Twin Tunnels Environmental Assessment
Idaho Springs, Clear Creek County

Twin Tunnels
Environmental Assessment

MEETING NOTES

Purpose:	**Project Leadership Team Meeting**		
Day:	**Thursday**	Date:	**November 3, 2011, 9:00 pm**

Location:	**CDOT Region 1 – Golden**	

Participants

Attendee	Representing	
Ben Acimovic	CDOT R 1	N
Chuck Attardo	CDOT R 1	N
Jim Bemelen	CDOT R 1	Y
Allan Brown	Atkins	Y
Kathy Connell	CDOT Trans. Commission Dist 6	N
Tony DeVito	CDOT R 1	N
Janet Gerak	CDOT R 1	Y
Dan Gibbs	Summit County	Y
Stephanie Gibson	FHWA	N
Vanessa Henderson	CDOT EPB	N
Randy Jensen	FHWA	Y
Loretta LaRiviere	CH2M HILL	Y
Gina McAfee	Jacobs	N
Tim Mauck	Clear Creek Co.	Y
Jack Morgan	Idaho Springs	N

Attendee	Representing	
Cindy Neely	Clear Creek Co.	Y
Jeanne Nicholson	Colorado State Legislature	N
Pat Noyes	Pat Noyes	Y
Kevin O'Malley	Clear Creek Co.	N
Bob Quinlan	Jacobs	N
Colleen Roberts	CH2M HILL	N
Tom Schilling	Intermountain CA	Y
David Singer	CDOT	Y
Darin Stavish	CDOT R 1	N
Melinda Urban	FHWA	Y
Mary Jo Vobejda	CH2M HILL	Y
Rebecca White	CDOT Local Affairs	Y
Mandy Whorton	CH2M HILL	Y
Kevin Wright	FHWA	Y

Introductions

Participants introduced themselves. Jim Bemelen welcomed the group and reviewed the agenda for the meeting.

Schedule

The schedule for the Twin Tunnels EA may have slipped two weeks. The decision document is now anticipated to be signed in October, 2012.

Other Corridor Project Schedules and Updates

There has been a request for a master calendar for the Twin Tunnels EA, Frontage Road and AGS projects. This is in the works and should be ready for distribution in a couple of weeks.

Frontage Road – The Field Inspection Review (FIR) for Phase 1 will be on December 1st.

The second PLT/TT Meeting was held on October 26th but was adjourned early because of the inclement weather. Meeting 2.5 was held on October 28, 2011. Phase 1 of this project is on schedule to advertise in spring of 2012 and construction to start in Summer/Fall of 2012.

The Greenway Issue Task Force is now combined for the Twin Tunnels EA and the Frontage Road projects. The first meeting is expected to be in mid-November.

AGS – The AGS Feasibility Study RFP will be advertised next week internationally. The expectation is to have a mass transit expert selected in January and notice to proceed in February. There will be a chartering session with the PLT shortly after the notice to proceed. Janet Gerak will be sharing this information with the Frontage Road PLT at their next meeting.

Colorado Inter-Regional Connectivity Study – This study will be mostly focused on the Front Range from Fort Collins to Pueblo. Ridership will also be studied on the I-70 Mountain Corridor from Eagle County to DIA. Portions of this study will run concurrently with the AGS project studying the alignment.

Where to find Project Information

Project Map – A Twin Tunnels project map (Attachment 1) will be distributed to all teams at upcoming meetings.

Communications and Teams – A communications packet is being put together that will include all the project team members, their roles and responsibilities and contact information. This will make it much easier to keep track of who is working on what and identify where there is overlap. This should be ready for distribution at the next PLT Meeting and when finalized it will also be available on the project website.

Website Tour - The project website: http://www.coloradodot.info/projects/i70twintunnels will be used as the repository for all the documents for the Project Leadership Team, Technical Teams and Issue Task Forces. Meeting packages will include the agenda, meeting summary and all handouts for each meeting.

The project team is using a SharePoint site for working documents. There are some legal issues that prevent the stakeholders from being able to view some of these documents. There was an instance where the Section 106 Issue Task Force had the need to view an Area of Potential Effect (APE) Atlas that included confidential information about properties in the project area so they were given access to that section of the SharePoint site only.

Design Approach and Proposed Cross-Sections

The group was given a packet with information about the two options being considered (Attachment 2).

The group reviewed the objective criteria being used to make decisions on the design of the project.

- The project's purpose is to perform initial improvements to solve an immediate problem
- The design will address safety by improving curves where possible by flattening and improving sight distance
- The improvements will address congestion by widening the eastbound bore and softening the portal, and by adding a third lane from East Idaho Springs to Floyd Hill.

The draft Safety Assessment was just completed and concluded that most of the accidents are run-off-the road which indicates speeds are too fast for the existing geometry which supports a 50 mph design speed.

Designing for 55 mph cannot be done without encroaching into Clear Creek and the westbound lanes. This design speed will have to be deferred until the ultimate improvements are pursued. Although the Stopping Sight Distance (SSD) on many curves doesn't meet today's criteria it is less of an issue than the curve radius. To minimize costs as much of the existing pavement will be used as possible. If reconstruction is done on a curve it will be brought up to today's standards. Superelevation transitions also cannot be consistently met unless reconstruction is done.

Design Variances will probably be needed for shoulder width, SSD and superelevation.

It was noted that I-70 CSS design criteria need to be added and addressed in the design of the Twin Tunnels project.

Design Options –Both options generally maintain the existing geometry but Option 1 widens to the right and Option 2 widens to the left. Both options are "outer limit" so the range of impacts can be evaluated. Most likely the final design will be a mixture of the two. Although the drawings show the highway as having a vertical separation, it won't be designed that way for the entire three miles. Option 1 will require a retaining wall or overhang. Option 2 may not work because there isn't enough room on the left side. Option 2 will need more variances but Option 1 has more impacts to the creek. As the design progresses cross sections of every 100′ of highway will be developed and shown to PLT and TT Meetings.

Proposed Roadway Sections – The goal is to build the improvements to meet the current criteria and address safety issues. The desired configuration is to have three 12′ lanes and

10′ shoulders. This configuration could have many environmental impacts because of the size of the platform. Reduced impacts could result from using a three 12′ lanes, a 4′ left shoulder and 8′ right shoulder configuration.

The desired tunnel configuration is a 61′ span with three 12′ lanes, 10′ shoulders and a 2.5′ walkway. The minimum configuration is 51′ span with three 12′ lanes, a 4′ shoulder on the left and an 8′ right shoulder. Adjacent to the shoulders is a barrier and within the shoulder a 1.5′ walkway. The barrier on the 51′ tunnel will insure trucks with vertical clearance don't have problems. The wider tunnel significantly increases the cost due to additional rock removal and stabilizing costs. Also the pillar between the two tunnels can't be reduced so the tunnel will have to be widened to the south. If the decision is made to move ahead with a managed lane, there will need to be space for the buffer separation which would come out of the shoulders.

Twin Tunnels Goals for Project Delivery Decision

The goals handed out (Attachment 3) were developed to assist in determining which delivery method is the best for this project. Jim Bemelen said the project will probably be done by the CMGC delivery method. The goals have been refined to be specific to this project and will be used in the RFP for the CMGC.

CMGC delivery method is working well in other states and can save CDOT a lot of money because the contractor is a partner in the design. The selection of the contractor in a CMGC method is based on qualifications and not on low bid. The project will be fixed-fee so CDOT will know upfront the proposed profit and overhead.

Randy Jensen reminded the group that the construction contract can't be signed or and work started until the decision document is signed.

The stakeholder's Core Values (Attachment 4) are being taken into consideration in the design. How some of the Core Values will be addressed is unknown until all of the design decisions have been made. The design team will use the Core Values in Design matrix as a tracking tool and back check to make sure all the Core Values are being addressed.

Other Items

Jim Bemelen said he attended a Traffic Modeling meeting this morning on the managed lane concept in the Twin Tunnels. He reminded the group that the managed lane will only be tolled when there is congestion and the price will fluctuate depending on demand. Since the proposed managed lane at the Twin Tunnels is at the end of the congestion and such a short distance, CDOT is studying the impacts of moving the managed lane further west.

The group discussed how difficult it is to compare the impact of congestion on recreational travelers versus the people using the highway for commuting because the economic loss is not the same.

There is concern that the additional signage for the managed lane may ruin the visual experience of traveling in the mountain corridor.

Next Meetings

The group agreed since the topic will be the Proposed Action Configuration, the December meeting should be a combined PLT/Technical Team meeting and settled on Wednesday, December 14th from 9:00 – 11:00 in the Trail Ridge Conference Room at CDOT in Golden. *After this meeting was held the decision was made to change the time of this meeting to 8:00 – 11:30.*

The January meeting's topic is the Proposed Action Footprint and this meeting will also be a combined PLT/TT Meeting on Thursday, January 12th from 8:00 – 12:00 in the Trail Ridge Conference Room.

The meeting was adjourned at 10:30 am.

I-70 Twin Tunnels Environmental Assessment
Project Leadership

Thursday, November 3, 2011
Golden Residency
9:00 am – 12:00 pm

1. Schedule for Twin Tunnels (Bemelen)

2. Other Corridor Project Schedules and Updates (Bemelen)
   - Frontage Road
   - Inter-regional Connectivity Study
   - AGS Study

3. Where to find Project Information (Vobejda)
   - Project Map
   - Communication and Teams
   - Website tour (www.coloradodot.info/projects/i70twintunnels)

Handouts

Agenda
Project Map
Typical Sections
Design Objectives and Design Approach
The Core Values in the design
Goals

4. Design Approach and Proposed cross-section (Brown)

5. Twin Tunnels Goals – for project delivery decision (Vobejda)

6. Next PLT will be a combined PLT/Tech Team meeting in December 2011 (Bemelen)
   Schedule dates for December and January PLT and Tech Team meetings

Date	Group	Purpose
Nov. 3	PLT	Present Environmental Status Present the Proposed Typical Section and Design Approach
Nov. 9	ALIVE	1st ALIVE Issue Task Force Meeting – discuss issues
Nov. 17	Tech Team	Present Environmental Status Present Issue Task Forces Progress Present the Proposed Typical Section and Design Approach
Nov. 30	SWEEP	2nd SWEEP Issue Task Force Meeting
Dec	PLT and Tech Team	Present the Proposed Action Configuration Present Issue Task Forces Progress
Jan	PLT	Proposed Action Footprint
Jan	Tech Team	Proposed Action Footprint
	Section 106 ITF	
	SWEEP	
Feb	PLT	Schedule and Project Status Discuss Impacts
	Tech Team	Discuss Impacts Present Issue Task Forces Progress
Mar	PLT	Schedule and Project Status Discuss Mitigation
	Tech Team	Discuss Mitigations Final Reports from Issue Task Forces
Apr	**NO PLT or Tech Team**	
May	PLT and Tech Team	Present highlights of the EA Discuss the Public Hearing
June	**NO PLT or Tech Team**	
June	Public Hearing	Present the Process, EA results, solicit comments
July	PLT	Next Steps for the PLT Discuss results of the Public Hearing
July	Tech Team	Discuss results of the Public Hearing Close the TT

Twin Tunnels Environmental Assessment

Proposed Action

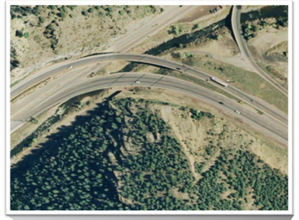
(Developed from Tunnel Visioning Concept Package 2)

Tunnel Entrance Existing - Eastbound

Conceptual Design - Eastbound

Existing Curve - Eastbound

Existing Curve - Eastbound

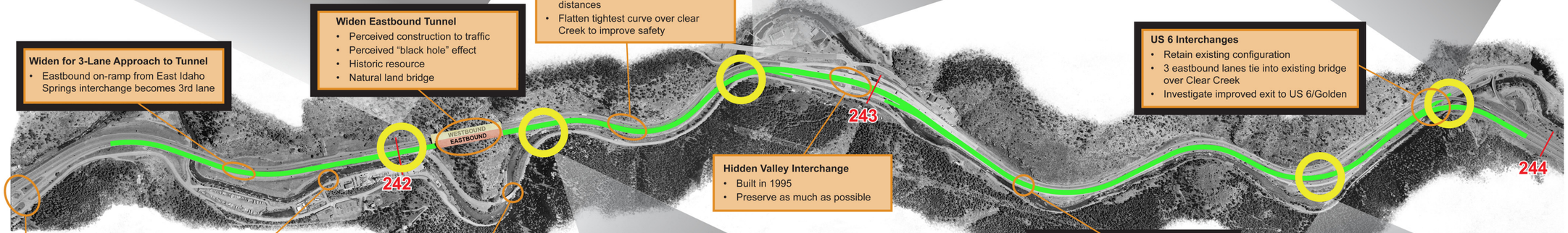


Widen for 3-Lane Approach to Tunnel
- Eastbound on-ramp from East Idaho Springs interchange becomes 3rd lane

Widen Eastbound Tunnel
- Perceived construction to traffic
- Perceived "black hole" effect
- Historic resource
- Natural land bridge

Improve Curve Safety
- High crash frequency
- Design speeds less than 50 mph
- Deficient sight distances
- Safety improvements indicated
- Median retaining wall improves sight distances
- Flatten tightest curve over clear Creek to improve safety

US 6 Interchanges
- Retain existing configuration
- 3 eastbound lanes tie into existing bridge over Clear Creek
- Investigate improved exit to US 6/Golden



East Idaho Springs Interchange
- Remains unchanged

Clear Creek Issues
- Water quality, sediment control
- Recreation resource - fishing, rafting
- Concerns over channelization
- Retaining walls to minimize encroachment

Possible Detour Around Tunnel
- Old US 40
- Clear Creek County Road 314 (to be closed during construction)
- Construction work and impacts to traffic will be minimized

Hidden Valley Interchange
- Built in 1995
- Preserve as much as possible

Widen to Accommodate 3 Lanes
- Balance widening to the south to minimize encroachment on Clear Creek with retaining walls in median and near Clear Creek

Existing Curve - Eastbound

Existing Curve - Eastbound

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Design Approach

Project Objective

- The project's purpose is to perform initial improvements to solve an immediate problem
- The design will address safety by improving curves where possible by flattening and improving sight distance
- The improvements will address congestion by widening the eastbound bore and softening the portal, and by adding a third lane from East Idaho Springs to Floyd Hill

Background

- Most crashes are run-off-the-road, indicating that speeds are too fast for conditions. Existing geometry seems to indicate 50 mph is most appropriate
- Rear-end crash frequency is far less, indicating sight distance is less of an issue than curve radius

Design Constraints

- Geometric improvements are highly influenced by the existing constraints of the canyon topography, creek, and roadway geometry
- The project will not impact westbound lanes of I-70
- Existing geometry, which is controlled by topography, is generally 50 mph minimum with one exception (45 mph)
- A 55 mph design is not achievable given the topography and other constraints, and must be deferred until the ultimate improvements for the corridor are pursued (either 55 or 65 mph)
- Stopping sight distance (SSD) cannot be met consistently; some curves are too tight to meet current criteria
- Superelevation transitions cannot be met consistently; lack of tangent length between curves precludes ability to transition
- As interim improvements, objective is to minimize costs by salvaging existing pavement to greatest extent possible

Design Decisions

- The goal is to design the corridor for a minimum 50 mph design speed and sign accordingly
- The project will not reduce any SSD below what is currently provided
- Existing superelevation will be preserved on curves that are not reconstructed. Superelevation is greater than 10% in some places
- Superelevation on reconstructed curves will be limited to 8% in accordance with current design practice rather than matching the existing 10% currently found in the project area

- Design speeds referenced are in regards to radius criteria only; SSD and other design criteria are not consistently met for all curves

Design Options

- Option 1 – generally maintains existing geometry and widens to the right
- Option 2 – generally maintains existing geometry and widens to the left
- Recommended Alignment – a compilation of the best aspects of Options 1 and 2 which could be thought of as a "best fit"

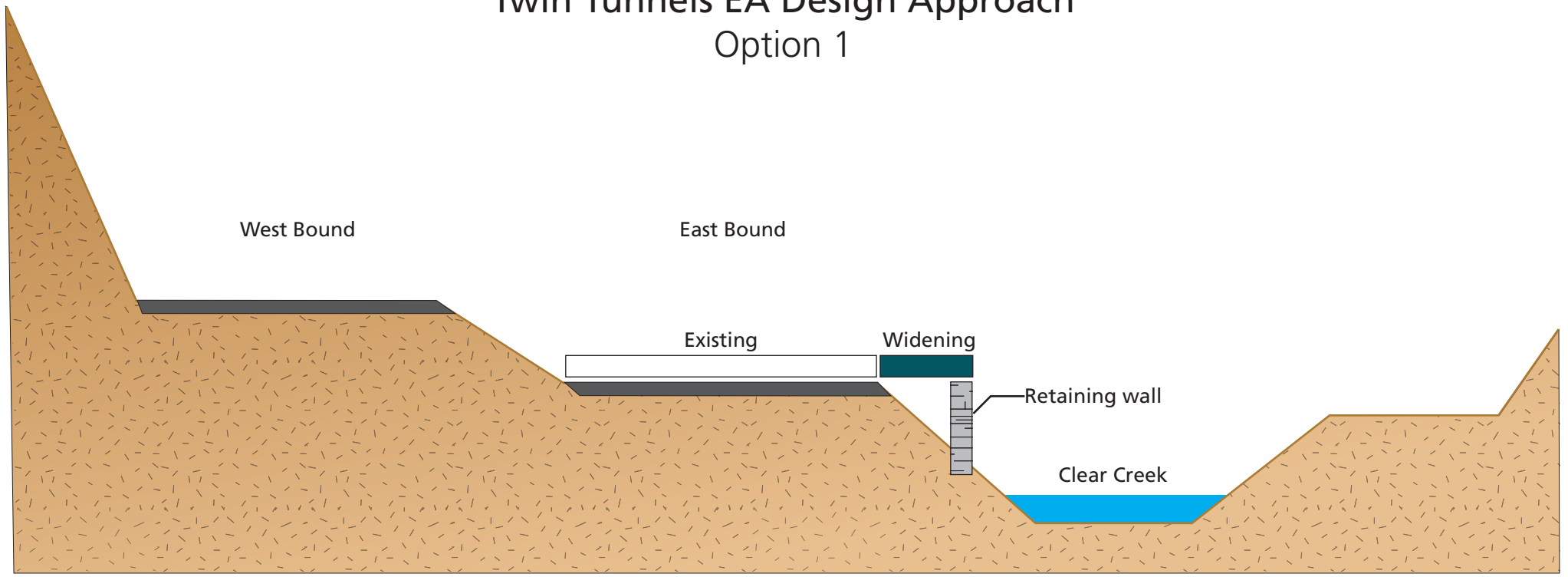
Option 1:

- Maintain existing geometry (except for one curve, see below). Achieves minimum design speed of 50 mph
- Improve curve over Clear Creek west of Hidden Valley to 55 mph
- Widen to the right side (creek bank)
- No encroachment into the median would be considered, which may limit the ability to address left-hand curves
- Preserve any existing curves greater than 50 mph

Option 2:

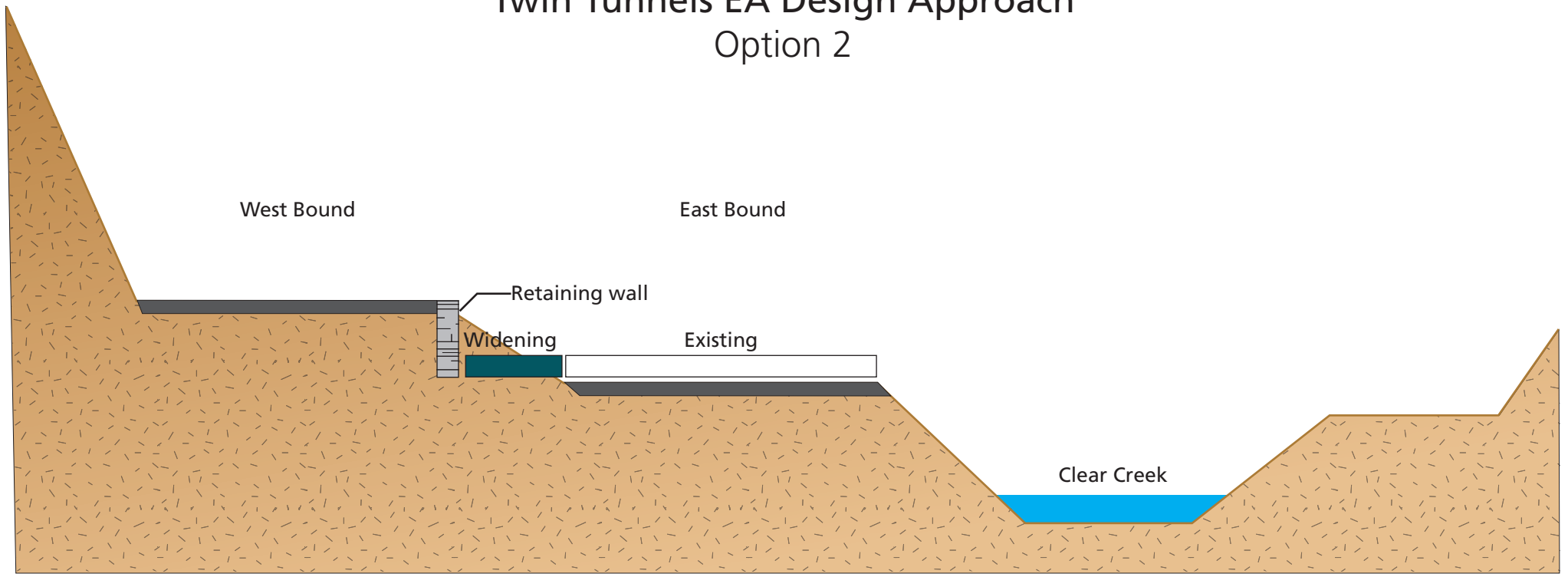
- Maintain existing geometry (except for one curve, see below). Achieves minimum design speed of 50 mph
- Improve curve over Clear Creek west of Hidden Valley to 55 mph
- Widen to the left side (median) wherever possible without impacting the westbound lanes
- Allows improvements to left-hand curves where necessary to improve either radius or stopping sight distance
- Preserve any existing curves greater than 50 mph

Twin Tunnels EA Design Approach
Option 1



Looking East

Twin Tunnels EA Design Approach
Option 2

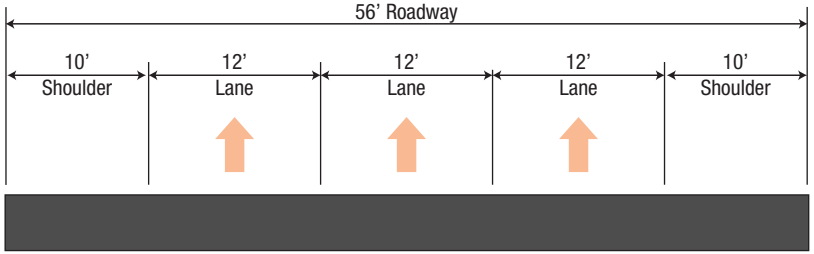


Looking East

Twin Tunnels Environmental Assessment
Idaho Springs, Clear Creek County

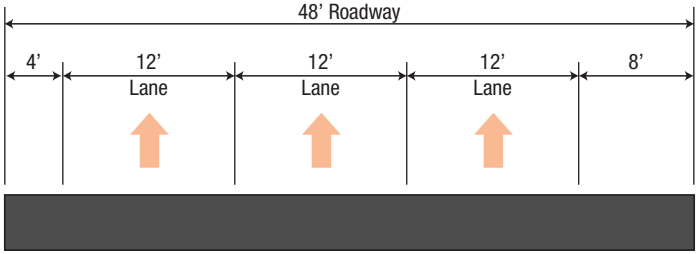
Proposed Action Design Options

(Roadway - East Idaho Springs to Floyd Hill)



Desired Configuration

- Meets AASHTO criteria for lane and shoulder widths



Minimum Configuration

- Maintains desired travel lane widths
- Reduces shoulder widths to minimize environmental impacts and costs

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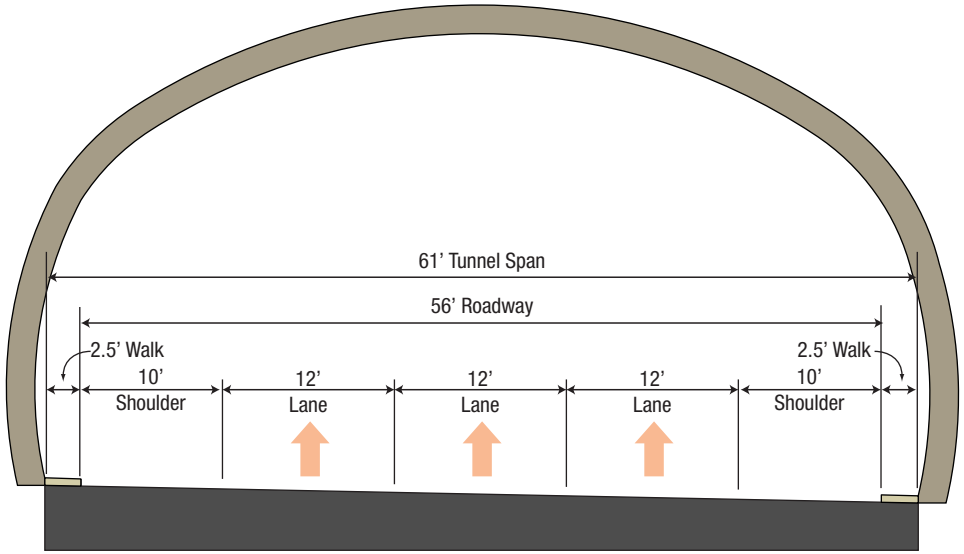
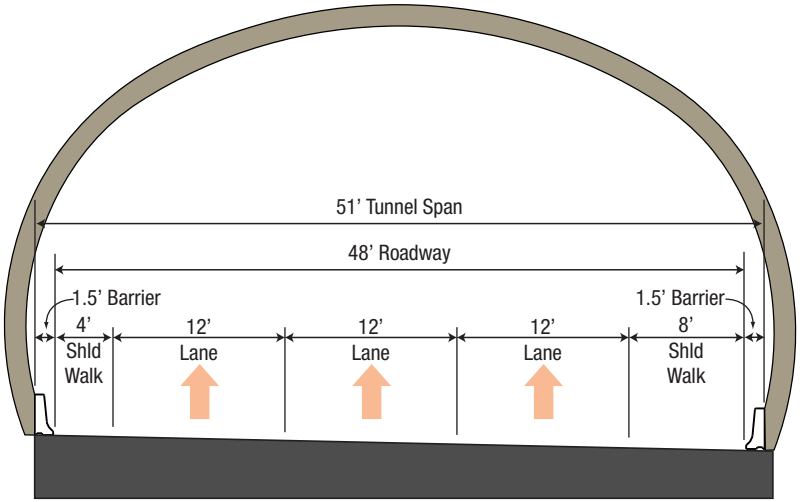
Proposed Action Design Options

(Eastbound Tunnel Bore)



Desired Configuration

- Meets AASHTO Criteria for lane, shoulder, and walkway widths in tunnel



Minimum Configuration

- Recommended section from Tunnel Visioning
- Maintains desired travel lane widths
- Reduces shoulder and walkway widths to minimize environmental impacts and costs

Twin Tunnel Stakeholder's Core Values	Realizing the Core Values in the Design
Safe travel for people and goods. **Safety** for emergency responders and maintenance workers. A s**afe** crossing for wildlife.	• The design will address safety by improving curves where possible, by flattening curves and improving sight distance • The goal is to design the corridor for a consistent minimum 50 mph design speed and sign accordingly • The project will not reduce any SSD below what is currently provided • Existing superelevation will be preserved on curves that are not reconstructed. Widen and overlay existing pavement only. Superelevation is greater than 10% in some places • Superelevation on reconstructed curves will be limited to 8% in accordance with current design practice rather than matching the existing 10% currently found in the project area
Mobility through safe and reliable transportation facilities.	• The improvements will address congestion by widening the eastbound bore and softening the portal, and by adding a third lane from East Idaho Springs to Floyd Hill
A primary access and visual **gateway** to the Mountain Mineral Belt, historic Idaho Springs and Front Range communities.	• The improvements will address congestion by widening the eastbound bore and softening the portal, and by adding a third lane from East Idaho Springs to Floyd Hill
Wildlife, wildlife habitat, migration routes and access to Clear Creek.	
Clear Creek, as a clean, high-quality water resource, a recreational asset, an aquatic resource with sustainable fisheries' habitat, a drinking water source, and a defining natural feature of the corridor.	
Tourist destinations and community facilities, including the Scott Lancaster Trail and Bridge, the waste-water treatment plant, the planned Clear Creek Greenway, the frontage road, and Clear Creek.	
History as a defining element of Clear Creek County. Celebrating the cultural resources associated with mining and mining towns, and the first successful tunneling operation as part of the construction of I-70 west through Colorado's mountains.	

I-70 Twin Tunnels Goals – November 3, 2011

1. PROJECT PURPOSE AND CORE VALUES

The purpose of the Twin Tunnels project is to improve eastbound highway safety, operations and travel time reliability in the Twin Tunnels area of the I-70 Mountain Corridor east of Idaho Springs.

Stakeholder Core Values
Safe travel for people and goods. **Safety** for emergency responders and maintenance workers. A s**afe** crossing for wildlife.
Mobility through safe and reliable transportation facilities.
A primary access and visual **gateway** to the Mountain Mineral Belt, historic Idaho Springs and Front Range communities.
Wildlife, wildlife habitat, migration routes and access to Clear Creek.
Clear Creek, as a clean, high-quality water resource, a recreational asset, an aquatic resource with sustainable fisheries' habitat, a drinking water source, and a defining natural feature of the corridor.
Tourist destinations and community facilities, including the Scott Lancaster Trail and Bridge, the waste-water treatment plant, the planned Clear Creek Greenway, the frontage road, and Clear Creek.
History as a defining element of Clear Creek County. Celebrating the cultural resources associated with mining and mining towns, and the first successful tunneling operation as part of the construction of I-70 west through Colorado's mountains.

2. PROJECT GOALS

1. SAFETY, MOBILITY, AND OPERATIONAL CHARACTERISTICS
    a. Improve safety, mobility, and operational characteristics in the project limits.
    b. Improve travel time reliability along the I-70 corridor.

2. QUALITY
    a. Design and construct a quality project that is consistent with the overall vision and commitments approved by the PEIS

3. SCHEDULE and BUDGET
    a. Meet the project schedule and budget to have three east bound lanes fully operational from approximately mile post 241.5 west of the Twin Tunnels to mile post 244 at the bottom of Floyd Hill by October 31, 2013 without sacrificing quality.

4. ENVIRONMENTAL
    a. Adhere to all environmental compliance requirements, including those documented in the Twin Tunnels final decision document, permitting stipulations and I-70 Mountain Corridor PEIS/ROD commitments.
    b. Implement innovative methods for environmental stewardship and community supported enhancements within the project scope, schedule, and budget.

5. STAKEHOLDER INVOLVEMENT
    a. Provide meaningful stakeholder involvement as prescribed in the I-70 Mountain Corridor CSS.
    b. Facilitate and foster collaboration, communication, and partnerships among all members of the project team.

6. PUBLIC COMMUNICATION
    a. Provide accurate, meaningful, and timely communication.

7. CONSTRUCTION
    a. Maintain mobility through the project during construction.
    b. Provide safe conditions for workers and the traveling public.

3. PROJECT RISKS – to be developed from list of Generic List of Uncertainties, Risks and Opportunities

Generic List of Uncertainties, Risks and Opportunities

This is not a comprehensive list of items for any particular project, and the listed items are overlapping. The list is only intended to serve as a supplemental "checklist" to help identify items.

Project Specific items must be added for each project. Project identified items then need to be redefined / recast to ensure a comprehensive, non-overlapping set of events in the risk register.

Generic List of Uncertainties, Risks and Opportunities

Uncertainty in "Soft" Costs and / or Schedule

- Design completion
- PS&E completion
- Administration costs (owner)
- Oversight costs (regulator)
- Construction management and construction inspection (CEI)
- Project management
- Design support during construction / construction engineering
- Mobilization
- Sales tax
- Financing
- Insurance
- Surety capacity and bonding
- Insurance
- Annual inflation rates (construction, right-of-way, engineering, other)
- Stipends
- Unable to reach GMP

Construction and Constructability

- Additional pavement resurfacing
- Additional geometry re-alignment
- Uncertainty in construction unit costs (e.g., earthwork)
- Uncertainty in construction quantities (e.g., bridges, walls, tunnels)
- Inadequate staging areas identified for construction
- Dewatering issues during construction
- Issues related to tunnel construction procedures (see also tunneling under Geotech)
- Issues related to other construction procedures
- Problems with or uncertainty in construction sequencing / staging / phasing / construction duration
- Maintenance of Traffic (MOT) / Work Zone Traffic Control (WZTC) Issues
    - Labor for assumed plan if plan is adequate
    - Proposed plan is not adequate
    - Issues related to detours
- Difficult or multiple contractor interfaces
- Uncertainty in structure demolition sequence and method
- Force Majeure during construction (earthquake, tornado, etc.)
- Safety issues (personnel, adjoining structures)
- Material reuse, removal, restoration
- Material, labor, and/or equipment procurement delays
- Condition of existing structures (repair required?)
- Accidents/incidents during construction (traffic/collapse/slope failure/vandalism)
- Critical equipment failure

- Excessive scour or flooding
- New or unproven systems, processes, or materials
- Marine-construction issues
- Other difficult or specialized construction issues
- Tie-ins with existing facilities/roadways/structures/local access
- Failure prior to replacement (e.g., bridges)
- Additional temporary erosion and sediment control (TESC) costs
- Railroad conflicts (anticipated or unanticipated)
- Utility conflicts (anticipated or unanticipated)
- Work-window restrictions (e.g., fish windows, weather shut-down windows)
- Other third-party delays during construction

Design

Consider the uncertainty, the risk or opportunity related to the "base" design elements. Consider risks such as early design or changing project definition. Consider the type, size, and location of design elements, the unit prices and the quantities. Example elements include:

- horizontal alignment (e.g., geometry / grade)
- vertical alignment (e.g., underground vs. surface vs. aerial)
- bridges
- other structures
- retaining walls
- earthwork
- noise walls
- storm water collection and treatment
- paving
- right-of-way (e.g., full vs. partial acquisitions; uncertain parcels/quantities)
- maintenance of traffic / traffic control
- Traffic Demand Management (TDM) / Intelligent Traffic Systems (ITS)
- construction staging/phasing
- electrical (systems, signals, illumination)
- mechanical
- Design errors and omissions or errors in plans/specs/estimates (discovered during construction)
- Urban design and construction issues
- Changes in design standards (e.g., increased seismic criteria for structures)
- Design deviations (e.g., design speeds, vertical clearances, turn radii)
- Access deviations (e.g., FHWA)
- Additional aesthetics / context-sensitive solutions (CSS)
- Allowances for miscellaneous items (known pay items not yet itemized in the estimate)
- Floodplain issues

Environmental

- Uncertainty related to changes in design, ROW, or other circumstances and the subsequent need for re-evaluated environmental documentation.
- Challenge to final decision document (e.g., resulting in delay in issuance of the final decision document).
- Delay in review and/or approval of environmental documentation
- Supplemental environmental documentation or Re-evaluation required that is time consuming
- Challenge to Early-Action Mitigation Plan (Wetlands, Floodplain/Habitat)
- Additional mitigation required, on- or off-site (e.g. solid waste disposal, wetlands, hazardous materials disposal)
- Uncertain wetland mitigation (e.g., uncertain impacts, uncertain type of mitigation (replacement, enhancement, banking); different replacement ratio than assumed)
- Uncertain storm water treatment standards or quantities
- Uncertain storm water discharge criteria (e.g., Receiving body exemptions)
- Uncertain groundwater treatment standards or quantities

- Additional mitigation required, on- or off-site (e.g. solid waste disposal, wetlands, hazardous materials disposal)
- Additional noise mitigation required
- Additional visual mitigation required (over and above that identified in the EA)
- Unanticipated Section 106 issues (archaeological, cultural, or historical finds)
- Unanticipated 4(f) issues
- 4(f) issues different than anticipated – particularly those related to the CCC Greenway Plan.
- Difficulty in obtaining a Section 404 permit
- Delay in agreement on wildlife crossing mitigation
- Delay in SWEEP impacts/mitigation agreement (permanent BMPs, SCAP measures)
- Other Regulatory/Permitting Issues (CDPHE fugitive dust, CDPHE solid waste disposal, CDPHE groundwater disposal, CDPHE hazardous materials, etc.)

External Influences (e.g., Political, Regulatory, Municipalities, Economic)

- Difficulty obtaining other agency approvals/agreements
- Conflicts with other projects
- Coordination with other entities (e.g., Railroads)
- Coordination between multiple contractors on this project
- Public opposition
- Political opposition
- Funding shortfall (and related delay or increased financing cost)
- Funding delay
- Legal challenges (other than environmental)
- Intergovernmental agreements and jurisdiction
- Labor issues (contract negotiations/strike)
- Tribal issues
- Failure of contractor to comply with permits
- Claims related to clarity of bid and contract documents (other than captured elsewhere)
- Program Management / executive oversight issues
- Project management issues / workload management
- Revenue issues
- Cash flow constraints

Geotechnical and Structural

- Uncertainty in bridges or culverts (including type/size/location (TS&L) – foundations and superstructure)
- Uncertainty in retaining walls (including type, length, height – foundations and superstructure)
- Poor ground/subsurface conditions
- Adverse groundwater conditions
- Slope stability issues
- Liquefaction design issues
- Tunneling-specific issues
    - Uncertain or early design
    - TBM problems (e.g., TBM operator issues / inexperience; machine procurement; machine maintenance; drive rate; other problems)
    - Other construction problems
- Compatibility of new structures when placed adjacent to existing structures
- Other general geotechnical risk

Operations and Maintenance

- Uncertain annual costs for typical maintenance
- Additional resurfacing or re-decking cycle(s) required
- Additional significant (unplanned) maintenance required
- Uncertain O&M period (e.g., for P3 concessions)

Permitting

- Difficulty obtaining permit approval (by permit type; e.g., 401, 404, NPDES)
- Uncertain permit requirements (current and in the future)
- Challenges to permits once issued (e.g., 401, 404)
- Air quality permitting issues
- Non-compliance with permits

Project Delivery and Procurement

- Project delivery method (D/B, D/B/B, CM/GC, PPP), including new or unique method to owner
- Single vs. multiple contracts (if not captured under market conditions)
- Construction market conditions (cyclic market, and location within cycle at time of bid; number of viable bidders), including the potential for delay to the procurement process and/or re-bidding
- Bid protests
- Unclear contract documents (identified during either procurement or later during construction)
- Other delays to procurement process
- Owner approach to specifications (e.g., prescriptive versus performance-based)

Right-of-Way / Real Estate

- Global Right of Way (ROW) problems (for widening, drainage, pipelines, detention, staging, etc.)
- Difficult or additional condemnation (either globally or for particular parcels)
- Additional relocation required (either globally or for particular parcels – business vs. residential)
- Additional demolition required (including unanticipated remediation) (either globally or for particular parcels)
- Accelerating pace of development in project corridor
- Changes in land use / demographics in project corridor
- Labor shortages
- Process delays (e.g., ROW plan development by team; plan approval process)
- Planned ROW donations do not occur, or opportunity for additional donations
- Railroad ROW Problems
- Other ROW issues

Scope Issues (other than identified through other items elsewhere in this list, such as design)

- Additional capacity required (e.g., lanes)
- Additional interchanges required (system-to-system or service)
- Additional local improvements required (e.g., additional paving or signals on local connections)
- Additional transit facility, park-and-ride, etc. required
- Other additional structures required (e.g., wildlife crossings)
- Scope reduction opportunity / Value Engineering
- Replace structures instead of retrofit existing (or vice-versa)
- Tolling facilities
- Managed lanes
- Note on scope changes: scope changes can occur during design and/or construction, and can be due to:
    - Incomplete design
    - Stakeholder influences leading to additional scope
    - Errors in design
    - Construction problems
    - Regulatory changes

Systems

- Software problems (technical, labor)
- Electrical-system problems (technical, labor)
- Mechanical-system problems (technical, labor)
- Problems with station finishes (technical, labor)
- Track-installation problems (technical, labor)
- Problems related to systems integration and testing

Traffic and Access Issues

- Uncertainty in Traffic Management Costs (ITS, TDM)
- Access to site during construction
- Business or economic disruption mitigation

Utilities Issues

- Utility relocations to be completed by others (Utility companies, municipalities) are not completed on time
- Encounter unexpected utilities during construction
- Utility integration with project and/or utility betterments not as planned
- Cost sharing with utilities not as planned

Vehicles

- Uncertainty in required number and/or type of vehicles
- Uncertainty in contracted price for vehicles (may include uncertainty in number/type of vehicles)
- Delay in vehicle delivery
- Cost increase due to change orders