

Twin Tunnels Design/Construction Technical Team Meeting #2

May 24, 2012
9:00AM – 12:00PM
Elks Lodge
1600 Colorado Blvd.
Idaho Springs, Colorado



Twin Tunnels Design/Construction
Idaho Springs/Clear Creek County



Agenda

1. Final endorsement of Work Plan / Public Involvement Plan
2. Project Criteria Updates
3. Proposed approaches: Traffic impacts, Noise/Vibration, Wall railings, Tunnel Lining concepts
4. Updates / New Information: Portal to portal access road and creek crossing
5. Develop initial criteria for: Bridge aesthetics, I-70 retaining wall, Rockfall mitigation, Signing
6. Follow-up on questions from prior meeting
7. Next Steps

Step 1
Define Desired Outcomes
and Actions

Step 2
Endorse the Process

Step 3
Establish Criteria

Step 4
Develop Alternatives and Options

Step 5
Evaluate, Select, and Refine
Alternatives and Options

Step 6
Finalize Documentation and
Evaluation Process



Twin Tunnels Design/Construction
Idaho Springs/Clear Creek County

Technical Team Proposed General Project Criteria

During construction and in the final design, how well does the project element...

15. Incorporate sustainability by using locally available materials and environmentally-friendly processes?
16. Coordinate with Frontage Road efforts, preserve opportunities for the AGS?
17. Create opportunities to "correct past damage"?

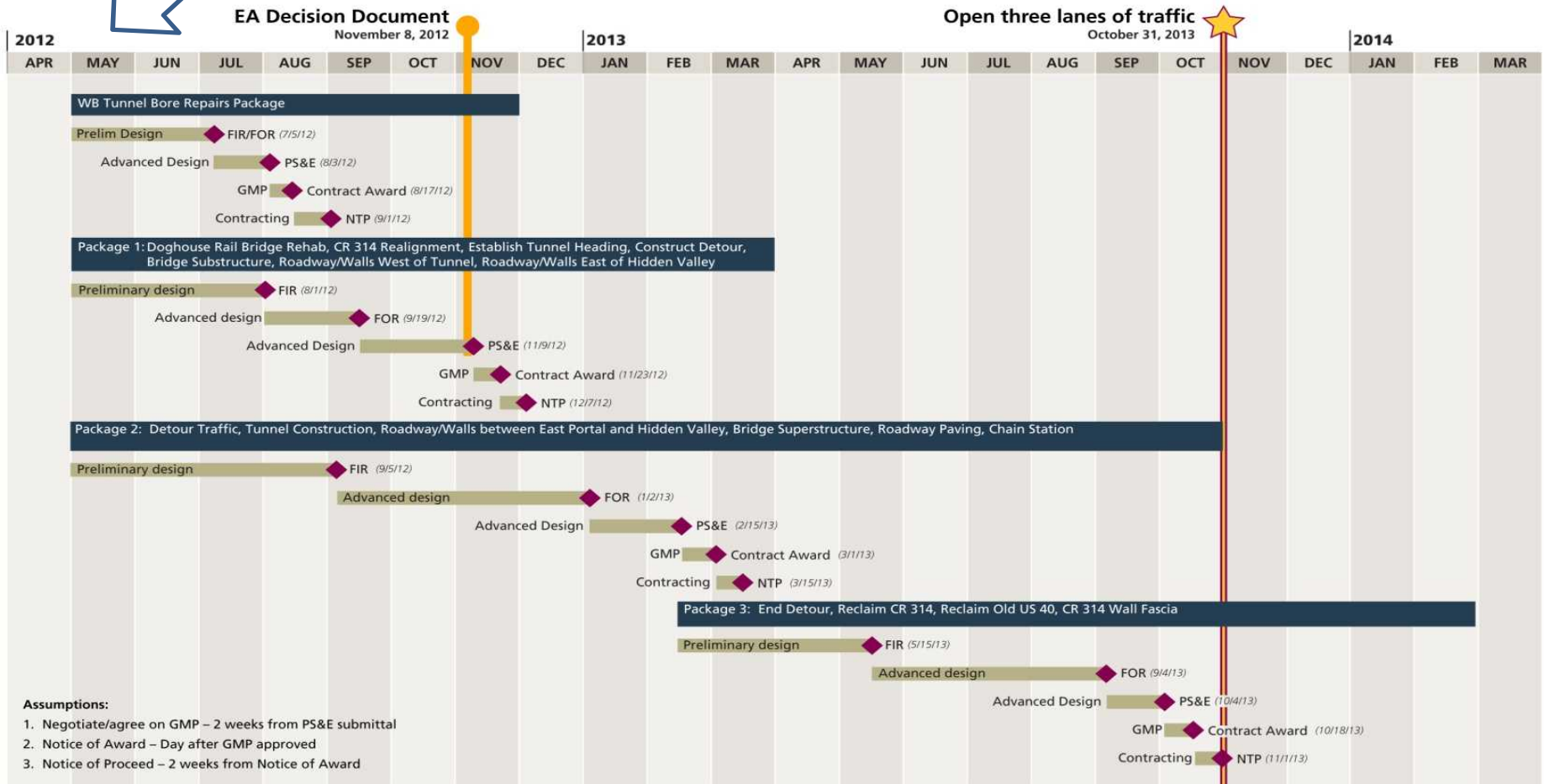


Preliminary Project Timeline

We are here



Timeline
Twin Tunnels Design/Construction



Assumptions:

1. Negotiate/agree on GMP – 2 weeks from PS&E submittal
2. Notice of Award – Day after GMP approved
3. Notice of Proceed – 2 weeks from Notice of Award



Establish Process and Measures for Applying Design Criteria

Fair / Better / Best Rating System

Fair	Better	Best
☹	☺	😊

1. Proposed by Project Team
2. Augmented by the Technical Team
3. Utilized by the Project Team to develop solutions
4. Results presented to Technical Team
5. Technical Team offers feedback
6. As necessary, Project Team incorporates refinements



Issues Timeline

TWIN TUNNELS WIDENING	
ISSUES FOR TECHNICAL TEAM PRELIMINARY SCHEDULE	
7-May-12	2012
	2013
	MAY JUNE JULY AUG SEPT OCT NOV DEC JAN FEB MAR APRIL MAY
ISSUES	1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4
NOISE/ VIBRATION	PLAN PREP [MAY 1-4] ON-GOING EXECUTION [DEC 1-2013]
TUNNEL LINING	[MAY 1-4]
RAILING	[MAY 1-4]
IMPACTS TO TRAFFIC	PLAN PREP [MAY 1-4] ON-GOING EXECUTION [AUG 1-2013]
I-70 RETAINING WALLS	[MAY 1-4]
BRIDGE AESTHETICS	[MAY 1-4]
NEPA ANALYSIS OF CONSTRUCTION METHODS	[MAY 1-4]
ROCKFALL STRUCTURES	PLAN PREP [MAY 1-4]
SIGNING	[MAY 1-4]
ADAPTIVE MITIGATION	PLAN PREP [MAY 1-4] ON-GOING EXECUTION [AUG 1-2013]
PUBLIC INFORMATION	PLAN PREP [MAY 1-4] ON-GOING EXECUTION [AUG 1-2013]
IMPACTS TO RECREATION USERS	[MAY 1-4] ON-GOING EXECUTION [AUG 1-2013]
INFRASTRUCTURE IN MEDIAN	[JUNE 1-4]
COATINGS (COLOR)	[JUNE 1-4]
LIGHTING	[JUNE 1-4]
LANDSCAPING	[JUNE 1-4]
TUNNEL PORTALS	[JUNE 1-4]
C.R. 314 FRONTAGE ROAD RETAINING WALLS	[SEPT 1-2013]
TRAILHEAD IMPROVEMETNS	[SEPT 1-2013]
ENHANCEMENT OPPORTUNITIES	SELECTION CRITERIA DEVELOPMENT [SEPT 1-2013] REFINE PRIORITIES [DEC 1-2013]

NOTE: FINAL DESIGN AND CONSTRUCTION WILL CONTINUE THROUGH MARCH 2014. AFTER FEBRUARY 2013, TECHNICAL TEAM MEETINGS WILL OCCUR ON AN AS NEEDED BASIS, LESS THAN ONCE A MONTH

Retaining Wall Railing Selection

- Feasible Bridge Rails on Tops of Retaining Walls
 - Bridge Rail Type 10M
 - Bridge Rail Type 7

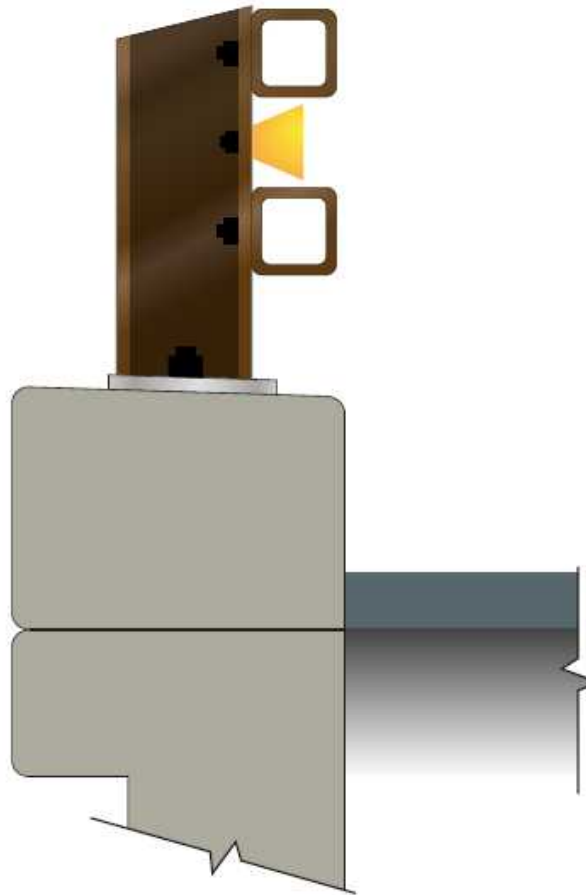


Twin Tunnels Design/Construction
Idaho Springs/Clear Creek County



DEPARTMENT OF TRANSPORTATION

Bridge Rail Type 10M



Twin Tunnels Design/Construction
Idaho Springs/Clear Creek County



DEPARTMENT OF TRANSPORTATION

Bridge Rail Type 10M



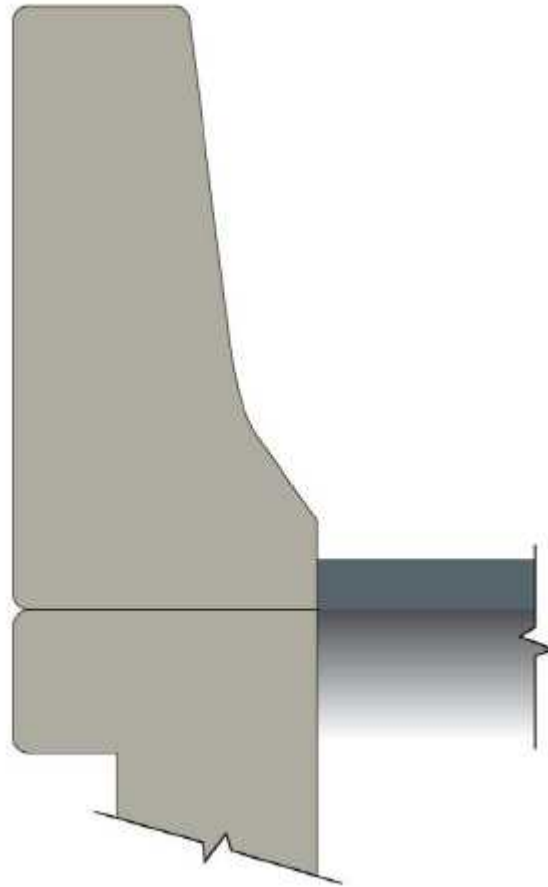
Bridge Rail Type 10M



Twin Tunnels Design/Construction
Idaho Springs/Clear Creek County



Bridge Rail Type 7



Twin Tunnels Design/Construction
Idaho Springs/Clear Creek County



DEPARTMENT OF TRANSPORTATION

Bridge Rail Type 7



Twin Tu
Idaho Sp



Bridge Rail Type 7



Twin Tunnels Design/Construction
Idaho Springs/Clear Creek County



DEPARTMENT OF TRANSPORTATION

Retaining Wall Railing Evaluation Criteria

In comparison to other options, how well does this project element...			
		Bridge Rail Type 10M	Bridge Rail Type 7
1	Address safety?	😊	😊
2	Improve mobility, in construction and long term?	😊	😐
3	Protect or create unique features for the area as a gateway?	😊	😞
4	Protect wildlife needs?	😊	😞
5	Protect Clear Creek?	😐	😊
6	Provide access and protect opportunities for enhancements to tourist destinations, community facilities, and interstate commerce?	😊	😊



Retaining Wall Railing Evaluation Criteria

	In comparison to other options, how well does this project element...		
		Bridge Rail Type 10M	Bridge Rail Type 7
7	Protect the defining historical elements of Clear Creek County?	☺	☺
8	Create infrastructure investments that are reasonable to construct and provide the best value for their life cycle, function and purpose.	☹	☺
9	Allow for a process to engage and communicate with all the local, regional and national users of the I-70 Mountain Corridor?	☺	☺
10	Enable the project team to achieve the goal of opening the EB tunnel and 3 rd eastbound lanes by October 31, 2013?	☹	☺
11	Achieve the mountain mineral belt aesthetic guidelines?	☺	☺
12	Meet the I-70 Mountain Corridor design criteria?	☺	☺

Retaining Wall Railing Evaluation Criteria

	In comparison to other options, how well does this project element...		
		Bridge Rail Type 10M	Bridge Rail Type 7
13	Minimize the effort required to maintain the option?	☹️	😊
14	Meet CDOT and industry standards?	😊	😊
15	Incorporate sustainability by using locally available materials and environmentally-friendly processes?	☹️	😊
16	Coordinate with Frontage Road efforts, preserve opportunities for the AGS?	😊	☹️
17	Create opportunities to "correct past damage"?	😊	😊

Retaining Wall Railing Evaluation Criteria

	In comparison to other options, how well does this project element...		
	Wall Railing Specific Criteria	Bridge Rail Type 10M	Bridge Rail Type 7
1	How durable is the railing including weathering and crash resistance? (Safety, Mobility)	☺	☺
2	How easy is the rail to maintain, repair and replace? (Mobility)	☺	☺
3	How well does the rail design provide lines of sight to and from the frontage road and Clear Creek? (Wildlife, Clear Creek, Destination)	☺	☹
4	How well does the rail design allow wildlife crossing? (Wildlife)	☺	☹
5	How well does the rail meet CDOT rail standards? (Safety, Constructability)	☺	☺
6	How well does the railing design achieve the mountain mineral aesthetic guidelines? (Gateway)	☺	☺



Retaining Wall Railing Selection

- Recommendation
Bridge Rail Type 10M



Twin Tunnels Design/Construction
Idaho Springs/Clear Creek County

Traffic Approach Criteria

- How well informed is the general public and able to anticipate congestion and adjust behaviors? (Inclusivity, Destinations, Gateway)
- How well are temporary impacts to traffic minimized? (Mobility, Inclusivity, Safety)
- How well is the overall duration of traffic impacts minimized? (Mobility, Schedule, Destinations)
- How well can local destinations be accessed? (Destinations)
- How well are incidents handled during the construction phase? (Safety, Mobility)



Traffic Approach Strategies

- Road and Lane Closures
 - » Based on 2011 I-70 volumes from Twin Tunnels continuous traffic counters
 - » Hourly Averages by month and by direction
 - Weekday (Monday through Thursday)
 - Friday
 - Saturday
 - Sunday
- Preliminary Strategy for Lane Closures
 - » One lane closed for roadway widening, shoulders, retaining walls, etc.
 - » Anytime from Sunday PM through Friday AM
 - » Overnight Friday-Saturday and Saturday-Sunday



Twin Tunnels Design/Construction
Idaho Springs/Clear Creek County



Traffic Approach Strategies

- Preliminary Strategy for Roadway Closures
 - » Primarily tunnel-related activities
 - Blasting – EB - 15 to 30 min EB, WB - 30 min
 - Geotechnical in tunnel – EB & WB – 30 min – overnight only
 - Geotech outside tunnel – EB & WB – 20 min – daytime only
 - Pillar and tunnel stabilization and Rockfall mitigation – unknown at this time
 - May include detour through one tunnel
 - » Queue clearance – queues clear within **one** hour of road reopening.
 - » Flexibility – CDOT PM and Contractor will have real-time traffic count data to compare with historic averages to more closely tailor schedules.



Twin Tunnels Design/Construction
Idaho Springs/Clear Creek County



Construction/Blasting Noise & Vibration

- How well does the minimization strategy conform to CDOT, FHWA and industry standards? (Safety, Constructability)
- How well does the concept minimize noise and/or vibration? (Safety)
- How much effort is required to manage the noise and/or vibration outreach effort? (Constructability, Schedule)
- How well does the mitigation strategy mitigate the real and perceived risks to the public? (Inclusivity)



Project Blasting Approach

- A blasting plan is submitted
- Every blast is monitored to measure noise and vibration levels.
- Test blast uses smaller amounts of explosives
- A pre-blast survey is conducted for structures and buildings located within close proximity of the blasting.
- Pre-blast warnings are conducted using an air-horn.
- Noise levels on this project will depend on the proximity to the blast.
- It will sound like a series of “popping” sounds rather than a large bang or boom.

Decibels	Noise Source
30	Soft Whisper
40	Refrigerator
50	Light traffic
60	Air Conditioning
70	Vacuum Cleaner
80	Average City Traffic
90	Lawn Mower
100	Garbage Truck
113	Residential Blast Noise Limit
130	20 MPH Wind
133	Blast Noise Limit
140	Jet Plane or Thunderclap
180	Rocket Launch



Project Blasting Approach

Table 2: Ground Vibration Limits

Type of Structure ¹	Peak Particle Velocity (inches per second)	
	At Low Frequency ² (<40 Hertz)	At High Frequency (>40 Hertz)
Modern structures, drywall interiors	0.75	2.0
Older structures, plaster on wood lath construction for interior walls	0.5	2.0

¹ For precarious structures not listed in the table, use the limits for older structures; for all other structures not listed in the table, use the limits listed for modern structures.

² All spectral peaks within 50 percent amplitude of the predominant frequency must be analyzed.

Table 3. Airblast Limits (dB)

Instrumentation	Residential Structures	All Other Structures
0.1 hertz high-pass system	115	134
2 hertz high-pass system	113	133
5 or 6 hertz high-pass system	110	129
C-slow (for events not exceeding 2 seconds' duration)	85	105



Twin Tunnels Design/Construction
Idaho Springs/Clear Creek County



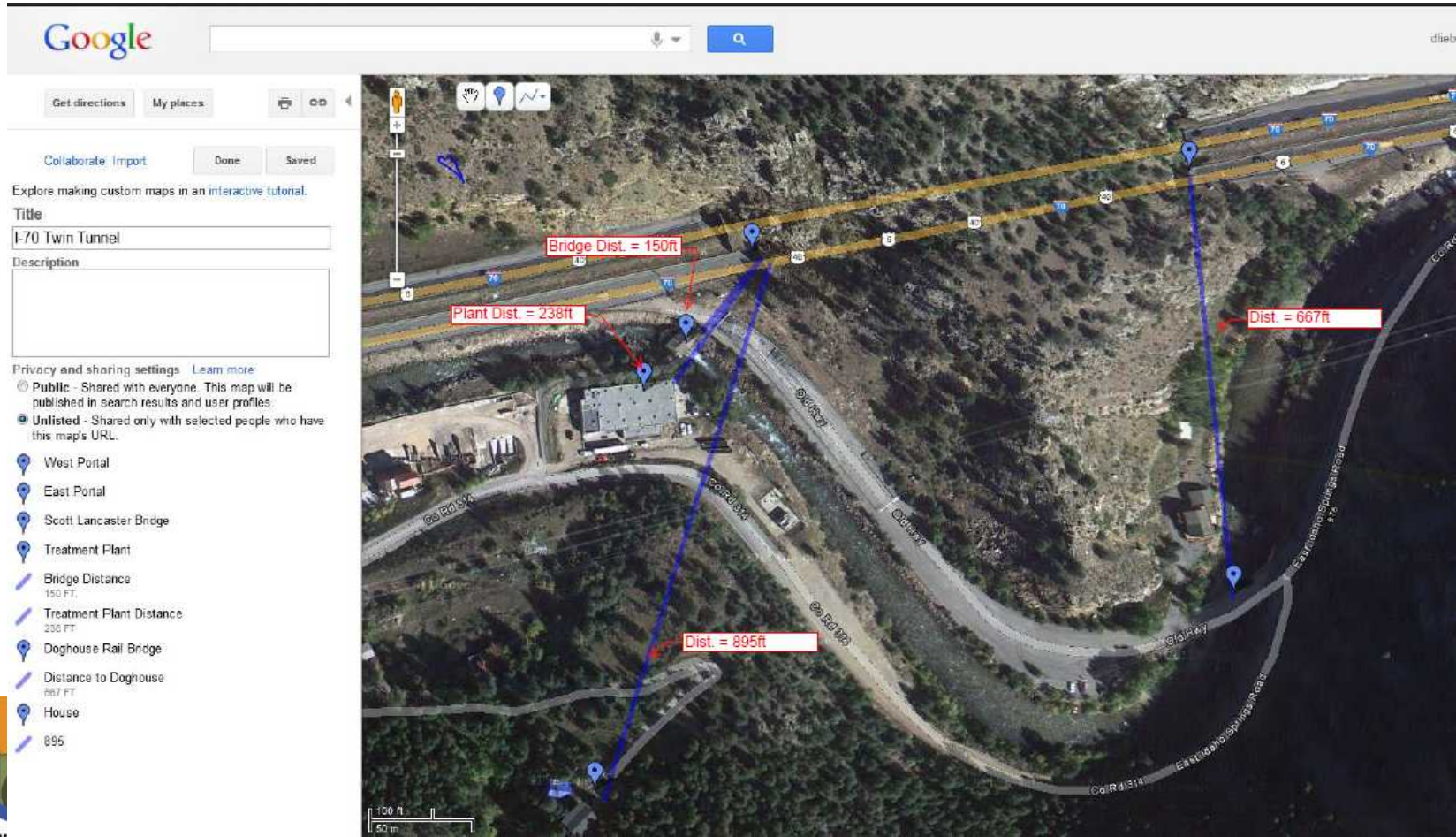
DEPARTMENT OF TRANSPORTATION

Project Blasting Approach

- Average residence experiences greater stress from daily environmental changes than from construction
- Water wells and buried pipelines can survive rather high-vibration intensities because they are constrained by the soil and bedding materials surrounding them.



Possible Monitoring Areas



Twin Tunnels design/construction
Idaho Springs/Clear Creek County



DEPARTMENT OF TRANSPORTATION

Black Hawk Blast Video



Tunnel Lining Options

4 Proposed Concepts

1. Cast-in-place with strip drains or full waterproof membrane
2. Vertical walls, structural shotcrete, with strip drains or full waterproof membrane
3. Vertical walls with thin shotcrete with strip drains
4. Vertical walls plus precast architectural arch



Twin Tunnels Design/Construction
Idaho Springs/Clear Creek County



Tunnel Lining Option 1

- Cast In Place Concrete



Twin Tunnels Design/Construction
Idaho Springs/Clear Creek County



Tunnel Lining Option 2 and 3

- Vertical Walls and Shotcrete



Twin Tunnels Design/Construction
Idaho Springs/Clear Creek County



Tunnel Lining Option 4

- Precast Arch - erected in upright position outside tunnel, then use rolled into place on vertical wall supports.



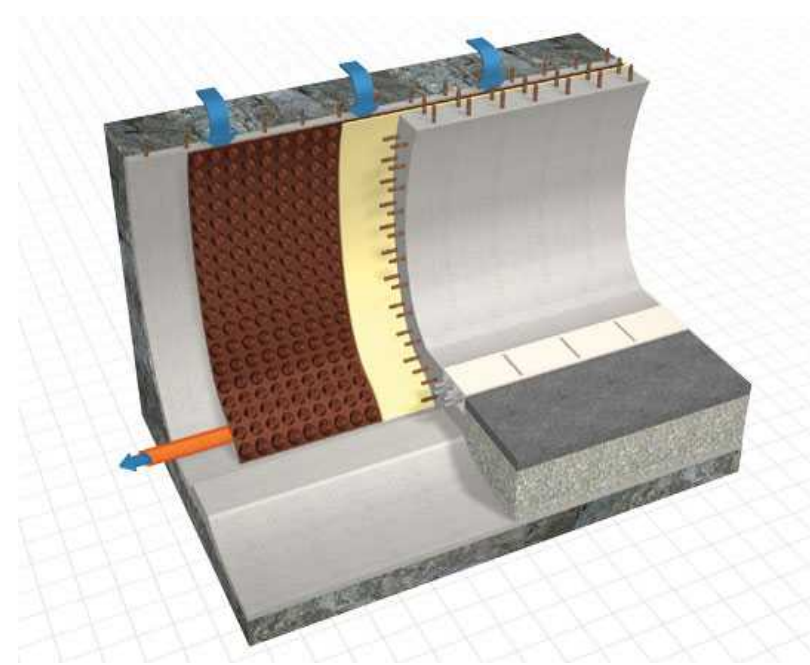
Twin Tunnels Design/Construction
Idaho Springs/Clear Creek County



DEPARTMENT OF TRANSPORTATION

Tunnel Lining – Waterproofing Options

Strip Drains in Isolated Locations



Tunnel Lining – Waterproofing Options

Waterproof Membrane - example at Hanging Lake Tunnel



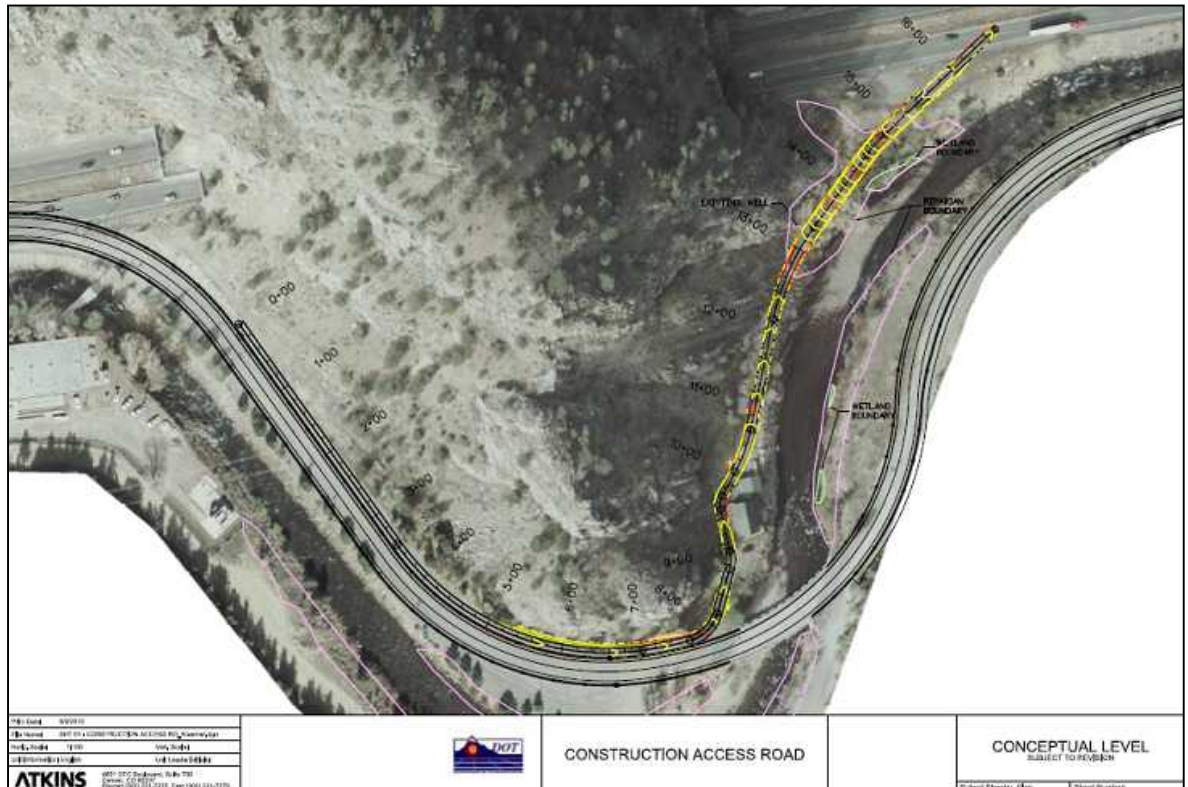
Twin Tunnels Design/Construction
Idaho Springs/Clear Creek County



DEPARTMENT OF TRANSPORTATION

Portal-Portal Access Road Proposal

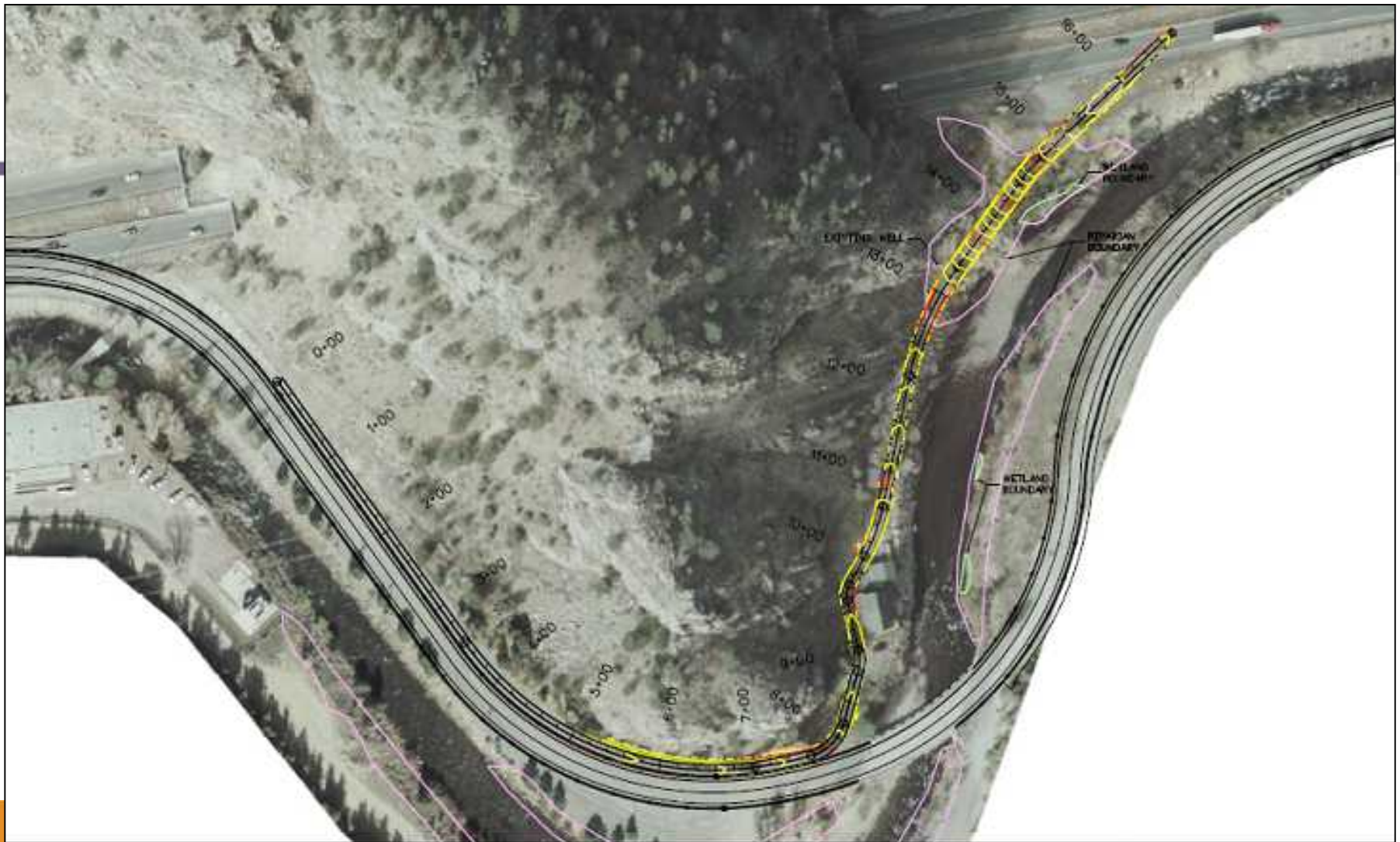
- Proposal: Construct access road beginning at the current West Portal, running through the Clear Creek property and up the embankment to the East Portal.
 - » Construction beginning February 2013
 - » Deconstruction beginning in September 2013



Portal-Portal Road Proposal

- Rationale: The access road will provide:
 - » Improved emergency service providers access
 - » Enhanced project constructability
 - » Decreased haul time
 - » Improved traffic mobility and public safety
 - » Reduced air quality impacts
- Environmental Analysis: This proposal will receive the same level of analysis as other elements of the alternative reviewed by the EA.
- Coordination will occur before final recommendation
 - » SWEEP / ALIVE groups
 - » Colorado Parks and Wildlife





File Code	100000
File Name	DOT ID - CONSTRUCTION ACCESS RD - Clear Creek
Scale	1" = 100'
Author	10/1/2010
Checked	10/1/2010
ATKINS	1001 2100 Southpark, Suite 700 Casper, WY 82401 Phone (307) 233-2010 Fax (307) 233-2070



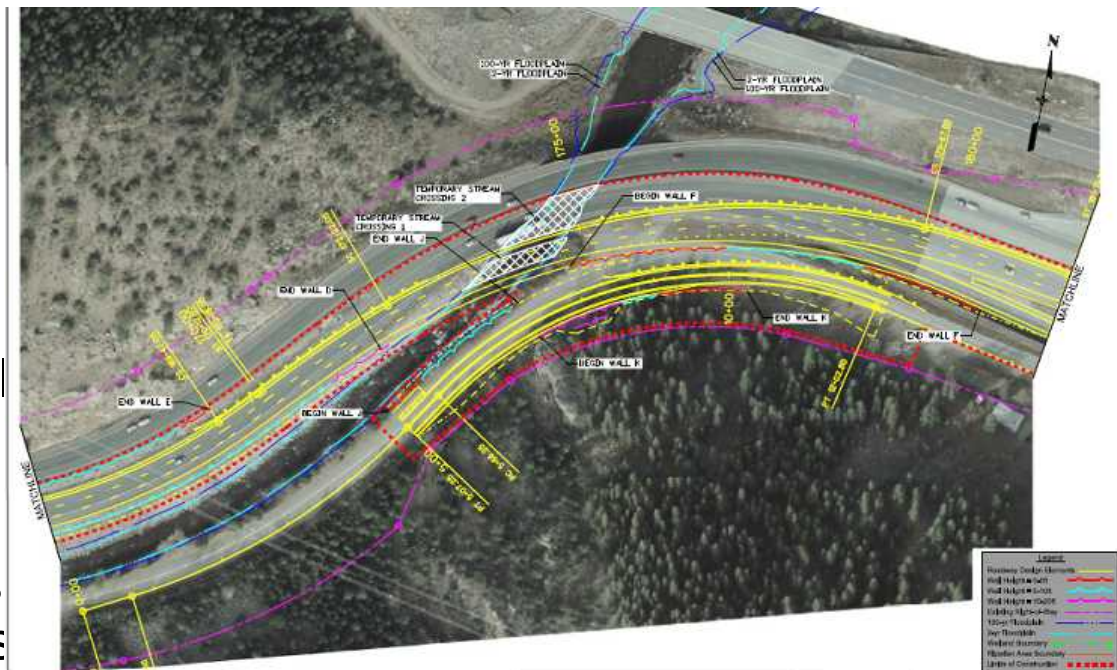
CONSTRUCTION ACCESS ROAD

CONCEPTUAL LEVEL
SUBJECT TO REVISION



Creek Crossing

- Proposal: Provide a temporary creek crossing to assist with bridge construction and demolition
 - » Minimize schedule risk
 - » Minimize other potential impacts natural resources



<p>ATKINS 600 E 7th Street, Suite 700 Boise, ID 83702 Phone: (208) 333-7070 Fax: (208) 333-7076</p>		<p>TEMPORARY STREAM CROSSING PROPOSAL</p>	<p>MAY 3, 2012</p>	<p>CONCEPTUAL LEVEL SUBJECT TO REVIEW</p> <p>PROPOSED ACTION - 65 FT ROAD SECTION</p> <p>Sheet Number: 6</p>
--	--	--	--------------------	---



Creek Crossing

- Rationale: The creek crossing will improve :
 - » Access
 - » Production for the removal of existing bridge structure
 - » Provide for improved protection of waterway during demolition
- Environmental Analysis:
 - » Secure approval from Army Corps. of Engineers
 - » Coordinate with Black Hawk concerning downstream water supply intake
 - » Creek crossing will not be in place during rafting season
 - » Will coordinate with CPW to minimize effects during spawning season
 - » Review with SWEEP / ALIVE



Core Values

- **Safety**
- **Mobility**
- **Gateway**
- **Wildlife**
- **The Creek**
- **Destination**
- **History**
- **Constructability**
- **Inclusivity**
- **Schedule**



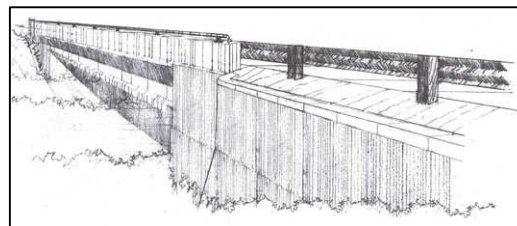
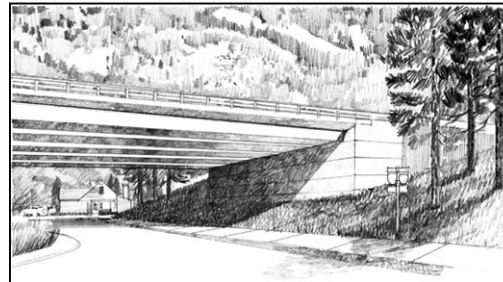
Twin Tunnels Design/Construction
Idaho Springs/Clear Creek County



DEPARTMENT OF TRANSPORTATION

Bridge Aesthetics

- How well does this bridge design conform with the structure selection report recommendations? (Safety, Constructability)
- How well does the bridge accommodate wildlife crossings? (Wildlife)
- How well does it accommodate future greenway expansion plans? (Wildlife, The Creek, Mobility)
- How well does it accommodate rafting fishing and other recreational uses in the creek? (The Creek, Destination, Constructability)
- How well does the bridge concept address the views from the creek (simple, clean lines per the aesthetic guidance)? (Gateway, Destination)
- How well do the structural systems on the bridge transition to the elements of the highway on both sides? (Safety, Constructability, Gateway)



Twin Tunnels Design/Construction
Idaho Springs/Clear Creek County



I-70 Retaining Wall

- How well does the option facilitate construction acceleration? (Schedule, Constructability)
- How easy is the option to construct? (Constructability)
- How easy is the wall to maintain, repair and replace? (Mobility, Safety)
- How well does the wall integrate into a restored natural appearance of the land and the visual conditions of the corridor? (Destination, Gateway)



Rock Fall Mitigation

- General Project Criteria
- Any other criteria?



Twin Tunnels Design/Construction
Idaho Springs/Clear Creek County



Follow up Questions from Prior Meeting

- What are the impacts of the trail placement decision on the location of the wall / blasting at the east end?
- Distribution of CSS tracking of commitments from last life cycle phase?
- Present team's approach for Package 3 and emphasizing its importance in relation to Package 1 and 2?



Next Steps

- Agenda for June 14th Technical Team Meeting
 - » Report back on ALIVE/SWEEP input from 6-7-12
 - » As necessary, present refinements for:
 - Traffic impacts
 - Noise / vibration
 - Wall railings
 - » Review criteria results and proposed solutions for:
 - Bridge aesthetics
 - I-70 Retaining wall aesthetics
 - Rockfall mitigation
 - Tunnel lining
 - » Develop initial performance measures for:
 - Impacts to recreational users
 - Infrastructure required in median
 - Coatings
 - Lighting
 - Signing



Twin Tunnels Design/Construction
Idaho Springs/Clear Creek County



Next Steps

- Agenda for June 28th Technical Team Meeting
 - » Present final refinements for:
 - Bridge aesthetics
 - Retaining wall aesthetics (sans Frontage Road)
 - Rockfall mitigation
 - Tunnel lining
 - » Review criteria and proposed solutions for:
 - Impacts to recreational users
 - Infrastructure required in median
 - Coatings
 - Lighting
 - Signing
 - » Develop initial performance measures for:
 - Landscaping
 - Tunnel Portals

- SWEEP / ALIVE meeting on June 7th



Twin Tunnels Design/Construction
Idaho Springs/Clear Creek County



END OF PRESENTATION



Twin Tunnels Design/Construction
Idaho Springs/Clear Creek County

