STREAM AND WETLAND ECOLOGICAL ENHANCEMENT PROGRAM (SWEEP) ISSUE TASK FORCE (ITF) MEETING MINUTES

Meeting Notes

I-70 Floyd Hill to Veterans Memorial Tunnels

Project:	I-70 Floyd Hill to VMT
Meeting:	**SWEEP Issues Task Force Meeting**
Date:	**April 17, 2018; 1:00 pm to 3:00 pm**
Location:	**CDOT Region 1, 425 Corporate Circle, Golden, CO**

Attendees:
See Attached Sign-in Sheet

Summary of Action Items	Responsibility	Status
1. Obtain information/figure on wetland area preserved by development approval near Floyd Hill/CR 65	Fred	Complete
2. Follow up to see if there are site specific locations that may still be using sand for treatment	Neil	In progress

SUMMARY OF DISCUSSION

[Note: Action items are in **blue**.]

1) Welcome / Introductions

Self-introductions were done by the group

2) Project Overview

Vanessa Henderson (CDOT) gave a project overview as shown in the attached presentation.

Lisa Lloyd (EPA): Is there a summary of the project description? The summary will be included with the notes for this meeting, and will be available on the website (https://www.codot.gov/projects/i-70-floyd-hill-to-veterans-memorial-tunnels-improvements).

Chase Taylor (Pinyon) reviewed the Stream and Wetland Ecological Enhancement Program (SWEEP) committee and the SWEEP Memorandum of Understanding (MOU) (January 2011). https://www.codot.gov/projects/i-70-old-mountaincorridor/final-peis/final-peis-documents/20_App_D_SWEEP_MOU_Signed_01_2011_Rev50.pdf

Clear Creek Sediment Control Action Plan (SCAP) https://www.codot.gov/projects/i-70-old-mountaincorridor/documents/clear-creek-scap-final-report.pdf

Other planning documents/elements considered include:

- A Regional Ecosystem Framework for Terrestrial and Aquatic Wildlife along the I-70 Mountain Corridor (https://www.codot.gov/projects/i70twintunnels/other-documents/plt-technical-team/issued-task-forces/waterresources/A%20Regional%20Ecosystem%20Framework%20for%20Terrestrial%20and%20Aquatic%20Wildlife%20Along%20the%20I-70%20Mountain%20Corridor.pdf)
- Guidelines for Improving Connectivity for Terrestrial and Aquatic Wildlife in the I-70 Mountain Corridor (https://www.codot.gov/projects/contextsensitivesolutions/docs/pdfs/i-70-guidelines-for-enhancing-wildlife.pdf)

Other relevant projects include:

- Veterans Memorial Tunnels (https://www.codot.gov/library/studies/i70twintunnels-environmental-assessment)
- Westbound I-70 Peak Period Shoulder Lane (https://www.codot.gov/projects/i-70-westbound-peak-period-shoulder-lane)

3) Fisheries, Wetlands, and Mining Issues and Concerns

Chase Taylor (Pinyon) reviewed fisheries, wetlands and wildlife concerns as shown in the attached presentation.

4) Mitigation Recommendations

Chase Taylor (Pinyon) discussed the mitigations as identified in the SCAP.

5) Map Review

Maps of the corridor were reviewed by the group. An overview of the discussion for each of the four maps is described below.

Neil Ogden (CDOT): Areas treated by traction sand recently changed – now being used from Empire Junction to 241 interchange (east Idaho Springs), magnesium chloride is being used from 241 to Denver. **Neil will follow up to see if there are site specific locations that may still be using sand.**

Holly Huyck (Clear Creek Watershed Foundation): Traction sand still exists in this area, ponds should be able to capture historic sand and erosion.

Lisa: Design of the corridor needs to keep some flexibility for future decisions (sand vs magnesium chloride)

Map 1

Anthony Pisano (Atkins): Options in the west include tunnel or rock cut. Rock cut would involve moving the creek slightly to the south. Does not change the angle of the road going into the tunnels.

Map comment: look at moving the creek north of the highway

Scott Haas (USFS): Need to be careful and consider geology when moving the creek. Issues were not encountered when work was done for Twin Tunnels.

Holly: Would rather have the tunnel option from a water quality perspective.

Map 2

Allison Michael (USFWS): Can the creek be moved north of the highway? Rather than kept between. May end up being a double move of the creek (move south to build the road, then relocate north).

Gary Frey (Trout Unlimited): Concerned about increased use of magnesium chloride going into the stream, and if that's really worse than the sand. Would like to see a study of comparison between the two.

Holly: Magnesium chloride has impacts on vegetation and reduces what will grow, need a buffer between the road and the stream.

Fred Rollenhagen (CCC): Frontage road issues with sanding/traction, this section of the creek may start to see more activity (potential for more sedimentation into the creek).

Map 3

Fred: a lot of erosion in this area, maybe there would be some opportunities for erosion mitigation coming off of I-70 and onto US 40.

Map 4

Holly: Preble's Meadow Jumping Mouse trapped here in 2004 (NE corner of CR 65).

*Fred: Wetlands on the south side of I-70, county approved development and attempted to preserve wetlands (**try to get figure**) between Floyd Hill and CR 65 (protected in the approval of the subdivision).*

Map comment: provide erosion control

6) Next Steps

Next steps for the project include:

- Next SWEEP meeting (late summer/early fall)
- Field Reconnaissance (wetlands)
- Agency Coordination
- Identify Mitigation
- Coordination with Design Team
- Partnership Opportunities

7) Project Schedule

Upcoming dates for future tasks include:

- Existing Conditions/Data Collection
  - Fall 2017 through 2018
- NEPA/30% Design
  - Winter 2017/2018 through Spring 2020
- Final Design followed by Construction (pending funding availability)
  - Spring/Summer 2020
  - Construction 2021-2024

8) Remaining Questions

Neil: Next meeting is after we have design, will there be more SWEEP meetings? Likely will have more meetings and more information from the field surveys.

Gary: Will the group get to see the field study report/methodology document? Will be included in a short presentation at an upcoming tech team meeting.

Gary: Are there any drinking water concerns with the additional chemicals in the creek? Not that we are aware of.

Sign-In Sheet

I-70 Floyd Hill to Veterans Memorial Tunnels

ATKINS

Project: I-70 Floyd Hill to Veterans Memorial Tunnels EA

Meeting: **SWEEP Issues Task Force Meeting**

Date/Time: **April 17, 2018; 1:00 pm to 3:00 pm**

Location: CDOT Region 1, 425 Corporate Circle, Golden, CO

Initial	Name	Agency	Address	Phone	E-Mail
CAT	Chase Taylor	Pinyon Env.	3222 S. Vance street 5200 Lakewood, CO 80227	303-980-5200	Taylor@pinyon-env.com
HH	Holly Huyck	Clear Creek Watershed Foundation		720-472-1511	hhuyck@phoenixgeosciencesgroup.com
AM	Alison Michael	USFWS		303 236-4758	alison_michael@fws.gov
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LH	Lisa Lloyd	EPA R8	1595 Wynkoop Denver, Co	303-232-7604	lloyd.lisa@epa.gov
JJW	Joe Walter	CPW	6060 Broadway Denver CO	303-916-1180	joseph.walter@state.co.us
SPG	Scott Garncarz	CDPHE	4300 Cherry Creek Drive S. Denver, Co 80246	303-692-2314	scott.garncarz@state.co.us

Sign-In Sheet

I-70 Floyd Hill to Veterans Memorial Tunnels

ATKINS

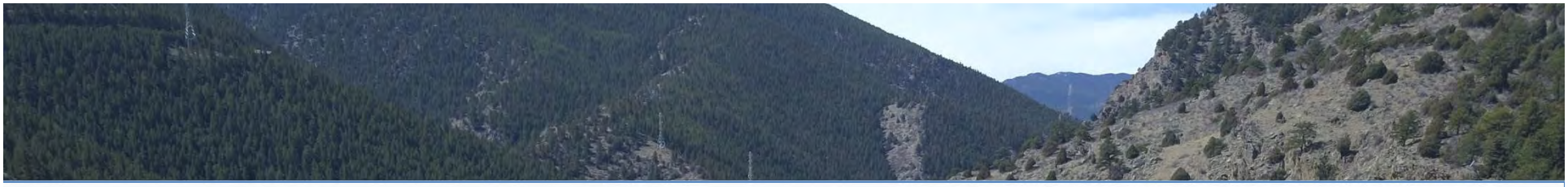
Project: I-70 Floyd Hill to Veterans Memorial Tunnels EA

Meeting: **SWEEP Issues Task Force Meeting**

Date/Time: **April 17, 2018; 1:00 pm to 3:00 pm**

Location: CDOT Region 1, 425 Corporate Circle, Golden, CO

Initial	Name	Agency	Address	Phone	E-Mail
G	Gary Frey	CTL		3.986.014	gbfrey@msn.com
FRH	Fred Rollenhagen	Clear Creek County	PO B 2000 Georgetown, CO 80444	3-679-2360	frollenhagen@co.clear-creek.co.us
VH	Vanessa Henderson	CDOT		7/497-6924	vanessa.henderson@state.co.us



I-70 Floyd Hill to Veterans Memorial Tunnels

ATKINS

SWEEP Meeting

April 17, 2018

I-70 Floyd Hill to Veterans Memorial Tunnels

Agenda

- Welcome/Introductions
- Project Overview
- Fisheries, Wetlands, and Mining Issues and Concerns
- Mitigation Recommendations
- Next Steps
- Project Schedule
- Questions

I-70 Floyd Hill to Veterans Memorial Tunnels

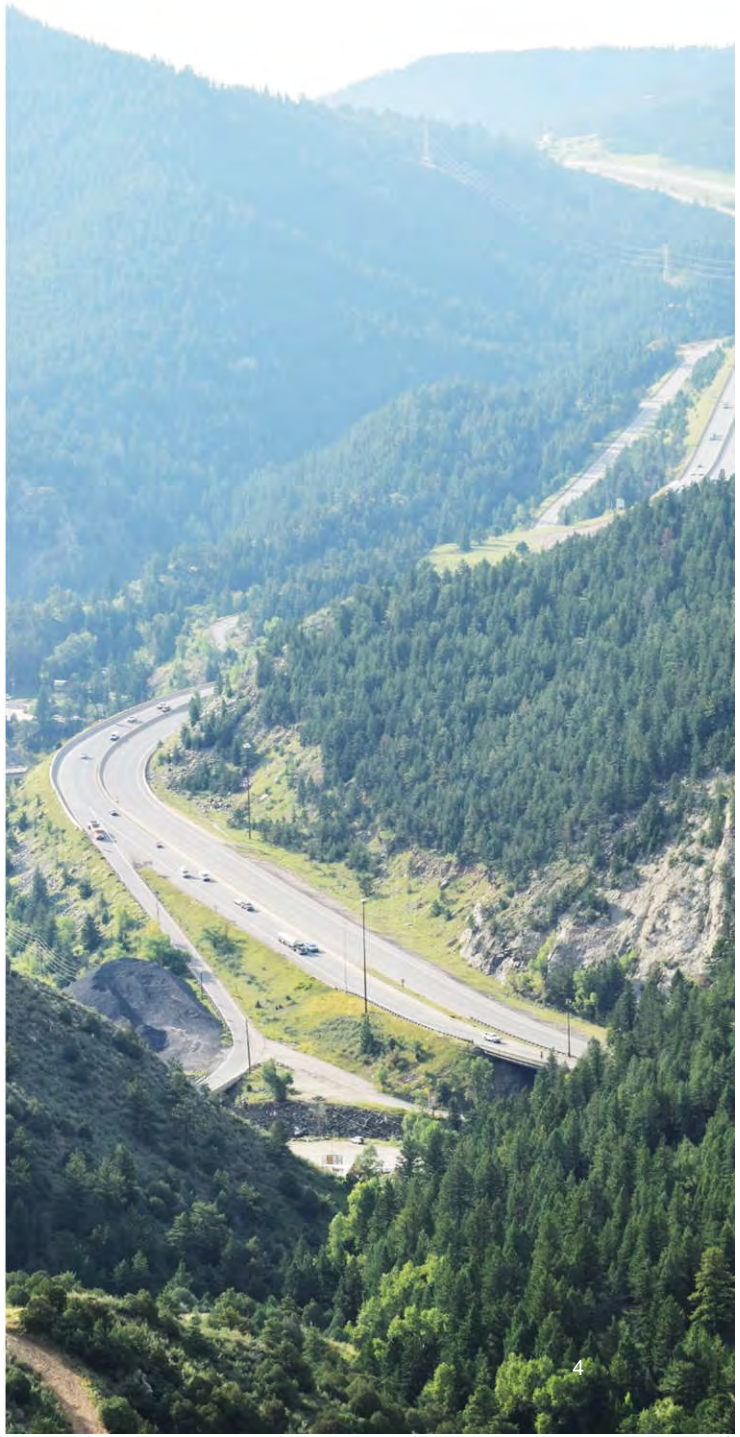
Project Overview and Background

I-70 Floyd Hill to Veterans Memorial Tunnels

Purpose

The purposes of the I-70 Floyd Hill to Veterans Memorial Tunnels project are to:

- Improve travel time reliability, safety, and mobility and address the deficient infrastructure on westbound I-70 through the Floyd Hill area of the I-70 Mountain Corridor.
- Improve multimodal connectivity and provide an alternate route parallel to the interstate mainline in case of emergency or severe weather conditions.



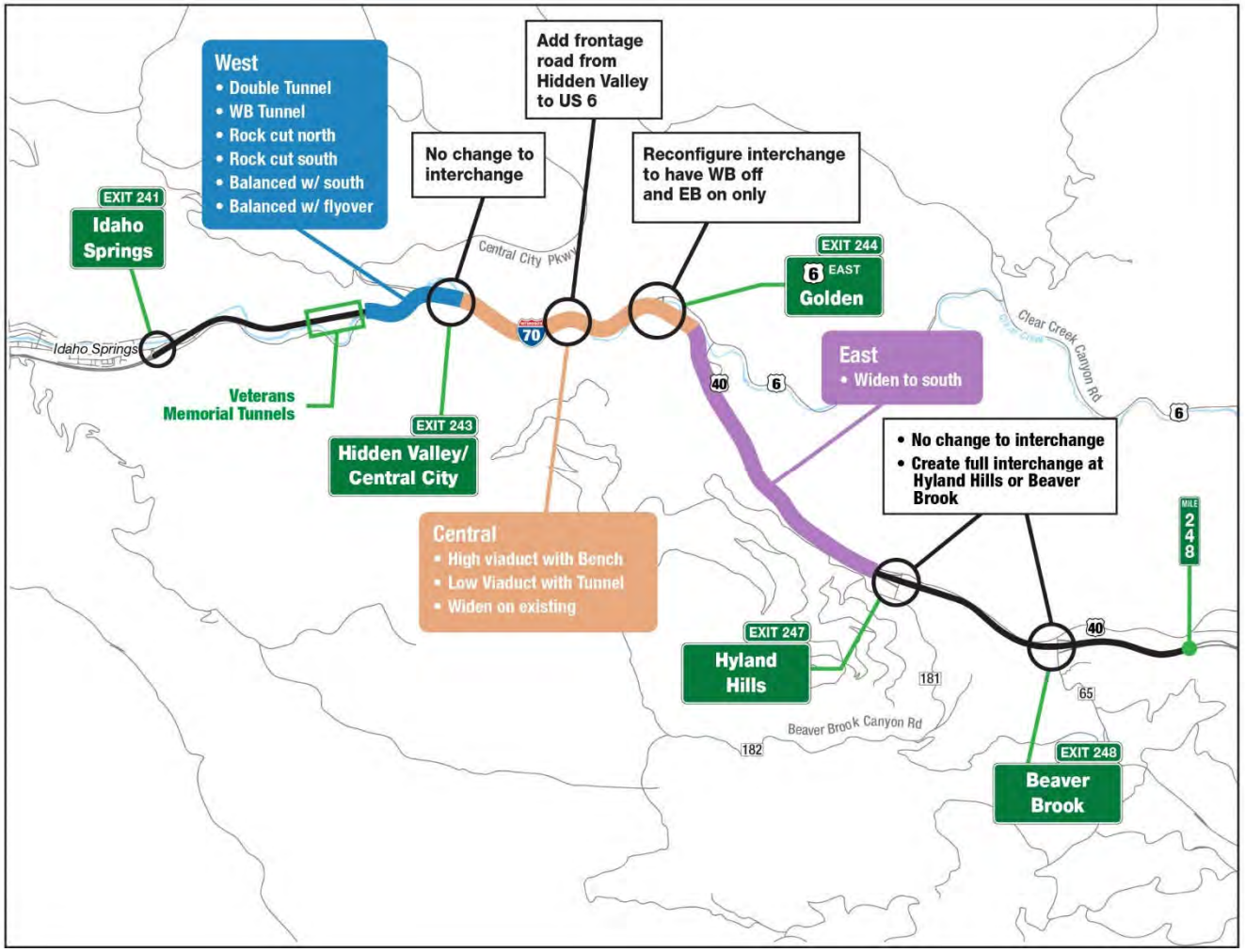
I-70 Floyd Hill to Veterans Memorial Tunnels

Proposed Action

- Provides a 3rd lane from the top of Floyd Hill through the tunnel (2011 ROD)
  - Evaluating options for tunneling, rock cuts, and benches at two locations (bottom of Floyd Hill and just west of Hidden Valley)
  - Evaluating west terminus (dropping 3rd lane and tie-in with WB PPSL)
  - Evaluating need for truck climbing/acceleration lane with eastbound on-ramp addition at US 6
  - Evaluating additional intersection and interchange improvement needs throughout
- Addition of trail and frontage road between tunnel and US 6 (2011 ROD)
- Evaluating eastbound curve safety improvements

I-70 Floyd Hill to Veterans Memorial Tunnels

Design Options



I-70 Floyd Hill to Veterans Memorial Tunnels

SWEEP Committee

The I-70 Mountain Corridor passes through several watersheds that support numerous aquatic resources.

- I-70 impacts water quality and viability of watershed ecology.
- Lead agencies formed a working group to address these issues through the Stream and Wetland Ecological Enhancement Program (SWEEP) committee.
- The committee works to identify and recommend appropriate mitigation strategies
- The SWEEP Memorandum of Understanding (MOU) (January 2011)
- This allows for holistic consultation and documentation by streamlining this process for all projects along the corridor.

I-70 Floyd Hill to Veterans Memorial Tunnels

Planning Elements

Clear Creek Sediment Control Action Plan (SCAP) finalized in 2013

- SCAP study area covers 33 mile Clear Creek I-70 Corridor from EJMT to Beaver Brook
- Recommends sediment control BMPs for highway-related impacts
- Three areas identified as higher priority for highway sediment and nutrient loading (FH).
- Areas with highly mineralized rock cuts or mine waste residuals were identified
- Other areas in general should use sediment control improvements as detailed in the SCAP




Photos: CDOT

I-70 Floyd Hill to Veterans Memorial Tunnels

Planning Elements

- SWEEP MOU and Implementation Matrix
- A Regional Ecosystem Framework for Terrestrial and Aquatic Wildlife along the I-70 Mountain Corridor
- Guidelines for Improving Connectivity for Terrestrial and Aquatic Wildlife in the I-70 Mountain Corridor

Photos: CDOT

I-70 Floyd Hill to Veterans Memorial Tunnels

SWEEP Implementation Matrix

Considerations during project development:

- Sediment management
- CWA Section 303 (d) list
- Mine workings in I-70 right-of-way
- Mine waste as road bed
- Wetlands protection
- Special status species
- Aquatic species as a recreation resource
- Information and research needs.

I-70 Floyd Hill to Veterans Memorial Tunnels

Other Relevant Projects

Veterans Memorial Tunnels

- Completion date 2015
- Implemented Clear Creek water quality monitoring program for Hidden Valley segment

Westbound I-70 Peak Period Shoulder Lane

- Environmental Evaluation and Analysis in Progress
- Approximately Fall 2018 for final design followed by construction

I-70 Floyd Hill to Veterans Memorial Tunnels

SWEEP Issues Discussion

Identify:

- Initial list of issues and concerns
- Information and data needs
- Initial mitigation recommendations

Graphic: Google Images

I-70 Floyd Hill to Veterans Memorial Tunnels

Initial Stakeholder Concerns

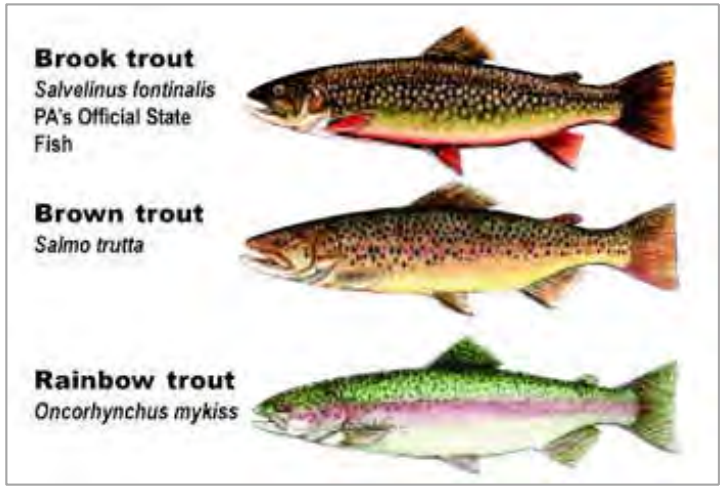
- Clear Creek is a high value fishery
- Channelization of Clear Creek
- Clear Creek Sediment Control Action Plan
- Minimize wetlands impacts
- Stream Cross Drains should be fish friendly
- Mining waste and mineralization
- Recreational Use and Quality of Experience
- Maintain fishing access

I-70 Floyd Hill to Veterans Memorial Tunnels

Issue: Fishery and Aquatic Species

Fish

- Brown trout
- Rainbow trout
- Brooke trout
- Cutthroat trout
- Various Suckers
- Benthic Invertebrates



Graphic: www.fishandtrout.com

I-70 Floyd Hill to Veterans Memorial Tunnels

Issue: Fishery and Aquatic Species

Construction and Maintenance Elements

- Increased storm water runoff from impervious surface
- Drainage Pattern Changes
- Petroleum discharge from spills and vehicles
- Maintain fish passage upstream/downstream during construction
- Sedimentation

Photo: www.streamcontinuity.org

I-70 Floyd Hill to Veterans Memorial Tunnels

Issue: Wetlands

- Multiple potential wetlands identified in the project area
- Primarily associated with Clear Creek and Beaver Brook (eastern end)
- Potential for wetlands along Sawmill Gulch, Johnson Gulch and unnamed tributaries
- Potential for impacts

Photo: Google Images

I-70 Floyd Hill to Veterans Memorial Tunnels

Issue: Mine Waste & Mineralization

- Mine Waste Residuals
- Mineralized Rock Cuts
- Historic Mining Claims and Shafts

Photo: www.mindat.org

I-70 Floyd Hill to Veterans Memorial Tunnels

Issue: Water Quality

- Floyd Hill identified in SCAP as one of three higher priority areas for erosion and sediment control
- High sedimentation rates resulting from slope erosion and traction sand from Beaver Brook (MP 248) to MP 244 (US 6)

I-70 Floyd Hill to Veterans Memorial Tunnels

Issue: Water Quality

- Impacted streams include Beaver Brook, Johnson Gulch, and Clear Creek
- SCAP integrates westbound and eastbound drainage and sediment control BMPs
- SCAP improvements also specified for 2-mile Hidden Valley segment.

I-70 Floyd Hill to Veterans Memorial Tunnels

Issue: Water Quality

- Baseline water quality data available for Clear Creek in Hidden Valley area for highway-related sediment/salt loading.
- Clear Creek is identified as 303(d) listed water body requiring TMDL's (COSPCL11 Mainstem of Clear Creek from a point just above the Argo Tunnel discharge to the Farmers Highline Canal diversion in Golden, Colorado)
  - Cadmium (Dissolved) High Priority (Roadway Pollutant of Concern per CDOT's MS4 Permit)
  - Temperature High Priority

I-70 Floyd Hill to Veterans Memorial Tunnels

Mitigation Recommendations

- Implement improvements identified in the SCAP as appropriate
- SCAP for Floyd Hill area identifies the following:
  - 32 sediment basins
  - Inlet sediment traps
  - Culvert pipe rundowns to prevent slope erosion
  - Implement standard construction BMPs
  - Develop a construction Materials Management Plan
- Aquatic permeability should be improved if culverts are replaced

I-70 Floyd Hill to Veterans Memorial Tunnels

MAP REVIEW

- Considerations for Central Section
- Considerations for West Section

I-70 Floyd Hill to Veterans Memorial Tunnels

Next Steps

- Next SWEEP meeting (late summer/early fall)
- Field Reconnaissance (wetlands)
- Agency Coordination
- Identify Mitigation
- Coordination with Design Team
- Partnership Opportunities

I-70 Floyd Hill to Veterans Memorial Tunnels

Schedule

- **Existing Conditions/Data Collection**
  - Fall 2017 through 2018
- **NEPA/30% Design**
  - Winter 2017/2018 through Spring 2020
- **Final Design followed by Construction***
  - Spring/Summer 2020
  - Construction 2021-2024

**Pending funding availability*

I-70 Floyd Hill to Veterans Memorial Tunnels

Questions

Meeting Notes

I-70 Floyd Hill to Veterans Memorial Tunnels

SNC·LAVALIN ATKINS

Project: I-70 Floyd Hill to Veterans Memorial Tunnels NEPA and 30% Design
Meeting: 21912 Floyd Hill SWEEP #2
Date: October 25, 2018
Location: CDOT Golden Region 1, Lookout Mountain

Summary of Action Items	Responsibility
1. Complete wetlands functional assessment.	Atkins
2. Set up meeting with CDOT Maintenance to determine existing vehicles and dimensions, maintenance activities and requests, traction sand application rates.	Atkins
3. Discuss BMP locations with CDOT Maintenance.	CDOT
4. Confirm that CDOT maintenance is aware of fire suppression emergency vault and procedures for closing the valve.	CDOT
5. Confirm BMP ponds will drain within 24 hours as required (to mitigate against standing water).	Atkins
6. Determine and map groundwater elevations to aid in impact analysis and design.	Atkins
7. Review as-builts and incorporate existing BMP locations into proposed design as applicable.	Atkins
8. Evaluate impacts of snow plowing over creek locations and consider opportunities to reduce snow from entering creek directly.	Atkins
9. Note that the curve modifications reduce the potential for truck overtopping and hazardous spills and need for sand oil separators. This note should be incorporated into the sediment control design and hazmat section of the EA and technical report.	Atkins
10. Provide project update to the Upper Clear Creek Watershed Association.	CDOT
11. Show wetland areas in roll plots for future meetings.	Atkins
12. Provide total impervious area and the capture volume of the BMPs.	Atkins

Summary of Discussion

The SWEEP Issue Task Force meeting #2 followed the attached agenda and presentation followed by a roll plot discussion of specific sediment control recommendations. Attendees are indicated in the sign-in sheet. *Green* notes indicate notes and discussions after the meeting.

1. Introductions

2. Issues and Actions from SWEEP Meeting No. 1

a) Water Quality Concerns Raised Previously
   i) Creek geology and moving the Creek
   ii) Sediment generated with moving the Creek and associated turbidity
   iii) Wetland complex at Beaver Brook
   iv) Methodology for Environmental Assessment
      a) Project location is outside of a MS4 Permit area
      b) Concern with Magnesium Chloride (MgCl) and other salts that cannot be captured; monitoring shows an overall increase in chlorides in the Creek

b) Status of Action Items from Meeting No. 1
   i) Complete wetland investigations
      a) Wetland delineation completed
      b) Wetland functional assessment will be completed
      c) Potential fen wetlands tested in the Beaver Brook area; while soil testing (conducted by Colorado State University (CSU) laboratory per USACE standards) showed organic soils, the testing did not support fen designation
   ii) Confirm maintenance use of traction sand
      a) Maintenance continues to use sand, especially on Floyd Hill due to steep grades. *After the SWEEP meeting, Maintenance confirmed that they no longer use sand east of the Veterans Memorial Tunnels (VMT) (even for traction) and only use Ice Slicer*
      b) Warmer winters leads to less application of sand; sand is weather dependent
      c) Design team intends to meet with Maintenance to document application rates *After the SWEEP meeting, Maintenance confirmed the application rate for sand is zero (the SCAP assumptions are too high)*
   iii) Concern about effects of chlorides from deicers entering the Creek
      a) Sand is more natural and preferred (Jim Ford) since the Black Hawk treatment plant can filter out the sand
      b) There are no readily available BMPs to capture chlorides
      c) CDOT continues to do research on deicers
      d) Need to continue coordination with Black Hawk regarding potential effects of chlorides on town water supply (intake located within the project area)

3. Proposed Action Updates: Design proposes moving approximately 1,000 feet of the Creek between VMT and Hidden Valley approximately 50 feet to the south. In this reach:

a) Highly channelized; no spawning habitat per CPW
b) EA needs to evaluate impacts to fishing and rafting; these may be in conflict
c) Creek modifications could provide opportunity for enhancements
d) 404 permitting could not rely on restoration NWP as the primary purpose is for transportation
e) SWEEP ITF is interested in reviewing and providing input to the tunnel and creek realignment designs as these elements are advanced

4. Water Resources Updates

a) Wetlands and waters of the U.S.
   i) Field delineations conducted for most of study area. In cases where properties were inaccessible (right of entry not granted), an advanced desktop review was conducted for properties.
   ii) Organic material was identified within two wetland complexes at the top of Floyd Hill: High-quality wetlands; however, not classified as fen wetlands based on CSU lab results—7% Total Organic Compound (TOC) versus the 12% TOC required to classify as fen.
   iii) Wetlands and waters of the U.S. are associated with Clear Creek and Beaver Brook

b) Streams and Riparian Areas
   i) CPW monitored fish populations in the stretch of Clear Creek east of the VMT from 2012 to 2017 (associated with the Twin Tunnels project commitments)
      a) No spawning areas in the area east of the improved section (after the bend at the doghouse rail bridge): Mostly resulting from channelization (the channelized section is favorable to rafting)
   ii) Boreal toads are not present in the project area to Mandy or Chase's knowledge. *After the meeting, Mandy consulted with the wildlife discipline lead and confirmed that boreal toad habitat has been mapped by CPW, and the eastern edge of suitable habitat is about 10 miles west of the Floyd Hill Project study area.*
   iii) Channelization of Clear Creek is a challenge for stream health as channelization increases stream erosion, transports more sediment, accelerates velocity of the water, and reduces vegetation along the stream bank resulting in poor habitat.
      a) Gary Frey provided input to the factors needed to assess stream health and habitat potential, such as water quality, flow, and stream structure, such as sinuosity and presence of pools, shelters, and barriers.
   iv) Sedimentation
      a) Sediment enters streams in the Project area from erosion generated from offsite sources and rock/landslides, winter maintenance of the highway, and mining influences, including metal runoff from mill sites
      b) Upper Clear Creek Watershed Association has water quality information for reference. The Upper Clear Creek Watershed Association would also be in interested in a project update. CDOT provides updates at their regularly scheduled meetings – the next scheduled CDOT update is in January.
   v) Response to hazmat spills has not yet been determined or coordinated with the state Fire Marshall. No determination has been made whether Hazmat vehicles will be allowed though the proposed tunnel or need to detour around on the frontage road. Additional discussion and coordination to occur in later design phases.
   vi) Stream enhancements must consider rafting, fishing, and water recreation, including access to minimize impacts to channel health and function

c) Winter Maintenance
   i) SWEEP group would prefer the use of sands instead of salt

ii) Plowing practices and associated snow storage need to be considered and incorporated into the design

5. Sediment Control

a) SCAP Recommendations

i) The SCAP is a planning-level document that provides a menu and identification of potential BMPs that could be incorporated into future I-70 projects in the Clear Creek watershed, as appropriate

ii) Within the Floyd Hill Project Area, numerous BMPs are identified (as described later in the meeting)

b) Project Approach and BMP Recommendations

The design team developed a venn diagram to illustrate the three overlapping considerations in developing sediment control facilities: engineering, maintenance, and environmental. Each of these factors is important to ensuring feasible facilities that can be maintained and integrated into the landscape into the future.

i) Engineering: Feasibility, efficiency, size and cost:

a) Effectiveness is most important feature of a BMP

(a) Holly Huyck indicated that a facility that works may not be aesthetically pleasing, but is preferable to one that does not work as well but looks nice.

(b) Need to capture sediment and drain properly

(i) The basin design at the east end of the Lawson bridge does not drain, and standing water has attracted mosquitos.

(ii) Jo Ann Sorenson receives annual reports on the sediment basins from the EB PPSL project that show the structures are not capturing sediment. Need to design them so that they work. *Based on discussions with Maintenance after the meeting, the lack of sediment may also be due to the lack of sand use in the area.*

ii) Maintenance

a) Maintenance of sediment control facilities is critical to their long-term effectiveness

b) Maintenance prefers fewer facilities that can be safely accessed within existing environments

c) Ideally maintenance would occur on an annual schedule (i.e., the facilities are large enough to hold a full season of sediment)

iii) Environmental: Natural looking, effective

a) BMP location and sizing should consider resiliency; proposed location should not be too close to Clear Creek. If they are within the 100-year floodplain, they need to be designed to withstand flooding impacts

b) It was recommended that grass not be planted adjacent to the roadway because it attracts wildlife closer to the roadway and may increase wildlife vehicle collisions

c) BMP Menu Overview: SCAP proposed versus Floyd Hill Conceptual Proposed BMP Design

i) Based on a review of the various criteria within the engineering, maintenance, and environmental categories, the design team has proposed two primary BMP types (basins and swales) that best balance the needs.

ii) Sediment Basins:
   a) 27 shown in the SCAP
   b) 12 Proposed with the Project design

iii) Roadside Swales
   a) Proposed with the Project due to limited right-of-way and trying to limit the Project's disturbed area.
   b) The swales will provide some treatment of runoff prior to being discharged into Clear Creek

iv) Loading Dock Traps:
   a) 3 shown in the SCAP
   b) 1 proposed with the Project because there is no room for a sediment basin in that area.
   c) The location is not in a highly visible area based on the current proposed design and the design will ensure that it is as minimally visible as possible

v) Inlet Sediment Traps:
   a) 26 in the SCAP
   b) None proposed for the Project
   c) Dangerous and difficult to maintain because Maintenance has to do lane closures at night to clean them
   d) Not effective because they are not maintained

6. Open Discussion: Walk through roll plot: See notes on attached roll plot pdf

a) Jo Ann Sorensen noted that the sediment basin installed at the east end of the EB PPSL project holds water and generates mosquito larvae. Josh Giovannetti believes it's because the BMP is not working correctly. Note that the WB PPSL project will be fixing the Lawson sediment basin.

b) Loading dock trap at the east end of the VMT is for spills, materials used during fires in the tunnels, and sediment capture; this one needs to be noted and maintained in the design

c) Recommended communication and hand off; provide a map of BMPs to:
   i) Maintenance
   ii) Fire response

d) Design considerations/review:
   i) Station 1022+00: Capture area (tunnel to bridge) sediment basin is just upstream of the intake: Proposed design must not impact or modify the existing water intake for the Black Hawk water treatment facility
   ii) Permanent Water Quality (PWQ) Outlet Structure must have a well screen to mitigate clogging and ensure better performance
      a) May need to modify existing PWQ feature from Central City and treat some of I-70
         (a) Approximate location is north of the highway and may be in between I-70 and Central City Pkwy to the west of the treatment plant
         (b) Need to coordinate with Central City because this location is one of their PWQ features
      b) Tunnel hazmat containment will be taken care of in future phases of design

c) Existing pond east of the proposed loading dock is filled with water (is not functioning properly)
d) Acquire groundwater information at all proposed sediment basin locations in future phases of the project

iii) Three informal ponds just west of U.S. Highway 6 (US 6); Atkins to investigate further. *After the SWEEP meeting, Atkins reviewed as-builts and conducted field investigations to locate these informal ponds; however, the review and field investigation could not identify these ponds. As a result, the "three informal ponds" will not be considered in design.*
iv) Step/tier ditches: Coordinate design to ensure that CDOT Maintenance vehicles are accommodated
v) Clean outs: Adhere to CDOT criteria for manhole spacing
vi) Possibility to have a PWQ facility east of US 6 where the rafters currently pull out of the Creek; however, there's a concern that trying to make something work within the site constraints will remove efficiency of a small PWQ facility.
vii) Wildlife crossing: One large one at the top of Floyd Hill on the east end of the project and will add separated benches whenever the opportunity arises under bridges to allow for better crossings such at the US 6 interchange
viii) Coordinate future development work at east end of the project
ix) Review as-builts and incorporate existing conditions into the proposed design
x) West end by the bridges:
a) Shoulder width is 6 ft inside and 10 ft outside
b) Storage cannot occur on bridges; lanes and medians must be clear for vehicle access
c) Specific areas for snow storage not included in the design but can consider snow capture options for specific areas such as bridges and over the Greenway/creek
d) Ensure that snow does not get plowed onto the Greenway and limit use of the recreational area
xi) Sand Oil Separators: Concerns with spills from overturned trucks going into Clear Creek
a) Just east of the VMT, trucks frequently overturn; Proposed improvements will smooth that curve out, which should help with trucks overturning
b) Provide verbiage that indicates the design smooths out curves, which reduces the potential for track overtopping and spills. As a result, sand oil separators are not anticipated. This should occur within sediment control design and hazmat section of the environmental documents.
c) Considering providing an Incident Management Plan in future phases of the project

Floyd Hill - SWEEP Meeting # 2 — 10/25/2018

Name	Organization	Email
Holly Hoyde	Clear Creek Watershed Foundation	hhoyde@phoenixgeosciencegroup.com
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Stephanie Gibson	FHWA	Stephanie.gibson@dot.gov
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Jim Ford	City of Black Hawk	jford@cityofblackhawk.org
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Floyd Hill - SWEEP Meeting # 2 — 10/25/2018

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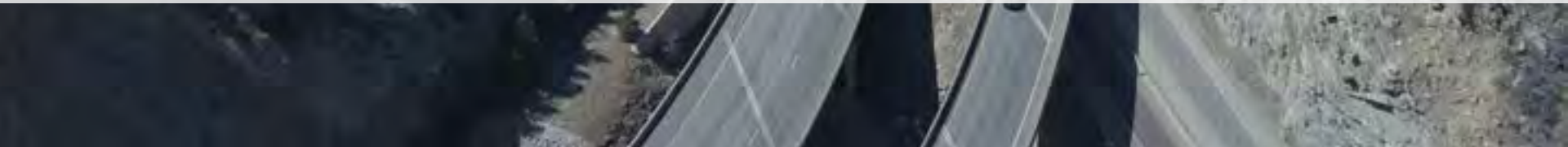
I-70 Floyd Hill to Veterans Memorial Tunnels

ATKINS

SWEEP Meeting #2

October 25, 2018



I-70 Floyd Hill to Veterans Memorial Tunnels

Agenda

- Welcome / Introductions
- Issues from SWEEP #1 Meeting
  - Committee Concerns
  - Action Items
- Proposed Action Updates
- Water Resources Updates
  - Wetlands and Waters of the US
  - Streams and Riparian Areas
  - Winter Maintenance
- Sediment Control
  - SCAP Recommendations
  - Project Approach and BMP Recommendations
- Next Steps & Review of Action Items

I-70 Floyd Hill to Veterans Memorial Tunnels

Initial Stakeholder Concerns

- Water quality
  - Traction sand, magnesium chloride, and erosion
  - I-70 and frontage road maintenance
  - Fish and riparian habitat
- Creek geology and moving the creek
- Wetland complex at Beaver Brook
- Methodology for environmental assessment

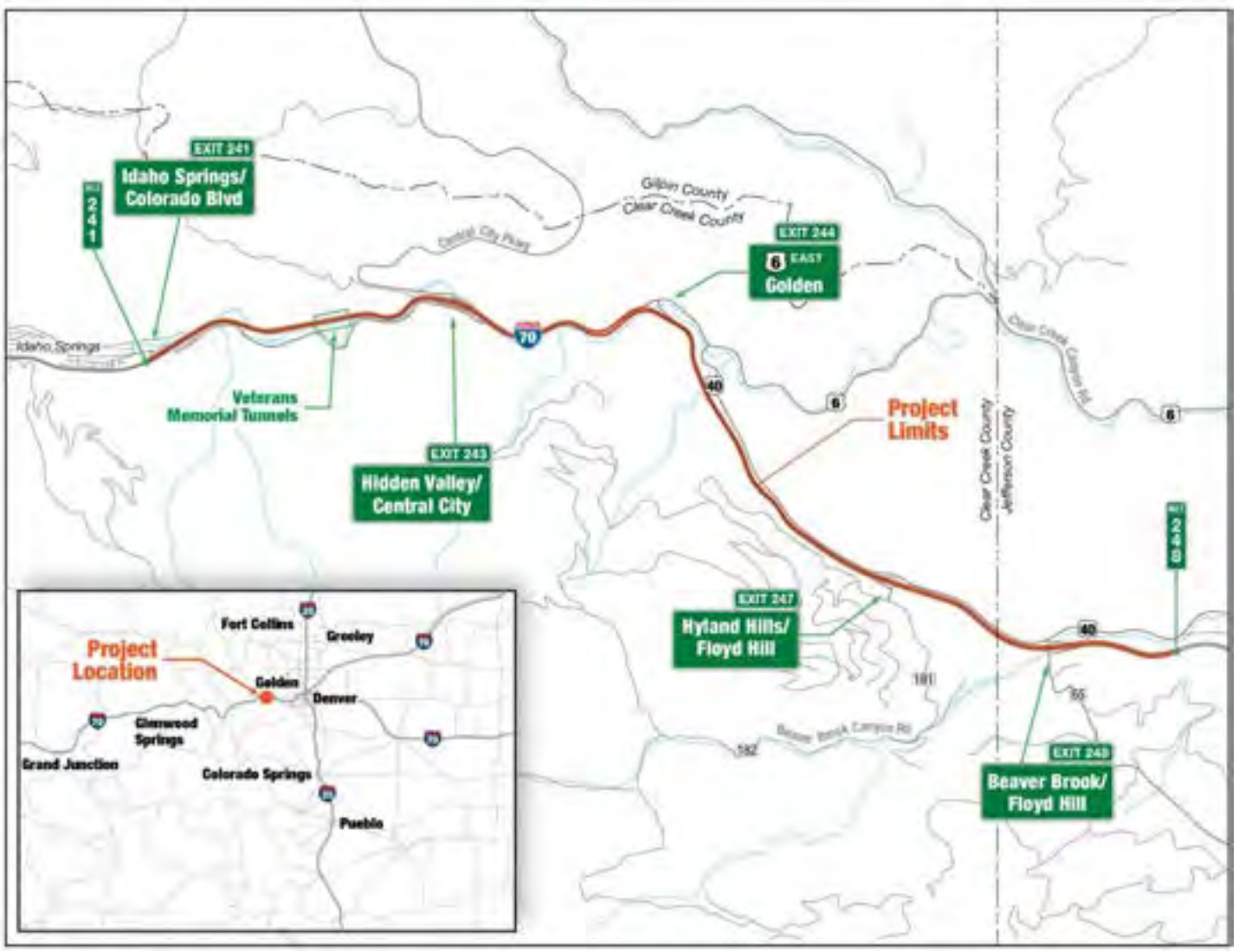
I-70 Floyd Hill to Veterans Memorial Tunnels

Action Item Review

Action Items from April 2018 Meeting	Status
1. Obtain information/figure on wetland area preserved by development approval near Floyd Hill/CR 65	Provided by Fred Rollenhagen (CCC).
2. Follow up to see if there are site specific locations that may still be using sand for treatment	CDOT maintenance confirmed that sand is used in spot locations to supplement chloride deicing when traction is an issue (such as on grades).

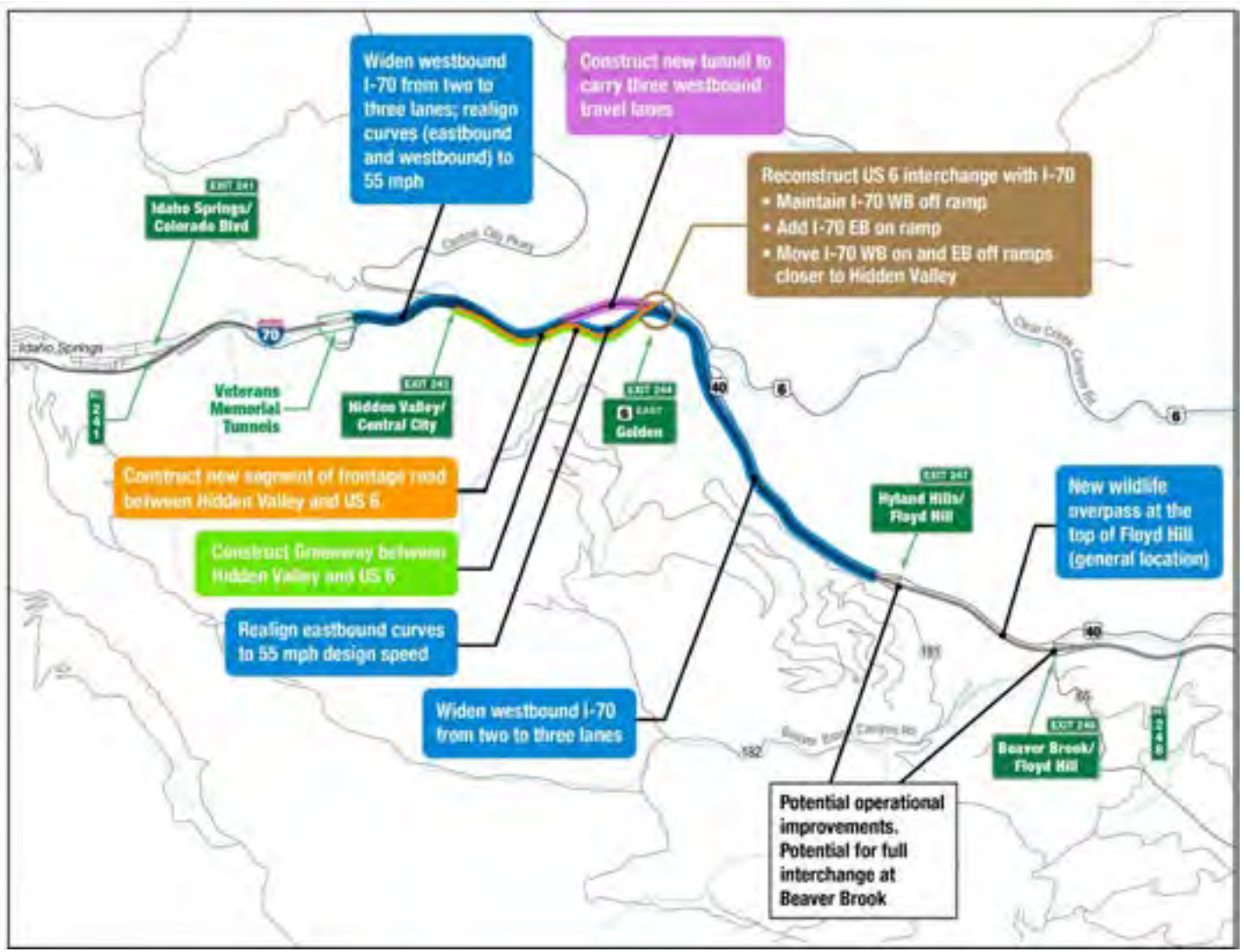
I-70 Floyd Hill to Veterans Memorial Tunnels

Project Area



I-70 Floyd Hill to Veterans Memorial Tunnels

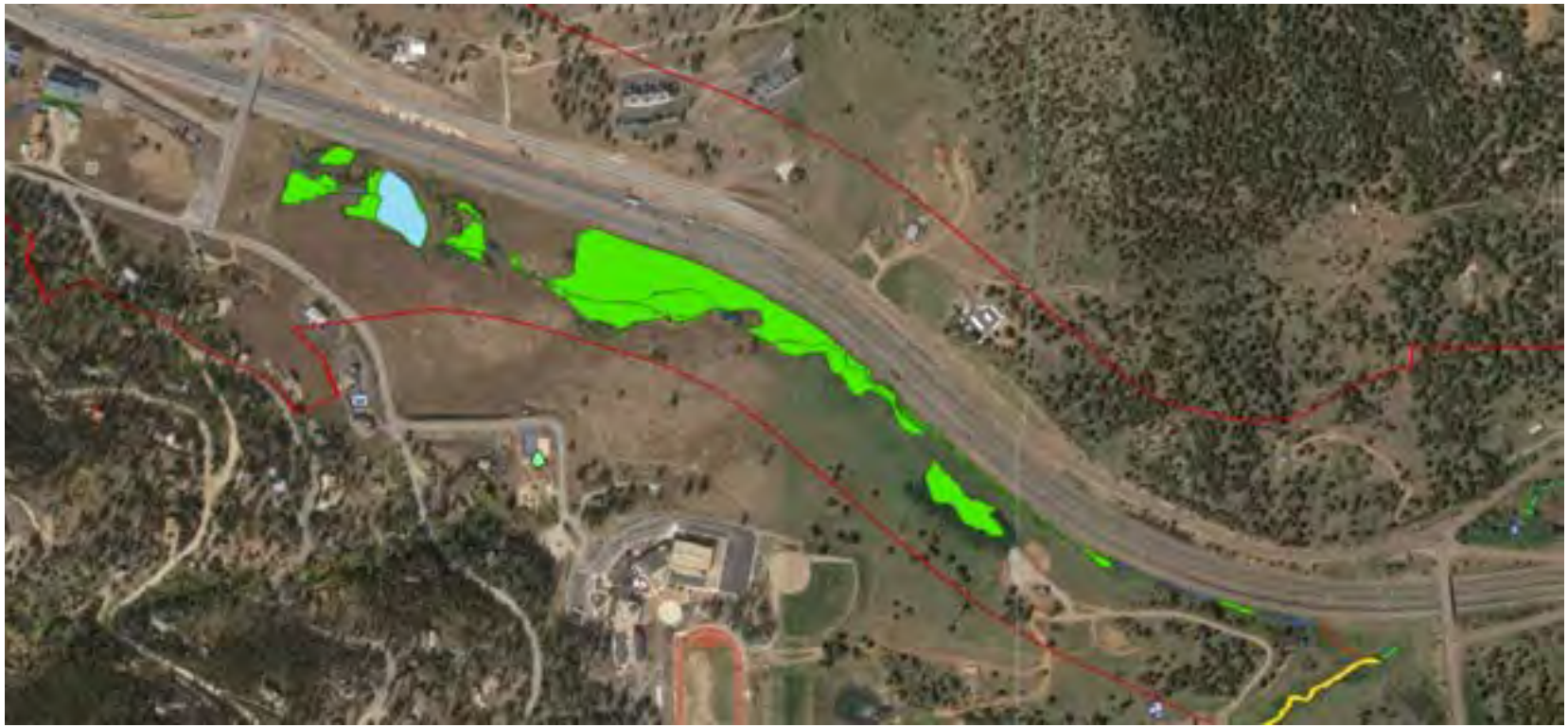
Proposed Action



I-70 Floyd Hill to Veterans Memorial Tunnels

Wetlands and Waters of the US

- WUS Delineations completed
- Additional characterization of wetlands at Beaver Brook
- Organic soils presented possibility of fen wetlands



I-70 Floyd Hill to Veterans Memorial Tunnels

Fen Wetland Testing

- Testing by Colorado State University following US Army Corps of Engineers protocol
  - August 21, 2018 sampling
  - Two week testing period
- Methods
  - Measure Total Organic Carbon
    - Fen wetlands minimum 12% TOC
    - Classified as histisol soils
  - Tested Samples Twice
- Results
  - Histic epipedon soils
  - TOC content around 7%
  - Not fen wetland

I-70 Floyd Hill to Veterans Memorial Tunnels

Streams and Riparian Areas

- Riparian areas limited due to channelization
- Sedimentation from erosion and winter maintenance (sand) negatively affects fish habitat
- Fish populations
  - Colorado Parks and Wildlife has been monitoring fish east of the Veterans Memorial Tunnels
  - No redds or spawning habitat in the project area due to channelization and rafting
  - No genetically pure greenback cutthroat trout in this stretch of Clear Creek

Other Stream Considerations

- Rafting, fishing, and water recreation (including access)
- Stream health (channelization and highway encroachment)
- Hazmat spills and response
- Mining (mineral) influences

Maintenance

- CDOT maintenance activities
  - De-icing (chlorides)
  - Traction sand
  - Snow plowing and storage
- Sediment capture (sand) is well understood
- CDOT continues to conduct research on deicing and chlorides

CDOT Water Quality Monitoring

SCAP Considerations

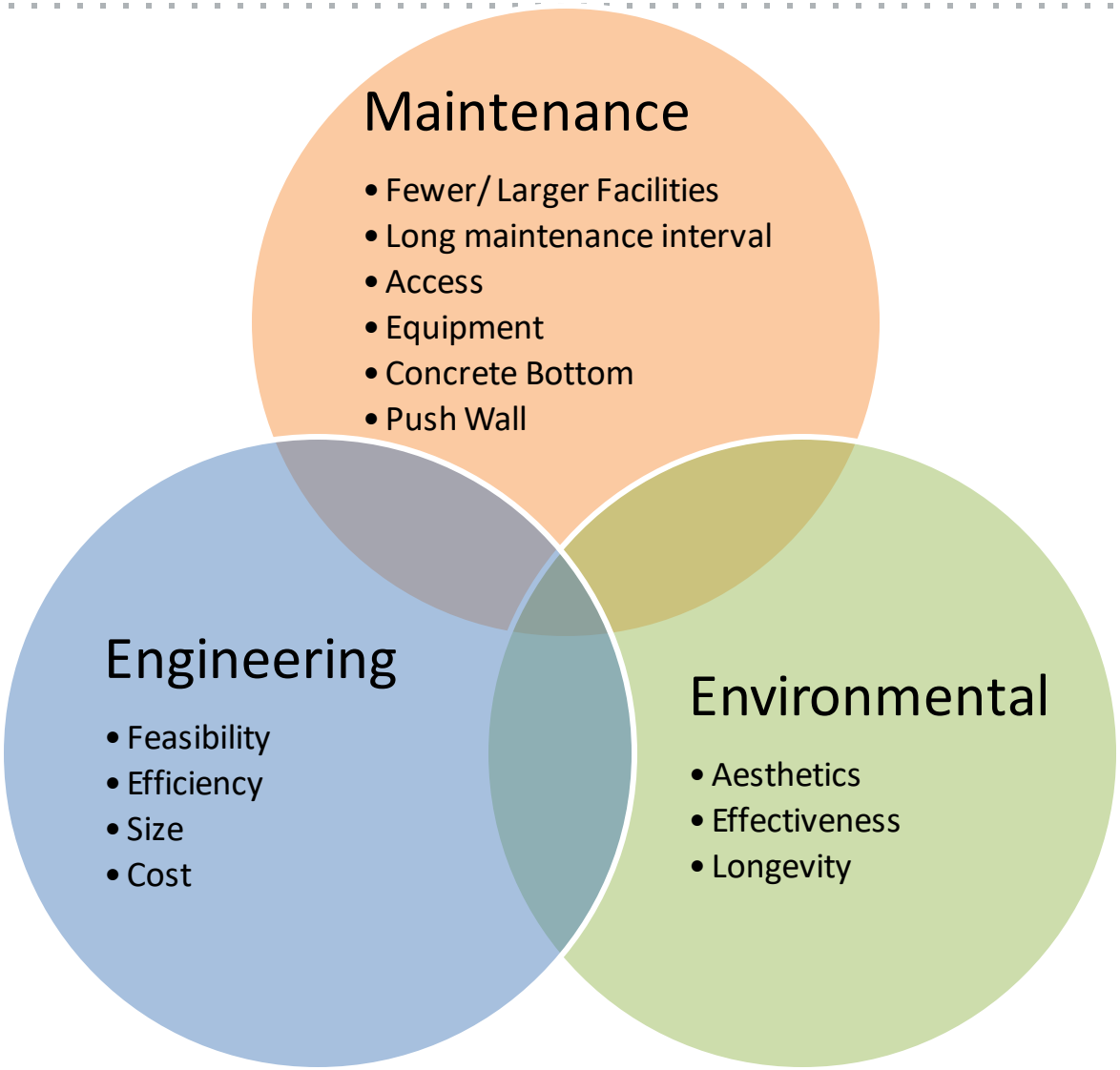
SEDIMENT CONTROL

Sediment Control

- Clear Creek Sediment Control Action Plan (SCAP) is a tool to better manage roadway traction sand and other highway-related sediment sources that can adversely impact Clear Creek
  - Provides a BMP menu to improve water quality
  - BMP details developed during preliminary design

From SCAP: "It is well documented that total phosphorus and total metals associated with sediment can also be controlled with adequate BMPs. Dissolved salts related to I-70 cannot be easily mitigated by conventional sediment control BMPs. However, retention of salt-laden runoff in control structures will also reduce direct salt loading to Clear Creek."

Sediment Control



Environmental Considerations

Aesthetics	The facility should not be identifiable from the highway or surrounding areas. It should look like a natural part of the environment.
Effectiveness	The facility needs to be able to capture and store traction sand and other contaminants of concern.
Longevity	Any constructed facility should be designed for a long life span.

Maintenance Considerations

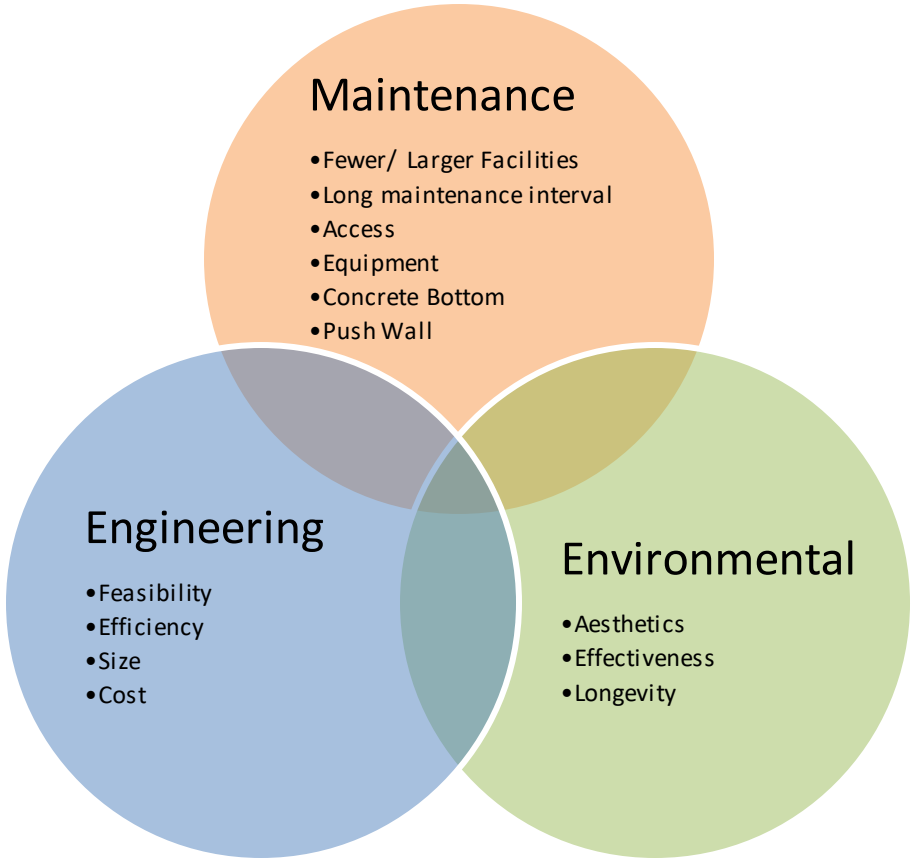
Fewer/Larger Facilities	Easier to maintain fewer facilities.
Long Maintenance Interval	The annual maintenance window for the corridor is limited to the summer months and must be shared with all roadway and faculties assigned to the Crew.
Access	The sediment capture system must be located so that it can be easily reached by maintenance equipment. Maintenance of Traffic should also be considered.
Equipment	Does CDOT have the required equipment to maintain a facility?
Concrete Bottom	Facilitates cleaning by providing a defined bottom. Easy to clean with a front loader or skidsteer.
Push Wall	Provides boundaries to help push sediment and debris into the bucket.

Engineering Considerations

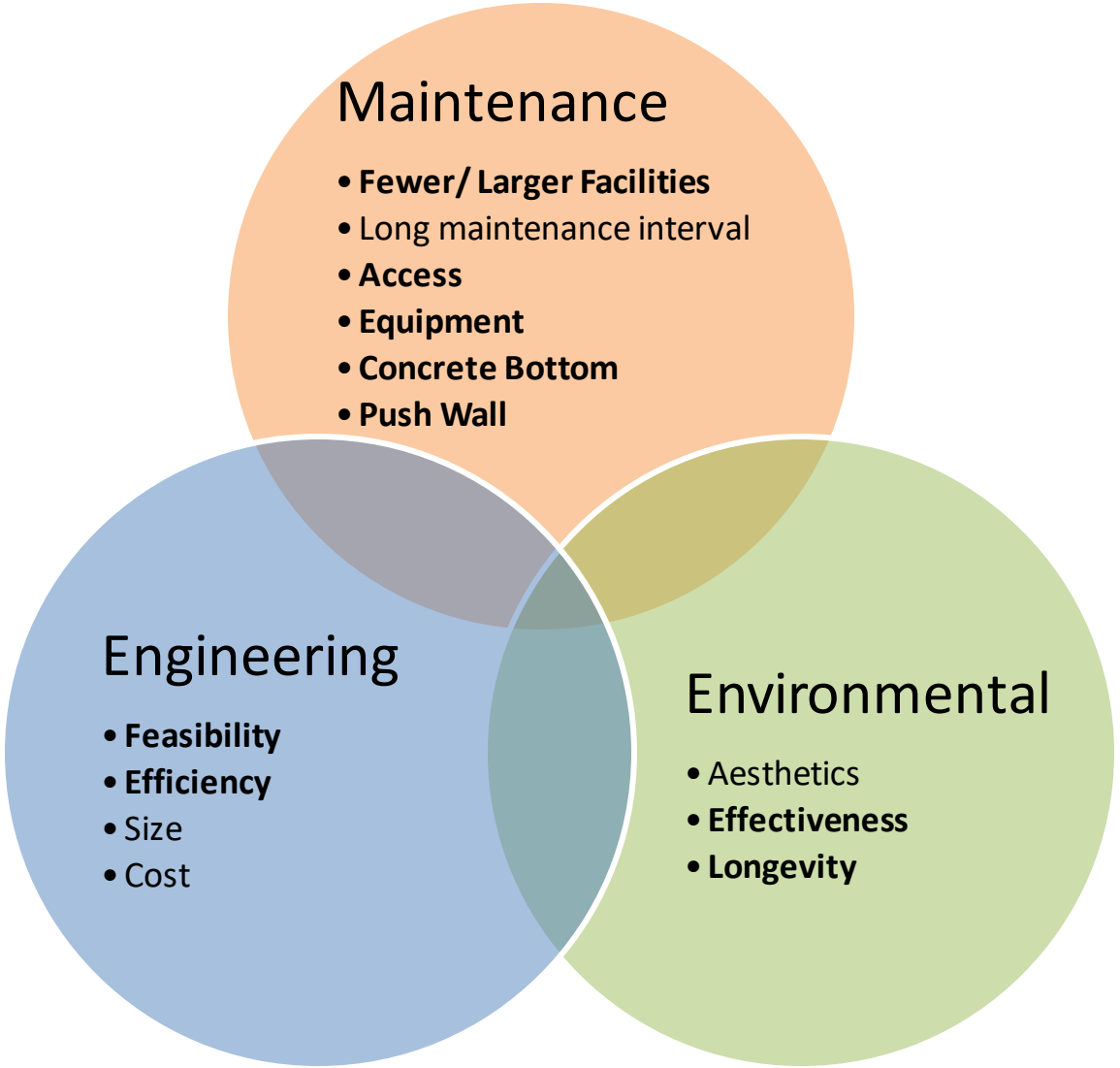
Feasibility	Can we capture and convey runoff to the facility?
Efficiency	The facility needs to be able to capture and store traction sand and other contaminants of concern that are routed to it.
Size	Can it fit and be maintained within the project limits?
Cost	Is it economical to construct and to maintain?

SCAP BMP Menu

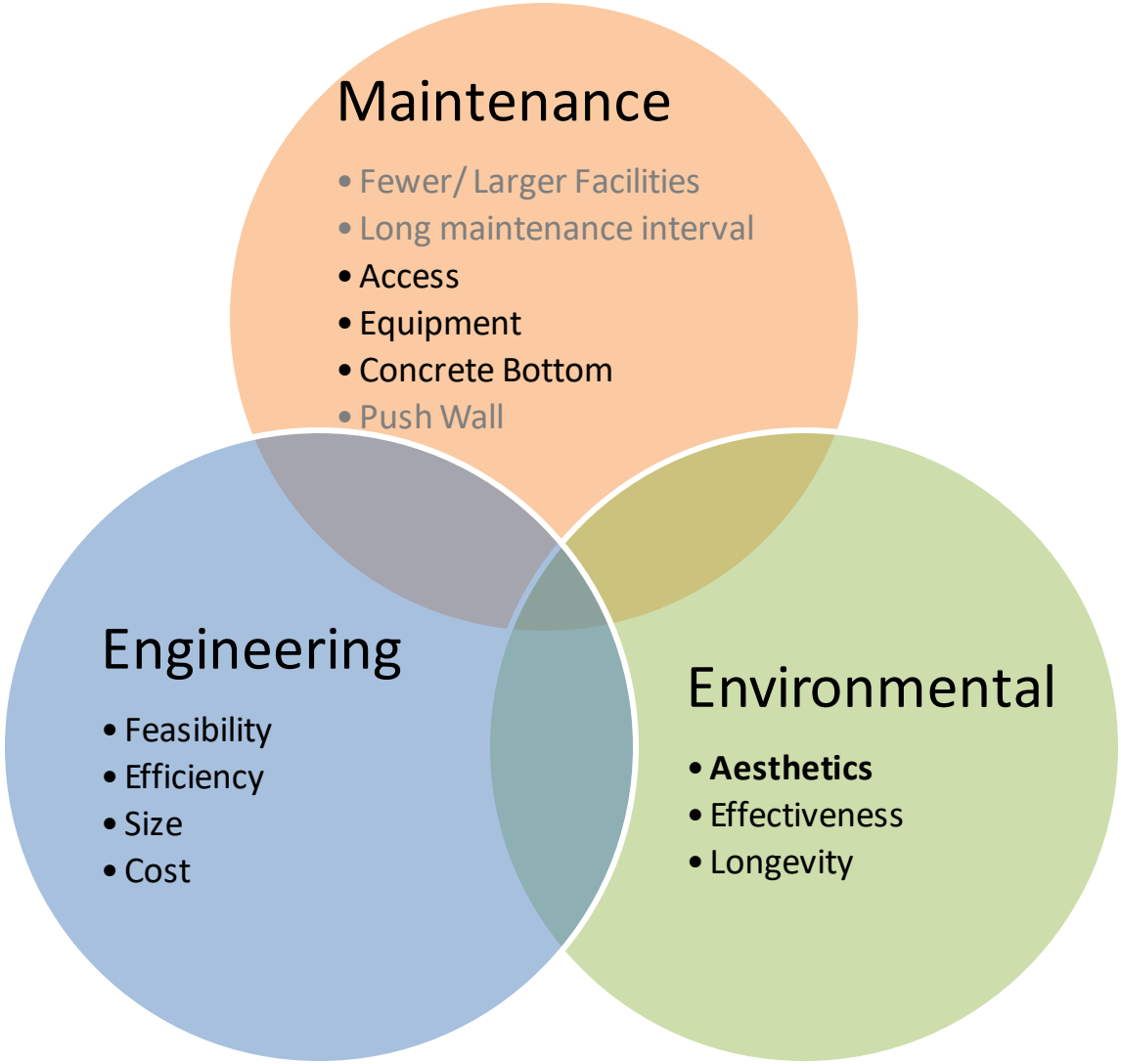
- Roadway Swale
- Curb & Gutter, Concrete Fan
- Filter Strip
- Bench Trap
- Sediment Basin
- Loading Dock Trap
- Inlet Sediment Trap
- Snow Storage Area
- Drainage Rundown
- Slope Stabilization & Revegetation
- Clean Water Diversions
- Underground Vault
- Sand/Oil Separator



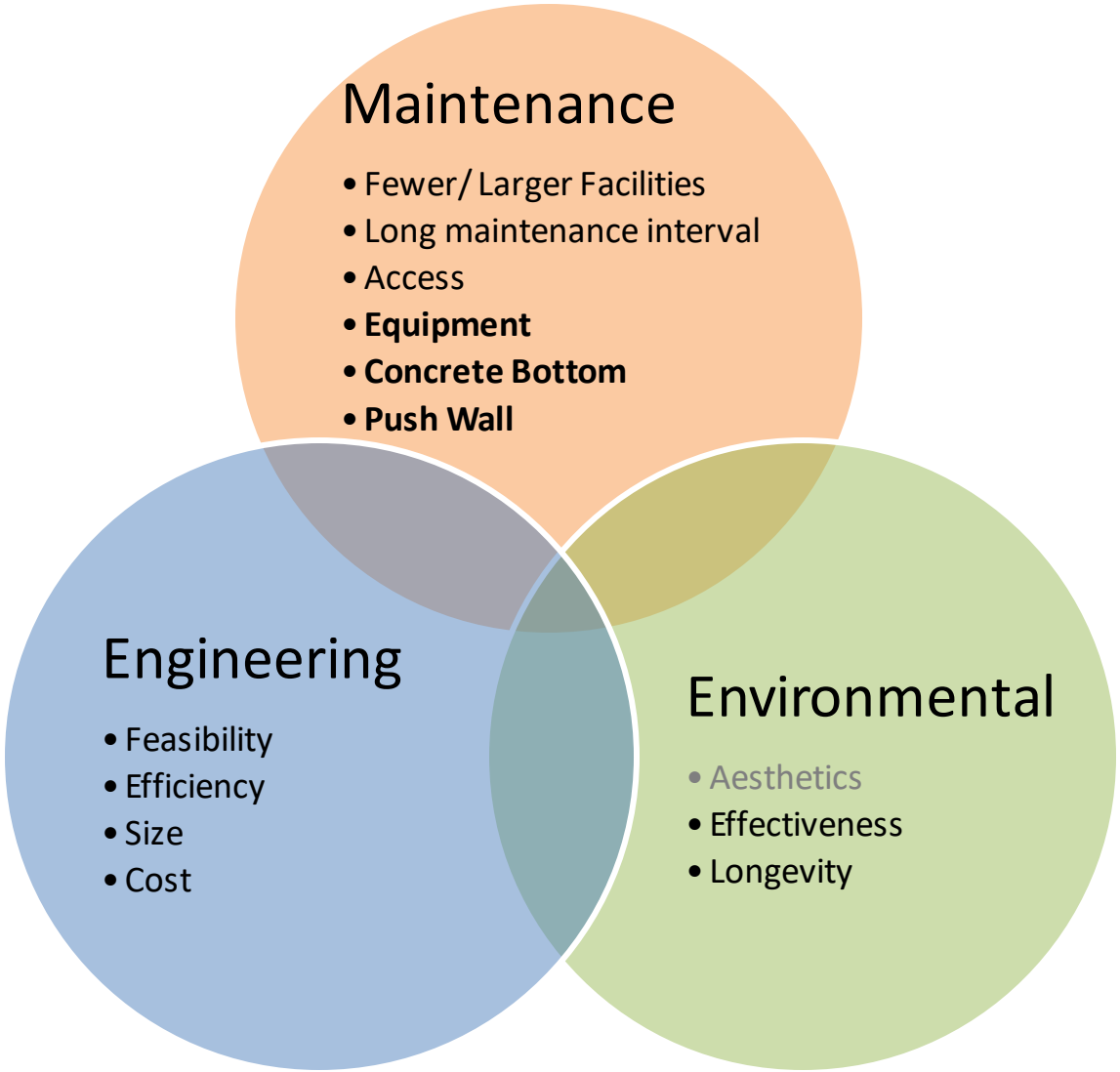
Sediment Ponds



Roadside Swale



Loading Dock Trap

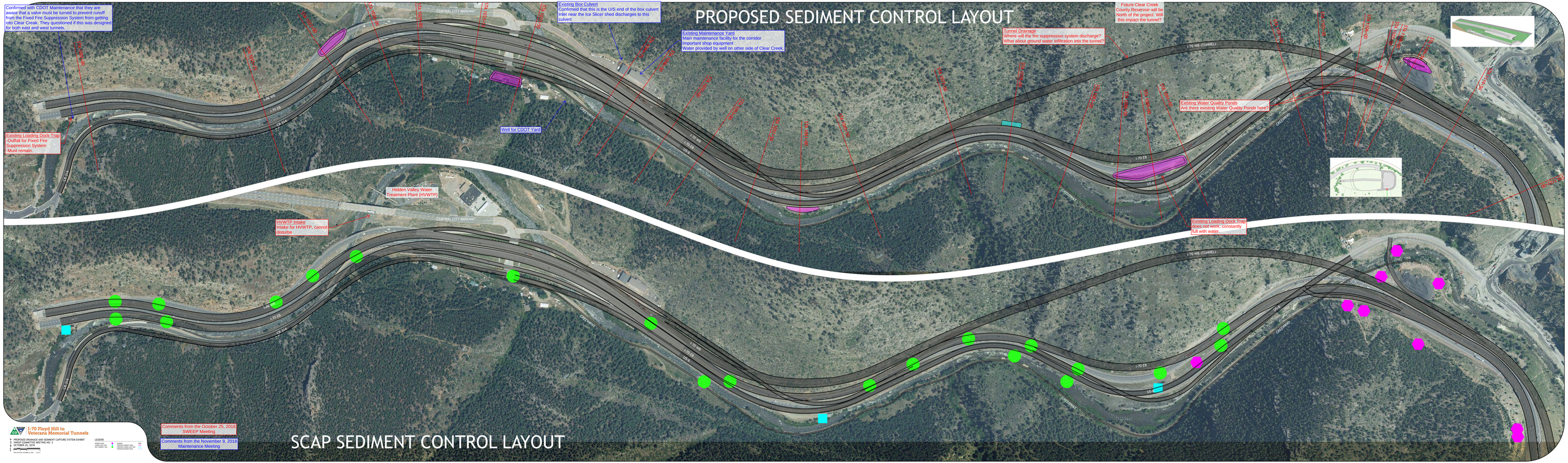


SCAP Recommended Sediment Control

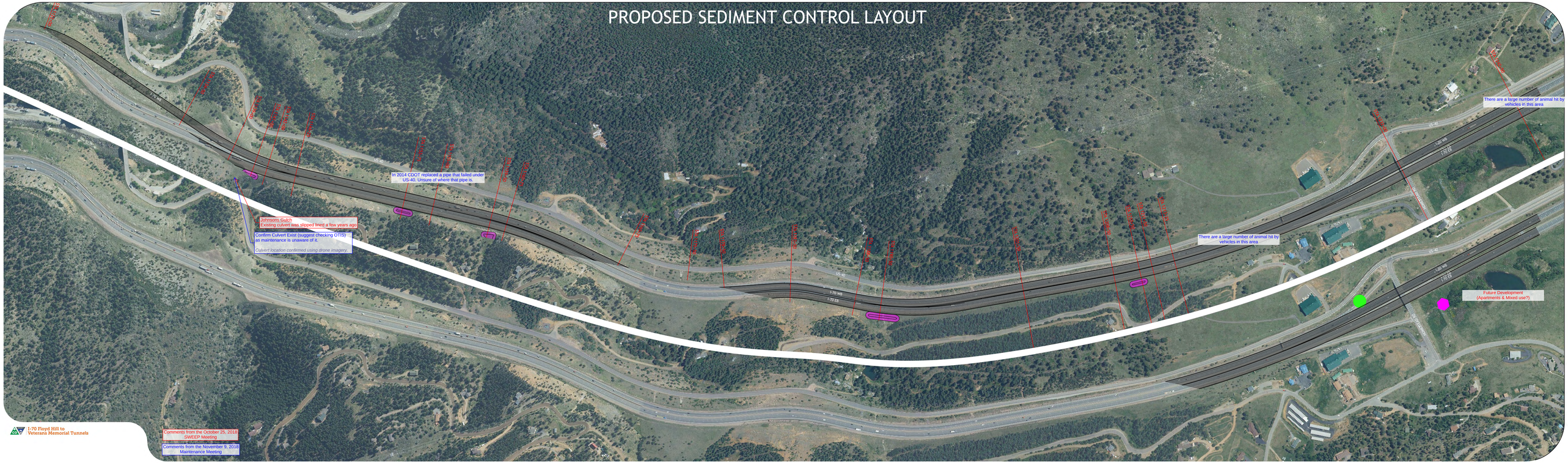
Proposed Sediment Control

I-70 Floyd Hill to Veterans Memorial Tunnels

Discussion, Questions, and Action Items


PROPOSED SEDIMENT CONTROL LAYOUT
SCAP SEDIMENT CONTROL LAYOUT
Confirmed with CDOT Maintenance that they are aware that a valve must be turned to prevent runoff from the Fixed Fire Suppression System from getting onto Clear Creek. They questioned if this was designed for both east and west tunnels.
Existing Box Culvert
Confirmed that this is the U/S end of the box culvert inlet near the Ice Slicer shed discharges to this culvert
Existing Maintenance Yard
Main maintenance facility for the corridor
Important shop equipment
Water provided by well on other side of Clear Creek.
Tunnel Drainage
Where will the fire suppression system discharge?
What about ground water infiltration into the tunnel?
Future Clear Creek County Reservoir will be North of the project. Will this impact the tunnel?
Existing Water Quality Ponds
Are there existing Water Quality Ponds here?
Existing Loading Dock Trap
-Outfall for Fixed Fire Suppression System
-Must remain.
Well for CDOT Yard
Hidden Valley Water Treatment Plant (HVWTP)
HVWTP Intake
Intake for HVWTP, cannot disturbe
Existing Loading Dock Trap
does not work. Constantly full with water.
Comments from the October 25, 2018 SWEEP Meeting
Comments from the November 9, 2018 Maintenance Meeting
I-70 Floyd Hill to Veterans Memorial Tunnels
PROPOSED DRAINAGE AND SEDIMENT CAPTURE SYSTEM EXHIBIT
SWEEP COMMITTEE MEETING NO. 2
OCTOBER 25, 2018
LEGEND
I-70 EB
I-70 WB
I-70 WB (TUNNEL)
US-6
CENTRAL CITY PARKWAY
GREENWAY

PROPOSED SEDIMENT CONTROL LAYOUT



I-70 Floyd Hill to Veterans Memorial Tunnels

COLORADO
Department of Transportation
Region 1

Region 1 West Program
425 A Corporate Circle
Golden, CO 80401

Floyd Hill – SWEEP Committee Meeting #3

Meeting Summary

May 14, 2020, 1:00 PM to 4:00 PM

Virtual Meeting – Google Hangouts

1. Welcome and Agenda Review

Vanessa Henderson, CDOT, welcomed the group, explained some basics of the online format and Google Hangouts platform, and did a roll call of participants:

- Amy Saxton, Clear Creek County
- Anthony Pisano, Atkins
- Billy Bunch, Environmental Protection Agency (EPA)
- Carol Coates, Atkins
- Chase Taylor, Pinyon Environmental
- Gary Frey, Trout Unlimited
- Holly Huyck, Upper Clear Creek Watershed Association
- Jim Ford, Black Hawk
- Jordan Falzetti, Atkins
- Joe Walter, Colorado Parks and Wildlife (CPW)
- Josh Giovannetti, CDOT
- Keith Hidalgo, Atkins
- Kevin Shanks, THK
- Kristin Salamack, US Fish and Wildlife Service (CDOT liaison)
- Mandy Whorton, Peak Consulting Group
- Matt Hubner, EPA
- Matt Montgomery, US Army Corps of Engineers (USACE)
- Melinda Urban, Federal Highway Administration (FHWA)
- Neil Ogden, CDOT
- Paul Winkle, CPW
- Becky Pierce, CDOT
- Scott Garncarz, Colorado Department of Public Health and Environment, Water Quality Control Division
- Stephanie Gibson, FHWA
- Tammy Eggers, Atkins
- Tom Matthews, US Forest Service
- Valerie Thompson-Van Ryzin, US Forest Service

Vanessa reviewed the agenda and thanked everyone for the robust participation. The presentation from the meeting is attached to these notes for reference.

2. Project Status and Alternatives

Vanessa reviewed project updates since the SWEEP Committee met in October 2018 ahead of the 109/110 ballot initiatives. After the failure of those initiatives, CDOT reassessed and regrouped in 2019, completing existing conditions surveys and reports and continuing to pursue Project funding. CDOT also developed a new alternative, the Canyon Viaduct Alternative. The new CDOT Administration also conducted a 10-year project planning effort to identify a 10-year pipeline of priority projects for the state. The Floyd Hill Project was validated as a priority through this process, and in late 2019, CDOT obtained funding to complete the EA including both the Tunnel and Canyon Viaduct Alternatives. The EA is expected to be released in Fall 2020 with a public hearing in late Fall 2020/early Winter 2021. A decision document would be released in Spring 2021 if construction funding for the Project is identified.

Vanessa reviewed the Project alternatives. She explained that the major Project elements are the same in both alternatives but differ in how they are implemented between US 6 and Hidden Valley interchanges (referred to as the central section of the Project).

Gary Frey asked about the current thinking on the tunnel design length. Vanessa said it was about 2,200 feet.

3. Water Quality and Aquatic Conditions

Mandy Whorton reviewed the existing conditions in the Project area and reviewed the SWEEP framework and issues raised in the previous 2017 and 2018 meetings. Clear Creek, Beaver Brook, Sawmill Gulch, and Johnson Gulch are all located within the Project Area, and Clear Creek is located adjacent to I-70 throughout the western portion of the project from US 6 to the Veterans Memorial Tunnels. Clear Creek through the Project area is highly valued for rafting, fishing, and recreation. While there are some areas with wetlands and riparian habitat, much of the creek is channelized and constrained. Beaver Brook crosses I-70 in the eastern portion of the project and, within the project area, supports high-quality wetland and riparian habitat, including potential Preble's Meadow Jumping Mouse habitat. Both Clear Creek and Beaver Brook have regulated floodplains and fall under Section 404 jurisdiction and Senate Bill 40 (SB 40) certification. Sawmill Gulch and Johnson Gulch flow to Clear Creek and are under Section 404 jurisdiction. Neither has a regulated floodplain, and Sawmill Gulch lacks riparian habitat under SB 40 certification requirements.

The SWEEP MOU and Implementation Matrix considerations for project development nearly all apply to the Project. Issues raised at previous SWEEP meetings include water quality, including coordination of best management practices (BMPs) with maintenance practices; wetlands; and issues associated with realigning Clear Creek.

Question: In the stream relocation area will you be reducing the width of the creek?

Answer: No, the width won't change. But the stream channel takes up most of the space so there isn't a lot of room to widen the channel or do any bank mitigation in this area. Tammy Eggers confirmed that the flow would be the same and that to meet peak flows, the channel could not narrow.

Question: What is planned for the wetlands around Black Hawk intake? Are you planning to construct additional wetlands in this area?

Answer: This is identified as an area where there is potential for mitigation to occur, but the team is aware that any work in the area cannot affect Black Hawk's water intake.

4. Water Quality

Stochastic Empirical Loading and Dilution Model (SELDM) Modeling

Jordan Falzetti provided an overview of the SELDM model and its use for the Project to inform the design and water quality approach.

Question: How were the differences between the alternatives analyzed with respect to the proposed scenario?

Answer: The Project was not analyzed separately for the different alternatives because the model is not detailed enough for that. The existing conditions were compared to the results for the Project (both alternatives).

Josh Giovannetti explained that CDOT hasn't had a lot of experience using SELDM modeling and for this project, it is being used primarily as a guideline to look at treatment effectiveness.

Holly Huyck said she is very familiar with the model based on her previous experience at CDOT in helping to develop and implement it. She suggested that the differences for the total impervious surface for each alternative should be calculated, and if it is more than 10 percent, additional analysis/modeling may be appropriate. She offered that an offline discussion might be beneficial. Josh said he would work with Vanessa to set up a meeting to discuss the details offline. (Subsequent to the meeting, Atkins provided impervious surface numbers. The existing is 68 acres, the Tunnel Alternative is 90 acres, and the Canyon Viaduct Alternative is 89 acres.)

BMP Selection

Jordan reviewed the Project's pollutant-focused, tiered approach to water quality. The approach incorporates formal water quality BMPs, such as detention basins, to mitigate the majority of roadway runoff and informal water quality BMPs, such as vegetated ditches, to mitigate roadway runoff with site constraints. He noted that, as discussed at the last SWEEP meeting in October 2018, the Sediment Control Action Plan (SCAP)-recommended BMPs focused on traction sand treatment and numerous, small facilities that were difficult for CDOT maintenance to access and maintain. The proposed BMPs reflect the new approach and have been updated to reflect changes in Project alternatives.

Jordan reviewed the water quality needs and proposed BMPs by Project section. In the east section (Floyd Hill), the main issue is chlorides, and because of the steep grade at Floyd Hill, this area receives both high and frequent application of de-icers. The primary treatment is through vegetated shoulders and engineered ditches. Constructed wetlands are also being considered in the area where de-icing agents concentrate; if they are successfully established, they can be very effective with uptake of chlorides.

In the central and west sections (Clear Creek), sediments, including metals, and chlorides need to be treated. In this area, larger basins could be included and are proposed under both the Tunnel and Canyon Viaduct Alternatives. The Tunnel Alternative has opportunities for larger basins in comparison to the Canyon Viaduct Alternative.

Question: What was the percentage of chloride reduction assumed for the BMPs in the model?

Answer: Between 1 and 10 percent for ponds and between 10 and 20 percent for swales

Question: How will the swales be maintained?

Answer: CDOT maintenance would maintain swales. Because pollutants would flow over natural vegetation on the way to swales to help removal (vegetation uptake), so even if swales are not well maintained, the system would still reduce pollutants and concentration of chloride. Josh stated that these are initial recommendations that will be refined in the next level of design.

Question: Is there evidence of arsenic in the area that would make it a concern? It was an issue on the Superfund site upstream.

Answer: Josh reviewed the Twin Tunnels Monitoring Report and noted that arsenic was not monitored, and after double checking the list of pollutants, said arsenic is listed on the MS4 Permit. Holly said the Colorado Water Quality Control Commission (CWQCC) is holding off on standards for arsenic because it is naturally occurring and found in almost every watershed in the state. Further, if arsenic was being treated, the same recommendations would apply as to other metals that are being captured in sediment ponds.

Holly expressed support for including larger detention facilities in the design because they are easier and more efficient for CDOT maintenance to clear out, which makes them more effective.

(Subsequent to the meeting, Atkins provided criteria in how pollutants were selected as project area in not in CDOT's municipal separate storm sewer system (MS4) Permit area. Pollutant selection was based on the EPA's 2016 Waterbody Report, with this section of Clear Creek having a 303(d) listed impairment for cadmium, lead, temperature, and zinc. Upon further review, stakeholder coordination recommended additional pollutants to review which finalize the pollutants of concern as cadmium, chloride, copper, lead, sediment (total suspended solids), and zinc.

Question: Did you consider the potential for airborne chlorides? University of Northern Colorado (UNC) did a study on Straight Creek in 2007 that indicated that airborne chlorides

disturbed from vehicles driving on dry roads were aerosolizing and damaging the pine forest up to 100 yards away.

Answer: This would be similar to other re-entrained particles that CDOT has BMPs, like street sweeping, to mitigate. Holly explained that CDOT has sponsored at least three different studies, and they don't all agree with each other. A common conclusion is that avoiding overspray in the application is one of the most effective ways to reduce chlorides in roadside vegetation. Also, it appears mag chloride affects riparian and aspens less than the evergreen trees, probably because it is applied during winter when plants and trees are dormant.

5. Wetlands and Waters of the US

Chase Taylor reviewed preliminary Project direct impacts for wetlands and open waters. The Tunnel and Canyon Viaduct Alternatives have slightly different impacts, as do the North and South frontage road options for the Tunnel Alternative. The largest Project impact is from relocation of Clear Creek at the west end of the Project, which is common to the alternatives and both design options.

Small impacts, less than an acre total, to many of the delineated waters would occur under all Project alternatives and design options. Wetland impacts are less than one-thousandth of an acre under all alternatives (40 to 44 square feet).

The proposed relocation of Clear Creek under both Project alternatives and design options represents the majority of Project impacts and is the focus of further discussion in this meeting regarding mitigation and enhancement opportunities.

Question: The numbers in the tables are hard to read. Is information presented in linear feet for the streams? That is usually how impacts are presented.

Answer: Matt said that the USACE likes to see acres and square feet as well, particularly in comparing alternatives. Chase confirmed the impacts are presented with all three metrics.

Question: Billy Bunch asked if the relocation of Clear Creek was considered a permanent or temporary impact, and is a full loss of those stream segments expected? Would mitigation be proposed?

Answer: These are considered permanent impacts because the creek would be relocated but the volume of water and width of the channel are not changing. The team is planning to mitigate for this as permanent impact but unlikely to be able to include much mitigation in the direct impact area.

Question: Is FACWet being performed for adjacent wetlands to inform the indirect impacts?

Answer: FACWet was performed for all delineated wetlands, not just those affected so that information is available. Indirect impacts associated with ground disturbance would be avoided with CDOT standard specifications for keeping a distance from known wetlands.

Section 404 Permitting

Becky Pierce reviewed Section 404 permitting.

The relocation of Clear Creek does not appear to fall under any Nationwide permit, and CDOT is planning for an Individual Permit. Matt confirmed that an Individual Permit would be needed.

Matt and Vanessa discussed permitting in preparation for the SWEEP meeting, and USACE recommended an informal Section 404/NEPA Merger process be followed. Vanessa provided the draft purpose and need and other background materials to Matt, and he indicated that he thought the documentation would be sufficient for the informal Merger process and would be able to be used by USACE in its permitting. Becky said since this is an EA, it is the choice of CDOT and the USACE to determine whether to follow the Merger process, and CDOT agrees that an informal process makes sense.

Other impacts of the Project meet Nationwide permit conditions, but Matt clarified that if any of the single crossings for a linear project result in a need for an Individual Permit, USACE expects all impacts would be permitted under that Individual Permit.

Becky mentioned that the Colorado Stream Quantification Tool (CSQT) may be applicable since impacts are primarily to open waters. Billy and Matt both said that the CQST may be helpful in determining the amount of mitigation required. Depending on the scores for the CSQT, it is unlikely that the linear feet of impact would result in a 1:1 mitigation requirement because it is unlikely that all would be considered "functional feet" units in the assessment.

Both USACE and EPA expressed interest and availability to be involved in the early Project planning to advise on permitting.

Scott Gancarz noted that if an Individual Permit is required, a Section 401 water quality certification will also be needed, and CDOT will need to work with the Water Quality Control Division to obtain that. Becky said this was an oversight not to mention; CDOT does very few Individual Permits, usually 1 to 2 per year, and thanked him for the reminder.

6. Relocation of Clear Creek

Mandy provided an overview of the relocation area, and Antony Pisano described the design reasons for the relocation. The team looked at a number of options but due to the design speeds of the existing curves, stopping sight distance around the curves, location of the Veterans Memorial Tunnels, and the canyon constraints and large required rock cuts, there are no feasible avoidance alternatives that can meet purpose and need and highway design and safety criteria.

Mandy showed a simulation of the creek relocation, which mostly affects the north bank of the creek, which is a steep riprap embankment. Downstream, there are several areas with wider existing riparian areas that present opportunities for enhancements. Paul Winkle provided an overview of his work monitoring trout populations in the Project area over the past 5 years. He said that this stretch of Clear Creek supports a wild brown trout population and that CPW stocks rainbow trout in the area, but they have not taken hold, which is common in areas where brown trout are dominant. The number of fish has continued to increase as the habitat has improved, which has been a result of habitat enhancement and improvements in water quality. Although the numbers are up, the trout are not large

compared to those downstream of reservoirs; large trout in Clear Creek might be 12 to 14 inches. In 2014, Paul conducted a redd survey, and identified almost 50 redds in the stretch of Clear Creek between US 6 and Veterans Memorial Tunnels; he plans to do another survey in the fall, which could also inform enhancement opportunities.

Additionally, areas where the I-70 footprint is smaller present opportunities to lay back slopes and open up the floodplain. Kevin Shanks stated that the Canyon Viaduct Alternative presented the most opportunities for creek enhancements because there was less highway infrastructure next to the creek. Holly asked for clarification about the potential differences in terms of percentage. Kevin said he had not calculated percentages, but estimated it was substantial – maybe 50 percent more. Billy noted that the CSQT could help quantify and compare options. Mandy showed the area in Google Earth, and Kevin reviewed specific locations of potential for enhancements, particularly at the bends. Kevin described the Twin Tunnels mitigation and working with CPW. Unlike the Project relocation area, one of the issues with the Twin Tunnels section was that it was too wide to provide pool-riffle-run sequences. Paul explained that the pools are particularly important for winter habitat. Holly asked how deep the pools were and if they had filled in. The deepest pools in that section are six feet deep or so, and they have not filled in with material. The spring runoff seems to flush them out. Kevin explained that the CPW biologist had carefully considered rock placement and direction to flow to ensure that they flushed naturally. Paul noted that the willow plantings had not survived but otherwise, the design was holding up well.

Kevin described several of the mitigation details from the Twin Tunnels project that were being reviewed for application on downstream Floyd Hill improvements.

Matt and Billy both stated that enhancements to riparian and aquatic habitat would be appropriate for Section 404 compensatory mitigation. The Project will need to show a functional lift for the stream, not necessarily a 1:1 linear foot of improvements. For instance, for the 1,200 feet of affected creek, perhaps the functional units may be 700 feet, which would establish the mitigation target. Billy asked to be included in 404 mitigation discussions.

Question: Gary asked about shading and if there were opportunities to develop riparian habitat that would have less sun exposure.

Answer: Right now, the north side of bank doesn't have much vegetation; if a bench could be added where willows, cottonwoods, and other plants could establish, this would create shading. Kevin said that although the Twin Tunnels project willow plantings failed, maybe there were lessons in including more diverse plantings and selecting willows that are better suited to higher elevations. The willows at the Black Hawk Sanitation District may be better, and Jim can help coordinate. Becky said the willows came from the mitigation site, which is just 300 feet higher in elevation, so she did not think this was an issue.

Question: If improved, would this stretch qualify for a re-stocking program?

Answer: CPW currently stocks rainbow trout in the Project area. While it is difficult for other species to compete with a strong brown trout population, creek enhancements might help the stocked rainbows establish.

7. Wrap-Up and Action Items

Mandy asked the group if there were any additional comments or thoughts. Gary and Holly said that they liked what was presented and thought things were on the right track. No one voiced any concerns.

Mandy summarized the next steps. Next week, there will be a site visit led by CPW to look at some of the mitigation opportunities. The mitigation plan will be developed further, and the team will continue to coordinate with the USACE and EPA on Section 4040 permitting and with CPW for SB 40 certification. It is anticipated that the planned enhancements can serve multiple mitigation commitments as well as the intention of the SWEEP MOU to improve aquatic and water quality conditions when possible. By mid-summer, the team should have a good handle on impacts and mitigation, which will be discussed with the Technical Team before completing the EA.

Action Items

- Hold an offline meeting to discuss SELDM (Josh, Vanessa, Holly, Jordan, and others)
- Conduct initial site visit to review mitigation opportunities (Paul, Kevin, and others)
- Conduct redd survey in fall 2020 (Paul)
- Prepare CSQT to inform mitigation requirements and effectiveness (timing and responsibility TBD)

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I-70 Floyd Hill
SWEEP Meeting #3

May 14, 2020

Agenda

- Project Updates and Status
- Overview of Project Alternatives
- Existing Conditions and SWEEP Issues
- Water Quality
- Wetlands and Waters of the US
- Clear Creek Relocation
- Next Steps and Action Items

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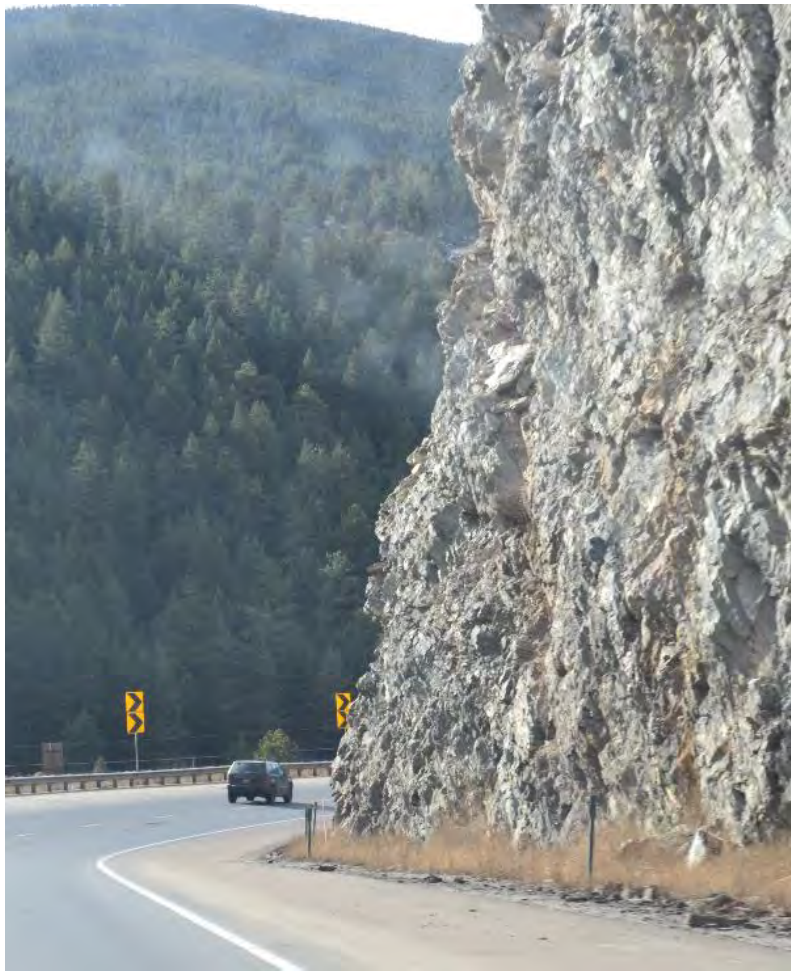
Project Updates

Project Updates

- Environmental Assessment initiated in summer 2017
- Developed Tunnel Alternative in 2018 as proposed action for ballot initiates 109/110
  - SWEEP meetings in April and October 2018
- Reassessed and regrouped in 2019
  - Completed existing conditions surveys and reports
  - Developed Canyon Viaduct Alternative as additional alternative
  - Confirmed project priority in 10-year plan through statewide planning effort with new CDOT administration
  - Continued to pursue funding; HPTE initiated financial study
- EA funded and resumed in late 2019/early 2020
  - Public Meeting #2 – February 2020
  - Environmental Assessment – Fall 2020
  - Public Hearing – Late Fall 2020/early Winter 2021
  - Decision document – Spring 2021 (if construction funding is identified)

Alternatives Overview: Major Project Elements

- Add third westbound I-70 travel lane from top of Floyd Hill through the Veterans Memorial Tunnels
- New frontage road connection between US 6 and Hidden Valley interchanges
- Improve traffic operations at interchanges and intersections within the project limits
- Enhance safety by flattening curves to improve design speeds and stopping sight distance
- Improve the Clear Creek Greenway
- Reduce animal-vehicle conflicts and improve wildlife connectivity



Environmental Assessment Alternatives

- No Action Alternative
  - Replace westbound I-70 bridge in its current location, and continue regular highway maintenance
- Tunnel Alternative
  - Major elements
  - New tunnel for westbound I-70 near US 6 interchange
  - Realign eastbound I-70 on the current highway footprint
  - Construct a frontage road between US 6 and Hidden Valley, either north or south of Clear Creek
- Canyon Viaduct Alternative
  - Major elements of the Proposed Action
  - Realign both eastbound and westbound I-70 between US 6 and Hidden Valley on a viaduct
  - Construct the frontage road on the current I-70 alignment

East Section: Floyd Hill to US 6

Central Section: US 6 to Hidden Valley
TUNNEL ALTERNATIVE

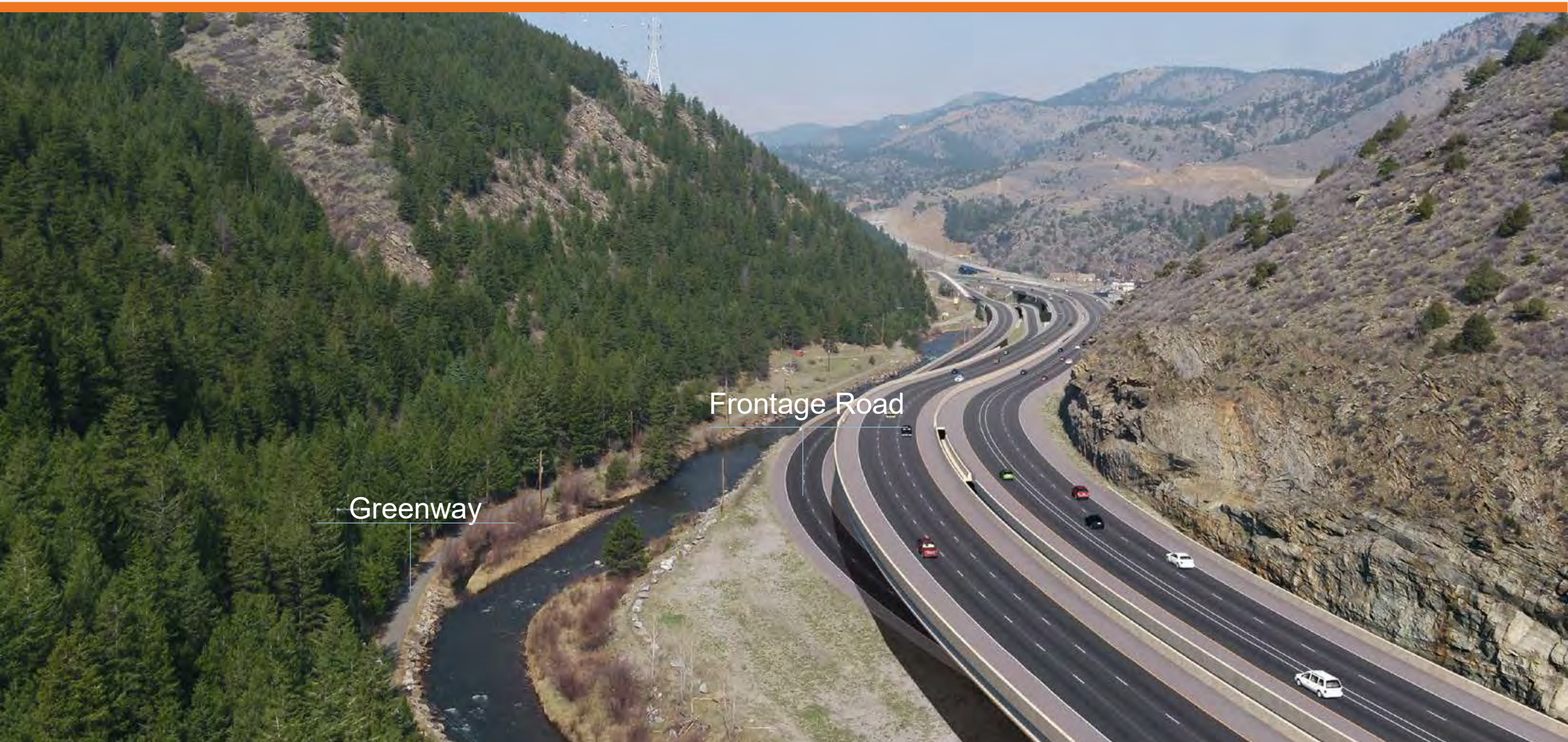
Central Section: US 6 to Hidden Valley
TUNNEL ALTERNATIVE, North Frontage Road

Central Section: US 6 to Hidden Valley
TUNNEL ALTERNATIVE, South Frontage Road

Central Section: US 6 to Hidden Valley
CANYON VIADUCT ALTERNATIVE

Central Section: US 6 to Hidden Valley
CANYON VIADUCT ALTERNATIVE

Central Section: US 6 to Hidden Valley
CANYON VIADUCT ALTERNATIVE



West Section: Hidden Valley to Veterans Memorial Tunnels

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Water Quality and Aquatic Conditions

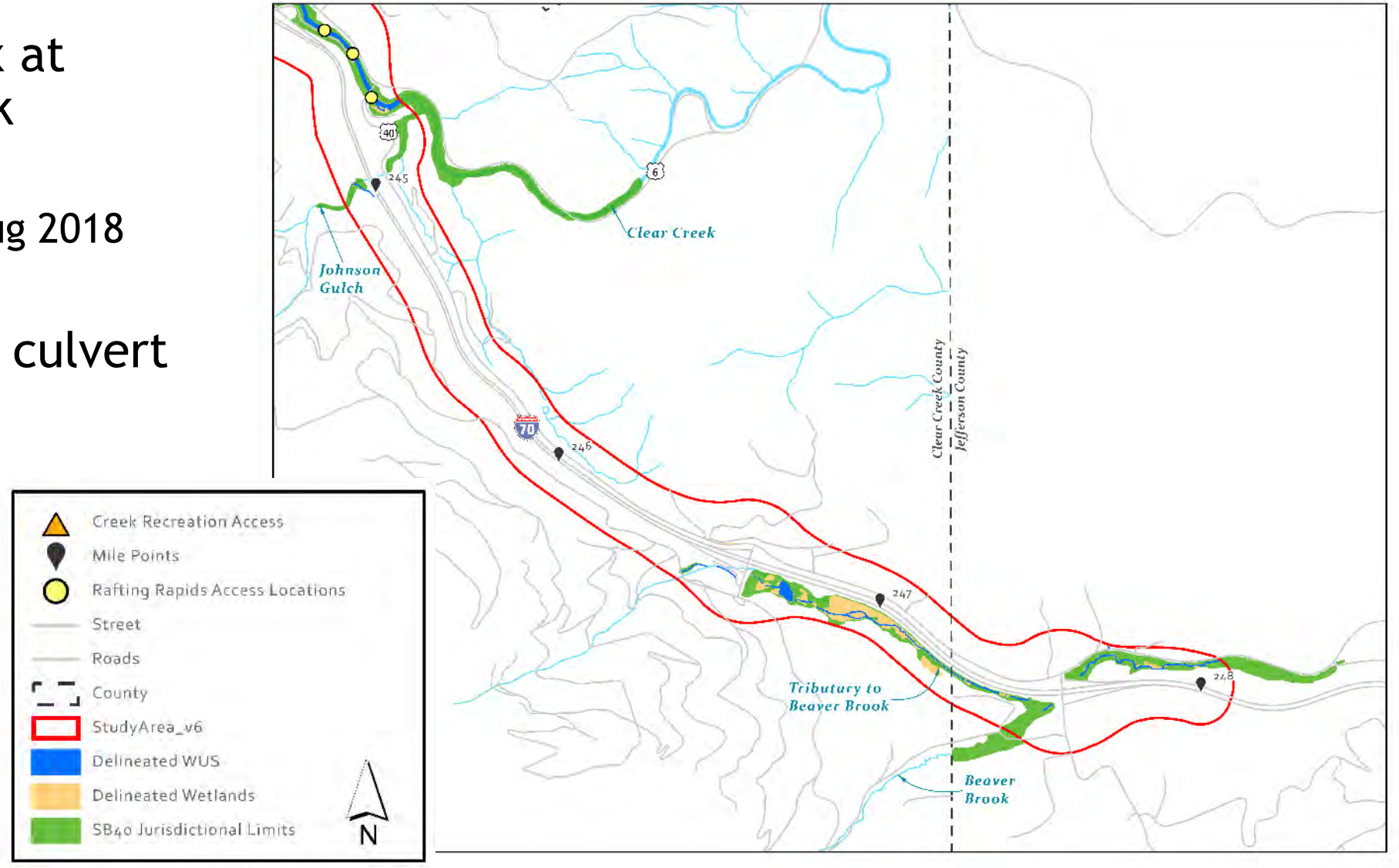
Water Quality and Aquatic Conditions

- Clear Creek water quality
  - Impaired for metals from mining and naturally occurring metals in soils/mineralized rock
  - Black Hawk drinking water intake
  - Decreasing use of traction sand and increased use of deicers
  - SCAP BMPs implemented for projects upstream; one existing WQ pond in Project area (near Black Hawk water intake)
- Clear Creek condition
  - Areas of significant channelization throughout
  - Wider floodplain areas support riparian habitat/wetlands
  - Regulated floodplain
- Clear Creek fishery
  - Clear Creek is a high value fishery
  - Brown trout spawning upstream; increasing density
  - Aquatic connectivity is not an issue

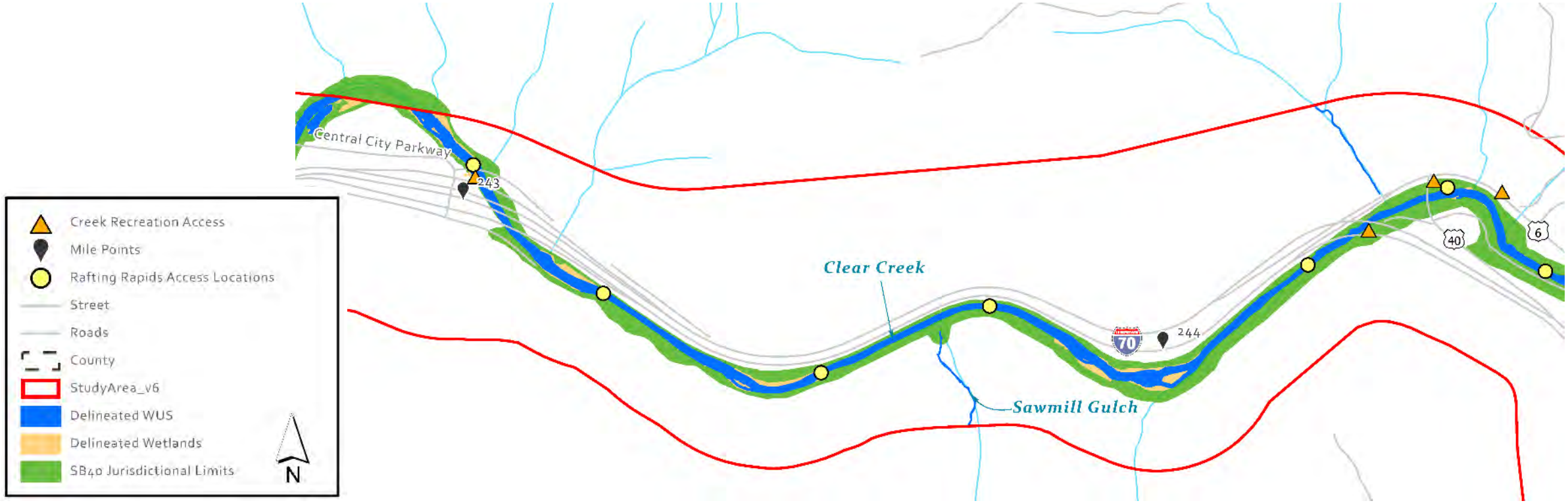
- Other streams and gulches
  - Johnson Gulch, Sawmill Gulch, Beaver Brook also impaired for metals
  - Sawmill Gulch lacks riparian vegetation for SB 40
  - Beaver Brook
    - Brook trout spawning 1-mile upstream of Project
    - Regulated Floodplain

Existing Conditions: East Section

- Wetland complex at Beaver Brook (elk meadows)
  - Fen testing in Aug 2018 (negative)
- Johnson Gulch in culvert under I-70



Existing Conditions: Central Section



- Numerous recreational points, including rafting rapids and fishing accesses
- Greatest potential for creek enhancement in the Project area
- Areas near Black Hawk intake and Sawmill Gulch are wider and support wetlands

Existing Conditions: West Section

- Previous Creek Restoration project upstream (Twin Tunnels)
- Highly constrained and channelized
- Area of Clear Creek realignment

SWEEP Commitments and Considerations

SWEEP MOU and Implementation Matrix considerations in project development

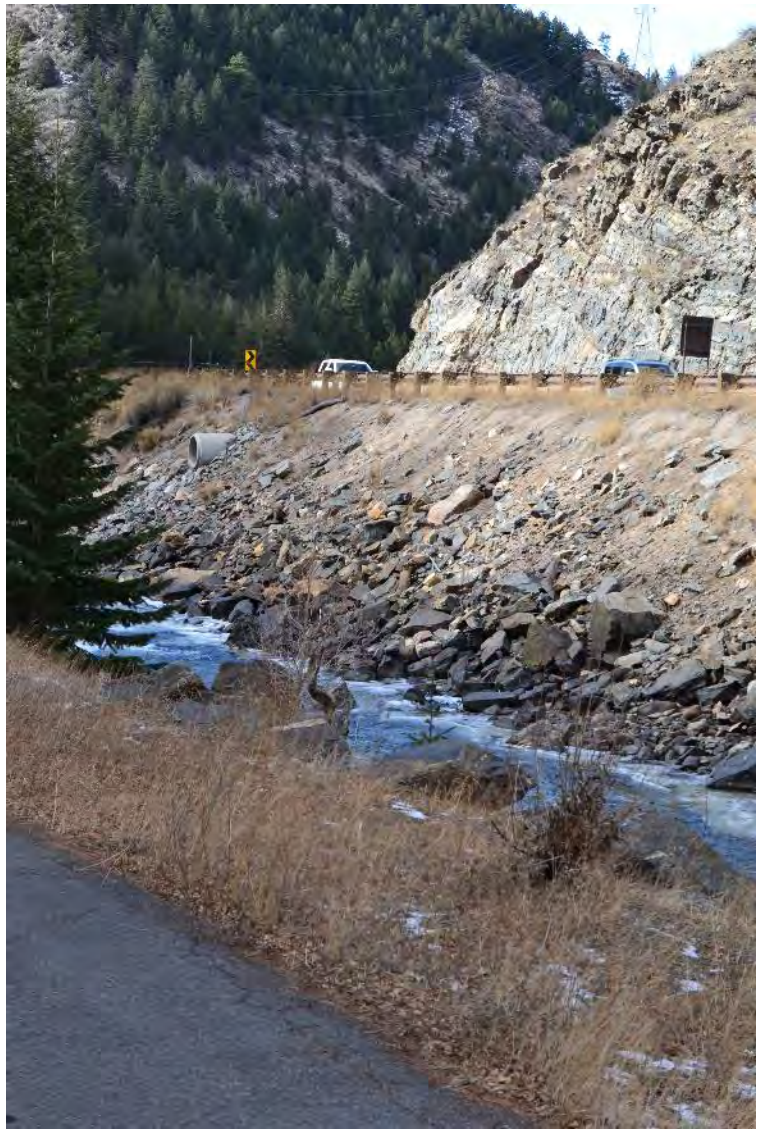
- Sediment management
- Section 303(d) impaired waters
- Mining wastes and mineralized rock
- Wetlands protection
- Special status species
- Aquatic species as recreational resource
- Information and research needs

PEIS Commitments for Tier 2 Projects

- Delineate wetlands using the latest approved USACE methodology
- Identify and analyze impacts to fens if applicable
- Functional Assessment of wetlands using FACWet
- Determine jurisdictional and non-jurisdictional wetlands
- More detailed analysis of direct and indirect impacts on aquatic resources
- Develop specific and detailed mitigation strategies and measures
- Develop specific best management practices

Issues Raised at Previous SWEEP Meetings

- Water quality
  - Chlorides and effects on water quality and vegetation
  - Increased sedimentation / contaminants from frontage road maintenance, rock cut areas, snow plowing over the creek
  - Potential for truck overturning and hazmat spills
- Coordination with maintenance
  - BMP design, location, and maintenance
  - Winter maintenance practices
- Wetlands
  - Complex at Beaver Brook (elk meadows)
  - Wetland functional assessment
- Realigning Clear Creek
  - Creek geology
  - Sediment and turbidity



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Water Quality

I-70 Floyd Hill to Veterans Memorial Tunnel

SELDM Model Factsheet

The Stochastic Empirical Loading and Dilution Model (SELDM) is a stochastic model that uses Monte Carlo methods to determine the effect of runoff on receiving waters. It is primarily used as a screening mechanism for projects' environmental impacts.

Four Scenarios:

- Existing Conditions
- Proposed Conditions, using no BMPs
- **Proposed Conditions, using extended detention basins (EDB)**
- **Proposed Conditions, using vegetated swales.**

Highway site inputs

- Drainage area = Combined area of I-70, US 6, Central City Parkway, and CR314.
- Drainage length = Veteran's Memorial Tunnel to the top of Floyd Hill
- Basin Development Factor = Proposed improvements cause an increase in peak runoff potential on a scale of 0 to 12.

Scenario	Drainage Area (ac)	Drainage Length (ft)	Basin Development Factor
Existing	105.18	28875.74	2
Proposed	124.77	28875.74	5

Preliminary Results:

Constituent	Existing vs Proposed No BMP (%)	Existing vs Proposed with Ponds (%)	Existing vs Proposed with Swales (%)
TSS	+18.62	-68.91	-66.67
Chloride	+18.65	+0.95	-20.19
Cadmium*	+18.64	-47.86	-80.90
Copper*	+18.65	-61.61	-68.9
Lead	+18.65	-9.44	-25.97
Zinc*	+18.64	-36.83	-37.73

*Used regional pollutant loading data

Loading Concentration Data:

- CDOT report Interstate 70 Mountain Corridor Storm Event/Snowmelt Water Quality Monitoring.

Data on the efficiency of applicable BMPs:

- USGS Statistical Study for SELDM Inputs

Data on the efficiency of BMPs on chlorides.

- Transportation Research Board *Synthesis 449: Strategies to Mitigate the Impacts of Chloride.*

Water Quality Approach:

- **Application of SCAP recommendations is no longer applicable**
- **No MS4 Permit.**
- **Focus on addressing specific pollutants of concern.**

Water Quality: SELDM

- Modeling Goals
- Inputs
- Results inform design
  - Define WQ Approach
  - SCAP
  - No MS4

Water Quality: BMP Selection

Pollutant Focused, Tiered Approach to Water Quality

- Formal WQ BMPs proposed to mitigate the majority of the Roadway Runoff
  - Extended Detention Basins: Highly effective for sediment and metal removal
  - Constructed Wetlands: Highly effective for treatment of de-icing agents as it dilutes Chlorides and maximizes uptake

Extended Detention Basin – Sediment and Metals

Constructed Wetlands – Deicing Agents / Chlorides via Dilution and Uptake)

Water Quality : BMP Selection

Pollutant Focused, Tiered Approach to Water Quality

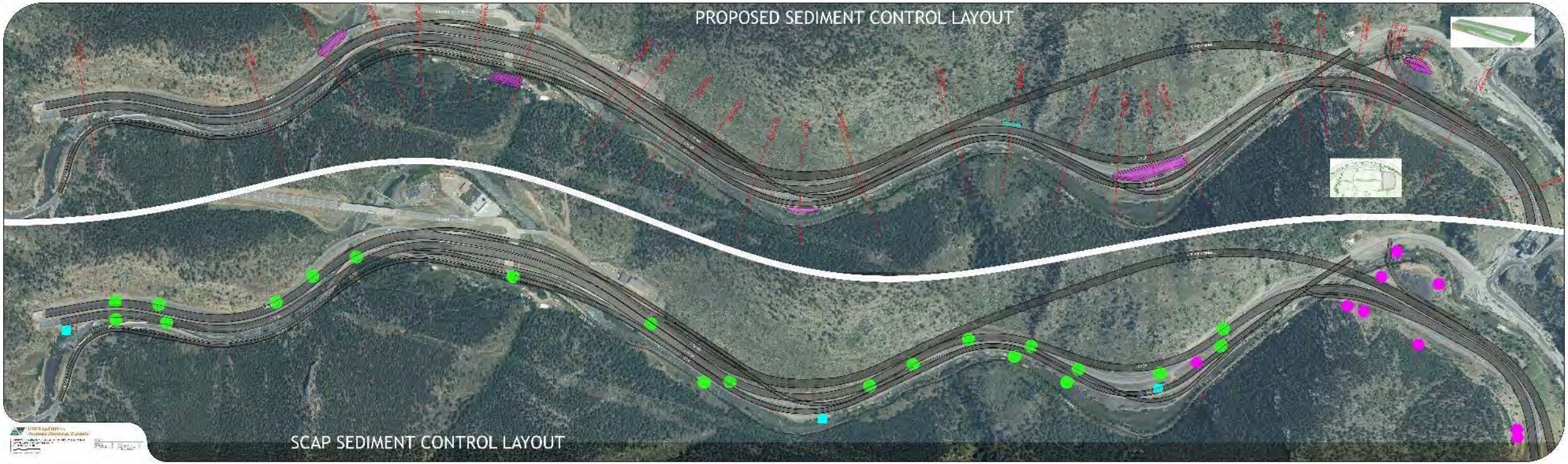
- Informal WQ BMPs proposed to mitigate roadway runoff with site constraints
  - Vegetated ditches
  - Stilling Basins
  - Engineered ditches with check dams
- Effective removal for sediment and metals and diluting chlorides

Vegetated Ditch w/ Stilling Basins (Bridge Sections) - Sediments and Metals

Engineered Ditch with check dams - Deicing agents

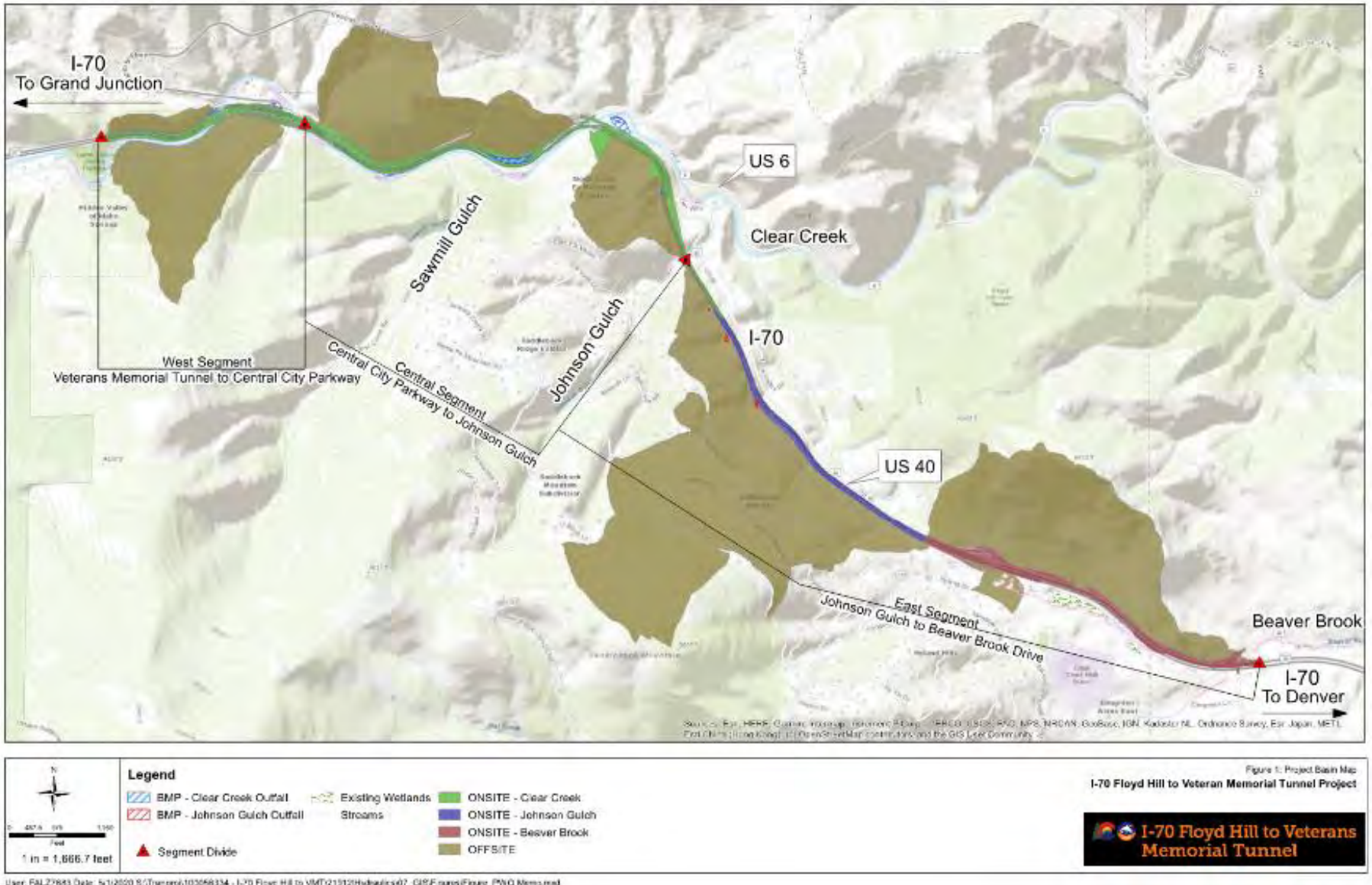
Water Quality : BMP Selection

- SWEEP Meeting No. 2 (October 25, 2018): Review of materials presented
  - CDOT transitioned to using de-icing agents in lieu of traction sand
  - SCAP-recommended BMPs focused on traction sand and present maintenance challenges
- Proposed BMPs have been updated to reflect changes in Design Options



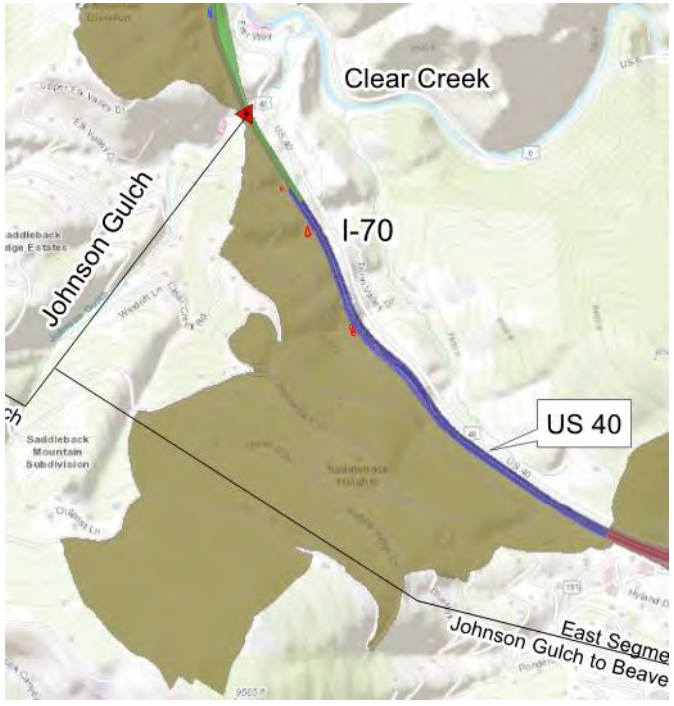
Water Quality : BMP Selection

- Project Section
  - East
  - Central
  - West
- WQ Watersheds
  - Floyd Hill
  - Clear Creek
    - Tunnel
    - Canyon



Water Quality: East Section (Floyd Hill)

- Chlorides and Sediment
- Vegetated shoulders/slopes provide natural treatment over flowpaths
- Engineered Ditches provide dilution and uptake
- Constructed Wetlands provide dilution and uptake



Vegetated Shoulders/slopes

Constructed Wetlands and Engineered Ditches

Water Quality: East Section (Floyd Hill)

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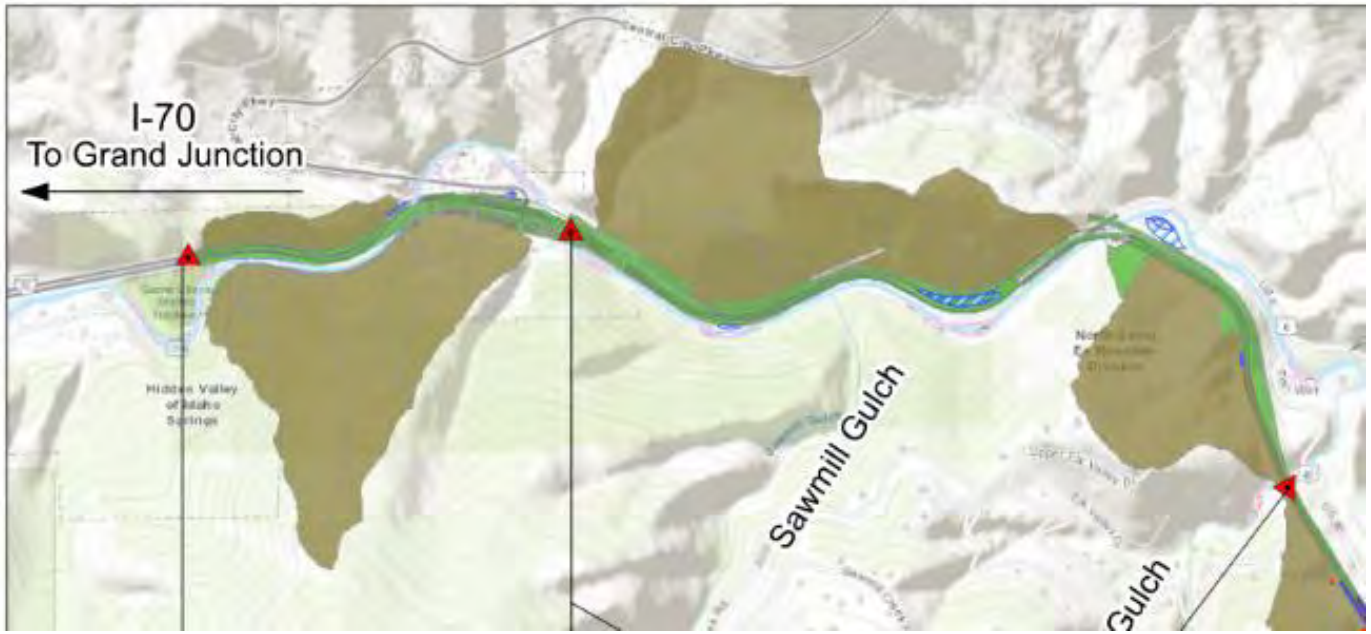
Water Quality: Central and West Sections (Clear Creek)

- Sediment, Metals, Chlorides
- Extended Detention Basins captures sediments and treats metals
- Sediment Basins captures sediment
- Vegetated ditches provide natural treatment over flowpaths
- Engineered Ditches provide dilution and uptake



Extended Detention Basins

Sediment Basins

Water Quality: BMP Locations, Clear Creek: Tunnel Alternative

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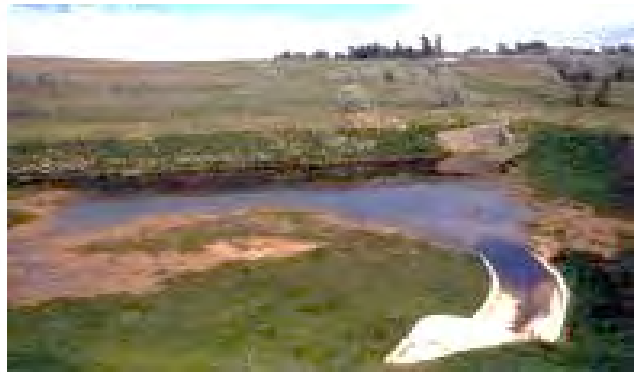
Water Quality: BMP Locations, Clear Creek: Canyon Alternative



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Wetlands and Waters of the US

Wetlands and Waters of the US

Permanent Impacts

- Impacts based on project design as of May 5, 2020.
- Permanent impacts would result from the widening and realignment of I-70 and Frontage Road, replacement of existing bridges, installation of bridge piers, and bank stabilization associated with roadway reconfiguration.

Alternative	Permanent Impact (Acres)	Permanent Impacts (Square Feet)	Linear Feet of Impact	Assumed Jurisdictional Status[1]
Tunnel Alternative (North Frontage Road Option)	0.908	39,565	1,575	Jurisdictional
Tunnel Alternative (South Frontage Road Option)	0.912	39,746	1,652	Jurisdictional
Canyon Viaduct Alternative	0.929	40,458	1,835	Jurisdictional

[1]Jurisdictional status assumed based on conditions in the field and review of maps and aerial imagery. Only the U.S. Army Corps of Engineers (USACE) has the authority to determine what is jurisdictional.

Wetlands

Alternative	Permanent Impact (Acres)	Permanent Impacts (Square Feet)	Classification[1]	Assumed Jurisdictional Status[2]
Tunnel Alternative (North Frontage Road Option)	0.001	44	PEM and PSS	NA
Tunnel Alternative (South Frontage Road Option)	0.001	40	PEM	NA
Canyon Viaduct Alternative	0.001	44	PEM and PSS	NA

[1]Cowardin et al., 1979

[2]Jurisdictional status assumed based on conditions in the field and review of maps and aerial imagery. Only USACE has the authority to determine what is jurisdictional.

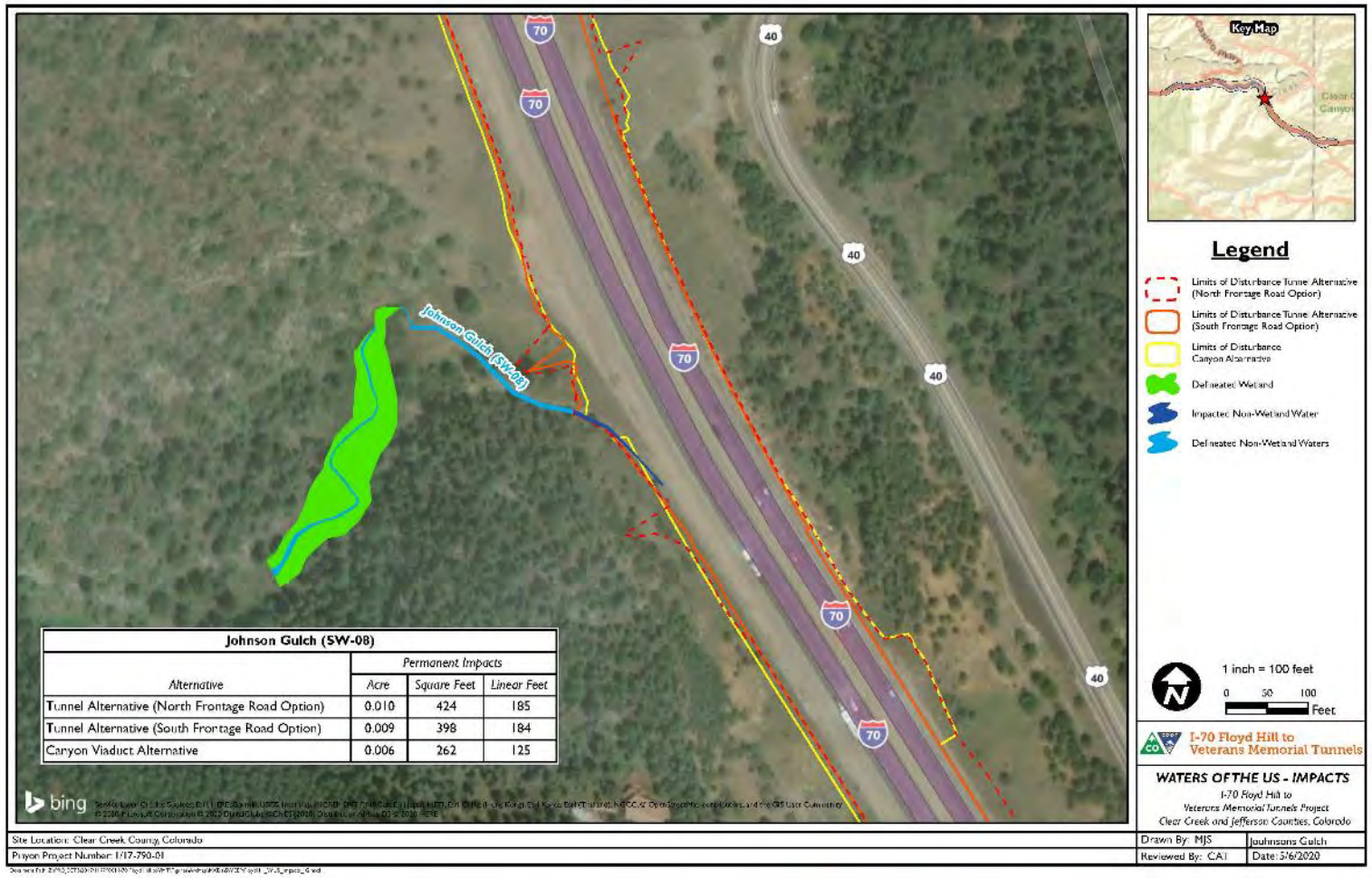
Notes:

PEM = palustrine emergent
PSS = palustrine scrub-shrub

Wetlands and Waters of the US

Johnson Gulch (SW-08)

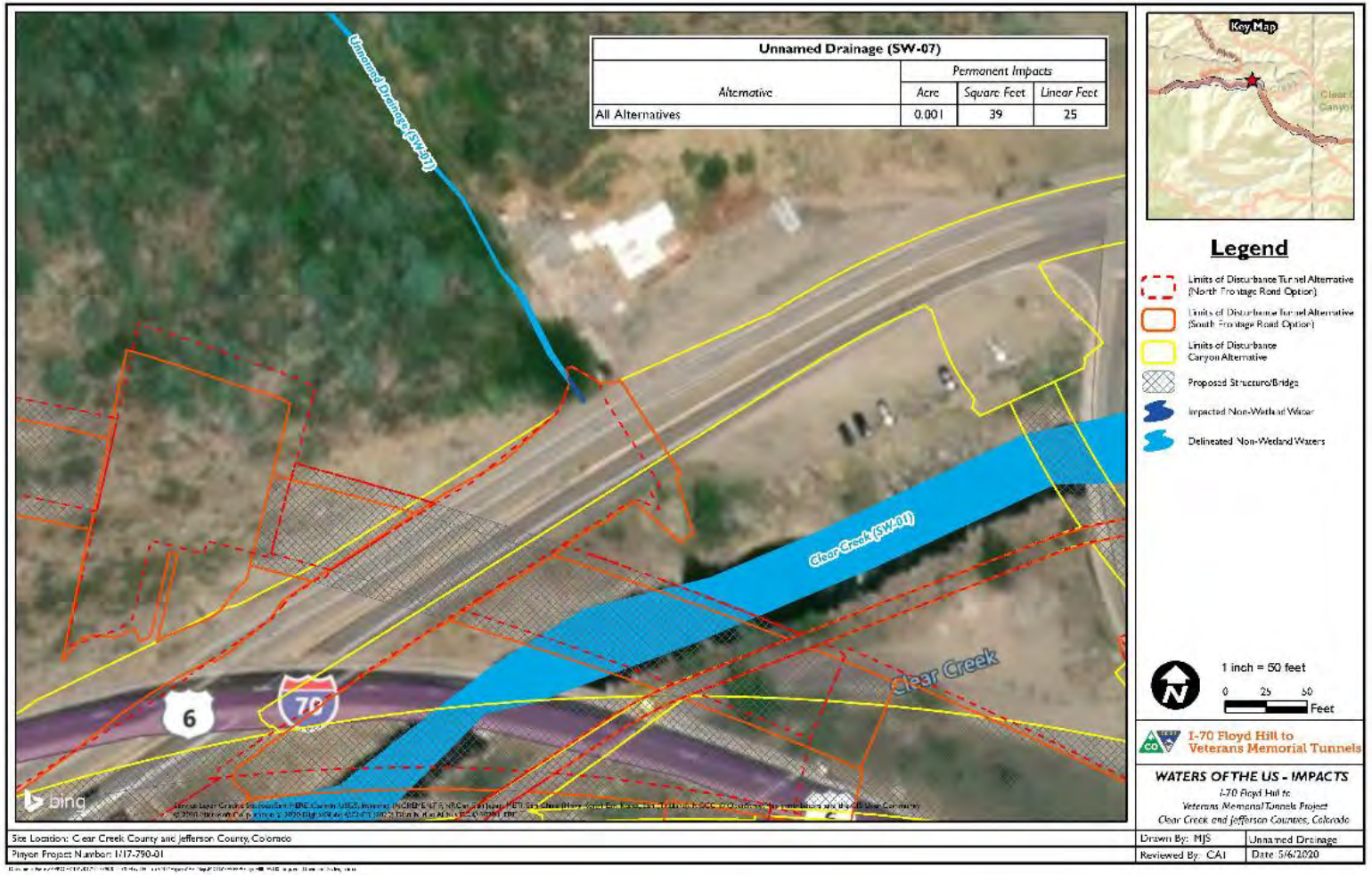
- Impacts vary slightly between action alternatives
- Impacts from:
  - Road widening
  - Grading for toe-of-slope
  - Road stabilization



Wetlands and Waters of the US

Unnamed Drainage (SW-07)

- Impacts are the same for action alternatives
- Impacts from:
  - Slope stabilization for US 6

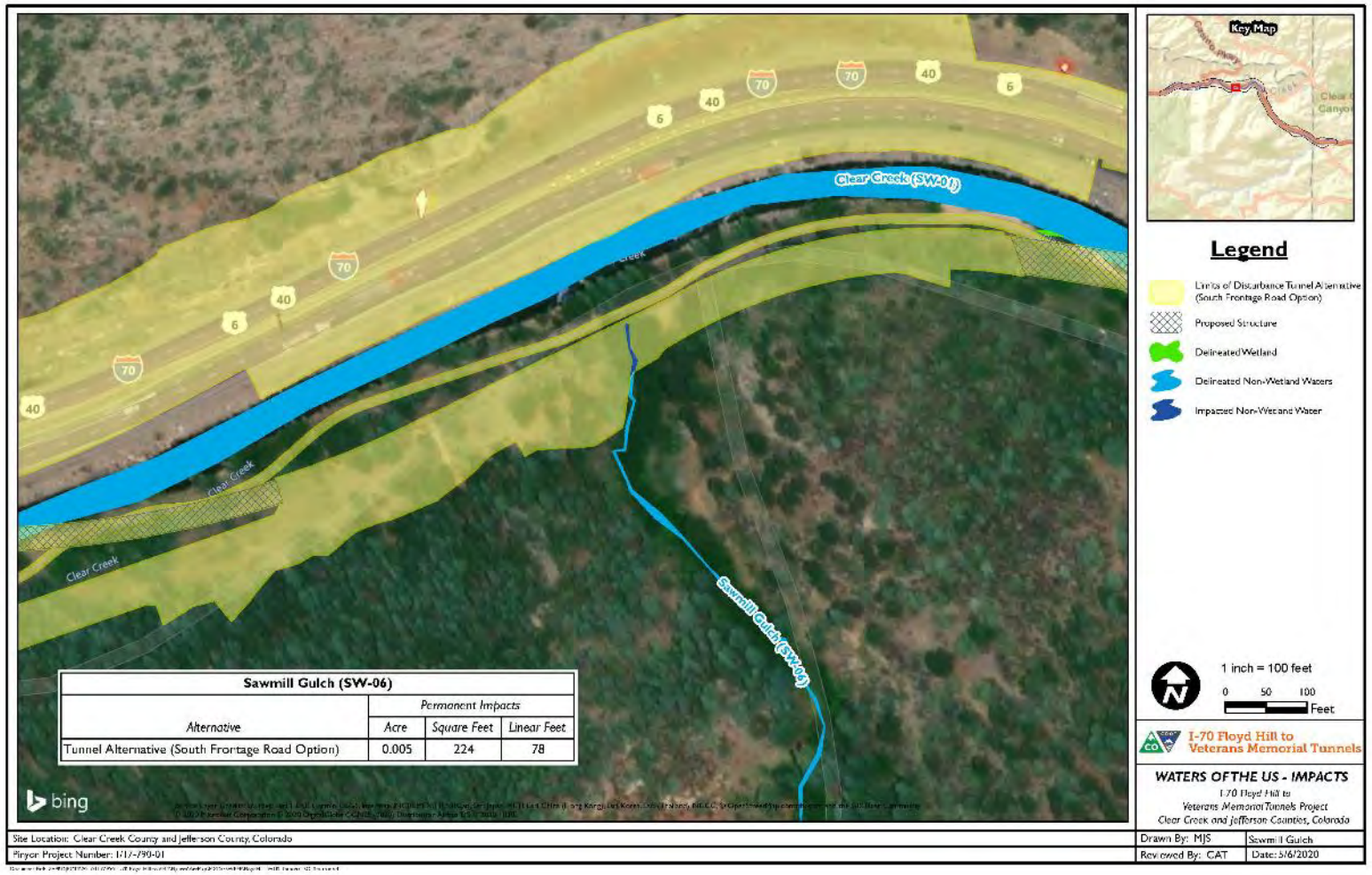


Wetlands and Waters of the US

Sawmill Gulch (SW-06)

Tunnel Alternative, South Frontage Road Option

- Impacts from:
  - Grading activities
  - New road alignment
  - Slope stabilization



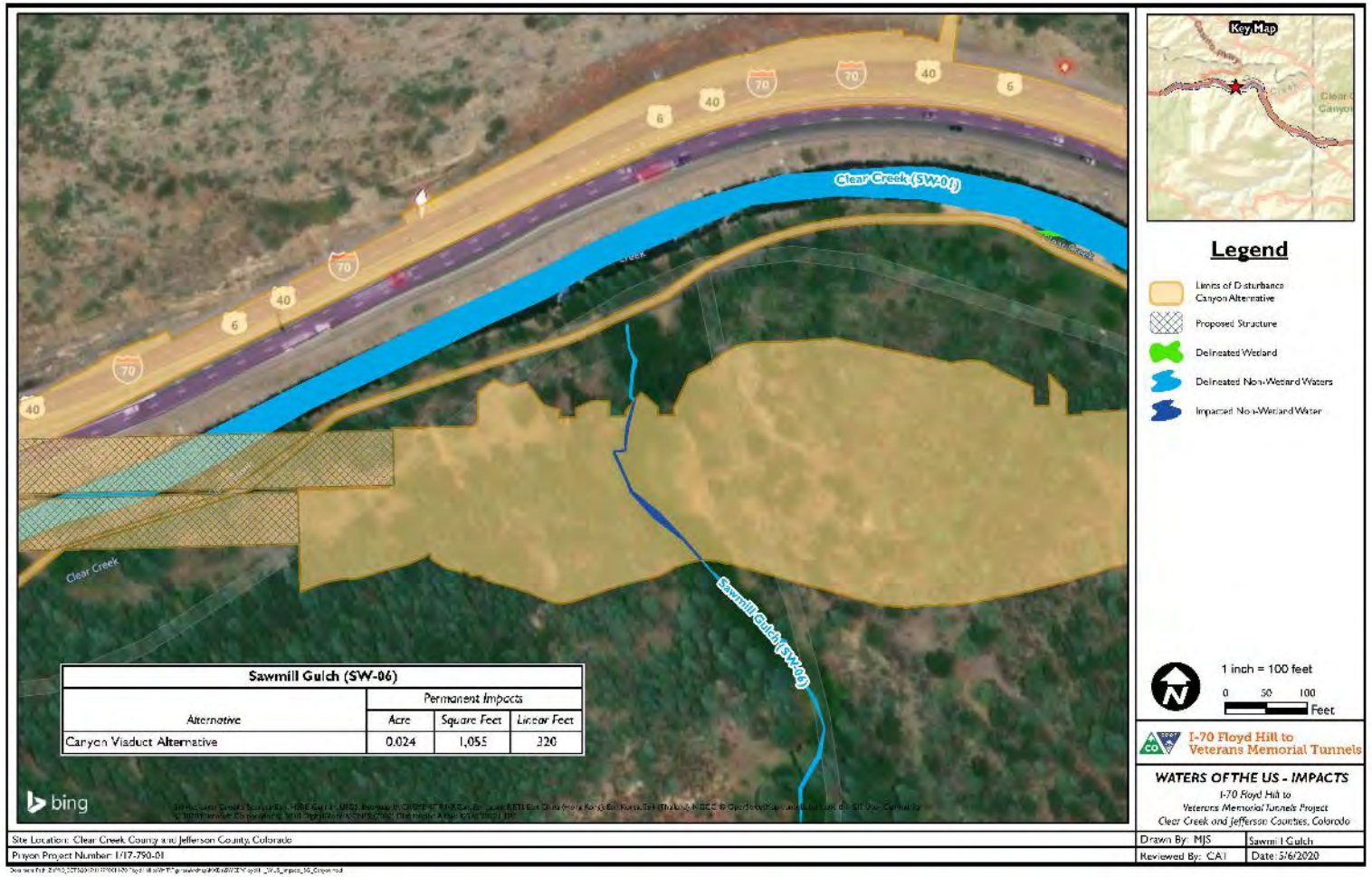
Sawmill Gulch (SW-06)			
	Permanent Impacts		
Alternative	Acre	Square Feet	Linear Feet
Tunnel Alternative (South Frontage Road Option)	0.005	224	78

Wetlands and Waters of the US

Sawmill Gulch (SW-06)

Canyon Viaduct Alternative

- Impacts from:
  - Grading activities
  - New road alignment
  - Slope stabilization

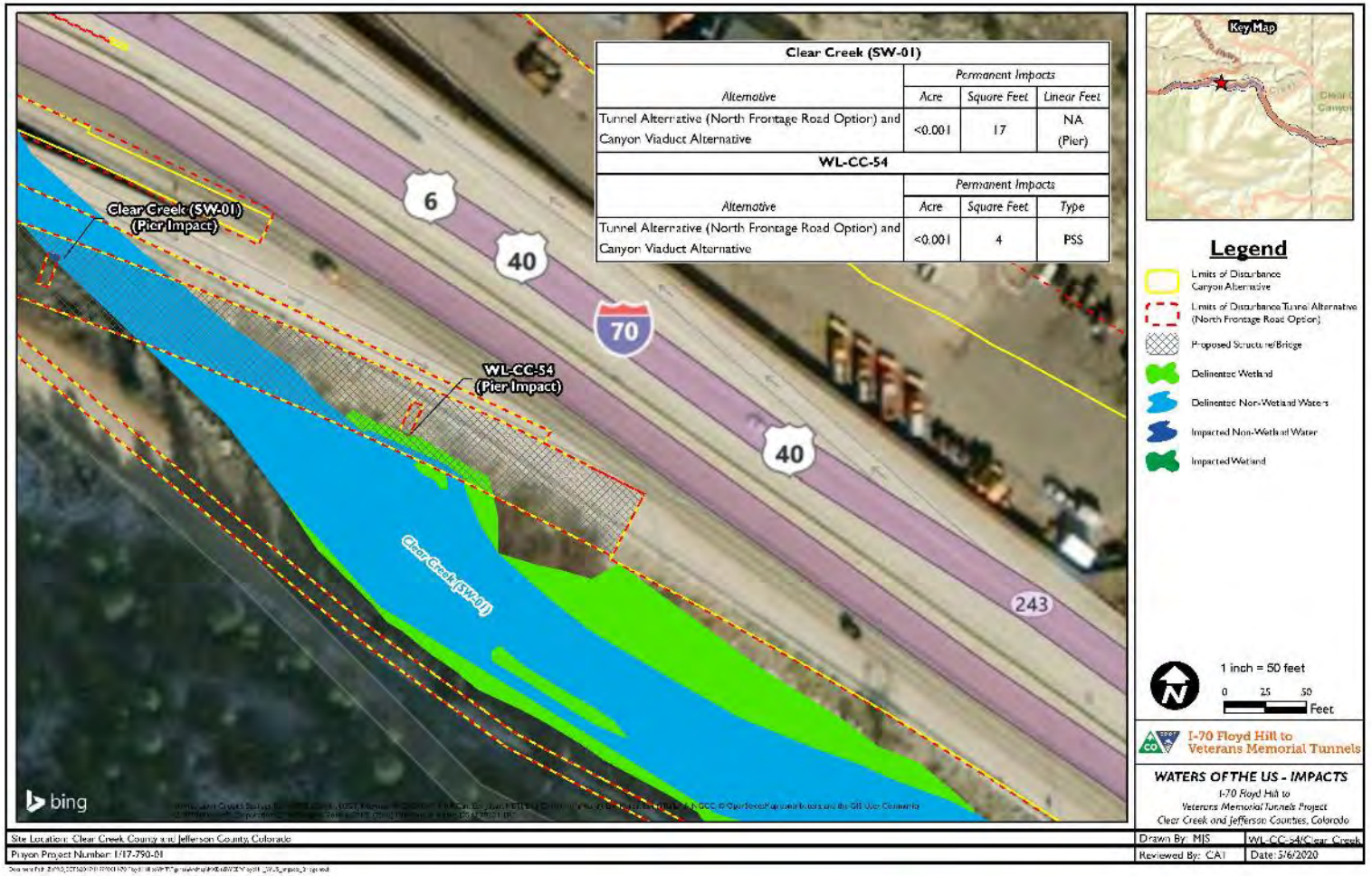


Wetlands and Waters of the US

Clear Creek (SW-01/WL-CC-54)

Tunnel Alternative, North Frontage Road Option) and Canyon Viaduct Alternative

- Impacts from
  - Installation of new Bridge Piers

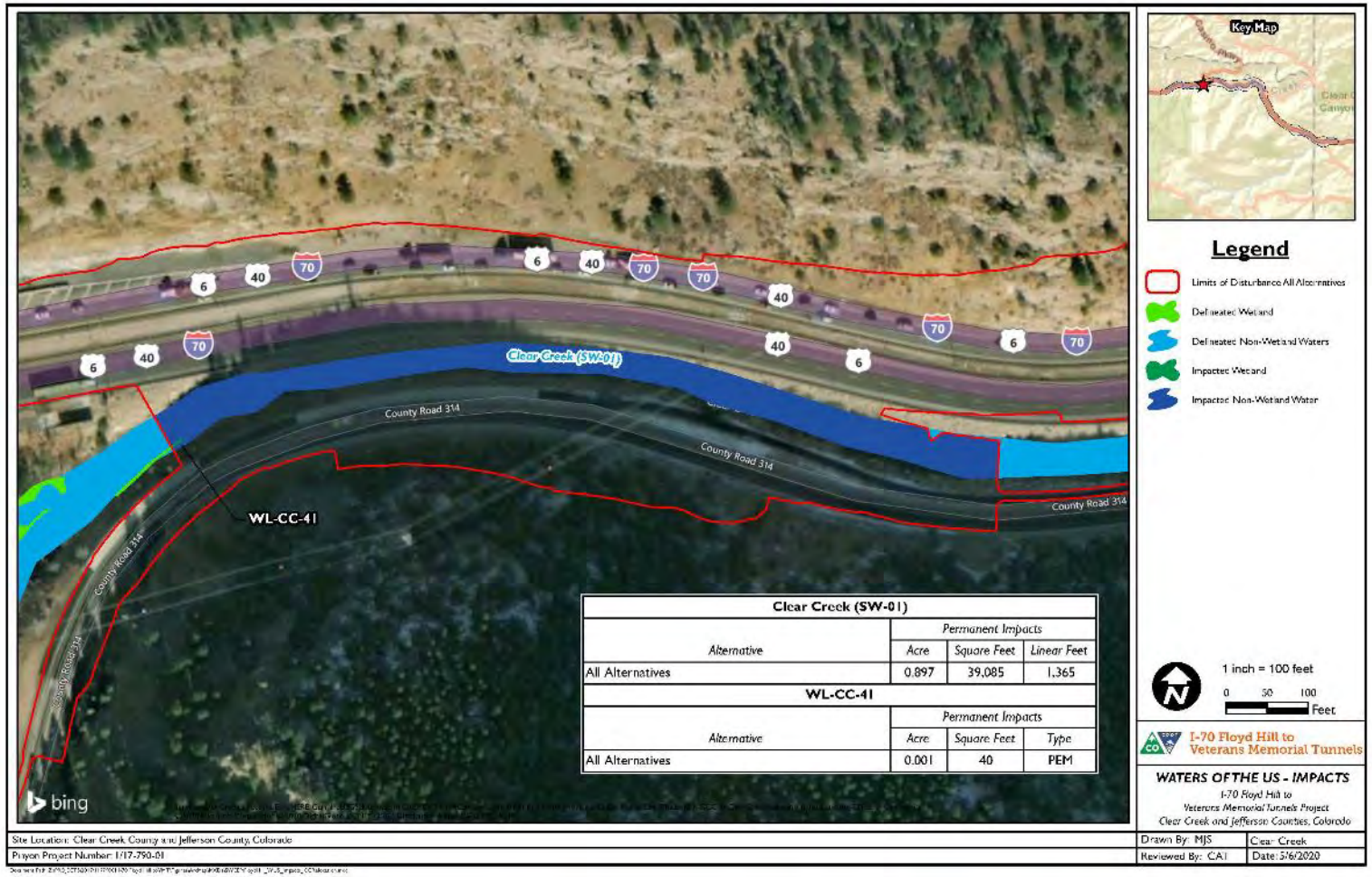


Wetlands and Waters of the US

Clear Creek (SW-01/WL-CC-41)

All Action Alternatives

- Impacts are the same for action alternatives
- Realignment of Clear Creek for new road layout (I-70 and CR 314)



Clear Creek (SW-01)			
	Permanent Impacts		
Alternative	Acre	Square Feet	Linear Feet
All Alternatives	0.897	39,085	1,365

WL-CC-41			
	Permanent Impacts		
Alternative	Acre	Square Feet	Type
All Alternatives	0.001	40	PEM

Wetlands and Waters of the US

Temporary Impacts

- Vegetation removal
- Earthmoving
- Bridge demolition
- Grading activities
- Surface runoff during construction

Wetlands and Waters of the US

Indirect Impacts

- Shading over Clear Creek
- Noxious weeds
- Increased impervious surfaces post construction
- Water Quality

Section 404 Permitting

- Relocation of Clear Creek does not appear to fall under any Nationwide Permit; an Individual Permit is anticipated
- Other impacts could meet Nationwide Permit conditions if permitted separately
- Permitting discussion
  - Informal NEPA/404 Merger process
  - Single vs multiple permits
  - Stream Quantification Tool

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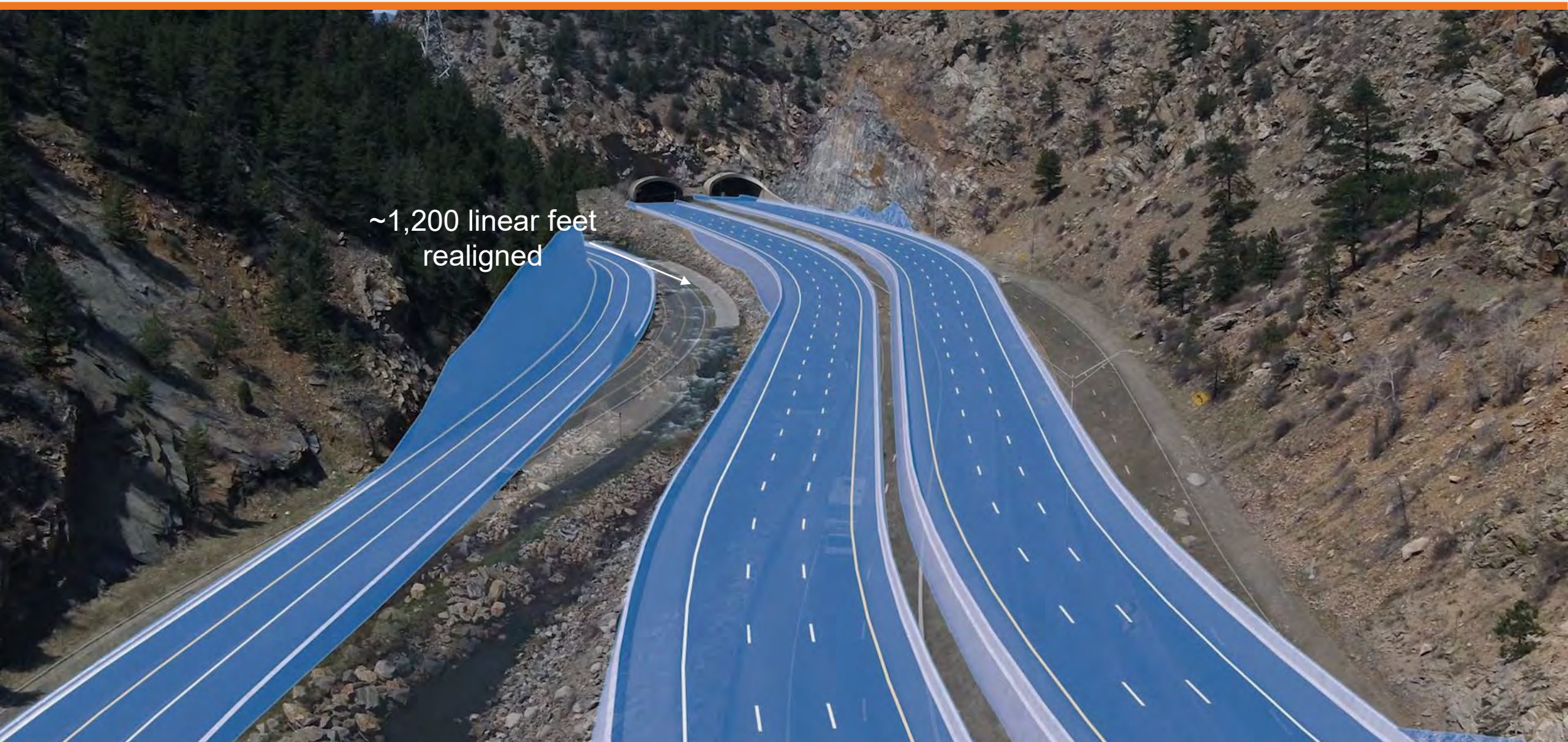
Relocation of Clear Creek

February 13, 2020

Relocation of Clear Creek



Need for Realignment

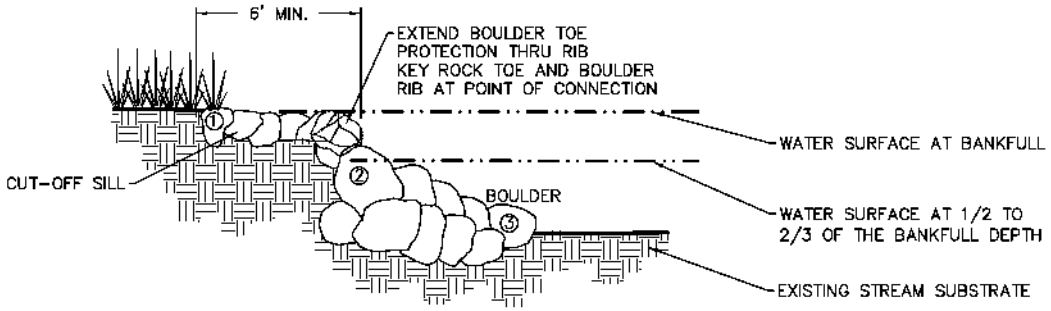
- I-70 Alignment
  - 55-mph design speed (curve radii)
  - Stopping sight distance
  - Rock cuts
  - Alignment with existing tunnels
- County Road 314/Greenway alignment
  - Minimal cross section width
  - Rock cuts to the south
- Hydraulics and floodplain

Limited Opportunities for Enhancements within Realignment Area

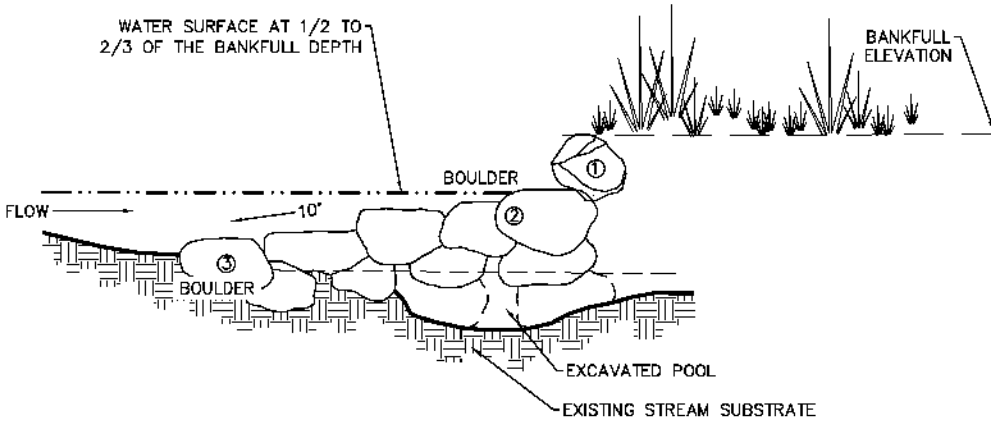
Downstream Enhancement Opportunities

- Wider existing riparian areas
- Areas where I-70 footprint is smaller and can be reclaimed (differs by alternative); open up floodplain and lay back slopes
- Other opportunities to improve (and balance) rafting and creek access

Potential Mitigation Details for Direct Relocation Area (from Twin Tunnels)

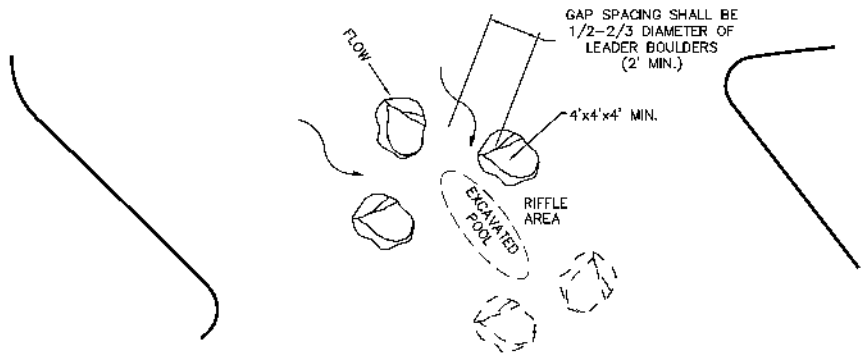


BOULDER RIB – CROSS SECTION
N.T.S.



BOULDER RIB – PROFILE VIEW
N.T.S.

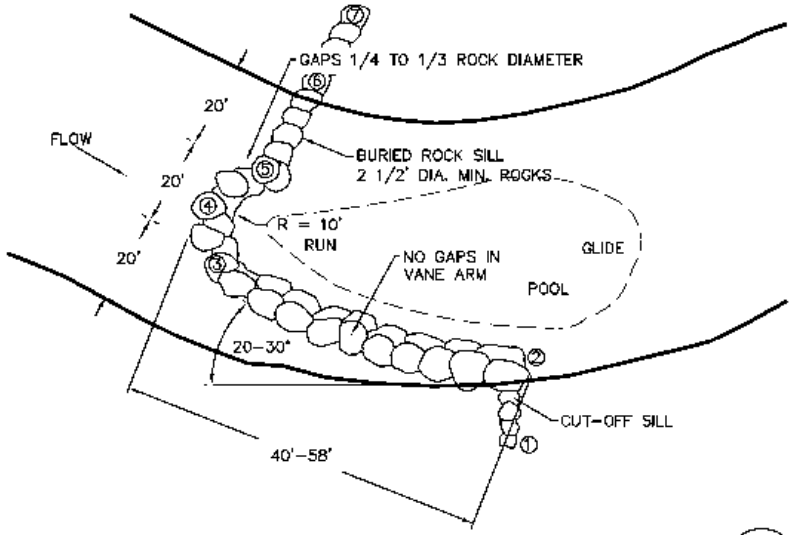
- EACH BOULDER PLACED INTO THE ACTIVE CHANNEL MOVING OUT FROM THE BANK SHOULD BE SET AT A LOWER ELEVATION USING A SLOPE OF 10%
- GAPS BETWEEN BOULDERS SHOULD BE ½ TO ⅔ OF THE BOULDER DIAMETER
- RIBS SHOULD ALTERNATE FROM ONE SIDE OF THE CHANNEL TO THE OTHER AT A SPACING OF 0.5 BANKFULL WIDTHS RESULTING IN INCREASED SINUOSITY.
- BOULDER SHALL BE KEYED INTO THE BANK
- MINIMUM BOULDER SIZE SHALL BE APPROXIMATELY 3'X3'X4'
- PLACEMENT OF ROCK WILL BE FIELD DIRECTED BASED ON INDIVIDUAL ROCK CHARACTERISTICS



1. BOULDER CLUSTERS SHALL BE PLACED ADJACENT TO THE THALWEG.

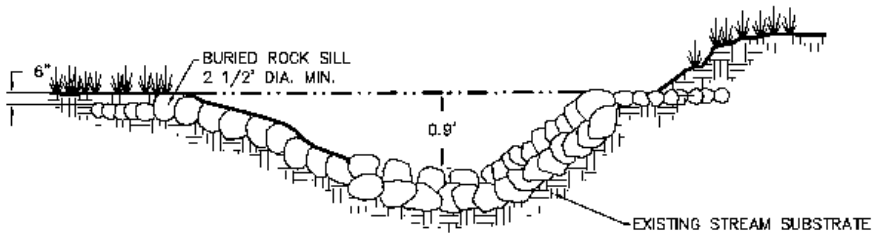
BOULDER CLUSTER – PLAN VIEW
N.T.S.

Potential Mitigation Details for Downstream Enhancements (from Twin Tunnels)

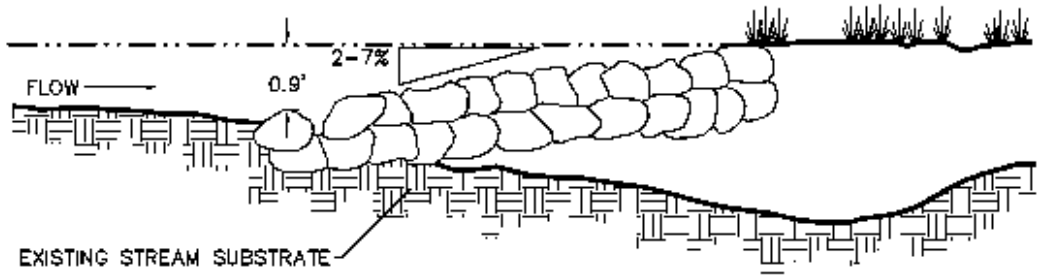


ROCK J-HOOK VANE – PLAN VIEW
N.T.S.

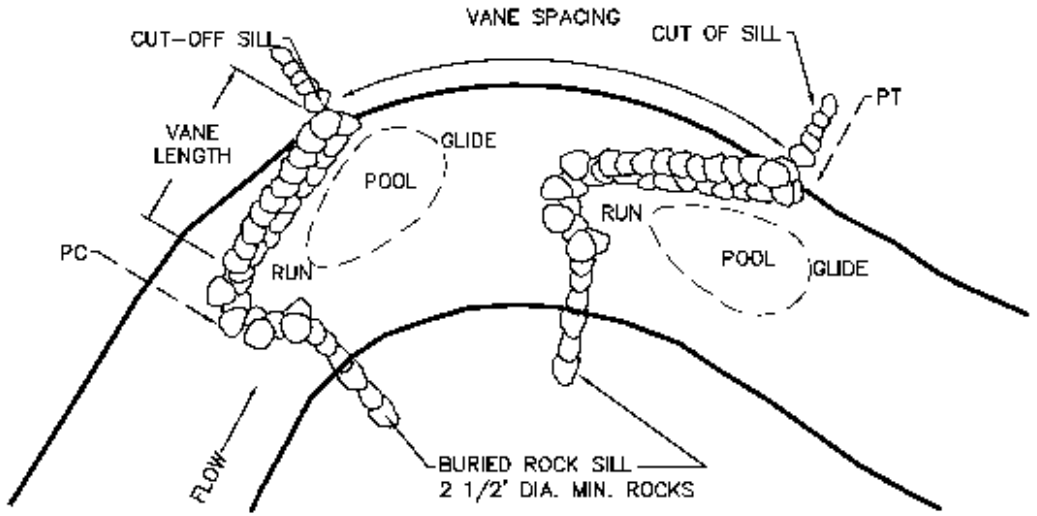
NOTES:
1. J-HOOK POINTS 3, 4 AND 5 SHALL BE PLACED AT A RADIUS OF 10'
2. PLACEMENT OF ROCK WILL BE FIELD DIRECTED BASE ON INDIVIDUAL ROCK CHARACTERISTICS.
3. J-HOOK ROCKS SHALL BE 4-5' DIA. X 2-3' HEIGHT.



ROCK J-HOOK VANE – CROSS SECTION VIEW
N.T.S.



ROCK J-HOOK VANE – PROFILE VIEW
N.T.S.

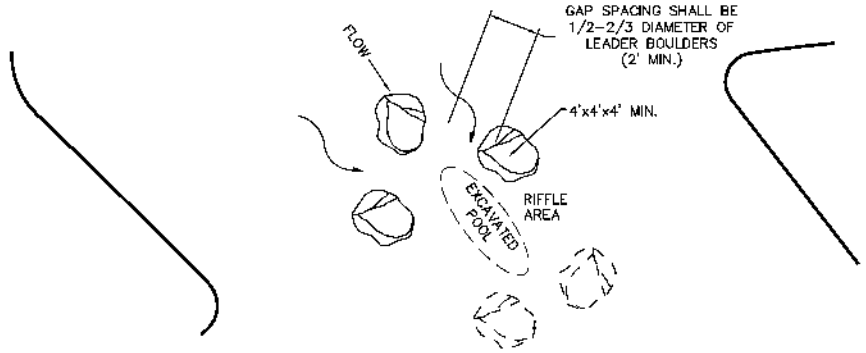


ROCK J-HOOK VANE SPACING
N.T.S.

COLORADO
Department of Transportation

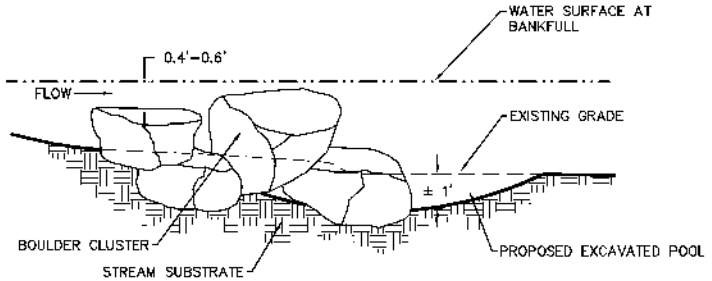
Questions / Comments?

Twin Tunnels Mitigation Project Details



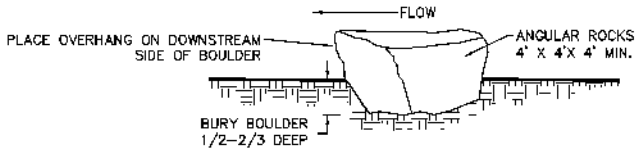
1. BOULDER CLUSTERS SHALL BE PLACED ADJACENT TO THE THALWEG.

BOULDER CLUSTER – PLAN VIEW
N.T.S.



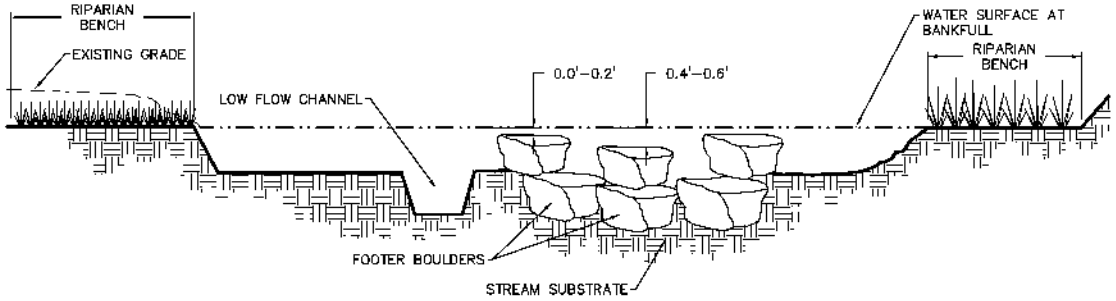
1. BOULDER CLUSTERS SHALL BE OF VARIABLE HEIGHT AND AT THE DISCRETION OF THE ENGINEER (FIELD DIRECTED).

BOULDER CLUSTER – PROFILE
N.T.S.



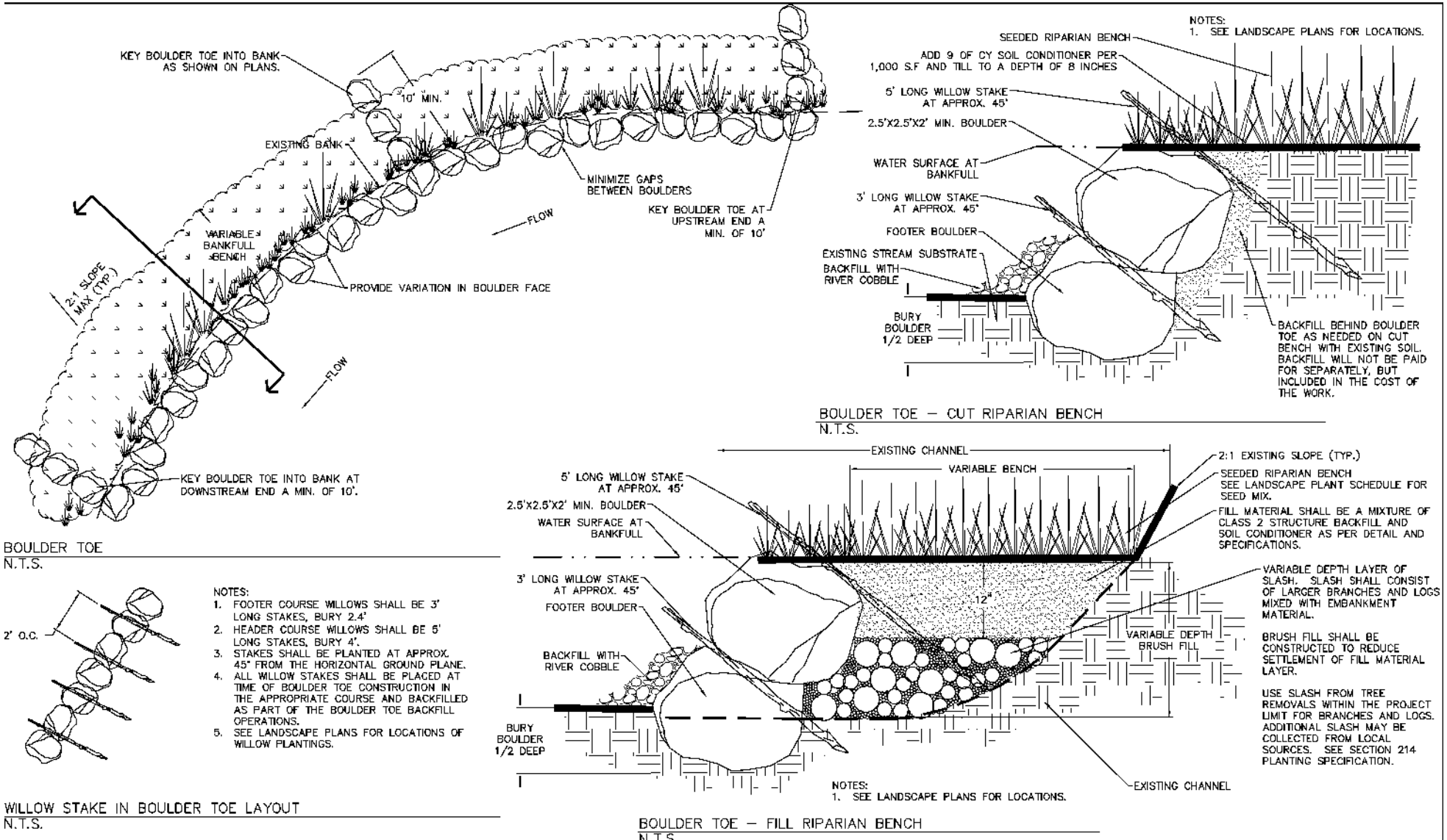
1. SEE PLANS FOR BOULDER PLACEMENT LOCATIONS.
2. BOULDER CLUSTERS MAY CONSIST OF 3–5 ROCK CLUSTERS. (FIELD DIRECTED).
3. PLACEMENT OF ROCK WILL BE FIELD DIRECTED BASED ON INDIVIDUAL ROCK CHARACTERISTICS.

BOULDER PLACEMENT
N.T.S.

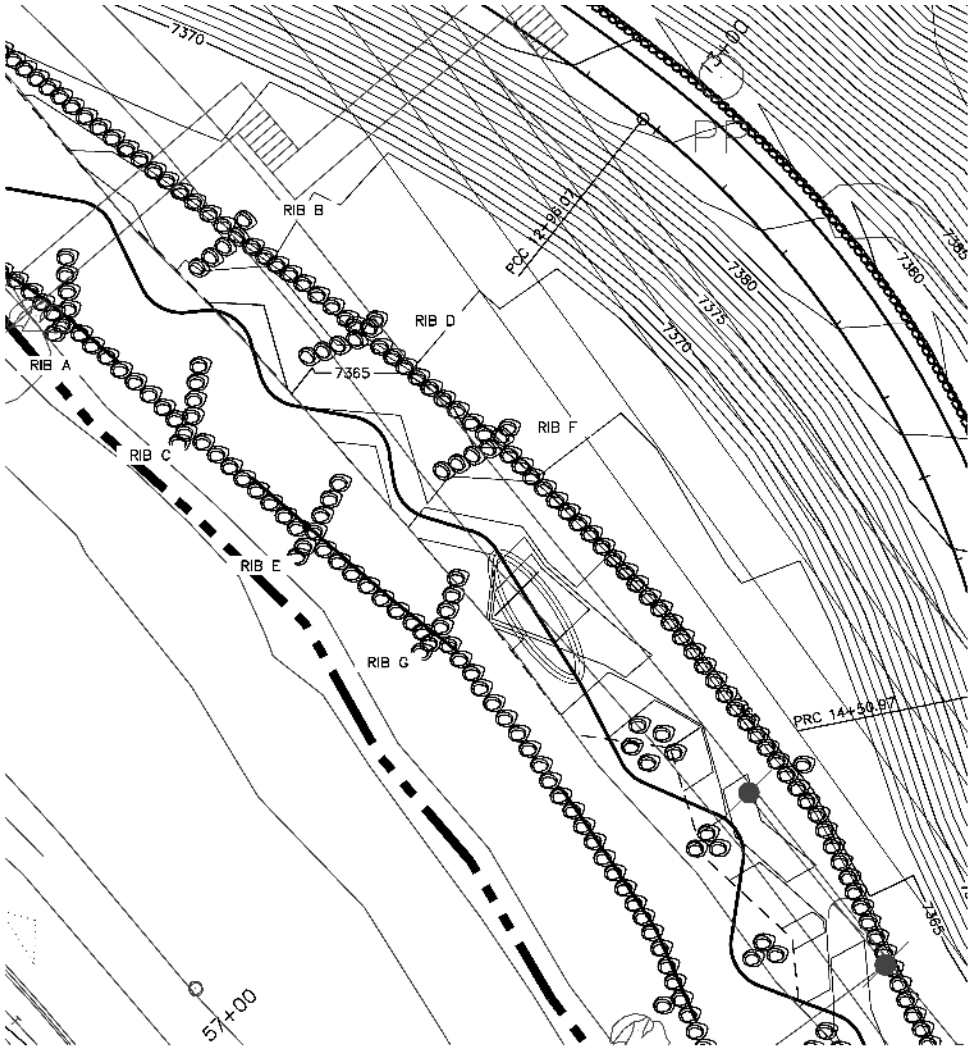


BOULDER CLUSTER – CROSS SECTION
N.T.S.

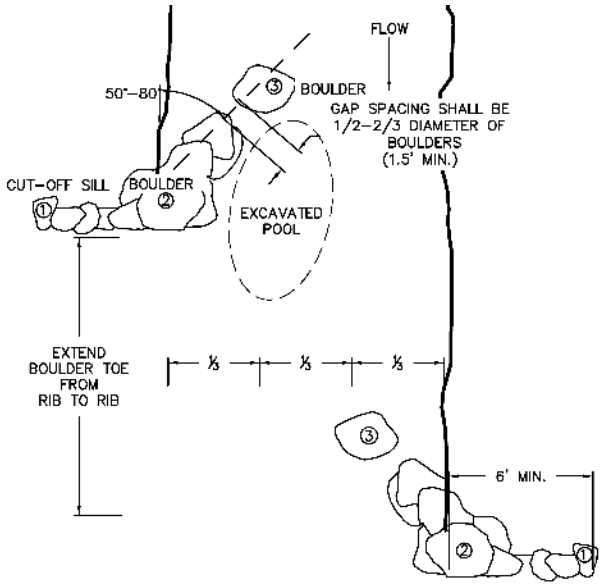
Twin Tunnels Mitigation Project Details



Twin Tunnels Mitigation Project Details



BOULDER RIB – PLAN VIEW
1"=30'-0"

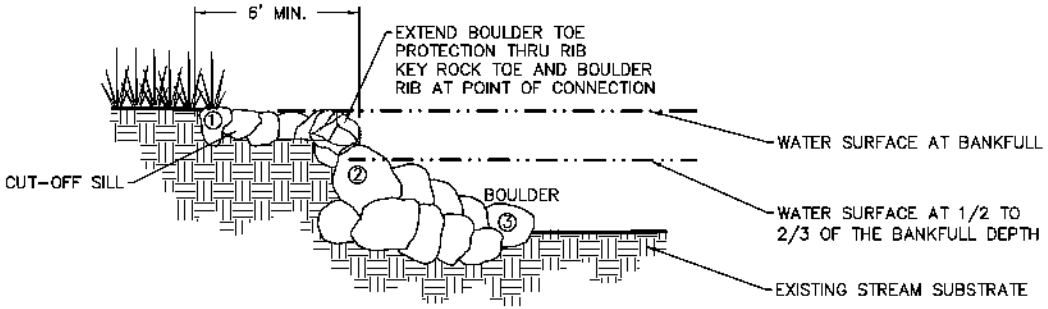


BOULDER RIB (TYP.)
N.T.S.

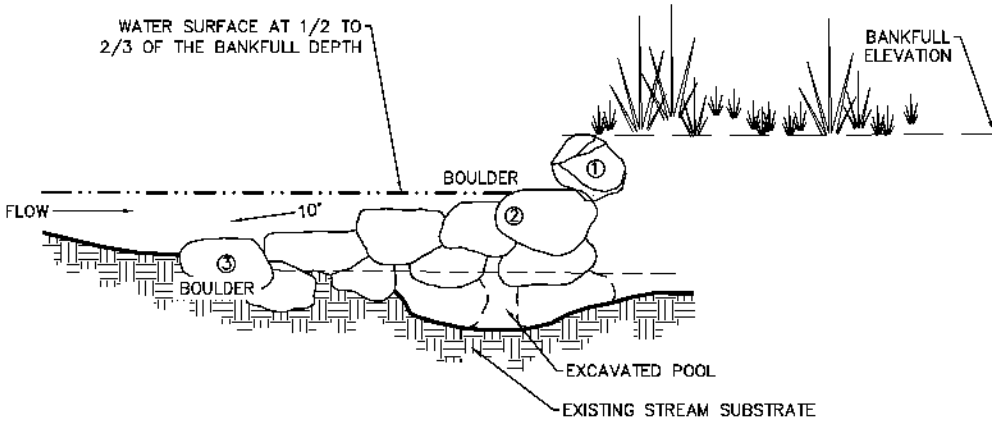
BOULDER RIB INFORMATION

RIB No.	OVERALL LENGTH	ANGLE FROM BANK (DEGREES)	BOULDER① ELEV. BACK ROCK OF TOE		BOULDER② ELEV. ROCK AT BANK		BOULDER③ ELEV. END ROCK IN CHANNEL	
			Elevation	North/East	Elevation	North/East	Elevation	North/East
A	15.8'	50	7368.90	695840.57 1006708.952	7368.08	695845.233 1006715.677	7366.50	695861.072 1006712.170
B	13.4'	78.5	7368.50	695896.657 1006752.182	7367.21	695864.206 1006750.694	7365.87	695855.458 1006740.505
C	15.5'	57	7367.80	6958163.396 1006736.557	7366.97	695821.277 1006740.415	7365.42	695836.609 1006742.623
D	15.8'	58.5	7367.40	695846.585 1006783.067	7366.55	695841.335 1006780.050	7364.97	695836.106 1006765.164
E	14.4'	74.5	7366.90	695792.545 1006764.206	7365.94	695768.207 1006768.207	7364.50	695810.022 1006774.440
F	15.3'	66.5	7366.30	695821.887 1006885.584	7365.53	695816.773 1006809.316	7364.00	695809.910 1006795.665
G	15.4'	60.5	7365.90	695769.124 1006792.116	7365.04	695773.588 1006796.174	7363.50	695788.190 1006801.213

Twin Tunnels Mitigation Project Details



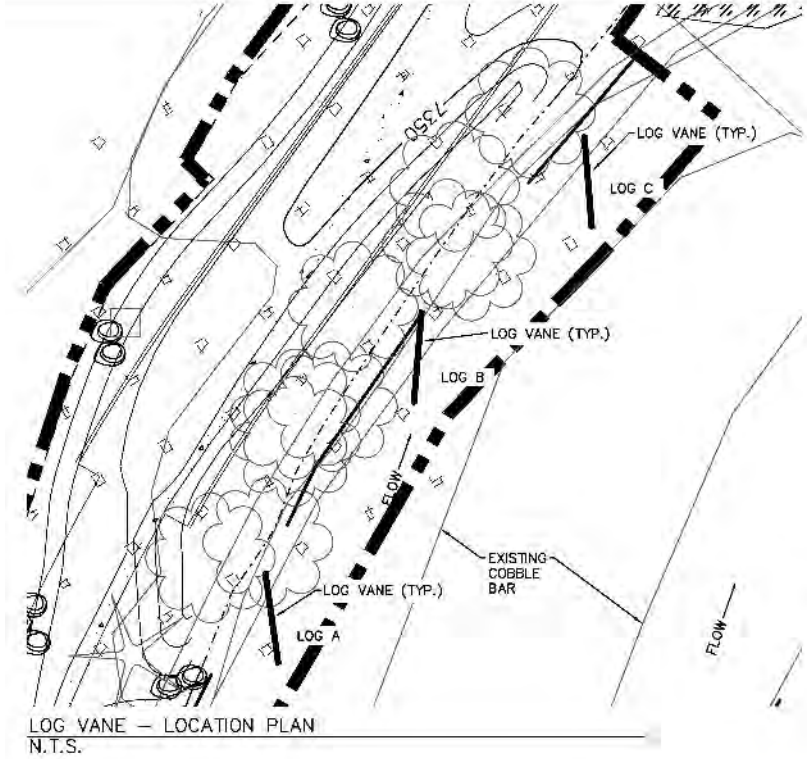
BOULDER RIB – CROSS SECTION
N.T.S.



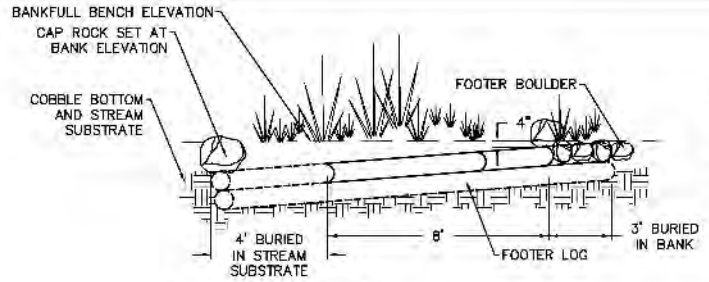
BOULDER RIB – PROFILE VIEW
N.T.S.

- EACH BOULDER PLACED INTO THE ACTIVE CHANNEL MOVING OUT FROM THE BANK SHOULD BE SET AT A LOWER ELEVATION USING A SLOPE OF 10%
- GAPS BETWEEN BOULDERS SHOULD BE ½ TO ⅔ OF THE BOULDER DIAMETER
- RIBS SHOULD ALTERNATE FROM ONE SIDE OF THE CHANNEL TO THE OTHER AT A SPACING OF 0.5 BANKFULL WIDTHS RESULTING IN INCREASED SINUOSITY.
- BOULDER SHALL BE KEYED INTO THE BANK
- MINIMUM BOULDER SIZE SHALL BE APPROXIMATELY 3'X3'X4'
- PLACEMENT OF ROCK WILL BE FIELD DIRECTED BASED ON INDIVIDUAL ROCK CHARACTERISTICS

Twin Tunnels Mitigation Project Details

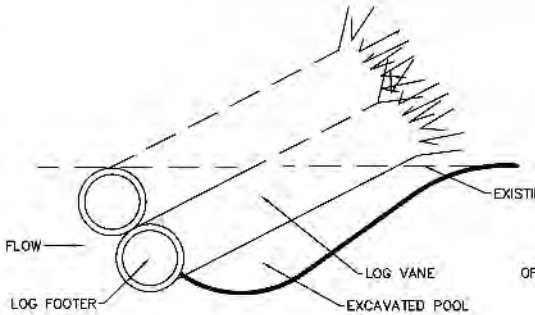


LOG VANE – LOCATION PLAN
N.T.S.

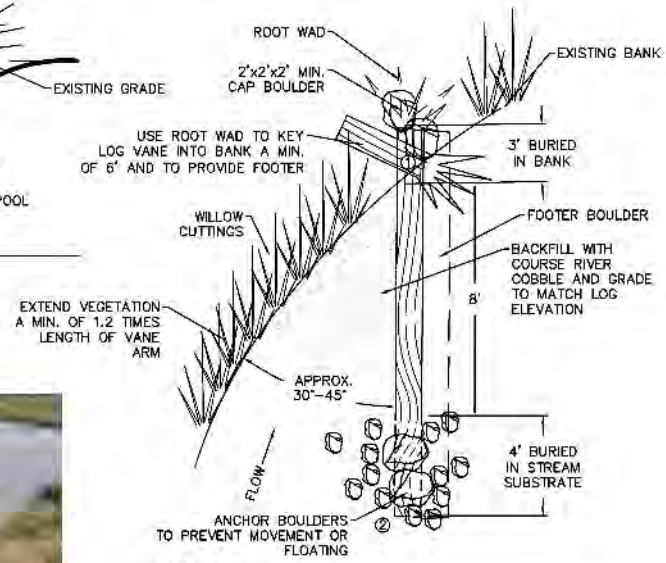


LOG VANE – ELEVATION
N.T.S.

- LOGS SHALL BE 12" DIA. MIN.
- ROOT WAD SHALL BE COVERED IN BANK BY CAP ROCKS.
- LOGS SHALL BE DE-LIMBED AND FREE OF BRANCHES.
- ELEVATIONS SHALL BE DETERMINED IN THE FIELD BASED ON EXISTING CHANNEL ELEVATIONS.
- FISH SPAWNING AREAS SHALL BE FLAGGED BEFORE CONSTRUCTION BEGINS AND WILL BE A NON-DISTURBANCE ZONE.
- LOG VANE LOCATIONS MAY BE ADJUSTED OR ELIMINATED IN THE FIELD TO ACCOUNT FOR FISH SPAWNING AREAS AND BEDROCK CONDITIONS AT THE DISCRETION OF THE ENGINEER (FIELD DIRECTED).



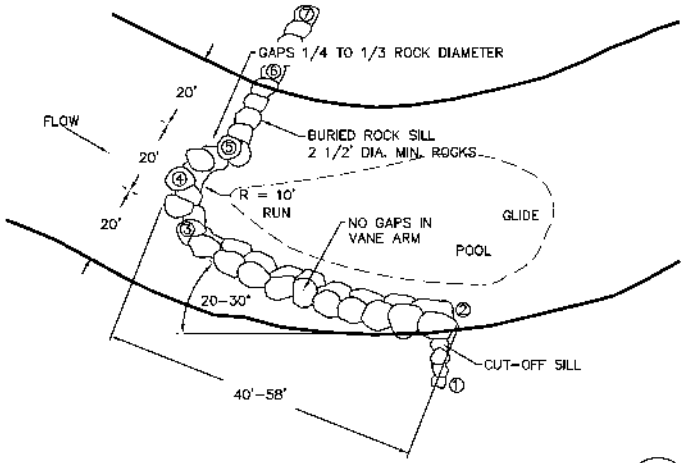
LOG VANE – PROFILE
N.T.S.



LOG VANE – PLAN
N.T.S.

LOG VANE No.	LOG LENGTH	ANGLE FROM BANK	LOG	
			Elevation	North/East
A	15	35 Deg.	① 696062.616 ② 696047.665	1007544.651 1007593.869
B	15	30 Deg.	① 696034.726 ② 696019.779	1007566.751 1007565.488
C	15	45 Deg.	① 695993.056 ② 695978.206	1007541.788 1007543.905

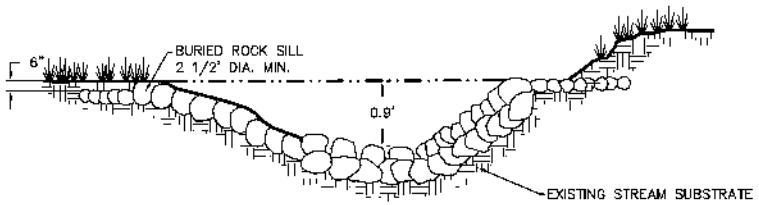
Twin Tunnels Mitigation Project Details



ROCK J-HOOK VANE – PLAN VIEW
N.T.S.

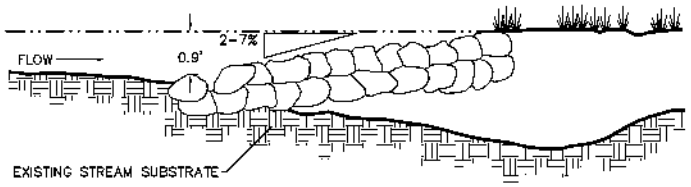
X
XX

NOTES:
1. J-HOOK POINTS 3, 4 AND 5 SHALL BE PLACED AT A RADIUS OF 10'
2. PLACEMENT OF ROCK WILL BE FIELD DIRECTED BASE ON INDIVIDUAL ROCK CHARACTERISTICS.
3. J-HOOK ROCKS SHALL BE 4-5' DIA. X 2-3' HEIGHT.



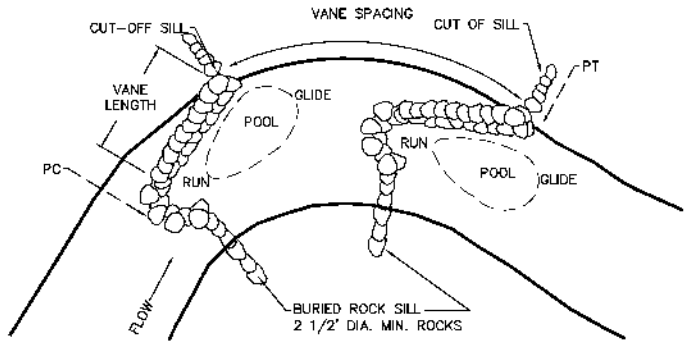
ROCK J-HOOK VANE – CROSS SECTION VIEW
N.T.S.

X
XX



ROCK J-HOOK VANE – PROFILE VIEW
N.T.S.

X
XX



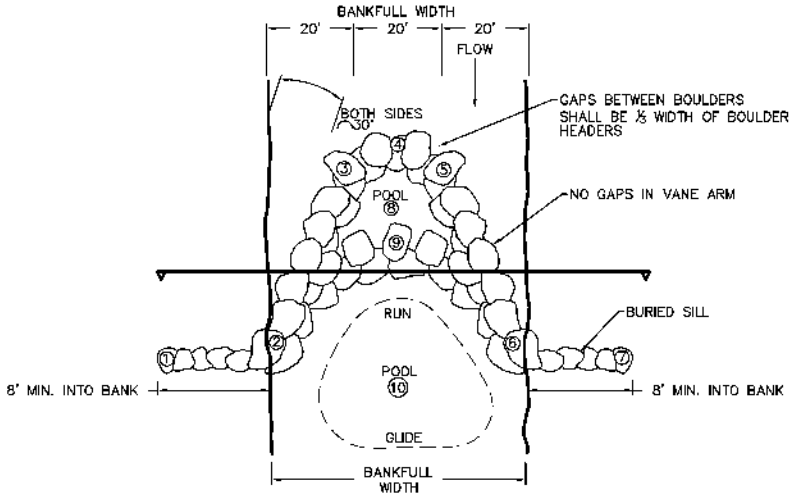
ROCK J-HOOK VANE SPACING
N.T.S.

X
XX

J-HOOK INFORMATION

J-HOOK No.	VANE ARM LENGTH	ANGLE FROM BANK	BOULDER 1 Elevation	BOULDER 1 North/East	BOULDER 2 Elevation	BOULDER 2 North/East	BOULDER 3 Elevation	BOULDER 3 North/East	BOULDER 4 Elevation	BOULDER 4 North/East
				695342.984		695346.297		695375.712		695391.434
1	40	30 Degrees	7360.0	1007104.201	7360.0	1007106.018	7359.9	1007092.443	7359.4	1007093.068
			BOULDER 5 Elevation	BOULDER 5 North/East	BOULDER 6 Elevation	BOULDER 6 North/East	BOULDER 7 Elevation	BOULDER 7 North/East		
				695391.701		695406.642		695419.512		
			7359.9	1007106.709	7360.1	1007117.410	7360.3	1007124.709		
			BOULDER 1 Elevation	BOULDER 1 North/East	BOULDER 2 Elevation	BOULDER 2 North/East	BOULDER 3 Elevation	BOULDER 3 North/East	BOULDER 4 Elevation	BOULDER 4 North/East
				695389.223		695390.757		695376.565		695379.852
2	40	30 Degrees	7355.0	1007473.715	7355.0	1007470.338	7354.6	1007438.944	7354.1	1007425.903
			BOULDER 5 Elevation	BOULDER 5 North/East	BOULDER 6 Elevation	BOULDER 6 North/East	BOULDER 7 Elevation	BOULDER 7 North/East		
				695391.849		695414.856		695442.622		
			7354.6	1007426.432	7356.0	1007409.482	7358.5	1007389.967		

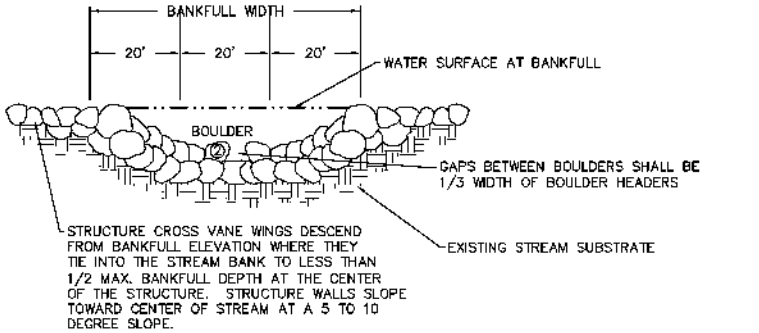
Twin Tunnels Mitigation Project Details



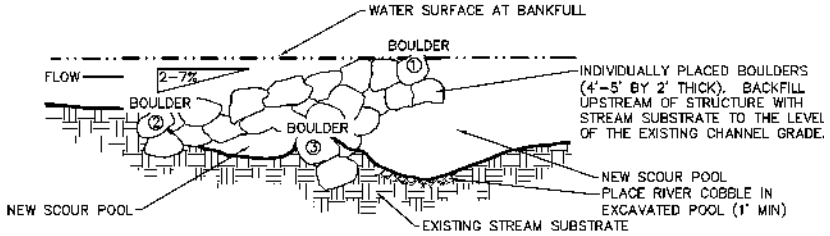
INDIVIDUALLY PLACED FOOTER ROCKS 4' TO 5' BY 2' THICK (MIN. TWO ROWS OF FOOTER ROCKS PLACED TIGHTLY TOGETHER WITH INTERSTITIAL SPACES FILLED WITH COBBLE AND GRAVEL).

CROSS VANE – PLAN VIEW
N.T.S.

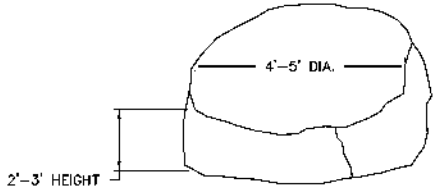
POINT	Northing	Easting	Elevation
1	695752.253	1007484.138	7349.0
2	695751.960	1007492.149	7349.0
3	695699.272	10047509.4	7348.0
4	695695.573	1007518.726	7347.9
5	695696.538	1007528.212	7348.0
6	695749.985	1007551.516	7349.0
7	695749.588	1007559.564	7349.0
8	695701.581	1007520.927	7347.0
9	695707.465	1007520.152	7347.5
10	695717.802	1007520.397	7345.0



CROSS VANE – CROSS SECTION
N.T.S.



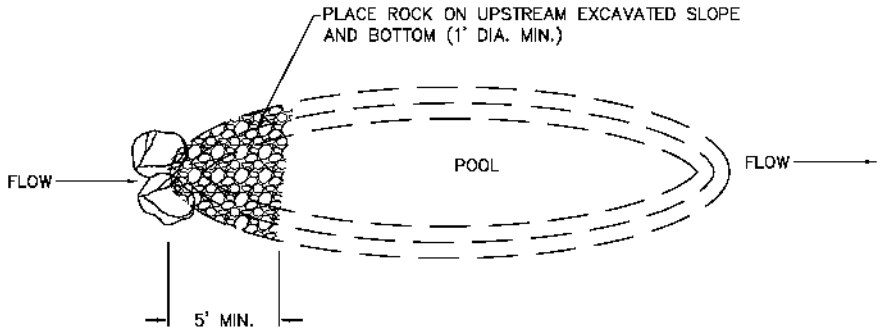
CROSS VANE – PROFILE
N.T.S.



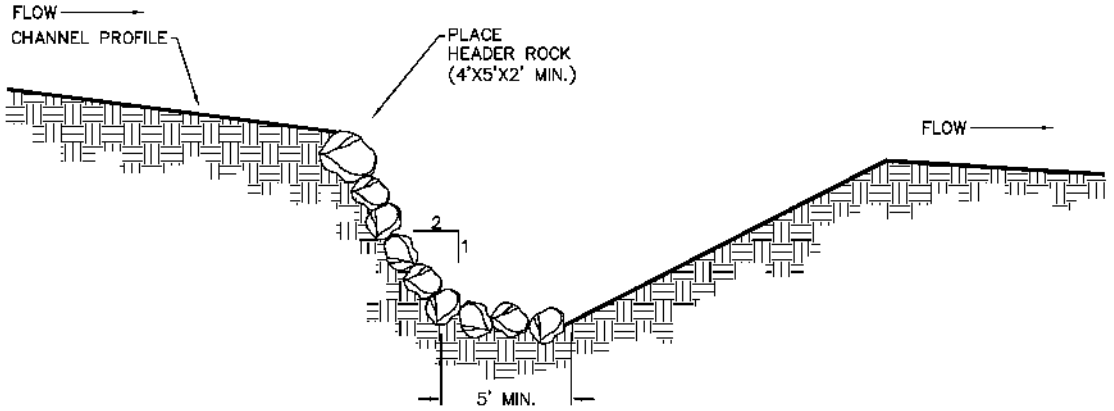
PLACEMENT OF ROCK WILL BE FIELD DIRECTED BASED ON INDIVIDUAL ROCK CHARACTERISTICS.

TYPICAL BOULDER HEADER/FOOTER
N.T.S.

Twin Tunnels Mitigation Project Details



TYPICAL POOL PLAN VIEW
N.T.S.



NOTE:
1. POOL ARMORING IS TO BE USED ONLY UNDER FIELD DIRECTION.

TYPICAL POOL PROFILE VIEW
N.T.S.