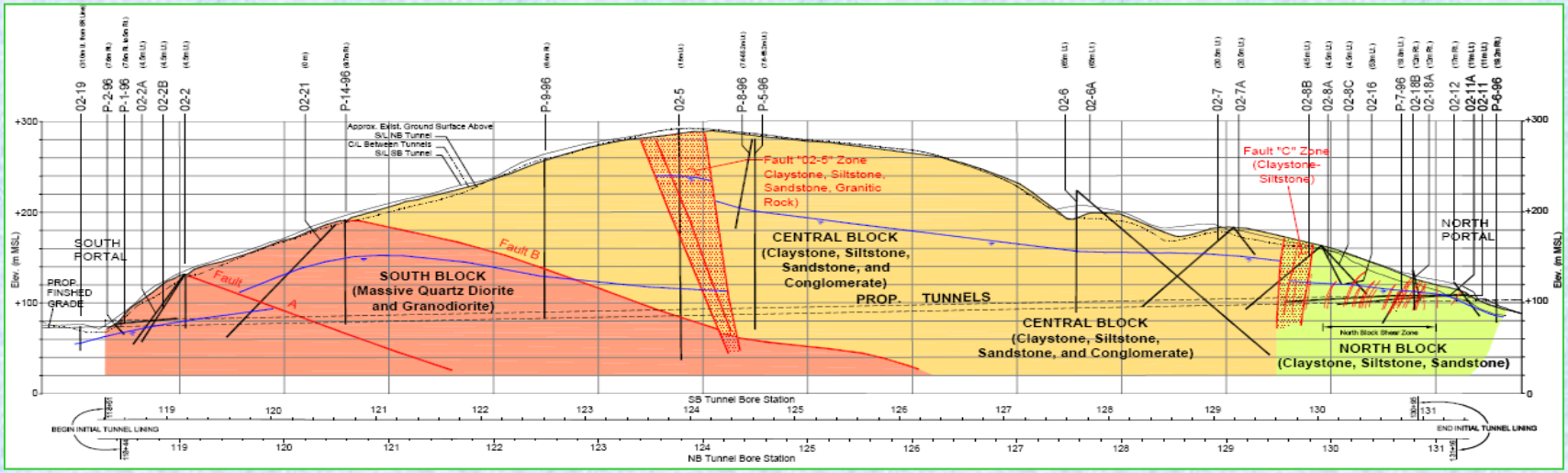
CATEGORY V

- Top Heading / Bench / Temp. Invert
- Advance Length: 1.0 m (3.3‘)
- Initial Lining: 0.3 m (1‘), 0.1 m (0.3‘) temp. face
- Rock Dowels: 4 m - 6 m (13‘ – 20‘), 1.0 m (3.3‘) O.C.
- Spiling: 4.0 m (13‘) long, 0.4m (1.3‘) on center
- Face Dowels: 8.0 m (26‘) long, every 4th round
- Grouted Pipes: 15.0 m (49‘) long
- Temporary and Permanent inverts

MODEL OF GROUND SUPPORT CATEGORY V

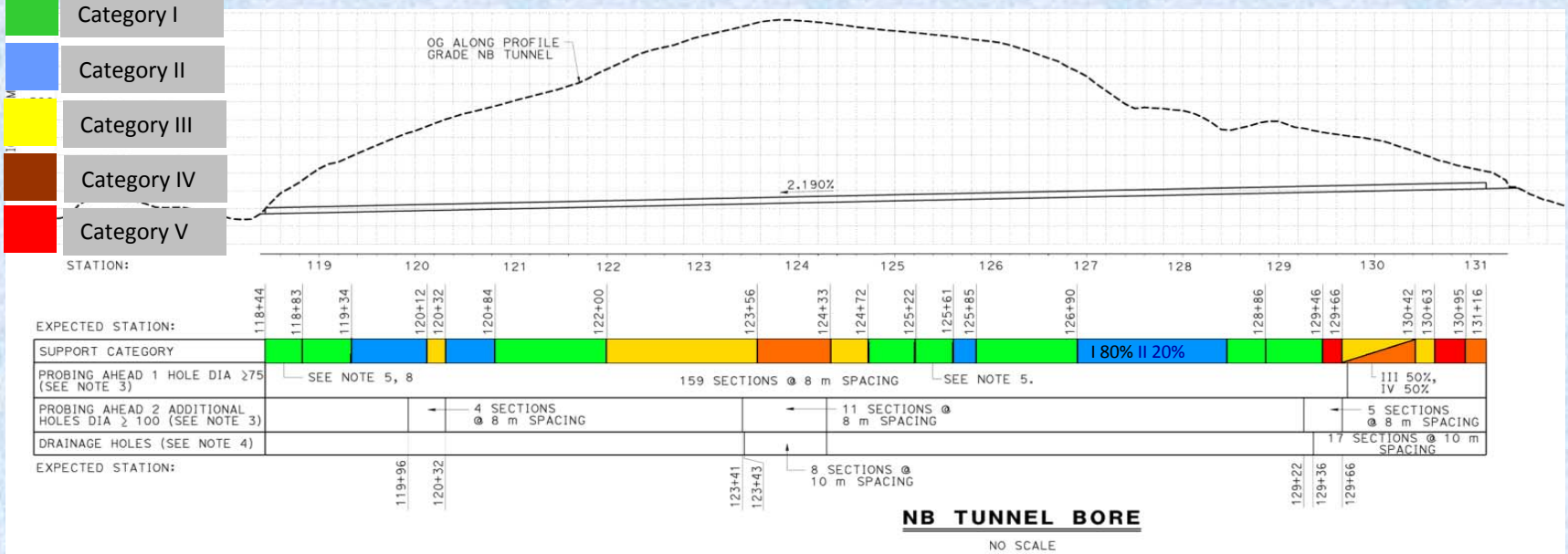


TUNNEL EXCAVATION



CATEGORIES OF SUPPORT

- Category I
- Category II
- Category III
- Category IV
- Category V



EXCAVATION SEQUENCE – CATEGORY III

Lattice Girder

Spiling

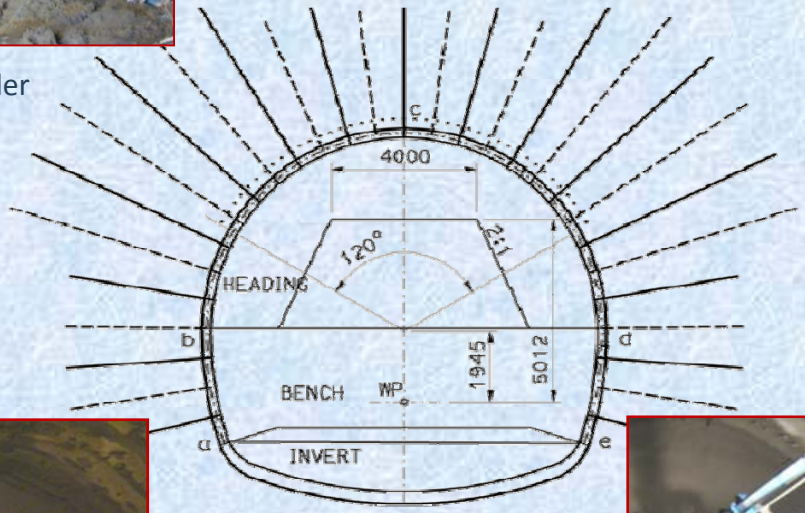
Shotcrete 150mm

Rock Dowel

Shotcrete 50mm

Excavation

Flashcrete 50mm

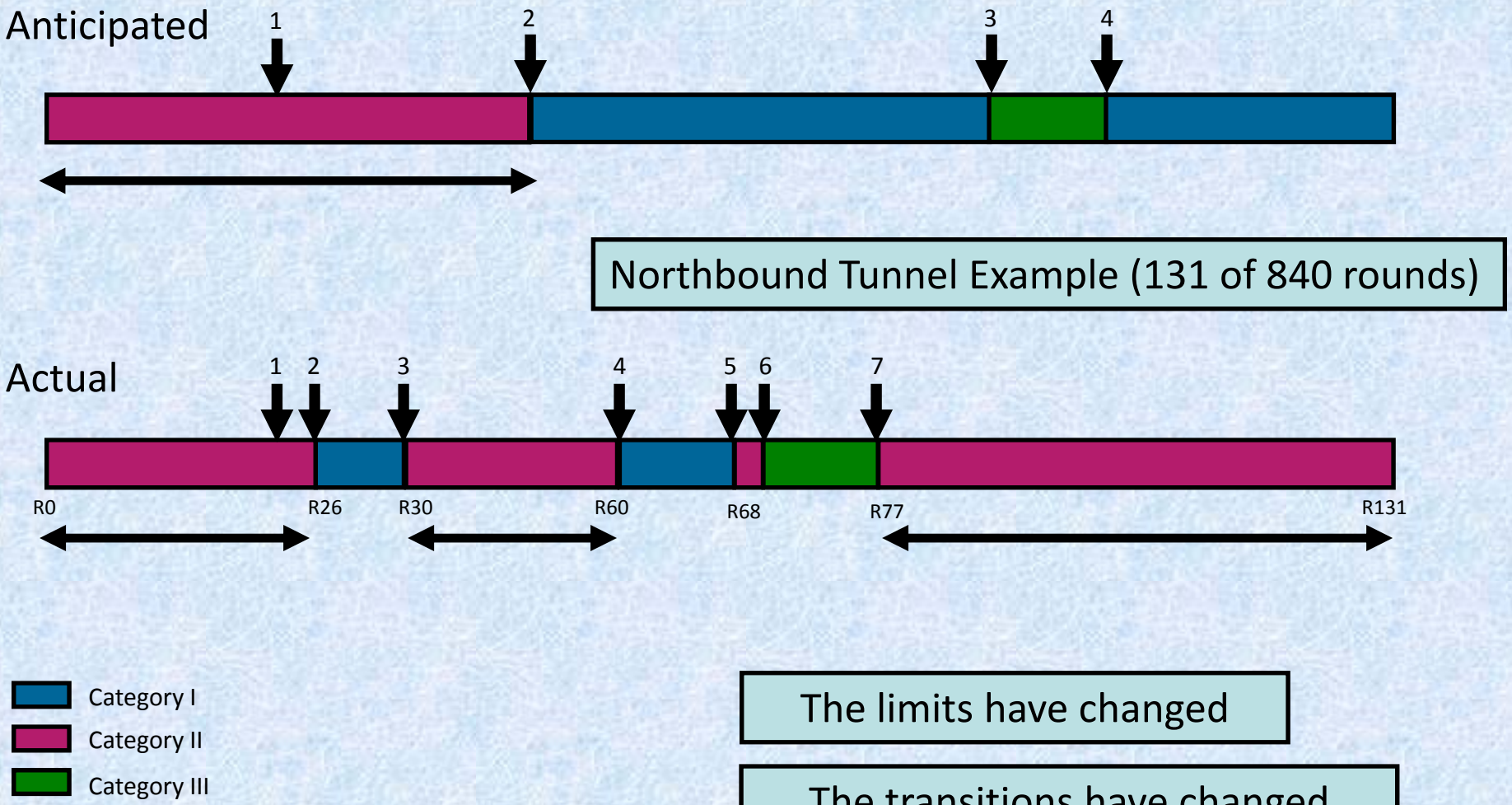


Support Category selected on observed Ground Behavior

TUNNEL EXCAVATION IMPACTS & DELAYS

- Tunnel excavation duration extended - 761 to 1150 days
- Change in CalOSHA tunnel classification
- Frequent changes in ground conditions due to Differing Site Conditions
  - 597 of 840 rounds in NB Tunnel had changes (70%)
  - 513 of 814 Rounds in SB Tunnel had changes (63%)
    - Changes in ground classifications
    - Changes in support categories
    - Mixed face conditions
    - Additional local support measures
    - Block Fallout
    - Convergence

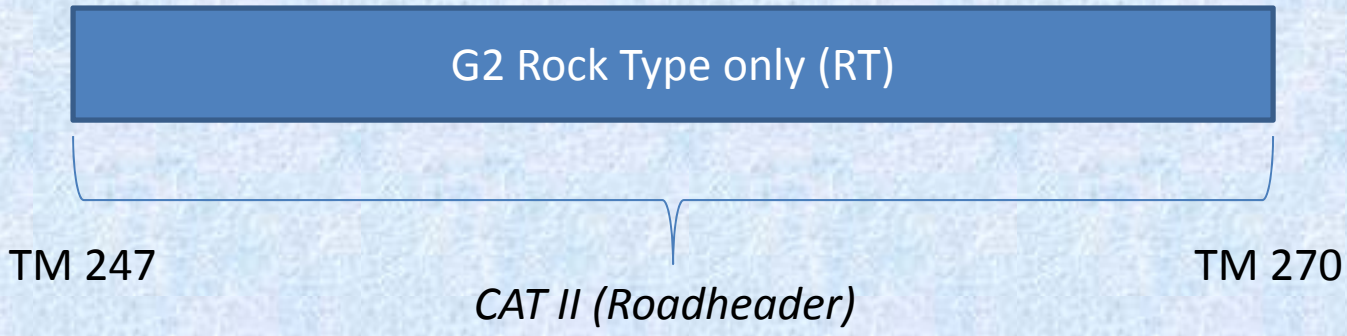
GROUND SUPPORT DISTRIBUTION



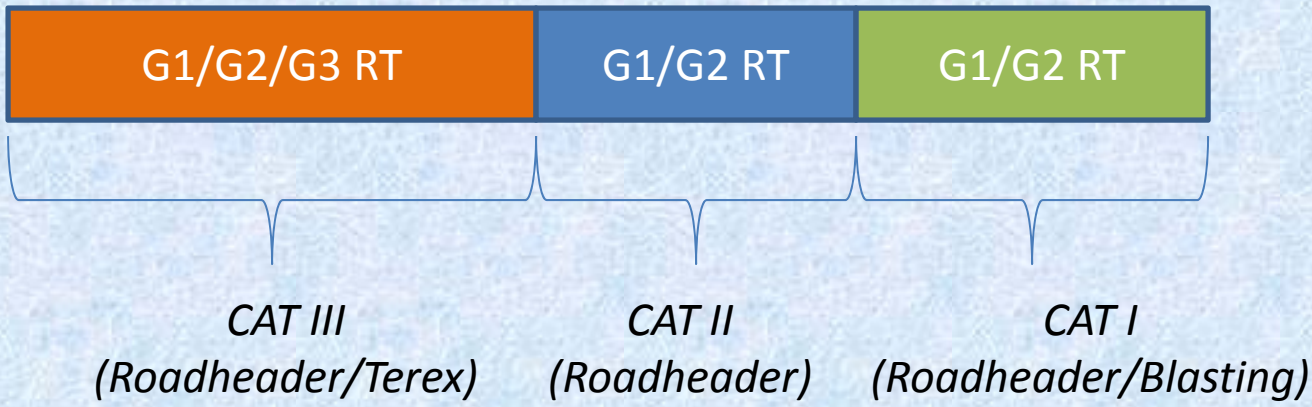
TRANSITION/MIXED FACE EXAMPLE

EXAMPLE: Planned Excavation versus Actual Excavation
TM 247 thru TM 270 Northbound Tunnel

Kiewit's expectation for GSC II Excavation per S2.25 of the plans

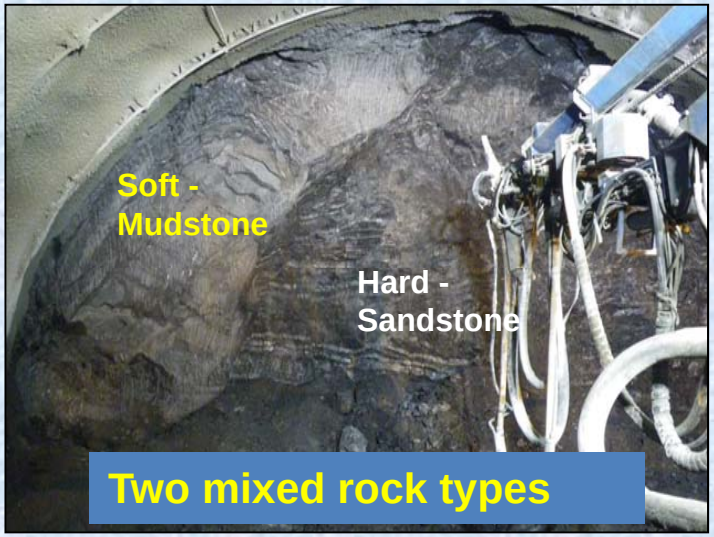


Actual Excavation Encountered



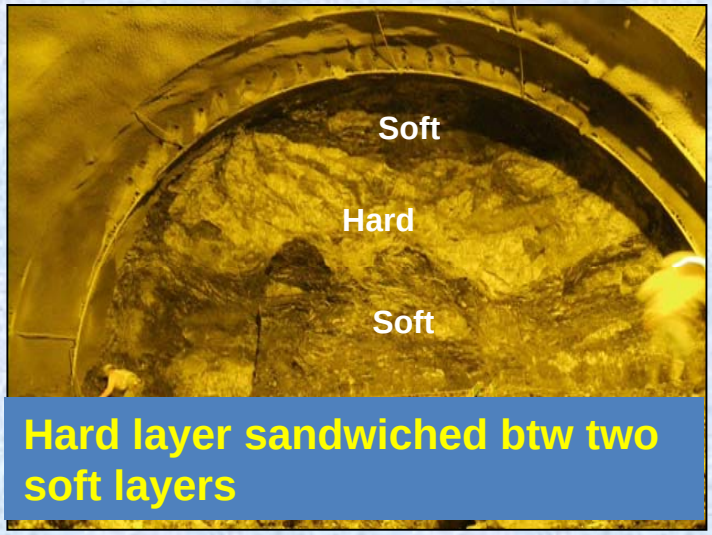
MIXED FACE CONDITIONS

Two mixed rock types & support - hard & soft



Two mixed rock types

Soft crown but hard bottom



Hard layer sandwiched btw two soft layers

BLOCK FALL-OUTS /CONVERGENCE

Block-fall-outs, Loose or unstable material in tunnel roof caused by unexpected ground conditions

Convergence , Anticipated movement of the tunnel walls. From meter 520 to 560, movement exceeded design limits requiring shut down of operations and installation of additional support.

Block fall out

Lattice Girder Bending Due to Convergence

CONTRACT FUND STATUS

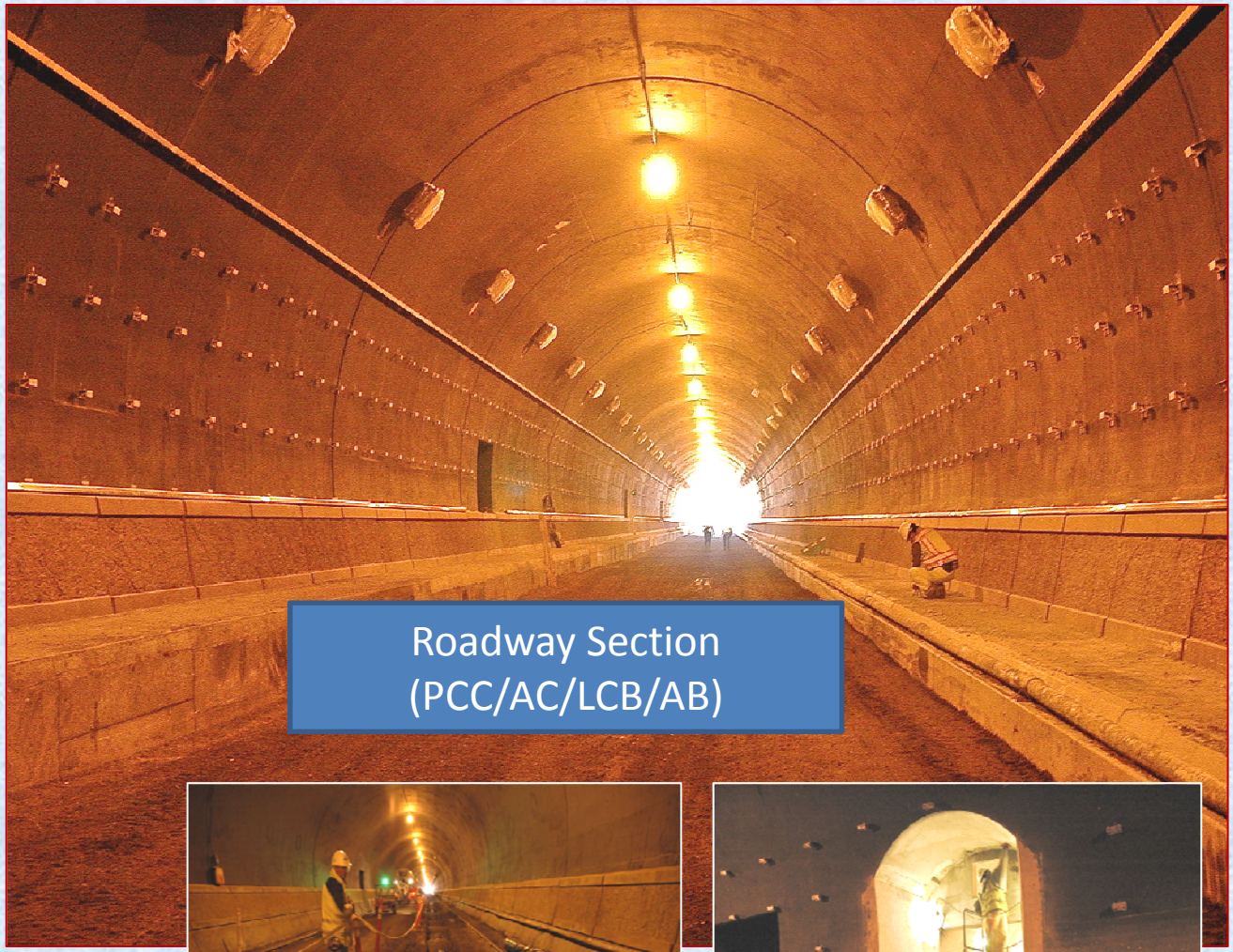
FEDERAL EMERGENCY RELIEF FUNDS (ER)

	Original Allotment	Revised Allotment	Spent to Date	Remaining Allotment
Bid Amount	$272,366,000	$272,366,000	$239,138,735	$33,177,265
Contingency	$13,722,300	$155,700,346	$138,427,549	$17,272,797
Supplemental	$2,136,700	$2,136,700	$279,407	$1,857,293
SFM	$2,875,000	$9,197,429	$9,197,429	$0
Total Allotment	$291,100,000	$439,400,475	$387,093,120	$52,307,355
Pending CCO/Item Increases				$ 7,204,337
Remaining Contingency Balance				$11,925,753

DEVIL'S SLIDE TUNNEL SCHEDULE INFORMATION

Activity	Baseline Schedule 1500 working days	Current Schedule 2263 working days
Northbound Top Heading Excavation "Hole-Thru"	5/21/09	9/28/10A
Southbound Top Heading Excavation "Hole-Thru"	6/22/09	10/12/10A
Traffic thru NB Tunnel Milestone	12/23/10	12/29/12
Traffic thru SB Tunnel Milestone	1/3/11	1/7/13
Project Completion	4/7/11	3/30/2013

TUNNEL CONSTRUCTION ACTIVITES



Roadway Section (PCC/AC/LCB/AB)

Porcelain Enameled Panels

Medium Voltage Vaults

Tunnel Waterline

Cross Passage Finish Work

Hydrant Line/Elect Conduits

QUESTIONS?